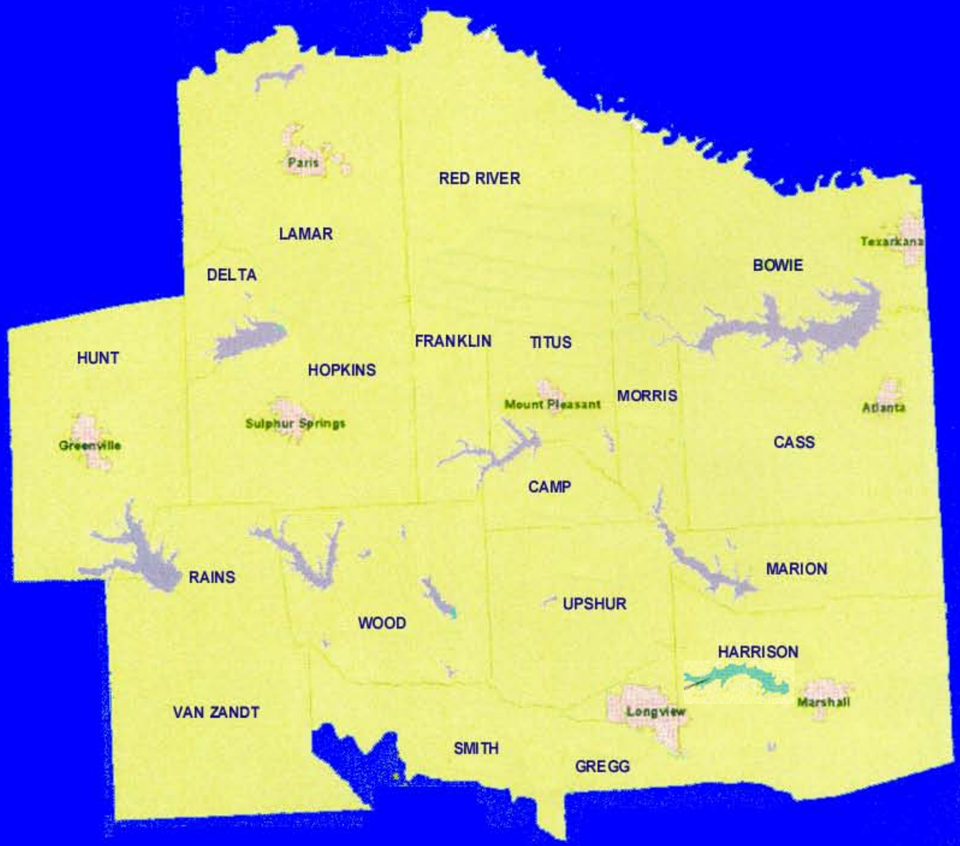
Adopted Water Plan

Prepared for

The North East Texas Regional Water Planning Group - Region D



Prepared by

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NORTH EAST TEXAS REGIONAL WATER PLANNING GROUP
DECEMBER 2000

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North East Texas Regional Water Plan
Executive Summary

The North East Texas Regional Water Planning Group (RWPG) represents the North East Texas Water Planning Area (here after referred to as the North East Texas Region). This region is made up of all or part of 19 counties in North East Texas (See Figure 1.1), including Bowie, Camp, Cass, Delta, Franklin, Gregg, Harrison, Hopkins, Hunt, Lamar, Marion, Morris, Rains, Red River, Smith, Titus, Upshur, Van Zandt and Wood. This RWPG includes representatives of twelve key public interest groups; in addition, each county has a representative. The administrative agent for the group is the Northeast Texas Municipal Water District, located in Hughes Springs, Texas.

The ultimate goal of the State Water Plan is to identify those policies and actions that may be needed to meet Texas' near- and long-term water needs based on a reasonable projected use of water, affordable water supply availability, and conservation of the state's natural resources.

The Regional Water Planning Groups have been charged with addressing the needs of all water users and suppliers within their respective regions. Groups are to consider socioeconomic, hydrological, environmental, legal and institutional aspects of the region when developing the regional water plan. Specifically, the groups are to address three major goals. These goals include:

- Determine ways to conserve water supplies
- Determine how to meet future water supply needs
- Determine strategies to respond to future droughts in the planning area

This summary provides an overview of the seven chapters of the Adopted Regional Water Plan for the North East Texas Region.

Chapter 1
Description of the Region
Summary

The Planning Process

The TWDB has developed a set of 7 tasks, which the regional groups are to accomplish in the regional water plan. This report addresses these tasks in the following manner:

Chapter 1 involves preparing a description of the planning region including the region's physical characteristics, demographics and economics. Other information included in this description are the sources of surface and ground water, major water suppliers and demand centers, current water uses, and water quality conditions. Finally, an initial assessment of the region's preparations for drought is discussed, as well as the region's agricultural and natural resources and potential threats to those resources.

Chapter 2 addresses population and water demand projections. Chapter 2 is divided into four subtasks. Through these subtasks, Chapter 2 discusses the following:

1) Population projections and water demand projections for each decade from 2000 to 2050 by city, county, and river basin for the municipal (urban and rural), manufacturing, irrigation, steam electric power generation, mining, and livestock watering use categories.

2) Population projections prepared by various government agencies compared to those of the TWDB.

3) Identification of the need for adjustments in TWDB population and water use projections based on water use data and water utility connection records, as well as historical growth patterns.

4) Water use demands on all 13 major water providers throughout the planning period.

Much of the information in this chapter is in the form of tables.

Chapter 3 is an evaluation of existing water supplies. This chapter discusses water supplies estimated to be currently available within or to the North East Texas Region under drought of record hydrologic conditions. These include surface supplies and groundwater supplies from major and minor aquifers in the region. This information is presented by city, county, river basin, and for categories of water use including municipal, manufacturing, irrigation, steam electric power generation, mining, and livestock watering.

Chapter 4 identifies areas of future water supply shortage and surplus by water use category for each decade from 2000 to 2050. Future water supply needs in adjacent regions (C and I) that could be supplied from the North East Texas Region are included in this analysis.

Chapter 5 consists of an overview of potentially feasible water management strategies and identification of specific strategies to meet the water supply needs identified in Chapter 4. The strategies are presented for each water user group; technical support for each strategy is presented in an appendix.

Chapter 6 presents policy recommendations on reservoir sites, groundwater, potential shifting of small groundwater public drinking water systems to surface water supplies, issues relating to the regional water planning process itself and a statement on ecologically unique stream segments.

Chapter 7 describes the public participation process, facilitation of the plan adoption and plan implementation issues. This chapter will includes RWPG responses to all public comments received during the public hearings on the Initially Prepared Regional Water Plan.

Physical Description of the Region

The North East Texas Region is located in the northeast corner of Texas. It is bordered on the east by the Texas/Louisiana/Arkansas border and on the north by the Texas/Oklahoma/Arkansas border. The western boundary of the region is approximately 110 miles west of the eastern edge of Texas, and the southern boundary is located approximately 100 miles south of the northern boundary. The region spans approximately 10,500 square miles, (refer to Figure 1.1).

Regional Entities

The North East Texas Region includes all or a part of the following counties:

Bowie County	Camp County	Cass County
Delta County	Franklin County	Gregg County
Harrison County	Hopkins County	Hunt County
Lamar County	Marion County	Morris County
Rains County	Red River County	Smith County (partial)
Titus County	Upshur County	Van Zandt County
Wood County		

Natural Resources

Soils within the North East Texas Region are good for crop production and cattle grazing. In early Texas history, the soils in the Blackland Prairies Belt were considered well suited for row-crop farming, and farmers, realizing the potential of the area, brought their families there to work the land. Soils in the Piney Woods support fruit crops, especially peaches, blueberries and strawberries. The Piney Woods is also abundant in timber and supports a large timber industry. Livestock is another important economic resource in Northeast Texas and regional soils support sufficient vegetation for grazing. Cattle in Northeast Texas are raised for stocker operations, cow-calf operations, beef production and dairies. Northeast Texas is home to major poultry processing plants, and many farmers raise poultry for eggs and broilers. Finally, hogs and horses are significant in some counties, but are raised less extensively region wide.

Timber is the second most important agricultural crop in Texas, and the most important timber producing area is in the Piney Woods of East Texas. Counties within the region with significant timber production include Bowie, Camp, Cass, Franklin, Gregg, Harrison, Marion, Morris, Red River, Smith, Titus, and Wood (See Figure 1.8). Of these counties, only Franklin, Titus, and Bowie produce more cubic feet of hardwoods than pine. Non-industrial parties own approximately 60% of timber production areas in the North East Texas Region, with industrial interests owning the remaining 40%.

Types of business and industry in the region vary from county to county, depending on location and natural resources present. For example, Cass County has paper mills and sawmills because of the abundance of timber in the area. Rains, Titus, and Gregg counties' economies are oil-based due to extensive oil resources. Hunt County is home to Texas A&M University - Commerce, and therefore has a percentage of its economic base in education. Hunt County is also located near the Dallas Metroplex, and many of its residents are employed there. While there are differences in economic base within the counties, there are also similarities. Government employment, tourism, manufacturing and agribusiness are present in almost every county within the region.

Socioeconomic Characteristics of the Region

Historical and Current Population

Population in the North East Texas Region has both increased and declined in the past 100 years due to economic (primarily agricultural) change. Because much of the economy in North East Texas has historically been based on agriculture, many large on-farm families lived in the area until the 1930's. During the depression years, many farmers had to look for work in the cities, and high-yield cotton-producing farms, as well as other types of farms, ceased production. Beginning in the 1950's, the region began to see a resurgence, and has been growing steadily since. Booms in the oil, timber and tourism industries brought people back to North East Texas in the 1970's and 1980's, and the 1990's have seen an increase in persons coming to North East Texas to retire on the area's lakes.

Population counts provided by the United States census show that most of the counties had growth of over 25 percent from 1960 to 1990. Several counties, including Rains, Smith, and Van Zandt, experienced growth of over 75 percent. The region as a whole grew 48 percent from 1960 to 1990, compared to a 77 percent growth in Texas and a 39 percent growth in the United States.

Demographics

The North East Texas Region is largely rural. Most towns within the region have populations of less than 10,000, and there are many small, unincorporated areas within counties. Cities with populations over 10,000 are listed in Table 1.8

Table 1.8 Cities with 1998 Populations Over 10,000 North East Texas Region

City	1998 Estimated Population
Greenville	25,238
Kilgore	*8,748
Longview	74,184
Marshall	25,066
Mount Pleasant	13,595
Paris	26,241
Sulphur Springs	15,160
Texarkana	42,247

Source: State Data Center
*The city of Kilgore is in Region D and I. This number represents Region D portion

Economic Activity

The North East Texas Region's main economic base is agribusiness. Crops are varied, and include vegetables, fruits, and grains. Cattle and poultry production are important – cattle for dairies and cow-calf operations, and poultry for eggs and fryers. Tourism is a growth industry in the region with tourists visiting the region from all over the country. The North East Texas Region boasts many museums, parks, lakes and other places of interest, as well as many annual fairs and festivals. In the eastern half of the region, the timber, oil and gas industries are important, as is mining. As one travels closer to the Dallas-Ft. Worth Metroplex, many residents of the region are employed there. Major corporate employers in the region include Campbell Soup, International Paper, Raytheon E-Systems, Kimberly Clark, Pilgrim's Pride and Rubbermaid. Other large employers include the Lowe's Distribution Center, Target Distribution Center, Neiman Marcus Headquarters, and Wal-Mart Distribution Center. Military bases in the region include Camp Maxey, the Lone Star Army Ammunition Plant, and the Red River Army Depot.

Descriptions of Water Supplies and Water Providers in the Region

Groundwater

The TWDB has identified two major aquifers and four minor aquifers in the North East Texas 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.

The major aquifers are the:

Carrizo-Wilcox
Trinity

Minor aquifers are the:

Blossom
Nacatoch
Queen City
Woodbine

Surface Water Supplies

The North East Texas Region contains portions of the Red, Sulphur, Cypress Creek and the Sabine River Basins. A small corner of Van Zandt County lies in the Neches River Basin, but the entire county has been considered part of the region for planning purposes. Likewise, a small corner of Hunt County is in the Trinity Basin.

Groundwater is limited in quality and quantity in large portions of the North East Texas Region, and, consequently a majority of the region relies on surface water supplies. For example, in the Sulphur Basin, 91 percent of the water used is surface water; 89 percent of water used in the Cypress Creek Basin is surface water, and in the Sabine River Basin, some 81 percent of the need is met by surface water. In the portion of the Red River Basin in the region, 88 percent of the water supply used is surface water.

Table 1.11 Capacity of Major Reservoirs North East Texas Region

	Original Capacity at Conservation Pool – ac.ft.	Date	Revised Capacity at Conservation Pool – ac.ft.	Date	Percent Reduction
Lake Bob Sandlin	213,350	1978	204,678	1998	4.0
Lake Cherokee	49,295	1948	41,506	1996	15.8
Lake Cypress Springs	72,800	1971	67,690	1999	7.0
Lake Monticello	40,100	1972	34,470	1998	14.0
Lake O' The Pines	254,900	1958	241,081	1998	5.4
Lake Tawakoni	936,200	1960	888,140	1997	5.1
Wright Patman Lake	145,300	1956	110,900	1997	23.7

Surface water is currently imported to, and exported from, the North East Texas Region. In the Red River Basin, Texarkana Water Utilities imports from Arkansas, and exports to the city of Texarkana, Arkansas. In the Sulphur Basin, Cooper Lake serves as a supply for the city of Irving and the North Texas Municipal Water District, both in Region C. Commerce has leased its water from Cooper Reservoir to Upper Trinity (Region C) for the next 50 years. In the Sabine Basin, Lake Tawakoni is a partial supply for Dallas Water Utilities, and that entity has rights to water in Lake Fork Reservoir not yet exercised. Several entities in Hunt County import water from Region C via the North Texas Municipal Water District. These are further identified in Table 1.12.

Major Water Providers

TWDB rules for SB 1 regional water planning require each RWPG to identify and designate “major water providers.” The intent of these requirements is to ensure that there is an adequate future supply of water for each entity that receives all or a significant portion of its current water supply from another entity. This requires an analysis of projected water demands and currently available water supplies for the primary supplier, each of its wholesale customers, and all of the suppliers in the aggregate as a “system.” For example, a city that serves both retail customers within its corporate limits as well as other nearby public water systems would need to have a supply source(s) that is adequate for the combined total of future retail water sales and future wholesale water sales. If there is a “system” deficit currently or in the future, then recommendations are to be included in the regional water plan with regard to strategies for meeting the “system” deficit.

Based upon this explanation, the North East Texas RWPG selected 13 major water providers, as follows:

Wholesale Water Suppliers	Municipal Water Suppliers
Cherokee Water Company	City of Greenville
Franklin County Water District	City of Longview
Northeast Texas Municipal Water District	City of Marshall
Sabine River Authority	City of Mt. Pleasant
Sulphur River Basin Authority	City of Paris
Titus County Freshwater Supply	City of Sulphur Springs
District No. 1	City of Texarkana

Description of Water Demand in the Region

Historical and Current Water Use

Historical and current uses in the North East Texas Region include municipal, manufacturing, recreation, irrigation, mining, power generation and livestock. According to Figure 1.13, manufacturing is the predominant use category, exceeding all others combined. Mining and irrigation are relatively insignificant water consumers in the North East Texas Region, and in fact, Table 1.15 indicates that mining use has declined by about 9 percent since 1980. While still a relatively small category, livestock watering use has increased by 40 percent since 1980. In the North East Texas Region, livestock includes poultry, and some estimates indicate further substantial increases in the poultry industry usage within the next 10 years.

The North East Texas Region utilizes both ground and surface water supplies, as shown in Table 1.16. In 1997, about 12 percent of the total water use in the region was ground water – a figure which has remained relatively constant since 1980. The bulk of this ground water – 42 percent - is used in the four counties of Smith, Upshur, Van Zandt, and Wood, and is drawn from the Queen City and Carrizo-Wilcox Aquifers.

In 1997, total reported usage in the North East Texas Region – both ground and surface – was 430,277 acre feet, distributed as follows:

Category	Usage	Percent of Total
Municipal	100,656	23.4
Manufacturing	247,064	57.4
Power	33,206	7.7
Mining	8,733	2.0
Irrigation	16,132	3.7
Livestock	24,486	5.7

A comparison of data from 1980 shows insignificant changes in the percentages used by each class.

By 2030, projections developed in this plan indicate usage will reach 676,002 acre-feet, a 36 percent increase from 1997. The usage will be distributed as follows:

Municipal	135,493	20.0%
Manufacturing	392,864	58.1%
Power	82,033	12.1%
Mining	22,964	3.4%
Irrigation	12,637	1.9%
Livestock	30,006	4.4%

Major Demand Centers

Major water demand centers include:

City	1998 Population	1998 Use
Longview	74,184	4,309 MG/YR
Texarkana, Texas	42,247	1,836 MG/YR
Paris	26,241	4,257 MG/YR
Greenville	25,238	1,430 MG/YR
Marshall	25,066	1,060 MG/YR

Recreational Demands

Recreational demands for water revolve principally around the region's reservoirs. Recreational activities include fishing, boating, swimming, water sports, picnicking, camping, wildlife observation, and others. Waterside parks attract thousands of visitors each year. For example:

Lake	1998 Visitors (Corps of Engineers facilities only)
Wright Patman	837,800
Pat Mayse	183,913
Lake O' the Pines	901,400
Cooper Lake	27,300

Recreational use of the region's reservoirs is coincidental with other purposes, including flood control and water supply. Conflicts arise when the designated use for flood control keeps water elevations too high for recreation or, in the opposite, when drought conditions and water supply demands leave boathouses and marinas dry.

Navigation

The lack of perennial streams limits the viability of navigation projects in North East Texas. However, two potential projects are noted. One project considered in the North East Texas Region is the "Red River Waterway Project – Shreveport to Daingerfield Reach." The Shreveport to Daingerfield navigation channel, with accompanying locks, would be an extension of the Red River Waterway Project, Mississippi River to Shreveport, Louisiana, which is in operation. A channel to Daingerfield was authorized by Congress in 1968. As envisioned, it would begin at the Red River and would be routed through Twelvemile Bayou, Caddo Lake, Cypress Bayou, and Lake O' the Pines. However, the Corps conducted an updated review of this project in the early 1990's, which concluded that the project was not currently economically feasible and could result in significant environmental impacts for which mitigation was not considered to be practicable.

A second navigation project under study is the Southwest Arkansas Navigation Study. This joint project between the U.S. Army Corps of Engineers and the Arkansas Red River Commission is studying the feasibility of making the Red River navigable from Shreveport, Louisiana, through southwest Arkansas to near Texarkana, Texas. The Red River is already navigable below Shreveport-Bossier City, through the construction of five locks and dams, and various channel modifications. The study is currently underway, with expected completion in 2004.

While transportation cost savings are the primary factor in the feasibility of a navigation project, there can often be associated benefits, including such things as hydropower, bank stabilization, recreation, flood control, water supply, and fish and wildlife habitat. From a water planning perspective, navigation can provide supply, as well as demands. Pools associated with the various locks and dams may be beneficial for water supply. On the other hand, low flow demands may be placed upon contributory streams to maintain navigable levels. Lake O' the Pines, for example, is obligated to supply up to 3600 acre-feet of water per year in conjunction with navigability of the Red River below Shreveport. Extension of this project northward would likely require similar releases from the Sulphur Basin.

Environmental Water Demands

Environmental water demands in the region include the need for water and associated releases necessary to support migratory water fowl, threatened and endangered species, and populations of sport and commercial fish. Flows must remain sufficient to assimilate waste water discharges or there will be higher costs associated with waste water treatment and nonpoint discharge regulations. Periodic “flushing” events should be allowed for channel maintenance, and low flow conditions must consider drought periods as well as average periods.

Existing Water Planning in the Region

Initial Assessment for Drought Preparedness

The survey of individual systems conducted as a part of this planning effort provided considerable insight into current preparations for drought conditions. For a number of years loans in excess of $500,000 from the TWDB have been accompanied by a requirement that the water supply entity develop a water conservation and drought contingency plan. The most recent legislative session mandated that all water supply systems that serve over 3,300 meters develop drought contingency plans by September 1, 1999, and that smaller systems comply with the same requirement in 2000. Despite these provisions, the RWPG survey of 268 individual systems indicated that only seven of these have water conservation plans and only 6 have adopted drought contingency plans. However, it should be recognized that many additional municipalities and districts have developed, or are developing, drought contingency plans as a result of SB-1. Recent droughts in the mid to late 90's resulted in emergency construction by several systems around Lake Tawakoni to lower intake structures to accommodate the critically low level of the lake. Similarly, a number of groundwater systems found that their rated well capacities were not valid for sustained use over periods of several weeks. Recent droughts have been relatively modest in relation to historically significant droughts of the 1950's and 1960's.

In summary, the region as a whole is poorly prepared for a drought of major historical proportions.

Chapter 2
Population Projections and Water Demand Projections
Summary

A key task in the preparation of the water plan for the North East Texas Region is to estimate current and future water demands within the region. In subsequent chapters of this plan, these projections are compared with estimates of currently available water supply to identify the location, extent, and timing of future water shortages.

The following is a summary of regional population and water demand projections for the North East Texas Region:

Table 2.1: Population and Water Demand Projections for the North East Region

Regional Total Projection	2000	2010	2020	2030	2040	2050
Population	**687,105**	**757,522**	**821,294**	**887,169**	**952,818**	**1,017,477**
Water Demand						
Municipal Water Demand (AF)	118,802	124,561	128,928	135,498	141,548	149,108
Manufacturing Water Demand (AF)	355,258	385,363	390,601	392,864	409,173	427,613
Irrigation Water Demand (AF)	12,566	12,734	12,684	12,637	12,471	12,127
Steam Electric Water Demand (AF)	52,432	72,033	74,033	82,033	82,033	89,533
Mining Water Demand (AF)	10,365	24,191	23,470	22,964	21,923	10,220
Livestock Water Demand (AF)	29,671	29,899	29,951	30,006	29,714	29,273
Total Water Demand (AF)	**579,094**	**648,781**	**659,667**	**676,002**	**696,862**	**717,874**

As shown, the population in the North East Texas Region is projected to grow from approximately 690,000 people at present to about 1 million in 2050. This projected population growth is directly responsible for large increases in municipal and manufacturing water demands. The result is a projected increase in total water demand of approximately 140,000 acre-feet per year (about 24%) from the year 2000 to the year 2050.

Water Demand Projections

Annual total water demand for the North East Texas Region is projected to increase by approximately 140,000 acre-feet over the 50-year planning period. This increase in total water demand is due to a projected increase in municipal, manufacturing, and steam electric water demands.

Methodology

As with the population projections, the planning group generated the proposed municipal water demand projections by starting with the state default projections and making updates on the basis of better, more current information. The following procedure describes the methodology used for generating these projections:

Municipal water demand was determined by multiplying the projected per capita municipal use with the projected population. The TWDB data from "Population and Water Use Projections-Region D from TWDB" was used for the projected 2000 daily per capita water use rate. The State Data Center populations and the populations generated by the "Forecast" method were multiplied times the TWDB calculated water use rates. In the case of the Survey data, the total community water use divided by the calculated population determined the proposed per capita daily water use rate.

The regulations, in "Water Conservation Impacts on Per Capita Water Use" issued by TWDB, prescribe a methodology for estimating water use conservation. This method was used to determine the projected per capita daily water conservation for each decade throughout the planning period. The projected daily per capita water use rate was calculated by subtracting the expected conservation from the reported/projected per capita use for the year 2000. The NETRWPG proposed a minimum per capita water use rate of 115 gal/cap/day be used since this appeared to be a reasonably expected minimum for successful communities. The 115 gal/cap/day minimum use selected is the 95% confidence limit of the existing water use rates. Although each community desires to achieve maximum conservation, the historical records indicate communities use more water as they become more affluent and as a steady supply of water is available.

After review by the TWDB, the NETRWPG agreed to use the 115 gal/cap/day as a minimum starting value for the year 2000 water use rate and then apply the conservation rates of 4 gal/cap/decade to this value. In rapidly growing communities, a minimum starting water use rate of 120 gal/cap/day was used and a conservation of 4 gal/cap/decade was applied to this value.

Regional Municipal Water Demand Projections

Annual municipal water demand within the North East Texas Region is projected to increase by about 30,000 acre-feet from the year 2000 to the year 2050. Table 2.4 presents the projected municipal water demand by county for each of the nineteen counties in the North East Texas Region. This table shows that municipal water demand in the North East Texas Region is concentrated in Bowie, Gregg, and Hunt counties.

Table 2-4: Municipal Water Demand Projections by County (in AF/Year)

COUNTY	**1996**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
BOWIE	11,937	15,657	16,128	16,606	17,313	18,005	18,907
CAMP	1,602	1,747	2,048	2,086	2,139	2,191	2,250
CASS	4,248	5,014	5,120	5,201	5,321	5,413	5,530
DELTA	639	926	898	866	838	810	790
FRANKLIN	1,524	2,005	2,216	2,413	2,689	2,830	3,002
GREGG	16,496	21,682	22,487	23,315	24,628	25,874	27,493
HARRISON	8,452	9,877	10,384	10,588	10,976	11,361	11,855
HOPKINS	6,041	5,531	5,835	6,078	6,455	6,782	7,238
HUNT	10,241	13,475	14,394	15,185	16,178	17,127	18,163
LAMAR	7,205	10,609	10,947	11,150	11,607	12,018	12,569
MARION	1,385	1,696	1,737	1,774	1,813	1,854	1,896
MORRIS	1,578	1,937	1,880	1,807	1,746	1,681	1,638
RAINS	1,219	1,374	1,513	1,637	1,787	1,940	2,111
RED RIVER	1,954	2,018	1,941	1,863	1,795	1,744	1,691
SMITH	4,278	3,759	3,992	4,206	4,489	4,786	5,154
TITUS	5,629	4,727	4,994	5,240	5,529	5,816	6,129
UPSHUR	4,530	5,067	5,365	5,354	5,583	5,846	6,001
VAN ZANDT	5,629	6,513	7,179	7,779	8,403	8,946	9,548
WOOD	5,155	5,188	5,503	5,780	6,209	6,524	7,143
TOTAL	**99,742**	**118,802**	**124,561**	**128,928**	**135,498**	**141,548**	**149,108**

*Municipal water demand projections by city, county, and river basin for each of the 19 counties in the North East Texas Region are provided in Appendix A.
Note: Smith County is partial.

Regional Irrigation Water Demand Projections

Annual irrigation water demand for the North East Texas Region is projected to decrease by 439 acre-feet from the year 2000 to the year 2050. Irrigation water demand in the North East Region is most heavily concentrated in Bowie and Lamar counties. A decrease in irrigation demand is projected due to improvements in irrigation efficiency and in some cases, the encroachment of urbanization on irrigable lands. Table 2.8 presents the projected irrigation water demands by county for the North East Region.

Regional Steam Electric Demand Projections

Annual steam electric water demand is projected to increase from 52,432 acre-feet per year in the year 2000 to 89,533 acre-feet per year in the year 2050. The majority of this increase is expected to occur in Red River, Titus, and Wood counties. Table 2.10 presents the projected steam electric water demand by county for each of the 19 counties in the North East Texas Region. Steam electric water demand was not projected for Hopkins County prior to development of these tables. Hopkins County has now been identified as a possible site for a merchant power plant, which if constructed would add additional 7126 acre-feet per year demand beyond that tabulated herein.

Regional Mining Water Demand Projections

Annual mining water demand for the North East Texas Region is projected to double from 2000 to 2010 and then remains relatively constant over the 30 year planning period before decreasing in 2050. Mining water demand represents a very small portion (about 1.4%) of the region's total water demand. Mining demand is largest in Titus County until year 2010 after which Wood County takes the first place. Table 2.12 presents the projected mining water demand by county for each of the counties in the North East Region.

Regional Livestock Water Demand Projections

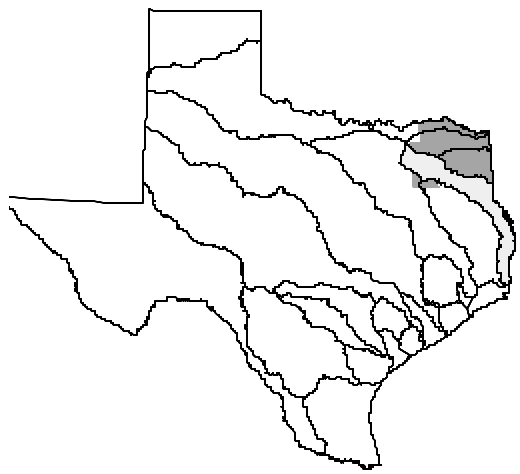
Annual livestock water demand for the North East Texas Region represents about 4% of the total regional water demand. Livestock water demand is projected to remain more or less constant over the 50-year planning period. Livestock water demand is spread relatively evenly over the 19 counties in the region. Table 2.14 presents these projected demands by county for the region.

After the water demand and population numbers were approved by TWDB, new information came to light. This information has not been included in the approved projections but it should be considered in the next plan update. According to this information, the water demand in Titus County is 34,494 acre-ft instead of 29,671 ac-ft in the year 2000, an increase of 4,823 acre-ft. If this increase was included and projected, it would result in an increase of 15,367 acre-ft by 2050. Since these numbers result in an increase of over 50% by year 2050, they should be included in the next plan update.

Chapter 3
Water Supplies of the North East Texas Region
Summary

Sabine River Basin

The Sabine River Basin originates in Collin County, just west of the North East Texas Region, and extends to Sabine Lake in the far southeastern portion of Texas. The total drainage area of the basin is nearly 9,800 square miles. Of this area, approximately 7,400 square miles are in Texas while the remaining 2,400 square miles of drainage area are in Louisiana. Within the North East Texas Region, all or portions of Hunt, Hopkins, Rains, Wood, Upshur, Gregg, Harrison, Smith, and Van Zandt counties are in the Sabine Basin.



The existing surface water supplies in the Sabine Basin include 10 water supply reservoirs and run-of-the-river supplies from the Sabine River. Table 3.2 presents the estimated available water supply for these sources during drought of record conditions by decade.

Table 3.2 - Sabine Basin Surface Water Supplies*

	Supply Available (ac-ft/yr)					
Name of Source	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Greenville City Lakes**	1,200	1,200	1,200	1,200	1,200	1,200
Lake Tawakoni	238,100	229,005	227,118	225,232	223,345	221,459
Lake Fork	188,600	187,776	187,590	187,403	187,217	187,031
Lake Gladewater**	1,679	1,679	1,679	1,679	1,679	1,679
Lake Cherokee**	18,000	18,000	18,000	18,000	18,000	18,000
Lake Quitman***	0	0	0	0	0	0
Lake Holbrook***	0	0	0	0	0	0
Lake Hawkins***	0	0	0	0	0	0
Lake Winnsboro***	0	0	0	0	0	0
Toledo Bend****	0	0	0	0	0	0
Sabine ROR	166,156	166,156	166,156	166,156	166,156	166,156
TOTAL	**613,735**	**603,816**	**601,743**	**599,670**	**597,597**	**595,525**

** Based on criteria described in Section 3.1.*

*** Sedimentation effects on available supply not available.*

**** Firm yields of Lake Quitman, Holbrook, Hawkins, and Winnsboro are 3,710, 3,285, 8,035, 5,760 acre-feet/yr, respectively. No available supply is show since none is permitted and no infrastructure is inplace.*
***** Firm yield for Texas' portion of Toledo Bend is 1,043,300 acre-feet per year, however the NETRWP Group elected to include no supply available due to the lack of infrastructure to import water from the Reservoir to the Region.*

Red River Basin

The Red River Basin originates in eastern New Mexico and extends eastward across north Texas and southern Oklahoma and into Louisiana. Approximately 24,460 square miles of the 48,030 square mile drainage area of the basin are within Texas. Within the North East Texas Region, all or part of Bowie, Red River, and Lamar counties are in the Red River Basin.

The existing surface water supplies in the Red River Basin that are available to the North East Texas Region include Lake Texoma, Pat Mayse Lake, and Lake Crook. Table 3.3 presents the estimated water supply that is available under drought of record conditions for each of these sources by decade.

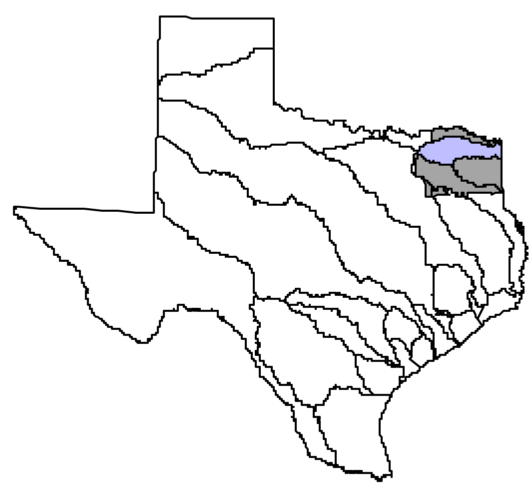
Table 3.3 - Red River Basin Surface Water Supplies*

	Supply Available (ac-ft/yr)					
Name of Source	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Lake Texoma***	0	0	0	0	0	0
Pat Mayse Lake	59,900	59,570	59,200	58,900	58,600	58,300
Lake Crook**	1,000	1,000	1,000	1,000	1,000	1,000
TOTAL	**60,900**	**60,570**	**60,200**	**59,900**	**59,600**	**59,300**

** Based on criteria described in Section 3.1.*
*** Sedimentation effects on available supply not available.*
**** Firm yield in 2000 is 932,950 AF/yr based on estimate from the Region C report entitled, "Task 3 Draft Report - Analysis of Current Water Supply in Region C."*

Sulphur River Basin

The Sulphur River Basin begins in Fannin and Hunt counties and extends eastward to southwest Arkansas where it joins the Red River. Within the North East Texas Region, all or part of Hunt, Delta, Lamar, Hopkins, Franklin, Titus, Red River, Morris, Bowie, and Cass counties are within the Sulphur Basin. The Texas portion of the Sulphur River Basin covers approximately 3,600 square miles.



Due to high average rainfall and runoff, the Sulphur Basin has an abundant supply of surface water. Approximately 91 percent of the water used for all purposes in the basin is from surface water supplies, with groundwater supplying the remainder (Brandes, 1999). There are 29 impoundments in the Sulphur Basin with a normal storage capacity greater than 200 acre-feet. However, five reservoirs account for the majority of current supply in the basin.

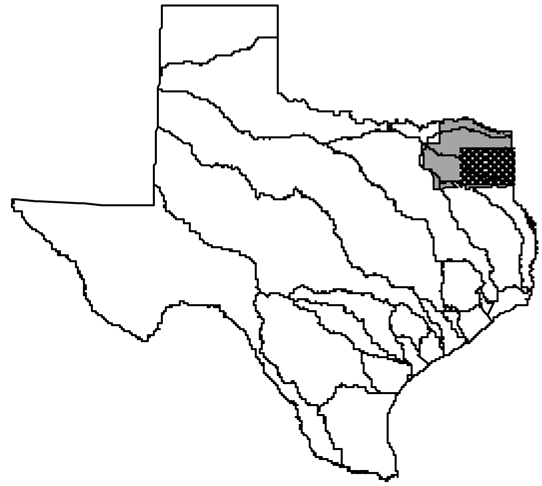


Table 3.4 presents the supply available in the Sulphur Basin during drought of record conditions for each of these sources by decade.

Table 3.4 - Sulphur River Basin Surface Water Supplies*

	Supply Available (ac-ft/yr)					
Name of Source	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Cooper Reservoir***	137,344	136,335	135,326	134,317	133,308	132,298
Lake Wright Patman****	180,000	180,000	180,000	180,000	180,000	180,000
Lake Sulphur Springs**	7,800	7,800	7,800	7,800	7,800	7,800
Big Creek Lake**	1,518	1,518	1,518	1,518	1,518	1,518
River Crest Lake**	10,000	10,000	10,000	10,000	10,000	10,000
Lansford Lake	1,215	1,215	1,215	1,215	1,215	1,215
Sulphur ROR	10,000	10,000	10,000	10,000	10,000	10,000
TOTAL	**347,887**	**346,868**	**345,859**	**344,850**	**343,841**	**342,831**

** Based on criteria described in Section 3.1.*

*** Sedimentation effects on available supply not available.*

**** Firm yield based on estimate from the Region C report entitled, "Task 3 Draft Report - Analysis of Current Water Supply in Region C."*

***** Based on existing water rights permits. A 1973 firm yield estimate for the reservoir was 282,000 AF/yr.*

Cypress Creek Basin

The Cypress Creek Basin originates in Hopkins County and extends eastward to northwest Louisiana, where it flows into the Red River. The Texas portion of Cypress Basin covers approximately 2,800 square miles and includes all or part of Hopkins, Franklin, Wood, Titus, Camp, Upshur, Cass, Gregg, Morris, Marion, and Harrison counties in the North East Texas Region.

According to the 1997 State Water Plan, surface water resources account for approximately 89 percent of the water used in the Cypress Creek Basin, with groundwater supplying the remainder. The Cypress Basin contains nine reservoirs with yields available to the North East Texas Region. Table 3.5 presents estimates of the supply available in the Cypress Basin during drought of record conditions for each of these sources by decade.

Table 3.5 - Cypress River Basin Surface Water Supplies*

	Supply Available (ac-ft/yr)					
Name of Source	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Lake O' the Pines**	130,600	130,600	130,600	130,600	130,600	130,600
Lake Bob Sandlin**	60,500	60,500	60,500	60,500	60,500	60,500
Lake Cypress Springs**	16,200	16,200	16,200	16,200	16,200	16,200
Monticello Lake**	7,700	7,700	7,700	7,700	7,700	7,700
Welsh Reservoir**	18,000	18,000	18,000	18,000	18,000	18,000
Ellison Creek Lake**	22,100	22,100	22,100	22,100	22,100	22,100
Johnson Creek Lake**	6,700	6,700	6,700	6,700	6,700	6,700
Caddo Lake**	10,000	10,000	10,000	10,000	10,000	10,000
Lake Gilmer **	7,470	7,470	7,470	7,470	7,470	7,470
Cypress ROR	84,607	84,607	84,607	84,607	84,607	84,607
TOTAL	**363,877**	**363,877**	**363,877**	**363,877**	**363,877**	**363,877**

** Based on criteria described in Section 3.1.*

*** Sedimentation effects on available supply not available.*

Groundwater Availability

Regionally, water from the Carrizo-Wilcox Aquifer is fresh to slightly saline with quality problems in localized areas. It is difficult to make generalizations about the quality of the water in the Carrizo-Wilcox Aquifer because the quality changes significantly throughout the North East Texas Region. In the outcrop, the water is generally hard yet usually low in dissolved solids. Downdip, the water is softer and contains more dissolved solids. On a local basis, hydrogen sulfide and methane may occur. In addition, corrosive water with a high iron content occurs naturally throughout the aquifer in the North East Texas Region. In the North East Texas Region, some instances of relatively high concentrations of dissolved solids, sulfate, manganese, and chloride have also been reported. These occurrences are often near areas where lignite is known to occur and may be due to mineralization by waters passing through the lignite, especially in the case of high sulfate.

Summary of Groundwater Availability by River Basin

Table 3.13 presents the groundwater availability estimates by river basin. Only a very small portion of the Trinity and Neches river basins are included in the North East Texas Region and therefore, the proportion of the total groundwater supply in these river basins is relatively small. Most of the groundwater supply in the North East Texas Region occurs in the Cypress and Sabine River basins. The Red River Basin contains only a relatively small percentage of the total regional groundwater supply because the Carrizo-Wilcox and Queen City aquifers do not occur within the basin.

Table 3.13 – Groundwater Availability by Aquifer and River Basin for the North East Texas Region.

Aquifer	River Basin						
	Cypress	Neches	Red	Sabine	Sulphur	Trinity	**Aquifer Total**
Blossom			587		224		**811**
Carrizo-Wilcox	263,538	3,043		154,579	61,070	1,490	**483,720**
Nacatoch			337	218	2,047	2	**2,604**
Queen City	234,500	7,839		135,044	7,000		**384,383**
Trinity			813	13	1,032	228	**2,086**
Woodbine			3,220			89	**3,309**
Basin Total	**498,038**	**10,882**	**4,957**	**289,854**	**71,373**	**1,809**	**876,913**

Supplies Currently Available to Each Water User Group

The water supplies available to the individual water user groups in the North East Texas Region are presented in the following sections. Also included is a description of the methods used to determine the supplies available to each water user group for this regional water plan and the assumptions, if any, made in developing this data.

The first series of data presents water supply by use category. This is followed by the supply of the water user combined by county and by river basin.

Discussion of Water User Supply Determination

As noted in Chapter 2, each water user group was surveyed to determine not only population and population growth patterns but also water use and water supply. Each water user group, and those water users within the "county other" category, was asked to identify their water supply source and supply volume.

The water user group was asked to provide the contract period if the water supply was provided by a contract with some other source. The water supply is assumed to end with the contract, although it is understood that contract renewal may likely continue the supply to meet future needs. In those instances where the water supply contract does not specify the contract expiration date, the contract is assumed to continue through at least year 2050. If a maximum quantity is not specified in the contract then the supply was set equal to the demand for each year of the contract.

TWDB water supply volumes were used if more current supply estimates were not available for the manufacturing, mining, livestock, irrigation and steam electric users. It was further assumed that, unless a specific source of supply was identified during the survey or in the field investigation, livestock and irrigation were from private supplies. These private supplies may be individual water wells on private property or local surface water supplies. In general, therefore, the plan has assumed that irrigation and livestock supply from local supplies will match the changes in livestock and irrigation water demand.

If water well capacity information was not available, the system supply from the well was estimated to be 30% of the rated pumping capacity of the well.

Regional Municipal Supply

The major water providers supply municipal water from surface water. Groundwater supplies, primarily from the Carrizo-Wilcox Aquifer supplement these surface water supplies. Most of the supply changes for the water users within the region who have contracts for water supply is the result of expiration of these contracts. Contract expiration is the primary reason for the 117,965 acre-feet per year decrease in municipal water supply over the planning period.

Regional Manufacturing Supply

The regional manufacturing supply is from municipalities, major water providers, wells and from local supplies.

Regional Irrigation Supply

The regional irrigation supply is from well water, primarily the Carrizo-Wilcox aquifer, and from local supply. Irrigation water supply remains fairly constant throughout the planning period.

Regional Steam Electric Supply

The regional steam electric supply is chiefly from major water providers, local municipalities or from the steam electric company's local surface water source. Some communities are projecting increased steam electric generation or new plants in their communities and are therefore increasing the water supply for this purpose over the planning period.

Regional Mining Supply

The regional mining water supply is chiefly from local supplies or from wells primarily in the Carrizo-Wilcox, Queen City or Trinity aquifers.

Regional Livestock Supply

The regional livestock supply is chiefly from wells in the Carrizo-Wilcox Aquifer or from local supplies.

Chapter 4
Water Shortages and Surpluses
Summary

The objective of this chapter is to compare the water demands within the North East Texas Region, as discussed in Chapter 2, with water supplies, as discussed in Chapter 3. This chapter compares the demands and supplies of each water user group (W.U.G.) within the Region to determine which entities are projected to encounter demands greater than their projected supplies, or water supply shortages. Water shortages in all six user group categories (municipal, manufacturing, mining, steam electric, irrigation and livestock) are presented in three ways. First, shortages are presented at the county level. W.U.G.'s that span two or more counties are listed in the county where the highest percentage of the entity is located. Second, shortages are shown by river basin. W.U.G.'s will be listed in the river basin where the demands occur, rather than the basin where the supplies are located. If a W.U.G. spans two or more river basins, it is divided proportionately between the appropriate basins. Finally, water shortages are divided among major water providers. If an entity obtains water from more than one major water provider, it is listed under each of its water sources.

Within the North East Texas Region, three types of water shortages have been identified. The first, and most common, is caused by expiration of a water supply contract or permit. Most water supply contracts and permits have expiration dates, and the Texas Water Development Board requires that when the contract or permit expires, the water source be considered unavailable even though that source is usually available by contract renewal. In this chapter, an "E" will designate W.U.G.'s with shortages due to contract or permit expirations. In most cases, the recommended water supply strategy for these W.U.G.'s will be renewal of their existing contract permit on or before its expiration date. The second type of shortage is also contractual. These are instances where a contract expires, and the simple renewal of that contract will not adequately compensate for increased demands. In this case, an increase in the contract amount or additional water supply sources would be required to meet demands. This type of shortage is designated by "EI". The final type of shortage addressed in this Region is the "actual" or "physical" water shortage, designated by an "A". In this case, the entity's current water supply will not be sufficient to meet projected demands, and additional water sources are the only alternative. This type of shortage is most common among entities that utilize groundwater supplies, because well capacity is held at existing development levels throughout the planning period.

River Basin Summaries of Water Needs

Red River Basin

The Red River Basin includes portions of Bowie, Lamar and Red River Counties. Water shortages in the Red River Basin are by and large contractual shortages. The only actual shortage is in the Town of English, which operates one well that is insufficient to meet demands. Tables 4.19 – 4.21 detail the shortages in the basin.

Sulphur River Basin

The Sulphur River Basin includes portions of Bowie, Cass, Franklin, Hopkins, Hunt, Lamar, Morris, Red River and Titus Counties. It also includes all of Delta County. Water shortages in the Sulphur Basin are mainly due to contract expiration, though there are several true water needs. Insufficient supplies in groundwater sources cause most of the actual needs. The cities of Pecan Gap and Wolfe City have inadequate surface water sources in their city lakes. Tables 4.22 – 4.24 detail the shortages in the basin.

Cypress River Basin

The Cypress River Basin includes portions of Cass, Franklin, Gregg, Harrison, Hopkins, Morris, Titus, Upshur and Wood Counties, as well as all of Camp and Marion Counties. Supply shortages in the Cypress River Basin occur mainly among entities, which utilize groundwater from the Carrizo-Wilcox Aquifer.

Sabine River Basin

The Sabine Basin includes portions of Gregg, Harrison, Hunt, Rains, Smith, Upshur, Van Zandt and Wood Counties as well as all of Rains County. The Sabine Basin has the highest number of shortages in the Region, and over 50% of these shortages are due to deficits in groundwater supply. Another 40% are due to contract expiration.

Summary of Shortages by River Basin

	Water Shortages in ac-ft.					
Year	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Contract Expiration	0	207	1194	2302	2362	2739
Contract Amounts	2310	3098	3308	3426	3514	3694
Actual Shortages	7	6	5	3	2	0
Red River Basin Total	**4317**	**5321**	**6537**	**7771**	**7918**	**8483**
Contract Expiration	13	1166	2384	6816	7478	8252
Contract Amounts	1340	2963	3727	4713	5232	5924
Actual Shortages	108	112	134	196	216	245
Sulphur Basin Total	**2614**	**5459**	**6245**	**11725**	**12926**	**6169**
Contract Expiration	0	3169	3372	3806	5711	5932
Contract Amounts	28	144	211	364	418	467
Actual Shortages	2329	7999	8210	8471	8733	8988
Cypress Basin Total	**2357**	**11312**	**11793**	**12641**	**14862**	**15387**
Contract Expiration	5	6699	10460	12532	15179	16577
Contract Amounts	122	1620	2350	2685	2988	3237
Actual Shortages	311	10708	13565	17503	21794	34019
Sabine Basin Total	**438**	**19027**	**26375**	**32720**	**39961**	**53833**
TOTAL OF MAJOR BASINS	10720	42315	50940	64847	75667	75389

Summary of Needs – Major Water Providers

This section lists the North East Texas Region's 13 major water providers. Tables shown indicate the total water supply for each of these major water providers assuming that current contracts, permits, and water rights are held constant. Demands are comprised of current contract amounts unless an entity's demand exceeds the contract amount sometime in the future. Where demand exceeds the contract amount, a notation has been made, and the estimated demand has been entered. While this method does not take into account that entities may use alternate water sources rather than increase contracts, it gives major water providers a good idea of what future demands will be if all current users continue on existing supplies. Finally, the amount of surplus is noted. None of the major water providers in the North East Texas Region have a shortage of water supply except for the Sabine River Authority.

Chapter 5
Evaluation and Selection of Water Management Strategies
Summary

The primary emphasis of the regional water supply planning process established by S.B. 1 is the identification of current and future water needs and the development of strategies for meeting those needs. This chapter presents the results of the evaluation of various water management strategies; a conceptual framework and overview of the water management strategies recommended for implementation within the North East Texas Region; and specific recommendations to meet specific water supply shortages.

Regional Summary

Current and Projected Water Demands

Current and projected water demands within the North East Texas Region are presented in Chapter 2 of this plan. As indicated, moderate population growth is expected to continue through the 50-year planning period, with population increasing from approximately 687,000 at present to over 1 million in 2050. With moderate population growth and continued urbanization, significant increases in municipal water demands are projected through the planning period. Table 5.1 below summarizes current and projected regional water demands for each of the six major water use categories.

Table 5.1 - Population and Water Demand Projections Summary for the North East Texas Regional Water Planning Area

Regional Total Projection	2000	2010	2020	2030	2040	2050
Population	687,105	757,522	821,294	887,167	952,818	1,017,477
Municipal Water Demand (ac-ft/yr)	118,802	124,561	128,928	135,498	141,548	149,108
Manufacturing Water Demand (ac-ft/yr)	355,258	385,363	390,601	392,864	409,173	427,613
Irrigation Water Demand (ac-ft/yr)	12,566	12,734	12,684	12,637	12,471	12,127
Steam Electric Water Demand (ac-ft/yr)	52,432	72,033	74,033	82,033	82,033	89,533
Mining Water Demand (ac-ft/yr)	10,365	24,191	23,470	22,964	21,923	10,220
Livestock Water Demand (ac-ft/yr)	29,671	29,899	29,951	30,006	29,714	29,273
TOTAL WATER DEMAND (ac-ft/yr)	579,094	648,781	659,667	676,002	696,862	717,874

It is important to note that while urban water demands are projected to increase significantly as a percentage of total regional water demand, manufacturing will remain the dominant water use in the region, accounting for roughly 61 percent of water demand at present and 60 percent of water demand in 2050. Clearly, the manufacturing sector will continue to be a vital component of the region's economy for the foreseeable future.

Currently Available Water Supply

As discussed in Chapter 3 of this plan, surface water is the primary water source for the North East Texas Region, now and in the future. At present, the dependable firm water supply from surface water supplies available to the Region during drought-of-record hydrologic conditions is approximately 1.47 million acre-feet per year. This represents more than 60 percent of the total amount of water presently available to the region from all sources (e.g., groundwater and other local sources). In addition to the supply available from surface water, approximately 40 percent, or nearly 877,000 acre-feet per year of water supply is estimated to be available from groundwater sources at present.

Water Supply Needs

The comparison of projected water demands to estimates of available water supply (Chapter 4) reveals that the North East Texas Region has adequate water supplies for the foreseeable future with existing water resources. A user-by-user comparison of supply and demand reveals that 128 entities within the designated water user groups (WUGs) within the North East Texas Region are projected to experience shortages during the 50-year planning period.

Two of the 19 manufacturing "water user groups" in the North East Texas Region (Camp County and Gregg County) show shortages during the 50-year planning period. No shortages are projected for the irrigation, mining, and livestock categories of water use for any of the counties in the region.

Total Shortages in all sectors are expected to reach 78,000 acre-ft/yr by the year 2050. Projected shortages within the municipal sector are widespread, with 12 municipal water user groups in the region showing shortages at some point during the 50-year planning period. Region-wide, there are two water shortages projected for the manufacturing sector, as discussed above, and the steam electric water user group in Upshur county is projected to have a shortage during the planning period.

Recommended Water Management Strategies

The RWPG is required by TWDB rules to evaluate all water management strategies that are determined to be "potentially feasible". Strategies that are not applicable to the conditions or needs of the region can be considered infeasible and excluded from evaluation.

Senate Bill 1 requires future projects to be consistent with the regional water plans to be eligible for Texas Water Development Board (TWDB) funding and Texas Natural Resource Conservation Commission (TNRCC) permitting. The provision related to TNRCC is found in Texas Water Code §11.134. It provides that the Commission shall grant an application to appropriate surface water, including amendments, only if the proposed appropriation address a water supply need in a manner that is consistent with an approved regional water plan. TNRCC may waive this requirement if conditions warrant. For TWDB funding, Texas Water Code § 16.053(j) states that after January 5, 2002, TWDB may provide financial assistance to a water supply project only after the Board determines that the needs to be addressed by the project will be addressed in a manner that is consistent with that appropriate regional water plan. The TWDB may waive this provision if conditions warrant.

Regional Water Planning Groups (RWPG) recognizes that a wide variety of proposals could be brought before TNRCC and TWDB. For example, TNRCC considers water right applications for irrigation, hydroelectric power, and industrial purposes, in addition to water right applications for municipal purposes. It also considers other miscellaneous types of applications, such as navigation or recreation uses. Many of these applications are for small amounts of water, often less than 1,000 acre-feet per year. Some are temporary.

Small applications to the TNRCC of this nature are consistent with the North East Texas Regional Water Plan, when the surface water uses will not have a significant impact on the region's water even though not specifically recommended in the regional water plan.

TWDB receives applications for financial assistance for many types of water supply projects. Some involve repairing plants and pipelines and constructing new water towers. Water supply projects that do not involve the development of or connection to a new water supply is consistent with the regional water plan even though not specifically recommended in the regional water plan.

Most of the water supply shortages in the region are projected to occur within the municipal and county-other water use category. There are also a few shortages projected to occur in the manufacturing and steam electric power generation categories, as discussed in the previous section. Within the municipal and county-other water use categories, there are two types of shortages: 1) those that are due to expiration of an existing water supply contract and / or an insufficient contract amount; and 2) actual physical shortages of water where the demand for water is projected to exceed currently available water supplies. With few exceptions, the recommended strategy for addressing the "contractual" water shortages is for the individual water user to renew their contract and / or increase the amount of water that can be supplied under an existing contract. Each water user with a contractual water shortage was contacted and their concurrence with the recommended strategy was requested.

The municipal water users identified with water supply shortages are small rural communities and rural water supply corporations within the "county-other" water user group. Generally speaking, there are only four categories of options for meeting the needs of these water users as follows:

- Advanced Water Conservation
- Water Reuse
- Groundwater
- Surface Water

<u>Recommended Strategies for Entities with Actual Shortages</u>

There are 50 entities with actual shortages. Thirty-five of these 50 entities are recommended to be improved with groundwater. The remaining 15 entities are recommended to be improved with surface water supply. Although there are more individual entities with a recommendation for groundwater, surface water is the predominant recommended supply, accounting for approximately 80 percent of the total supply required in acre-feet per year. The following table summarizes these entities:

Table 5.3 – Recommended Strategies for Entities with Actual Shortages

	Shortage (ac-ft/yr)		Ground Water Strategy (ac-ft/yr)		Surface Water Strategy (ac-ft/yr)	
Year	2030	2050	2030	2050	2030	2050
Bowie County						
Camp County						
Manufacturing	2232	2232				
Cass County						
Linden	136	176			136	176
Bloomburg WSC		20		62		
Delta County						
Ben Franklin WSC	29	27			29	29
Pecan Gap	9	6			38	38
Franklin County						
Gregg County						

Gladewater	281	429			1679	1679
Liberty City	272	321	376	470		
Manufacturing	12671	17746			12671	17746
West Gregg WSC	225	386	242	403		
Harrison County						
Waskom	13	47	44	88		
Blocker-Crossroads WSC	26	60	64	64		
Caddo Lake WSC	16	40	36	72		
Elysian Fields WSC		6		50		
Harleton WSC	178	303			239	309
North Harrison WSC	26	62	67	67		
Waskom Rural WSC #1	31	74	59	118		
West Harrison WSC	27	60	108	108		
Hopkins County						
Como	12	26	46	46		
Pickton WSC		12		41		
Shirley WSC	20	65	46	46		
Hunt County						
Wolfe City	43	74	80	80		
Tri-County WSC	98	85				
Lamar County						
Petty WSC	18	17			18	17
Marion County						
Kellyville-Berea WSC	67	108			67	108
Pine Harbor Water System	6	43	108	108		
Shady Shores Water System	14	24	46	46		
Morris County						
Rains County						
Bright Star-Salem WSC	68	21			560	560
Red River County						
Detroit	44	46			106	106
Town of English	3				7	7
Smith County						
Enchanted Lakes Water Co.	64	102	62	62		
Lindale Rural WSC	723	1176	1182	1182		
Star Mountain WSC	237	344	323	323		
Titus County						
Upshur County						
East Mountain	140	174	187	187		
Steam Electric	5601	5601			5601	5601
Diana WSC	162	299	71	71	248	248
Harmony ISD	44	66	48	73		
Pritchett WSC	382	529			532	532
Union Grove WSC	58	106	84	167		
Van Zandt County						
Canton	73	221	323	323		
Grand Saline	163	294	323	323		
Van	99	220	269	269		

Ben Wheeler WSC	23	50	134	134		
Corinth WSC	36	82	108	108		
Crooked Creek WSC	33	70	108	108		
Edom WSC	86	140	46	92		
Fruitvale WSC	242	400	269	269		
Little Hope-Moore WSC	179	265			145	145
Wood County						
Mineola	125	276	323	323		
Fouke WSC		27		108		
Lake Fork WSC	253	410	430	430		
TOTALS (all counties)			**5,612**	**6,421**	**22,076**	**27,301**

Chapter 6

Additional Recommendations Re: Legislative Designation of Unique Reservoir Sites, Ecologically Unique Streams, and Policy Issues Summary

In addition to making recommendations regarding strategies for meeting current and future water needs, TWDB rules for S.B. 1 regional planning allow the regional water planning groups (RWPG) to include recommendations in the regional water plan with regard to unique sites for reservoir development, legislative designation of ecologically unique streams, and policy issues. The North East Texas RWPG elected to consider recommendations in each of these areas, which are presented in this chapter.

Reservoir Sites

TWDB rules (31 TAC, Section 357.9) for the preparation of regional water supply plans provide that the regional water planning groups "…may recommend sites of unique value for construction of reservoirs by including descriptions of the sites, reasons for the unique designation and the expected beneficiaries of the water supply to be developed at the site." TWDB rules further specify that the following criteria are to be applied to determine whether a site is unique for reservoir construction:

(1) site-specific reservoir development is recommended as a specific water management strategy or in an alternative long-term scenario in an adopted regional water plan;

(2) the location, hydrologic, geologic, topographic, water availability, water quality, environmental, cultural, and current development characteristics or other pertinent factors make the site uniquely suited for:
(a) reservoir development to provide water supply for the current planning period; or
(b) where it might reasonably be needed to meet needs beyond the 50-year planning period.

Pursuant to TWDB rules, the approved scope of work for the preparation of the North East Texas Regional Water Plan included a subtask to "…determine which sites for future reservoir development to include in the regional water plan." Accordingly, consultants to the North East Texas RWPG conducted a "reconnaissance-level" assessment of previously identified reservoir sites in the region. This assessment was based on a review and limited update of information contained in previous studies for three previously "proposed reservoirs" and 14 "potential" reservoir sites. It should be noted that the "proposed" and "potential" designations used here and in the *Reservoir Site Assessment Study (Appendix B)* were made only to assist in the planning process and are not intended to convey a relative priority among the various reservoir sites.

The 1997 state water plan recommended development of two new reservoirs within the North East Texas Region – the George Parkhouse II reservoir project (Lamar County) and the Marvin Nichols I reservoir project (Franklin, Morris, Red River, and Titus counties), both of which are located within the Sulphur River Basin. It is noted in the 1997 state water plan that development of the Nichols I reservoir could eliminate or significantly delay the need for the Parkhouse II reservoir. Also, the recently completed *Comprehensive Sabine Watershed Management Plan* includes a recommendation that the Sabine River Authority develop the Prairie Creek Reservoir and Pipeline Project (Gregg and Smith counties) to supply projected needs within portions of the North East Texas Region. It should be noted that the Prairie Creek Reservoir and Pipeline Project is being pursued at this time due to a federal fish and wildlife conservation easement in the Waters Bluff reservoir site. If the conservation easement were removed, the Waters Bluff reservoir would be the Sabine River Authority's top priority project to meet projected water needs in the upper Sabine River Basin.

<u>Recommendation</u>: Reservoir Development and Reservoir Site Preservation

The North East Texas RWPG recommends that the **Marvin Nichols I** site be developed to provide a source of future water supply for water users both within the North East Texas Region and the Dallas-Ft. Worth Metroplex (Region C). The Region C RWPG has indicated that the Marvin Nichols 1 site is their preferred option for reservoir development within the Sulphur River Basin. Should this site prove not feasible, the Region C RWPG has indicated that its secondary preference would be to develop an equivalent amount of water supply through the construction of the **George Parkhouse I and II** sites and the **Marvin Nichols II** site.

The development of the Marvin Nichols I reservoir site as a future water source for the Dallas-Ft. Worth Metroplex would require interbasin transfer authorizations from the Texas Natural Resource Conservation Commission. Among its many provisions, S.B. 1 includes provisions (Texas Water Code, Section 11.085) requiring the TNRCC to weigh the benefits of a proposed new interbasin transfer to the receiving basin against the detriments to the basin supplying the water. S.B. 1 also established the following criteria to be used by the TNRCC in its evaluation of proposed interbasin transfers:

- The need for the water in the basin-of-origin and in the receiving basin.
- Factors identified in the applicable regional water plan(s).
- The amount and purposes of use in the receiving basin.
- Any feasible and practicable alternative supplies in the receiving basin.
- Water conservation and drought contingency measures proposed in the receiving basin.
- The projected economic impact that is expected to occur in each basin.
- The projected impacts on existing water rights, instream uses, water quality, aquatic and riparian habitat, and bays and estuaries.
- Proposed mitigation and compensation to the basin-of-origin.

The North East Texas RWPG supports the full application of the criteria for authorization of interbasin transfers contained in current state law. With regard to compensation to the basin-of-origin, the North East Texas RWPG recommends that a portion of the firm yield of the Marvin Nichols I reservoir, or other projects developed in the Sulphur River Basin for interbasin transfer, be reserved for future use within the basin. The specific terms of such compensation, along with other issues associated with development of the project (e.g., financing, operation of the reservoir, etc.), should be addressed by the appropriate representatives of the Sulphur Basin Authority, in coordination with the Franklin County Water District and the Titus County Freshwater Supply District No. 1, and with the entities in Region C and within the North East Texas Region that are seeking the additional water supply.

The North East Texas RWPG also endorses the recommendation contained in the recently adopted *Comprehensive Sabine Watershed Management Plan* that the Sabine River Authority (SRA) develop the Prairie Creek Reservoir. Located centrally in the upper portion of the Sabine Basin, the proposed reservoir would enable the SRA to supply projected future manufacturing needs in Harrison County. As previously noted, the **Prairie Creek Reservoir** and Pipeline Project is being pursued by the Sabine River Authority at this time due to a federal fish and wildlife conservation easement in the **Waters Bluff** reservoir site. If the conservation easement were removed, the Water Bluff Reservoir would become the Sabine River Authority's top priority project to meet projected water needs in the upper Sabine River Basin.

The North East Texas RWPG also recommends that 15 of the 17 reservoir sites identified within the region be designated by the Texas Legislature as unique for future reservoir development. The Black Cypress reservoir site and the enlargement of Caddo Lake should not be considered for this designation. The sites recommended for designation are:

Cypress Creek Basin

Little Cypress (Harrison)

Red River Basin

Barkman (Bowie)
Big Pine (Lamar and Red River)
Liberty Hills (Bowie)

Sabine River Basin

Big Sandy (Wood and Upshur)
Carl Estes (Van Zandt)
Carthage (Harrison)
Kilgore II (Gregg and Smith)
Prairie Creek (Gregg and Smith)
Waters Bluff (Smith, Upshur, and Wood)

Sulphur River Basin

George Parkhouse I(Delta and Hopkins)
George Parkhouse II (Delta and Lamar)
Marvin Nichols I (Red River and Titus)
Marvin Nichols II (Titus)
Pecan Bayou (Red River)

Members of the North East Texas RWPG have raised concerns about local property owners who would be directly impacted by reservoir construction. The RWPG may wish to consider a policy statement directed at the treatment of local property owners who may face displacement.

Recommendation: Legislative Designation of Ecologically Unique Stream Segments

At the regular meeting on May 17, 2000, the North East Texas RWPG considered nominations for legislative designation of river or stream segments in the region as ecologically unique. It was decided that the RWPG would not offer any recommendations in the initial water plan for the North East Texas Region. Rather, the North East Texas RWPG requests the Texas Legislature to reconsider and possibly amend current state law to clarify the implications of stream segment designation. Specifically, the North East Texas RWPG has concerns regarding the potential impacts of stream designation on private property owners and on governmental activities other than water development. With such legislative clarification, the North East Texas RWPG intends to re-consider the issue of ecologically unique stream segment designations in the first five-year update of the regional water plan.

Policy Recommendations

Recommendation: Proposed Reservoir & Interbasin Transfers

At its meeting on June 21, 2000, the North East Texas RWPG adopted the following recommendation with regard to the development of new reservoirs in the Sulphur River Basin and future exports of water supplies from that basin to the Dallas-Ft. Worth Metroplex:

> The North East Texas RWPG recommends that the Marvin Nichols I site be developed to provide a source of future water supply for water users both within the North East Texas Region and the Dallas-Ft. Worth Metroplex (Region C). The Region C RWPG has indicated that the Marvin Nichols 1 site is their preferred option for reservoir development within the Sulphur River Basin.

Should this site prove not to be feasible, the Region C RWPG has indicated that its secondary preference would be to develop an equivalent amount of water supply through the construction of the Parkhouse I and II sites and the Marvin Nichols II site.

The development of the Marvin Nichols I reservoir site as a future water source for the Dallas-Ft. Worth Metroplex would require interbasin transfer authorizations from the Texas Natural Resource Conservation Commission. Among its many provisions, S.B. 1 includes provisions (Texas Water Code, Section 11.085) requiring the Texas Natural Resource Conservation Commission (TNRCC) to weigh the benefits of a proposed new interbasin transfer to the receiving basin against the detriments to the basin supplying the water. S.B. 1 also established the following criteria to be used by the TNRCC in its evaluation of proposed interbasin transfers:

- The need for the water in the basin-of-origin and in the receiving basin.
- Factors identified in the applicable regional water plan(s).
- The amount and purposes of use in the receiving basin.
- Any feasible and practicable alternative supplies in the receiving basin.
- Water conservation and drought contingency measures proposed in the receiving basin.
- The projected economic impact that is expected to occur in each basin.
- The projected impacts on existing water rights, instream uses, water quality, aquatic and riparian habitat, and bays and estuaries.
- Proposed mitigation and compensation to the basin-of-origin.

The North East Texas RWPG supports the full application of the criteria for authorization of interbasin transfers contained in current state law. With regard to compensation to the basin-of-origin, the North East Texas RWPG recommends that a portion of the firm yield of the Marvin Nichols I reservoir, or other projects developed in the Sulphur River Basin for interbasin transfer, be reserved for future use within the basin. The specific terms of such compensation, along with other issues associated with development of the project (e.g., financing, operation of the reservoir, etc.) should be addressed by the appropriate representatives of the Sulphur River Basin Authority, in coordination with the Franklin County Water District and the Titus County Freshwater Supply District No. 1, and with the entities in Region C and the North East Texas Region seeking the additional water supply.

<u>Recommendation</u>: Conversion of Public Water Supplies from Groundwater to Surface Water

Given the potential limitations on both the quantity and quality of groundwater supplies within the North East Texas Region, the North East Texas RWPG recommends the following:

The TWDB should provide funding support for an in-depth assessment of groundwater-supplied public water systems that have or may have difficulty achieving compliance with state and federal drinking water standards due to the quality of source waters. The assessment should identify and evaluate alternative means of achieving or maintaining compliance with state and federal standards including the potential for acquisition of alternative water supplies and regionalization of systems of public water supply systems within the North East Texas Region. This assessment should be completed on a schedule that will allow the results to be incorporated, as appropriate, into the first update of the North East Texas Regional Water Plan.

Recommendation: Groundwater Policy

The North East Texas RWPG supports the completion of the TWDB's Groundwater Availability Modeling (GAM) Program. It is hoped that the development of new modeling tools will result in more accurate and realistic assessments of groundwater availability within the North East Texas Region. In particular, TWDB is urged to consider water quality and economic factors in future estimates of groundwater availability. Specifically, any groundwater availability model developed for aquifers within the North East Texas Region should have the ability to generate estimates of the quantities of groundwater that are available that meet current state and federal drinking water standards for total dissolved solids without treatment (ie. 1,000 mg/l).

Recommendation: Texas Natural Resource Conservation Commission Regulations

The North East Texas RWPG adopted the following recommendations with regard to TNRCC regulatory policies:

There should be consistency between TWDB rules for regional water supply planning and TNRCC rules for public drinking water systems with regard to minimum requirements for water supply.

TNRCC should expedite the effort to replace MTBE in reformulated gasoline with additives that do not pose risks to drinking water supplies.

Recommendation: Improvements to the Regional Water Supply Planning Process

The North East Texas RWPG offers the following recommendations with regard to improvements to the S.B. 1 regional water planning process:

TWDB should revise its rules for regional water planning to permit greater flexibility in the calculation of future water demands to allow for the consideration of alternative scenarios of population growth and economic development.

TWDB should revise procedures for calculating water demand reduction projections contained in its conservation scenarios by recognizing a floor for the application of demand reduction for rural and small city areas where the per capita water consumption levels are already very low.

TWDB should revise its rules for regional water planning to allow multiple options to be put forth as recommended strategies for meeting the needs of individual water user groups.

Chapter 7
Public Participation
Summary

Chapter 7 describes the public participation process, facilitation of the plan adoption, and contains a summary of public comments or questions regarding the Initially Prepared Plan and RWPG answers thereto.

The public hearing process featured (1) public comment opportunities at NETRWPG meetings; (2) an initial public hearing prior to submission of the TWDB funding proposal; (3) outreach to and a survey of water providers; (4) development of a public participation plan;(5) community meetings hosted by RWPG members; (6) slide presentations for community meetings; (7) interviews with individual RWPG members; (8) media contact; and (9) a series of public meetings prior to adoption of the Initially Prepared Plan.

After release of the Initially Prepared Plan, the RWPG conducted a series of four public meetings dispersed around the region, and a public hearing. Copies of the plan were made available in the office of the County Clerk, and in a public library, in each of the 19 counties in the region. Comments received are summarized, together with the RWPG response, in Chapter 7. In general, these comments could be categorized in the following groups:

(a) Marvin Nichols 1 Reservoir and Related Issues
(b) Other Reservoir Sites
(c) Water Policy
(d) Condemnation and Property Rights
(e) Groundwater
(f) Ecologically Unique Stream Segments and Environmental Protection
(g) Conservation and Alternative Technologies
(h) Regional Water Planning Process, Strategies and Terminology
(i) Public Participation Process

TABLE OF CONTENTS

1.0 Introduction

1.0 (a) Overview of Senate Bill 1

Water is defined by Webster's dictionary as "a major constituent of all living matter." It is a vital resource for humans and the environment alike, and the importance of water has long been understood. Our very existence depends on the availability of water to sustain life.

The population of Texas is growing rapidly. As industry and commercial development continue, populations increase, and, subsequently, water demands increase. These ever-increasing water demands are placed on finite resources which, although renewable, can be exhausted if not conserved.

Realizing the need for available water both today and tomorrow, Texans have been involved in water planning for generations. Civil engineers, planners, the Texas Water Development Board (TWDB), water supply districts, river authorities, and others have developed local and regional water plans. While these plans are vital for local water planning, they may not always consider the effects on larger regions and the state as a whole. Therefore, water planning on a statewide basis is essential in order to grasp the totality of the needs of the people and environments and the resources available to meet those needs. The responsibility for water planning on a statewide basis is that of the TWDB. This agency's task includes analyzing water supply and demand using a holistic approach over the entire state.

Increased awareness of Texas' vulnerability to drought, and an estimated fifty percent increase in population over the next fifty years, caused the 75th Texas Legislature to consider several avenues in state water resource planning. In 1997, the Texas Legislature enacted Senate Bill 1, comprehensive legislation which addresses water planning. One result of this legislation is a "bottom up" approach to Texas water planning. Rather than the top-down approach of the past, this new approach gives local and regional entities a greater opportunity to participate in the planning and to have a stake in the future of water availability in Texas. The TWDB divided the state into 16 planning regions, each of which is responsible for analyzing a geographic area and creating a water plan spanning the next fifty years. Once these 16 regional plans are submitted to the TWDB, Board staff will review the plans and mold them into a statewide water plan.

Regional water planning groups have been established by the TWDB in each region to prepare and adopt a regional water plan for a designated area. Each water planning group represents diverse realms of public interest including:

- Agriculture
- Counties
- Environment
- Industry
- Municipalities
- Small business
- River authorities
- Water utilities
- Water districts
- Electric generating utilities
- General public

This variety of backgrounds of the board members is intended to ensure that all areas of public interest are represented.

The North East Texas Regional Water Planning Group (RWPG) represents the North East Texas Region. This region is made up of all or part of 19 counties in North East Texas (See Figure 1.1), including Bowie, Camp, Cass, Delta, Franklin, Gregg, Harrison, Hopkins, Hunt, Lamar, Marion, Morris, Rains, Red River, Smith, Titus, Upshur, Van Zandt and Wood. This RWPG includes representatives of all of the above-mentioned public interest groups; in addition, each county has a representative. The administrative agent for the group is the Northeast Texas Municipal Water District, located in Hughes Springs, Texas.

The ultimate goal of the State Water Plan is to identify those policies and actions that may be needed to meet Texas' near- and long-term water needs based on a reasonable projected use of water, affordable water supply availability, and conservation of the state's natural resources.

The Regional Water Planning Groups have been charged with addressing the needs of all water users and suppliers within their respective regions. Groups are to consider socioeconomic, hydrological, environmental, legal and institutional aspects of the region when developing the regional water plan. Specifically, the groups are to address three major goals. These goals include:

- Determine ways to conserve water supplies
- Determine how to meet future water supply needs
- Determine strategies to respond to future droughts in the planning area

1.0 (b) The Planning Process

The TWDB has developed a set of 7 tasks which the regional groups are to accomplish in the regional water plan. This report addresses these tasks in the following manner:

Chapter 1 presents a description of the planning region including the region's physical characteristics, demographics and economics. Other information included in this description are the sources of surface and groundwater, major water suppliers and demand centers, current water uses, and water quality conditions. Finally, an initial assessment of the region's preparations for drought is discussed, as well as the region's agricultural and natural resources and potential threats to those resources.

Chapter 2 addresses population and water demand projections. Chapter 2 is divided into three subtasks. Through these subtasks, Chapter 2 discusses the following:

1) Population projections and water demand projections for each decade from 2000 to 2050 by city, county, and river basin for the municipal (urban and rural), manufacturing, irrigation, steam electric power generation, mining, and livestock watering use categories.

2) A review of population projections prepared by various government agencies compared to those of the TWDB.

3) Identification of the need for adjustments in TWDB population and water use projections based on water use data and water utility connection records, as well as historical growth patterns.

Much of the information in this chapter is in the form of tables.

Chapter 3 is an evaluation of current water supplies in the North East Texas Region, including surface and groundwater. It also presents the available supplies for each user group.

Chapter 4 of the report presents identified water shortages and surpluses in the region and lists shortages by county and river basin. It also includes a comparison of supply and demand for each major water provider.

Chapter 5 is an evaluation of water shortages identified in chapter 4. A strategy for solving each shortage is presented, along with cost estimation and environmental impact analysis. This chapter also establishes criteria to be applied in the evaluation of water management strategies.

Chapter 6 identifies policy recommendations regarding designation of unique reservoir sites and unique streams. Other policy recommendations include interbasin transfers, conversion of water supplies from groundwater to surface water, TNRCC regulations, and improvements to the regional water supply planning process.

Chapter 7 consists of a summary of public involvement throughout the planning process.

Figure 1.1
Region Location Map

1.1 Physical Description of the Region

The North East Texas Region is located in the northeast corner of Texas. It is bordered on the east by the Texas/Louisiana/Arkansas border and on the north by the Texas/Oklahoma/Arkansas border. The western boundary of the region is approximately 110 miles west of the eastern edge of Texas, and the southern boundary is located approximately 100 miles south of the northern boundary. The region spans approximately 10,500 square miles, (refer to Figure 1.1).

1.1 (a) Regional Entities

The North East Texas Region includes all or a part of the following counties:

Bowie County	Camp County	Cass County
Delta County	Franklin County	Gregg County
Harrison County	Hopkins County	Hunt County
Lamar County	Marion County	Morris County
Rains County	Red River County	Smith County (partial)
Titus County	Upshur County	Van Zandt County
Wood County		

The North East Texas Region also includes various agencies interested in water planning.

Councils of Government represented within the region include:

- Ark-Tex Council of Governments
- East Texas Council of Governments
- North Central Texas Council of Governments

River Authorities represented include:

- Red River Authority
- Sabine River Authority
- Sulphur River Basin Authority
- Neches River Authority

At the federal level, the Natural Resource Conservation Service and Rural Development agencies of the United States Department of Agriculture maintain offices in the region. The Corps of Engineers district office in Tulsa covers the Red River Basin, while the remaining basins lie in the Fort Worth District. Navigation studies along the Red River are under the direction of the Vicksburg District.

The counties in the North East Texas Region share some similar traits such as location, climate, recreational activities, and a predominately rural economy and culture. Differences among the counties include size, population, vegetation, and types of business/industry. The following table compares the size and population of the counties and lists the largest city in each county.

Figure 1.2
Water Planning Area Location Map

Table 1.1 County Comparison North East Texas Region

County	Area (Square Miles)	1990 County Census Population	Largest City
Bowie	923	81,665	Texarkana°
Camp	203	9,904	Pittsburg
Cass	960	29,982	Atlanta
Delta	278	4,857	Cooper
Franklin	295	7,802	Mount Vernon
Gregg	276	104,948	Longview°
Harrison	915	57,483	Marshall°
Hopkins	793	28,833	Sulphur Springs
Hunt	882	64,343	Greenville°
Lamar	932	43,949	Paris°
Marion	420	9,984	Jefferson
Morris	259	13,200	Daingerfield
Rains	259	6,715	Emory
Red River	1,058	14,317	Clarksville
Smith	433*	22,689*	Lindale*
Titus	426	24,009	Mount Pleasant
Upshur	593	31,370	Gilmer
Van Zandt	860	37,944	Wills Point
Wood	696	29,380	Mineola

*Portion within the North East Texas Region
°Population over 20,000

1.1 (b) <u>Physiography</u>

The North East Texas Region is located in the physiographic region known as the Gulf Coastal Plains. The Gulf Coastal Plains region extends from the eastern border of Texas to the Balcones fault zone and spans from the Texas/Oklahoma border to the southern tip of the state. Topography in this region is primarily hilly in the east, with pine and hardwood vegetation. Moving westward, the region becomes more arid with a post oak dominated fauna, until the vegetation becomes prairie. The Gulf Coastal Plains are located in “lowland Texas” as opposed to upland Texas west of the Balcones fault.

The Gulf Coastal Plains has been divided into several area designations. Within the North East Texas planning region, the Blackland Prairies Belt, the Post Oak Belt and the Piney Woods Belt are represented. These belts are distinguished by surface topography and vegetation.

The eastern half of the region has rolling hills and large amounts of timber. This area is defined as the Piney Woods Belt. Timber is predominately pine, with hardwood timbers interspersed near valleys of rivers and creeks. Soils are well adapted for some crops. Geology includes clays, oil, lignite and other minerals.

Moving westward and entering the Post Oak Belt, the terrain flattens slightly and native timber changes from predominately pine to oak. Soils have characteristics of both the Blackland Prairies and Piney Woods Belts. Varied cattle and farming activities are an important part of this area’s economic base. This belt also has clays, lignite, and other minerals.

The western portion of the North East Texas Region is designated as the Blackland Prairies. The terrain can be described as rolling prairie. Vegetation is largely prairie with dense timber along streams. Soils are very good for row crops such as cotton. Minerals include chalk, lignites, gas, oil, sand, and gravel.

Elevations within the North East Texas Region range from 150 - 200 feet above sea level at Caddo Lake on the eastern edge of the region, to 650 – 700 feet above sea level in the northwestern portions of Hunt County.

The North East Texas Region has 24 surface water bodies with capacity of 5000 ac-ft or more, scattered throughout the region. The terrain is crossed by a network of rivers, streams, and creeks. In addition, farm and pasture land is scattered with ponds and pools. Major waterways bordering or crossing through the region include the Red River, Sulphur River, Sabine River, and Cypress Creek. There are six river basins in the North East Texas Region including the Red, Sulphur, Cypress, Sabine, and small portions of the Neches in Van Zandt County and the Trinity in Hunt County.

1.1 (c) Climate

Climate in the North East Texas Region is generally mild. The average annual temperature in North East Texas is 65°F. The mean high temperature for July in the region is 94°F, and the mean low January temperature is 32°F. The 30-year average number of days with temperatures of 100°F and higher is 8. Relative humidity is high in the region, which makes temperatures seem more extreme. The last freeze in the spring normally occurs around March 20 and the first freeze in the fall occurs around November 14. The growing season in North East Texas lasts approximately 239 days.

Average annual precipitation in the region is 43.7 inches, and ranges from an annual high of 46.8 inches in Franklin County to a low of 40.4 inches in Hunt County. The average number of days with precipitation of 0.10 inches and higher over a 30-year period is 63. The 25-year 2-day precipitation ranges from 11 inches to 12 inches across the North East Texas region, and the 25-year 2-hour precipitation is around 4 inches. The average annual lake surface evaporation for the North East Texas Region in 1997 was 50.46 inches. In January of that year, the average evaporation rate was 2.57 inches, and in August 1997 the rate was 6.47 inches. See Figure 1.3 for average annual precipitation and Figure 1.4 for evaporation rates. Droughts do occur within the North East Texas Region, and the region has experienced ten recorded droughts of more than 58 days in duration over the past 97 years. Winter precipitation, such as snow, sleet and ice, occurs in North East Texas, but is by no means an annual occurrence. When snow and ice conditions do transpire, they are normally short-lived.

Winds in North East Texas are predominately from a southerly direction during summer months, although winds from the north do occur. In winter, northern winds are common. Velocities range from an annual average of 8.3 mph on the eastern edge of the region, to 10.7 mph on the west.

Destructive weather is a factor in the North East Texas Region. While hurricanes in the Gulf of Mexico do not normally cause destructive damage so far north, they can bring thunderstorms with high winds. In April of 1966, 20 to 26 inches of rain fell in Wood, Marion, Harrison, Smith, Morris and Upshur counties in a one week period, drowning 19 people. Tornadoes are frequent and are frequently destructive. Between 1951 and 1989, there was an average of 122 tornadoes per year in Texas, with most tornadoes occurring in May. The North East Texas Region has an average frequency of 1-2 tornadoes per 2,500 square miles per year. The Red River Valley, in the northern part of the North East Texas Region, has the highest frequency of tornadoes in the state. Among the state's worst natural disasters, a tornado in Paris in 1982 claimed 10 lives and caused $50 million in damage.

1.1 (d) Geology

Surface outcroppings in the North East Texas Region are from the Cretaceous, Paleocene and Eocene periods. From the northwest corner of the region moving southeast, the bands of rocks become younger. Soils in the North East Texas Region range from light colored, acid sandy loams, clay loams and sands in the east to dark colored calcareous clays in the western part of the region. North East Texas is located just east of the Ouachita Mountains, a buried mountain range that reaches from southwest Texas through the Austin and Dallas areas and eventually runs eastward to the Appalachian Mountains. Formation of this range 300 million years ago caused downwarping on either side, and as a result, much erosion and sediment settled in North East Texas. For the past 60 million years, the North East Texas Region has been "sinking", and rocks from earlier periods have been buried rather than exposed. The effects of sediment buildup from the mountain range run-off coupled with waters of the Gulf of Mexico flowing over the surface, lead to the formation of rich organic sediments that over time turned into oil and gas deposits. Salt deposits, compressed by dense, organic-rich muds, formed domes and spikes beneath the surface.

Mineral resources in the North East Texas Region are varied and abundant. Lamar and Red River Counties have chalk deposits buried beneath the surface. The southern part of the region is dotted with salt domes. Salt was deposited about 200 million years ago when the Gulf of Mexico was beginning, before it was connected to other oceans. This salt, which pushed up through layers of thick dense sediment, created domes which are mined today. This area also contains significant oil and gas deposits. Oil in North East Texas is produced from the late Cretaceous Woodbine Formation. Normally found deep below the surface, some oil has been forced upward by the upheaval of the salt domes which trapped oil and natural gas. Oil is an important industry in Texas, and Gregg County had the eighth highest number of barrels of oil produced in the state in 1998. Lignite, a low grade form of coal, was formed in North East Texas when organic rich muds, flowing from the Ouachita Mountains were pressed beneath later layers. This fuel resource is used by the electric utility industry. Industrial clays, used for producing bricks, tile, pottery, and even fine china, are located beneath parts of Bowie, Harrison, Morris, Titus, Franklin, Hopkins, Rains and Van Zandt counties.

Earthquakes are not generally a concern in the North East Texas Region, although one or two smaller quakes are on record in Lamar County.

Figure 1.3
Average Annual Precipitation

Figure 1.4
Average Net Evaporation

1.1 (e) Natural Resources

Soils within the North East Texas Region are good for crop production and cattle grazing. In early Texas history, the soils in the Blackland Prairies Belt were considered well suited for row-crop farming, and farmers, realizing the potential of the area, brought their families there to work the land. Soils in the Piney Woods support fruit crops, especially peaches, blueberries and strawberries. The Piney Woods is also abundant in timber and supports a large timber industry. Livestock is another important economic resource in North East Texas and regional soils support sufficient vegetation for grazing. Cattle in North East Texas are raised for stocker operations, cow-calf operations, beef production and dairies. North East Texas is home to major poultry processing plants, and many farmers raise poultry for eggs and broilers. Finally, hogs and horses are significant in some counties, but are raised less extensively regionwide. The following table lists the counties in the North East Texas Region and their principal agricultural products:

Table 1.2 Principal Agricultural Products

County	Principal Crops	Principal Livestock
Bowie	Wheat, soybean, rice, milo	Beef and dairy cattle, poultry, horses
Camp	Hay, peaches, blueberries	Broilers, eggs, beef and dairy cattle
Cass	Forages, timber, fruit, vegetables	Beef, broilers
Delta	Hay, wheat, soybean, cotton	Beef and dairy cattle
Franklin	Hay, blueberries, peaches,	Beef and dairy cattle, broilers
Gregg	Hay, Christmas trees	Beef, race horses
Harrison	Nursery plants, hay, timber	Cattle, hogs
Hopkins	Hay, wheat, silage, corn, rice, soybean	Beef and dairy cattle
Hunt	Hay, cotton, wheat	Beef and dairy cattle, race horses
Lamar	Hay, wheat, soybean, cotton, peanuts	Beef and dairy cattle
Marion	Hay, timber	Beef, horses, hogs
Morris	Peanuts, hay, watermelons, peaches	Beef, poultry
Rains	Vegetables, watermelons, wheat, hay	Beef and dairy cattle
Red River	Soybeans, corn, cotton, alfalfa, wheat, timber	Stocker, cow-calf operations, dairy cattle
Smith	Rose bushes, hay, watermelons, timber	Beef and dairy cattle, poultry, broilers
Titus	Corn, watermelons, grain sorghums, hay, peanuts	Cattle, dairy products, horses, hogs
Upshur	Vegetables, hay, peaches, timber	Beef and dairy cattle, poultry
Van Zandt	Hay, sweet potatoes, nursery stock, grains	Cattle, hogs, dairy products
Wood	Truck crops, hay, corn, grains, Christmas trees, timber	Beef and dairy cattle, hogs, horses, broilers

Vegetation in the North East Texas Region is varied due to local differences in rainfall, temperature, and terrain. Figure 1.5 delineates the vegetative regions within North East Texas. The Piney Woods is appropriately named, because the vast majority of its timber is pine. Native vegetation is defined as a pine-hardwood forest, and principal trees include shortleaf pine, loblolly pine, sweetgum and red oak. Moving westward, vegetation changes from pine to oak and from oak to prairie with scattered trees. Vegetation in the Post Oak Belt is distinct between uplands and bottomlands. Uplands contain tall bunchgrasses and stands of post oak and blackjack oak. The bottomlands, wooded and brushy, contain chiefly hardwoods, with an occasional pecan. Native vegetation in the Blackland Prairies Belt is classified as true prairie with important native grasses being little bluestem, big bluestem, Indian grass, switch grass, and Texas wintergrass. Pastures seeded with Dallis grass and Bermuda grass are common. Principal trees are post oak, shumard oak, bur oak, magnificent chinquapin oak, pecan, American and cedar elms, soapberry, hackberry and eastern red cedar.

The North East Texas Region supports numerous species of abundant wildlife, including, but certainly not limited to white-tailed deer, armadillo, quail, rabbit, opossum, raccoon, squirrel, dove, wild hog and wild duck. Since northeast Texas is predominantly rural, there is farm and ranch land as well as recreational, undeveloped and timbered land available for wildlife habitat. The numerous surface water impoundments, rivers and streams provide suitable habitat for many different species. Wetlands, bottomland hardwood forests, pine forests and state protected lands also provide habitat. At one time, larger deer and black bears were found in the area, however population growth and accompanying development and hunting encroached upon the habitat of bears, and also caused a reduction in deer size. According to the Texas Parks and Wildlife Department, there are four TPW wildlife management areas in the North East Texas Region. These include Cooper (14,480 acres), Pat Mayse (8,925 acres), Tawakoni (1,562 acres), and White Oak Creek (25,700 acres). These areas are used for hunting, research, fishing, wildlife viewing, hiking, camping, bicycling, and horseback riding. A map of the biotic provinces of Texas is included in Appendix A.

Air quality in Texas is monitored by the Texas Natural Resource Conservation Commission (TNRCC), which has monitoring stations in various locations around the state. The monitoring locations in or near the North East Texas Region include those in the Dallas-Ft. Worth area and the Tyler-Marshall-Longview area. Currently, the TNRCC monitors six air pollutants including ozone, sulfur dioxide, nitrogen dioxide, respirable particulate matter, carbon monoxide, and lead. Both the Dallas-Ft. Worth area and the Tyler-Longview-Marshall area violate the national standard for ozone levels, but fall within the national levels for all other pollutants. This does not suggest that the entire region violates the ozone standard, only those areas within the monitoring location. The majority of the North East Texas Region is expected to have air quality that is low in air pollutants and will not hinder the quality of life.

There are major oil fields located throughout the region, as noted on Figure 1.6. At one time, the largest oil field in Texas was located partly in Gregg County, however overproduction and low prices have somewhat diminished the importance of the oil and gas industry in North East Texas. Counties in the North East Texas Region with the largest oil production in 1998 included Gregg, Wood, Van Zandt, and Smith. Table 1.3, taken from the 2000-2001 Texas Almanac, lists the amount of crude oil produced in the North East Texas Region counties in 1997 and 1998.

Table 1.3 Crude Oil Production

County	Crude Production 1997 (barrels)	Crude Production 1998 (barrels)	Total Production from discovery to January 1 , 1999
Bowie	308,396	270,472	5,357,356
Camp	372,603	584,046	26,444,514
Cass	679,799	551,156	111,626,245
Delta	0	0	64,058
Franklin	641,076	617,669	174,009,863
Gregg	16,112,519	12,943,293	3,256,062,659
Harrison	990,694	965,913	83,694,475
Hopkins	449,345	393,874	87,344,327
Hunt	7,059	4,523	2,024,233
Lamar	0	0	0
Marion	242,650	270,447	54,360,192
Morris	0	0	0
Rains	0	0	148,886
Red River	836,150	671,463	5,891,703
Smith	1,772,647	1,616,000	256,267,038
Titus	707,242	607,123	208,104,817
Upshur	910,372	789,681	283,152,422
Van Zandt	1,963,851	2,505,380	541,022,966
Wood	6,413,952	6,374,644	1,164,344,772

Figure 1.5
Vegetation Map

Figure 1.6
Oil & Gas Wells

Lignite resources are also found in portions of North East Texas (See Figure 1.7), and there are near-surface operating mines in Harrison, Titus, and Hopkins counties. Once an important energy resource before oil and gas were readily available, lignite, a low-grade coal, is again being sought by energy suppliers. Finally, both ceramic and nonceramic iron oxide deposits are located in Cass, Harrison, Marion, Morris, Smith, and Upshur counties.

Agricultural land is important to North East Texas and much agricultural production takes place on prime farm land. Prime farm land is defined by the Natural Resource Conservation Service as "land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses." Figure 1.8 shows locations of agricultural land in the North East Texas Region. Timber is the second most important agricultural crop in Texas, and the most important timber producing area is in the Piney Woods of East Texas. Counties within the region with significant timber production include Bowie, Camp, Cass, Franklin, Gregg, Harrison, Marion, Morris, Red River, Smith, Titus, Upshur and Wood (See Figure 1.8). Of these counties, only Franklin, Titus, and Bowie produce more cubic feet of hardwoods than pine. Non-industrial parties own approximately 60 percent of timber production areas in the North East Texas Region, with industrial interests owning the remaining 40 percent.

The following table, taken from the 2000-2001 Texas Almanac, lists counties within the region that are important timber producers.

Table 1.4 Total Timber Production and Value by County in Texas, 1997

County	Pine – Cu-Ft.	Hardwood – Cu-Ft.	Total	Stumpage Value ($1000)	Delivered Value ($1000)
Bowie	5,532,747	5,680,830	11,213,576	9,419	15,423
Camp	1,072,900	948,972	2,021,873	1,429	2,543
Cass	16,825,833	10,048,739	26,874,572	18,896	33,592
Franklin	354,138	784,724	1,138,862	888	1,515
Gregg	3,684,911	1,730,148	5,415,059	6,483	9,120
Harrison	16,160,018	5,051,457	21,211,475	19,843	30,752
Marion	9,826,412	5,107,590	14,934,002	10,770	18,894
Morris	8,868,341	2,200,657	11,068,998	13,453	18,758
Red River	6,783,553	4,377,029	11,160,581	8,830	14,825
Smith	5,100,935	2,659,171	7,760,106	6,621	10,724
Titus	1,075,485	1,369,225	2,444,710	2,097	3,405
Upshur	6,435,236	2,845,821	9,281,058	8,591	13,401
Wood	3,635,581	2,198,002	5,833,583	3,790	7,017

Types of business and industry in the region vary from county to county, depending on location and natural resources present. For example, Cass County has paper mills and sawmills because of the abundance of timber in the area. Rains, Titus, and Gregg counties' economies are oil-based due to extensive oil resources. Hunt County is home to Texas A&M University - Commerce, and therefore has a percentage of its economic base in education. Hunt County is also located near the Dallas Metroplex, and many of its residents are employed there. While there are differences in economic base within the counties, there are also similarities. Government employment, tourism, manufacturing and agribusiness are present in every county within the region.

Figure 1.7
Lignite resources

Figure 1.8
Landuse Map

North East Texas's flora and fauna, as well as its rich history and local pride, are attractions for tourists. There are many things to see and do in North East Texas, from visiting museums and local festivals to taking nature walks in state parks. The following table lists state parks in the region by county:

Table 1.5 State Parks by County

County	State Park(s)
Cass	Atlanta State Park
Delta and Hopkins	Cooper Lake State Park
Harrison	Caddo Lake State Park
Lamar	Pay Mayse State Park Sam Bell Maxey State Park
Morris	Daingerfield State Park
Smith	Tyler State Park
Titus	Lake Bob Sandlin State Park
Van Zandt	Purtis Creek State Park
Wood	Governor Hogg Shrine State Park

The North East Texas Region has agricultural, art and cultural museums, including the Parchman House in Franklin County, the Marshall Pottery Museum, the Cotton Museum in Greenville, the North East Texas Rural Heritage Center Museum and the Texarkana Historical Museum, to name a few. Almost every town in the North East Texas Region has at least one fair or festival throughout the year. Some of these festivals are listed below.

Table 1.6 Fairs and Festivals by County

County	Event
Bowie	Four-States Fair, Red Neck Day
Camp	Chick Fest
Cass	Wildfire Trails, Market Fest
Delta	Mayfest, Chiggerfest
Franklin	Countryfest
Gregg	Glory Days, Loblolly Festival, Alley Fest, The Great East Texas Balloon Race
Harrison	Fire Ant Festival, Stagecoach Days
Hopkins	Dairy Festival, Stew Contest
Hunt	Cotton Jubilee, Bois d'Arc Bash
Lamar	Paris Art Fair, Christmas in Fair Park
Marion	Mardi Gras, Founder's Day
Morris	Captain Daingerfield Day, Watermelon Festival
Rains	Eagle Fest
Red River	Fall Stew Cookoff
Smith	Country Fest
Titus	Wrangler Fest
Upshur	East Texas Yamboree, Pecan Festival
Van Zandt	Canton's First Monday Craft Show
Wood	Mineola May Days, Autumn Trails

1.2 Socioeconomic Characteristics of the Region

1.2 (a) Historical and Current Population

Population in the North East Texas Region has both increased and declined in the past 100 years due to economic (primarily agricultural) change. Because much of the economy in North East Texas has historically been based on agriculture, many large on-farm families lived in the area until the 1930's. During the depression years, farmers had to look for work in the cities, and high-yield cotton-producing farms, as well as other types of farms, ceased production. Beginning in the 1950’s, the region saw a resurgence, and has been growing steadily since. Booms in the oil, timber and tourism industries brought people back to North East Texas in the 1970’s and 1980’s, and the 1990's have seen an increase in persons coming to North East Texas to retire around area lakes.

Table 1.7 presents the historical population of each county and the region as a whole. These population counts are provided by the United States census. The graph shows that most of the counties have seen growth of over 25 percent. Several counties, including Rains, Smith, and Van Zandt, experienced growth of over 75 percent. The region as a whole grew 48 percent from 1960 to 1990, compared to a 77 percent growth in Texas and a 39 percent growth in the United States.

Table 1.7 Historic Population by County

County	Population and % Growth							30 Yr. Growth
	1960	1970	%Growth	1980	%Growth	1990	%Growth	
Bowie	59,971	67,813	13.10%	75,301	11.00%	81,665	8.40%	36.00%
Camp	7,849	8,005	1.90%	9,275	15.90%	9,904	6.80%	26.00%
Cass	23,496	24,133	2.70%	29,430	21.90%	29,982	1.90%	28.00%
Delta	5,860	4,927	-15.20%	4,839	-1.80%	4,857	0.30%	-17.00%
Franklin	5,101	5,291	3.70%	6,893	30.30%	7,802	14.10%	53.00%
Gregg	69,436	75,929	9.40%	99,487	31.00%	104,948	5.50%	51.00%
Harrison	45,594	44,841	-1.60%	52,265	16.50%	57,483	9.90%	26.00%
Hopkins	18,594	20,710	11.30%	25,247	21.90%	28,833	14.20%	55.00%
Hunt	39,399	47,948	21.70%	55,248	15.20%	64,343	16.50%	63.00%
Lamar	34,234	36,062	5.30%	42,156	17.00%	43,949	4.30%	28.00%
Marion	8,049	8,517	5.80%	10,360	21.60%	9,984	-3.60%	24.00%
Morris	12,576	12,310	-2.10%	14,629	18.90%	13,200	-97.70%	-9.80%
Rains	2,993	3,752	25.40%	4,839	28.90%	6,715	38.70%	38.70%
Red River	15,682	14,298	-8.80%	16,101	12.60%	14,317	-11.10%	-11.10%
Smith	86,350	97,096	12.40%	128,366	32.20%	151,309	17.90%	17.90%
Titus	16,785	16,702	-4.20%	21,442	28.40%	24,009	11.90%	11.90%
Upshur	19,793	20,976	6.00%	28,595	36.30%	31,370	9.70%	9.70%
Van Zandt	19,091	22,155	16.00%	31,426	41.80%	37,944	20.70%	20.70%
Wood	17,653	18,589	5.30%	24,697	32.90%	29,380	17.60%	17.60%

*Population numbers reflect the whole of Smith County, not the portion in Region D.

1.2 (b) Demographics

The North East Texas Region is largely rural. Most towns within the region have populations of less than 10,000, and there are many small, unincorporated areas within counties. Cities with populations over 10,000 are listed in Table 1.8

Table 1.8 Cities with 1998 Populations Over 10,000

City	1998 Estimated Population
Greenville	25,238
Longview	74,184
Marshall	25,066
Mount Pleasant	13,595
Paris	26,241
Sulphur Springs	15,160
Texarkana	42,247

Source: State Data Center Projections

The 1990 U.S. Census identifies totals of ethnic categories, including black, white, and other (Asian, American Indian, Hispanic, etc.). The graph in Figure 1.9 illustrates ethnic percentages in the North East Texas Region compared to the state.

Incomes in the North East Texas Region are earned through a variety of occupations, with many fields either directly or indirectly related to agriculture. The median household income in the region, as reported by the 1990 census, is $21,465, which is lower than the state average of $27,017. Marion County reported the lowest median income of the region, at $15,288, and Gregg County reported the highest income at $25,484. Table 1.9 lists the median family income by county. The average per capita income for the region is $10,705, compared to the state average of $12,904. Red River County reported the lowest per capita income of $8,482, and Gregg County reported the highest, at $12,457.

Opportunities for obtaining a good education are available in the North East Texas Region. There are numerous school districts within the region teaching students from kindergarten through 12th grade. In addition, there are multiple junior colleges and community colleges including North East Texas Community College, Kilgore Junior College, Panola Junior College, Paris Junior College and Texarkana College. Finally, there are four-year undergraduate universities, including East Texas Baptist University, Texas State Technical College and Wylie College in Marshall, Le Tourneau in Longview, and Texas A&M University in Commerce. A majority of residents within the North East Texas Region have graduated from high school or have a high school equivalent. Some have taken college courses, but most do not have a college education, according to the 1990 census.

Figure 1.9
Race Ethnicity

Table 1.9 1989 Regional Incomes

County	Median Income	Per Capita Income
Bowie	$24,237	$11,846
Camp	$19,673	$9,936
Cass	$19,886	$9,391
Delta	$20,208	$9,859
Franklin	$23,103	$12,370
Gregg`	$25,484	$12,457
Harrison	$22,625	$10,173
Hopkins	$20,771	$11,049
Hunt	$25,317	$11,845
Lamar	$21,551	$10,511
Marion	$15,288	$9,197
Morris	$19,895	$10,344
Rains	$21,741	$10,711
Red River	$16,217	$8,482
Smith	$25,769	$12,742
Titus	$22,173	$11,163
Upshur	$21,889	$10,254
Van Zandt	$21,072	$10,130
Wood	$20,927	$10,937
North East Texas Region	$21,465	$10,705
Texas	$27,017	$12,904

1.2 (c) Economic Activity

The North East Texas Region's main economic base is agribusiness. Crops are varied, and include vegetables, fruits, and grains. Cattle and poultry production are important – cattle for dairies and cow-calf operations, and poultry for eggs and fryers. Tourism is a growth industry in the region with tourists visiting the region from all over the country. The North East Texas Region boasts many museums, parks, lakes and other places of interest, as well as many annual fairs and festivals. In the eastern half of the region, the timber, oil and gas industries are important, as is mining. Closer to the Dallas-Ft. Worth Metroplex, many residents of the region are employed there. Major corporate employers in the region include Campbell Soup, International Paper, Raytheon E-Systems, Kimberly Clark, Pilgrim's Pride and Rubbermaid. Other large employers include the Lowe's Distribution Center, Target Distribution Center, Neiman Marcus Headquarters, and Wal-Mart Distribution Center. Military bases in the region include Camp Maxey, the Lone Star Army Ammunition Plant, and the Red River Army Depot.

The North East Texas Region is traversed by several major highways, including Interstate 30 which passes from Dallas-Ft. Worth through the region to Texarkana. Interstate 20 runs from the Dallas Metroplex east/west across the southern portion of the region. Other major highways include U.S. 271, U.S. 69, U.S. 82, U.S. 59, U.S. 259, and U.S. 80. A new interstate route is under consideration from Texarkana south through the region, to accommodate traffic generated by the North American Free Trade Agreement.

Water travel is not significant in the North East Texas Region. However, there are numerous county and municipal airports including the Atlanta Municipal Airport, Caddo Municipal Airport in Hunt County, Clarksville-Red River County Airport, Commerce Municipal Airport, Cox Field in Lamar County, Cypress Airport in Marion County, Franklin County Airport, Gilmer-Upshur County Airport, Gladewater

Municipal Airport, Greater Morris County Airport, Gregg County Airport, Harrison County Airport, Majors Field in Hunt County, Manning Field in Marion County, Mineola-Quitman Airport, Mineola-Wisener Field, Mount Pleasant Municipal Airport, Sulphur Springs Municipal Airport, Taylor Airport in Hunt County, Texarkana Regional Airport, Wills Point Municipal Airport in Van Zandt County, and Winnsboro Municipal Airport in Wood County.

1.3 Descriptions of Water Supplies and Water Providers in the Region

1.3 (a) Groundwater

The TWDB has identified two major aquifers and four minor aquifers in the North East Texas 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.

Major aquifers are the:

- Carrizo-Wilcox
- Trinity

Minor aquifers are the:

- Blossom
- Nacatoch
- Queen City
- Woodbine

Figure 1.10 and Figure 1.11 shows the aerial extent of major and minor aquifers in North East Texas. In addition, there are other aquifers in the region that have not been designated as either a major or minor aquifer by the TWDB. For planning purposes, these aquifers have been grouped together into an "other aquifer" category. The following generalized descriptions of the major and minor aquifers are based largely on the work of the TWDB. A more thorough discussion of these aquifers, especially in relation to water supply availability, can be found in Chapter 3.

The total groundwater usage in the North East Texas Region was 52,806 ac-ft during 1997. Seventy percent of that groundwater was used for municipal purposes. About fifteen percent of the groundwater was used for livestock purposes and the rest of the groundwater was used for manufacturing, mining, irrigation, and power generation.

(1) Major Aquifers

a) Carrizo-Wilcox Aquifer

The Carrizo-Wilcox Aquifer is the most heavily utilized aquifer in the region, producing approximately 76 percent of the total groundwater used in the region. 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 northeast into Arkansas and Louisiana, providing water to all or parts of 60 counties in Texas. Figure 1.11 which shows the extent of the Carrizo-Wilcox Aquifer in the region, illustrates that the Carrizo-Wilcox Aquifer in the region occurs as a major trough caused by the Sabine Uplift near the Texas-Louisiana border. In the outcrop, wells generally yield less than 100 gpm – downdip yields greater than 500 gpm are not uncommon. Regionally, water from the Carrizo-Wilcox Aquifer is fresh to slightly saline. Iron and manganese are frequently encountered. In the outcrop, the water is hard, yet usually low in dissolved solids. Hydrogen sulfide and methane may occur locally. Excessively corrosive water is common in some areas of the region.

Total groundwater pumpage from the Carrizo-Wilcox Aquifer in the North East Texas Region was 39,995 ac-ft during 1997. Seventy percent of the groundwater was utilized for municipal purposes. Approximately 15 and 13 percent of the groundwater was utilized for livestock and mining, respectively, and the remainder was used for power, manufacturing, and irrigation purposes.

b) Trinity Aquifer

The Trinity Aquifer is composed of sand, clay, and limestone units which occur in a band from the Red River in north Texas, to the Hill Country of south-central Texas. It provides water in all or parts of 55 Texas counties. Sherman and Gainesville are two large public supply users of the Trinity Aquifer located west of this region. The groundwater use from the Trinity Aquifer during 1997 in the North East Texas Region was 558 ac-ft. Of this total, 79 percent was used for municipal purposes and remainder was used for livestock. These values are relatively small because only a small northwestern portion of the region overlies the downdip portion of the Trinity Aquifer, and the groundwater from the Trinity Aquifer in the region exceeds the 1,000 mg/l TDS limits established by TNRCC for municipal supply.

Figure 1.10
Major Aquifers

Figure 1.11
Minor Aquifers

(2) Minor Aquifers

a) Queen City Aquifer

The Queen City Aquifer extends in a band across most of Texas from the Frio River in south Texas northeast into Louisiana. The extent and distribution of the Queen City Aquifer in the North East Texas Region is shown as Figure 1.11. 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 wells exceed 400 gal/min. 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. Due to the relatively low well yields, overdrafting of the aquifer has not occurred. The groundwater usage from the Queen City during 1997 in the region was 6,329 ac-ft. Of this total, 60 percent was used for municipal purposes and 30 percent was used for livestock purposes.

b) Woodbine Aquifer

The Woodbine Aquifer extends from McLennan County in north-central Texas northward to Cooke County and eastward to Red River County, paralleling the Red River (see Figure 1.11). The Woodbine Aquifer is composed of water bearing sand and sandstone beds interbedded with shale and clay. The water in storage is under water-table conditions in the outcrop and under artesian conditions in the subsurface. The aquifer dips eastward into the subsurface where it reaches a maximum depth of 2,500 feet below land surface and a maximum thickness of approximately 700 feet.

Yields of wells completed in the Woodbine Aquifer in the North East Texas Region are generally less than 100 gpm. Water produced from the aquifer furnishes municipal, industrial, domestic, livestock, and small irrigation supplies throughout North East Texas. Chemical quality of water deteriorates rapidly in well depths below 1,500 feet. In areas between the outcrop and this depth, quality is considered good overall as long as groundwater from the upper Woodbine Aquifer is sealed off. The upper Woodbine Aquifer contains water of extremely poor quality in downdip locales and contains excessive iron concentrations along the outcrop. Total pumpage from the Woodbine Aquifer in the North East Texas Region during 1997 was 642 ac-ft, all in Hunt and Lamar counties.

c) Nacatoch Aquifer

The Nacatoch Aquifer occurs in a narrow band in North East Texas and extends eastward into Arkansas and Louisiana (see Figure 1.11). The Nacatoch formation is composed of one to three sequences of sands separated by impermeable layers of mudstone or clay. The aquifer also includes a hydrologically connected mantle of alluvium up to 80 feet thick where it covers the Nacatoch Formation along major drainage ways. Groundwater in this aquifer is usually under artesian conditions except in shallow wells on the outcrop where water-table conditions exist. Well yields are generally low, less than 50 gal/min, and rarely exceed 500 gal/min. The quality of groundwater in the aquifer is generally alkaline, high in sodium bicarbonate, and soft. Dissolved-solids concentrations increase in the downdip portion of the aquifer and are significantly higher downdip of faults.

Annual availability, equivalent to annual effective recharge, for the Nacatoch Aquifer is estimated to be 3,030 ac ft. Recharge to the aquifer occurs mainly from precipitation on the outcrop. Aquifer water levels have been significantly lowered in some areas as a result of pumpage exceeding the effective recharge. For example, long term municipal pumpage in past years has resulted in water level declines around the City of Commerce in Delta and Hunt counties. Fortunately, these declines have been stabilized with conjunctive use of available surface water supplies. During 1997, pumpage from the aquifer totaled 3,167 ac-ft, 79 percent of which was used for municipal purposes. Other uses include rural domestic, livestock, and irrigation.

d) <u>Blossom Aquifer</u>

The Blossom Aquifer occupies a narrow east-west band in parts of Bowie, Red River, and Lamar counties in the North East corner of the state (see Figure 1.11). The Blossom formation consists of alternating sequences of sand and clay. In places it attains a thickness of 400 feet, although no more than 29 percent of this thickness consists of water-bearing sand. The Blossom Aquifer yields water in small to moderate amounts over a limited area on and south of the outcrop area. Most of the water in storage is under water-table conditions. The average well yields 75 gal/min in Red River County. Production decreases in the western half of the aquifer where yields less than 50 gal/min are more typical. Wells producing fresh to slightly saline water are located on the formation outcrop in northwestern Bowie and eastern Red River counties and in the City of Clarksville. The groundwater is generally soft, slightly alkaline and, in some areas, high in sodium bicarbonate, iron, and fluoride.

In 1997, municipal pumpage accounted for 83 percent of the total pumpage of 1,003 ac ft from the Blossom Aquifer. Annual availability for the Blossom Aquifer is equal to the annual effective recharge, which occurs mainly through infiltration of rainfall on the outcrop.

(3) <u>Other Aquifers</u>

Some groundwater pumpage from "other aquifers" is registered in the TWDB database in Bowie, Delta, Hopkins, Hunt, Lamar, Rains, Red River, Titus, and Van Zandt counties. The total reported from these aquifers in 1997 was 1,112 ac-ft and ranged from 4 ac-ft in Van Zandt County to 361 ac-ft in Bowie County.

(4) <u>Springs</u>

There are over 150 springs of various sizes documented in the North East Texas Regional Water Planning Area (Brune, 1981). The majority of the largest springs (20 to 200 gpm) are located in the southern third of Region D. The northern third of the region has smaller spring flows ranging from 0.2 to 20 gpm. A number of springs in Red River, Bowie, Hunt, Delta, Lamar and Titus counties have gone dry. Most springs discharge less than 10 gpm and are inconsequential for planning purposes.

In the northern third of Region D (Lamar, Red River, and Bowie counties) springs issue from the Upper Cretaceous Formations including the Woodbine, Navarro and Ozan Sands, Bonham and Blossom. Springs in the central and southern third of the Region issue from the Tertiary Eocene Sands including the Reklaw, Carrizo, Wilcox and Queen

City. The water quality of springs in Region D is dominated by calcium and sodium bicarbonate type waters with locally high concentrations of iron, manganese and sulfate.

(5) Threats and Constraints on Water Supply

Potential threats to the groundwater resources of the region include contamination from point and nonpoint sources. In general, contamination from point sources such as landfills, waste water outfalls, hazardous waste spills, and leaking underground storage tanks have a relatively localized impact on the shallow water resources of the aquifers. Nonpoint source contamination from agricultural practices such as fertilization and application of herbicides and pesticides as well as urban runoff may have more regionalized impact on shallow groundwater. Adherence to TNRCC regulations concerning stormwater and waste water discharges should reduce threats to groundwater from these sources.

1.3 (b) Surface Water Supplies

The North East Texas Region contains portions of the Red, Sulphur, Cypress Creek and the Sabine River Basins. A small corner of Van Zandt County lies in the Neches River Basin, but the entire county has been considered part of the region for planning purposes. Likewise, a small corner of Hunt County is in the Trinity Basin.

Groundwater is limited in quality and quantity in large portions of the North East Texas Region, and, consequently a majority of the region relies on surface water supplies. For example, in the Sulphur Basin, 91 percent of the water used is surface water; 89 percent of water used in the Cypress Creek Basin is surface water, and in the Sabine River Basin, some 81 percent of the need is met by surface water. In the portion of the Red River Basin in the region, 88 percent of the water supply used is surface water.

Within the region, a number of surface water reservoirs greater than 500 surface acres exist as shown in Table 1.10. The larger of these reservoirs are illustrated on Figure 1.12.

Surface water reservoirs in the region are used for a variety of purposes, including municipal and industrial water supply, fishing, boating, water sports, cooling water for electric generation, irrigation, livestock, and flood control. State parks exist adjacent to several of the reservoirs, including: Caddo Lake State Park, Lake Bob Sandlin State Park, and Cooper Lake State Park. The Texas Parks and Wildlife Department maintains an 8925 acre wildlife management area on Pat Mayse Lake in Lamar County. The Corps of Engineers maintains recreational areas on several reservoirs, including: Pat Mayse, Lake O' the Pines, and Wright Patman. The Sabine River Authority and various local districts and municipalities maintain recreation facilities on their respective reservoirs. Corps of Engineers lakes in the North East Texas Region such as Pat Mayse, Wright Patman, and Lake O' the Pines have a major operational goal of flood control, as well as water supply and recreation. Other reservoirs such as Monticello, Rivercrest, and Welsh Reservoir provide cooling water for power generation as well as recreation.

Table 1.10 Existing Reservoirs

			Conservation Pool		
Lake/Reservoir	**County**	**Built**	**Area (acres)**	**Capacity (ac-ft)**	**Supply (ac-ft)**
Red River Basin					
Crook	Lamar	1923	1,226	9,664	1,000
Pay Mayse Lake	Lamar	1967	5,993	124,500	59,900
Sulphur River Basin					
Big Creek Lake	Delta	1986	520	4,890	1,518
Cooper	Delta	1991	19,280	310,000	146,520
Rivercrest	Red River	1953	555	7,100	10,000
Langford Creek Lake	Red River	1966	162	2,334	1,215
Lake Sulphur Springs	Hopkins	1974	1,557	14,370	7,800
Lake Wright Patman	Bowie/Cass	1954	33,750	265,300	180,000
Cypress Creek Basin					
Lake Bob Sandlin	Wood/Titus/Franklin	1975	9,460	213,350	60,500
Caddo Lake	Marion/Harrison	1971	26,800	129,000	10,000
Cypress Springs	Franklin	1971	3,400	72,800	15,300
Ellison Creek	Morris	1943	1,516	24,700	23,000
Lake Gilmer	Upshur	1998	895	12,720	7,470
Cypress Creek Basin (cont.)					
Johnson Creek Reservoir	Marion	1961	650	10,100	6,688
Lake O' the Pines	Marion/Upshur	1958	19,780	254,900	130,600
Monticello Lake	Titus	1973	2,000	40,100	16,300
Tankersley Lake	Titus		na	na	2,230
Welsh Reservoir	Titus	na	1365	23,587	0
Sabine River Basin					
Lake Cherokee	Gregg	1948	3,987	46,700	22,500
Lake Gladewater	Upshur	1952	800	6,950	1,679
Greenville Lakes	Hunt	na	na	6,864	4,159
Lake Fork	Wood/Rains	1980	27,960	675,819	188,660
Lake Hawkins	Wood	1962	776	11,890	0
Lake Holbrook	Wood	1962	653	7,990	0
Lake Quitman	Wood	1962	814	7,400	0
Lake Winnsboro	Wood	1962	806	8,100	0
Lake Tawakoni	Rains/Van Zandt/Hunt	1960	36,200	936,200	238,100

Figure 1.12
Reservoirs

Three major agreements, which affect surface water availability in the region, are the Red River Compact, the Cypress Basin Operating Agreement, and the Sabine River Compact. The Red River Compact, entered into by Arkansas, Oklahoma, Louisiana, and Texas was adopted in 1979, and apportions water from the Red, Sulphur, and Cypress Creek Basins between the various states. In addition to the compact, water in the Cypress Basin is controlled by the Cypress Basin Operating Agreement. This agreement between the various water rights holders in the basin provides an accounting of water storage, and specifies the storage capabilities of Lakes Bob Sandlin and Cypress Springs, subject to calls for release by downstream Lake O' the Pines. The Sabine River Compact, to which Texas and Louisiana are partners, recognizes that neither entity will construct reservoirs which reduce the “Stateline” flow to less than 36 cubic feet per second.

Several of the water supply reservoirs in the region have been the subject of recent volumetric surveys by the TWDB. In each case, as shown below in Table 1.11, the survey showed a lesser volume than originally estimated. While this can at least partially be attributed to sedimentation, it is difficult to draw any further conclusions since original estimating methodologies varied and generally lacked the precision of these latest surveys.

Table 1.11 Capacity of Major Reservoirs

	Original Capacity at Conservation Pool – (ac-ft)	Date	Estimated Capacity at Conservation Pool – (ac-ft)	Date	Percent Reduction
Lake Bob Sandlin	213,350	1978	204,678	1998	4.0
Lake Cherokee	49,295	1948	41,506	1996	15.8
Lake Cypress Springs	72,800	1971	67,690	1999	7.0
Lake Monticello	40,100	1972	34,470	1998	14.0
Lake O' The Pines	254,900	1958	241,081	1998	5.4
Lake Tawakoni	936,200	1960	888,140	1997	5.1
Wright Patman Lake	145,300	1956	110,900	1997	23.7

Surface water is currently imported to, and exported from, the North East Texas Region. In the Red River Basin, Texarkana Water Utilities imports from Arkansas, and exports to the City of Texarkana, Arkansas. In the Sulphur Basin, Cooper Lake serves as a supply for the City of Irving and the North Texas Municipal Water District, both in Region C. Commerce has leased its water in Cooper Reservoir to Upper Trinity (Region C) for the next 50 years. In the Sabine Basin, Lake Tawakoni is a partial supply for Dallas Water Utilities, and that entity has rights to water in Lake Fork Reservoir not yet exercised. Several entities in Hunt County import water from Region C via the North Texas Municipal Water District. These are further identified in Table 1.12.

Table 1.12 Imported and Exported Water

Entity	Imported From	Exported To
Ables Springs WSC	Region C (City of Terrell)	Region C Kaufman County
Ben Wheeler WSC	—	Region I Smith County
BHP WSC	Region C (NTMWD)	Region C Rockwall County
Caddo Basin Special Utility District	Region C (NTMWD)	Region C Collin County
Caddo Mills	Region C (NTMWD)	—
Cash WSC	Region C (NTMWD)	Region C Rockwall County
Edom WSC	—	Region I Henderson County
Elderville WSC	—	Region I Rusk County
Elysian Field WSC	—	Region I Panola County
Gill WSC	—	Region I Panola County
Hickory Creek Special Utility District	Region C (Collin County – Groundwater)	Region C – Fannin County and Collin County
Kilgore, City of	—	Region I Rusk County
Longview	Region I (Lake Cherokee)	—
MacBee WSC	—	Region C Kaufman County
North Hunt WSC	Region C (Fannin County-Groundwater)	
RMP WSC	—	Region I Henderson and Smith Counties
Terrell, City of	—	Region C Kaufman County
Texarkana Water Utilities	Arkansas (Milwood Reservoir)	Texarkana, Arkansas
Van, City of	—	Region I Smith County
West Gregg WSC	—	Region I Rusk County
City of Wolfe City	Region C (Fannin County Groundwater)	—

1.3 (c) Surface Water Quality

The Texas Natural Resource Conservation Commission (TNRCC) is the state agency responsible for monitoring water quality in Texas. In the Texas Nonpoint Pollution and Assessment Report and Management Program, developed by TNRCC and the State Soil and Water Conservation Board, Texas is divided into 5 basin groups for watershed quality management. Water quality in three basin groups is studied individually on 5-year cycles. Each year, TNRC makes determinations on water quality within one basin group. These determinations are compiled into the “303d list,” which identifies specific causes of water body impairment and prioritizes listed bodies for subsequent Total Maximum Daily Load development. The year 2000 303d list focused on basin group A, which includes the Canadian River Basin, Red River Basin, Sulphur River Basin, Cypress Creek Basin, Sabine River Basin, Sabine Pass and the Neches River Basin. Basin group A includes 97 percent of the North East Texas Region. Table 1.13 presents a summary of water quality improvements within the North East Texas Region are from TNRCC's 2000 Draft 303d list:

Table 1.13
Surface Water Segments on 303d List
North East Texas Region

***Segment* Number**	**Water Body Name**	**Priority**	**Basin Group**	**PS**	**NPS**	**Summary of Impairment**
0302	Wright Patman Lake	M	A	Y	Y	In the upper 6,693 acres of the reservoir, dissolved oxygen concentrations are sometimes lower than the standard established to assure optimum conditions for aquatic life (M/NS). In a 400 acre area near the dam, a 123 acre area in the northwestern-most tip of the reservoir, and in a 3,381 acre area in the upper middle, dissolved oxygen concentrations are occasionally lower than the standard established to assure optimum conditions for aquatic life (M/PS). In a 123 acre area in the northwestern-most tip of the reservoir, pH levels are higher than the standard established to safeguard general water quality uses (L/CN). In the 2,350 acre arm northwest of the dam, a 3,726 acre area in the middle, and a 3,381acre area in the upper middle of the reservoir, pH levels are occasionally higher than the standard established to safeguard general water quality uses (L/CP).
0303A	Big Creek Lake (unclassified water body north of Cooper in Delta County)	T-h	A		Y	All water quality measurements currently support use as a public water supply; however, atrazine concentrations in finished drinking water indicate contamination of source water and represent a threat to future use (T-h).
0303B	White Oak Creek (unclassified water body north of Omaha in Morris County)	M	A	Y	Y	In the lower 50 miles, dissolved oxygen concentrations are occasionally lower than the standard established to assure optimum conditions for aquatic life (M/PS).
0304A	Swampoodle Creek (unclassified water body central Texarkana in Bowie County)	M	A		Y	The average concentration of malathion in water exceeds the chronic criterion established to assure optimum conditions for aquatic life (M/NS). The average mercury concentration in water exceeds the human health criterion for freshwater fish (M/NS). This criterion was established to protect consumers from bioaccumulation of toxicants in fish tissue. Risk of exposure to mercury from fish consumption has not been assessed.

Segment **Number**	**Water Body Name**	**Priority**	**Basin Group**	**PS**	**NPS**	**Summary of Impairment**
0306	Upper South Sulphur River	M	A	Y	Y	In the upper 25 miles, pH levels are sometimes higher than the criterion established to safeguard general water quality uses (L/CN). In the lower 6 miles, dissolved oxygen concentrations are occasionally lower than the standard established to assure optimum conditions for aquatic life (M/PS). In the same 6 miles, bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS).
0307	Cooper Lake	M	A	Y	Y	In the lower 8,000 acres of the reservoir, dissolved oxygen concentrations are occasionally lower than the standard established to assure optimum conditions for aquatic life (M/PS). In the 3,000-acre lower arm of the reservoir, pH levels are sometimes higher tan the criterion established to safeguard general water quality uses (L/CN). In the 10,000 acres of the middle and lower portions of the reservoir, pH level are occasionally higher than the criterion established to safeguard general water quality uses (L/CP).
0401	Caddo Lake	M	A	Y	Y	The fish consumption use is partially supported, based on a restricted-consumption advisory issued by the Texas Department of Health in November 1995 for Caddo Lake due to elevated concentrations of mercury in fish tissue (M/PS). In approximately 650 acres in the Harrison Bayou Arm, approximately 1,000 acres near Hells Half Acre in Carter Lake, and in approximately 2,000 acres near Devils Elbow in Clinton Lake, dissolved oxygen concentrations are sometimes lower than the standard established to assure optimum conditions for aquatic life (L/NS). In approximately 1,000 acres near Hells Half Acres in Carter Lake, pH levels are occasionally lower than the minimum criterion established to safeguard general water quality uses (L/CP). In approximately 2,000 acres near Devils Elbow in Clinton Lake, pH levels are sometimes lower than the minimum criterion established to safeguard general water quality uses (L/CN). The average concentration of total dissolved solids exceeds the criterion established to safeguard general water quality uses (L/CN).

***Segment* Number**	**Water Body Name**	**Priority**	**Basin Group**	**PS**	**NPS**	**Summary of Impairment**
0402	Big Cypress Creek Below Lake O' the Pines	M	A	Y	Y	The fish consumption use if partially supported, based on a restricted-consumption advisory issued by the Texas Department of Health in November 1995 due to elevated levels of mercury in fish tissue (M/PS). In the lower 25 miles, dissolved oxygen concentrations are sometimes lower than the standard established to assure optimum conditions for aquatic life (L/NS). In the same 25 miles, pH levels are occasionally below the minimum criterion established to safeguard general water quality uses (L/CP).
0402A	Black Cypress Bayou (unclassified water body between Avinger and Linden in Cass County)	M	A	Y	Y	In a one-mile portion around SH155 (Pruitt Lake), dissolved oxygen concentrations are sometimes lower than the standard established to assure optimum conditions for aquatic life (L/NS). In the same area, the fish consumption use is only partially supported based on a consumption advisory issued by the Texas Department of Health in April 1999 due to elevated levels of mercury in fish tissue (M/PS).
0403	Lake O' the Pines	H	A	Y	Y	In approximately 2,000 acres in the upper end of the lake, dissolved oxygen concentrations are occasionally lower than the standard established to assure optimum conditions for aquatic life (L/PS).
0404B	Tankersley Creek (unclassified water body near Mt. Pleasant in Titus County)	L	A	Y	Y	Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS).
0404D	Welsh Reservoir (unclassified water body between Mt. Pleasant and Dangerfield in Titus County)	M	A	Y	Y	The fish consumption use is partially supported based on a restricted-consumption advisory issued by the Department of Health due to elevated levels of selenium in fish tissue (M/PS).
0407	James' Bayou	M	A	Y	Y	In the lower 32 miles, dissolved oxygen concentrations are occasionally lower than the standard established to assure optimum conditions for aquatic life (L/PS). In the lower 32 miles, the average mercury concentration in water exceeds the human health criterion for freshwater fish (M/NS). This criterion was established to protect consumers from bioaccumulation of toxicants in fish tissue. Risk of exposure to mercury from fish consumption has not been assessed.

Segment Number	Water Body Name	Priority	Basin Group	PS	NPS	Summary of Impairment
0409	Little Cypress Bayou (Creek)	M	A	Y	Y	Dissolved oxygen concentrations are sometimes lower than the standard established to assure optimum conditions for aquatic life (L/NS). In the lower 50 miles, the average mercury concentration in water exceeds the human health criterion for freshwater fish (M/NS). This criterion was established to protect consumers from bioaccumulation of toxicants in fish tissue. Risk of exposure to mercury from fish consumption has not been assessed.

Priority – The overall priority rank of the water body for TMDL development is shown in this column. If there are multiple impairments, the highest rank assigned for an individual pollutant becomes the overall rank. However, in the case of international/interstate waters, the overall rank usually will be low (because of the uncertainty associated with obtaining interstate/international collaboration in TMDL development), regardless of the rank of individual pollutants.

Impaired waters: H=high; M=medium; L=low; U=a project to address a listed pollutant is underway. Projects include total maximum daily load (TMDL) development, targeted monitoring to assess the extent and severity of a problem, or assessment of the appropriateness of the water quality standard. Where the project underway does not address all listed pollutants, the overall priority will show the highest priority single pollutant not addressed by the TMDL, but will also show a “U” to indicate that one or more pollutants of concern are being addressed. There are 92 water bodies listed for bacteria. These waters are being addressed indirectly through a statewide study to assess the appropriateness of the indicator, but are not designated as underway.

Threatened waters: T-h=threatened high; T-m=threatened medium.

PS/NPS – a “Y” indicates whether the impairment is from point source (PS) or nonpoint sources (NPS). This includes unknown and/or potential point or nonpoint sources.

1.3 (d) Major Water Providers

TWDB rules for regional water planning require each RWPG to identify and designate "major water providers." TWDB guidelines define a "major water provider" as:

> "…an entity, which delivers and sells a significant amount of raw or treated water for municipal and/or manufacturing use on a wholesale and/or retail basis. The entity can be public or private (nonprofit or for-profit). Examples include municipalities with wholesale customers, river authorities, and water districts."

The intent of these requirements is to ensure that there is an adequate future supply of water for each entity that receives all or a significant portion of its current water supply from another entity. This requires an analysis of projected water demands and currently available water supplies for the primary supplier, each of its wholesale customers, and all of the suppliers in the aggregate as a "system." For example, a city that serves both retail customers within its corporate limits as well as other nearby public water systems would need to have a supply source(s) that is adequate for the combined total of future retail water sales and future wholesale water sales. If there is a "system" deficit currently or in the future, then recommendations are to be included in the regional water plan with regard to strategies for meeting the "system" deficit.

Based upon this explanation, the North East Texas RWPG selected 13 major water providers, as follows:

Wholesale Water Suppliers	Municipal Water Suppliers
Cherokee Water Company	City of Greenville
Franklin County Water District	City of Longview
Northeast Texas Municipal Water District	City of Marshall
Sabine River Authority	City of Mt. Pleasant
Sulphur River Basin Authority	City of Paris
Titus County Freshwater Supply	City of Sulphur Springs
District No. 1	City of Texarkana

Table 1.14 shows the wholesale activities of each of these entities:

Table 1.14 Wholesale Providers of Municipal and Manufacturing Water Supply

Wholesale Water Supplier	Wholesale Customers	
Cherokee Water Company	Knox Lee Power Plant Longview	
City of Greenville	Caddo Mills Jacobia WSC	Shady Grove WSC
City of Longview	Elderville WSC Gum Springs WSC Hallsville	Tryon Road WSC White Oak (raw water)
City of Marshall	Cypress Valley WSC Gill WSC	Leigh WSC Talley WSC
City of Mt. Pleasant	Tri Water WSC Winfield	

Table 1.14 Wholesale Providers of Municipal and Manufacturing Water Supply (cont.)

Wholesale Water Supplier	Wholesale Customers	
City of Paris	Lamar County WSD MJC WSC	
City of Sulphur Springs	Brashear WSC Brinker WSC Gafford Chapel WSC Martin Springs WSC	North Hopkins WSC Pleasant Hill WSC Shady Grove WSC 2
City of Texarkana	Annona Avery Central Bowie WSC DeKalb Federal Correctional Institution Hooks Macedonia Eylau MUD	Maud Nash New Boston Oak Grove WSC Red River County WSC Redwater Wake Village
Franklin County Water District	Cypress Springs WSC Mt. Vernon	Winnsboro
Northeast Texas Municipal Water District	Avinger Daingerfield Hughes Springs Jefferson Lone Star Lone Star Steel	Longview Mims WSC Pittsburg SWEPCO Texas Utilities
Sabine River Authority	Ables Springs WSC Caddo Mills Cash WSC Combined Consumers WSC Commerce Community Water Co. Eastman Chemical Edgewood Emory Greenville	Kilgore Longview MacBee WSC Point Quitman South Tawakoni WSC Texas Utilities West Tawakoni Wills Point
Sulphur River Basin Authority	Anticipated future sales from reservoirs developed in the Sulphur Basin	
Titus County Freshwater Supply District No. 1	Mt. Pleasant Texas Utilities	

1.4 Description of Water Demand in the Region

1.4 (a) <u>Historical and Current Water Use</u>

Historical and current uses in the North East Texas Region include municipal, manufacturing, recreation, irrigation, mining, power generation and livestock. According to Figure 1.13, manufacturing is the predominant use category, exceeding all others combined. Mining and irrigation are relatively insignificant water consumers in the North East Texas Region, and in fact, Table 1.15 indicates that mining use has declined by about 9 percent since 1980. While still a relatively small category, livestock watering use has increased by 40 percent since 1980. In the North East Texas Region, livestock includes poultry, and some estimates indicate further substantial increases in the poultry industry usage within the next 10 years.

The North East Texas Region utilizes both ground and surface water supplies, as shown in Table 1.16. In 1997, about 12 percent of the total water use in the region was groundwater – a figure which has remained relatively constant since 1980. The bulk of this groundwater – 42 percent - is used in the four counties of Smith, Upshur, Van Zandt, and Wood, and is drawn from the Queen City and Carrizo-Wilcox Aquifers.

Figure 1.13
Water Use by Year and Category

Table 1.15
Water Use by County and Category
North East Texas Region

Table 1.16 Ground and Surface Water Use in Ac-ft by County

County	Total Ground Water Use			Total Surface Water Use		
	1980	1990	1997	1980	1990	1997
Bowie	4,434	5,029	2,651	21,394	12,318	15,864
Camp	1,928	1,853	1,561	203	422	1,041
Cass	4,987	4,593	3,710	36,164	83,217	91,164
Delta	257	221	142	2,263	3,136	822
Franklin	1,216	1,583	1,450	2,098	2,111	2,141
Gregg	4,294	2,475	3,505	20,524	30,644	20,649
Harrison	3,924	3,202	3,121	34,316	85,921	57,277
Hopkins	2,639	3,835	4,667	3,867	7,759	11,348
Hunt	1,872	2,018	1,538	10,483	12,735	11,171
Lamar	863	2,250	607	23,742	19,040	15,343
Marion	963	903	1,114	6,006	2,621	2,125
Morris	1,406	7,490	1,153	196,926	121,401	95,987
Rains	419	547	575	683	1,359	1,470
Red River	2,324	1,763	1,681	7,120	2,912	6,376
Smith	3,863	4,323	4,749	643	367	314
Titus	1,335	1,570	3,084	28,447	44,108	35,757
Upshur	3,924	4,679	5,139	970	1,430	1,404
Van Zandt	6,322	5,303	6,161	3,130	3,375	4,970
Wood	7,087	7,644	5,892	681	1,979	2,554
NE TX Region	**54,057**	**61,281**	**52,500**	**399,660**	**436,855**	**377,777**

Source: TWDB

In 1997, total reported usage in the North East Texas Region – both ground and surface – was 430,277 acre feet, distributed as follows:

Category	Usage	Percent of Total
Municipal	100,656	23.4
Manufacturing	247,064	57.4
Power	33,206	7.7
Mining	8,733	2.0
Irrigation	16,132	3.7
Livestock	24,486	5.7

A comparison of data from 1980 shows insignificant changes in the percentages used by each class.

By 2030, projections developed in this plan indicate usage will reach 676,002 ac-ft, a 36 percent increase from 1997. The usage will be distributed as follows:

Municipal	135,493	20.0%
Manufacturing	392,864	58.1%
Power	82,033	12.1%
Mining	22,964	3.4%
Irrigation	12,637	1.9%
Livestock	30,006	4.4%

1.4 (b) Major Demand Centers

Major water demand centers include:

City	1998 Population	1998 Use*
Longview	74,184	4,309 MG/YR
Texarkana, Texas	42,247	1,836 MG/YR
Paris	26,241	4,257 MG/YR
Greenville	25,238	1,430 MG/YR
Marshall	25,066	1,060 MG/YR

*Usage developed from 1999 Region D Planning Group user surveys, excluding wholesale and industrial user. Texarkana includes Texas usage only.

1.4 (c) Recreational Demands

Recreational demands for water revolve principally around the region's reservoirs. Recreational activities include fishing, boating, swimming, water sports, picnicking, camping, wildlife observation, and others. Waterside parks attract thousands of visitors each year. For example:

Lake	1998 Visitors (Corps of Engineers facilities only)
Wright Patman	837,800
Pat Mayse	183,913
Lake O' the Pines	901,400
Cooper Lake	27,300

Recreational use of the region's reservoirs is coincidental with other purposes, including flood control and water supply. Conflicts arise when the designated use for flood control keeps water elevations too high for recreation or, in the opposite, when drought conditions and water supply demands leave boathouses and marinas dry.

1.4 (d) Navigation

The lack of perennial streams limits the viability of navigation projects in North East Texas. However, two potential projects are worth noting.

One project considered in the North East Texas Region is the “Red River Waterway Project – Shreveport to Daingerfield Reach.” The Shreveport to Daingerfield navigation channel, with accompanying locks, would be an extension of the Red River Waterway Project, Mississippi River to Shreveport, Louisiana,

which is in operation. A channel to Daingerfield was authorized by Congress in 1968. As envisioned, it would begin at the Red River and would be routed through Twelvemile Bayou, Caddo Lake, Cypress Bayou, and Lake O' the Pines. However, an updated review of this project was conducted by the Corps in the early 1990’s, which concluded that the project was not currently economically feasible and could result in significant environmental impacts for which mitigation was not considered to be practicable.
A second navigation project under study is the Southwest Arkansas Navigation Study. This joint project between the U.S. Army Corps of Engineers and the Arkansas Red River Commission is studying the feasibility of making the Red River navigable from Shreveport, Louisiana, through southwest Arkansas to near Texarkana, Texas. The Red River is already navigable below Shreveport-Bossier City, through the construction of five locks and dams, and various channel modifications. The study is currently underway, with expected completion in 2004.

While transportation cost savings are the primary factor in the feasibility of a navigation project, there can often be associated benefits, including such things as hydropower, bank stabilization, recreation, flood control, water supply, and fish and wildlife habitat. From a water planning perspective, navigation can provide supply, as well as demands. Pools associated with the various locks and dams may be beneficial for water supply. On the other hand, low flow demands may be placed upon contributory streams to maintain navigable levels. Lake O’ the Pines, for example, is obligated to supply up to 3,600 ac-ft of water per year in conjunction with navigability of the Red River below Shreveport. Extension of this project northward would likely require similar releases from the Sulphur Basin.

1.4 (e) <u>Environmental Water Demands</u>

Environmental water demands in the region include the need for water and associated releases necessary to support migratory water fowl, threatened and endangered species, and populations of sport and commercial fish. Flows must remain sufficient to assimilate wastewater discharges or there will be higher costs associated with waste water treatment and nonpoint discharge regulations. Periodic “flushing” events should be allowed for channel maintenance, and low flow conditions must consider drought periods as well as average periods.

1.5 Existing Water Planning in the Region

1.5 (a) <u>Initial Assessment for Drought Preparedness</u>

The survey of individual systems conducted as a part of this planning effort provided considerable insight into current preparations for drought conditions. For a number of years loans in excess of $500,000 from the TWDB have been accompanied by a requirement that the water supply entity develop a water conservation and drought contingency plan. The most recent legislative session mandated that all water supply systems that serve over 3,300 meters develop drought contingency plans by September 1, 1999, and that smaller systems comply with the same requirement in 2000. Despite these provisions, the RWPG survey of 268 individual systems indicated that only seven of these have water conservation plans and only 6 have adopted drought contingency plans. Recent droughts in the mid to late 90's resulted in emergency construction by several systems around Lake Tawakoni to lower intake structures to accommodate the critically low level of the lake. Similarly, a number of groundwater systems found that their rated well capacities were not valid for sustained use over periods of several weeks. Recent droughts have been relatively modest in relation to historically significant droughts of the 1950's and 1960's. In summary, the region as a whole is poorly prepared for a drought of major historical proportions.

1.5 (b) Existing Local Water Plans

During the survey of local systems conducted as part of this planning effort, 32 cities were identified as having local water plans out of a total of 78 surveyed. In general, the smaller systems allocate insufficient funds for long range planning purposes. Instead, the systems rely on periodic inspections by TNRCC, and then respond in a "crisis" mode to correct the deficiencies encountered by the regulators.

1.5 (c) Existing Regional Water Plans

A number of major suppliers in the North East Texas Region maintain regional plans. Among these are the Sabine River Authority, which has recently completed a study entitled "Comprehensive Sabine Watershed Management Plan," dealing with water resources in the Sabine River Basin. The Sulphur River Authority has completed regional plans dealing with water quality in the basin, as well as potential aspects of reservoir supply around the City of Clarksville in Red River County. Longview prepared a water supply study in 1982, and Paris completed a water system study in 1991. In addition, Northeast Texas Municipal Water District has completed studies on sources of additional water supply. Lamar County Water Supply District maintains a master plan for its two county service area in the northwest corner of the North East Texas Region.

Each of these regional plans pertains to the existing and fringe service areas of the entity involved. There are vast expanses of the planning region which are not covered by any regional plan. The region is divided among four river basins and three council of government planning regions. Thus, regional planning is hampered by the numerous small entities with conflicting and competing goals, and the lack of an overall entity with authority throughout a substantial portion of the region.

1.5 (d) Summary of Recommendations from the 1997 State Water Plan

The 1997 Texas Water Plan "Water for Texas" noted that in many areas of this region, shallow groundwater has high concentrations of iron and is acidic, making the water undesirable for municipal use and many manufacturing processes. Recommendations for continued use of groundwater included completing wells in deeper water bearing strata and/or treatment of water from the shallower wells. The plan noted that surface water and good quality groundwater are potentially available to meet projected water needs for the region if projects are planned and developed on schedule.

The state plan noted that during the next 50 years, member cities of the SRMWD could have excess water supplies in Cooper Lake. The Upper Trinity Regional Water District has entered into an agreement with the City of Commerce for the use of Commerce's share of the water from Cooper Lake. Any further excess water that the District member cities have could be used in the Dallas-Ft. Worth Metroplex.

The state plan also noted that the Northeast Texas Municipal Water District has storage rights in Lake O' the Pines that are in excess of its current contracts, and could be used to meet future demands in the Cypress or Sabine River Basins.

The state plan noted that the City of Longview holds contracts for water in Lake Cherokee and Lake Fork as well as having water rights to flows in the Sabine River and Big Sandy Creek. The city holds contracts with NETMWD for water from Lake O' the Pines and the Cypress Creek Basin. While it had not used that water at the time of the 1997 plan, it has plans to do so in the future. The Texas Water Plan anticipated that Longview should be able to meet its future water needs through the year 2050 from its present water supplies. Similar recommendations were contained in the plan for the cities of Texarkana, Paris, and Marshall. The 1997 plan noted that each of these communities had the ability to meet water needs through the 2050 planning year based upon existing sources of supply.

The 1997 state plan recommended two new water supply projects for development in the Sulphur River Basin, these being George Parkhouse II and Marvin Nichols I. The plan anticipated that these projects could be used to meet local needs as well as the needs of the Dallas-Ft. Worth Metroplex. Under one development alternative, Parkhouse II would be built by the year 2015 to meet the needs of the North Texas Municipal Water District member cities and customers and local entities. By the year 2040, Nichols I would be developed to meet additional needs in the Dallas-Ft. Worth Metroplex. The Parkhouse project would inundate about 11,018 acres. The Nichols project would inundate about 67,957 acres. Conveyance facilities would be required in either case to transmit the captured flows to entities within the basin and the Dallas-Ft. Worth Metroplex.

The water plan contained no significant recommendations for the Red River Basin counties in the North East Texas Region. No additional reservoirs or major recommendations were provided for the Cypress Creek Basin.

Within the Sabine River Basin it was noted that no major water supply reservoirs were proposed in the plan, although the Waters Bluff Reservoir project in the Upshur/Gregg county area could provide over 320,000 ac-ft per year to meet in basin or out of basin needs. Congressional action would be required to overcome environmental objections to the project, since, in 1988 the U.S. Fish and Wildlife Service accepted a conservation easement on 3,802 acres in the area proposed for the reservoir, for the purpose of conserving bottomland hardwood habitat. The 1997 plan noted that additional groundwater sources could be tapped to meet needs in the Upper Sabine Basin, primarily for mining and steam electric power generation, and that a pipeline could be constructed from Toledo Bend reservoir up to the Gregg/Harrison county area. The plan noted that existing contract rights belonging to Dallas Water Utilities in Lake Fork Reservoir are projected to be exported to Dallas through construction of major conveyance facilities before the year 2010.

1.6 Threats to Agricultural and Natural Resources

1.6 (a) Prime Farmland

The federal government has instituted the Farmland Protection Policy Act to protect prime farmland from being converted to other uses in order to provide for adequate farmland for the future. Currently, prime farmland is plentiful in North East Texas, but it can be destroyed in several ways. Developments, such as subdivisions, schools, industrial parks, and others, can wipe out hundreds of acres of prime farmland. Building new reservoirs on prime farmland is another way to reduce the amount of this valuable resource. Finally, when rivers and streams reroute themselves over time, they may encroach upon prime farmlands.

1.6 (b) Surface Water

The North East Texas Region has many lakes and reservoirs as well as ponds and streams. Currently, most of the region uses surface water as a primary source for drinking water. Surface water resources must be carefully protected to ensure sufficient quality and quantity of this resource. Surface water quality is threatened by point and nonpoint source pollution from waste water treatment facilities, industry, farms and ranches, recreational vehicles, etc. Surface water quantity is threatened by both short term and long term overuse. Short term overuse can occur during drought conditions when conservation practices are not implemented. Long term overuse, the constant depletion of the resource, is a more serious problem.

These threats can be controlled by proactive use of conservation practices, judicious construction of new supplies, and active enforcement of prohibitions and controls on use of potential contaminants in the watershed.

Specific steps for minimizing threats to surface water supplies from point and non-point source pollution include the following:

1. Continuation of the efforts of the TPDES permitting process for point sources including enforcement procedures for permit violations.
2. Continuation of the 303d assessment program under the auspices of the TNRCC and the Texas State Soil and Water Conservation Board.
3. Encouragement of reservoir owners/operators to participate in watershed protection programs such as the TWDB Source Water Assessment Program, part of the Clean Water State Revolving Fund; and the Section 319 Program offered by the Natural Resources Conservation Service in Conjunction with the Texas State Water Conservation Board.
4. Active enforcement by coounty on-site system regulatory agencies of TNRCC on-site sewage system regulations, particularly within critical areas around drinking water supply resources.
5. Continuation of the funding of data gathering and research activities for the TNRCC Clean Rivers Program throughout the North East Texas Region.

1.6 (c) Groundwater

In areas where good quality and quantity groundwater is available in North East Texas, it is utilized. Groundwater, like surface water, is threatened in quantity and quality. Water levels in several aquifers have declined over the past several decades due to extensive pumping by municipalities, agriculture, and industries, and will continue to do so if conservation practices are not followed. Continued over pumping can degrade water quality, as less desirable water is drawn into the aquifer. Abandoned wells must be adequately plugged. Groundwater quality can be degraded by waste activity such as landfills and waste spills where contaminants seep into aquifers. Groundwater is a key supply for many entities in the region and should be protected through wellhead protection and similar programs.

Specific areas of over pumping, further discussed in Chapter 3 of this plan include: the Woodbine Aquifer in Hunt County, the Nacatoch Aquifer in Bowie, Hopkins and Hunt counties, and the Blossom Aquifer in Lamar and Red River counties.

In Hunt County, usage of the Woodbine Aquifer is decreasing as larger regional systems absorb and/or contract with smaller groundwater entities. The larger regional systems such as Cash WSC rely on surface water from Lake Tawakoni and/or other regions. A specific example of potential conversion from the Woodbine Aquifer to surface water is the recommendation in Chapter 5 of this plan that the Tri-Water Supply Corporation convert to surface water by contracting with Ables Springs WSC and Cash WSC. The only recommendation for additio0nal wells in the Woodbine Aquifer in Hunt County is a 150 gpm well for the City of Wolfe City. The Ralph Hall Reservoir, proposed by Region C, could alternatively meet this need.

In Bowie, Hopkins, and Hunt counties, reliance on the Nacatoch Aquifer is also declining for reasons noted above. The City of Commerce, once a major user of Nacatoch resources, recently completed an expansion of its surface water facility and now relies predominantly on supply from Lake Tawakoni. The city is also wholesaling surface water to area groundwater suppliers including Gafford Chapel WSC, Maloy WSC, and North Hunt WSC. There are no recommendations in Chapter 5 of this plan for locating additional wells in the Nacatoch Aquifer in Bowie, Hopkins, or Hunt counties.

Finally, usage in the Blossom Aquifer is decreasing due to conversion to surface water and the availability of larger regional supplies such as the Lamar County Water Supply District in Lamar and Red River counties, and Texarkana Water Utilities in Red River and Bowie Counties. Both of these regional systems utilize surface water supplies. As a result of these conversions, the City of Clarksville and irrigation are the only recorded draws on the Blossom Aquifer in the North East Texas Region. Clarksville will ultimately have convenient access to the proposed Marvin Nichols I reservoir.

1.6 (d) Wildlife and Vegetation

Increased population and development in North East Texas causes increased stress on vegetation and wildlife resources. Urbanization destroys natural habitat and pushes animals into smaller and smaller territories. Loss of vegetation affects even those species that are abundant, such as deer, opossum, rabbit, and dove. Currently, there are 152 plant and animal species on the Texas threatened and endangered species list, and 25 of those species could be found in the planning region. See Table 1.17 for a regionally specified listing of endangered species as supplied by the Texas Parks and Wildlife Department in 1999. Efforts to protect these natural resources are ongoing, and must be continued in order to save the species of plants and animals that are in decline in North East Texas.

Chapter 4, in Exhibit B includes a table *of "Threatened, Endangered, or Rare Species of Potential Occurrence or Habitat in the Project Area"* for each of the reservoir project site. These tables should be referenced for more extensive lists of species in the study area.

1.6 (e) Petroleum Resources

The oil industry is economically important in North East Texas, but overproduction and declining prices have brought about a slump in the market over the past several years. In addition, oil is a renewable resource, but one that takes millions of years to produce, and exhausting this resource is a possibility. Careful monitoring of petroleum resources is important to ensure that they will be available in the future.

1.6 (f) Air

Clean air is vital to both humans and the environment. Air quality in the North East Texas Region complies with national ambient air quality standards in all areas, except the Tyler-Longview-Marshall area. This area is compliant with all standards except those of ozone. Air quality problems result from vehicle emissions, industrial exhaust, fire, and similar contaminants. Problems must be addressed and resolved in order to protect this nonrenewable resource.

1.6 (g) Wetlands

The U.S. Corps of Engineers defines wetlands as, "these areas that are inundated or saturated by surface or groundwater at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Wetlands are an important natural resource in North East Texas for several reasons. Wetlands support numerous plant and animal species including several threatened and endangered species. When wetlands are harmed, fish, bird, and other species that make their homes there are also harmed. In addition, wetlands influence the flow and quality of water by acting as sponges. They are able to store flood water and then slowly release it, reducing water's erosive potential. Finally, wetlands improve water quality by removing nutrients, processing organic wastes, and reducing sediment load. Destruction of wetlands has a documented negative impact on the environment.

Table 1.17 Texas Parks and Wildlife Department Listed Threatened and Endangered Species in the North East Texas Region

Source: Texas Biological and Conservation Data System. Texas Parks and Wildlife Department, Endangered Resources Branch. County Lists of Texas' Special Species, 1999.

Birds

American Peregrine Falcon	*Falco Peregrinus Anatum*
Arctic Peregrine Falcon	*Falco Peregrinus Tundrius*
Bachman's Sparrow	*Aimophila Aestivalis*
Bald Eagle	*Haliaeetus Leucocephalus*
Brown Pelican	*Pelecanus Occidentalis*
Eskimo Curlew	*Numenius Borealis*
Interior Least Tern	*Sterna Antillarum Athalassos*
Reddish Egret	*Egretta Rufescens*
White-Faced Ibis	*Plegadis Chihi*
Wood Stork	*Mycteria Americana*

Fishes

Blue Sucker	*Cycleptus Elongatus*
Blackside Darter	*Percina Maculata*
Bluehead Shiner	*Notropis Hubbsi*
Creek Chubsucker	*Erimyzon Oblongus*
Paddlefish	*Polyodon Spathula*
Shovelnose Sturgeon	*Scaphirhynchus Platorynchus*

Mammals

Black Bear	*Ursus Americanus*
Louisiana Black Bear	*Ursus Americanus Luteolus*
Rafinesque's Big-Eared Bat	*Corynorhinus Rafinesquii*

Mollusks

Ouachita Rock-Pocketbook Mussel	*Arkansia Wheeleri*

Reptiles

Alligator Snapping Turtle	*Macroclemys Temminckii*
Louisiana Pine Snake	*Pituophis Melanoleucus Ruthveni*
Scarlet Snake	*Cemophora Coccinea*
Texas Horned Lizard	*Phrynosoma Cornutum*
Timber/Canebrake Rattlesnake	*Rotalus Horridus*

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2.0 Population Projections and Water Demand Projections

A key task in the preparation of the water plan for the North East Texas Region is to estimate current and future water demands within the region. In subsequent chapters of this plan, these projections are compared with estimates of currently available water supply to identify the location, extent, and timing of future water shortages.

The following is a summary of regional population and water demand projections for the North East Texas Region.

Table 2.1 – Population and Water Demand Projections for the North East Texas Region

Regional Total Projection	2000	2010	2020	2030	2040	2050
Population	**687,105**	**757,522**	**821,294**	**887,169**	**952,818**	**1,017,477**
Water Demand (ac-ft)						
Municipal Water Demand	118,802	124,561	128,928	135,498	141,548	149,108
Manufacturing Water Demand	355,258	385,363	390,601	392,864	409,173	427,613
Irrigation Water Demand	12,566	12,734	12,684	12,637	12,471	12,127
Steam Electric Water Demand	52,432	72,033	74,033	82,033	82,033	89,533
Mining Water Demand	10,365	24,191	23,470	22,964	21,923	10,220
Livestock Water Demand	29,671	29,899	29,951	30,006	29,714	29,273
Total Water Demand (ac-ft)	**579,094**	**648,781**	**659,667**	**676,002**	**696,862**	**717,874**

As shown, the population in the North East Texas Region is projected to grow from approximately 690,000 people at present to over 1 million in 2050. This projected population growth is directly responsible for large increases in municipal and manufacturing water demands. The result is a projected increase in total water demand of approximately 140,000 ac-ft (about 24 percent) from the year 2000 to the year 2050.

The following sections of this chapter describe the methodology used to develop regional population and water demand projection. This chapter also presents projections of population and water demand for cities, major providers of municipal and manufacturing water, and for categories of water use including municipal, manufacturing, irrigation, steam electric power generation, mining, and livestock watering. Projected demands are also provided for each of the six river basins located within the North East Texas Region.

2.1 TWDB Guidelines For Revisions to Population and Water Demand Projections

Senate Bill 1 and associated rules of the Texas Water Development Board (TWDB) require the use of population and water demand projections from the 1997 State Water Plan. Specifically, Section 357.5 of TWDB rules for regional water planning state:

> *"In developing regional water plans, regional water planning groups shall use:*
> *(1) State population and water demand projections contained in the state water plan or adopted by the board after consultation with the Texas Natural Resource Conservation Commission and the Texas Parks and Wildlife Department, in preparation for revision of the state water plan; or*

(2) *In lieu of paragraph (1) of this subsection, population and water demand projection revisions that have been adopted by the board, after coordination with the Texas Natural Resource Conservation Commission and the Texas Parks and Wildlife Department, based on changed conditions and availability of new information."*

In essence, TWDB rules require that the state's projections be used as the "default" for regional water planning unless there are substantiated reasons to revise those projections. The TWDB established guidelines to be used in developing proposed revisions. Based on these guidelines, a number of revisions to the state's "default" projections were proposed by the North East Texas Regional Water Planning Group and adopted by the TWDB.

2.2 Population Projections

The population and water demand projections presented in this chapter were developed by revising the state "default" projections to reflect more current information, in accordance with TWDB guidelines. This section describes the methodology applied by the planning group to develop the approved population projections for the North East Texas Region.

2.2 (a) Methodology

The population projections are provided at county level for the 19 counties in Region D. The proposed projections were made using the most reasonable results of four different population projection methods. These four methods are explained below:

1. The historical population data (1960 to 1998) of the counties was used to project populations through 2050 using a function in Microsoft Excel called "FORECAST." "FORECAST" utilizes linear regression calculations of existing population values to determine future population values. All available historical data points from 1960 were considered while using this method. In the cases that the "FORECAST" method was chosen for county population projections, then all the city populations within that county were projected based on the "FORECAST" method. These projections were then distributed at the same ratio of city to total county population as the State Data Center (SDC) population distribution for the year 1996.

2. Texas Water Development Board (TWDB) population estimates are taken from "Population and Water Use Projections-Region D from TWDB" and are based on 1990 U.S. Census Bureau data. The TWDB projected populations beyond 1990 for separate demographic groups with the population changes based on fertility rates, survival rates and migration for each group. These numbers were then used to project the populations for each municipality and "county other" category. Projections were made for each 10 year interval from the year 2000 to 2050.

3. Texas State Data Center (SDC) population estimates were taken from "Population Estimates and Projections Programs from Texas State Data Center" dated February 1998 and were made using a simple ratio correlation method of births, deaths, elementary school enrollment, vehicle registration, and voter registration variables. The 1998 estimates were compared to the 1990 census data for a straight-line projection of the year 2000 population. Population changes for each 10 year cycle from the year 2000 to 2050 were projected using the same population change as was determined in the TWDB projections.

4. Each of the 268 public water systems in the North East Texas Region were surveyed. These surveys were completed based on interviews with a responsible representative of each public

water system where possible or by existing data from TWDB if the information was not available. The survey population projections were based on the number of residential water service connections reported by the survey participants multiplied by the census tract household populations. The residents from additional multifamily units were incorporated into the data. Population changes for each 10 year cycle from the year 2000 to 2050 were projected using the same population change as was projected in the TWDB projections.

The results of each of the four population projection methods were evaluated to determine a proposed population projection through the planning period to 2050. If the populations indicated a declining population, then for planning purposes, the populations were held steady at the peak population level for the remainder of the planning period. Because these population projections will be used to develop water demands for the region, the more conservative, reasonable projection was proposed for use throughout the remainder of the plan development. These population projections are summarized below.

2.2 (b) Regional Population Projection

The population of the nineteen counties that comprise the North East Texas Region is projected to grow over the 50 year planning period. This projected growth will result in an increase of population from 687,105 in year 2000 to 1,017,477 in 2050 (about 48 percent increase). Table 2.2 presents these projections by county for each decade of the 50 year planning period.

Table 2.2 – Population Projection by County

County	1996	2000	2010	2020	2030	2040	2050
Bowie	84,973	91,749	99,801	107,853	115,905	123,957	132,009
Camp	10,692	10,849	13,668	14,488	15,307	16,127	16,946
Cass	30,725	32,185	34,409	36,634	38,858	41,082	43,307
Delta	5,014	6,091	6,127	6,148	6,148	6,148	6,148
Franklin	8,724	9,242	10,760	12,263	13,950	14,886	15,885
Gregg	111,509	113,989	125,032	136,075	147,119	158,162	169,205
Harrison	60,449	61,214	67,305	71,646	76,587	81,804	86,850
Hopkins	31,013	31,995	35,467	38,938	42,410	45,881	49,353
Hunt	69,176	72,519	80,814	89,110	97,406	105,702	113,997
Lamar	45,656	47,536	51,865	55,467	59,083	62,572	66,095
Marion	10,405	10,964	11,671	12,378	13,085	13,792	14,499
Morris	13,485	14,446	14,659	14,763	14,813	14,813	14,812
Rains	7,457	7,765	9,033	10,300	11,567	12,834	14,101
Red River	14,662	14,761	14,792	14,807	14,840	14,889	14,937
Smith	23,377	24,357	27,517	30,678	33,838	36,999	40,159
Titus	26,264	26,574	29,293	32,012	34,731	37,449	40,168
Upshur	34,520	33,215	36,733	38,236	41,102	44,379	46,742
Van Zandt	42,067	44,352	51,014	57,676	64,338	71,000	77,661
Wood	33,312	33,302	37,562	41,822	46,082	50,342	54,603
Total	**663,480**	**687,105**	**757,522**	**821,294**	**887,169**	**952,818**	**1,017,477**

** Population projections by City, County, and River Basin for each of the nineteen counties in the North East Texas Region are provided in the Appendix.*

As discussed in Chapter 1, the North East Texas Region covers portions of the Red, Sulphur, Sabine, Trinity, Neches, and Cypress River basins. Table 2.3 below presents the population projections by basin for the North East Texas Region.

Table 2.3 – Population Projection by River Basin

River Basin	1996	2000	2010	2020	2030	2040	2050
Cypress	131,621	134,065	147,342	156,521	166,898	177,362	187,223
Neches	10,821	11,406	13,120	14,833	16,545	18,257	19,973
Red	38,287	39,315	43,073	46,095	49,150	52,120	55,146
Sabine	309,394	317,768	353,358	387,147	421,733	456,525	490,892
Sulphur	164,819	175,533	190,274	205,006	219,811	234,182	248,533
Trinity	8,538	9,018	10,355	11,692	13,032	14,372	15,710
Total	**663,480**	**687,105**	**757,522**	**821,294**	**887,169**	**952,818**	**1,017,477**

2.3 Water Demand Projections

Annual total water demand for the North East Texas Region is projected to increase by approximately 140,000 acre-feet over the 50 year planning period. This increase in total water demand is due to a projected increase in municipal, manufacturing, and steam electric water demands.

2.3 (a) Municipal Water Demand Projections

Methodology

As with the population projections, the planning group generated municipal water demand projections by starting with the state default projections and making updates on the basis of better, more current information. The following procedure describes the methodology used for generating these projections:

> Municipal water demand was determined by multiplying the projected per capita municipal use by the projected population. The TWDB data from "Population and Water Use Projections-Region D from TWDB" was used for the projected year 2000 daily per capita water use rate. The State Data Center populations and the populations generated by the "FORECAST" method were multiplied times the TWDB calculated water use rates. In the case of the survey data, the total community water use divided by the calculated population determined the proposed per capita daily water use rate.

The regulations, in "Water Conservation Impacts on Per Capita Water Use," issued by TWDB, prescribe a methodology for estimating water use conservation. This method was used to determine the projected per capita daily water conservation for each decade throughout the planning period. The projected daily per capita water use rate was calculated by subtracting the expected conservation from the reported/projected per capita use for the year 2000. The NETRWPG proposed a minimum per capita water use rate of 115 gal/cap/day be used since this appeared to be a reasonably expected minimum for successful communities. The 115 gal/cap/day minimum use selected is the 95 percent confidence limit of the existing water use rates. Although each community desires to achieve maximum conservation, the historical records indicate communities use more water as they become more affluent and as a steady supply of water is available.

After review by the TWDB, the NETRWPG established 115 gal/cap/day as a minimum starting value for the year 2000 water use rate, and then applies the conservation rates of four gal/cap/decade to this value. In rapidly growing communities, a minimum starting water use rate of 120 gal/cap/day was used and a conservation of four gal/cap/decade was applied to this value.

Regional Municipal Water Demand Projections

Annual municipal water demand within the North East Texas Region is projected to increase by about 30,000 ac-ft from the year 2000 to the year 2050. Table 2.4 presents the projected municipal water demand by county for each of the nineteen counties in the North East Texas Region. This table shows that municipal water demand in the North East Texas Region is concentrated in Bowie, Gregg, and Hunt counties.

Table 2.4 – Municipal Water Demand Projections by County (in ac-ft/yr)

County	1996	2000	2010	2020	2030	2040	2050
Bowie	11,937	15,657	16,128	16,606	17,313	18,005	18,907
Camp	1,602	1,747	2,048	2,086	2,139	2,191	2,250
Cass	4,248	5,014	5,120	5,201	5,321	5,413	5,530
Delta	639	926	898	866	838	810	790
Franklin	1,524	2,005	2,216	2,413	2,689	2,830	3,002
Gregg	16,496	21,682	22,487	23,315	24,628	25,874	27,493
Harrison	8,452	9,877	10,384	10,588	10,976	11,361	11,855
Hopkins	6,041	5,531	5,835	6,078	6,455	6,782	7,238
Hunt	10,241	13,475	14,394	15,185	16,178	17,127	18,163
Lamar	7,205	10,609	10,947	11,150	11,607	12,018	12,569
Marion	1,385	1,696	1,737	1,774	1,813	1,854	1,896
Morris	1,578	1,937	1,880	1,807	1,746	1,681	1,638
Rains	1,219	1,374	1,513	1,637	1,787	1,940	2,111
Red River	1,954	2,018	1,941	1,863	1,795	1,744	1,691
Smith	4,278	3,759	3,992	4,206	4,489	4,786	5,154
Titus	5,629	4,727	4,994	5,240	5,529	5,816	6,129
Upshur	4,530	5,067	5,365	5,354	5,583	5,846	6,001
Van Zandt	5,629	6,513	7,179	7,779	8,403	8,946	9,548
Wood	5,155	5,188	5,503	5,780	6,209	6,524	7,143
Total	**99,742**	**118,802**	**124,561**	**128,928**	**135,498**	**141,548**	**149,108**

**Municipal water demand projections by city, county, and river basin for each of the 19 counties in the North East Texas Region are provided in Appendix A.*

As with population, all river basins showed an increase in water demand. Table 2.5 presents these municipal water demand projections by river basin.

Table 2.5 – Municipal Water Demand Projections by River Basin (in ac-ft/yr)

River Basin	1996	2000	2010	2020	2030	2040	2050
Cypress	19,891	21,360	22,451	22,880	23,708	24,467	25,302
Neches	1,538	1,655	1,832	1,989	2,148	2,286	2,428
Red	5,646	7,690	7,970	8,171	8,452	8,741	9,144
Sabine	46,542	55,491	58,532	60,987	64,753	68,191	72,544
Sulphur	25,104	31,388	32,433	33,344	34,878	36,207	37,938
Trinity	1,021	1,218	1,343	1,557	1,559	1,656	1,752
Total	**99,742**	**118,802**	**124,561**	**128,928**	**135,498**	**141,548**	**149,108**

2.3 (b) Manufacturing Water Demand Projections

Methodology

For Senate Bill 1 regional water planning purposes, manufacturing water use is considered to be the cumulative water demand by county and river basin for all industries within specified industrial classifications (SIC) determined by the TWDB. Manufacturing water demand was predicted based on the information provided by the major manufacturing industries. Surveys were conducted and revisions made to the TWDB manufacturing water demand projections. The proposed revisions to the TWDB projections were then incorporated.

Regional Manufacturing Water Demand Projections

Manufacturing water demand for the North East Texas Region is projected to increase by 72,355 ac-ft from year 2000 to year 2050. This increase in manufacturing water demand is predominantly due to the projected growth in Harrison County and Gregg County. The projected increases in Harrison and Gregg counties are from TWDB (1997 state plan) default numbers for manufacturing water demand. The water demand increase in Camp County from the year 2010 is due to the expected construction a poultry processing facility. Table 2.6 presents the projected manufacturing water demand for each of the 19 counties in the North East Texas Region.

Table 2.6 – Manufacturing Water Demand Projections by County (in ac-ft/yr)

County	1996	2000	2010	2020	2030	2040	2050
Bowie	1,885	1,944	2,152	2,366	2,590	2,826	3,071
Camp	33	10	2,242	2,242	2,242	2,242	2,242
Cass	79,123	80,129	76,867	76,871	74,569	77,555	80,664
Delta	0	8	8	8	8	8	8
Franklin	0	6	6	6	6	6	6
Gregg	3,826	16,538	18,576	20,934	23,507	26,515	29,716
Harrison	49,692	110,588	135,166	141,913	147,949	161,370	176,471
Hopkins	627	2,654	2,853	3,016	3,148	3,410	3,669
Hunt	803	740	818	903	998	1,129	1,276
Lamar	5,179	5,422	6,213	6,932	7,575	8,590	9,608
Marion	35	20	20	20	20	20	20
Morris	96,271	132,451	135,264	129,869	124,443	119,127	113,929
Rains	1	2	2	2	2	2	2
Red River	9	11	15	17	19	21	25
Smith	181	262	298	325	346	377	403
Titus	2,832	3,734	3,997	4,199	4,357	4,722	5,079
Upshur	161	215	232	241	243	277	314
Van Zandt	607	280	344	396	451	508	566
Wood	149	244	290	341	391	468	544
Total	**241,414**	**355,258**	**385,363**	**390,601**	**392,864**	**409,173**	**427,613**

**Manufacturing water demand projections by city, county, and river basin for each of the 19 counties in the North East Texas Region are provided in Appendix A.*

Manufacturing water demand in the North East Texas Region is located predominantly in the Sabine River Basin. Table 2.7 presents these demands by river basin for the North East Texas Region.

Table 2.7 - Manufacturing Water Demand Projections by River Basin (in ac-ft/yr)

RIVER BASIN	1996	2000	2010	2020	2030	2040	2050
Cypress	99,817	137,727	143,370	138,254	133,055	128,303	123,691
Neches	0	0	0	0	0	0	0
Red	627	562	574	586	596	638	690
Sabine	54,749	127,205	153,681	162,869	171,559	188,027	206,330
Sulphur	86,221	89,764	87,738	88,892	87,654	92,205	96,902
Trinity	0	0	0	0	0	0	0
TOTAL	**241,414**	**355,258**	**385,363**	**390,601**	**392,864**	**409,173**	**427,613**

2.3 (c) Irrigation Water Demand Projections

Methodology

The irrigation water use projections that were developed by the TWDB and used in the 1997 State Water Plan were used as the default projections except where better, more current information was submitted. The TWDB projections were determined with assistance from the Texas Agricultural Extension Service and assume expected case conservation practices and no reduction in federal farm program subsidies. Letters were mailed to the county extension agents in each county of the region requesting their review of

TWDB irrigation water demand projections. Written or verbal input was received from all county agents in the region. The proposed revisions to the TWDB projections were then incorporated based on the information provided by the county agents.

Regional Irrigation Water Demand Projections

Annual irrigation water demand for the North East Texas Region is projected to decrease by 439 ac-ft from the year 2000 to the year 2050. Irrigation water demand in the North East Texas Region is most heavily concentrated in Bowie and Lamar counties. A decrease in irrigation demand is projected due to improvements in irrigation efficiency, and in some cases, the encroachment of urbanization on irrigable lands. Table 2.8 presents the projected irrigation water demands by county for the North East Texas Region.

Table 2.8 - Irrigation Water Demand Projections by County (in ac-ft/yr)

County	1996	2000	2010	2020	2030	2040	2050
Bowie	5,025	4,400	4,620	4,620	4,620	4,500	4,200
Camp	32	87	87	87	87	87	87
Cass	13	0	0	0	0	0	0
Delta	4	1,978	1,956	1,934	1,913	1,891	1,870
Franklin	44	33	33	33	33	33	33
Gregg	25	0	0	0	0	0	0
Harrison	106	100	100	100	100	100	100
Hopkins	25	0	0	0	0	0	0
Hunt	618	271	271	271	271	271	271
Lamar	4,700	4,368	4,319	4,271	4,223	4,176	4,129
Marion	98	0	0	0	0	0	0
Morris	121	190	188	186	184	182	180
Rains	27	20	20	20	20	20	20
Red River	3,480	99	98	97	96	95	94
Smith	86	446	468	491	516	542	569
Titus	0	0	0	0	0	0	0
Upshur	20	0	0	0	0	0	0
Van Zandt	1,015	220	220	220	220	220	220
Wood	219	354	354	354	354	354	354
TOTAL	**15,658**	**12,566**	**12,734**	**12,684**	**12,637**	**12,471**	**12,127**

**Irrigation water demand projections by city, county, and river basin for each of the 19 counties in the North East Texas Region are provided in Appendix A.*

Irrigation water demand is mainly concentrated in the Red River Basin. Table 2.9 presents the projected irrigation water demands for the North East Texas Region.

Table 2.9 - Irrigation Water Demand Projections by River Basin (in ac-ft/yr)

River Basin	1996	2000	2010	2020	2030	2040	2050
Cypress	474	458	456	454	452	450	448
Neches	1,015	0	0	0	0	0	0
Red	10,525	8,822	8,993	8,944	8,896	8,728	8,381
Sabine	793	1,022	1,044	1,067	1,092	1,118	1,145
Sulphur	2,851	2,044	2,021	1,999	1,977	1,955	1,933
Trinity	0	220	220	220	220	220	220
Total	**15,658**	**12,566**	**12,734**	**12,684**	**12,637**	**12,471**	**12,127**

2.3 (d) Steam Electric Water Demand Projections

Methodology

Steam electric water use projections that were developed by TWDB and used in the 1997 State Water Plan were used as the default projections except where better, more current information indicated the need for revision. Corporation names and points of contact were received from the Public Utility Commission of Texas for steam electric power generators in the region. Letters were sent to 10 power generation plants in eight counties. Demand and source, as well as future requirements, were determined and used to project modifications to the TWDB figures in seven counties.

Regional Steam Electric Water Demand Projections

Annual steam electric water demand is projected to increase from 52,432 ac-ft/yr in the year 2000 to 89,533 ac-ft/yr in the year 2050. The majority of this increase is expected to occur in Red River, Titus, Upshur, and Wood counties. Table 2.10 presents the projected steam electric water demand by county for each of the 19 counties in the North East Texas Region. Steam electric water demand was not projected for Hopkins County prior to development of these tables. Hopkins County has now been identified as a possible site for a merchant power plant, which if constructed, would add an additional 7,126 ac-ft/yr demand beyond that tabulated herein.

Table 2.10 - Steam Electric Water Demand Projections by County (in ac-ft/yr)

County	1996	2000	2010	2020	2030	2040	2050
Bowie	0	0	0	0	0	0	0
Camp	0	0	0	0	0	0	0
Cass	0	0	0	0	0	0	0
Delta	0	0	0	0	0	0	0
Franklin	0	0	0	0	0	0	0
Gregg	1,723	1,251	1,251	1,251	1,251	1,251	1,251
Harrison	8,972	5,760	5,760	5,760	5,760	5,760	5,760
Hopkins	0	0	0	0	0	0	0
Hunt	405	516	516	516	516	516	516
Lamar	0	12,209	12,209	12,209	12,209	12,209	12,209
Marion	3,321	2,868	2,868	2,868	2,868	2,868	2,868
Morris	16	48	48	48	48	48	48
Rains	0	0	0	0	0	0	0
Red River	227	1,500	5,000	7,000	10,000	10,000	10,000
Smith	0	0	0	0	0	0	0
Titus	31,388	28,280	31,280	31,280	36,280	36,280	36,280
Upshur	0	0	5,601	5,601	5,601	5,601	5,601
Van Zandt	0	0	0	0	0	0	0
Wood	0	0	7,500	7,500	7,500	7,500	15,000
Total	**46,052**	**52,432**	**72,033**	**74,033**	**82,033**	**82,033**	**89,533**

**Steam electric water demand projections by city, county, and river basin for each of the 19 counties in the North East Texas Region are provided in Appendix A.*

The Cypress, Red, Sabine, and Sulphur River basins contain all of the current and projected steam electric water demand for the region. Table 2.11 shows the projected steam electric water demand by basin.

Table 2.11 - Steam Electric Water Demand Projections by River Basin (in ac-ft/yr)

River Basin	1996	2000	2010	2020	2030	2040	2050
Cypress	34,725	31,196	39,797	39,797	44,797	44,797	44,797
Neches	0	0	0	0	0	0	0
Red	0	12,209	12,209	12,209	12,209	12,209	12,209
Sabine	11,100	7,527	15,027	15,027	15,027	15,027	22,527
Sulphur	227	1,500	5,000	7,000	10,000	10,000	10,000
Trinity	0	0	0	0	0	0	0
Total	**46,052**	**52,432**	**72,033**	**74,033**	**82,033**	**82,033**	**89,533**

2.3 (e) Mining Water Demand Projections

Methodology

The TWDB mining water use projections that were used in the 1997 State Water Plan were developed based on projected future production levels by mineral category and expected water use rates. These production projections were derived from state and national historic rates and were constrained by accessible mineral reserves in each region. The TWDB–1997 State Water Plan mining water demands projections were used except where better, more current information was available. A list of the mining operations in the North East Texas Region was obtained from the Texas Railroad Commission. Six major mining operations were identified in six counties. Letters and questionnaires were sent to each mine. Even though there were no mines in 12 of the 19 counties, significant demand was indicated. The origin and validity of the mining demands for this group of counties could neither be confirmed nor denied. It should be noted however, that mining water demand can include fuels, including oil and gas drilling operations, and nonfuels components and therefore mining water demands in counties without mines would not be unusual.

Regional Mining Water Demand Projections

Annual mining water demand for the North East Texas Region is projected to double from 2000 to 2010, and then remain relatively constant over the next 30 years before decreasing by 2050. Mining water demand represents a very small portion (about 1.4 percent) of the region's total water demand. Mining demand is largest in Titus County until year 2010 after which Wood County takes the first place. Table 2.12 presents the projected mining water demand by county for each of the counties in the North East Texas Region.

Table 2.12 - Mining Water Demand Projections by County (in ac-ft/yr)

County	1996	2000	2010	2020	2030	2040	2050
Bowie	41	53	52	53	56	61	66
Camp	24	132	131	131	131	131	131
Cass	1,045	1,254	990	942	902	872	496
Delta	0	0	0	0	0	0	0
Franklin	1,354	1,479	1,384	1,338	1,278	1,297	1,359
Gregg	129	96	67	46	37	29	27
Harrison	492	370	370	370	370	370	370
Hopkins	148	125	122	120	117	116	116
Hunt	67	70	71	73	75	77	79
Lamar	22	25	24	24	25	25	25
Marion	99	71	43	30	24	20	34
Morris	39	31	16	12	10	10	11
Rains	0	0	0	0	0	0	0
Red River	0	0	0	0	0	0	0
Smith	203	425	178	91	32	18	6
Titus	3,349	2,772	1,991	1,796	1,722	1,705	1,744
Upshur	1	1	1	1	1	1	0
Van Zandt	1,421	1,359	1,167	1,099	1,077	1,084	1,115
Wood	562	2,102	17,584	17,344	17,107	16,107	4,641
Total	**8,996**	**10,365**	**24,191**	**23,470**	**22,964**	**21,923**	**10,220**

**Mining water demand projections by city, county, and river basin for each of the 19 counties in North East Texas Region are provided in Appendix A.*

Table 2.13 presents the mining water demand projections by river basin.

Table 2.13 - Mining Water Demand Projections by River Basin (in ac-ft/yr)

River Basin	1996	2000	2010	2020	2030	2040	2050
Cypress	4,689	4,361	3,521	3,310	3,205	3,198	2,943
Neches	48	80	48	28	19	14	14
Red	36	37	36	36	37	38	38
Sabine	2,572	4,116	19,151	18,753	18,424	17,422	5,977
Sulphur	1,606	1,725	1,389	1,298	1,235	1,206	1,202
Trinity	45	46	46	45	44	45	46
Total	**8,996**	**10,365**	**24,191**	**23,470**	**22,964**	**21,923**	**10,220**

2.3 (f) Livestock Water Demand Projections

Methodology

For all the counties in the North East Texas Region, the livestock water use projections developed by the TWDB and used in the 1997 State Water Plan were used as the default projections. These projections were developed using Texas Agricultural Statistics Service projections of number of livestock by type, county, and Texas Agricultural Extension Service estimates of water use rates by type of livestock. Letters were mailed to the county extension agents requesting their review of TWDB livestock water demand projections. Written or verbal input was received from all county agents in the region. The proposed revisions to the TWDB projections were then incorporated based on the information provided by the county agents.

Regional Livestock Water Demand Projections

Annual livestock water demand for the North East Texas Region represents about 4 percent of the total regional water demand. Livestock water demand is projected to remain more or less constant over the 50 year planning period. Livestock water demand is spread relatively evenly over the 19 counties in the region. Table 2.14 presents these projected demands by county for the region.

After the water demand and population numbers were approved by TWDB, new information came to light. This information has not been included in the approved projections, but it should be considered in the next plan update. According to this information, the water demand in Titus County is 34,494 ac-ft instead of 29,671 ac-ft in the year 2000, an increase of 4,823 ac-ft. If this increase was included and projected, it would result in an increase of 15,367 ac-ft by 2050. Since these numbers result in an increase of over 50 percent by year 2050, they should be included in the next plan update.

Table 2.14 - Livestock Water Demand Projections by County (in ac-ft/yr)

County	1996	2000	2010	2020	2030	2040	2050
Bowie	1,941	3,671	3,850	3,850	3,850	3,500	3,000
Camp	982	800	800	800	800	800	800
Cass	820	851	851	851	851	851	851
Delta	344	770	770	770	770	770	770
Franklin	1,418	1,595	1,595	1,595	1,595	1,595	1,595
Gregg	215	265	265	265	265	265	265
Harrison	712	991	1,040	1,092	1,147	1,205	1,264
Hopkins	6,744	7,100	7,100	7,100	7,100	7,100	7,100
Hunt	1,779	1,237	1,237	1,237	1,237	1,237	1,237
Lamar	1,970	1,523	1,523	1,523	1,523	1,523	1,523
Marion	165	182	182	182	182	182	182
Morris	490	624	624	624	624	624	624
Rains	721	700	700	700	700	700	700
Red River	1,929	1,180	1,180	1,180	1,180	1,180	1,180
Smith	383	453	453	453	453	453	453
Titus	1,111	858	858	858	858	858	858
Upshur	2,407	1,928	1,928	1,928	1,928	1,928	1,928
Van Zandt	2,311	2,381	2,381	2,381	2,381	2,381	2,381
Wood	2,728	2,562	2,562	2,562	2,562	2,562	2,562
Total	**29,170**	**29,671**	**29,899**	**29,951**	**30,006**	**29,714**	**29,273**

**Livestock water demand projections by city, county, and river basin for each of the 19 counties in the North East Texas Region are provided in Appendix A.*

Table 2.15 presents these demands by river basin for the North East Texas Region.

Table 2.15 - Livestock Water Demand Projections by River Basin (in ac-ft/yr)

River Basin	1996	2000	2010	2020	2030	2040	2050
Cypress	5,796	5,491	5,520	5,549	5,581	5,615	5,648
Neches	638	657	657	657	657	657	657
Red	2,728	2,775	2,840	2,840	2,840	2,712	2,530
Sabine	9,009	8,710	8,730	8,753	8,776	8,800	8,826
Sulphur	10,380	11,404	11,518	11,518	11,518	11,296	10,978
Trinity	619	634	634	634	634	634	634
Total	**29,170**	**29,671**	**29,899**	**29,951**	**30,006**	**29,714**	**29,273**

2.4 Major Water Providers

The North East Texas Regional Water Planning Group has designated 13 entities as "major water providers." This distinction was made to satisfy the TWDB guidelines that require each RWPG to identify and designate "major water providers." Major water providers are defined by the TWDB as an entity "…which delivers and sells a significant amount of raw or treated water for municipal and/or manufacturing use on a wholesale and/or retail basis."

The intent of TWDB requirements is to ensure that there is an adequate future supply of water for each entity that receives all or a significant portion of its current water supply from another entity. This requires an analysis of projected water demands and currently available water supplies for the primary supplier, each of its wholesale customers, and all of the suppliers in the aggregate as a "system." For example, a city that serves both retail customers within its corporate limits, as well as other nearby public water systems, would need to have a supply source(s) that is adequate for the combined total of future retail water sales and future wholesale water sales. If there is a "system" deficit currently or in the future, then recommendations are to be included in the regional water plan with regard to strategies for meeting the "system" deficit.

2.4 (a) Cherokee Water Company

The Cherokee Water Company provides water for municipal, and steam electric uses. The existing service area of the water company covers portions of Gregg and Harrison counties. Table 2.16 presents the aggregated demands of all users supplied by Cherokee Water Company.

Table 2.16 – Projected Water Demand for Cherokee Water Company (in ac-ft/yr)

System Name	County	2000	2010	2020	2030	2040	2050
City of Longview	Gregg	15,360	15,360	15,360	15,360	15,360	15,360
City of Longview	Harrison	640	640	640	640	640	640
Steam Electric	Gregg	2,000	2,000	2,000	2,000	2,000	2,000
Total		**18,000**	**18,000**	**18,000**	**18,000**	**18,000**	**18,000**

2.4 (b) Franklin County Water District

The Franklin County Water District provides water for municipal water use. The water district's service area covers portions of Franklin, Hopkins, Titus, and Wood counties. Table 2.17 presents the aggregated demands of all users supplied by the water district.

Table 2.17 – Projected Water Demand for Franklin County Water District (in ac-ft/yr)

System Name	County	2000	2010	2020	2030	2040	2050
City of Mount Vernon	Franklin	3,000	3,000	3,000	3,000	3,000	3,000
City of Winnsboro	Franklin	450	450	450	450	450	450
Cypress Springs WSC	Franklin	3,045	3,045	3,045	3,045	3,045	3,045
Cypress Springs WSC	Hopkins	350	350	350	350	350	350
Cypress Springs WSC	Titus	35	35	35	35	35	35
City of Winnsboro	Wood	4,550	4,550	4,550	4,550	4,550	4,550
Cypress Springs WSC	Wood	70	70	70	70	70	70
Total		**11,500**	**11,500**	**11,500**	**11,500**	**11,500**	**11,500**

2.4 (c) Northeast Texas Municipal Water District

The Northeast Texas Municipal Water District (NETMWD) provides water for municipal, manufacturing, and steam electric water uses. NETMWD's service area covers portions of Camp, Cass, Gregg, Harrison, Marion, Morris, Titus, and Upshur counties. Table 2.18 presents the aggregated water demands of all users supplied by NETMWD.

Table 2.18 – Projected Water Demand for Northeast Texas Municipal Water Demand (in ac-ft/yr)

System Name	County	2000	2010	2020	2030	2040	2050
City of Pittsburg	Camp	13,633	13,633	13,633	13,633	13,633	13,633
City of Hughes Springs	Cass	4,748	4,748	4,748	4,748	4,748	4,748
City of Avinger	Cass	1,551	1,551	1,551	1,551	1,551	1,551
Mims WSC	Cass	168	168	168	168	168	168
City of Longview	Gregg	19,200	19,200	19,200	19,200	19,200	19,200
City of Longview	Harrison	800	800	800	800	800	800
System Electric	Harrison	18,000	18,000	18,000	18,000	18,000	18,000
City of Ore City	Marion	83	83	83	83	83	83
City of Ore City	Marion	625	625	625	625	625	625
Mims WSC	Marion	6,700	6,700	6,700	6,700	6,700	6,700
Steam Electric	Marion	9,776	9,776	9,776	9,776	9,776	9,776
City of Jefferson	Marion	4,841	4,841	4,841	4,841	4,841	4,841
City of Lone Star	Morris	243	243	243	243	243	243
City of Daingerfield	Morris	1,002	1,002	1,002	1,002	1,002	1,002
City of Hughes Springs	Morris	8	8	8	8	8	8
Mims WSC	Morris	32,400	32,400	32,400	32,400	32,400	32,400
Manufacturing	Morris	10,329	10,329	10,329	10,329	10,329	10,329
City of Daingerfield	Morris	31	31	31	31	31	31
City of Hughes Springs	Morris	12,000	12,000	12,000	12,000	12,000	12,000
Steam Electric	Titus	10,000	10,000	10,000	10,000	10,000	10,000
Steam Electric	Upshur	2,690	2,690	2,690	2,690	2,690	2,690
Total		**148,828**	**148,828**	**148,828**	**148,828**	**148,828**	**148,828**

2.4 (d) Sabine River Authority

The Sabine River Authority (SRA) provides water for municipal and manufacturing uses. SRA's service area covers portions of Gregg, Harrison, Hopkins, Hunt, Rains, Van Zandt, and Wood counties. Table 2.19 presents the aggregated water demands of all users supplied by SRA. Its largest customers are City of Greenville followed by Longview.

Table 2.19 – Projected Water Demand for Sabine River Authority (in ac-ft/yr)

System Name	County	2000	2010	2020	2030	2040	2050
City of Longview	Gregg	19,200	19,200	19,200	19,200	19,200	19,200
City of Kilgore	Gregg	6,721	6,721	6,721	6,721	6,721	6,721
City of Longview	Harrison	800	800	800	800	800	800
Manufacturing	Harrison	3,500	3,500	3,500	3,500	3,500	3,500
Mining	Harrison	7,000	7,000	7,000	7,000	7,000	7,000
Cash WSC	Hopkins	107	107	107	107	107	107
City of Commerce	Hunt	8,396	8,396	8,396	4,481	4,481	4,481
City of Greenville	Hunt	21,283	21,283	21,283	21,283	21,283	21,283
City of West Tawakoni	Hunt	1,120	1,120	1,120	1,120	1,120	1,120
Cash WSC	Hunt	3,207	3,207	3,207	3,207	3,207	3,207
Combined Consumers WSC	Hunt	2,240	2,240	2,240	2,240	2,240	2,240
Mac Bee WSC	Hunt	2,240	2,240	2,240	2,240	2,240	2,240
City of Emory	Rains	2,016	2,016	2,016	2,016	2,016	2,016
City of Point	Rains	448	448	448	448	448	448
City of Wills Point	Van Zandt	2,540	2,540	2,540	2,540	2,540	2,540
Mac Bee WSC	Van Zandt	3,159	3,159	3,159	3,159	3,159	3,159
South Tawakoni WSC	Van Zandt	560	560	560	560	560	560
City of Quitman	Wood	1,120	1,120	1,120	1,120	1,120	1,120
City of Edgewood	Van Zandt	840	840	840	840	840	840
Total		**86,497**	**86,497**	**86,497**	**82,582**	**82,582**	**82,582**

2.4 (e) Titus County Fresh Water Supply District No. 1

The Titus County Fresh Water Supply District No. 1 provides water for municipal and steam electric uses. The water supply district's service area covers portions of Titus County. Table 2.20 presents the aggregated water demands of all users supplied by the water district.

Table 2.20 – Projected Water Demand for Titus County Fresh Water Supply District (in ac-ft/yr)

System Name	County	2000	2010	2020	2030	2040	2050
City of Mount Pleasant	Titus	10,000	10,000	10,000	10,000	10,000	10,000
Texas Utilities	Titus	38,500	38,500	38,500	38,500	38,500	38,500
Total		**48,500**	**48,500**	**48,500**	**48,500**	**48,500**	**48,500**

2.4 (f) City of Greenville

The City of Greenville provides water for municipal, manufacturing, mining, and steam electric water uses. The city's service area covers portions of Hunt County. Table 2.21 presents the aggregated water demands of all users supplied by the City of Greenville.

Table 2.21 – Projected Water Demand for City of Greenville (in ac-ft/yr)

System Name	County	2000	2010	2020	2030	2040	2050
City of Caddo Mills	Hunt	166	166	174	183	191	197
City of Greenville	Hunt	6,291	6,689	7,021	7,520	8,034	8,620
Jacobia WSC	Hunt	336	336	336	336	336	336
Shady Grove	Hunt	336	336	336	336	336	336
Manufacturing	Hunt	740	818	903	998	1,129	1,276
Mining	Hunt	24	25	27	33	35	45
Steam Electric	Hunt	800	800	800	800	800	800
Total		**8,693**	**9,170**	**9,597**	**10,206**	**10,861**	**11,610**

2.4 (g) City of Longview

The City of Longview provides water for municipal use. The city's service area covers portions of Gregg, Harrison, and Upshur counties. Table 2.22 presents the aggregated water demands of all users supplied by the City of Longview.

Table 2.22 – Projected Water Demand for City of Longview (in ac-ft/yr)

System Name	County	2000	2010	2020	2030	2040	2050
City of White Oak	Gregg	1,088	1,088	1,088	1,088	1,088	1,088
C & C Mobile Home Park	Gregg	18	18	18	18	18	18
Elderville WSC	Gregg	516	516	516	570	646	744
Tryon Road WSC	Gregg	928	928	928	928	928	928
City of White Oak	Gregg	12	12	12	12	12	12
City of Hallsville	Harrison	368	368	368	368	368	368
Gum Springs WSC	Harrison	415	591	754	906	1,041	1,161
Tryon Road WSC	Harrison	103	103	103	103	103	103
City of White Oak	Upshur	20	20	20	20	20	20
City of Longview	Gregg	18,519	19,306	20,308	21,487	22,732	24,275
City of Longview	Harrison	6,590	7,990	8,379	8,736	9,510	10,384
Total		**28,577**	**30,940**	**32,494**	**34,237**	**36,467**	**39,102**

2.4 (h) City of Marshall

The City of Marshall provides water for municipal use. The city's service area covers portions of Harrison County. Table 2.23 presents the aggregated water demands of all users supplied by the City of Marshall.

Table 2.23 – Projected Water Demand for City of Marshall (in ac-ft/yr)

System Name	County	2000	2010	2020	2030	2040	2050
Cypress Valley WSC	Harrison	5	5	5	5	5	5
Gill WSC	Harrison	125	125	125	125	125	125
Leigh WSC	Harrison	184	184	184	184	184	184
Talley WSC	Harrison	31	49	65	79	90	103
City of Marshall	Harrison	4,906	5,113	5,177	5,393	5,609	5,955
Total		**5,251**	**5,476**	**5,556**	**5,786**	**6,013**	**6,372**

2.4 (i) City of Mount Pleasant

The City of Mount Pleasant provides water for municipal, mining and manufacturing uses. The city's service area covers portions of Franklin, Morris, and Titus counties. Table 2.24 presents the aggregated water demands of all users supplied by the City of Mount Pleasant.

Table 2.24 – Projected Water Demand for City of Mount Pleasant (in ac-ft/yr)

System Name	County	2000	2010	2020	2030	2040	2050
Tri WSC	Franklin	45	48	54	61	68	76
Tri WSC	Morris	122	124	125	126	127	127
System Name	**County**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City of Winfield	Titus	153	153	153	153	153	153
Tri WSC	Titus	1,268	1,304	1,445	1,543	1,648	1,732
Manufacturing	Titus	3,421	3,421	3,421	3,421	3,650	3,882
City of Mt. Pleasant	Titus	3,012	3,167	3,312	3,512	3,722	3,970
Lake Bob Sandlin State Park	Titus	1	1	1	1	1	1
Mining	Titus	1,098	450	315	272	275	324
Total		**9,120**	**8,668**	**8,826**	**9,089**	**9,644**	**10,265**

2.4 (j) City of Paris

The City of Paris provides water for municipal, manufacturing, and steam electric use. The city's service area covers portions of Lamar and Red River counties. Table 2.25 presents the aggregated water demands of all users supplied by the City of Paris.

Table 2.25 – Projected Water Demand for City of Paris (in ac-ft/yr)

System Name	County	2000	2010	2020	2030	2040	2050
City of Paris	Lamar	8,583	8,750	8,904	9,237	9,552	9,973
Lamar County WSD	Lamar	4,000	4,000	4,000	4,000	4,000	4,000
M-J-C WSC	Lamar	92	92	92	92	92	92
Manufacturing	Lamar	5,422	6,213	6,932	7,575	8,590	9,608
Steam Electric	Lamar	12,209	12,209	12,209	12,209	12,209	12,209
Lamar County WSD	Red River	1,601	1,601	1,601	1,601	1,601	1,601
Total		**31,907**	**32,865**	**33,738**	**34,714**	**36,044**	**37,483**

2.4 (k) City of Sulphur Springs

The City of Sulphur Springs provides water for municipal, manufacturing, and livestock use. The city's service area covers portion of Franklin and Hopkins county. Table 2.26 presents the aggregated water demands of all users supplied by the City of Sulphur Springs.

Table 2.26 – Projected Water Demand for City of Sulphur Springs (in ac-ft/yr)

System Name	County	2000	2010	2020	2030	2040	2050
Manufacturing	Hopkins	5,640	5,640	5,640	5,640	5,640	5,640
City of Sulphur Springs	Hopkins	4,836	5,234	5,167	5,104	4,975	4,845
Brashear WSC	Hopkins	173	123	120	120	119	121
Brinker WSC	Hopkins	70	114	221	275	281	294
Gafford Chapel WSC	Hopkins	62	109	130	234	254	280
Martin Springs WSC	Hopkins	223	376	402	452	463	481
North Hopkins WSC	Hopkins	713	778	831	893	954	1,030
Pleasant Hill WSC # 2	Hopkins	28	30	31	33	35	37
Shady Grove # 2 WSC	Hopkins	72	76	79	84	88	94
Manufacturing	Hopkins	2,666	2,861	3,024	3,151	3,409	3,668
Livestock	Hopkins	2,221	2,310	2,431	2,696	2,711	3,000
Total		**16,704**	**17,651**	**18,076**	**18,682**	**18,929**	**19,490**

2.4 (l) City of Texarkana

The City of Texarkana provides water for municipal and manufacturing use. The city's service area covers portions of Bowie, Cass and Red River counties. Table 2.27 presents the aggregated water demands of all users supplied by the City of Texarkana.

Table 2.27 – Projected Water Demand for City of Texarkana (in ac-ft/yr)

System Name	County	2000	2010	2020	2030	2040	2050
City of Dekalb	Bowie	470	470	470	470	470	470
City of Hooks	Bowie	500	500	500	500	500	528
City of Maud	Bowie	246	246	246	246	246	246
City of Nash	Bowie	368	368	368	368	368	368
City of New Boston	Bowie	784	1,164	1,217	1,280	1,346	1,425
City of Redwater	Bowie	147	335	345	506	587	673
City of Texarkana	Bowie	7,350	7,587	7,814	8,162	8,476	8,890
City of Wake Village	Bowie	358	690	718	743	764	781
Central Bowie WSC	Bowie	258	258	1,099	1,121	1,294	1,765
Federal Correction Inst.	Bowie	230	235	240	250	261	275
Macedonia-Elyau MUD # 1	Bowie	552	552	552	1,151	1,312	1,412
Oak Grove WSC	Bowie	74	74	100	125	140	157
Manufacturing	Bowie	1,916	2,124	2,338	2,562	2,798	3,043
City of Atlanta	Cass	1,904	1,904	1,904	1,904	1,904	1,904
City of Queen City	Cass	365	365	365	365	365	385
City of Domino	Cass	55	55	55	55	55	55
Manufacturing	Cass	80,082	76,814	76,814	74,508	77,487	80,589
City of Annona	Red River	68	68	68	68	68	68
City of Avery	Red River	92	92	92	122	133	141
Oak Grove WSC	Red River	8	8	12	14	16	18
Red River County WSC	Red River	110	110	110	110	110	110
Total		**95,937**	**94,019**	**95,427**	**94,630**	**98,700**	**103,303**

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3.0 Evaluation of Current Water Supplies in the Region

A key task in the preparation of the water plan for the North East Texas Region is to determine the amount of water that is currently available to the region. In Chapter 4, this information will be compared to the water demand projections presented in the previous chapter to identify water user groups with projected needs.

According to Texas Water Development Board requirements, the analysis of currently available water supply is to be presented in three parts:

- Estimates of available supply by source;
- Estimates of the supplies currently available to each water user group; and
- Estimates of the supplies currently available to each designated major water provider.

The following sections of this chapter present the supply availability estimates accordingly.

3.1 Surface Water Supplies

The North East Texas Regional Water Planning Area includes all or a portion of 19 counties that encompass major portions of four river basins: the Cypress Creek Basin, the Red River Basin, Sulphur River Basin and the Sabine River Basin. Relatively small portions of the Neches River Basin and the Trinity River Basin also extend into the North East Texas Region. Surface water sources within the region include rivers, streams, lakes, ponds, and tanks.

Surface water in Texas is owned by the State, and its use is regulated under the legal doctrine of prior appropriation. This means that water rights that are issued by the state for the diversion and use of surface water have priority according to the date that the right was issued. The oldest issued water right has priority over all subsequently issued water rights, regardless of the type of use. Water rights issued by the state generally are one of two types, run-of-the-river rights and stored water rights.

Run-of-the-river water rights permits allow diversions of water directly from a river or stream provided there is water in the stream and that the water is not needed to meet senior downstream water rights. Run-of-the-river rights are greatly impacted by drought conditions, particularly in the upper portions of a river basin.

Stored water rights allow the impoundment of water by a permittee in a reservoir. Water can be held for storage as long as the inflow is not needed to meet a senior downstream water right or other condition, such as release requirements for maintenance of instream flows. Water stored in the reservoir can be withdrawn by the permittee at a later date to meet water demands. Stored water rights are generally based on a reservoir's firm yield and are therefore less sensitive to drought conditions.

In addition to water rights issued by the state, individual land owners are allowed to use certain surface waters without a permit. Specifically, land owners are allowed to construct impoundments with up to 200 acre-feet of storage or use water directly from a stream for domestic and livestock purposes. These types of water supplies are referred to as "local supply sources."

A summary of the available surface water supplies for each of the river basins within the region is presented below. In accordance TWDB requirements, the estimates of available water supply are based on the following key assumptions:

- Water supply is to be evaluated as the amount of water that a user can depend on obtaining during drought of record conditions. For reservoirs, this corresponds to the firm yield. For run-of-the-river sources this corresponds to the amount of water available for diversion during the driest period of record.

- Water availability is to be based on the assumption that all senior downstream water rights are being fully utilized.

- Water availability is to be based on the infrastructure that is currently in place. For example, water would not be considered available from a reservoir if a user needs to construct the water intake and pipeline required for diverting and conveying water from the reservoir to the area of need.

It is important to note that the description of available surface water supplies described in the subsequent sections is limited by the availability of information. This is particularly true in the case of run-of-the-river supplies. At present, information is not available to estimate the amount of run-of-the-river supply available for the conditions described above. The state is currently in the process of developing new water availability models for 21 river basins in Texas. Once completed, these models will allow for better estimation of run-of-the-river supply availability during drought of record conditions. Of the six river basins in the region, only the Sulphur River Basin has been modeled to date. Water availability models for the other basins are scheduled to be completed by December 2001.

In addition to the data limitations for run-of-the-river water availability, there is also only limited information available to characterize the supply available under drought of record conditions from small impoundments and from local water sources. Consequently, river basin supply estimates are based largely on the estimated firm yield of existing reservoirs. However, it should be noted that run-of-the-river supplies do constitute another important component of the total water supply available to users within the region.

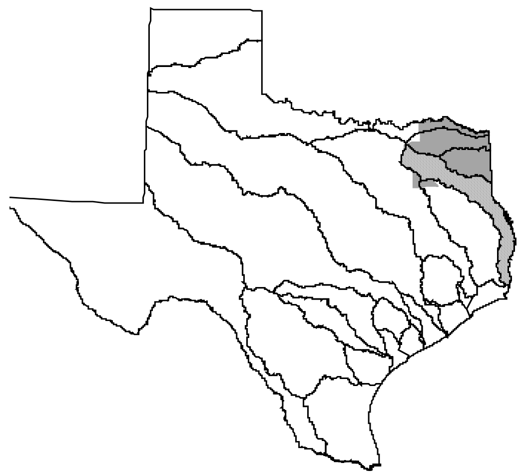
The following surface water supply descriptions include the most current available firm yield estimates. In most cases, the yield analyses were performed by the TWDB and are included in the current State Water Plan. For several of the reservoirs in the North East Texas Region, the TWDB has performed more recent hydrographic surveys to determine current reservoir storage capacities. These revised storage capacity estimates differ from previous estimates due to more accurate hydrographic survey methods and/or the effects of sedimentation. However, this information has not yet been used to reevaluate firm yield of these reservoirs. For these reservoirs, the actual firm yield may be less than presented in this chapter. The following table presents the summarized results of recent hydrographic surveys for reservoirs in the North East Texas Region.

Table 3.1 - TWDB Reservoir Volumetric Surveys for Reservoirs in the North East Texas Region

Reservoir Name	TWDB Survey Date	Conservation Storage Capacity (ac-ft)	Last Prior Survey Date	Percent Change in Storage Capacity Since Last Survey
Lake Cherokee	October 1996	41,506	1986	-8.1
Wright Patman Reservoir	January 1997	110,900	1956	-23.7
Lake Tawakoni	April 1997	888,140	1960	-5.1
Lake Bob Sandlin	February 1998	192,350	1978	-4.0
Lake Monticello	February 1998	34,740	1972	-23.7
Lake Cypress Springs	April 1998	67,690	1972	-7.0
Lake O' the Pines	October 1998	238,933	1959	-6.0

3.1 (a) Sabine River Basin

The Sabine River Basin originates in Collin County, just west of the North East Texas Region, and extends to Sabine Lake in the far southeastern portion of Texas. The total drainage area of the basin is nearly 9,800 square miles. Of this area, approximately 7,400 square miles are in Texas while the remaining 2,400 square miles of drainage area are in Louisiana. Within the North East Texas Region, all or portions of Hunt, Hopkins, Franklin, Rains, Wood, Upshur, Gregg, Harrison, Smith, and Van Zandt counties are in the Sabine Basin.



The existing surface water supplies in the Sabine Basin include 10 water supply reservoirs and run-of-the-river supplies from the Sabine River. Table 3.2 presents the estimated available water supply for these sources during drought of record conditions by decade.

Table 3.2 - Sabine Basin Surface Water Supplies*

	Supply Available (ac-ft/yr)					
Name of Source	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Greenville City Lakes**	1,205	1,205	1,205	1,205	1,205	1,205
Lake Tawakoni	238,100	229,005	227,118	225,232	223,345	221,459
Lake Fork	188,600	187,776	187,590	187,403	187,217	187,031
Lake Gladewater**	1,679	1,679	1,679	1,679	1,679	1,679
Lake Cherokee**	18,000	18,000	18,000	18,000	18,000	18,000
Lake Quitman***	0	0	0	0	0	0
Lake Holbrook***	0	0	0	0	0	0
Lake Hawkins***	0	0	0	0	0	0
Lake Winnsboro***	0	0	0	0	0	0
Toledo Bend****	0	0	0	0	0	0
Sabine ROR	166,156	166,156	166,156	166,156	166,156	166,156
TOTAL	**613,740**	**603,821**	**601,748**	**599,675**	**597,602**	**595,530**

** Based on criteria described in Section 3.1.*
*** Sedimentation effects on available supply not available.*
**** Firm yields of Lake Quitman, Holbrook, Hawkins, and Winnsboro are 3,710, 3,285, 8,035, 5,760 ac-ft/yr, respectively. No available supply is shown since none is permitted and no infrastructure is in place.*
***** Firm yield for Texas' portion of Toledo Bend is 1,043,300 acre-feet per year, however the NETRWP Group elected to include no supply available due to the lack of infrastructure to import water from the reservoir to the region.*

<u>Greenville City Lakes:</u> These lakes consist of a series of off-channel reservoirs that are used to impound diversions from the Cowleech Fork of the Sabine River. The Comprehensive Sabine Water Management Plan (1999) states that operational modifications could increase the firm yield from 1,205 ac-ft/yr to 2,800 ac-ft/yr. Permitted use from the lakes is 4,159 ac-ft/yr which means that, even with operational improvements, the total permitted use would not be available during drought of record conditions. Supply from these lakes is used by the City of Greenville to meet municipal and steam electric water demands.
<u>Lake Tawakoni:</u> Lake Tawakoni is located in Rains, Van Zandt, and Hunt counties and contains the largest supply source in the region with a firm yield of approximately 230,890 ac-ft/yr. Permitted use is 238,100 ac-ft/yr (Freese and Nichols, 1999). Lake Tawakoni is owned and operated by the Sabine River Authority (SRA). Supply from this reservoir is used for municipal water supply, with the City of Dallas being entitled to 80 percent of the yield. The remaining supply from Lake Tawakoni is allocated by contract to municipal users within the North East Texas Region.

<u>Lake Fork:</u> Lake Fork is located on Lake Fork Creek, a tributary to the Sabine River, in Wood, Rains, and Hopkins counties. The firm yield of Lake Fork is estimated to be nearly 188,000 ac-ft/yr, of which approximately 70 percent is dedicated by contract to the City of Dallas (Freese and Nichols, 1999). However, 11,860 ac-ft/yr of this contract cannot be transferred outside of the Sabine Basin. The SRA, which owns and operates the reservoir, has committed all of the remaining supply through contracts and options with local entities.

<u>Lake Gladewater:</u> Owned and operated by the City of Gladewater, Lake Gladewater has an estimated firm yield of 6,900 ac-ft/yr (Freese and Nichols, 1999). The city currently holds a water right for 1,679 ac-ft/yr, although they have submitted a request to the TNRCC to increase this permitted right to 3,358 ac-ft/yr.

<u>Lake Cherokee:</u> Lake Cherokee is owned and operated by the Cherokee Water Company. The reservoir is located in Rusk and Gregg counties, approximately 12 miles southeast of Longview. Based on the owner's current operating conditions, the maximum available supply is estimated to be 18,000 ac-ft/yr, although firm yield for Lake Cherokee is estimated to be 39,400 acre-feet per year (Freese and Nichols, 1999). Water supply from Lake Cherokee is used for municipal and industrial purposes.

<u>Wood County Lakes (Lake Quitman, Holbrook, Hawkins, and Winnsboro):</u> The Wood County Lakes are owned and operated by Wood County, primarily for recreation and flood control purposes. The firm yield for these lakes was estimated by the Sabine River Authority to be 3,710 ac-ft/ yr for Lake Quitman, 3,285 ac-ft /yr for Lake Holbrook, 8,035 acre-feet per year for Lake Hawkins, and 5,760 ac-ft/ yr for Lake Winnsboro. However, due to lack of infrastructure and water rights, no water is currently available from these reservoirs.

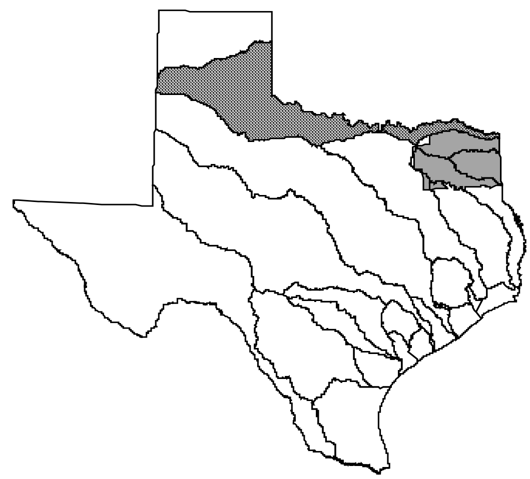
<u>Toledo Bend:</u> Toledo Bend Reservoir is located in Newton, Shelby, and Sabine counties in the East Texas Regional Water Planning Area. Firm yield of the Toledo Bend Reservoir is estimated at 1,043,300 ac-ft/yr. Current permits allow the Sabine River Authority to use 750,000 ac-ft/yr. Currently there is no infrastructure in place to transfer water from Toledo Bend for use in the North East Texas Region. The

North East Texas Regionalal Water Planning Group has elected not to show any of the supply from this reservoir as available to the region.

Sabine Run-of-the-River: Based on TNRCC water right information, 166,156 ac-ft/ yr of run-of-the-river supply is available in the Sabine Basin in the North East Texas Region. Of this supply, 153,606 ac-ft/yr is from the Sabine River, 1,100 ac-ft/yr from the Brandy Branch and 1,550 ac-ft/yr from Mill Creek. These supply estimates are based on TNRCC municipal and industrial water rights and may need to be revised subject to analysis with the Sabine River water availability model when it is available.

3.1 (b) Red River Basin

The Red River Basin originates in eastern New Mexico and extends eastward across north Texas and southern Oklahoma and into Louisiana. Approximately 24,460 square miles of the 48,030 square mile drainage area of the basin are within Texas. Within the North East Texas Region, all or part of Bowie, Red River, and Lamar counties are in the Red River Basin.



The existing surface water supplies in the Red River Basin include Lake Texoma, Pat Mayse Lake, and Lake Crook. Table 3.3 presents the estimated water supply that is available under drought of record conditions for each of these sources by decade. None of the water in Lake Texoma is considered available to the North East Texas Region due to lack of infrastructure and water rights. The salinity of Lake Texoma water is also a problem.

Table 3.3 - Red River Basin Surface Water Supplies*

	Supply Available (ac-ft/yr)					
Name of Source	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Lake Texoma***	0	0	0	0	0	0
Pat Mayse Lake	59,900	59,570	59,200	58,900	58,600	58,300
Lake Crook**	1,000	1,000	1,000	1,000	1,000	1,000
TOTAL	**60,900**	**60,570**	**60,200**	**59,900**	**59,600**	**59,300**

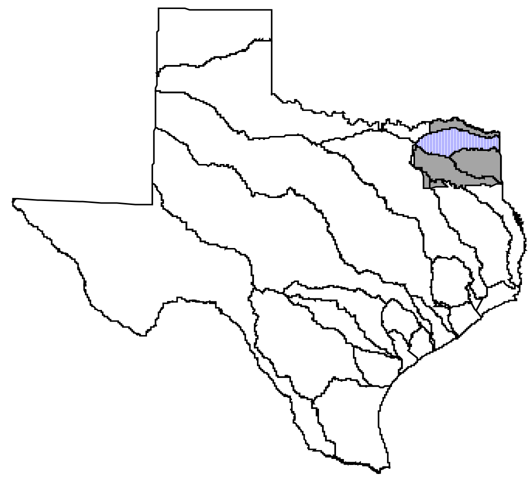
** Based on criteria described in Section 3.1.*
*** Sedimentation effects on available supply not available.*
**** Firm yield in 2000 is 932,950 AF/yr based on estimate from the Region C report entitled, "Task 3 Draft Report - Analysis of Current Water Supply in Region C."*

Lake Texoma: Lake Texoma was created for flood protection, water supply, hydroelectric power generation, and recreational purposes. Lake Texoma has an estimated firm yield of 932,950 acre-feet per year. Lake Texoma is located in Region C, in Grayson County, Texas, as well as in Oklahoma. While there is some supply from Lake Texoma that may be available for use in the North East Texas Region, currently there is no infrastructure in place to transfer this water into the region. Therefore, the North East Texas Regionalal Water Planning Group has elected to not show any of the supply from this reservoir as available to the region.

Pat Mayse Lake: Pat Mayse Lake is located in Lamar County on Sanders Creek, 10 miles north of Paris, Texas. Pat Mayse Lake is owned and operated by the USACE for flood control, water supply, and recreation purposes. The firm yield of Pat Mayse Lake is estimated to be 59,900 ac-ft/yr. The City of Paris holds the rights to all water from Pat Mayse Lake.

Lake Crook: Lake Crook is also located in Lamar County. It is a small lake with an estimated firm yield of 1,000 ac-ft/ yr. Yield from this reservoir also is used to meet the water demands of the City of Paris.

3.1 (c) Sulphur River Basin



The Sulphur River Basin begins in Fannin and Hunt counties and extends eastward to southwest Arkansas where it joins the Red River. Within the North East Texas Region, all or part of Hunt, Delta, Lamar, Hopkins, Franklin, Titus, Red River, Morris, Bowie, and Cass counties are within the Sulphur Basin. The Texas portion of the Sulphur River Basin covers approximately 3,600 square miles.

Due to high average rainfall and runoff, the Sulphur Basin has an abundant supply of surface water. Approximately 91 percent of the water used for all purposes in the basin is from surface water supplies, with groundwater supplying the remainder (Brandes, 1999). There are 29 impoundments in the Sulphur Basin with a normal storage capacity greater than 200 acre-feet. However, five reservoirs account for the majority of current supply in the basin.
Table 3.4 presents the supply available in the Sulphur Basin during drought of record conditions for each of these sources by decade.

Table 3.4 - Sulphur River Basin Surface Water Supplies*

	Supply Available (ac-ft/yr)					
Name of Source	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Cooper Reservoir***	137,344	136,335	135,326	134,317	133,308	132,298
Lake Wright Patman****	180,000	180,000	180,000	180,000	180,000	180,000
Lake Sulphur Springs**	7,800	7,800	7,800	7,800	7,800	7,800
Big Creek Lake**	1,518	1,518	1,518	1,518	1,518	1,518
River Crest Lake**	10,000	10,000	10,000	10,000	10,000	10,000
Langford Lake	1,215	1,215	1,215	1,215	1,215	1,215
Sulphur ROR	10,000	10,000	10,000	10,000	10,000	10,000
TOTAL	**347,877**	**346,868**	**345,859**	**344,850**	**343,841**	**342,831**

** Based on criteria described in Section 3.1.*
*** Sedimentation effects on available supply not available.*
**** Firm yield based on estimate from the Region C report entitled, "Task 3 Draft Report - Analysis of Current Water Supply in Region C."*
***** Based on existing water rights permits. A 1973 firm yield estimate for the reservoir was 282,000 AF/yr.*

Cooper Reservoir: Cooper Reservoir, which is also known as Jim Chapman Lake, is owned and operated by the USACE for water supply, flood control, and recreation benefits. Lake Cooper is located on the

South Sulphur River in Delta and Hopkins counties. Firm yield from this reservoir is estimated to be 137,344 ac-ft/ yr in the year 2000. Major water right holders for this reservoir includes the City of Irving, the North Texas Municipal Water District, and the Sulphur River Municipal Water District.

Lake Wright Patman: Formerly known as Lake Texarkana, Lake Wright Patman is located on the Sulphur River in Bowie and Cass counties, approximately seven miles upstream of the Texas-Louisiana state line. In addition to providing water supply to Texarkana, Lake Wright Patman provides flood control protection and recreation benefits. This reservoir is owned and operated by the USACE and currently has permitted water rights of 180,000 ac-ft/ yr, although firm yield of the reservoir is estimated to be 282,000 ac-ft/yr (USACE, 1973). The planning group has elected to only show the permitted yield from the reservoir as currently available to the region. Unpermitted yield from the reservoir could become available for supply through future water right permit amendments.

Lake Sulphur Springs: Lake Sulphur Springs is located just north of the City of Sulphur Springs in Hopkins County. This reservoir is located on White Oak Creek, the largest tributary to the Sulphur River. Lake Sulphur Springs is owned by the Sulphur Springs Water District and is estimated to have a firm yield of 7,800 ac-ft/ yr.

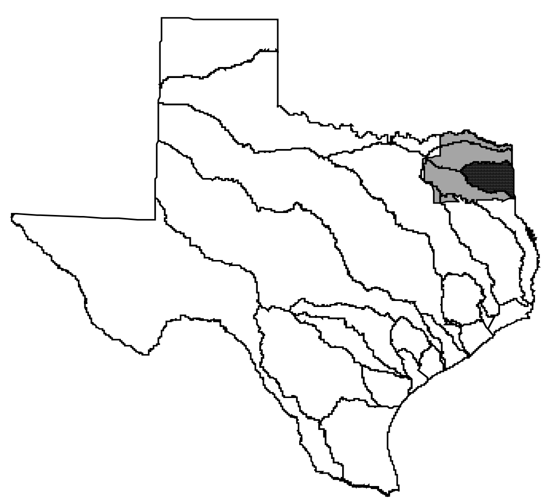
Big Creek Lake: Big Creek Lake is estimated to have a firm yield of 1,518 ac-ft / yr. Supply from Big Creek Lake is used to meet water demands for the City of Cooper.

River Crest Lake: River Crest Lake is located just north of the Sulphur River in Red River County. The lake's firm yield is estimated to be 10,000 ac-ft/ yr. This water supply is currently used for steam electric power generation.

Langford Lake: Lanfgord Lake is located on Langford Creek, north of the City of Claksville, in Red River County. The lake is used for recreation, and as a partial water supply for the City of Clarksville.

Sulphur Run-of-the-River: Based on TNRCC water right information, 10,000 ac-ft/ yr of run-of-the-river supply is available in the Sulphur Basin in the North East Texas Region. This supply is a water right owned by Texas Utilities Electric Company. Available run-of-the-river supplies may need to be revised subject to analysis with the Sulphur River water availability model.

3.1 (d) Cypress Creek Basin



The Cypress Creek Basin originates in Hopkins County and extends eastward to northwest Louisiana, where it flows into the Red River. The Texas portion of Cypress Basin covers approximately 2,800 square miles and includes all or part of Hopkins, Gregg, Franklin, Wood, Titus, Camp, Upshur, Cass, Marion, Morris and Harrison counties in the North East Texas Region.

According to the 1997 State Water Plan, surface water resources account for approximately 89 percent of the water used in the Cypress Creek Basin, with groundwater supplying the remainder. The Cypress Basin contains nine reservoirs with yields available to the North East Texas Region. Table 3.5 presents estimates of the supply available in the Cypress Basin during drought of record conditions for each of these sources by decade.

Table 3.5 - Cypress River Basin Surface Water Supplies*

	Supply Available (ac-ft/yr)					
Name of Source	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Lake O' the Pines**	130,600	130,600	130,600	130,600	130,600	130,600
Lake Bob Sandlin**	60,500	60,500	60,500	60,500	60,500	60,500
Lake Cypress Springs**	16,200	16,200	16,200	16,200	16,200	16,200
Monticello Lake**	7,700	7,700	7,700	7,700	7,700	7,700
Welsh Reservoir**	18,000	18,000	18,000	18,000	18,000	18,000
Ellison Creek Lake**	22,100	22,100	22,100	22,100	22,100	22,100
Johnson Creek Lake**	6,700	6,700	6,700	6,700	6,700	6,700
Caddo Lake**	10,000	10,000	10,000	10,000	10,000	10,000
Gilmer Lake**	7,470	7,470	7,470	7,470	7,470	7,470
Cypress ROR	84,607	84,607	84,607	84,607	84,607	84,607
TOTAL	**363,877**	**363,877**	**363,877**	**363,877**	**363,877**	**363,877**

** Based on criteria described in Section 3.1.*
*** Sedimentation effects on available supply not available.*

Lake O' the Pines: Located on Big Cypress Bayou in Marion, Morris, and Upshur counties, Lake O' the Pines covers 18,700 acres and has an estimated firm yield of 130,600 ac-ft/yr. Since its impoundment in 1956, USACE has owned and operated the lake. Northeast Texas Municipal Water District, which is the largest water right holder of supply from the reservoir, has water supply contracts with several cities in the region.

Lake Bob Sandlin: Lake Bob Sandlin is located on the Big Cypress River and occupies approximately 9,460 acres in Titus and Camp Counties. The lake was impounded in 1977 and is owned and operated by the Titus County Fresh Water Supply District Number 1. Firm yield for the reservoir is estimated by the TWDB to be 48,500 ac-ft/yr. The Tri-Lateral agreement raises the firm yield to 60,500 ac-ft/yr due to transfer of 12,000 ac-ft/yr from Lake O' the Pines.

Monticello Lake: In the 1960's Dallas Power and Light Company, now Texas Utilities, constructed a dam across Blundell Creek in Titus County to form Monticello Lake. This lake is used for steam electric power generation and has an estimated firm yield of 7,700 ac-ft/yr. In addition to water use, Monticello Lake has a recreational benefit, having the distinction of producing more bass per acre than any other lake in Texas.

Lake Cypress Springs: Lake Cypress Springs is located in Franklin County, 11 miles southwest of Mount Vernon. The lake was impounded in 1970 and occupies 3,450 acres. Estimated firm yield for the reservoir is 16,200 ac-ft/yr. Franklin County Water District owns most of the water rights for yield from this reservoir.

Welsh Reservoir: Welsh Reservoir, also known as Welsh Lake, is owned by Southwestern Electric Power Company and is used for steam electric power generation. Welsh Reservoir is located in Titus County and is estimated to have a firm yield of 18,000 ac-ft/yr.

Ellison Creek Lake: Ellison Creek Lake is located in southern Morris County, south of Daingerfield, Texas. The reservoir dam was constructed by the United States Defense Plant in 1942 and was acquired by the Lone Star Steel Company in 1947. Impounded water in the reservoir comes from Ellison Creek, which is also known as Brutons Creek. Firm yield for the reservoir is estimated to be 22,100 ac-ft/yr and is used to meet manufacturing water demands in the region.

Johnson Creek Lake: Johnson Creek Lake is located on Johnson Creek, approximately 13 miles northwest of Jefferson, Texas in northwestern Marion County. The reservoir is owned and operated by Southwestern Electric Power Company and is used for industrial cooling and steam electric power generation. The firm yield of the reservoir is approximately 6,700 ac-ft/yr. In order to maintain lake levels, water is purchased from Lake O' the Pines which is pumped to Johnson Creek Lake.

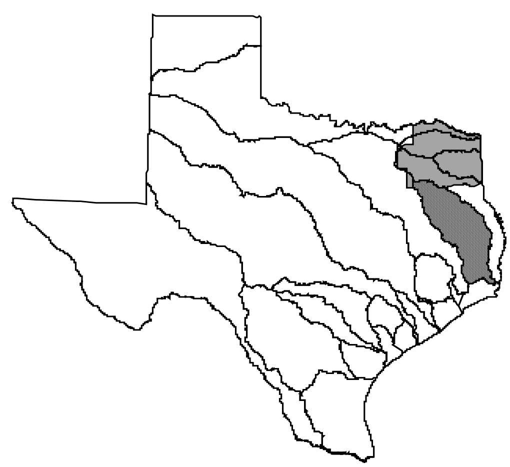
Caddo Lake: Impounded by Caddo Dam in Louisiana, Caddo Lake extends into Harrison and Marion Counties in Texas. The original dam forming the lake was constructed in 1914. In 1971 the USACE finished construction of a replacement dam that forms the current reservoir. The dam is now owned and operated by the Caddo Lake Levee District. Estimated firm yield for the lake is estimated to be 10,000 ac-ft/yr, some of which is used to supply local manufacturing demand.

Lake Gilmer: With impoundment beginning in 1997, Lake Gilmer is the newest major reservoir in the North East Texas Region. The lake is located on Kelsey Creek, northwest of Gilmer, Texas in Upshur County. Estimated firm yield from the reservoir is 7,470 ac-ft/yr. Water supply from Lake Gilmer is expected to supply water for a proposed power plant in Upshur County and for the City of Gilmer.

Cypress Run-of-the-River: Based on TNRCC municipal and industrial water right information, 84,607 ac-ft/yr of run-of-the-river supply is available in the Cypress Basin in the North East Texas Region. Of this supply, 57,523 ac-ft/yr is from Cypress Creek, 16,084 ac-ft/yr is from a tributary to Grays Creek and 11,000 ac-ft/yr is from Swauano Creek. These supply estimates may need to be revised subject to analysis with the Cypress River water availability model when it is available.

3.1 (e) Neches River Basin

The Neches River Basin originates in Van Zandt County and extends southeast to the Gulf of Mexico. The total drainage area of the basin is approximately 10,000 square miles, although the portion within the North East Texas Region is very small. Only small portions of Van Zandt and Smith Counties are located within the Basin.

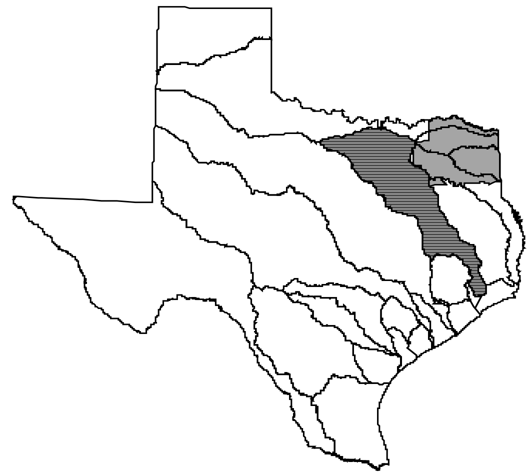


There are no major surface water supplies within the portion of the Neches Basin in the North East Texas Region. However, some supply from Lake Tyler may be available for future use in the North East Texas Region.

Lake Tyler: Located on Prairie Creek in eastern Smith County, Lake Tyler is located wholly within the East Texas Regional Water Planning Area (Region I). The reservoir is owned and operated by the City of Tyler as a water supply for domestic, municipal, and industrial use. The lake actually has two parts, referred to as Lake Tyler East and Lake Tyler West. In 1949 Lake Tyler West was completed with the construction of Whitehouse Dam. Lake Tyler East was completed in 1967 with the construction of Mud Creek Dam. The two lakes were joined by a canal in 1968. Estimated firm yield for the combined lake is 38,500 ac-ft/yr. However, currently there is no infrastructure in place to transfer water from Lake

Tyler for use in the North East Texas Region. The North East Texas Regionalal Water Planning Group has elected not to show any of the supply from this reservoir as available to the region.

3.1 (f) Trinity River Basin



The Trinity River Basin originates in Archer County and extends southeast to the Gulf of Mexico. The total drainage area of the basin is nearly 18,000 square miles and contains the largest population of any basin in the state. However, within the North East Texas Region only small parts of Hunt, and Van Zandt counties are located within the Trinity River Basin.

There are no major surface water supplies within the portion of the Trinity Basin in the North East Texas Region. However, some supply from Lake Lavon may be available for future use in the region. Table 3.6 presents the supply available in the Trinity Basin during drought of record conditions for each of these sources by decade.

Table 3.6 – Trinity River Basin Surface Water Supplies*

	Supply Available (ac-ft/yr)					
Name of Source	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Lake Lavon**	104,000	104,000	104,000	104,000	104,000	104,000
TOTAL	**104,000**	**104,000**	**104,000**	**104,000**	**104,000**	**104,000**

** Based on criteria described in Section 3.1.*
*** Sedimentation effects on available supply not available.*

Lake Lavon: Lake Lavon is located on the East Fork of the Trinity River and Pilot Grove Creek in southern Collin County. The reservoir is owned and operated by the USACE. The North Texas Municipal Water District is the local cooperative agency that helped fund the construction of the reservoir and subsequently has rights to 100,000 acre-feet of water in the lake. The lake was constructed for flood control, water supply, and recreational use. Estimated firm yield in the reservoir is 104,000 ac-ft/yr. While no North East Texas Region entities draw water directly from Lake Lavon, a number are supplied by the North Texas Municipal Water District.

3.2 Groundwater Supplies

Groundwater availability estimates for the North East Texas Region are presented in the sections that follow. This includes a brief discussion of the various methods that can be used to estimate groundwater availability, including the methodology used to develop estimates for this regional water plan, and the key assumptions and limitations of each method.

3.2 (a) Discussion of Groundwater Availability Estimation Methods

Previous estimates of groundwater availability for the North East Texas Region were developed by the TWDB and were based on numerous local and regional aquifer studies that employed various methods for estimating water supply availability. Under one common approach, which will be referred to as the

recharge method, groundwater availability is assumed equal to the long term average annual recharge to the aquifer. Recharge refers to the total of all sources by which an aquifer can be replenished with water, including precipitation, infiltration from streams, lateral or vertical inflow from other subsurface formations, and irrigation return flow.
After estimating groundwater availability based on average annual recharge estimates, assumptions must be made with regard to how a particular groundwater supply will be managed. In general, there are two management options. One option assumes that the "safe yield" of the aquifer will not be exceeded and that the overall static water level in the aquifer will not be continually decreased. The second option assumes that the long term water availability from an aquifer is equal to the annual recharge volume plus a specified volume of water held in storage within the aquifer. This management scenario is often referred to as "aquifer mining" in that a long term water level decline is expected, and the groundwater supply will be depleted over time. Both of these groundwater management approaches have been practiced in Texas based on the varying hydro-geologic, political, and socioeconomic factors found in different areas of the state. For example, aquifer mining has been an accepted policy throughout much of the Ogallala Aquifer in the Texas High Plains because the recharge is relatively low and groundwater demand for irrigation is relatively high. On the other hand, a "safe yield" policy has been adopted for the Edwards Aquifer in Central Texas in part because of potential impact to endangered species that are dependent on spring discharge from the aquifer.

For some areas of the state, previous state water plans have assumed that groundwater supply is equal to the historical groundwater usage in the particular geographical region plus the projected increase in demand by current users of the resource. This method was used in cases where there was great uncertainty in estimates of long term groundwater availability. Uncertain estimates may exist for many reasons, including aquifer complexity, lack of adequate recharge estimates, or lack of quantitative understanding of the flow system. This approach is considered conservative in terms of ensuring that groundwater resources are not over-allocated. However, in some areas, this approach is likely to underestimate long term groundwater availability, particularly if the historical use is only a fraction of the total recharge.

Another complexity of predicting long term groundwater availability under "mining" conditions is predicting future groundwater supply when the groundwater demand is unknown. For example, a severe drought may cause significantly more groundwater mining than under normal conditions, leaving a groundwater supply shortage for the future. In other words, it is difficult to know under mining scenarios how and when the groundwater in storage will be utilized and it is therefore difficult to predict what the available supply will be in the future.

TWDB guidelines for developing groundwater availability estimates state:

> *"...groundwater availability shall be reported in Table 4 as the largest annual amount of water that may be pumped from a given aquifer that does not violate the most restrictive physical or regulatory conditions limiting withdrawals during a drought of record period."*

TWDB guidelines also state:

> *"... that the method used to split the groundwater into county/basin units was an estimate based on the proportion of groundwater actually used from each aquifer in each county/basin. Therefore, these values do not necessarily represent the actual amount of groundwater available. Regional Water Planning Groups and their consultants are encouraged to evaluate different ways to arrive at county/basin groundwater availability estimates during drought of record conditions."*

TWDB guidelines do not mandate a specific policy with regard to methods for estimating groundwater availability. As such, the North East Texas Regional Water Planning Group is free to adopt a groundwater management approach based on either the safe yield or aquifer mining concepts.

3.2 (b) Method Selected for Estimating Groundwater Supply in the North East Texas Region

Groundwater availability can be defined in various ways. For this amount to be meaningful, however, it should be based on regionally accepted water use policy and regulatory considerations. For the North East Texas Region, groundwater availability estimates for each major and minor aquifer are based on a combination of methods as discussed below. The overall approach reflects the North East Texas Regional Water Planning Group's desire that there be only limited expansion of groundwater supplies to meet projected demands.

The groundwater availability for each river basin-aquifer-county is presented in Appendix A and in the following sections. Groundwater availability has been estimated differently for different aquifers. For the Carrizo-Wilcox Aquifer, groundwater availability estimates were determined by the TWDB through the utilization of a groundwater flow model. In utilizing the model, the TWDB first estimated groundwater demand to the year 2050. The model was then used to evaluate whether that demand could be met during the planning period. If the model indicated that the groundwater demand could be met, the groundwater availability was set equal to the groundwater demand. If the model indicated that the groundwater demand could not be met, the model was used to estimate the maximum groundwater availability over the planning period. Therefore, the Carrizo-Wilcox groundwater availability estimates in this chapter provide a relatively conservative estimate of long term availability. In some counties where historical use has been low due to small demand, the actual groundwater availability may be larger than those shown in the following tables. In other counties where the demand has been higher, the groundwater availability estimates may be very similar to actual long term supply for the county. The details of the TWDB modeling assessment have not been documented.

For the other aquifers in the North East Texas Region, groundwater availability was estimated by calculating the long term sustainable annual recharge to the aquifer. For these aquifers, the availability estimate provides a reasonable projection of long term groundwater availability that is not dependent on historical or projected groundwater demand.

It should not be assumed that the entire volume of available groundwater is necessarily available at any location in the county or to a particular water user. Determination of a user's access to the available groundwater requires a more thorough local evaluation, which is beyond the scope of this effort. A user in a particular county might not (and in most cases will not) have access to the entire volume of groundwater shown in Table 3.7 due to physical and infrastructure limitations. Likewise, the availability of groundwater is only one of many factors that will determine the water supply for a given entity. Political, infrastructure, financial, and other considerations must also be factored into the decision for determining the optimum water supply. For example, although there may be sufficient groundwater supply, dissatisfaction with groundwater quality may compel an entity to pursue surface alternate sources. In summary, the following groundwater availability estimates are meant to provide an overall summary and are not intended to be the sole basis for determining water usage scenarios for a region, county, or local water user.

3.2 (c) Summary of Groundwater Availability by Aquifer

Blossom Aquifer

The Blossom Aquifer occupies a narrow east-west band in parts of Bowie, Red River, and Lamar counties in the northeast corner of the North East Texas Region. The TWDB has historically assumed that the annual availability for the Blossom Aquifer is equal to the effective recharge that occurs primarily through infiltration of rainfall over the outcrop.

The Blossom Aquifer yields water in small to moderate amounts over a limited area on and south of the outcrop, with the largest well yields occurring in Red River County. Production decreases in the western half of the aquifer, where yields of 35 gal/min to 85 gal/min are typical. In addition, water quality from the Blossom Aquifer does not meet current drinking water standards for public water supplies but may be used for domestic and livestock purposes.

As shown in Table 3.7, the average annual effective recharge for the aquifer is estimated to be 811 ac-ft. Most of the outcrop area and therefore most of the groundwater availability of the Blossom Aquifer is located in Red River County. The groundwater usage from the Blossom Aquifer in 1996 (1,096 ac-ft/yr) was greater than the long term groundwater availability of 811 ac-ft / yr. Overall, the North East Texas Region is using 135 percent of the sustainable groundwater supply from the Blossom Aquifer. However, groundwater usage from the Blossom Aquifer is only about two percent of the total groundwater usage in the North East Texas Region and less than 0.2 percent of the total water usage in the North East Texas Region. Therefore, the North East Texas Region should have ample surface water supply to supplement or replace the existing groundwater supplies in areas where it is required.

Table 3.7 – Groundwater Availability by Basin and County for the Blossom Aquifer

County / Basin	**Supply Available (ac-ft/yr)**		
	Red	Sulphur	**County Total**
Bowie	73		**73**
Lamar	10	68	**78**
Red River	204	456	**660**
Basin Total	**287**	**524**	**811**

<u>Carrizo-Wilcox Aquifer</u>
The Carrizo-Wilcox group is the most extensive and productive aquifer in the North East Texas Region and is considered a major aquifer by the TWDB. The production capacity of the Carrizo-Wilcox Aquifer is variable because of the heterogeneous nature of the sediments that comprise the aquifer. Nevertheless, in general, it is a very productive aquifer and is recharged from infiltration from precipitation. The majority of municipal wells in the North East Texas Region produce from the Carrizo-Wilcox Aquifer.

Estimates of groundwater availability from the Carrizo-Wilcox Aquifer in the North East Texas Region are provided in Table 3.8. Total estimated groundwater availability from the Carrizo-Wilcox Aquifer in the North East Texas Region is over 489,000 ac-ft/yr. This represents 55 percent of the total groundwater availability in the North East Texas Region. Total groundwater pumpage from the Carrizo-Wilcox in the North East Texas Region for all usage categories was 40,700 acre-feet during 1996, or only about eight percent of the total estimated groundwater availability.

Regionally, water from the Carrizo-Wilcox Aquifer is fresh to slightly saline with quality problems in localized areas. It is difficult to make generalizations about the quality of the water in the Carrizo-Wilcox Aquifer because the quality changes significantly throughout the North East Texas Region. In the outcrop, the water is generally hard, yet usually low in dissolved solids. Downdip water is softer and contains more dissolved solids. On a local basis, hydrogen sulfide and methane may occur. In addition, corrosive water with a high iron content occurs naturally throughout the aquifer in the North East Texas Region. In the North East Texas Region, some instances of relatively high concentrations of dissolved solids, sulfate, manganese, and chloride have also been reported. These occurrences are often near areas where lignite is known to occur and may be due to mineralization by waters passing through the lignite, especially in the case of high sulfate.

Table 3.8 – Groundwater Availability by Basin and County for the Carrizo-Wilcox Aquifer

County / Basin	Supply Available (ac-ft/yr)					
	Cypress	Neches	Sabine	Sulphur	Trinity	**County Total**
Bowie				14,000		**14,000**
Camp	2,500					**2,500**
Cass	68,767			15,733		**84,500**
Franklin	2,155			545		**2,700**
Gregg	1,333		20,267			**21,600**
Harrison	71,429		112,071			**183,500**
Hopkins	68		4,033	1,100		**5,201**
Hunt			5			**5**
Marion	1,300					**1,300**
Morris	109,004			27,596		**136,600**
Rains			1,400			**1,400**
Red River				25		**25**
Smith			8,194			**8,194**
Titus	6,400			700		**7,100**
Upshur	4,027		1,473			**5,500**
Van Zandt		1,843	3,567		390	**5,800**
Wood	164		9,000			**9,164**
Basin Total	**267,147**	**1,843**	**160,010**	**59,699**	**390**	**489,089**

Nacatoch Aquifer

The Nacatoch Aquifer is classified as a minor aquifer by the TWDB. Table 3.9 shows the detailed groundwater availability by county and basin for the Nacatoch Aquifer. The total groundwater supply for the North East Texas Region based on estimates of annual recharge to the aquifer is 4,352 ac-ft/yr. In 1996, the total volume of groundwater pumped from the Nacatoch was 3,778 ac-ft/yr. Therefore, based on these estimates of recharge and usage, the aquifer is being mined in areas of heavy usage. Approximately 40 and 35 percent of the groundwater pumped from the Nacatoch Aquifer in the North East Texas Region is from Hunt and Bowie Counties, respectively.

Comparison of the water availability estimates with the groundwater demand estimates indicates that Bowie, Hopkins, and Hunt counties are overusing available groundwater supply from the Nacatoch. In 1996, groundwater usage in Hunt County was about four times higher than the estimated long term groundwater availability.

Table 3.9 – Groundwater Availability by Basin and County for the Nacatoch Aquifer

County / Basin	Supply Available (ac-ft/yr)				
	Red	Sabine	Sulphur	Trinity	**County Total**
Bowie	1050		584		**1,634**
Delta			227		**227**
Franklin			10		**10**
Hopkins		319	32		**351**
Hunt		197	400	2	**599**
Lamar	3		45		**48**
Rains		2			**2**
Red River	220		711		**931**
Titus			550		**550**
Basin Total	**1,273**	**518**	**2,559**	**2**	**4,352**

Queen City Aquifer

The Queen City Aquifer is classified as a minor aquifer by the TWDB. The Queen City Aquifer overlies the Carrizo-Wilcox Aquifer and is shallower and more prone to potential impacts of drought and overpumping as compared to the deeper Carrizo-Wilcox Aquifer. For these reasons, the aquifer has not been greatly developed for public water supply purposes. However, the Queen City Aquifer contains relatively large quantities of recoverable groundwater in the North East Texas Region.

Groundwater availability from the Queen City Aquifer is estimated to be 424,362 ac-ft/yr or about 45 percent of total groundwater availability in the North East Texas Region. This estimate is based on conservative recharge values over the areal extent of the aquifer. The groundwater availability shown herein assumes an average of about 3.5 percent of the total precipitation recharges the aquifer. Because the Queen City Aquifer is a shallow aquifer, some of this water discharges from the aquifer into streams. Based on 1996 groundwater usage statistics, only about two percent of the available groundwater from the Queen City aquifer is pumped. The largest potential utilization of groundwater from the Queen City Aquifer is for irrigation, livestock, and rural domestic use and limited public water supply. In the shallower portions of the aquifer water quality is impaired by high iron concentration and low pH.

Table 3.10 – Groundwater Availability by Basin and County for the Queen City Aquifer

County / Basin	Supply Available (ac-ft/yr)				
	Cypress	Neches	Sabine	Sulphur	**County Total**
Camp	11,725				**11,725**
Cass	86,765			7,000	**93,765**
Gregg	4,690		9,646		**14,336**
Harrison	23,450		2,756		**26,206**
Marion	30,485				**30,485**
Morris	16,415				**16,415**
Smith			46,852		**46,852**
Upshur	53,935		22,048		**75,983**
Van Zandt		7,839			**7,839**
Wood	7,035		53,742		**60,777**
Basin Total	**234,500**	**7,839**	**135,044**	**7,000**	**384,383**

Trinity Aquifer

Water quality in the Trinity Aquifer in the North East Texas Region, is typically not acceptable for public water supply because it does not meet current drinking water standards, but it may be used for domestic, irrigation, and livestock purposes. Although the Trinity Aquifer is classified as a major aquifer by the TWDB, groundwater availability and usage from the aquifer is limited in the North East Texas Region. Groundwater supplied from the Trinity Aquifer represents less than 0.3 percent of the total estimated groundwater availability for the region. Only the downdip, confined portions of the Trinity Aquifer, occurs in the North East Texas Region. There are only a few Trinity Aquifer public water supply wells in the North East Texas Region. Overall groundwater use from the Trinity Aquifer in the North East Texas Region is only about 30 percent of the estimated available supply. The total groundwater availability for the Trinity Aquifer in the North East Texas Region is 3,686 ac-ft/yr. On a county basis, the highest utilization of the available groundwater from the Trinity Aquifer is 41 percent in Lamar County.

Table 3.11 – Groundwater Availability by Basin and County for the Trinity Aquifer

County / Basin	Supply Available (ac-ft/yr)				
	Red	Sabine	Sulphur	Trinity	**County Total**
Delta			1,117		**1,117**
Hunt		433	19	8	**460**
Lamar	1,030		477		**1,507**
Red River	383		219		**602**
Basin Total	**1,413**	**433**	**1,832**	**8**	**3,686**

Woodbine Aquifer

The Woodbine Aquifer is classified as a minor aquifer by the TWDB. Water quality in the Woodbine Aquifer in the North East Texas Region is typically not acceptable for public water supply because it does not meet current drinking water standards, but it may be used for domestic, irrigation, and livestock purposes. Table 3.12 presents the estimated groundwater availability by county and basin for the Woodbine Aquifer. The total water supply available from the Woodbine Aquifer in the North East Texas Region, based on estimates of annual recharge to the aquifer, is 3,309 ac-ft / yr. In 1996, the total volume of groundwater pumped from the Woodbine was 725 acre-feet. Therefore, based on these estimates of recharge and usage, the aquifer is not being mined from a general perspective. However, pumpage from the Woodbine Aquifer in Hunt County is approximately five times greater than the estimated long term groundwater availability.

Table 3.12 – Groundwater Availability by Basin and County for the Woodbine Aquifer

County / Basin	Supply Available (ac-ft/yr)		
	Red	Trinity	**County Total**
Hunt		89	**89**
Lamar	2,520		**2,520**
Red River	700		**700**
Basin Total	**3,220**	**89**	**3,309**

3.2 (d) Summary of Groundwater Availability by River Basin

Table 3.13 presents the groundwater availability estimates by river basin. Only a very small portion of the Trinity and Neches River Basins are included in the North East Texas Region, and therefore, the proportion of the total groundwater supply in these river basins is relatively small. Most of the groundwater supply in the North East Texas Region occurs in the Cypress and Sabine River Basins. The Red River Basin contains only a relatively small percentage of the total regional groundwater supply because the Carrizo-Wilcox and Queen City aquifers do not occur within the basin.

Table 3.13 – Groundwater Availability by Aquifer and River Basin for the North East Texas Region

Aquifer	River Basin						
	Cypress	Neches	Red	Sabine	Sulphur	Trinity	**Aquifer Total**
Blossom			287		524		**811**
Carrizo-Wilcox	267,147	2,143	111	159,710	59,588	390	**489,089**
Nacatoch			1,273	518	2,559	2	**4,352**
Queen City	234,500	7,839		135,044	7,000		**384,383**
Trinity			1,413	433	1,832	8	**3,686**
Woodbine			3,220	535	341	135	**4,231**
Basin Total	**501,647**	**9,982**	**6,304**	**296,240**	**71,844**	**535**	**886,552**

3.3 Supplies Currently Available to Each Water User Group

The water supplies available to the individual water user groups in North East Texas Region are presented in the following sections. Also included is a description of the methods used to determine the supplies available to each water user group for this regional water plan and the assumptions, if any, made in developing this data.

The first series of data presents water supply by use category. This is followed by the supply of the water user combined by county and by river basin.

3.3 (a) Discussion of Water User Supply Determination

As noted in Chapter 2, each water user group was surveyed to determine not only population and population growth pattern but also water use and water supply. Each water user group, and those water users within the "county other" category, was asked to identify their water supply source and supply volume.

The water user group was asked to provide the contract period if the water supply was provided by a contract with some other source. The water supply is assumed to end with the contract, although it is understood that contract renewal may likely continue the supply to meet future needs. In those instances where the water supply contract does not specify the contract expiration date, the contract is assumed to continue through at least year 2050. If a maximum quantity is not specified in the contract then the supply was set equal to the demand for each year of the contract.

TWDB water supply volumes were used if more current supply estimates were not available for the manufacturing, mining, livestock, irrigation and steam electric users. It was further assumed that, unless a specific source of supply was identified during the survey or in the field investigation, livestock and irrigation were from private supplies. These private supplies may be individual water wells on private property or local surface water supplies. In general, therefore, the plan has assumed that irrigation and livestock supply from local supplies will match the changes in livestock and irrigation water demand.

3.3 (b) Regional Municipal Supply

The major water providers supply municipal water from surface water. Groundwater supplies, primarily from the Carrizo-Wilcox Aquifer, provide water to other municipal users. Most of the supply shortages for the water users within the region who have contracts in water supply are the result of contract expiration. Contract expiration is the primary reason for the decrease in municipal water supply over the planning period.

The following table 3.15 summarizes the regional municipal water supply.

Table 3.15- Regional Municipal Water Supply

Supply Available, ac-ft/yr						
County Name	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Bowie	24,598	30,136	29,927	32,129	28,925	25,592
Camp	15,470	15,483	15,484	15,489	15,490	15,490
Cass	9,819	7,504	7,504	7,520	7,520	7,520
Delta	1,737	1,726	1,652	1,567	1,566	1,566
Franklin	6,614	6,569	6,569	3,569	74	74
Gregg	57,924	41,034	41,034	41,036	26,532	10,692
Harrison	43,063	37,507	37,507	37,323	37,323	32,043
Hopkins	21,478	21,619	20,362	20,227	19,511	22,481
Hunt	39,093	14,603	9,753	5,141	4,181	4,031
Lamar	36,723	35,751	35,309	34,467	33,261	31,822
Marion	12,749	12,749	12,749	12,749	12,749	12,749
Morris	17,182	17,094	17,094	17,080	17,080	17,080
Rains	2,894	2,894	1,854	749	749	749
Red River	2,624	2,474	2,015	1,645	1,643	1,639
Smith	5,000	5,065	5,121	5,182	5,242	5,309
Titus	14,448	14,655	15,333	15,221	14,956	14,674
Upshur	13,438	13,705	13,705	13,705	13,705	13,705
Van Zandt	11,212	11,215	5,503	4,453	4,454	4,456
Wood	12,015	12,015	12,015	12,015	7,393	7,393
Total	**348,081**	**303,797**	**290,489**	**281,266**	**252,353**	**229,064**

3.3 (c)Regional Manufacturing Supply

The regional manufacturing supply is from municipalities, major water providers, wells, reuse, and from local supplies. The following table 3.16 summarizes the regional manufacturing supply.

Table 3.16- Regional Manufacturing Water Supply

Supply Available, ac-ft/yr						
County Name	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Bowie	1,944	2,152	2,366	2,590	2,826	3,071
Camp	10	10	10	10	10	10
Cass	80,129	76,867	76,871	74,569	77,555	80,664
Delta	9,188	9,188	9,188	9,188	9,188	9,188
Franklin	7	7	7	7	7	7
Gregg	5,821	9,488	10,366	10,836	11,385	11,970
Harrison	202,255	206,720	207,440	207,732	208,436	209,379
Hopkins	2,668	2,864	3,027	3,155	3,414	3,673
Hunt	940	1,018	1,103	1,198	1,329	1,449
Lamar	5,422	6,213	6,932	7,575	8,590	9,608
Marion	20	20	20	20	20	20
Morris	133,551	136,364	130,969	125,543	120,227	115,029
Rains	2	2	2	2	2	2
Red River	11	15	17	19	21	25
Smith	262	298	325	346	377	403
Titus	44,897	45,068	45,199	45,302	45,540	45,772
Upshur	965	982	991	993	1,027	1,064
Van Zandt	280	344	396	451	508	566
Wood	244	290	341	391	468	544
Total	**488,616**	**497,910**	**495,570**	**489,927**	**490,980**	**492,444**

3.3 (d) Regional Irrigation Supply

The regional irrigation supply is from well water, primarily the Carrizo-Wilcox Aquifer, and from local supply. Irrigation water supply remains fairly constant throughout the planning period. Table 3.17 summarizes the regional irrigation supply.

Table 3.17- Regional Irrigation Water Supply

Supply Available, ac-ft/yr						
County Name	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Bowie	4,400	4,620	4,620	4,620	4,500	4,200
Camp	87	87	87	87	87	87
Cass	0	0	0	0	0	0
Delta	1,978	1,956	1,934	1,913	1,891	1,870
Franklin	33	33	33	33	33	33
Gregg	0	0	0	0	0	0
Harrison	100	100	100	100	100	100
Hopkins	0	0	0	0	0	0
Hunt	271	271	271	271	271	271
Lamar	4,368	4,319	4,271	4,223	4,176	4,129
Marion	0	0	0	0	0	0
Morris	190	188	186	184	182	180
Rains	20	20	20	20	20	20
Red River	99	98	97	96	95	94
Smith	446	468	491	516	542	569
Titus	0	0	0	0	0	0
Upshur	200	200	200	200	200	200
Van Zandt	220	220	220	220	220	220
Wood	354	354	354	354	354	354
Total	**12,766**	**12,934**	**12,884**	**12,837**	**12,671**	**12,327**

3.3 (e) Regional Steam Electric Supply

The regional steam electric supply is chiefly from major water providers, local municipalities or from the stream electric company's local surface water source. Table 3.18 summarizes the steam electric supply.

Table 3.18- Regional Steam Electric Water Supply

Supply Available, ac-ft/yr						
County Name	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Bowie	0	0	0	0	0	0
Camp	0	0	0	0	0	0
Cass	0	0	0	0	0	0
Delta	0	0	0	0	0	0
Franklin	0	0	0	0	0	0
Gregg	6,686	7,186	7,186	7,186	7,186	8,186
Harrison	29,000	29,000	29,000	29,000	29,000	29,000
Hopkins	0	0	0	0	0	0
Hunt	800	0	0	0	0	0
Lamar	12,209	12,209	12,209	12,209	12,209	12,209
Marion	6,700	6,700	6,700	6,700	6,700	6,700
Morris	12,000	12,000	12,000	12,000	12,000	12,000
Rains	0	0	0	0	0	0
Red River	11,500	11,500	11,500	11,500	11,500	11,500
Smith	0	0	0	0	0	0
Titus	45,000	45,000	45,000	37,300	37,300	37,300
Upshur	0	0	0	0	0	0
Van Zandt	0	0	0	0	0	0
Wood	0	7,500	7,500	7,500	7,500	7,500
Total	**123,895**	**131,095**	**131,095**	**123,395**	**123,395**	**124,395**

3.3 (f) Regional Mining Supply

The regional mining water supply is chiefly from local supplies or from wells primarily in the Carrizo-Wilcox, Queen City or Trinity Aquifers. Table 3.19 summarizes the mining supply.

Table 3.19- Regional Mining Water Supply

Supply Available, ac-ft/yr						
County Name	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Bowie	53	52	53	56	61	66
Camp	132	131	131	131	131	131
Cass	1,254	990	942	902	872	496
Delta	0	0	0	0	0	0
Franklin	1,479	1,384	1,338	1,278	1,297	1,359
Gregg	96	67	46	37	29	27
Harrison	890	890	890	890	890	890
Hopkins	125	122	120	117	116	116
Hunt	70	71	73	75	77	79
Lamar	25	24	24	25	25	25
Marion	71	43	30	24	20	34
Morris	31	16	12	10	10	11
Rains	0	0	0	0	0	0
Red River	0	0	0	0	0	0
Smith	425	178	91	32	18	6
Titus	2,772	1,991	1,796	1,722	1,705	1,744
Upshur	1	1	1	1	1	0
Van Zandt	1,359	1,167	1,099	1,077	1,084	1,115
Wood	2,102	17,584	17,344	17,107	16,107	4,641
Total	**10,885**	**24,711**	**23,990**	**23,484**	**22,443**	**10,740**

3.3 (g) Regional Livestock Supply

The regional livestock supply is chiefly from wells in the Carrizo-Wilcox Aquifer or from local surface supplies. Table 3.20 summarizes the livestock supply.

Table 3.20- Regional Livestock Water Supply

Supply Available, ac-ft/yr						
County Name	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Bowie	3,671	3,850	3,850	3,850	3,500	3,000
Camp	800	800	800	800	800	800
Cass	851	851	851	851	851	851
Delta	770	770	770	770	770	770
Franklin	1,595	1,595	1,595	1,595	1,595	1,595
Gregg	265	265	265	265	265	265
Harrison	991	1,040	1,092	1,147	1,205	1,264
Hopkins	7,428	7,428	7,428	7,428	7,428	7,428
Hunt	1,237	1,237	1,237	1,237	1,237	1,237
Lamar	1,523	1,523	1,523	1,523	1,523	1,523
Marion	182	182	182	182	182	182
Morris	624	624	624	624	624	624
Rains	700	700	700	700	700	700
Red River	1,180	1,180	1,180	1,180	1,180	1,180
Smith	453	453	453	453	453	453
Titus	858	858	858	858	858	858
Upshur	1,928	1,928	1,928	1,928	1,928	1,928
Van Zandt	2,381	2,381	2,381	2,381	2,381	2,381
Wood	2,562	2,562	2,562	2,562	2,562	2,562
Total	**29,999**	**30,227**	**30,279**	**30,334**	**30,042**	**29,601**

3.4 Supply by County

3.4 (a) Bowie County Water Supply

Bowie County municipal water supply is from the City of Texarkana as the major water provider and from wells, primarily located in the Carrizo-Wilcox Aquifer. Some livestock supply is from the Nacatoch aquifer. Other livestock and irrigation water supply is from local supply. The City of Texarkana water supply is provided by a contract with the USACE from Lake Wright Patman.

Most of the water users' contracts with the City of Texarkana typically expire between the year 2000 and 2010. The water supply contract for the City of Texarkana from the reservoir continues through the study period.

Supplies for water users in the "County Other" are tabulated in the Appendix A. Generally, these water supplies are also from the City of Texarkana or from wells in the Carrizo-Wilcox Aquifer. The Burns Redbank Water Supply Corporation's supply is from the City of Hooks, which in turn receives its water from the City of Texarkana.

Table 3.21- Bowie County Water Supply

System Name	Supply Source Type	Supply Source Name	Supply Available, ac-ft/yr 2000	2010	2020	2030	2040	2050
City Of Dekalb	Contract	City Of Texarkana	439	0	0	0	0	0
City Of Hooks	Contract	City Of Texarkana	371	0	0	0	0	0
City Of Maud	Contract	City Of Texarkana	246	0	0	0	0	0
City Of Nash	Groundwater	Carrizo-Wilcox	13	13	13	13	13	13
City Of Nash	Contract	City Of Texarkana	368	0	0	0	0	0
City Of New Boston	Contract	City Of Texarkana	784	0	0	0	0	0
City Of Redwater	Contract	City Of Texarkana	64	0	0	0	0	0
City Of Redwater	Groundwater	Carrizo-Wilcox	45	45	45	45	45	45
City Of Texarkana	Contract	USACE	0	0	0	0	0	0
City Of Wake Village	Contract	City Of Texarkana	358	0	0	0	0	0
County Other	See Appendix A		1,587	9	11	14	17	20
Manufacturing			1,944	80	81	84	89	94
Mining			53					
Irrigation			4,400	4,909	4,909	4,909	4,789	4,489
Livestock			3,671	1,016	1,016	1,016	888	706
TOTAL			**14,343**	**6,072**	**6,075**	**6,081**	**5,841**	**5,367**

3.4 (b) Camp County Water Supply

The City of Pittsburg has the potential of obtaining water from Lake Bob Sandlin but the current water supply throughout the study period is from the Carrizo-Wilcox Aquifer and from the Northeast Texas Municipal Water District. The Camp County manufacturing supply is from the City of Pittsburg. Mining and irrigation supply is from the Carrizo-Wilcox Aquifer. Livestock water supply is from the Carrizo-Wilcox and Queen City Aquifers or from local supply.

"County Other" supply is tabulated in Appendix A. The water supply for the "County Other" water users is from the Carrizo-Wilcox Aquifer.

Table 3.22- Camp County Water Supply

System Name	Supply Source Type	Supply Source Name	Supply Available, ac-ft/yr 2000	2010	2020	2030	2040	2050
City Of Pittsburg	Contract	NETMWD	12,157	12,143	12,142	12,141	12,141	12,141
City Of Pittsburg	Contract	NETMWD	1,930	1,930	1,930	1,930	1,930	1,930
City Of Pittsburg	Contract	NETMWD	1,930	1,930	1,930	1,930	1,930	1,930
County Other	See Appendix A		1,383	1,410	1,412	1,418	1,419	1,419
Manufacturing			10	10	10	10	10	10
Mining			132	131	131	131	131	131
Irrigation			87	87	87	87	87	87
Livestock			800	800	800	800	800	800
TOTAL			**18,429**	**18,441**	**18,442**	**18,447**	**18,448**	**18,448**

3.4 (c)<u>Cass County Water Supply</u>

The municipal water supply in Cass County comes from three sources: City of Texarkana, Northeast Texas Municipal Water District, and groundwater from the Carrizo-Wilcox Aquifer. Manufacturing supplies are from Wright Patman Lake and Lake O' the Pines as well as the Carrizo-Wilcox Aquifer. Mining supplies are from groundwater wells and livestock supplies are either Queen City or Carrizo-Wilcox groundwater or local supply.

"County Other" supply is tabulated in Appendix A. The water supply for water users in "County Other" is from the same sources as for the major water users except for Holly Springs Water Supply Company which is supplied by the City of Hughes Springs which, in turn, is supplied by the Northeast Texas Municipal Water District. The City of Atlanta and Queen City water supply contracts with the City of Texarkana expire in 2002.

Table 3.23- Cass County Water Supply

System Name	Supply Source Type	Supply Source Name	Supply Available, ac-ft/yr 2000	2010	2020	2030	2040	2050
City Of Atlanta	Contract	City of Texarkana	1,878	0	0	0	0	0
City Of Hughes Springs	Contract	Netmwd	4,528	4,528	4,528	4,602	4,602	4,602
City Of Linden	Groundwater	Carrizo-Wilcox	231	231	231	231	231	231
City Of Queen City	Groundwater	Carrizo-Wilcox	279	279	279	279	279	279
City Of Queen City	Contract	City of Texarkana	348	0	0	0	0	0
County Other	See Appendix A		2,555	2,466	2,466	2,408	2,408	2,408
Manufacturing			80,129	76,867	76,871	74,569	77,555	80,664
Mining			1,254	990	942	902	872	496
Livestock			851	851	851	851	851	851
TOTAL			**92,053**	**86,212**	**86,168**	**83,842**	**86,798**	**89,531**

3.4 (d) Delta County Water Supply

Big Creek Lake and a contract with the Sulphur River Municipal Water District are the sources of supply of water to the City of Cooper. City of Cooper provides the water supply for the Delta County manufacturing component. Livestock and irrigation components get their water from local supplies and Nacatoch and Trinity aquifers.

"County Other" supply is tabulated in Appendix A. These supplies are from water supply companies, utility districts, City of Cooper, and Trinity aquifer. The West Delta WSC and the North Hunt WSC are also supplied by the City of Commerce and Woodbine Aquifer.

Table 3.24- Delta County Water Supply

			Supply Available, ac-ft/yr					
System Name	**Supply Source Type**	**Supply Source Name**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City Of Cooper	Contract	Sulphur River Mwd	0	0	0	0	0	0
City Of Cooper	Surface Water	Big Creek	992	992	992	1,510	1,510	1,510
County Other	See Appendix A		745	734	660	57	56	56
Manufacturing			9,188	9,188	9,188	9,188	9,188	9,188
Irrigation			1,978	1,956	1,934	1,913	1,891	1,870
Livestock			770	770	770	770	770	770
TOTAL			**13,673**	**13,640**	**13,544**	**13,438**	**13,415**	**13,394**

3.4 (e) Franklin County Water Supply

The Cities of Mount Vernon and Winnsboro have contracts with Franklin County Water District and get their water supply from Lake Cypress Springs. These contracts will expire after 2020 and 2030, respectively. Manufacturing water supply is from Lake Cypress Springs. Mining, irrigation and livestock supplies are from the Carrizo-Wilcox Aquifer or from local supplies.

"County Other" supply is tabulated in the Appendix A. "County Other" supplies are from Lake Cypress Springs through the Franklin County Water District, Carrizo-Wilcox Aquifer, and local supplies. The Tri Water Supply Corporation supply is from Mount Pleasant in Titus County.

Table 3.25- Franklin County Water Supply

			Supply Available, ac-ft/yr					
System Name	**Supply Source Type**	**Supply Source Name**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City Of Mount Vernon	Contract	*FCWD	3,000	3,000	3,000	0	0	0
City Of Winnsboro	Contract	*FCWD	450	450	450	450	0	0
County Other	See Appendix A		3,164	3,119	3,119	3,119	74	74
Manufacturing			5,640	5,640	5,640	5,640	5,640	5,640
Mining			1,479	1,384	1,338	1,278	1,297	1,359
Irrigation			33	33	33	33	33	33
Livestock			1,595	1,595	1,595	1,595	1,595	1,595
TOTAL			**15,361**	**15,221**	**15,175**	**12,115**	**8,639**	**8,701**

**Franklin County Water District*

3.4 (f) Gregg County Water Supply

The City of Gladewater owns Lake Gladewater and provides for its supply as well as the supply for Clarksville City, Warren City, and a portion of Starrville-Friendship WSC. The supply of the other municipal major water users' is from the Sabine River Authority, the Cherokee Water Company, the City of Longview, Northeast Texas Municipal Water District; from run-of-the-river permits on Big Sandy Creek and the Sabine River; and from the Carrizo-Wilcox Aquifer. Manufacturing supply sources include the Carrizo-Wilcox Aquifer, local supply sources, the City of Longview, and from direct reuse. Mining and livestock supplies are from the Carrizo-Wilcox Aquifer. Steam electric supply is from direct reuse and from the Cherokee Water Company.

"County Other" supply is tabulated in Appendix A. The "County Other" systems get their supplies from the Carrizo-Wilcox Aquifer, from the City of Longview, the City of Gladewater, and the Sabine River Authority. Many of the contracts for water supply with the City of Longview and the City of Gladewater expire before 2010.

Table 3.26- Gregg County Water Supply

			Supply Available, ac-ft/yr					
System Name	**Supply Source Type**	**Supply Source Name**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Clarksville City	Contract	City Of Gladewater	322	0	0	0	0	0
City Of Gladewater	Surface Water	Lake Gladewater	499	796	796	796	796	796
City Of Kilgore	Surface Water	Sabine River Authority	2,241	2,241	2,241	2,241	2,241	2,241
City Of Kilgore	Groundwater	Carrizo-Wilcox	490	490	490	490	490	490
City Of Lakeport	Contract	Elderville WSC	112	0	0	0	0	0
City Of Lakeport	Groundwater	Carrizo-Wilcox	22	22	22	22	22	22
Liberty City	Groundwater	Carrizo-Wilcox	356	356	356	356	356	356
City Of Longview	Surface Water	Sabine River (TNRCC Permits)	14,502	14,502	14,502	14,504	0	0
City Of Longview	Contract	Sabine River Authority	15,000	0	0	0	0	0
City Of Longview	Contract	Netmwd	15,000	15,000	15,000	15,000	15,000	0
City Of Longview	Surface Water	Big Sandy Creek (TNRCC Permits)	0	840	840	840	840	0
City Of Longview	Contract	Cherokee Water Co.	5,600	5,600	5,600	5,600	5,600	5,600
City Of East Mountain	Groundwater	Carrizo-Wilcox	18	18	18	18	18	18
City Of White Oak	Contract	City Of Longview	1,035	0	0	0	0	0
C&C Mobile Home Park	Contract	City Of Longview	18	18	18	18	18	18
Manufacturing	See Appendix A		3,009	4,746	5,193	5,193	5,193	5,193
Steam Electric			7,707	8,079	8,510	8,980	9,529	10,114
Steam Electric			2,500	3,000	3,000	3,000	3,000	4,000
Mining			96	67	46	37	29	27
Livestock			265	265	265	265	265	265
TOTAL			**68,792**	**56,040**	**56,897**	**57,360**	**43,396**	**29,139**

3.4 (g) <u>Harrison County Water Supply</u>

The municipal water supply in Harrison County is primarily from the City of Longview, the Cherokee Water Company, the Sabine River Authority, Northeast Texas Municipal Water District; from run-of-the-river permits in the Sabine River and Big Sandy Creek; from the Big Cypress Bayou, and from the Carrizo-Wilcox Aquifer. The water supply contracts for the City of Hallsville and the City of Longview expire before 2010.

Manufacturing supply is provided by the major water providers, as a permit from the Lake O' the Pines Reservoir and Caddo Lake, by direct reuse, and from the Carrizo-Wilcox Aquifer. Steam electric supply is from Lake O' the Pines. Mining, irrigation, and livestock supplies are from the Queen City, Nacatoch and Carrizo-Wilcox aquifers or from local supplies.

"County Other" supply is tabulated in Appendix A. "County Other" supply is either from the major water providers of City of Marshall or the City of Longview or directly or indirectly from the Carrizo-Wilcox Aquifer.

Table 3.27- Harrison County Water Supply

			Supply Available, ac-ft/yr					
System Name	**Supply Source Type**	**Supply Source Name**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City Of Hallsville	Contract	City Of Longview	368	0	0	0	0	0
City Of Hallsville	Groundwater	Carrizo-Wilcox	143	143	143	143	143	143
City Of Longview	Surface Water	Big Sandy Creek (TNRCC Permits)	0	280	280	280	280	0
City Of Longview	Contract	Netmwd	5,000	5,000	5,000	5,000	5,000	0
City Of Longview	Contract	Cherokee Water Company	10,400	10,400	10,400	10,400	10,400	10,400
City Of Longview	Surface Water	Sabine River (TNRCC Permits)	4,834	4,834	4,834	4,834	4,834	4,834
City Of Longview	Contract	Sabine River Authority	5,000	0	0	0	0	0
City Of Marshall	Surface Water	Big Cypress Bayou	13,815	13,815	13,815	13,815	13,815	13,815
City Of Waskom	Groundwater	Carrizo-Wilcox	291	291	291	291	291	291
County Other	See Appendix A		3,211	2,744	2,744	2,560	2,560	2,560
Manufacturing			198,755	203,220	203,940	204,232	204,936	205,879
Steam Electric			29,000	29,000	29,000	29,000	29,000	29,000
Mining			890	890	890	890	890	890
Irrigation			100	100	100	100	100	100
Livestock			991	1,040	1,092	1,147	1,205	1,264
TOTAL			**272,799**	**271,757**	**272,529**	**272,692**	**273,454**	**269,176**

3.4 (h) Hopkins County Water Supply

The Hopkins County municipal supplies are from the Carrizo-Wilcox and the Nacatoch Aquifers, the Sulphur River Municipal Water District, and Lake Sulphur Springs. Manufacturing water supplies are from the major water provider, City of Sulphur Springs, and from the Carrizo-Wilcox Aquifer. Mining supply is from a well in an unidentified aquifer. Livestock supply is primarily from the Carrizo-Wilcox and an unidentified aquifer or from local sources. The City of Sulphur Springs also provides some of the livestock water supply.

"County Other" supply is tabulated in Appendix A. "County Other" supply is from the City of Sulphur Springs, Northeast Texas Municipal Water District, the Sabine River Authority, Franklin County Water District, Cash Water Supply Company, and from the Carrizo-Wilcox Aquifer. Many of the "County Other" water users have contracts that expire prior to the year 2050.

Table 3.28- Hopkins County Water Supply

			Supply Available, ac-ft/yr					
System Name	**Supply Source Type**	**Supply Source Name**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City Of Como	Groundwater	Carrizo-Wilcox	103	103	103	103	103	103
City Of Cumby	Groundwater	Nacatoch	137	137	137	137	137	137
City Of Sulphur Spngs.	Contract	Sulphur River MWD	13,070	13,389	13,113	13,041	12,803	15,902
City Of Sulphur Springs	Surface Water	Lake Sulphur Springs	4,836	5,234	5,167	5,104	4,975	4,845
County Other	See Appendix A		3,332	2,756	1,842	1,842	1,493	1,494
Manufacturing			2,668	2,864	3,027	3,155	3,414	3,673
Mining			125	122	120	117	116	116
Livestock			7,428	7,428	7,428	7,428	7,428	7,428
TOTAL			**31,699**	**32,033**	**30,937**	**30,927**	**30,469**	**33,698**

3.4 (i) Hunt County Water Supply

Major water providers (City of Greenville, and Sabine River Authority) provide most of the municipal water supply in Hunt County. The City of Commerce, North Texas Municipal Water District, Cash Water Supply Corporation, and Sulphur River Municipal Water District also provide water supply. Groundwater is taken from the Nacatoch and Woodbine Aquifers. Manufacturing water supply is from the City of Greenville and from the Trinity Aquifer. Mining water supply is from Lake Tawakoni and the Trinity Aquifer. Steam electric water supply is from Lake Tawakoni and City of Greenville. Irrigation and livestock supply is from the Trinity Aquifer and from local supplies.

"County Other" supply is tabulated in Appendix A. "County Other" supply is either from the major water providers of City of Greenville, or the Sabine River Authority. The City of Pecan Gap, the Cash Water Supply Corporation, and City of Commerce also provide water to some communities. Groundwater is primarily from the Woodbine Aquifer with some additional supplies from the Carrizo-Wilcox, Trinity, and the Nacatoch Aquifers. Three water supply corporations, North Hunt Water Supply Corporation, Maloy Water Supply Corporation and Mac Bee Water Supply Corporation, have contracts that expire prior to 2010 or 2020.

Table 3.29- Hunt County Water Supply

			Supply Available, ac-ft/yr					
System Name	**Supply Source Type**	**Supply Source Name**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City Of Caddo Mills	Contract	City Of Greenville	166	166	0	0	0	0
City Of Caddo Mills	Contract	NTMWD	0	0	0	0	0	0
Campbell Water Supply Corp.	Groundwater	Nacatoch	147	147	147	147	147	147
City Of Celeste	Groundwater	Woodbine	159	159	159	159	159	159
City Of Commerce	Contract	Sabine River Authority	4,030	4,155	4,249	0	0	0
City Of Commerce	Groundwater	Nacatoch	340	351	351	130	130	130
Texas A&M University	Contract	City Of Commerce	221	221	221	221	221	221
Texas A&M University	Groundwater	Nacatoch	0	0	0	0	0	0
City Of Greenville	Surface Water	City Lakes	2,401	2,323	2,404	2,645	2,514	2,364
City Of Greenville	Contract	Sabine River Authority	21,283	0	0	0	0	0
City Of Lone Oak	Contract	Cash WSC	381	0	0	0	0	0
City Of Quinlan	Contract	Cash WSC	224	0	0	0	0	0
City Of West Tawakoni	Contract	Sabine River Authority	1,120	0	0	0	0	0
City Of Wolfe City	Groundwater	Woodbine	86	86	86	86	86	86
City Of Wolfe City	Surface Water	City Lakes	134	134	134	114	114	114
County Other	See Appendix A		8,401	6,861	2,002	1,639	810	810
Manufacturing			940	1,018	1,103	1,198	1,329	1,449
Steam Electric			800	0	0	0	0	0
Mining			70	71	73	75	77	79
Irrigation			271	271	271	271	271	271
Livestock			1,237	1,237	1,237	1,237	1,237	1,237
TOTAL			**42,411**	**17,200**	**12,437**	**7,922**	**7,095**	**7,067**

3.4 (j) Lamar County Water Supply

Municipal water supply for Lamar County is provided by the City of Paris, a major water provider. It is withdrawn from Pat Mayse Reservoir and Lake Crook. Contracts with Lamar County Water Supply

District expire in 2019 except for the City of Deport, whose contract expires prior to 2009. Manufacturing and steam electric water supply is provided by the City of Paris. Mining water is supplied from the Trinity Aquifer. Irrigation and livestock water supply is from the Trinity and Woodbine Aquifers, and also from local supplies.

“County Other” supply is tabulated in Appendix A. Lamar “County Other” supply is from the major water providers, City of Paris, from the Lamar County Water Supply District or taken from the Woodbine Aquifer. The water supply contracts expire in 2019 or in 2025.

Table 3.30- Lamar County Water Supply

			Supply Available, ac-ft/yr					
System Name	**Supply Source Type**	**Supply Source Name**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City Of Blossom	Contract	Lamar County WSD	223	230	0	0	0	0
City Of Deport	Contract	Lamar County WSD	113	0	0	0	0	0
City Of Paris	Contract	Pat Mayse Reservoir	30,705	29,839	28,966	33,467	32,261	30,822
City Of Paris	Surface Water	Lake Crook	1,000	1,000	1,000	1,000	1,000	1,000
City Of Reno	Contract	Lamar County WSD	411	562	0	0	0	0
City Of Roxton	Contract	Lamar County WSD	93	96	0	0	0	0
County Other	See Appendix A		4,178	4,024	5,343	0	0	0
Manufacturing			5,422	6,213	6,932	7,575	8,590	9,608
Steam Electric			12,209	12,209	12,209	12,209	12,209	12,209
Mining			25	24	24	25	25	25
Irrigation			4,368	4,319	4,271	4,223	4,176	4,129
Livestock			1,523	1,523	1,523	1,523	1,523	1,523
TOTAL			**60,270**	**60,039**	**60,268**	**60,022**	**59,784**	**59,316**

3.4 (k) Marion County Water Supply

The City of Jefferson’s water supply is approximately 11 percent from a run-of-the-river permit on Big Cypress Creek and the remaining is from Northeast Texas Municipal Water District. Steam electric water supply is from Lake O’ the Pines or as a run-of-the-river permit from Johnson Creek. Mining water supply is from the Carrizo-Wilcox Aquifer and livestock supply is from the Carrizo-Wilcox and the Queen City Aquifers.

“County Other” supply is tabulated in Appendix A. “County Other” supply is either from the major water provider, Northeast Texas Municipal Water District or the Carrizo-Wilcox Aquifer.

3.31- Marion County Water Supply

			Supply Available, ac-ft/yr					
System Name	**Supply Source Type**	**Supply Source Name**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City Of Jefferson	Surface Water	Big Cypress Creek	1,287	1,287	1,287	1,287	1,287	1,287
City Of Jefferson	Contract	NETMWD	9,760	9,760	9,760	9,760	9,760	9,760
County Other	See Appendix A		1,702	1,702	1,702	1,702	1,702	1,702
Manufacturing			20	20	20	20	20	20
Steam Electric			6,200	6,200	6,200	6,200	6,200	6,200
Mining			71	43	30	24	20	34
Livestock			182	182	182	182	182	182
TOTAL			**19,722**	**19,694**	**19,681**	**19,675**	**19,471**	**19,685**

3.4 (l) Morris County Water Supply

The municipal water users in Morris County obtain their water supply either from major water provider, Northeast Texas Municipal Water District, or from the Carrizo-Wilcox Aquifer. Manufacturing water supply is from Lake O' the Pines, Ellison Creek Lake, indirect reuse, and Queen City Aquifer. Mining supply is from the Queen City Aquifer; irrigation water supply is from local supply; and the livestock supply is from either local supply, or the Carrizo-Wilcox or Queen City Aquifers.

"County Other" supply is tabulated in Appendix A. "County Other" water users in Morris County obtain their water supply either from major water providers, City of Mount Pleasant and Northeast Texas Municipal Water District, or from the Carrizo-Wilcox Aquifer. The source of Holly Springs water supply is from the City of Hughes Springs, who in turn is supplied by the Northeast Texas Municipal Water District.

Table 3.32- Morris County Water Supply

			Supply Available, ac-ft/yr					
System Name	**Supply Source Type**	**Supply Source Name**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City Of Daingerfield	Contract	NETMWD	10,329	10,329	10,329	10,329	10,329	10,329
City Of Hughes Springs	Contract	NETMWD	28	28	28	29	29	29
City Of Lone Star	Contract	NETMWD	4,893	4,893	4,893	4,893	4,893	4,893
City Of Naples	Groundwater	Carrizo-Wilcox	249	249	249	249	249	249
City Of Omaha	Groundwater	Carrizo-Wilcox	191	191	191	191	191	191
County Other	See Appendix A		1,544	1,456	1,456	1,441	1,441	1,441
Manufacturing			132,451	135,264	129,869	124,443	119,127	113,929
Steam Electric			12,000	12,000	12,000	12,000	12,000	12,000
Mining			31	16	12	10	10	11
Irrigation			190	188	186	184	182	180
Livestock			814	812	810	808	806	804
TOTAL			**164,720**	**167,436**	**162,043**	**156,607**	**151,297**	**146,106**

3.4 (m)<u>Rains County Water Supply</u>

Rains County municipal water supply is either directly or indirectly from the Sabine River Authority. These contracts expire in 2013 or 2025. Manufacturing water supply is from City of Emory. Irrigation water is supplied from local supply and the livestock water supply is from local supply or from the nearby Lake Medina.

"County Other" supply is tabulated in Appendix A. "County Other" water users in Rains County obtain their water supply from major water provider Sabine River Authority, and North Texas Municipal Water District; from Cash Water Supply Corporation and City of Emory; directly from Lake Fork, Lake Tawakoni or Lake Lavon; or from the Carrizo-Wilcox Aquifer.

Table 3.33- Rains County Water Supply

			Supply Available, ac-ft/yr					
System Name	**Supply Source Type**	**Supply Source Name**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City Of East Tawakoni	Contract	City Of Emory	552	552	0	0	0	0
City Of Emory	Contract	*SRA	1,105	1,105	1,105	0	0	0
City Of Point	Contract	*SRA	224	224	0	0	0	0
County Other	See Appendix A		1,013	1,013	749	749	749	749
Manufacturing			2	2	2	2	2	2
Irrigation			20	20	20	20	20	20
Livestock			700	700	700	700	700	700
TOTAL			**3,616**	**3,616**	**2,576**	**1,471**	**1,471**	**1,471**

**Sabine River Authority*

3.4 (n) Red River County Water Supply

The Red River County municipal water supplies are from the Trinity, Nacatoch, or the Blossom Aquifers or from Langford Lake or from Wright Patman Lake via City of Texarkana. Manufacturing water supply is from the City of Clarksville. Steam electric water supply is from River Crest Lake and Sulphur River. Irrigation is from local supplies and livestock supply is from local supply or from the Woodbine and Blossom Aquifers.

"County Other" supply is tabulated in Appendix A. "County Other" water users in Red River County obtain their water supply from major water providers, City of Texarkana and City of Paris; (through the Lamar County Water Supply District); or from the Nacatoch, Blossom, or alluvium aquifers.

Table 3.34- Red River County Water Supply

			Supply Available, ac-ft/yr					
System Name	**Supply Source Type**	**Supply Source Name**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City Of Bogata	Groundwater	Nacatoch	373	373	373	373	373	373
City Of Clarksville	Surface Water	Langford Lake	390	390	390	390	390	390
City Of Clarksville	Groundwater	Blossom	369	365	363	361	359	355
City Of Detroit	Groundwater	Trinity	60	60	60	60	60	60
County Other	See Appendix A		1,432	1,286	829	461	461	461
Manufacturing			11	15	17	19	21	25
Steam Electric			11,500	11,500	11,500	11,500	11,500	11,500
Irrigation			99	98	97	96	95	94
Livestock			1,180	1,180	1,180	1,180	1,180	1,180
TOTAL			**17,414**	**17,277**	**16,829**	**16,470**	**16,479**	**16,488**

3.4 (o) Smith County Water Supply

The Smith County municipal water supply for the City of Lindale is from the Carrizo-Wilcox Aquifer. Manufacturing water supply is from the Carrizo-Wilcox Aquifer. Mining supplies are from the Carrizo-Wilcox and the Queen City aquifers. Irrigation supply is from local supply, and the livestock water supply is from the Carrizo-Wilcox and Queen City Aquifers.

"County Other" supply is tabulated in Appendix A. "County Other" water users in Smith County obtain their water supply from the City of Lindale, the City of Gladewater, and from the Carrizo-Wilcox Aquifer.

Table 3.35- Smith County Water Supply

			Supply Available, ac-ft/yr					
System Name	**Supply Source Type**	**Supply Source Name**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City Of Lindale	Groundwater	Carrizo-Wilcox	1,253	1,207	1,166	1,123	1,081	1,035
City Of Overton	Groundwater	Carrizo-Wilcox	16	18	19	20	21	22
County Other	See Appendix A		3,731	3,840	3,936	4,039	4,140	4,252
Manufacturing			262	298	325	346	377	403
Mining			425	178	91	32	18	6
Irrigation			446	468	491	516	542	569
Livestock			453	453	453	453	453	453
TOTAL			**6,586**	**6,462**	**6,481**	**6,529**	**6,632**	**6,740**

3.4 (p) Titus County Water Supply

The City of Mount Pleasant municipal water supply is from Lake Cypress Springs, Lake Tankersley, and Lake Bob Sandlin. Manufacturing water supply is from the City of Mount Pleasant or from the Carrizo-Wilcox Aquifer. Steam electric is from Lake O' the Pines, Monticello Lake, and Welsh Reservoir. Mining supply is from Lake Bob Sandlin and the Carrizo-Wilcox Aquifer. Livestock supply is from the Carrizo-Wilcox Aquifer and local supplies.

"County Other" supply is tabulated in Appendix A. "County Other" water users in Titus County obtain their water supply from major water providers, City of Mount Pleasant and Franklin County Water District; from Tri Water Supply Corporation; and from the Carrizo-Wilcox and Nacatoch aquifers. The Tri Water Supply Corporation water supply contract expires in 2006.

Table 3.36- Titus County Water Supply

System Name	Supply Source Type	Supply Source Name	Supply Available, ac-ft/yr 2000	2010	2020	2030	2040	2050
City Of Mount Pleasant	Surface Water	Lake Cypress Springs	2321	2641	2788	2797	2747	2686
City Of Mount Pleasant	Contract	Titus County Fresh Water District	6452	7341	7749	7774	7635	7465
City Of Mount Pleasant	Surface Water	Lake Tankersley	1936	2202	2325	2332	2291	2240
County Other	See Appendix A		3,739	2,471	2,471	2,318	2,283	2,283
Manufacturing			44,897	45,068	45,199	45,302	45,540	45,772
Steam Electric			45,000	45,000	45,000	37,300	37,300	37,300
Mining			2,772	1,991	1,796	1,722	1,705	1,744
Livestock			858	858	858	858	858	858
TOTAL			**107,975**	**107,572**	**108,186**	**100,403**	**100,359**	**100,348**

3.4 (q) Upshur County Water Supply

The Upshur County municipal water supply is from major water supplier Northeast Texas Municipal Water District; from Lake Gladewater, from Lake Gilmer, and from the Carrizo-Wilcox Aquifer. Manufacturing and mining water supplies are from the Carrizo-Wilcox Aquifer. Irrigation water supply is from Lake Loma, and livestock supply is from local supply and from the Carrizo-Wilcox Aquifer.

"County Other" supply is tabulated in Appendix A. "County Other" water users in Upshur County obtain their water supply from major water provider City of Longview, from Lake Loma, from the City of Gladewater, from run-of-the-river permit on Big Sandy Creek, and from the Carrizo-Wilcox Aquifer.

Table 3.37- Upshur County Water Supply

			Supply Available, ac-ft/yr					
System Name	**Supply Source Type**	**Supply Source Name**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City Of Big Sandy	Groundwater	Carrizo-Wilcox	328	328	328	328	328	328
City Of East Mountain	Groundwater	Carrizo-Wilcox	63	63	63	63	63	63
City Of Gilmer	Surface Water	Lake Gilmer	5,430	5,430	5,430	5,430	5,430	5,430
City Of Gilmer	Groundwater	Carrizo-Wilcox	1,145	1,145	1,145	1,145	1,145	1,145
City Of Gladewater	Surface Water	Lake Gladewater	499	796	796	796	796	796
City Of Ore City	Contract	Netmwd	2,690	2,690	2,690	2,690	2,690	2,690
City Of Ore City	Groundwater	Carrizo-Wilcox	243	243	243	243	243	243
County Other	See Appendix A		3,041	3,010	3,010	3,010	3,010	3,010
Manufacturing			965	982	991	993	1,027	1,064
Mining			1	1	1	1	1	0
Irrigation			200	200	200	200	200	200
Livestock			1,928	1,928	1,928	1,928	1,928	1,928
TOTAL			**18,532**	**18,826**	**18,845**	**18,857**	**18,901**	**18,947**

3.4 (r)<u>Van Zandt County Water Supply</u>

The Van Zandt County municipal water supply is from major water supplier Sabine River Authority; from Lake Canton or Edgewood City Lake; and from the Carrizo-Wilcox Aquifer. The City of Wills Point water supply contract expires in 2015. Manufacturing water supply is from the Carrizo-Wilcox Aquifer or from Lake Tawakoni. Mining supply is from either local supply or from the Carrizo-Wilcox Aquifer. Irrigation is from the Carrizo-Wilcox Aquifer and livestock supply is from the Carrizo-Wilcox Aquifer or local supply.

"County Other" supply is tabulated in Appendix A. "County Other" water users in Van Zandt County obtain their water supply either from major water provider Sabine River Authority or from the Carrizo-Wilcox Aquifer.

Table 3.38: Van Zandt County Water Supply

			Supply Available, ac-ft/yr					
System Name	**Supply Source Type**	**Supply Source Name**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City Of Canton	Groundwater	Carrizo-Wilcox	818	818	818	818	818	818
City Of Edgewood	Surface Water	City Lake	110	110	110	110	110	110
City Of Edgewood	Contract	Sabine River Authority	840	840	0	0	0	0
City Of Grand Saline	Groundwater	Carrizo-Wilcox	586	586	586	586	586	586
City Of Van	Groundwater	Carrizo-Wilcox	564	564	564	564	564	564
City Of Wills Point	Contract	Sabine River Authority	2,210	2,210	0	0	0	0
County Other	See Appendix A		6,085	6,088	3,426	2,376	2,377	2,379
Manufacturing			280	344	396	451	508	566
Mining			1,359	1,167	1,099	1,077	1,084	1,115
Irrigation			220	220	220	220	220	220
Livestock			2381	2381	2381	2381	2381	2381
TOTAL			**15,452**	**15,327**	**9,599**	**8,582**	**8,697**	**8,738**

3.4 (s) Wood County Water Supply

The Wood County municipal water supply is from major water suppliers, Sabine River Authority, and the Franklin County Water District, and also from the Carrizo-Wilcox Aquifer. The City of Winnsborro water supply contract expires after 2030. Manufacturing water supply is from the Carrizo-Wilcox Aquifer. Steam electric supply is from the Queen City Aquifer. Mining and irrigation supply is from the Carrizo-Wilcox and the Queen City Aquifers. Livestock supply is from local supply and from the Carrizo-Wilcox Aquifer.

"County Other" supply is tabulated in Appendix A. "County Other" water users in Wood County obtain their water supply either from major water provider, Franklin County Water District; from the City of Winnsboro, or from the Carrizo-Wilcox Aquifer. The Sharon Water Supply Corporation water supply contract expires between 2000 and 2010.

Table 3.39- Wood County Water Supply

			Supply Available, ac-ft/yr					
System Name	**Supply Source Type**	**Supply Source Name**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City Of Hawkins	Groundwater	Carrizo-Wilcox	1,073	1,073	1,073	1,073	1,073	1,073
City Of Mineola	Groundwater	Carrizo-Wilcox	890	890	890	890	890	890
City Of Quitman	Contract	Sabine River Authority	560	560	560	560	560	560
City Of Quitman	Groundwater	Carrizo-Wilcox	69	69	69	69	69	69
City Of Winnsboro	Contract	Franklin County Water District	4,308	4,529	4,529	4,529	0	0
County Other	See Appendix A		5,115	4,894	4,894	4,894	4,801	4,801
Manufacturing			244	290	341	391	468	544
Steam Electric			0	7,500	7,500	7,500	7,500	7,500
Mining			2,102	17,584	17,344	17,107	16,107	4,641
Irrigation			354	354	354	354	354	354
Livestock			2,562	2,562	2,562	2,562	2,562	2,562
TOTAL			**17,277**	**40,305**	**40,116**	**39,929**	**34,384**	**22,994**

3.5 Supply by River Basin

As the data on water supply was collected from each water user, the data was also collected by river basin. The following tables summarize the water supply by river basin.

Table 3.40- Municipal Water Supplies by River Basin

	Supply Available, ac-ft/yr					
Basin Name	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Cypress	124,573	303,798	290,489	281,266	252,353	229,064
Neches	1,843	1,843	1,843	1,843	1,843	1,843
Red	38,131	37,173	36,300	35,200	33,994	32,555
Sabine	131,260	84,384	72,732	66,269	50,842	49,642
Sulphur	52,140	55,383	53,921	55,550	51,627	51,259
Trinity	134	134	134	134	134	134
Total	**348,081**	**482,714**	**455,419**	**440,262**	**390,793**	**364,497**

Table 3.41- Manufacturing Water Supplies by River Basin

	Supply Available, ac-ft/yr					
Basin Name	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Cypress	232,908	236,227	231,040	225,785	220,907	216,170
Neches	0	0	0	0	0	0
Red	562	574	586	596	638	690
Sabine	151,775	159,820	161,569	162,491	163,882	165,505
Sulphur	98,771	96,689	97,775	96,455	100,903	105,479
Trinity	0	0	0	0	0	0
Total	**484,016**	**493,310**	**490,970**	**485,327**	**486,330**	**487,844**

Table 3.42- Steam Electric Water Supplies by River Basin

	Supply Available, ac-ft/yr					
Basin Name	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Cypress	81,900	81,900	81,900	74,200	74,200	74,200
Neches	0	0	0	0	0	0
Red	12,209	12,209	12,209	12,209	12,209	12,209
Sabine	16,486	23,686	23,686	23,686	23,686	24,686
Sulphur	11,500	11,500	11,500	11,500	11,500	11,500
Trinity	0	0	0	0	0	0
Total	**134,095**	**141,295**	**141,295**	**133,595**	**133,595**	**134,595**

Table 3.43- Mining Water Supplies by River Basin

	Supply Available, ac-ft/yr					
Basin Name	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Cypress	4,360	3,520	3,309	3,204	3,197	2,943
Neches	80	48	28	19	14	14
Red	37	36	36	37	38	38
Sabine	4,636	19,671	19,273	18,944	17,942	6,497
Sulphur	1,725	1,389	1,298	1,235	1,206	1,202
Trinity	46	46	45	44	45	46
Total	**10,884**	**24,710**	**23,989**	**23,483**	**22,442**	**10,740**

Table 3.44- Irrigation Water Supplies by River Basin

	Supply Available, ac-ft/yr					
Basin Name	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Cypress	458	456	454	452	450	448
Neches	0	0	0	0	0	0
Red	8,822	8,993	8,944	8,896	8,728	8,381
Sabine	1,222	1,244	1,267	1,292	1,318	1,345
Sulphur	2,044	2,021	1,999	1,977	1,955	1,933
Trinity	220	220	220	220	220	220
Total	**12,766**	**12,934**	**12,884**	**12,837**	**12,671**	**12,327**

Table 3.45- Livestock Water Supplies by River Basin

	Supply Available, ac-ft/yr					
Basin Name	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Cypress	5,491	5,520	5,549	5,581	5,615	5,648
Neches	657	657	657	657	657	657
Red	2,775	2,840	2,840	2,840	2,712	2,530
Sabine	8,710	8,730	8,753	8,776	8,800	8,826
Sulphur	11,532	11,646	11,646	11,646	11,424	11,106
Trinity	634	634	634	634	634	634
Total	**29,799**	**30,027**	**30,079**	**30,134**	**29,842**	**29,401**

3.5 (a) Estimates of Supplies Currently Available to Each Designated Major Water Provider

Many of the water user groups depend on a water supply from the major water providers. Consequently, it is important to evaluate the water supply for each of the major water providers. For some of the major water providers, such as Greenville, Longview, Marshall, Mount Pleasant, Paris, Sulphur Springs, and Texarkana, water supply data was collected from the surveys sent to each water user group. This information was then verified with the major water providers once it was compiled. For nonmunicipal major water providers, the information was collected directly from the provider.
The following tables summarize the supply for each major water provider:

Table 3.46- Cherokee Water Company

	Supply Available, ac-ft/yr						
Source Name	**Source Type**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Lake Cherokee	Surface	18,000	18,000	18,000	18,000	18,000	18,000
Total		**18,000**	**18,000**	**18,000**	**18,000**	**18,000**	**18,000**

Table 3.47- Franklin County Water District

	Supply Available, ac-ft/yr						
Source Name	**Source Type**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Lake Cypress Springs	Surface	11,710	11,710	11,710	11,710	11,710	11,710
Total		**11,710**	**11,710**	**11,710**	**11,710**	**11,710**	**11,710**

Table 3.48- Northeast Texas Municipal Water District

	Supply Available, ac-ft/yr						
Source Name	**Source Type**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Lake O' The Pines	Surface	130,600	130,600	130,600	130,600	130,600	130,600
Lake Bob Sandlin	Surface	12,000	12,000	12,000	12,000	12,000	12,000
Johnson Creek Lake	Surface	6,700	6,700	6,700	6,700	6,700	6,700
Lake Monticello	Surface	7,700	7,700	7,700	7,700	7,700	7,700
Swauno Creek	Surface	4,500	4,500	4,500	4,500	4,500	4,500
Total		**161,500**	**161,500**	**161,500**	**161,500**	**161,500**	**161,500**

Table 3.49- Sabine River Authority

		Supply Available, ac-ft/yr					
Source Name	**Source Type**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Lake Tawakoni	Surface	238,100	238,100	238,100	238,100	238,100	238,100
Lake Fork	Surface	188,660	188,660	188,660	188,660	188,660	188,660
Total		**426,760**	**426,760**	**426,760**	**426,760**	**426,760**	**426,760**

Table 3.50- Titus County Fresh Water Supply District No.1

		Supply Available, ac-ft/yr					
Source Name	**Source Type**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Lake Bob Sandlin	Surface	60,500	60,500	60,500	60,500	60,500	60,500
Total		**60,500**	**60,500**	**60,500**	**60,500**	**60,500**	**60,500**

Table 3.51- City of Greenville

		Supply Available, ac-ft/yr					
Source Name	**Source Type**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Sabine River Authority	Surface	21,283	21,283	21,283	21,283	21,283	21,283
City Lakes	Surface	1,200	1,200	1,200	1,200	1,200	1,200
Total		**22,483**	**22,483**	**22,483**	**22,483**	**22,483**	**22,483**

Table 3.52- City of Longview

		Supply Available, ac-ft/yr					
Source Name	**Source Type**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Cherokee Water Company	Surface	16,000	16,000	16,000	16,000	16,000	16,000
NETMWD	Surface	20,000	20,000	20,000	20,000	20,000	20,000
Big Sandy Creek	Surface	1,120	1,120	1,120	1,120	1,120	1,120
Lake Fork	Surface	20,000	20,000	20,000	20,000	20,000	20,000
Sabine River Authority	Surface	19,337	19,337	19,337	19,337	19,337	19,337
Total		**76,457**	**76,457**	**76,457**	**76,457**	**76,457**	**76,457**

Table 3.53- City of Marshall

		Supply Available, ac-ft/yr					
Source Name	**Source Type**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Big Cypress Bayou	Surface	16,000	16,000	16,000	16,000	16,000	16,000
Total		**16,000**	**16,000**	**16,000**	**16,000**	**16,000**	**16,000**

Table 3.54- City of Mt. Pleasant

		Supply Available, ac-ft/yr					
Source Name	**Source Type**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Lake Tankersley	Surface	3,000	3,000	3,000	3,000	3,000	3,000
Lake Cypress Springs	Surface	3,590	3,590	3,590	3,590	3,590	3,590
Titus County FWSD 1	Surface	10,000	10,000	10,000	10,000	10,000	10,000
Total		**16,590**	**16,590**	**16,590**	**16,590**	**16,590**	**16,590**

Table 3.55- City of Paris

		Supply Available, ac-ft/yr					
Source Name	**Source Type**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Pat Mayse Lake	Surface	59,900	59,700	59,200	58,900	58,600	58,300
Lake Crook	Surface	1,000	1,000	1,000	1,000	1,000	1,000
Total		**60,900**	**60,570**	**60,200**	**59,900**	**59,600**	**59,300**

Table 3.56- City of Sulphur Springs

		Supply Available, ac-ft/yr					
Source Name	**Source Type**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Cooper Lake	Surface	16,034	15,935	15,726	15,717	15,608	15,608
Lake Sulphur Springs	Surface	7,800	7,800	7,800	7,800	7,800	7,800
Total		**23,834**	**23,735**	**23,526**	**23,517**	**23,408**	**23,408**

Table 3.57- City of Texarkana

		Supply Available, ac-ft/yr					
Source Name	**Source Type**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Lake Wright Patman	Surface	108,661	108,661	108,661	108,661	108,661	108,661
Total		**108,661**	**108,661**	**108,661**	**108,661**	**108,661**	**108,661**

SOURCES:

The Handbook of Texas Online, www.tsha.utexas.edu/handbook/online, 1997.

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C.L. Dowell and R.G. Petty, *Engineering Data on Dams and Reservoirs in Texas* (Texas Water Development Board Report 126), 1974.

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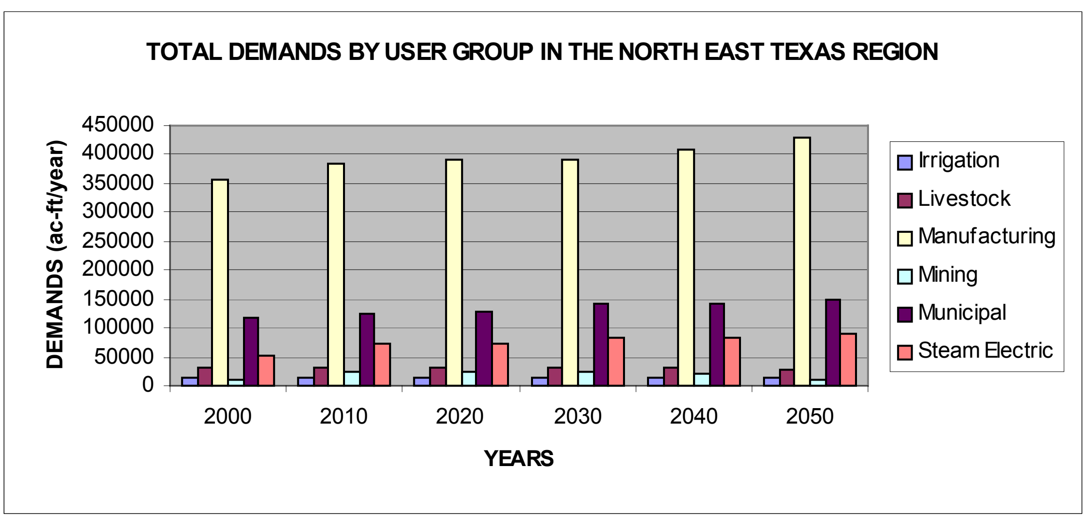
4.0 Comparison of Water Demands with Water Supplies to Determine Needs

The objective of this chapter is to compare the water demands within the North East Texas Region, as presented in Chapter 2, with currently available water supplies, as presented in Chapter 3. This chapter compares the demands and supplies of each water user group (W.U.G.) within the Region to determine which entities are projected to encounter demands greater than their projected supplies, or water supply shortages. Water shortages for all six user group categories (municipal, manufacturing, mining, steam electric, irrigation, and livestock) are presented in three ways. First, shortages are presented at the county level. W.U.G.s that span two or more counties are listed in the county where the highest percentage of the entity is located. Second, shortages are shown by river basin. W.U.G.s are listed in the river basin where the demands occur, rather than the basin where the supplies are located. If a W.U.G. spans two or more river basins, it is divided proportionately between the appropriate basins. Finally, water shortages are presented for major water providers. If an entity obtains water from more than one major water provider, it is listed under each of its water sources.

Within the North East Texas Region, three types of water shortages have been identified. The first, and most common, is caused by expiration of a water supply contract or permit. Most water supply contracts and permits have expiration dates, and the TWDB guidelines require that when the contract or permit expires, the water source is to be considered unavailable even though that source will usually be available through contract renewal. In this chapter, an “E” will designate W.U.G.s with shortages due to contract or permit expirations. In most cases, the recommended water supply strategy for these W.U.G.s will be renewal of their existing contract/permit on or before its expiration date. The second type of shortage is also contractual. These are instances where a contract expires, and the simple renewal of that contract will not adequately compensate for increased demands. In this case, an increase in the contract amount or additional water supply sources would be required to meet demands. This type of shortage is designated by “EI”. The final type of shortage addressed in this region is the “actual” or “physical” water shortage, designated by an “A”. In this case, the entity’s current water supply will not be sufficient to meet projected demands and additional water sources will be required. This type of shortage is most common among entities that utilize groundwater supplies because well capacity is held at existing development levels throughout the planning period.

Figure 4.1 illustrates projected demands of the six water user groups within the region.



4.1 County Summaries of Water Needs

The following subsections 4.1(a) – 4.1(s) identify water supply shortages in all six categories of water use within the North East Texas Region. The tables in this section list only the entities that have been determined to have water needs that exceed supply at some point within the planning period. Entities, which are anticipated to have a surplus, have been included in Table 4.43 at the end of this chapter.

4.1 (a) Bowie County

The primary source of water in Bowie County is Wright Patman Lake. A majority of the industrial and municipal user groups have contracts with the City of Texarkana (Texarkana Water Utilities) for water supply from Wright Patman. All of the projected water shortages in Bowie County are contractual. A summary of the estimated water supply shortages in Bowie County is listed below as Table 4.1. City of Texarkana also imports water from Arkansas, and exports water to Texarkana, Arkansas. For this water plan, these imports and exports are assumed to offset one another, and Arkansas demand/supply has been excluded from the plan totals.

Table 4.1 – Water Supply Shortages in Bowie County

Bowie County	Total Water Shortage in ac-ft/yr						Shortage
Year	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Type**
DeKalb		300	331	366	389	416	E
Hooks	69	454	465	484	495	528	EI
Maud		138	144	149	153	157	E
Nash		300	313	324	334	341	E
New Boston	325	1,164	1,217	1,280	1,346	1,425	EI
Redwater	134	290	300	461	542	628	EI
Wake Village	299	690	718	743	764	781	EI
Burns Redbank WSC	68	281	297	318	339	364	EI
Central Bowie WSC	503	517	1,099	1,121	1,294	1,765	EI
Macedonia-Eylau MUD #1	90	315	453	1,151	1,312	1,412	EI
Oak Grove WSC	16	34	129	146	162	182	EI

4.1 (b) Camp County

The Carrizo-Wilcox Aquifer supplies water for all of the municipalities in Camp County and is estimated to be sufficient to meet projected needs. The identified manufacturing shortage represents an increased poultry processing need for a processing plant now in the early development phases, which has a projected demand of 2.0 MGD. At present, this industry has not secured a water supply source. A summary of the identified water supply shortages in Camp County is listed below as Table 4.2.

Table 4.2 – Water Supply Shortages in Camp County

Camp County	Total Water Shortage in ac-ft/yr						Shortage
Year	2000	2010	2020	2030	2040	2050	Type
Manufacturing		2,232	2,232	2,232	2,232	2,232	A

4.1 (c) Cass County

Two municipalities in Cass County are supplied by the Carrizo-Wilcox Aquifer, and only one of these municipalities relies on groundwater as its sole supply source. The greater portion of the total municipal supply is provided by surface water from outside of the county. Four of the shortages in this county are contractual, but the City of Linden and Bloomburg WSC have actual shortages caused by inadequate groundwater supply. The following table, Table 4.3, is a summary of identified water supply shortages in Cass County.

Table 4.3 – Water Supply Shortages in Cass County

Cass County	Total Water Shortage in ac-ft/yr						Shortage
Year	2000	2010	2020	2030	2040	2050	Type
Atlanta		1,426	1,412	1,416	1,411	1,422	E
Linden	95	104	116	136	151	176	A
Queen City		36	45	58	72	92	E
Bloomburg WSC					8	20	A
Domino		40	53	65	76	85	EI
Holly Springs WSC	21	70	116	250	288	322	EI

4.1 (d) Delta County

The primary source for Delta County water supply is Big Creek Lake. Charleston WSC and West Delta WSC have contractual shortages due to contract expirations with their water supplier, the Delta County MUD. Enloe-Lake Creek will experience an expiration of its contract with Ben Franklin WSC, which is currently unable to supply both its own needs and its current contractual obligations. The City of Pecan Gap's city lake supply is also inadequate to meet current demands. The following table, Table 4.4, is a summary of identified water supply shortages in Delta County.

Table 4.4 – Water Supply Shortages in Delta County

Delta County	Total Water Shortage in ac-ft/yr						Shortage
Year	2000	2010	2020	2030	2040	2050	Type
Ben Franklin WSC	9	8	5	29	28	27	A
Charleston WSC				131	126	123	E
Pecan Gap	15	13	11	9	7	6	A
Enloe-Lake Creek WSC				58	56	54	E
West Delta WSC				140	135	128	E

4.1 (e) Franklin County

Both the Carrizo-Wilcox Aquifer and Lake Cypress Springs are important water supplies in Franklin County. Water deficits shown for Mount Vernon, Cypress Springs WSC, and Pelican Bay are due to expiration of contracts with Franklin County Water District (Lake Cypress Springs). A summary of the identified water supply shortages in Franklin County is provided as Table 4.5.

Table 4.5 – Water Supply Shortages in Franklin County

Franklin County	**Total Water Shortage in ac-ft/yr**						**Shortage**
Year	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Type**
Mount Vernon				707	738	780	E
Cypress Springs WSC					1,631	1,825	E
Pelican Bay (CSWSC)					75	75	E

4.1 (f) <u>Gregg County</u>

The major surface water supply source in Gregg County is the Sabine River, which flows through the southern portion of the county and provides water for the cities of Kilgore, White Oak and Longview. The City of Gladewater is supplied by Lake Gladewater. Gladewater currently has contractual commitments to other entities, which, in combination with its own projected municipal needs, exceed its permitted supply. As these contracts expire, Gladewater's deficit appears to decline. In reality, these contracts will likely be extended. Liberty-Danville FWSD No.2 has a contract that does not expire within the planning period but is inadequate to meet projected demands in 2050. Most of the manufacturing demands in Gregg County are supplied from Longview. However, there are other sources, including local supply, direct reuse, and the Carrizo-Wilcox Aquifer, and these sources are insufficient to meet current demands. The City of Liberty City and West Gregg WSC utilize groundwater from the Carrizo-Wilcox and have insufficient well capacity. A summary of the identified water supply shortages in Gregg County is presented as Table 4.6.

Table 4.6 – Water Supply Shortages in Gregg County

Gregg County	**Total Water Shortage in ac-ft/yr**						**Shortage**
Year	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Type**
Clarksville City		135	143	150	155	161	E
Gladewater	157						A
Lakeport		107	113	119	123	127	EI
Liberty City	227	238	250	272	296	321	A
White Oak		877	897	937	979	1,038	E
Manufacturing	10,747	9,088	10,568	12,671	15,130	17,746	A
Warren City		40	43	49	54	61	E
Elderville WSC		433	488	593	669	767	EI
Liberty City WSC	166	210	243	303	348	407	A
Liberty-Danville FWSD 2						10	EI*
Tryon Road WSC		409	512	660	778	922	E
West Gregg WSC	28	76	138	225	297	386	A

** Contract is in perpetuity but is inadequate in 2050*

4.1 (g) <u>Harrison County</u>

Most of the water shortages in this county are due to limited current well capacity to withdraw water from the Carrizo-Wilcox Aquifer. The following table, Table 4.7, is a summary of identified water supply shortages in Harrison County.

Table 4.7 – Water Supply Shortages in Harrison County

Harrison County	Total Water Shortage in ac-ft/yr						Shortage
Year	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Type**
Hallsville		264	275	288	301	310	E
Waskom			2	13	27	47	A
Big Oaks Mobile Home Pk	19	17	15	12	10	8	EI
Blocker-Crossroads WSC			7	26	44	60	A
Caddo Lake WSC			2	16	29	40	A
Cypress Valley WSC			3	30	54	76	EI
Elysian Fields WSC					1	6	A
Gum Springs WSC	51	591	754	906	1,041	1,161	EI
Harleton WSC		32	107	178	244	303	A
Leigh WSC				110	121	131	E
North Harrison WSC			6	26	45	62	A
Talley WSC	28	45	61	75	87	98	EI
Waskom WSC			7	31	54	74	A
West Harrison WSC			7	27	44	60	A

4.1 (h) Hopkins County

All actual shortages in this county are caused by current limited well capacity to withdraw water from the Carrizo-Wilcox Aquifer water supply. Contracts in Hopkins County are by and large with the City of Sulphur Springs. There is no steam electric demand shown in Hopkins County, since none existed during the demand assessment phase of this regional planning process. Subsequently, however, the City of Sulphur Springs has begun negotiations for development of a merchant power plant in Hopkins County, which, if constructed, would require an additional 7,281 ac-ft/yr of supply. The following table, Table 4.8, is a summary of identified water supply shortages in Hopkins County.

Table 4.8 – Water Supply Shortages in Hopkins County

Hopkins County	Total Water Shortage in ac-ft/yr						Shortage
Year	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Type**
Como	0	2	6	12	18	26	A
Brashear WSC		123	120	120	119	121	E
Brinker WSC				2	8	21	E
Gafford Chapel WSC	13	100	128	150	170	196	E
Martin Springs WSC		7	24	49	60	78	E
Miller Grove WSC		11	24	40	55	75	E
North Hopkins WSC			831	893	954	1030	E
Pickton WSC					5	12	A
Pleasant Hill WSC 2			31	33	35	37	E
Shady Grove #2 WSC		76	79	84	88	94	E
Shirley WSC				20	40	66	A

4.1 (i) Hunt County

Water shortages in Hunt County are predominately contractual in nature. The City of Wolfe City is expected to experience an actual supply deficit. Wolfe City's water is supplied by a Woodbine Aquifer well and two city lakes, and the combined capacity is not sufficient to meet projected demands. Tri-

County Water Corporation has insufficient capacity to withdraw water from the Woodbine Aquifer. The following table, Table 4.9, is a summary of identified water supply shortages in Hunt County.

Table 4.9 – Water Supply Shortages in Hunt County

Hunt County	Total Water Shortage in ac-ft/yr						Shortage
Year	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Type**
Caddo Mills			174	183	191	197	EI
Commerce				2,132	2,296	2,504	E
Greenville		4,366	4,617	4,875	5,520	6,256	E
Lone Oak		89	95	102	108	113	E
Quinlan		229	243	256	267	276	EI
West Tawakoni		219	228	244	258	275	E
Wolfe City		2	9	43	56	74	A
Steam Electric		516	516	516	516	516	E
BHP WSC	26	239	274	301	336	317	EI
Caddo Basin SUD					892	938	E
Cash WSC			1,312	1,419	1,486	1,558	E
Combined Consmers WSC			864	925	928	988	E
Community Water Co.	0	0	92	88	85	81	E
Jacobia WSC				92	90	87	E
Maloy WSC		2	12	18	25	32	E
North Hunt WSC	146	266	284	298	344	375	EI
Shady Grove WSC				221	221	221	E
Tri-County WSC	108	114	108	98	94	85	A

4.1 (j) Lamar County

All identified shortages in Lamar County are municipal water user groups, and all are due to contract expirations, with the expectation of the Petty WSC. Petty WSC has a well in the Woodbine Aquifer that is not expected to be adequate to meet projected demands after 2020. A summary of the identified water supply shortages in Lamar County is presented below as Table 4.10.

Table 4.10 – Water Supply Shortages in Lamar County

Lamar County	Total Shortages in ac-ft/yr						Shortage
Year	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Type**
Blossom			236	241	245	248	E
Deport		118	121	124	126	127	E
Reno			611	656	682	707	E
Roxton			99	101	102	103	E
Lamar County WSD				2,122	2,188	2,289	E
M J C WSC		74	70	68	66	65	E
Pattonville WSC				43	42	43	E
Petty WSC			18	18	18	17	A

4.1 (k) Marion County

The Carrizo-Wilcox Aquifer supplies most of the water demand in Marion County, but current development is not sufficient to meet all of the projected needs in the county. All deficits in Marion County are municipal. A summary of the identified water supply shortages in Marion County is presented below as Table 4.11.

Table 4.11 – Water Supply Shortages in Marion County

Marion County	**Total Water Shortage in ac-ft/yr**						**Shortage**
Year	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Type**
Kellyville-Berea WSC		16	43	67	88	108	A
Pine Harbor Water System				6	26	43	A
Shady Shores Water System		1	8	14	19	24	A

4.1 (l) Morris County

Two cities within Morris County rely on the Carrizo-Wilcox for supply and the other two rely on surface water from Lake O' the Pines. All of these municipalities have adequate supply for the next 50 years. There are no identified water supply shortages in Morris County.

4.1 (m)Rains County

Several user groups in Rains County show future shortages due to contract expirations. However, the Bright Star-Salem WSC is projected to experience an actual shortage. Bright Star-Salem WSC is situated on the outcrop of the Carrizo-Wilcox Aquifer, and groundwater development to meet continued growth is problematic. South Rains WSC has a contract amount with the City of Emory that is not sufficient to meet current demands. The following table, Table 4.12, is a summary of identified water supply shortages in Rains County.

Table 4.12 – Water Supply Shortages in Rains County

Rains County	**Total Water Shortage in ac-ft/yr**						**Shortage**
Year	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Type**
East Tawakoni			126	138	147	160	E
Emory				278	302	329	E
Point			131	141	151	164	E
Bright Star-Salem WSC				68	134	214	A
South Rains WSC	52	95	399	441	488	531	EI

4.1 (n) Red River County

The City of Detroit uses water supplied from the Trinity Aquifer. Detroit's current capacity is inadequate to meet current demands, and another supply source will be required. The town of English also has a well that is currently insufficient. Other municipal shortages are caused by contract expirations with Texarkana and the Lamar County WSD. A summary of the identified water supply shortages in Red River County is listed in the following Table 4.13.

Table 4.13 – Water Supply Shortages in Red River County

Red River County	Total Water Shortage in ac-ft/yr						Shortage
Year	2000	2010	2020	2030	2040	2050	Type
Detroit	46	46	44	44	45	46	A
410 WSC			284	274	263	253	E
Annona		44	42	41	39	37	E
Avery		81	78	75	72	69	E
Red River County WSC				84	64	46	E
Town of English	7	6	5	3	2		A

4.1 (o) Smith County

The portion of Smith County that is in the North East Texas Region is almost solely supplied by the Carrizo-Wilcox Aquifer. Most projected shortages in this county are due to insufficient well capacity to withdraw water from the aquifer. Tyler's supply comes from a source in Region I. A summary of the identified water supply shortages in Smith County is listed below as Table 4.14.

Table 4.14 – Water Supply Shortages in Smith County

Smith County	Total Water Shortage in ac-ft/yr						Shortage
Year	2000	2010	2020	2030	2040	2050	Type
Enchanted Lakes Water Co.	62	62	62	62	62	62	A
Lindale Rural WSC	108	108	108	108	108	108	A
Star Mountain WSC	80	135	185	237	288	344	A

4.1 (p) Titus County

Water supply in Titus County is predominately from Lakes Monticello, Bob Sandlin and Tankersley, and from the Carrizo-Wilcox Aquifer. Titus County FWSD supplies water to the City of Mount Pleasant. Mount Pleasant supplies Winfield, Tri-Water, and manufacturing demands in addition to its internal needs. Individual shortages are contractual. A summary of the identified water supply shortages in Titus County is listed below as Table 4.15.

Table 4.15 – Water Supply Shortages in Titus County

Titus County	Total Water Shortage in ac-ft/yr						Shortage
Year	2000	2010	2020	2030	2040	2050	Type
Winfield				116	127	134	E
Tri Water Supply Corp		1,476	1,624	1,730	1,843	1,935	E

4.1 (q) Upshur County

Municipal shortages in this county are due in part to insufficient water quality and yield in the Carrizo-Wilcox Aquifer. The identified steam electric shortage results from a proposed steam electric generation plant near Gilmer that has not yet secured a water supply. The following table, Table 4.16, is a summary of identified water supply shortages in Upshur County.

Table 4.16 – Water Supply Shortages in Upshur County

Upshur County	Total Water Shortage in ac-ft/yr						Shortage
Year	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Type**
Steam Electric		5,601	5,601	5,601	5,601	5,601	A
Diana WSC		6	81	162	235	299	A
East Mountain	87	109	120	140	158	174	A
Harmony ISD	2	17	31	44	56	66	A
Pritchett WSC	95	200	296	382	460	529	A
Union Grove WSC			29	58	83	106	A

4.1 (r) Van Zandt County

The cities of Canton, Grand Saline, and Van obtain water from the Carrizo-Wilcox Aquifer. In addition, Canton utilizes supply from its city lake. These three cities will all experience deficits due to inadequate supplies and will need to seek additional sources of water within the next 30 years. The City of Wills Point has a shortage due to contract expiration. Other actual shortages are due to insufficiencies in groundwater production capacity. The following table, Table 4.17, is a summary of identified water supply shortages in Van Zandt County.

Table 4.17 – Water Supply Shortages in Van Zandt County

Van Zandt County	Total Water Shortage in ac-ft/yr						Shortage
Year	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Type**
Canton				73	133	221	A
Edgewood			138	156	171	199	E
Grand Saline		50	98	163	218	294	A
Van			41	99	152	220	A
Wills Point			684	740	792	867	E
Ben Wheeler WSC			7	23	38	50	A
Corinth WSC			9	36	60	82	A
Crooked Creek WSC			12	33	53	70	A
Edom WSC		21	55	86	114	140	A
Fruitvale WSC		51	151	242	325	400	A
Little Hope-Moore WSC	186	186	186	186	186	186	A
Mac Bee WSC				929	997	1,053	E
South Tawakoni WSC			624	736	838	929	E

4.1 (s) Wood County

All actual shortages in Wood County are caused by groundwater sources, which will prove insufficient within the planning period. Additional sources of supply will be needed for these entities. The City of Winnsboro has a projected shortage due to contract expiration. Table 4.18, is a summary of identified water supply shortages in Wood County.

There is also a projected steam electric demand in Wood County, which is assigned to be met by local sources. This assumption is based on the reality that a steam electric facility would not locate in Wood

County unless a willing supply source existed. The most likely supply source would be from a major water supplier such as the Sabine River Authority. Therefore, this supply/demand comparison was not treated as a shortage.

Table 4.18 – Water Supply Shortages in Wood County

Wood County	Total Water Shortage in ac-ft/yr						Shortage
Year	2000	2010	2020	2030	2040	2050	Type
Mineola		39	90	167	224	319	A
Winnsboro					853	916	E
Fouke WSC						27	A
Lake Fork WSC	21	103	175	253	318	410	A

4.2 River Basin Summaries of Water Needs

The North East Texas Regional Water Planning Area is divided among four main river basins including the Red River Basin, the Sulphur River Basin, the Cypress River Basin, and the Sabine River Basin. There is a small area of the Neches Basin in Van Zandt County and a smaller portion of the Trinity Basin in Hunt and Van Zandt Counties. These two basins are not discussed because of the small area situated within the North East Texas Region.

4.2 (a) Red River Basin

The Red River Basin includes portions of Bowie, Lamar, and Red River Counties. Water shortages in the Red River Basin are by and large contractual shortages. The only actual shortage is in the town of English, which operates one well that is insufficient to meet demands. Tables 4.19 – 4.21 detail the shortages in the basin.

Table 4.19 – Water Shortages due to Contract Expirations – Red River Basin

Contract Expirations	Water Shortage in ac-ft/yr					
Year	2000	2010	2020	2030	2040	2050
City of Avery		81	78	75	72	69
City of Blossom			236	241	245	248
City of DeKalb		126	127	132	137	144
City of Reno			611	656	682	707
410 WSC			142	137	132	127
Lamar County WSD				1,061	1,094	1,444

Table 4.20 – Water Shortages due to Expirations and Insufficient Contract Amounts – Red River Basin

Expiration and Increase	Water Shortage in ac-ft/yr					
Year	2000	2010	2020	2030	2040	2050
City of Hooks	69	454	465	484	495	528
City of New Boston	64	232	243	256	269	285
Burns-Redbank WSC	68	281	297	318	339	364
Central Bowie WSC	101	104	222	226	261	356
Oak Grove WSC	8	17	61	70	78	88
Red River WSC				42	32	23

Table 4.21 – Actual Water Shortages – Red River Basin

Actual Shortages	Water Shortage in ac-ft/yr					
Year	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Town of English	7	6	5	3	2	

4.2 (b) Sulphur River Basin

The Sulphur River Basin includes portions of Bowie, Cass, Franklin, Hopkins, Hunt, Lamar, Morris, Red River, and Titus Counties. It also includes all of Delta County. Water shortages in the Sulphur Basin are primarily due to contract expirations, though there are several entities with projected actual water needs. Most of the actual needs are caused by insufficient supplies from groundwater sources. The cities of Pecan Gap and Wolfe City have inadequate surface water sources in their city lakes. Tables 4.22 – 4.24 detail the shortages in the basin.

Table 4.22 – Water Shortages due to Contract Expiration – Sulphur River Basin

Contract Expirations	Water Shortage in ac-ft/yr					
Year	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City of Annona		44	42	41	39	37
City of Commerce				2,132	2,296	2,504
City of DeKalb		174	204	234	252	272
City of Deport		118	121	124	126	127
City of Maud		138	144	149	153	157
City of Mount Vernon				707	738	780
City of Nash		300	313	324	334	341
City of Queen City		17	20	24	29	38
City of Roxton			99	101	102	103
Brashear WSC		123	120	120	119	121
Brinker WSC				2	8	21
Charleston WSC				131	126	123
Cypress Springs WSC					328	352
Enloe-Lake Creek WSC				58	56	54
410 WSC			142	137	131	126
Gafford Chapel WSC	13	100	128	150	170	196
Lamar County WSD				1,061	1,094	1,445
Maloy WSC		2	12	18	25	32
MJC WSC		74	70	68	66	65
North Hopkins WSC			831	893	954	1,033
Pattonville WSC				43	42	43
Pleasant Hill WSC			31	33	35	37
Red River County WSC				42	32	23
Shady Grove #2 WSC		76	79	84	88	94
West Delta WSC				140	135	128

Table 4.23 – Water Shortages due to Expiration and Insufficient Contract Amount – Sulphur River Basin

Expiration and Increase	Water Shortages in ac-ft/yr					
Year	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City of Domino		40	53	65	76	85
City of New Boston	261	932	974	1,024	1,077	1,140
City of Redwater	134	290	300	461	542	628
City of Wake Village	299	690	718	743	764	781
Central Bowie WSC	402	413	877	895	1,033	1,409
Macedonia-Eylau WSC	90	315	453	1,151	1,312	1,412
North Hunt WSC	146	266	284	298	344	375
Oak Grove WSC	8	17	68	76	84	94

Table 4.24 – Actual Water Shortages – Sulphur River Basin

Actual Shortages	Water Shortages in ac-ft/yr					
Year	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City of Como	38	43	47	53	59	67
City of Detroit	46	46	44	44	45	46
City of Pecan Gap	15	13	11	9	7	6
City of Wolfe City		2	9	43	56	74
Ben Franklin WSC	9	8	5	29	28	27
Bloomburg WSC					3	8
Petty WSC			18	18	18	17

4.2 (c) Cypress River Basin

The Cypress River Basin includes portions of Cass, Franklin, Gregg, Harrison, Hopkins, Morris, Titus, Upshur, and Wood Counties, as well as all of Camp and Marion Counties. Supply shortages in the Cypress River Basin occur primarily among entities, which utilize groundwater from the Carrizo-Wilcox Aquifer.

Table 4.25 – Water Shortages due to Contract Expiration – Cypress River Basin

Contract Expirations	Water Shortages in ac-ft/yr					
Year	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City of Atlanta		1,426	1,412	1,416	1,411	1,422
City of Queen City		19	25	34	43	54
City of Winfield				116	127	134
City of Winnsboro					212	226
Cypress Springs WSC					1,407	1,498
Leigh WSC				110	121	131
Pelican Bay					75	75
Tri Water Supply Corp		1,476	1,624	1,730	1,843	1,935
Tryon Road WSC		248	312	400	472	557

Table 4.26 – Water Shortages due to Expiration and Insufficient Contract Amount – Cypress River Basin

Expiration and Increase	Water Shortages in ac-ft/yr					
Year	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Cypress Valley WSC			3	30	54	76
Gum Springs WSC	7	74	95	114	130	145
Holly Springs WSC	21	70	116	250	288	322
Talley WSC	5	9	11	14	16	18

Table 4.27 – Actual Water Shortages – Cypress River Basin

Actual Shortages	Water Shortages in ac-ft/yr					
Year	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City of Linden	95	94	96	106	111	126
City of Waskom			2	13	27	47
Manufacturing (Camp Co.)	2,232	2,232	2,232	2,232	2,232	2,232
Steam Electric (Upshur Co.)		5,601	5,601	5,601	5,601	5,601
Bloomburg WSC					5	12
Caddo Lake WSC			2	16	29	40
Diana WSC		6	81	162	235	299
Glenwood WSC				2	5	9
Harleton WSC		32	107	178	244	303
Harmony ISD	2	17	31	44	56	66
Kellyville-Berea WSC		16	43	67	88	108
North Harrison WSC			6	26	45	62
Pickton WSC					3	6
Pine Harbor Water System				6	26	43
Shady Shores WSC		1	8	14	19	24
West Harrison WSC			1	4	7	10

4.2 (d) Sabine River Basin

The Sabine Basin includes portions of Gregg, Harrison, Hunt, Rains, Smith, Upshur, Van Zandt, and Wood Counties as well as all of Rains County. The Sabine Basin has the highest number of shortages in the region, and over 50 percent of these shortages are due to deficits in groundwater supply. Another 40 percent are due to contract expiration.

Table 4.28 – Water Shortages due to Contract Expiration – Sabine River Basin

Contract Expirations	Water Shortages in ac-ft/yr					
Year	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City of Clarksville City		135	143	150	155	161
City of East Tawakoni			126	138	147	160
City of Edgewood			138	156	171	199
City of Emory				278	302	329
City of Greenville		4,366	4,617	4,875	5,520	6,256
City of Hallsville		264	275	288	301	310
City of Lone Oak		89	95	97	108	113
City of Point			131	141	151	164
City of West Tawakoni		219	228	244	258	275
City of Warren City		40	43	49	54	61
City of White Oak		877	897	937	979	1038
City of Wills Point			341	369	395	433
City of Winnsboro					641	690
Steam Electric (Hunt Co.)		516	516	516	516	516
Caddo Basin SUD					892	938
Cash WSC			1,,312	1,419	1,486	1,558
Combined Consumers		14	864	925	928	988
Jacobia WSC				92	90	87
Mac Bee WSC				929	997	1053
Martin Springs WSC		7	24	49	60	78
Miller Grove WSC	5	11	24	40	55	75
South Tawakoni WSC			624	736	838	929
Tryon Road WSC		161	200	260	306	365
Community Water Co.	0	0	92	88	85	81

Table 4.29 – Water Shortages due to Expiration and Insufficient Contract Amount – Sabine River Basin

Expiration and Increase	Water Shortages in ac-ft/yr					
Year	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City of Caddo Mills			174	183	191	197
City of Lakeport		107	113	119	123	127
City of Quinlan		229	243	256	267	276
BHP WSC	26	239	274	301	336	317
Elderville WSC		433	488	593	669	767
Gum Springs WSC	44	517	659	792	911	1,016
South Rains WSC	52	95	399	441	488	531
Talley WSC	23	36	50	61	71	80

Table 4.30 – Actual Water Shortages – Sabine River Basin

Actual Shortages	Water Shortages in ac-ft/yr					
Year	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
City of Canton				73	133	221
City of East Mountain	87	109	120	140	158	174
City of Gladewater	157					
City of Grand Saline		50	98	163	218	294
City of Kilgore		62	146	268	395	548
Liberty City	227	238	250	272	296	321
City of Mineola		39	90	167	224	319
City of Van			30	33	35	38
Manufacturing (Gregg Co.)	10,166	8,909	10,820	13,393	16,401	19,,602
Steam Electric (Wood Co.)						7,500
Big Oaks MHP	19	17	15	12	10	8
Blocker-Crossroads WSC			7	26	44	60
Bright Star-Salem WSC				68	134	214
Corinth WSC			9	36	60	82
Crooked Creek WSC			12	33	53	70
Elysian Fields WSC					1	6
Enchanted Lakes Water	62	62	62	62	62	62
Fouke WSC						27
Fruitvale WSC		51	151	242	325	400
Lake Fork WSC	21	103	175	253	318	410
Liberty City-Danville						10
Liberty City WSC	166	210	243	303	348	407
Lindale Rural WSC	57	293	504	723	939	1,176
Pickton WSC					3	6
Pritchett WSC	95	200	296	382	460	529
Shirley WSC				20	40	66
Star Mountain WSC	108	108	108	108	108	108
Tri County WSC	108	114	108	98	94	85
Union Grove WSC			29	58	83	106
West Gregg WSC	28	76	138	225	297	386
West Harrison WSC			7	23	37	50

4.3 Summary of Needs – Major Water Providers

The following section presents the supply/demand analysis for the 13 major water providers in the North East Texas Region. Tables present the total water supply for each major water provider assuming that current contracts, permits, and water rights are held constant. Demands are comprised of current contract amounts unless an entity's projected demand exceeds the contract amount sometime in the future. Where projected demand exceeds the contract amount, a notation has been made, and the estimated demand has been entered. While this method does not take into account that entities may use alternate water sources rather than increase contracts, it gives major water providers a good idea of what future demands will be if all current users continue with existing supplies and contracts. Finally, the amount of surplus is noted. The analysis indicates that none of the major water providers in the North East Texas Region will have a shortage of water supply.

4.3 (a) Cherokee Water Company

This provider supplies the city of Longview and industry with surface water supply from Lake Cherokee in Gregg and Rusk Counties, Region I. Longview obtains water from three major water providers, Cherokee Water, Sabine River Authority, and Northeast Texas Municipal Water District. Assuming contract amounts stay constant over the planning period, Cherokee Water Company. will have adequate supply, which is shown below in Table 4.31.

Table 4.31 – Water Supplies and Demands for Cherokee Water Company

SUPPLIES (ac-ft/yr)	2000	2010	2020	2030	2040	2050
Lake Cherokee	18,000	18,000	18,000	18,000	18,000	18,000
TOTAL	**18,000**	**18,000**	**18,000**	**18,000**	**18,000**	**18,000**

DEMANDS (ac-ft/yr)	2000	2010	2020	2030	2040	2050
City of Longview	16,000	16,000	16,000	16,000	16,000	16,000
Manufacturing	2,000	2,000	2,000	2,000	2,000	2,000
TOTAL	**18,000**	**18,000**	**18,000**	**18,000**	**18,000**	**18,000**

SURPLUS (ac-ft/yr)	2000	2010	2020	2030	2040	2050
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**

4.3 (b) Franklin County Water District

The Franklin County Water District (FCWD) holds water rights in Lake Cypress Springs of 11,710 ac-ft. FCWD serves wholesale customers only, and these customers include Cypress Springs WSC, the City of Mount Vernon and the City of Winnsboro. These wholesale customers hold water supply contracts with FCWD which expire in 2024 or 2040. Ninety-nine percent (99 percent) of FCWD's water is in these wholesale contracts and the remaining 1 percent is used for local irrigation. FCWD is estimated to have adequate supply through 2050, which is shown in Table 4.32. Shortages are due to contract expiration.

Table 4.32 – Water Supplies and Demands for Franklin County Water District

SUPPLIES (ac-ft/yr)	2000	2010	2020	2030	2040	2050
Lake Cypress Springs	11,710	11,710	11,710	11,710	11,710	11,710
TOTAL	**11,710**	**11,710**	**11,710**	**11,710**	**11,710**	**11,710**

DEMANDS (ac-ft/yr)	2000	2010	2020	2030	2040	2050
Cypress Springs WSC	3,500	3,500	3,500	3,500	3,500	3,500
City of Mount. Vernon	3,000	3,000	3,000	3,000	3,000	3,000
City of Winnsboro	5,000	5,000	5,000	5,000	5,000	5,000
Irrigation	210	210	210	210	210	210
TOTAL	**11,710**	**11,710**	**11,710**	**11,710**	**11,710**	**11,710**

SURPLUS (ac-ft/yr)	2000	2010	2020	2030	2040	2050
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**

4.3 (c) Northeast Texas Municipal Water District

Northeast Texas Municipal Water District obtains water from numerous sources, listed below. This provider supplies the cities of Avinger, Daingerfield, Hughes Springs, Jefferson, Lone Star, Longview, Ore City Pittsburg, and Mims WSC. Northeast Texas Municipal Water District is projected to maintain a supply surplus throughout the planning period which is shown in Table 4.33.

Table 4.33 – Water Supplies and Demands for Northeast Texas Municipal Water District

SUPPLIES (ac-ft/yr)	2000	2010	2020	2030	2040	2050
Lake O' the Pines	130,600	130,600	130,600	130,600	130,600	130,600
Lake Bob Sandlin	12,000	12,000	12,000	12,000	12,000	12,000
Johnson Creek Lake	6,700	6,700	6,700	6,700	6,700	6,700
Lake Monticello	7,700	7,700	7,700	7,700	7,700	7,700
Swauno Creek	4,500	4,500	4,500	4,500	4,500	4,500
TOTAL	**161,500**	**161,500**	**161,500**	**161,500**	**161,500**	**161,500**

DEMANDS (ac-ft/yr)	2000	2010	2020	2030	2040	2050
Avinger	1,551	1,551	1,551	1,551	1,551	1,551
Daingerfield	10,572	10,572	10,572	10,572	10,572	10,572
Hughes Springs	5,781	5,781	5,781	5,781	5,781	5,781
Jefferson	9,776	9,776	9,776	9,776	9,776	9,776
Lone Star	4,,841	4,841	4,841	4,841	4,841	4,841
Longview	20,000	20,000	20,000	20,000	20,000	20,000
Ore City	2,773	2,773	2,773	2,773	2,773	2,773
Pittsburg	13,633	13,633	13,633	13,633	13,633	13,633
Mims WSC	801	801	801	801	801	801
Manufacturing	91,300	91,300	91,300	91,300	91,300	91,300
TOTAL	**161,028**	**161,028**	**161,028**	**161,028**	**161,028**	**161,028**

SURPLUS (ac-ft/yr)	2000	2010	2020	2030	2040	2050
TOTAL	**472**	**472**	**472**	**472**	**472**	**472**

4.3 (d) Sabine River Authority

The Sabine River Authority (SRA) holds water rights in two surface water bodies including Lake Fork (Wood and Rains Counties) and Lake Tawakoni (Hunt, Rains, and Van Zandt Counties). The Sabine River Authority supplies the cities of Commerce, Edgewood, Emory, Greenville, Quitman, Kilgore, Longview, Point, West Tawakoni, Wills Point, the Ables Springs WSC, Cash WSC, Combined Consumers WSC, Community Water Company, MacBee WSC and South Tawakoni, as well as industry.

Several of the Sabine River Authority's customers have water shortages, all caused by contract expiration. Approximately 75 percent of the firm water supply in both Lake Fork and Lake Tawakoni is committed to entities in Regions C and I as noted in Table 4.34.

Table 4.34 – Water Supplies and Demands for Sabine River Authority

SUPPLIES (ac-ft/yr)	2000	2010	2020	2030	2040	2050
Lake Tawakoni	238,100	238,100	238,100	238,100	238,100	238,100
Lake Fork	188,660	188,660	188,660	188,660	188,660	188,,660
TOTAL	**426,760**	**426,760**	**426,760**	**426,760**	**426,760**	**426,760**

DEMANDS (ac-ft/yr)	2000	2010	2020	2030	2040	2050
Commerce	8,396	8,396	8,396	8,396	8,396	8,396
Edgewood	840	840	840	840	840	840
Emory	2,016	2,016	2,016	2,016	2,016	2,016
Greenville	21,283	21,283	21,283	21,283	21,283	21,283
Quitman	1,120	1,120	1,120	1,120	1,120	1,120
Kilgore	6,721	6,721	6,721	6,721	6,721	6,721
Longview	20,000	20,000	20,000	20,000	20,000	20,000
Point	448	448	448	448	448	448
West Tawakoni	1,120	1,120	1,120	1,120	1,120	1,120
Wills Point	2,540	2,540	2,540	2,540	2,540	2,540
Ables Springs WSC	1,120	1,120	1,120	1,120	1,120	1,120
Cash WSC	3,314	3,314	3,314	3,314	3,314	3,314
Combined Consumers WSC	2,240	2,240	2,240	2,240	2,240	2,240
Mac Bee WSC	5,399	5,399	5,399	5,399	5,399	5,399
South Tawakoni WSC	560	560	560	560	560	560
Mining	7,000	7,000	7,000	7,000	7,000	7,000
Other Regions	342,643	342,643	342,643	342,643	342,643	342,643
Manufacturing	3,500	3,500	3,500	3,500	3,500	3,500
TOTAL	**426,760**	**426,760**	**426,760**	**426,760**	**426,760**	**426,760**

SURPLUS (ac-ft/yr)	2000	2010	2020	2030	2040	2050
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**

4.3 (e) Sulphur River Basin Authority

This supplier currently has no customers, but anticipates becoming a wholesale water supplier when new reservoirs are developed in the Sulphur River Basin.

4.3 (f) Titus County Fresh Water Supply District No.1

This entity supplies the City of Mount Pleasant and Texas Utilities with water from Lake Bob Sandlin. TCFWSD has no uncommitted water supply in Lake Bob Sandlin. Though both contracts expire within the planning period, they include an option for renewal; therefore, no shortages are projected for this system as shown in Table 4.35.

Table 4.35 Water Supplies and Demands for Titus County Fresh Water Supply District

SUPPLIES (ac-ft/yr)	2000	2010	2020	2030	2040	2050
Lake Bob Sandlin	48,500	48,500	48,500	48,500	48,500	48,500
TOTAL	**48,500**	**48,500**	**48,500**	**48,500**	**48,500**	**48,500**

DEMANDS (ac-ft/yr)	2000	2010	2020	2030	2040	2050
Mt. Pleasant	10,000	10,000	10,000	10,000	10,000	10,000
Texas Utilities	38,500	38,500	38,500	38,500	38,500	38,500
TOTAL	**48,500**	**48,500**	**48,500**	**48,500**	**48,500**	**48,500**

SURPLUS (ac-ft/yr)	2000	2010	2020	2030	2040	2050
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**

4.3 (g) City of Greenville

Greenville owns city lakes which have a combined firm yield of 1,200 ac-ft. In addition, Greenville has a contract with the Sabine River Authority for 21,283 ac-ft/yr of supply from Lake Tawakoni. This contract with Sabine River Authority expires in 2006, but it is assumed in this chapter to be renewed until 2050. Greenville supplies water to its own municipal, steam electric, mining, and industrial customers as well as Jacobia WSC, Shady Grove WSC, and the City of Caddo Mills. It should be noted that Shady Grove WSC was inadvertently omitted from the TWDB tables in Appendix A, but their demands have been included here. Shady Grove WSC should be included in the plan update. Caddo Mills currently has a contract with Greenville for 166 ac-ft, but the city's demand will exceed that amount by 2020. As shown in Table 4.36, Greenville has a water supply surplus of approximately 63 percent of it total supply.

Table 4.36 – Water Supplies and Demands for the City of Greenville

SUPPLIES (ac-ft)	2000	2010	2020	2030	2040	2050
Lake Tawakoni	21,283	21,283	21,283	21,283	21,283	21,283
City Lakes	1,200	1,200	1,200	1,200	1,200	1,200
TOTAL	**22,483**	**22,483**	**22,483**	**22,483**	**22,483**	**22,483**

DEMANDS (ac-ft)	2000	2010	2020	2030	2040	2050
Caddo Mills	166	166	*174	183	191	197
Greenville Municipal	6,291	6,689	7,021	7,520	8,034	8,620
Jacobia WSC	336	336	336	336	336	336
Shady Grove WSC	336	336	336	336	336	336
Steam Electric	800	800	800	800	800	800
Manufacturing	740	818	903	998	1,129	1,276
Mining	24	25	27	33	35	45
TOTAL	**8,693**	**9,170**	**9,597**	**10,206**	**10,861**	**11,610**

SURPLUS (ac-ft)	2000	2010	2020	2030	2040	2050
TOTAL	**14,090**	**13,313**	**12,886**	**12,277**	**11,622**	**10,873**

** Caddo Mills will require a contract increase to meet demands.*

4.3 (h) City of Marshall

This water provider, located in Harrison County, supplies water to several water supply corporations including Cypress Valley WSC, Talley WSC, Gill WSC, and Leigh WSC, with water from the Big Cypress Bayou. It also supplies its own water needs. Shortages in this system are caused by contractual inadequacies. Leigh's deficit is a matter of contract expiration. However, in the case of Cypress Valley WSC and Talley WSC, water is purchased from Marshall though there is no formal contract in place. Marshall is projected to have a surplus of approximately 64 percent of its total water supply which is shown in Table 4.37.

Table 4.37 – Water Supplies and Demands for the City of Marshall

SUPPLIES (ac-ft/yr)	2000	2010	2020	2030	2040	2050
Big Cypress Bayou	16,000	16,000	16,000	16,000	16,000	16,000
TOTAL	**16,000**	**16,000**	**16,000**	**16,000**	**16,000**	**16,000**

DEMANDS (ac-ft/yr)	2000	2010	2020	2030	2040	2050
Marshall Municipal	4,906	5,113	5,177	3,393	5,609	5,955
Cypress Valley WSC	5	5	13	40	64	86
Talley WSC	32	49	65	79	118	102
Gill WSC	125	125	125	125	125	125
Leigh WSC	184	184	184	184	184	184
TOTAL	**5,252**	**5,476**	**5,564**	**3,821**	**6,100**	**6,452**

SURPLUS (ac-ft/yr)	2000	2010	2020	2030	2040	2050
TOTAL	**10748**	**10524**	**10436**	**12179**	**9900**	**9548**

4.3 (i) City of Longview

The City of Longview purchases supply from NETMWD, Cherokee Water Co., and SRA. Shortages in this system are contractual. Table 4.38 shows the Longview system is projected to have a supply surplus throughout the planning period of approximately 56 percent of total available supply. Shortages in this system are caused mainly by contractual expirations, with one contractual inadequacy.

Table 4.38 – Water Supplies and Demands for the City of Longview

SUPPLIES (ac-ft/yr)	2000	2010	2020	2030	2040	2050
Cherokee Water Company	16,000	16,000	16,000	16,000	16,000	16,000
NETMWD	20,000	20,000	20,000	20,000	20,000	20,000
Big Sandy Creek	1,120	1,120	1,120	1,120	1,120	1,120
Sabine River Authority	20,000	20,000	20,000	20,000	20,000	20,000
Sabine River	19,337	19,337	19,337	19,337	19,337	19,337
TOTAL	**76,457**	**76,457**	**76,457**	**76,457**	**76,457**	**76,457**

DEMANDS (ac-ft/yr)	2000	2010	2020	2030	2040	2050
Longview Municipal	15,864	16,295	16,875	17,601	18,316	19,298
Hallsville	368	368	368	368	368	368
White Oak	1,120	1,120	1,120	1,120	1,120	1,120
C&C Mobile Home Park	18	18	18	18	18	18
Elderville WSC	516	516	516	570	646	744
Tryon Road WSC	1,031	1,031	1,031	1,031	1,031	1,031
Gum Springs WSC	415	593	754	906	1041	1161
Manufacturing	9,245	11,001	11,812	12,622	13,926	15,361
TOTAL	**28,577**	**30,942**	**32,494**	**34,236**	**36,466**	**39,101**

SURPLUS (ac-ft/yr)	2000	2010	2020	2030	2040	2050
TOTAL	**47,880**	**45,515**	**43,963**	**42,221**	**39,991**	**37,356**

4.3 (j) City of Mount Pleasant

Mount Pleasant has water rights in Lake Cypress Springs of 3,590 ac-ft. The city has a contract with Titus County Freshwater Supply District for 10,000 ac-ft from Lake Bob Sandlin. Finally, Mount Pleasant has water rights in Lake Tankersley of 3,000 ac-ft, bringing the city's total available supply to 16,590 ac-ft. Mount Pleasant provides water to its own municipal customers as well as some of the mining and manufacturing users in Titus County. Mount Pleasant's wholesale customers include Tri Water Supply Corporation and the City of Winfield. Lake Bob Sandlin State Park is a separate entity from Mount Pleasant, but is treated as a retail customer. The City is currently using 54 percent of its available supply and is projected to use 64 percent by 2050, as shown in Table 4.39

Table 4.39 – Water Supplies and Demands for the City of Mount Pleasant

SUPPLIES (ac-ft/yr)	2000	2010	2020	2030	2040	2050
Lake Tankersley	3,000	3,000	3,000	3,000	3,000	3,000
Lake Cypress Springs	3,590	3,590	3,590	3,590	3,590	3,590
Lake Bob Sandlin	10,000	10,000	10,000	10,000	10,000	10,000
TOTAL	**16,590**	**16,590**	**16,590**	**16,590**	**16,590**	**16,590**

DEMANDS (ac-ft/yr)	2000	2010	2020	2030	2040	2050
Mount Pleasant Municipal	3,012	3,167	3,312	3,512	3,722	3,970
Tri Water Supply Corp.	1,216	1,476	1,624	1,730	1,843	1,935
Winfield	153	153	153	153	153	153
Lake Bob Sandlin Park	1	1	1	1	1	1
Manufacturing	3,421	3,421	3,421	3,421	3,650	3,882
Mining	1,098	450	315	272	275	324
TOTAL	**8,901**	**8,668**	**8,826**	**9,089**	**9,644**	**10,265**

SURPLUS (ac-ft/yr)	2000	2010	2020	2030	2040	2050
TOTAL	**7,689**	**7,922**	**7,764**	**7,501**	**6,946**	**6,325**

4.3 (k) City of Paris

The City of Paris, Lamar County, has water rights in Lake Crook of 1,000 ac-ft/yr, and in Pat Mayse Lake of 61,612 ac-ft/yr. Paris serves its own municipal, steam electric and manufacturing needs. In addition, the city has wholesale contracts with Lamar County Water Supply District and MJC WSC. Currently, Paris has almost 50 percent of its total available supply in use. As shown in Table 4.40, it is expected that 58 percent of the City's supply will be in use by 2050.

Table 4.40 – Water Supplies and Demands for the City of Paris

SUPPLIES (ac-ft/yr)	2000	2010	2020	2030	2040	2050
Pat Mayse Lake	59,900	59,570	59,200	58,900	58,600	58,300
Lake Crook	1,000	1,000	1,000	1,000	1,000	1,000
TOTAL	**60,900**	**60,570**	**60,200**	**59,900**	**59,600**	**59,300**

DEMANDS (ac-ft/yr)	2000	2010	2020	2030	2040	2050
Lamar County WSD	5,601	5,601	5,601	5,601	5,601	5,601
M J C WSC	92	92	92	92	92	92
Manufacturing	5,422	6,213	6,932	7,575	8,590	9,608
Steam Electric	12,209	12,209	12,209	12,209	12,209	12,209
Paris Municipal	7,583	7,750	7,904	8,237	8,552	8,973
TOTAL	**30,907**	**31,865**	**32,738**	**33,714**	**35,044**	**36,483**

SURPLUS (ac-ft/yr)	2000	2010	2020	2030	2040	2050
TOTAL	**29,993**	**28,705**	**27,462**	**26,186**	**24,556**	**22,817**

4.3 (l) City of Sulphur Springs

Sulphur Springs, located in Hopkins County, has two sources of water supply. Lake Sulphur Springs has a safe yield of 7,800 ac-ft/yr. The city has a contract with the Sulphur River Municipal Water District (SRMWD) for 16,034 ac-ft/yr of supply from the Cooper Reservoir, available for the life of the reservoir. Yields shown for Cooper reservoir in Table 4.41 are based upon the latest TNRCC water availability model for the Sulphur River. Sulphur Springs currently has a surplus totaling 62 percent of total available supply. By 2050, the surplus decreases to 46 percent. Sulphur Springs is anticipating the construction of a power plant in the near future. If this occurs, the system's demands will increase by an estimated 7,281 ac-ft/yr, which is shown below in Table 4.41.

Table 4.41 – Water Supplies and Demands for the City of Sulphur Springs

SUPPLIES (ac-ft/yr)	2000	2010	2020	2030	2040	2050
Cooper Lake	16,034	15,935	15,726	15,717	15,608	15,608
Lake Sulphur Springs	7,800	7,800	7,800	7,800	7,800	7,800
TOTAL	**23,834**	**23,735**	**23,526**	**23,517**	**23,408**	**23,408**

DEMANDS (ac-ft/yr)	2000	2010	2020	2030	2040	2050
Sulphur Springs Municipal	2,771	2,920	3,037	3,240	3,407	3,637
Brashear WSC	173	123	120	120	119	121
Brinker WSC	70	114	221	275	281	294
Gafford Chapel	62	109	130	234	254	280
Martin Springs WSC	223	376	402	452	463	481
North Hopkins WSC	713	778	831	893	954	1,030
Pleasant Hill WSC	28	30	31	33	35	37
Shady Grove WSC	72	76	79	84	88	94
Manufacturing	2,666	2,861	3,024	3,151	3,409	3,,668
Livestock	2,221	2,310	2,431	2,696	2,711	3,000
TOTAL	**8,999**	**9,697**	**10,306**	**11,178**	**11,721**	**12,642**

SURPLUS (ac-ft/yr)	2000	2010	2020	2030	2040	2050
TOTAL	**14,835**	**14,038**	**13,230**	**12,339**	**11,687**	**10,766**

4.3 (m)City of Texarkana

The City of Texarkana, Bowie County, is comprised of Texarkana, Texas, and Texarkana, Arkansas. There is supply and demand in both states. For planning purposes, it has been assumed that water supply from Arkansas will meet Arkansas demand. Therefore, supply and demands in Table 4.42 only consider the Texas side of the city.

Texarkana, Texas supply comes from Lake Wright Patman through a contract with the U.S. Corps of Engineers for 108,661 ac-ft/yr. Demands come from three counties and are as follows: Texarkana municipal and manufacturing, City of DeKalb, City of Hooks, City of Maud, City of Nash, City of New Boston, City of Redwater, City of Wake Village, City of Atlanta, City of Queen City, City of Domino, City of Annona, City of Avery, central Bowie WSC, Macedonia-Eylau MUD #1, Oak Grove WSC, Red River WSC and manufacturing in Cass County. The Federal Correctional Institution is actually a commercial customer but is being treated as a separate entity for the purposes of this plan. Currently, Texarkana has a surplus totaling 10 percent of total available supply. By 2050, the surplus decreases to 5 percent. Water shortages projected for the Texarkana system are contractual. Most are caused by expirations, though several entities require contract amount increases as noted on Table 4.42.

Table 4.42 – Water Supplies and Demands for the City of Texarkana

SUPPLIES (ac-ft/yr)	2000	2010	2020	2030	2040	2050
Lake Wright Patman	108,661	108,661	108,661	108,661	108,661	108,661
TOTAL	**108,661**	**108,661**	**108,661**	**108,661**	**108,661**	**108,661**

DEMANDS (ac-ft/yr)	2000	2010	2020	2030	2040	2050
DeKalb	470	470	470	470	470	470
Hooks	500	500	500	500	500	*528
Fed. Correctional Institution	230	235	240	250	261	275
Maud	246	246	246	246	246	246
Nash	368	368	368	368	368	368
New Boston	*1,109	1,164	1,217	1,280	1,346	1,425
Redwater	*326	335	345	506	587	673
Wake Village	*657	690	718	743	764	781
Central Bowie WSC	*761	775	1,099	1,121	1,294	1,765
Macedonia-Eylau MUD #1	*642	867	1,005	1,151	1,312	1,412
Oak Grove	*90	107	122	139	156	175
Atlanta	1,904	1,904	1,904	1,904	1,904	1,904
Queen City	364	364	364	364	364	*384
Domino	55	55	55	*85	96	104
Annona	68	68	68	68	68	68
Avery	92	92	92	92	92	92
Red River WSC	110	110	110	110	110	110
Manufacturing Bowie	1,916	2,124	2,338	2,562	2,798	3,043
Manufacturing Cass	80,082	76,814	76,814	74,508	77,487	80,589
Texarkana Municipal	7,421	7,660	7,889	8,240	8,557	8,976
TOTAL	**97,411**	**94,948**	**95,964**	**94,707**	**98,780**	**103,388**
SURPLUS (ac-ft/yr)	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
TOTAL	**11,250**	**13,713**	**12,697**	**13,954**	**9,881**	**5,273**

- *Needs a contract increase to meet projected demand.*

4.4 Water Surpluses in the North East Texas Region

Table 4.43 lists the entities within the North East Texas Region which have a supply surplus throughout the planning period. Though many entities have surpluses in some years, those that eventually run short of supply due to contract/permit expiration or demands which exceed supply have been omitted from this table. Table 4.43 will not agree with tables 4.31-4.42 for major water providers, as tables 4.31-4.42 do not take into account contract expirations. Table 4.43 lists only those WUG's that experience a surplus in each year of the planning period.

Table 4.43 Water Surpluses in the North East Texas Region

Total Water Supply Surplus in ac-ft/yr

Bowie County	2000	2010	2020	2030	2040	2050
Texarkana	12,902	21,069	20,958	23,351	19,819	16,053
Cody's Mobile HP	42	41	42	42	42	43
El Chaparral MHP	39	38	40	40	41	41
Park Terrace MHP	34	34	34	34	34	34
Plattners MHP	7	6	7	9	10	10
Woodland Estates	19	19	18	18	17	17
Total	**13,043**	**21,207**	**21,099**	**23,494**	**19,963**	**16,198**

Total Water Supply Surplus in ac-ft/yr

Camp County	2000	2010	2020	2030	2040	2050
Pittsburg	1,461	1,426	1,405	1,365	1,322	1,268
Bi-County WSC	410	205	192	185	179	176
Cherokee Point WC	108	104	104	104	103	103
Newsome WSC	69	52	49	48	47	41
Sharon WSC	7	2	2	2	0	0
Thunderbird WS	15	0	0	0	0	2
Total	**2,070**	**1,789**	**1,752**	**1,704**	**1,651**	**1,590**

Total Water Supply Surplus in ac-ft/yr

Cass County	2000	2010	2020	2030	2040	2050
Hughes Springs	5,086	5,072	5,086	5,173	5,180	5,179
Lone Star	4,574	4,583	4,592	4,601	4,611	4,620
Naples	3	0	6	10	17	19
Omaha	28	28	33	35	40	42
Bi-County WSC	161	130	117	86	75	78
Atlanta St. Rec.	7	7	7	7	7	7
Avinger	1,538	1,518	1,499	1,483	1,466	1,452
Douglasville	4	5	5	6	6	7
Green Hills Subd.	12	13	13	13	14	14

Total Water Supply Surplus in ac-ft/yr

Cass County	2000	2010	2020	2030	2040	2050
Linden-Kildare HS	11	10	9	8	8	7
Linden-Kildare Jr Hs	8	7	6	5	5	4
Marietta WSC	36	27	19	12	5	0
McLeod ISD	34	33	32	31	31	30
McLeod WSC	31	25	21	16	12	9
Sherwood Addition	11	12	12	12	12	12
Spring Valley Subd	11	12	12	12	12	12
Whispering Pines MHP	5	6	6	7	7	7
Whispering Pines Subd.	10	10	10	10	10	11
Total	**11,470**	**11,498**	**11,485**	**11,527**	**11,518**	**11,510**

Total Water Supply Surplus in ac-ft/yr (cont.)

Delta County	2000	2010	2020	2030	2040	2050
Cooper	569	581	596	1,125	1,136	1,139
Manufacturing	9,180	9,180	9,180	9,180	9,180	9,180
Delta County MUD	1,852	182	182	0	0	0
Total	**9,931**	**9,943**	**9,958**	**10,305**	**10,316**	**10,319**

Total Water Supply Surplus in ac-ft/yr

Franklin County	2000	2010	2020	2030	2040	2050
Manufacturing	1	1	1	1	1	1
Deer Cove POA WS	1	1	1	1	1	1
Total	**2**	**2**	**2**	**2**	**2**	**2**

Total Water Supply Surplus in ac-ft/yr

Gregg County	2000	2010	2020	2030	2040	2050
Kilgore	812	717	729	552	417	253
Steam Electric	1,249	1,749	1,749	1,749	1,749	2,749
C&C Mobile HP	9	9	10	10	10	10
Gladewater	7	19	18	17	16	15
Longview	59,476	40,165	39,587	38,863	23,645	1,544
E J Water Company	33	36	39	38	39	39
Forest Lake Estates	10	12	14	14	15	14
Garden Acres Subd.	52	52	53	53	53	53
Sabine ISD	13	15	17	17	18	17
Sun Acres MHP	3	3	4	4	4	4
Total	**61,664**	**42,777**	**42,220**	**41,317**	**25,966**	**4,698**

Total Water Supply Surplus in ac-ft/yr

Harrison County	2000	2010	2020	2030	2040	2050
Marshall	8,909	8,702	8,638	8,422	8,206	7,860
Manufacturing	84,667	64,554	58,527	52,783	40,066	25,908

Total Water Supply Surplus in ac-ft/yr (cont.)

Harrison County	2000	2010	2020	2030	2040	2050
Mining	520	520	520	520	520	520
Steam Electric	23,240	23,240	23,240	23,240	23,240	23,240
Caddo Lake State Pk	0	1	1	2	3	4
Scottsville	50	53	56	58	61	63
Gill WSC	151	136	123	110	100	90
Holiday Springs MHP	4	4	4	5	5	5
Karnack WSC	60	62	64	66	68	70
Pinehill MHP	2	3	3	4	5	5
Rolling Acres	2	2	2	3	3	3
Shadowood Water Co	22	22	23	24	25	25
Total	**117,627**	**97,299**	**91,201**	**85,237**	**72,302**	**57,793**

Total Water Supply Surplus in ac-ft/yr

Hopkins County	2000	2010	2020	2030	2040	2050
Cumby	32	27	24	17	12	4
Sulphur Springs	15,135	15,703	15,243	14,905	14,371	17,110
Livestock	328	328	328	328	328	328
Manufacturing	14	11	11	7	4	4
Cornersville WSC	129	127	126	122	119	113
Total	**15,638**	**16,196**	**15,732**	**15,379**	**14,834**	**17,559**

Total Water Supply Surplus in ac-ft/yr

Hunt County	2000	2010	2020	2030	2040	2050
Campbell	35	26	18	11	5	0
Celeste	41	32	24	17	11	6
Manufacturing	200	200	200	200	200	173
Ables Springs WSC	896	858	820	782	744	706
Hasco Water Systems	3	2	3	4	4	6
Hickory Creek SUD	163	129	93	63	56	45
Little Creek Acres	88	87	88	88	89	90
W Oak Phoenix WS	42	42	42	43	43	43
Whispering Oaks Water Co-op	3	2	3	3	4	4
Total	**1,471**	**1,378**	**1,291**	**1,211**	**1,156**	**1,073**

Total Water Supply Surplus in ac-ft/yr

Lamar County	2000	2010	2020	2030	2040	2050
Paris	24,122	23,089	22,062	26,230	24,709	22,849
Total	**24,122**	**23,089**	**22,062**	**26,230**	**24,709**	**22,849**

Total Water Supply Surplus in ac-ft/yr (cont.)

Marion County	2000	2010	2020	2030	2040	2050
Jefferson	10,423	10,411	10,399	10,380	10,354	10,322
Steam Electric	3,832	3,832	3,832	3,832	3,832	3,832

Total Water Supply Surplus in ac-ft/yr

Marion County	2000	2010	2020	2030	2040	2050
C&C Water Works	3	3	4	4	5	5
Ore City	92	91	90	89	88	87
Crestwood WSC	78	79	79	80	81	81
E. Marion Co WSC	125	15	106	95	88	82
Holiday Harbor Gold Coast WSC	80	81	81	82	82	83
Indian Hills Harbor Subdivision	111	112	113	113	114	115
Mims WSC	695	655	619	585	554	527
Tejas Village WS	3	3	3	3	4	4
Total	**15,442**	**15,282**	**15,326**	**15,263**	**15,202**	**15,138**

Total Water Supply Surplus in ac-ft/yr

Morris County	2000	2010	2020	2030	2040	2050
Daingerfield	10,165	10,183	10,203	10,219	10,230	10,228
Total	**10,165**	**10,183**	**10,203**	**10,219**	**10,230**	**10,228**

Total Water Supply Surplus in ac-ft/yr

Rains County	2000	2010	2020	2030	2040	2050
Cedar Cove Landing	4	4	4	3	3	2
Lone Oak	13	13	13	12	12	12
Total	**17**	**17**	**17**	**15**	**15**	**14**

Total Water Supply Surplus in ac-ft

Red River County	2000	2010	2020	2030	2040	2050
Bogata	180	187	194	201	207	214
Clarksville	85	115	146	168	176	182
Steam Electric	10,,000	6,500	4,500	1,500	1,500	1,500
Total	**10,265**	**6,802**	**4,840**	**1,869**	**1,883**	**1,896**

Total Water Supply Surplus in ac-ft/yr

Smith County	2000	2010	2020	2030	2040	2050
Lindale	991	928	871	804	739	666
Crystal Systems Texas, Inc.	195	195	195	195	195	195

Total Water Supply Surplus in ac-ft/yr (cont.)

Smith County	2000	2010	2020	2030	2040	2050
Garden Valley Golf Resort	156	155	155	155	154	154
Lindale Rural WS	729	729	729	729	729	729
Silver Leaf Vacation	414	404	395	383	370	354
Smith County Club	734	688	647	604	562	516
Twin Oaks Ranch Water Supply	40	34	29	24	19	13
Total	**3,259**	**3,133**	**3,021**	**2,894**	**2,768**	**2,627**

Total Water Supply Surplus in ac-ft/yr

Titus County	2000	2010	2020	2030	2040	2050
Mt. Pleasant	7,697	9,017	9,550	9,391	8,951	8,421
Talco	613	609	604	599	590	577
Manufacturing	41,163	41,071	41,000	40,945	40,818	40,693
Steam Electric	16,720	13,720	13,720	1,020	1,020	1,020
Lake Bob Sandlin SP	4	4	4	4	4	4
North East Tx. CC	1,589	1,590	1,591	1,591	1,,592	1,593
Total	**67,786**	**66,011**	**66,469**	**53,550**	**51,383**	**52,308**

Total Water Supply Surplus in ac-ft/yr

Upshur County	2000	2010	2020	2030	2040	2050
Big Sandy	97	89	91	81	68	56
Gilmer	5,221	5,149	5,158	5,076	4,982	4,906
Ore City	2,779	2,774	2,778	2,771	2,763	2,756
Irrigation	200	200	200	200	200	200
Manufacturing	750	750	750	750	750	750
Ambassador College	543	543	544	544	544	544
Brookshire's Camp Joy	15	16	17	18	18	20
Texas Water System	38	39	32	32	33	46
Total	**9,643**	**9,560**	**9,570**	**9,472**	**9,358**	**9,278**

Total Water Supply Surplus in ac-ft/yr

Van Zandt County	2000	2010	2020	2030	2040	2050
Canton North Estates	22	21	20	19	18	17
Edgewood	735	719	702	684	669	641
Golden WSC	61	57	52	48	45	42
Martins Mill WSC	24	18	13	9	5	1
Total	**842**	**815**	**787**	**760**	**737**	**701**

Total Water Supply Surplus in ac-ft/yr (cont.)

Wood County	2000	2010	2020	2030	2040	2050
Alba	38	42	46	48	50	49
Hawkins	1059	1,044	1,032	1,011	996	968
Quitman	237	206	179	145	112	69
Brookhaven Retreat	4	4	4	4	4	4
Big Woods Springs	23	25	26	27	28	27
Clear Lakes Village	75	80	84	86	89	88
Holly Ranch Water	278	299	318	326	338	334
Jones WSC	178	148	121	82	55	1
Ramey WSC	280	247	217	179	150	100
Yantis	106	109	100	96	93	86
Jarvis Christian College	279	284	288	290	292	291
New Hope WSC	218	200	183	162	146	117
Sharon WSC	417	170	153	125	105	65
Total	**3,192**	**2,858**	**2,751**	**2,581**	**2,458**	**2,199**

4.5 Socio-Economic Impacts of Not Meeting Water Needs

Section 357.7(4) of the rules for implementing Senate Bill 1 require that the social and economic impact of not meeting regional water supply needs be evaluated by the Regional Water Planning Groups. The North East Texas Regional Water Planning Group took advantage of TWDB technical assistance in this regard. Board staff completed the analysis of the social and economic impacts of not meeting water needs as identified in Exhibit B, Table 7. TWDB evaluated each negative value, showing an unmet water need for an individual water user group (WUG), using data that connected water use with the economy and the population of the region. The detailed results of the analysis are found in a separate report as well as Tables 9 and 10, included in Appendix A.

Looking at the region as a whole, including all six WUGs, the value of need in 2000 is 18,596 acre-feet, increasing to 121,346 acre-feet by 2050. This projected need could, in a worst case scenario, impact 41,744 jobs in 2000, up to 171,346 jobs in 2050. Not meeting projected water needs could impact the population in the region by 80,923 people in 2000 up to 368,070 people in 2050. In addition to these impacts, the effects of not meeting water needs on gross business output, regional incomes and school enrollment were analyzed. Collectively, the summation of all of these impacts gives the region a view of the ultimate magnitude of the impacts caused by not meeting all of the entire list of needs. These summations should be considered a worst-case scenario for the region.

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5.0 Evaluation and Selection of Water Management Strategies

The primary emphasis of the regional water supply planning process established by S.B. 1 is the identification of current and future water needs and the development of strategies for meeting those needs. This chapter presents the results of the evaluation of various water management strategies, a conceptual framework and overview of the water management strategies recommended for implementation within the North East Texas Region, and specific recommendations to meet specific water supply shortages.

5.1 TWDB Guidelines for Preparation of Regional Water Plans

By rule, the Texas Water Development Board (TWDB) has set forth specific requirements for the preparation of a regional water plan (31 Texas Administrative Code, Chapter 357). With regard to recommendations for meeting identified water supply needs, the regional water plans are to include:

- Specific recommendations for meeting near-term needs (2000-2030) in sufficient detail to allow the TWDB and the Texas Natural Resource Conservation Commission (TNRCC) to make financial assistance or regulatory decisions with regard to the consistency of the proposed action with an approved regional water plan.

- Recommendations or alternative scenarios for meeting long term needs (2030-2050).

It should be noted that TWDB rules provide that a regional water plan may also identify water needs for which no water management strategy is feasible, provided applicable strategies are evaluated and reasons are given as to why no strategies are determined to be feasible.

TWDB rules also specify that the regional water plans are to include the evaluation of all water management strategies the Regional Water Planning Group determined to be potentially feasible. Strategies to be considered may include:

- Municipal water conservation and drought response planning, including demand management
- Reuse of waste water;
- Expanded use or acquisition of existing supplies including systems optimization and conjunctive use of resources;
- Reallocation of reservoir storage to new uses;
- Voluntary redistribution of water resources including water marketing, regional water banks, sales, leases, options, subordination agreements, and financing arrangements;
- Enhancements of yields of existing sources;
- Control of naturally occurring chlorides;
- Interbasin transfers;
- New supply development including construction and improvement of surface water resources;
- Brush control, precipitation enhancement, and desalinization;
- Water supply that could be made available by cancellation of water rights based on data; provided by the Texas Natural Resource Conservation Commission;
- Aquifer storage and recovery.

According to TWDB rules, each of the potentially feasible water management strategies are to be evaluated by considering:

- The quantity, reliability, and cost of water delivered and treated for the end user's requirements;
- Environmental factors including effects on environmental water needs, wildlife habitat, and cultural resources;
- Impacts on other water resources of the state including other water management strategies and groundwater / surface water interrelationships;
- Impacts of water management strategies on threats to agricultural and natural resources;
- Any other factors deemed relevant by the regional water planning group including recreational impacts;
- Equitable comparison and consistent application of all water management strategies the regional water planning group determines to be potentially feasible for each water supply need;
- Consideration of the provisions in Texas Water Code, Section 11.085(k)(1) for interbasin transfers; and
- Consideration of third party social and economic impacts resulting from voluntary redistributions of water.

TWDB rules also require the RWPGs to "…provide water management strategies to be used during a drought-of-record" and, for each source of supply within a region, identify:

- Factors specific to each source of water supply to be considered in determining whether to initiate a drought response; and
- Actions to be taken as part of the response.

The North East Texas Regional Water Planning Group approach to the evaluation of water management strategies focused on the estimated water supply yield, cost, and the anticipated environmental impact of each water management strategy. In accordance with TWDB guidelines, yield is the quantity of water that is available from a particular strategy under drought-of-record hydrologic conditions. The cost of implementing a strategy includes the estimated capital cost (including construction, engineering, legal, and other costs), the total annualized cost, and the unit cost expressed as dollars per acre-foot of yield. As indicated, cost estimates include the cost of water delivered and treated for end user requirements. Cost estimates were prepared in consideration of TWDB guidelines regarding interest rates, debt service, and other project costs (e.g., environmental studies, permitting, and mitigation). In addition to environmental considerations included in estimates of cost for each strategy, environmental impacts were considered and assessed at a reconnaissance level. A description of the cost estimating procedure is included in Appendix A.

In general, most of the projected water supply needs within the North East Texas Region are associated with relatively small municipal water users and water supply systems in the rural "county-other" water user groups. Overall, the recommended strategies for meeting these needs involve the development of additional groundwater supplies in areas where supply availability is not a constraint or the contractual acquisition of surface water supplies from existing sources. With the exception of proposed new reservoir projects (see Chapter 6), no major water supply development projects are recommended to meet needs within the region. As such, the mostly local solutions proposed for localized water supply problems will not adversely impact other water resources of the state, will not aggravate or increase threats to agricultural and natural resources (see Chapter 1), and will not result in adverse socio-economic impacts to third parties from voluntary redistribution of water (e.g., contractual water sales). Also, to the extent that future interbasin transfers from the North East Texas Region to adjacent regions are contemplated in another region's water plan, it is primarily the responsibility of that region to fully consider the provisions of current state law relating to state authorization of interbasin transfers (Texas Water Code, Section 11.085(k)(1)).

5.2 Regional Summary

5.2 (a) Current and Projected Water Demands

Current and projected water demands within the North East Texas Region are presented in Chapter 2 of this plan. As indicated, moderate population growth is expected to continue through the 50 year planning period, with population increasing from approximately 687,000 at present to over 1 million in 2050. With population growth and continued urbanization, increases in municipal water demands are projected through the planning period. Table 5.1 below summarizes current and projected regional water demands for each of the six major water use categories.

Table 5.1 - Population and Water Demand Projections Summary for the North East Texas Regional Water Planning Area

Regional Total Projection	2000	2010	2020	2030	2040	2050
Population	687,105	757,522	821,294	887,167	952,818	1,017,477
Municipal Water Demand (ac-ft/yr)	118,802	124,561	128,928	135,498	141,548	149,108
Manufacturing Water Demand (ac-ft/yr)	355,258	385,363	390,601	392,864	409,173	427,613
Irrigation Water Demand (ac-ft/yr)	12,566	12,734	12,684	12,637	12,471	12,127
Steam Electric Water Demand (ac-ft/yr)	52,432	72,033	74,033	82,033	82,033	89,533
Mining Water Demand (ac-ft/yr)	10,365	24,191	23,470	22,964	21,923	10,220
Livestock Water Demand (ac-ft/yr)	29,671	29,899	29,951	30,006	29,714	29,273
TOTAL WATER DEMAND (ac-ft/yr)	**579,094**	**648,781**	**659,667**	**676,002**	**696,862**	**717,874**

It is important to note that while urban water demands are projected to increase significantly as a percentage of total regional water demand, manufacturing will remain the dominant water use in the region, accounting for roughly 61 percent of water demand at present and 60 percent of water demand in 2050. Clearly, the manufacturing sector will continue to be a vital component of the region's economy for the foreseeable future.

5.2 (b) Currently Available Water Supply

As discussed in Chapter 3 of this plan, surface water is the primary water source for the North East Texas Region, now and in the future. At present, the water supply from surface water supplies available to the region during drought-of-record hydrologic conditions is approximately 1.47 million ac-ft/yr. This represents more than 60 percent of the total amount of water presently available to the region from all sources (i.e., groundwater and other local sources).

In addition to the supply available from surface water, nearly 877,000 ac-ft./yr. of water supply, or 40 percent of the total water supply is estimated to be available from groundwater sources at present.

5.2 (c) Water Supply Needs

The comparison of projected water demands to estimates of available water supply (Chapter 4) reveals that the North East Texas Region has adequate water supplies for the foreseeable future with existing water resources. However, a user-by-user comparison of supply and demand reveals that 131 entities within the designated water user groups (WUGs) within the North East Texas Region are projected to experience shortages during the 50 year planning period.

Two of the 19 manufacturing “water user groups” in the North East Texas Region (Camp County and Gregg County) show shortages during the 50 year planning period. No shortages are projected for the irrigation, mining, and livestock categories of water use for any of the counties in the region.

Total shortages in all sectors are expected to reach 78,000 acre-ft/yr by the year 2050. Projected shortages within the municipal sector are widespread, with 12 designated municipal water user groups in the region showing shortages at some point during the 50 year planning period. Regionwide, there are two water shortages projected for the manufacturing sector, as discussed above, and the steam electric water user group in Upshur County is projected to need additional supply during the planning period.

5.2 (d) Recommended Water Management Strategies

The Regional Water Planning Group is required by TWDB rules to evaluate all water management strategies that are determined to be “potentially feasible.” Strategies that are not applicable to the conditions or needs of the region can be considered infeasible and excluded from evaluation.

Most of the water supply shortages in the region are projected to occur in rural communities within the municipal “county other” water use category. There are also a few shortages projected to occur in the manufacturing and steam electric power generation categories, as discussed in the previous section. Within the municipal water use category, there are two types of shortages: 1) those that are due to expiration of an existing water supply contract and / or an insufficient contract amount; and 2) actual physical shortages of water where the demand for water is projected to exceed currently available water supplies. With few exceptions, the recommended strategy for addressing the “contractual” water shortages is for the individual water user to renew their contract and / or increase the amount of water that can be supplied under an existing contract. Each water user with a contractual water shortage was contacted and their concurrence with the recommended strategy was requested.

As indicated, most of the municipal water users identified with water supply shortages are small rural communities and rural water supply corporations within the “county other” water user group. Generally speaking, there are only four categories of options for meeting the needs of these water users as follows:

- Advanced Water Conservation
- Water Reuse
- Groundwater
- Surface Water

Presented below is the discussion of the potentially feasible water management strategies selected by the North East Texas RWPG within each option category. Each of the potentially feasible water management strategies listed below correspond with one more of those listed in the TWDB rules.

5.2 (e) Advanced Water Conservation

The adopted water demand projections for municipal water users includes a significant degree of reduction in future per capita water demand. Described as the "expected case" by the TWDB, the water conservation measures imbedded in the approved municipal water demand projections for the North East Texas Region include:

- Compliance with current state and federal plumbing fixture efficiency standards for new construction and fixture replacement;
- Continued implementation of water conservation educational programs;
- Continued implementation of state requirements to develop water conservation programs; and
- Current and expected future levels of effort in the areas of water distribution system leak detection and repair, commercial water conservation, and trends in home appliance water use efficiency.

An "advanced" water conservation scenario has also been evaluated for municipal water users in the North East Texas Region. This scenario, which was developed by the TWDB for the 1997 State Water Plan, includes implementation of all of the measures included in the expected case plus implementation of additional measures by local entities including:

- Accelerated replacement of older, less efficient plumbing fixtures through consumer incentive programs (e.g., rebates for toilet replacement, free low flow shower heads);
- Implementation of landscape irrigation ordinances to require use of low-water use landscaping and efficient irrigation technology;
- Intensified programs to promote water conservation in institutional and commercial establishments;
- Intensified programs to control distribution system water losses; and
- Implementation of conservation oriented water rate structures (e.g., increasing block rates, seasonal rates, excess use rates).

In addition, the advanced water conservation scenario would also involve additional action by the state of Texas, including mandatory implementation of water conservation programs by all municipal water users; a statewide water conservation education program with funding similar to that provided for the "Don't Mess with Texas" highway litter educational program; and requirements for labeling of clothes washers and dishwashers with consumer oriented water use and conservation information.

The North East Texas Regional Water Planning Group established a floor of 115 gallons/person/day in the approved water demand projections. As such, the advanced water conservation scenario was not considered as a strategy for any municipal water user with per capital use ratio below 115 gallons per capita per day.

5.2 (f) Water Reuse

This strategy includes the direct use of reclaimed water for nonpotable purposes (e.g., irrigation, industrial and steam electric cooling water). This strategy was considered applicable only to entities with a central waste water collection and treatment system.

5.2 (g) Groundwater

This strategy includes development of new supply (e.g., drilling additional wells), receipt of a contract supply from another provider, and consideration of advanced treatment scenarios (e.g., demineralization, removal of iron, manganese, or fluoride).

Due to the increasing costs to comply with more stringent regulations and decreasing reliability of groundwater as a future supply source due to quality issues within the region, this strategy was considered applicable only to entities with demands considered small with respect to the entire region. For example, a small, isolated water supply corporation with available groundwater wells and a relatively low demand is a likely candidate for this option.

It is recommended that groundwater supplied systems in the region combine resources and / or solicit future water supply from neighboring systems and / or major water providers in the region where possible. If feasible alternatives become available, such as system grouping or creation of a large surface water supply network, groundwater supply recommendations should be re-evaluated.

5.2 (h) Surface Water

This strategy includes receipt of contract supply from another provider (e.g., water purchase contracts), the development of new supply (e.g., new run-of-the-river diversions, new reservoirs, enhanced yields of existing sources), and consideration of interbasin transfers.

Other strategies listed in the TWDB rules and listed in Section 5.1 are not considered applicable in the North East Texas Region and were therefore not evaluated. For example, brush control and precipitation enhancement are approaches to increasing water supply that do not provide the degree of reliability during drought conditions that is required for municipal, manufacturing, and steam electric uses. Similarly, sea water desalinization, aquifer storage and recovery, water rights cancellations, control of naturally occurring chlorides, and reservoir storage reallocation are not considered to be applicable to the needs of water users in the North East Texas Region.

5.3 Recommended Water Management Strategies

In order to more accurately estimate the water needs in the North East Texas Region, the county other water user group in each of the 19 counties was divided into individual entities. The entities included water supply corporations, special utility districts, freshwater supply districts, unincorporated cities, cities not designated as water user groups by the TWDB, and self-supplied persons.

Senate Bill 1 requires future projects to be consistent with the regional water plans to be eligible for Texas Water Development Board (TWDB) funding and Texas Natural Resource Conservation Commission (TNRCC) permitting. The provision related to TNRCC is found in Texas Water Code §11.134. It provides that the Commission shall grant an application to appropriate surface water, including amendments, only if the proposed appropriation address a water supply need in a manner that is consistent with an approved regional water plan. TNRCC may waive this requirement if conditions warrant. For TWDB funding, Texas Water Code § 16.053(j) states that after January 5, 2002, TWDB may provide financial assistance to a water supply project only after the Board determines that the needs to be addressed by the project will be addressed in a manner that is consistent with that appropriate regional water plan. The TWDB may waive this provision if conditions warrant.

Regional Water Planning Groups (RWPG) recognizes that a wide variety of proposals could be brought before TNRCC and TWDB. For example, TNRCC considers water right applications for irrigation, hydroelectric power, and industrial purposes, in addition to water right applications for municipal purposes. It also considers other miscellaneous types of applications, such as navigation or recreation uses. Many of these applications are for small amounts of water, often less than 1,000 acre-feet per year. Some are temporary.

Small applications to the TNRCC of this nature are consistent with the North East Texas Regional Water Plan, when the surface water uses will not have a significant impact on the region's water even though not specifically recommended in the regional water plan.

TWDB receives applications for financial assistance for many types of water supply projects. Some involve repairing plants and pipelines and constructing new water towers. Water supply projects that do not involve the development of or connection to a new water supply is consistent with the regional water plan even though not specifically recommended in the regional water plan.

A total of 128 entities are projected to have a water shortage in either 2030 or 2050. Of these entities, 78 are contractual related shortages. The remaining 50 entities were actual projected shortages which require consideration of alternative water management strategies.

It should be noted that the cities of Lakeport and Liberty City in Gregg County are water user groups, in accordance with TWDB rules. However, the City of Lakeport is served by Elderville Water Supply Corporation, and the City of Liberty City is served by Liberty City Water Supply Corporation. Liberty City WSC and Elderville WSC are entities included in the county other WUG for Gregg County. In this report, these cities and their respective water supply corporation are considered as one distinct entity.

5.3 (a) Recommended Strategies for Entities with Contractual Shortages

Within the North East Texas Region, there are 78 municipal entities with contractual shortages. Fifty-seven of these shortages are due to expiration of a water supply contract or permit. As discussed in Chapter 4, there are three possible strategies to resolve these shortages. The first, and most common strategy is to renew the contract on or before its expiration date. This strategy is designated with an “E”, for “expiration.” There are some entities that require a renewal of their contract along with an increase in the contracted amount. This strategy is designated with an “EI”, for “expiration and inadequate contract amount.” The Liberty-Danville Freshwater Supply District No. 1 in Gregg County has a contract that is valid for perpetuity, but is inadequate in 2050. For this particular entity, the recommended strategy is to increase their contracted amount. This strategy is designated with an “EI*”. Each of the entities with a contractual shortage is shown in Table 5.2.

It should be noted a Water Supply Contract has been entered into between the City of Texarkana, Texas, and each of the “Member Cities”, being the Cities of Annona, Avery, DeKalb, Hooks, Maud, New Boston and Wake Village, Texas. These cities are members of the Lake Texarkana Water Supply Corporation. The Corporation is organized for the purpose of furnishing a water supply to towns, cities, private corporations, individuals and military camps and bases, and is authorized to obtain money for the purpose of financing the acquisition, construction and maintenance of its projects and improvements and to evidence the transaction by the issuance of bonds to secure the funds so obtained.

In the event that equitable contract renewal terms could not be reached between the parties, an alternative strategy would be for Lake Texarkana Water Supply Corporation to develop its own treatment facilities to supply the member cities. Raw water supply for this entity could be available from Lake Wright Patman and ultimately from the proposed Marvin Nichols Reservoir.

Table 5.2 – Recommended Strategies for Entities with Contractual Shortages

	Shortage (ac-ft/yr)		Groundwater Strategy (ac-ft/yr)		Surface Water Strategy (ac-ft/yr)	
Year	**2030**	**2050**	**2030**	**2050**	**2030**	**2050**
Bowie County						
DeKalb	366	416			366	416
Hooks	484	528			484	528
Maud	149	157			149	157
Nash	324	341			324	341
New Boston	1,280	1,425			1,280	1,425
Redwater	461	628			461	628
Wake Village	743	781			743	781
Burns Redbank WSC	318	364			318	364
Central Bowie WSC	1,121	1,765			1,121	1,765
Macedonia-Eylau MUD #1	1,151	1,412			1,151	1,412
Oak Grove WSC	146	182			146	182
Camp County						
Cass County						
Atlanta	1,416	1,422			1,416	1,422
Queen City	58	92			58	92
Domino	65	85			65	85
Holly Springs WSC	250	322			250	322
Delta County						
Charleston WSC	131	123			131	123
Enloe-Lake Creek WSC	58	54			58	54
West Delta WSC	140	128			140	128
Franklin County						
Mount Vernon	707	780			707	780
Cypress Springs WSC		1,825				1,825
Pelican Bay (CSWSC)		75				75
Gregg County						
Clarksville City	150	161			150	161
Lakeport	119	127			119	127
White Oak	946	1,047			946	1,047
Warren City	49	61			49	61
Elderville WSC	593	767			593	767
Liberty-Danville FWSC 2		10				10
Tryon Road WSC	660	922			660	922
Harrison County						
Hallsville	288	310			288	310
Gum Springs WSC	906	1,161			906	1,161
Leigh WSC	110	131			110	131
Big Oaks Mobil Home Park	12	8			12	8
Cypress Valley WSC	30	76			30	76
Talley WSC	75	98			75	98
Hopkins County						
Brashear WSC	120	121			120	121
Brinker WSC	2	21			2	21

	Shortage (ac-ft/yr)		Groundwater Strategy (ac-ft/yr)		Surface Water Strategy (ac-ft/yr)	
Year	**2030**	**2050**	**2030**	**2050**	**2030**	**2050**
Hopkins County (cont.)						
Gafford Chapel WSC	150	196			150	196
Martin Springs WSC	49	78			49	78
Miller Grove WSC	40	75			40	75
North Hopkins WSC	893	1,030			893	1,030
Pleasant Hill WSC 2	33	37			33	37
Shady Grove #2 WSC	84	94			84	94
Hunt County						
Caddo Mills	183	197			183	197
Commerce	2,132	2,504			2,132	2,504
Greenville	4,875	6,256			4,875	6,256
Lone Oak	97	113			97	113
Quinlan	256	276			256	276
West Tawakoni	244	275			244	275
Steam Electric	516	516			516	516
BHP WSC	301	317			301	317
Caddo Basin SUD		938				938
Cash WSC	1,419	1,558			1,419	1,558
Combined Consumers WSC	925	988			925	988
Community Water	88	81			88	81
Jacobia WSC	92	87			92	87
Maloy WSC	18	32			18	32
North Hunt WSC	298	375			298	375
Lamar County						
Blossom	241	248			241	248
Deport	124	127			124	127
Reno	656	707			656	707
Roxton	101	103			101	103
Lamar County WSD	2,122	2,289			2,122	2,289
M J C WSC	68	65			68	65
Pattonville WSC	43	43			43	43
Marion County						
Morris County						
Rains County						
East Tawakoni	138	160			138	160
Emory	278	329			278	329
Point	141	164			141	164
South Rains WSC	441	531			441	531
Red River County						
410 WSC	274	253			274	253
Annona	41	37			41	37
Avery	75	69			75	69
Red River County WSC	84	46			84	46
Smith County						
Titus County						
Winfield	116	134			116	134

	Shortage (ac-ft/yr)		Groundwater Strategy (ac-ft/yr)		Surface Water Strategy (ac-ft/yr)	
Year	**2030**	**2050**	**2030**	**2050**	**2030**	**2050**
Titus County (cont.)						
Tri Water Supply Corp	1,730	1,935			1,730	1,935
Upshur County						
Van Zandt County						
Edgwood	156	199			156	199
Wills Point	740	867			740	867
Mac Bee WSC	929	1,053			929	1,053
South Tawakoni WSC	736	929			736	929
Wood County						
Winnsboro		699				699

5.3 (b) <u>Recommended Strategies for Entities with Actual Shortages</u>

There are 50 entities in the North East Texas Region with actual projected water supply shortages. Additional groundwater supply is recommended for 34 of these entities. Surface water supplies are recommended for the other 15 entities. Diana WSC in Upshur is recommended for both surface and groundwater. Although there are more individual entities with a recommendation for groundwater, surface water is the predominate recommended supply, accounting for approximately 80 percent of the total supply required. Table 5.3 summarizes these entities.

Table 5.3 – Recommended Strategies for Entities with Actual Shortages

	Shortage (ac-ft/yr)		Groundwater Strategy (ac-ft/yr)		Surface Water Strategy (ac-ft/yr)	
Year	**2030**	**2050**	**2030**	**2050**	**2030**	**2050**
Bowie County						
Camp County						
Manufacturing	2,232	2,232	2,232	2,232		
Cass County						
Linden	106	126			136	176
Bloomburg WSC		20		62		
Delta County						
Ben Franklin WSC	29	27			29	29
Pecan Gap	9	6			38	38
Franklin County						
Gregg County						
Gladewater	281	429			1,679	1,679
Liberty City	311	461	376	470		
Manufacturing	12,671	17,746			12,671	17,746
West Gregg WSC	225	386	242	403		
Harrison County						
Waskom	13	47	44	88		
Blocker-Crossroads WSC	26	60	64	64		
Caddo Lake WSC	16	40	36	72		
Elysian Fields WSC		6		50		
Harleton WSC	178	303			239	309

	Shortage (ac-ft/yr)		Groundwater Strategy (ac-ft/yr)		Surface Water Strategy (ac-ft/yr)	
Year	**2030**	**2050**	**2030**	**2050**	**2030**	**2050**
Harrison County (cont.)						
North Harrison WSC	26	62	67	67		
Waskom Rural WSC No.1	31	74	59	118		
West Harrison WSC	27	60	108	108		
Hopkins County						
Como	12	26	46	46		
Pickton WSC		12		41		
Shirley WSC	20	66	46	92		
Hunt County						
Wolfe City	43	74	80	80		
Tri-County Corp. WSC	22	9			38	38
Lamar County						
Petty WSC	18	17			18	17
Marion County						
Kellyville-Berea WSC	67	108			67	108
Pine Harbor Water System	6	43	108	108		
Shady Shores Water System	14	24	46	46		
Morris County						
Rains County						
Bright Star-Salem WSC	68	214			560	560
Red River County						
Detroit	44	46			106	106
Town of English	3				7	7
Smith County						
Enchanted Lakes Water Co.	64	102	62	62		
Lindale Rural WSC	366	819	591	1,182		
Star Mountain WSC	237	344	323	323		
Titus County						
Upshur County						
East Mountain	140	174	187	187		
Steam Electric	5,601	5,601			5,601	5,601
Diana WSC	162	299	71	71	248	248
Harmony ISD	44	66	48	73		
Pritchett WSC	382	529			532	532
Union Grove WSC	58	106	84	167		
Van Zandt County						
Canton	73	221	108	216		
Grand Saline	163	294	323	323		
Van	99	220	269	269		
Ben Wheeler WSC	23	50	134	134		
Corinth WSC	36	82	108	108		
Crooked Creek WSC	33	70	108	108		
Edom WSC	86	140	46	92		
Fruitvale WSC	242	400	269	430		

	Shortage (ac-ft/yr)		Groundwater Strategy (ac-ft/yr)		Surface Water Strategy (ac-ft/yr)	
Year	**2030**	**2050**	**2030**	**2050**	**2030**	**2050**
Van Zandt County (cont.)						
Little Hope-Moore WSC	179	265			145	145
Wood County						
Mineola	125	276	323	323		
Fouke WSC		27		108		
Lake Fork WSC	253	410	430	430		
TOTALS (all counties)	**24,864**	**33,219**	**7,038**	**8,753**	**22,114**	**27,339**

The development of water wells generally has minimal environmental impact, because of the limited disturbance, and the limited disturbance tends to be temporary. Generally environmental issues can be easily avoided in the siting of new wells. Similarly, the water management strategies that utilize surface water that require the transmission of treated water as opposed to new facilities or the discharge of any material, typically have minimal environmental impact because the disturbances with water mains are also temporary or can be avoided in the routing of the water transmission pipelines. The development of treatment facilities may have greater environmental impact. All of these strategies should avoid, minimize, or mitigate the environmental impacts during project development.

Back-up information on the evaluation of water management strategies for each entity with projected shortages can be found in Appendix A.

5.3 (c) Bowie County

There are no entities with actual shortages in Bowie County.

5.3 (d) Camp County

- **Manufacturing**

Description / Discussion of Needs

Manufacturing in Camp County is projected to have a water supply shortage within the planning period. This projected shortage is related to a proposed poultry processing facility being constructed on Walker Creek east of U.S. Highway 271 between Pittsburg and Mount Pleasant. The facility is being developed by Pilgrim's Pride Corporation and is projected to need 2,232 ac-ft/yr of supply by 2010.

Recommendations

The Pilgrim's Pride facility is not in production at this time and it will be the responsibility of the company to locate an acceptable water source or sources. Sources that are being considered by the company include groundwater from the Carrizo-Wilcox formation, purchase of treated water from area municipal and rural water systems, and surface water purchased from existing water rights holders. Additionally, the plant design will emphasize water reuse and conservation techniques to minimize the need for new water sources.

5.3 (e) Cass County

- **Bloomburg WSC**

Description / Discussion of Needs

Bloomburg WSC, which is included in the County Other for Cass County, provides water service in the northeastern portion of Cass County. The system is not bounded by any immediate water supply corporations or other entities, but is bounded on the east by the State of Arkansas. In 1998 the WSC served approximately 225 connections. The WSC currently serves a population of approximately 543 persons, and is projected to grow to 1,343 persons by the year 2050. The system relies on two wells with a total rated capacity of 230 GPM, or 123 ac-ft/yr. The system currently has a leak detection program in place for water conservation. BWSC does not have either a water conservation plan or a drought management plan. The BWSC is projected to have a water supply surplus of 5 ac-ft/yr in 2030 and a deficit of 20 ac-ft/yr by 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered for Bloomburg WSC because the per capita use rate is below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because the Bloomburg service area does not have a centralized waste water collection system. Surface water alternatives were not considered as there is no surface water supply source within close proximity to the area and surface water treatment is generally not economically feasible for a system of this size.

Recommendations

Additional groundwater is the recommended strategy that is cost effective and reliable for Bloomburg WSC to meet their projected deficit in the year 2040. One additional well with a rated capacity of 115 GPM would provide approximately 62 ac-ft/yr. The strategy would require drilling an additional water well similar to their existing wells. The recommended supply source for the wells would be the Carrizo-Wilcox Aquifer in Cass County. The Carrizo-Wilcox Aquifer in Cass County is projected to have an ample supply availability for Bloomburg WSC.

- **City of Linden**

Description / Discussion of Needs

The City of Linden is located in central Cass County. The system is bounded on all sides by the Western Cass WSC certificate of convenience and necessity area. The Western Cass WSC is currently under construction. In 1998, the city served 992 connections. The city is projected to grow from a current population of 2,465 persons in 2000 to 3,317 persons by the year 2050. The city relies on groundwater from four water wells, which produce a cumulative total of approximately 430 GPM, or 231 ac-ft/yr. The city does not have either a water conservation plan or a drought management plan. The City of Linden is projected to have a water supply deficit of 95 ac-ft/yr beginning in 2000 and increasing to a deficit of 176 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered because the per capita ratio do not exceed the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Although the City of Linden has a centralized waste water collection system, water reuse was not considered because Linden does not have a suitable user of non-potable water. Groundwater was not considered, as the City of Linden has been experiencing steady decrease in the quantity of water from their existing wells. Surface water was considered, as the Northeast Texas Municipal Water District has recently entered into an agreement with the city to provide treated water.

Recommendations

The recommended strategy that is cost effective and reliable for the City of Linden to meet their projected deficits would be to continue their efforts to acquire treated water from the Northeast Texas Municipal Water District. The City of Linden has recently entered into contract with the Northeast Texas Municipal Water District to purchase treated water at a maximum of 800,000 GPD, or 896 ac-ft/yr on an annualized basis. The Northeast Texas Municipal Water District has a water supply line approximately 14 miles from the City of Linden. The City intends to construct a pipe line to connect the source to the City. The City of Linden plans to augment their existing well production with the purchased surface water, gradually increasing the water purchased as their existing wells continue to deteriorate in production. The recommended water supply source, Lake O' The Pines, has an ample supply to meet the needs of the City of Linden.

5.3 (f) Delta County

- **Ben Franklin WSC**

Description / Discussion of Needs

Ben Franklin WSC, which is within the County Other area in Delta County, is a small public water supply located in northern Delta County. In 1998, Ben Franklin served 91 connections. The system currently serves 241 people and is not projected to grow over the planning period. The current source of supply is a single well into the Trinity Aquifer. Ben Franklin WSC provides water to its own customers and also has a supply contract with the Enloe-Lake Creek WSC. Enloe-Lake Creek is projected to have growth over the planning period. Once contract demands are met, Ben Franklin will not have adequate supply to meet its own needs. In addition, the WSC's well does not meet TNRCC secondary water quality standards and is expected to fail sometime after 2020. The system does not have either a water conservation plan or a drought management plan. BFWSC is projected to have a water supply deficit of 9 ac-ft/yr beginning in 2000 and increasing to a deficit of 27 ac-ft/yr in 2050.

Evaluated Strategies

Advanced conservation is not applicable since per capita use is less than 115 gallons per capita per day. There are no current water needs in Ben Franklin that could be met by water reuse. Finally, groundwater is not sufficient or of appropriate quality, as noted above. Conversion to surface water by contracting or merging with Delta County MUD was the alternative selected for evaluation for this entity.

Recommendations

The recommended strategy that is cost effective and reliable for Ben Franklin WSC is to enter into a contract for treated surface water from Delta County MUD. The MUD has adequate supply available and has an expansion project underway which could deliver water to the Ben Franklin area by 2005. Since Delta County MUD already has water available, and since there would be no significant construction, environmental impact would be negligible.

An alternate strategy would be to treat the existing groundwater to meet TNRCC standards. This presumes that the Enloe/Lake Creek need will be met by connection to Delta County MUD, leaving Ben Franklin's well adequate to supply its own needs. Treatment will be required to reduce iron, fluoride, and dissolved solids. Disposal of the waste stream plus technological complexity render this alternative problematic.

- **City of Pecan Gap**

Description / Discussion of Needs

The City of Pecan Gap is located in northwestern Delta County, and is situated in the Sulphur River Basin. In 1998, Pecan Gap served 109 connections. The system currently serves 286 people, and is expected to remain at that population until the year 2050. Pecan Gap is supplied from a city lake and surface water treatment plant. Pecan Gap also supplies water to the Lone Star WSC. Lone Star is not projected to grow during the planning period. The supply is deficient because the firm yield of Lyndsay Lake, the city's reservoir, is insufficient. The system does not have a water conservation plan or a drought management plan. The City of Pecan Gap is projected to have a water supply deficit of 15 ac-ft/yr in 2000.

Evaluated Strategies

Advanced conservation is not applicable since per capita use is less than 115 gallons per capita per day. There are no current water needs which could be met by water reuse. Groundwater quality in the area around Pecan Gap does not meet TNRCC secondary quality standards. Therefore, a water purchase contract with the Delta County MUD was the alternative selected for this entity. There are no other systems in the immediate area with sufficient capacity to supply Pecan Gap.

Recommendations

The recommended strategy that is cost effective and reliable for Pecan Gap is to contract with Delta County MUD for purchase of water from Big Creek Lake. These entities are already in negotiation, and are both agreeable to this strategy. Funding has been offered through the USDA – Rural Development, and that agency has issued a finding of "no significant impact" on the environment. The MUD has adequate supply in the Big Creek Reservoir. Because the entities involved have agreed to this proposed solution, no further alternatives were analyzed.

5.3 (g) Franklin County

There are no entities with actual shortages in Franklin County.

5.3 (h) Gregg County

- **City of Gladewater**

Description / Discussion of Needs

The City of Gladewater is located along the Gregg / Upshur county line, near the eastern border of Smith County. The city provides water service to city residents in both Upshur and Gregg Counties. In 1998, the city served 2,720 connections. The population is projected to increase from 6,896 persons in 2000 to 9,987 persons in 2050. The city is currently contractually obligated to serve three other entities; Clarksville City, Warren City, and Starrville-Friendship WSC. Of these entities, only Starrville-Friendship has a secondary water supply source to complement Gladewater's supply. The city relies on surface water from Lake Gladewater, which is owned and operated by the City. The city is currently permitted by the TNRCC to withdraw 1,679 ac-ft/yr. The city has a water conservation plan in place, which includes universal metering and education and information. The city does not have a drought contingency plan. The system is bounded on the east by the City of Warren City and the City of White Oak; the south by the Sabine River; the west by Starrville-Friendship WSC, and on the north by Pritchett and Union Grove Water Supply Corporations. The City of Gladewater is projected to have a water supply deficit of 157 ac-ft/yr beginning in 2000 and increasing to a deficit of 429 ac-ft/yr in 2050.

Evaluated Strategies

Advanced water conservation was considered as a strategy because the per capita use per day exceeded the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because there are no non-potable water users large within reasonable proximity to wastewater treatment facilities. Surface water was considered, as the city's primary source is surface water from Lake Gladewater.

Recommendations

The City of Gladewater is requesting a water permit amendment to expand to 3,358 ac-ft/yr. The recommended strategy that is cost effective and reliable for the city to meet their projected needs is to continue the permit amendment process and upgrade their water treatment facilities as necessary to expand their treatment capabilities to meet demands. The recommended supply source, Lake Gladewater, with an estimated firm yield of 6,900 ac-ft/yr, has ample supply to provide for the further needs of the City of Gladewater.

- **Manufacturing in Gregg County**

Description / Discussion of Needs

Manufacturing water demand in Gregg County is projected to increase from a current demand of 16,538 ac-ft/yr in 2000 to 29,716 ac-ft/yr in 2050. The projected demand is largely a result of expected industrial growth in and near the City of Longview. Manufacturing in Gregg County relies on four primary supply sources: the Carrizo-Wilcox Aquifer, direct reuse, local supply sources, and the City of Longview water system. The manufacturing WUG in Gregg County is projected to have a water supply deficit of 10,717 ac-ft/yr beginning in 2000 and increasing to a deficit of 17,746 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered because it is not applicable to manufacturing. Water reuse was not considered because there would be no net change in demand required by an entity if reuse were implemented, and the entities are projected entities only, and cannot be construed to benefit from reuse. Groundwater was not considered due to questionable reliability and the large quantity required for manufacturing. Surface water was considered, as the City of Longview has available supply from surface water sources in its water system.

Recommendations

The recommended strategy that is cost effective and reliable for the Gregg County manufacturing WUG to meet projected demands during the planning period is to purchase raw or treated water from the City of Longview. The City of Longview has an ample supply of water to meet the needs of manufacturing in Gregg County.

- **Liberty City WSC (including the City of Liberty City)**

Description / Discussion of Needs

Liberty City WSC provides water service in the rural southern portion of Gregg County. In 1998, the WSC served 1,495 connections. The population is projected to increase from 3,600 persons in 2000 to 6,639 persons in 2050. The City of Liberty City is served by the WSC, and in 1998, approximately 2,778 persons of the total population lived within the city limits of Liberty City. The system is bounded on the north by Prairie Creek and the Sabine River; the east by SH 31; the south by Liberty-Danville FWSD #1 and West Gregg WSC; and on the west by the Smith County line. The system currently relies on five wells with a total rated capacity of 860 GPM, or 462 ac-ft/yr. The system currently has a leak detection program for water conservation. LCWSC does not have either a water conservation plan or a drought management plan. Liberty City WSC is projected to have a water supply deficit of 134.2 ac-ft/yr beginning in 2000 and increasing to a deficit of 461.2 ac-ft/yr in 2050.

Evaluated Strategies

Advanced water conservation was not considered for the County Other portion of LCWSC because the per capita use rate is below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. However, advanced water conservation was considered for the city portion. Water reuse was not considered because the Liberty City area does not have a centralized waste water collection system. Surface water alternatives were also not considered since no supply source is within close proximity to the area, and surface water treatment is generally not economically feasible for a system of this size. LCWSC has purchased water from the City of Kilgore in the recent past, so a purchase agreement alternative was considered.

Recommendations

Liberty City WSC is currently completing plans to construct an additional water well (June, 2000). The recommended strategy that is cost effective and reliable for LCWSC to meet their projected deficits would be to complete construction of this water well, and construct four additional water wells similar to their existing wells. The recommended supply source for the wells would be the Carrizo-Wilcox Aquifer in Gregg County which is projected to have an ample supply available for Liberty City WSC. A total of five additional wells with a rated capacity of 175 GPM each would provide approximately 470 additional ac-ft/yr. The wells should be constructed in the decades when the deficits are projected to occur. Due to the high unit cost of purchasing water from the City of Kilgore, the purchase agreement option is not recommended. Due to the high unit cost of implementing water conservation, advanced water conservation is not recommended.

- **West Gregg WSC**

Description / Discussion of Needs

West Gregg WSC provides water service in the rural southwestern corner of Gregg County, a portion of eastern Smith County, and a small portion of Rusk County. The system is bounded on the north by Liberty City WSC; the east by Liberty-Danville FWSD #1; the south by the City of Kilgore, and the west by the Browning community in Smith County. Approximately 3 percent of the system is outside of the North East Texas Region. In 1997, the system served approximately 1,223 connections. The population is projected to increase from 2,291 persons in 2000 to 5,764 persons in 2050. The WSC is included in the County Other WUG for Gregg and Smith County. The system relies on five wells with a total rated capacity of 640 GPM, or 344.1 ac-ft/yr. Approximately 10.3 ac-ft of this capacity is allocated to users outside of Region D. The system currently has a water conservation plan and a leak detection program. WGWSC has a water conservation plan but does not have a drought management plan. West Gregg WSC is projected to have a water supply deficit of 0.2 ac-ft/yr beginning in 2000 and increasing to a deficit of 385 ac-ft/yr in 2050.

Evaluated Strategies

Advanced water conservation was considered because the per capita use rate exceeded the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because the West Gregg WSC service area does not have a centralized waste water collection system. Surface water alternatives were also not considered since no supply source is within close proximity to the area and surface water treatment is not economically feasible for a system of this size. A 10 year master plan was recently completed for this system and the supply improvements specified in that plan were considered.

Recommendations

The recommended strategy that is cost effective and reliable for West Gregg WSC to meet their projected deficits would be to construct five additional water wells similar to their existing wells. The recommended supply source for the wells would be the Carrizo-Wilcox Aquifer in Gregg County, which is projected to have an ample supply availability for WGWSC. A total of five additional wells at 150 GPM each would provide approximately 403 additional ac-ft/yr. The wells should be constructed in the decades when the deficits are projected to occur. Advanced water conservation is not recommended for WGWSC due to the higher unit cost, as compared to the groundwater strategy. Given the increasing costs to comply with more stringent regulations and decreasing reliability of groundwater as a future supply source due to quality issues in this region, it is recommended that groundwater supply systems consider combining resources and/or soliciting future water supply from neighboring systems and/or major water providers in the region. If a feasible alternative becomes available, then the recommendations previously discussed should be re-evaluated.

5.3 (i) Harrison County

- **Blocker-Crossroads WSC**

Description / Discussion of Needs

Blocker-Crossroads WSC is located in southeastern Harrison County and serves an area east of US Hwy 59 and South of Interstate Highway 20. The system is bound on the west by Gill WSC, on the north by the City of Scottsville, on the east by Waskom Rural WSC No. 1, and on the south by Elysian Fields WSC. In 1999 the system had 330 members. The population is projected to increase from 677 persons in 2000 to 1677 persons in 2050. The BCWSC is included in the County Other water user group for Harrison County. The system's current water supply consists of two water wells which provide water from the Carrizo-Wilcox Aquifer. The total rated capacity of these two wells is 240 GPM which equates to 128 ac-ft/yr on an annual average basis. BCWSC does not have either a water conservation plan or a drought management plan. Blocker-Crossroads WSC is projected to have a water supply deficit of 7 ac-ft/yr in 2020 increasing to a deficit of 60 ac-ft/yr in 2050.

Evaluated Strategies

Advanced conservation was omitted from consideration because the per capita use rate was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was omitted from consideration because the BCWSC does not have a centralized sewerage collection system. Surface water alternatives were also not considered since there is not a supply source within close proximity to the BCWSC and surface water treatment is generally not economically feasible for a system of this size.

Recommendations

The recommended strategy that is cost effective and reliable for the Blocker-Crossroads WSC to meet their projected water needs is to construct one additional water well similar to their existing two wells. The recommended supply source will be the Carrizo-Wilcox Aquifer in Harrison County. A well with rated capacity of 120 gpm would provide approximately 64 ac-ft on an annualized basis. The Carrizo-Wilcox Aquifer in Harrison County is projected to have a more than ample supply availability to meet the needs of BCWSC for the planning period.

- **Caddo Lake WSC**

Description / Discussion of Needs

Caddo Lake WSC is located in northeastern Harrison County and serves the community of Uncertain east of Karnack and west of Caddo Lake. The system is bound on the west by Karnack WSC, on the north by the Big Cypress Bayou, on the east by Caddo Lake, and on the south by the Longhorn Army Ammunition Plant. In 1999 the system had 397 members. The population is projected to increase from 838 persons in 2000 to 1638 persons in 2050. The CLWSC is included in the County Other water user group for Harrison County. The system's current water supply consist of four water wells which provide water from the Carrizo-Wilcox Aquifer. The total rated capacity of these four wells is 267 GPM, which equates to 144 ac-ft/year on an annual average basis. The CLWSC does not have either a water conservation plan or a drought management plan. Caddo Lake WSC is projected to have a water supply deficit of 2.0 ac-ft/yr in 2020 and increasing to a deficit of 40 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal conservation was not considered because the per capita use rate is below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was omitted from consideration because the CLWSC does not have a centralized sewerage collection system. Surface water alternatives were also not considered since there is not a supply source within close proximity to the CLWSC and surface water treatment is not generally economically feasible for a system of this size.

Recommendations

The recommended strategy that is cost effective and reliable for the Caddo Lake WSC to meet their projected water needs is to construct one additional water well similar to their existing wells just prior to the decade in which the deficits occur. The recommended supply source is the Carrizo-Wilcox Aquifer in Harrison County. Two wells with rated capacity of 67 gpm each would provide approximately 36 ac-ft each or 72 ac-ft total on an annualized basis. The Carrizo-Wilcox Aquifer in Harrison County is projected to have a more than ample supply availability to meet the needs of CLWSC for the planning period.

- **City of Waskom**

Description / Discussion of Needs

The City of Waskom is located in southeastern Harrison County and serves the incorporated city limits and an area immediately north, east, and south of the City of Waskom. The system is bound on the east, south, and west by the Waskom Rural WSC No.1 In 1999 the system had 876 connections. The population is projected to increase from 2,301 persons in 2000 to 3,292 persons in 2050. The city is included in the County Other WUG for Harrison County. The system's current water supply consists of eight water wells from the Carrizo-Wilcox Aquifer. The total rated capacity of these wells is 654 GPM, or 352 ac-ft/yr. The City does not have a water conservation plan. The City of Waskom is projected to have a water supply deficit of 2 ac-ft/yr in 2020 and increasing to a deficit of 47 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal conservation was not considered because the per capita use rate is below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because the City does not have a large user of nonpotable water. Surface water alternatives were not considered since there is not a supply source within close proximity to the City and surface water treatment is not economically feasible for a system of this size.

Recommendations

The recommended strategy that is cost effective and reliable for the City of Waskom to meet their projected water needs is to construct one additional water well similar to their existing wells just prior to the decade in which the deficits occur. The recommended supply source will be the Carrizo-Wilcox Aquifer in Harrison County. Two wells with rated capacity of 82 gpm each would provide approximately 44 ac-ft each or 88 ac-ft/yr. The Carrizo-Wilcox Aquifer in Harrison County is projected to have a more than ample supply availability to meet the needs of the City of Waskom for the planning period.

- **Elysian Fields WSC**

Description / Discussion of Needs

Elysian Fields WSC is located in southeastern Harrison County (90 percent Region D) and northeastern Panola County (10 percent Region I). The service area is located along State Highway 31 and in the Elysian Fields Community. The system is bounded on the west by Gill WSC, on the north by Blocker-Crossroads WSC, on the east by Waskom Rural WSC No.1, and on the south by Rock Hill WSC. In 1999 the system had 214 members. The population is projected to increase from 452 persons in 2000 to 852 persons in 2050. The EFWSC is included in the County Other WUG for Harrison County. The system's current water supply consists of two water wells, which provide water from the Carrizo-Wilcox Aquifer. The total rated capacity of these two wells is 185 GPM, which equates to 100 ac-ft/yr. The supply is distributed proportionately between the two counties for this evaluation. EFWSC does not have a water conservation plan or a drought contingency plan. Elysian Fields WSC is projected to have a water supply surplus of 5 ac-ft/yr in 2030 and a deficit of 6 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal conservation was not considered because the per capita use rate was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because the EFWSC does not have a centralized sewerage collection system. Surface water alternatives also were not considered since there is not a supply source within close proximity to the EFWSC and surface water treatment is not economically feasible for a system of this size.

Recommendations

The recommended strategy that is cost effective and reliable for the Elysian Fields WSC to meet their projected water needs would be to construct one additional water well similar to their existing two wells. The recommended supply source will be the Carrizo-Wilcox Aquifer in Harrison County. A well with rated capacity of 90 gpm would provide approximately 50 ac-ft/yr. The Carrizo-Wilcox Aquifer in Harrison County is projected to have a more than ample supply availability to meet the needs of EFWSC for the planning period.

- **Harleton WSC**

Description / Discussion of Needs

Harleton WSC is located in northwestern Harrison County and southwestern Marion County and serves an area around the communities of Harleton, Smyrna, Lake Deerwood, and Jackson. The system is bounded on the west by Diana WSC, on the north by Lake O' the Pines, and on the south by Little Cypress Creek. In 1999 the system had 867 members with 87 percent in Harrison County and 13 percent in Marion County. The population is projected to increase from 1,808 persons in 2000 to 5,408 persons in 2050. The HWSC is included in the County Other WUG for Harrison and Marion Counties. The system's current water supply consists of five water wells from the Carrizo-Wilcox Aquifer. The total rated capacity of these wells is 557 GPM, or 299 ac-ft/yr. HWSC does not have either a water conservation plan or a drought contingency plan. Harleton WSC is projected to have a water supply deficit of 27.7 ac-ft/yr in 2010 and increasing to a deficit of 302.7 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal conservation was not considered because the per capita use rate is below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because the HWSC does not have a centralized sewerage collection system. One surface water alternative was evaluated, which involves purchasing treated water from the Northeast Texas Municipal Water District near Jefferson. A groundwater strategy was evaluated that assumes HWSC can construct water wells of adequate quantity and quality for domestic use. HWSC has had difficulty in the past developing acceptable wells due to poor quality groundwater. The HWSC recently received funding assistance from USDA Rural Utility Services to expand their service area and connect to the NETMWD near Jefferson.

Recommendations

The recommended strategy that is cost effective and reliable for the Harleton WSC to meet their water needs is to construct a treated water main and related facilities to purchase surface water from the Northeast Texas Municipal Water District. The recommended supply source will be Lake O' The Pines in Marion County. NETMWD would initially provide approximately 168 ac-ft/yr and ultimately could provide 309 ac-ft/yr to the HWSC. Lake O' The Pines in Marion County is projected to have a supply available to meet the short term needs of HWSC for the planning period.

- **North Harrison WSC**

Description / Discussion of Needs

North Harrison WSC is located in north central Harrison County and serves an area along US Highway 59 around the community of Woodlawn. The system is bound on the west by the Cypress Valley WSC, on the north and east by a proposed expansion project by Harleton WSC, and on the south by Leigh WSC. In 1999 the system had 330 members. The population is projected to increase from 696 persons in 2000 to 1,746 persons in 2050. The NHWSC is included in the County Other WUG for Harrison County. The system's current water supply consists of two water wells, which provide water from the Carrizo-Wilcox Aquifer. The total rated capacity of these two wells is 250 GPM, which equates to 134 ac-ft/yr. NHWSC does not have either a water conservation plan or a drought contingency plan. North Harrison WSC is projected to have a water supply deficit of 6 ac-ft/yr in 2020 and increasing to a deficit of 62 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal conservation was not considered because the per capita use rate is below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because the NHWSC does not have a centralized sewerage collection system. Surface water alternatives were not considered since no supply source is within close proximity to the NHWSC and surface water treatment is generally not economically feasible for a system of this size.

Recommendations

The recommended strategy that is cost effective and reliable for the North Harrison WSC to meet their water needs is to construct one additional water well similar to their existing wells. The recommended supply source will be the Carrizo-Wilcox Aquifer in Harrison County. One well with rated capacity of 125 gpm would provide approximately 67 ac-ft/yr. The Carrizo-Wilcox Aquifer in Harrison County is projected to have a more than ample supply availability to meet the needs of NHWSC for the planning period.

- **Waskom Rural WSC No.1**

Description / Discussion of Needs

Waskom Rural WSC No.1 is located in southeastern Harrison County and serves an area east, south, and west of the City of Waskom. The system is bound on the west by the City of Scottsville, on the east by the State of Louisiana, and on the south by De Berry WSC. In 1999 the system had 240 members. The population is projected to increase from 506 persons in 2000 to 1,706 persons in 2050. The WRWSC No.1 is included in the County Other WUG for Harrison County. The system's current water supply consist of two water wells which provide water from the Carrizo-Wilcox Aquifer. The total rated capacity of these two wells is 220 GPM, which equates to 118 ac-ft/yr. WRWSC No.1 does not have either a water conservation plan or a drought contingency plan. The Waskom Rural WSC No.1 is projected to have a water supply deficit of 7 ac-ft/yr in 2020 and increasing to a deficit of 74 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal conservation was not considered because the per capita use rate is below the 115 gallons per capita per day threshold set by the planning group. Water reuse was not considered because the WRWSC No.1 does not have a centralized sewerage collection system. Surface water alternatives were omitted since no supply source is within close proximity to the WRWSC No.1 and surface water treatment is generally not economically feasible for a system of this size.

Recommendations

The recommended strategy that is cost effective and reliable for the Waskom Rural WSC No.1 to meet their projected water needs is to construct one additional water well similar to their existing wells just prior to the decade in which the deficits occur. The recommended supply source will be the Carrizo-Wilcox Aquifer in Harrison County. Two wells with rated capacity of 110 gpm each would provide approximately 59 ac-ft each or 118 ac-ft/yr. The Carrizo-Wilcox Aquifer in Harrison County is projected to have a more than ample supply availability to meet the needs of WRWSC No.1 for the planning period.

- **West Harrison WSC**

Description / Discussion of Needs

West Harrison WSC is located in western Harrison County and serves an area on the north, east, and south side of the City of Hallsville. The system is bound on the west by the City of Hallsville and Gum Springs WSC, on the north and east by Talley WSC, and on the south by the Sabine River. In 1999 the system had 397 members. The population is projected to increase from 922 persons in 2000 to 1,972 persons in 2050. The WHWSC is included in the County Other WUG for Harrison County. The system's current water supply consists of three water wells from the Queen City and Carrizo-Wilcox Aquifers. The total rated capacity of these three wells is 300 GPM, or 161 ac-ft/yr. WHWSC does not have either a water conservation plan or a drought contingency plan. West Harrison WSC is projected to have a water supply deficit of 7 ac-ft/yr in 2020 and increasing to a deficit of 60 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal conservation was not considered because the per capita use rate is below the 115 gallons per capita per day threshold set by the water planning group. Water reuse was not considered because the WHWSC does not have a centralized sewerage collection system. Surface water alternatives were not considered since no supply source is within close proximity to the WHWSC and surface water treatment is not economically feasible for a system of this size.

Recommendations

The recommended strategy that is cost effective and reliable for the West Harrison WSC to meet their water needs is to construct one additional water well similar to their largest existing well. The recommended supply source will be the Carrizo-Wilcox Aquifer in Harrison County. One well with rated capacity of 200 gpm would provide approximately 108 ac-ft/yr. The Carrizo-Wilcox Aquifer in Harrison County is projected to have a more than ample supply availability to meet the needs of WHWSC for the planning period.

5.3 (j) Hopkins County

- **City of Como**

Description / Discussion of Needs

The City of Como is located in southeast Hopkins County, and is situated in both the Sabine and Sulphur river basins. It is surrounded by multiple WSCs. Como served 261 connections in 1998. The City's estimated population is 643 people, which is projected to increase to 992 by the year 2050. Como's current source of supply comes from two wells in the Carrizo-Wilcox formation. Water quality meets current TNRCC standards, however the quantity is not sufficient to meet demands. The system does not have either a water conservation plan or a drought contingency plan. The City of Como is projected to have a water supply deficit of 2 ac-ft/yr beginning in 2010 and increasing to a deficit of 26 ac-ft-/yr in 2050.

Evaluated Strategies

There are no current water needs which could be met by water reuse. Advanced municipal conservation is not applicable since per capita use would be less than 115 gallons per capita per day. Finally, connection with a surface water supply source was evaluated (City of Sulphur Springs) and would prove significantly more costly than continued reliance on groundwater. Drilling an additional well was the alternative selected for this entity. The average production capacity of Como's current wells is 95 GPM, which can be projected to yield 46 ac-ft/yr under drought-of-record conditions. One additional well would be sufficient to meet projected demands.

Recommendations

The recommended strategy that is cost effective and reliable for the City of Como is to drill an additional well by the year 2010 into the Carrizo-Wilcox Aquifer. An additional well with a yield of 46 ac-ft/yr would be sufficient to supply the 26 ac-ft/yr deficit. Currently, groundwater quality meets TNRCC standards and the groundwater supply is adequate in this area. Environmental impact would be minimal, and primarily related to any pipeline required to connect the new well to the system.

Como is located approximately eight miles from the City of Sulphur Springs, a major water provider in the North East Texas Region. In the event that groundwater is not available, or should other factors dictate, it is recommended that Como consider soliciting future supply from Sulphur Springs. Sulphur Springs has adequate supply to meet the system's needs.

- **Pickton WSC**

Description / Discussion of Needs

The Pickton WSC is located in Hopkins County, along S.H. 11. It is surrounded by several WSCs serving Hopkins and Wood Counties. In 1998, Pickton served 208 connections. The estimated population served in the year 2000 is 503 and it is projected to increase to 776 persons by the year 2050. Pickton's current source of supply consists of two wells in the Carrizo-Wilcox formation. The rated capacity of these wells is 93 GPM under drought of record conditions, which equates to 98 ac-ft/yr on an annual average basis. Water quality from these wells is in compliance with TNRCC standards, however quantity will not prove sufficient to meet projected demands. The WSC does not have either a water conservation plan or a drought contingency plan. The PWSC is projected to have a water supply surplus of 5 ac-ft/yr in 2020 and a deficit of 12 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal conservation was not considered applicable since per capita use is less than the 115 gallons per capita per day set by the Regional Water Planning Group. Water reuse was not considered applicable since the WSC does not have a wastewater collection or treatment system in place. A surface supply option of connection to the City of Sulphur Springs was considered. Continued use of groundwater is the preferred option.

Recommendations

The recommended strategy that is cost effective and reliable for the Pickton WSC would be to drill one additional well into the Carrizo-Wilcox formation, at a depth of about 500 feet. Environmental impacts are considered minimal, and this aquifer can adequately supply the increase in demand. Purchase of treated surface water from the City of Sulphur Springs would also be feasible, but does not appear cost-effective as long as an adequate quality and quantity of groundwater is available.

- **Shirley WSC**

Description / Discussion of Needs

The Shirley WSC is located in the southwest corner of Hopkins County and the northeast corner of Rains County. It is situated in the Sabine River Basin. Shirley is bound on the west by Miller Grove WSC, and on the east by various small WSCs. In 1998, Shirley served 609 connections. The estimated population in the year 2000 is 1,394, and is projected to grow to 2,290 by the year 2050. Shirley's current water supply comes from seven wells in the Carrizo-Wilcox Aquifer. Water quality meets current TNRCC standards; however, the quantity will not be sufficient to meet projected demands. The system does not have either a water conservation plan or a drought contingency plan. The SWSC is projected to have a water supply deficit of 20 ac-ft/yr in 2030 and increasing to a deficit of 66 ac-ft/yr in 2050.

Evaluated Strategies

Water reuse is not applicable since Shirley has no wastewater collection or treatment system. Advanced municipal conservation is not applicable since per capita use is less than 115 gallons per capita per day. Connection with a surface water supply source was considered (City of Sulphur Springs) and would prove more costly than a groundwater supply. Shirley's existing wells produce an average of 96 GPM, which can be equated to 46 ac-ft/yr in a drought of record situation. Drilling two additional wells will meet the need for this entity.

Recommendations

The recommended strategy that is cost effective and reliable for the Shirley WSC is to drill one additional well into the Carrizo-Wilcox by the year 2030 and a second well between 2030 and 2050. Currently, groundwater quality meets TNRCC standards. Environmental impact would be negligible.

An alternative strategy would be to purchase water from the City of Sulphur Springs. Sulphur Springs is a major water provider, located about five miles from the Shirley service area, and has sufficient water to meet Shirley's need. Connection to Sulphur Springs would initially be more costly than additional well development. However, Shirley's service area is on the outcrop of the Carrizo-Wilcox, and in this area both water quality and quantity problems are common. Difficulties in obtaining additional wells or the increasing complexity of operating a groundwater system could make surface water supply an attractive alternative.

5.3 (k) Hunt County

- **Tri County WSC**

Description / Discussion of Needs

The Tri County Water Corporation is made up of five subdivisions located in Hunt County, which are managed by the Aqua Source Corporation. These subdivisions are Barrow, Country Wood Estates, Quinlan North, Quinlan South, and Crazy Horse Rancheros. These combined systems served 406 connections in 1998. The estimated population in the Tri-County service area in 2000 is 1,357 people, and the population is expected to increase to 1,458 by the year 2050. Tri County's current source of supply comes from several wells in the Woodbine formation. The system does not have a water conservation plan or a drought contingency plan. The Tri-County WSC is projected to have a water supply deficit of 32 ac-ft/yr in 2000.

Evaluated Strategies

Water reuse is not applicable because the system does not have a centralized wastewater collection or treatment facility. Advanced municipal conservation is not applicable since per capita use is less than 115 gallons per capita per day. Groundwater does not meet TNRCC secondary standards in most of the system's wells; therefore, conversion to surface water is recommended if possible.

Recommendations

The recommended strategy that is cost effective and reliable for the Tri-County WSC is to convert from poor quality groundwater to surface water. The five subdivisions comprising this user group are too scattered to be interconnected with one another. Ten out of 11 wells exceed one or more secondary drinking water standards, but the only identified shortage is in the Barrow area. This shortage can be resolved by purchasing treated surface water from Lake Tawakoni through the Ables Springs WSC. Environmental impact would be minimal because an available connection to the Ables Springs system is less than 100 feet from the Barrow service area. Water quality issues in the remaining service areas should be addressed by purchasing treated surface water, either to replace the wells or for blending from Cash WSC.

- **Wolfe City**

Description / Discussion of Needs

The City of Wolfe City is located in northern Hunt County and is situated in the Sulphur River Basin. Wolfe City is bound on the west side by the Hickory Creek SUD, and the City of Commerce is located southeast of the city. In 1998, Wolfe City served 744 connections. The system currently serves 1,633 people, and the population is expected to increase to 2,568 by the year 2050. Wolfe City's current source of supply comes from two city lakes located on Turkey Creek in the South Sulphur River Basin, as well as one well in the Woodbine formation about seven miles west of the city. Water quality meets current TNRCC standards; however, the quantity will not be sufficient to meet projected demands. The system does not have a water conservation plan nor a drought contingency plan. The City of Wolfe City is projected to have a water supply deficit of two ac-ft/yr beginning in 2010 and increasing to a deficit of 74 ac-ft/yr in 2050.

Evaluated Strategies

There are no current water needs which could be met by water reuse. Advanced municipal conservation is not applicable since per capita use is less than 115 gallons per capita per day. The system has a number of surface water options, including connection to the City of Commerce, City of Greenville, or the proposed Ralph Hall Reservoir in Region C. Additional groundwater was the alternative selected for this entity.

Recommendations

The recommended strategy that is cost effective and reliable for the City of Wolfe City is to drill an additional 150 gpm well into the Woodbine Aquifer west of the city, in Fannin County. The time frame for this alternative would be around 2010. The well would discharge into the existing transmission main from the city's current well to town. An intermediate pumping and storage facility would be added to enhance the capacity of the transmission main. This recommendation is made based on limited knowledge of firm yield of the city lakes. No in-depth studies were available indicating either the current firm yield of the reservoirs, or whether dredging or similar enhancements to the storage capacity could improve the firm yield. It is recommended that the city pursue such a study.

Surface water from the proposed Ralph Hall Reservoir in Fannin County near Ladonia could be a long range future supply. The lake is proposed in the Region C plan, but the permit process has not begun and the date of impoundment, if any, is unknown. The city currently operates its own surface water treatment plant; should the future regulatory or economic environment significantly affect this operation, purchase of treated surface water from Commerce or Greenville could be an option.

5.3 (l) Lamar County

- **Petty WSC**

Description / Discussion of Needs

Petty WSC is a small public water supply located in western Lamar County along State Highway 82. It is surrounded on all sides by the Lamar County WSD. In 1998, Petty served 53 connections. The estimated population is 114 in the year 2000 and is projected to be 137 by the year 2050. Petty WSC is included in the County Other water user group for Lamar County. Current source of supply is a single well into the Woodbine formation. Water quality does not meet current TNRCC standards. Backup for the single well is provided through a 6 inch connection to Lamar County WSD. The system does not have either a water conservation plan or a drought contingency plan. PWSC is projected to have a water supply deficit of 18 ac-ft/yr in 2020.

Evaluated Strategies

Advanced municipal conservation is not applicable since per capita use is less than 115 gallons per capita per day, the threshold set by the planning group. There are no current water needs which could be met by water reuse. Groundwater is not of suitable quality. The WSC's existing well is projected to fail by 2020 and a replacement well will not be a viable option, since water quality is below TNRCC minimum standards. Conversion to surface water by contracting with LCWSD was the alternative selected for this entity.

Recommendations

The recommended strategy that is cost effective and reliable is for Petty WSC to enter into a contract for treated surface water with Lamar County Water Supply District when necessary. LCWSD has adequate supply available and already has facilities in place to provide this service. There are no other suppliers in the Petty area with adequate facilities to meet Petty's needs. Given that facilities are in place, capital costs would be negligible. Since LCWSD already has water available, and no significant construction would be required, environmental impact would be negligible.

An alternative scenario would be to treat the existing groundwater to remove fluoride and dissolved solids. The capital cost of this technology, coupled with the problems of disposal of the waste stream, results in surface water being the proposed alternative.

5.3 (m) Marion County

- **Kellyville-Berea WSC**

Description / Discussion of Needs

The Kellyville-Berea WSC is located in central Marion County, west of the City of Jefferson. In 1998, the WSC provided water service to 320 connections. The system is bounded on the east by the City of Jefferson; the south by the Big Cypress River; the west by Mims WSC; and on the north by East Marion County WSC. The population is projected to increase from 581 persons in 2000 to 1,831 persons in 2050. The system is included in the County Other WUG for Marion County. The system relies on groundwater from two water wells. The two wells provide a cumulative total of 165 GPM, or 87 ac-ft/yr. The system does not have either a water conservation plan or a drought contingency plan, but does have a leak detection system in place. KBWSC is projected to have a water supply deficit of 16 ac-ft/yr in 2010 and increasing to a deficit of 108 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was considered because the per capita use per day exceeded the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse not considered because the Kellyville-Berea WSC service area does not have a centralized waste water collection system, and a reuse system is not economically feasible for an entity of this size. Surface water was considered, as the Northeast Texas Municipal Water District (NETMWD) is currently completing construction of a water main to serve the City of Jefferson, which will be located near the Kellyville-Berea system.

Recommendations

The Kellyville-Berea WSC has met with the NETMWD regarding the purchase of treated water from the NETMWD's Jefferson supply line. The NETMWD has an ample supply in their Jefferson Water line to meet the projected needs of Kellyville-Berea WSC. The WSC intends to enter into negotiations with the NETMWD before their supply deficit occurs. The WSC may choose to augment their existing well production with the purchased surface water, gradually increasing the water purchased. The recommended strategy that is cost effective and reliable for the Kellyville-Berea WSC to meet their projected deficits would be to continue their efforts to enter into a water purchase contract with the NETMWD for treated water. The recommended supply source, Lake O' The Pines, has an adequate supply to meets the needs of the Kellyville-Berea WSC.

- **Pine Harbor WSC**

Description / Discussion of Needs

Pine Harbor WSC provides water service on the north side of Lake O' The Pines, in Marion County. The system currently serves approximately 379 customers. The system is bounded on the north by Mims WSC, on the east by Indian Hills Harbor Subdivision, and on the south and west by Lake O' The Pines. The population is projected to increase from 692 persons in 2000 to 1,842 persons in 2050. The system is included in the County Other water user group for Marion County. Pine Harbor WSC relies on two water wells with a combined rated capacity of 285 GPM, or 153 ac-ft/yr. The WSC has a leak detection program in place. PHWSC does not have either a water conservation plan or a drought contingency plan. Pine Harbor WSC is projected to have a water supply deficit of 6 ac-ft/yr in 2030 and increasing to a deficit of 43 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered for PHWSC because the per capita use rate is below the 115 gallons per capita per day threshold set by the water planning group. Water reuse was not considered because the Pine Harbor area does not have a centralized waste water collection system. Surface water alternatives were not considered since no supply source is within close proximity to the area and surface water treatment is generally not economically feasible for a system of this size.

Recommendations

The recommended strategy that is cost effective and reliable for Pine Harbor WSC to meet their projected water needs is to construct an additional water well similar to their existing well No. 2. The well should be constructed before the year 2030. The recommended supply source for the well is the Carrizo-Wilcox Aquifer in Marion County. One well with a rated capacity of 200 GPM would provide approximately 108 ac-ft/yr. The Carrizo-Wilcox Aquifer in Marion County is projected to have an adequate supply availability for the Pine Harbor WSC.

- **Shady Shores WSC**

Description / Discussion of Needs

Shady Shores WSC provides water service on the south side of Lake O' The Pines, in Marion County. The system currently serves approximately 170 customers. The system is bounded on the north by the lake, and there are no organized water supply systems bounding the system on the west, south, or east. The population is projected to increase from 308 persons in 2000 to 658 persons in 2050. The system is included in the County Other WUG for Marion County. Shady Shores WSC relies on one water well with a rated capacity of 85 GPM, or 45 ac-ft/yr. The WSC does not have a conservation plan or a drought contingency plan. Shady Shores WSC is projected to have a water supply deficit of 1 ac-ft/yr in 2010 and increasing to a deficit of 24 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered for Shady Shores WSC because the per capita use per day was below the 115 gallons per capita per day threshold set by the water planning group. Water reuse was not considered because the Shady Shores area does not have a centralized wastewater collection system. Surface water alternatives were omitted since no supply source is within close proximity to the area, and surface water treatment is not economically feasible for a system of this size

Recommendations

The recommended strategy that is cost effective and reliable for Shady Shores WSC to meet their projected water needs is to construct an additional water well similar to their existing well. The well should be constructed before the year 2010. The recommended supply source for the well is the Carrizo-Wilcox Aquifer in Marion County. One well with a rated capacity of 85 GPM would provide approximately 46 ac-ft/yr. The Carrizo-Wilcox Aquifer in Marion County is projected to have an ample supply availability for the Shady Shores WSC.

5.3 (n) <u>Morris County</u>

There are no entities with actual shortages in Morris County.

5.3 (o) <u>Rains County</u>

- **Bright Star-Salem WSC**

Description / Discussion of Needs

The Bright Star-Salem WSC is located in Wood and Rains Counties, near Lake Fork Reservoir. The system lies on the outcrop of the Carrizo-Wilcox, where the aquifer is poorly developed and both quality and quantity are spotty. In 1998, the system served 1460 connections. The estimated population in the year 2000 is 2692 people, and it is expected to increase to 4713 persons by the year 2050. Bright Star's current source of supply consists of 10 wells in the Carrizo-Wilcox Aquifer. Water quality from these wells is generally in compliance with TNRCC standards, except that iron and manganese are a problem in some wells. A filtration plant is used for iron/manganese removal at one well, and chemical sequestration is employed at another. Quantity will not prove sufficient to meet projected demands. The WSC does not have a water conservation plan, but is in the process of creating a drought contingency plan. BSSWSC is projected to have a water supply deficit of 68 ac-ft/yr in 2030 and increasing to a deficit of 214 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered since per capita use is less than 115 gallons per capita per day set by the Regional Water Planning Group. Water reuse was not considered applicable since the WSC does not have a wastewater collection or treatment system in place. Continued use of groundwater is not the preferred long term option because Bright Star's existing well water quantity and quality is unreliable. Conversion to surface water by contracting with the Sabine River Authority would be the preferred alternative for this entity, although there is presently no water available in Lake Fork Reservoir. Should water not be available at the time required, additional wells may be the only available option.

Recommendations

The recommended strategy that is cost effective and reliable for the Bright Star-Salem WSC is to connect with the Sabine River Authority for water from Lake Fork Reservoir. At present, all Lake Fork water is under contract, and the implementation of this strategy will depend on water becoming available in an appropriate time frame. The system has requested a 750,000-gpd allotment from SRA. It is anticipated, however, that Bright Star would convert partially to this surface water supply, while retaining several of its more productive wells. While the current supply shows to be adequate, most of the well supply is in the southeastern part of the system, while a substantial part of the growth is in the far north. Consequently, shortages are being experienced in the northern portions of the system, and another well in that area will be required near term. Should surface water not become available in time, additional wells would be required. These would likely be located in the southern part of the system, and would require associated pumping and transmission facilities to service the northern areas.

5.3 (p) <u>Red River County</u>

- **City of Detroit**

Description / Discussion of Needs

The City of Detroit is located in western Red River County along U.S. Highway 82, and is situated in both the Red and Sulphur Basins. It is surrounded on three sides by the 410 WSC, and on the west by the Lamar County WSD. In 1998, Detroit served 279 connections. The system currently serves 822 people, and is anticipated to grow to 998 by the year 2050. Detroit's current source of supply is a single well into the Trinity formation. The rated capacity of this well is 120 GPM, which equates to 60 ac-ft/yr on an annual average basis. The city does not have either a water conservation plan or a drought contingency plan. The City of Detroit is projected to have a water supply deficit of 46 ac-ft/yr in 2000.

Evaluated Strategies

Advanced municipal water conservation was not considered since per capita use is less than 115 gallons per capita per day. There are no current needs that could be met by water reuse. Continued use of groundwater is not the preferred option because Detroit's existing well water quantity is unreliable, and water quality is below TNRCC secondary standards because of fluoride and total solids. Conversion to surface water by contracting with Lamar County Water Supply District was the alternative selected for this entity.

Recommendations

The recommended strategy that is cost effective and reliable is for the City of Detroit to enter into a contract for treated surface water with Lamar County Water Supply District as soon as possible. LCWSD has adequate supply available, and there are no other systems in the Detroit area with sufficient supply to serve the city. Detroit already has plans and funding in place to tie on to the LCWSD system. A finding of "no significant impact" on the environment has been issued by the USDA for construction of the necessary tie-in facilities.

An alternative strategy would be to treat the existing groundwater. This is considered less desirable than the selected alternative, because (1) an additional well would still be required; (2) technology for this treatment is expensive; and (3) disposal of the waste stream is problematic in the Detroit area.

- **Town of English**

Description / Discussion of Needs

The town of English is located in northeastern Red River County, and is situated in the Red River Basin. It is surrounded on all sides by the Red River County WSC. In 1998, English served 65 connections. The system's year 2000 projected population is 163 people, which is expected to decline to 130 by the year 2050. English's current source of supply comes from two wells in an alluvial formation. The system does not have a water conservation plan or a drought contingency plan. The town of English is projected to have a water supply deficit of 7 ac-ft/yr in 2000.

Evaluated Strategies

English does not have a centralized wastewater collection or treatment system; therefore, water reuse is not an option. Advanced conservation is not applicable since per capita use is less than 115 gallons per capita per day. The alluvial formation in which current wells are located is not considered adequate for increased production. Therefore, surface water was the alternative selected for this entity. Red River WSC has lines very close to English, and is willing to supply the small quantity required to meet the projected deficit.

Recommendations

The recommended strategy that is cost effective and reliable for the town of English is to contract with the Red River WSC for a supplemental supply. The water would be surface water from Lake Wright Patman, purchased by Red River WSC from Texarkana Water Utilities. Red River WSC has three potential points of connection, all within ½ mile of the English system.

English could also purchase its water directly from Texarkana, but the capital cost would be substantially greater, particularly in light of the small amount of water required. A pump station and storage tank would be required, as well as a significant amount of water main.

5.3 (q) Smith County

- **Enchanted Lakes Water Company**

Description / Discussion of Needs

Enchanted Lakes Water Company provides water service in Smith County. Enchanted Lakes Water Company has been sold to and is operated by Aqua Source based in Houston, Texas. In 2000, the WSC served 130 connections, representing a population of approximately 434 persons. The population is projected to be 868 in the year 2050. The system doesn't expect to have more than 260 connections since they only serve one older subdivision. Enchanted Lakes Water Company is included in the County Other water user group for Smith County. The Golden WSC is located northwest of Enchanted Lakes Water Company. The system's current water supply consists of one well which provide water from the Carrizo-Wilcox Aquifer. The total pumping capacity of this one well is 117 GPM, which equates to 62 ac-ft/yr on an annual average basis. ELWC is projected to have a water supply deficit of 4 ac-ft/yr in 2000 and increasing to a deficit of 48 ac-ft/yr in 2050.

Evaluated Strategies

Water reuse was omitted from consideration because the system does not have a centralized sewerage collection system. Surface water alternatives were omitted since there is not a supply source within close proximity to the system.

Recommendations

The recommended strategy that is cost effective and reliable for Enchanted Lakes Water Company to meet their projected water needs is to construct another groundwater well similar to the one existing. The recommended supply source will be the Carrizo-Wilcox Aquifer in Smith County. A well with a rated capacity of 116 Gallon Per Minute would provide approximately 62 ac-ft/yr. This is enough to meet their projected shortages.

- **Lindale Rural WSC**

Description / Discussion of Needs

Lindale Rural WSC provides water service in Smith County. The service area extends to about 6 miles north of downtown Tyler on US Hwy 69, bounded on east by Saline and Hills Creeks, south by County Road 46, west by County RD 411, and north by the old Sabine River channel. In 1998, the WSC served 1,914 connections. The estimated population is 5,164 in the year 2000 and is projected to be 15,079 in the year 2050. Lindale Rural WSC is included in the County Other water user group for Smith County. The system relies on four wells with a total pumping capacity of 1,020 GPM, or 548 ac-ft/yr on an annual average basis. The WSC is currently drilling a well in the same location as the abandoned well #4. When this well is completed, the projected total pumping capacity will be 2,020 GPM, or 1,086 ac-ft/yr. They have a drought contingency plan. LRWSC is projected to have a water supply deficit of 147 ac-ft/yr in 2020 and increasing to a deficit of 819 ac-ft/yr in 2050.

Evaluated Strategies

Water reuse was not considered because the WSC does not have a centralized sewerage collection system. Lindale Rural WSC currently has an emergency water connection with the City of Lindale and is negotiating for surface water with the City of Tyler, therefore surface water alternatives were considered.

Recommendations

The recommended strategy that is cost effective and reliable for Lindale Rural WSC to meet their projected water needs is to construct groundwater wells. The recommended supply source will be the Carrizo-Wilcox Aquifer in Smith County. A well with a rated capacity of 1,100 GPM would provide approximately 591 ac-ft per year. This is enough to meet their projected shortages through the year 2040 but falls short of meeting their projected shortages for the decade of 2050 by 228 ac-ft/yr. The most viable strategy (in terms of unit cost) is to drill another well by the year 2050.

- **Star Mountain WSC**

Description / Discussion of Needs

Star Mountain WSC provides water service in Smith and Gregg Counties. Its service area extends along Texas Highway 271, approximately seven miles along several rural and county roads. In 1998, the WSC served 430 connections. The estimated population is 1,220 in the year 2000 and is projected to be 3,562 in the year 2050. Star Mountain WSC is included in the County Other water user group for Smith County. The system is served by two wells from the Carrizo-Wilcox Aquifer with a total pumping capacity of 200 GPM, or 108 ac-ft/yr on an average annual basis. SMWSC is projected to have a water supply deficit of 78 ac-ft/yr in 2000 and increasing to a deficit of 342 ac-ft/yr in 2050.

Evaluated Strategies

Water reuse was omitted from consideration because the WSC does not have a centralized sewerage collection system. Surface water alternatives were not considered since surface water treatment is not available.

Recommendations

The recommended strategy that is cost effective and reliable for Star Mountain WSC to meet their projected water needs is to construct three additional water wells in the Carrizo-Wilcox aquifer. Three wells with a total rated capacity of 600 GPM would provide approximately 323 ac-ft on an average per year. The first well has to be constructed in the year 2000, the second well has to be constructed by the year 2010, and the third well has to be constructed by the year 2030 for the WSC to meet their water demands.

5.3 (r) Titus County

There are no entities with actual shortages in Titus County.

5.3 (s) Upshur County

- **City of East Mountain**

Description / Discussion of Needs:

The City of East Mountain provides water service in the southern portion of Upshur County and the northern portion of Gregg County. The system is bounded on the west by Union Grove and Pritchett WSC; on the north and east by Glenwood WSC; and on the south by the City of Longview, Clarksville City, and the City of White Oak. The population is projected to increase from 1,237 persons in 2000 to

2,195 persons by 2050. Approximately 78 percent of the population is in Upshur County. The City of East Mountain is included in the County Other WUG for Upshur and Gregg. The city relies on one well with a capacity of 150 GPM, or 81 ac-ft/yr. The City does not have either a water conservation plan or a drought contingency plan. The City of East Mountain is projected to have a water supply deficit of 87 ac-ft/yr beginning in 2000 and increasing to a deficit of 174 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered because the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because the East Mountain area does not have a centralized wastewater collection system. Surface water alternatives were not considered since there is not a supply source within close proximity to the area, and surface water treatment is not economically feasible for a system of this size.

Recommendations

East Mountain has contracted with Glenwood WSC for 50 GPM through an interconnect. The recommended strategy that is cost effective and reliable for East Mountain to meet their projected water needs is to complete their planned interconnect with Glenwood WSC, and construct two water wells similar to their existing well. The first well should be constructed immediately and the second well before the year 2010. The recommended supply source is the Carrizo-Wilcox Aquifer in Upshur County. The interconnect will provide approximately 26 ac-ft/yr. Two wells at 150 GPM each would provide approximately 161 ac-ft/yr, for a total of 187 ac-ft/yr. The Carrizo-Wilcox in Upshur County is projected to have an adequate supply availability for the City of East Mountain.

- **Diana WSC**

Description / Discussion of Needs

Diana WSC is located in eastern Upshur County, northwestern Harrison County, and southwestern Marion County and serves an area around the communities of Diana, Graceton, Stamps, and Ashland. The system is bounded on the west by Bi-County WSC, on the north by Ore City, on the south by Glenwood WSC, and on the east by Harleton WSC. In 1999 the system had 1,380 members with 88 percent in Upshur County, 7 percent in Harrison County, and 5 percent in Marion County. The population is projected to increase from 3,061 persons in 2000 to 7,461 persons in 2050. The DWSC is included in the County Other WUG for Upshur, Harrison, and Marion Counties. The system's current water supply consists of seven water wells from the Carrizo-Wilcox Aquifer. The total rated capacity of these wells is 922 GPM, or 498 ac-ft/yr. DWSC has a water conservation plan and a drought contingency plan. Diana WSC is projected to have a water supply deficit of 81 ac-ft/yr in 2020 and increasing to a deficit of 299 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered because the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because the DWSC does not have an identified demand for non-potable water. One surface water alternative was completed which included participation in a regional system sponsored by the Northeast Texas Municipal Water District and purchasing treated water from a proposed water plant on the south side of Lake O' The Pines. The regional system sponsored by NETMWD is proposed to be constructed in approximately 10 years.

Recommendations

The recommended strategy that is cost effective and reliable for the Diana WSC to meet their projected short term deficit of 81 ac-ft/yr in 2020 would be to construct one additional water well. The recommended supply source will be the Carrizo-Wilcox Aquifer in Upshur County. One well with rated capacity of 132 gpm would provide approximately 71 ac-ft/yr. The Carrizo-Wilcox Aquifer in Upshur County is projected to have a more than ample supply availability to meet the short term needs of DWSC for the planning period.

The recommended strategy that is cost effective and reliable for the Diana WSC to meet their projected long term deficit of 299 ac-ft/yr in 2050 would be to continue to participate in the planned NETMWD southside regional system. The recommended supply source will be Lake O' The Pines in Marion County. The proposed system will have a rated capacity of 460 gpm and would provide approximately 248 ac-ft/yr. Lake O' The Pines in Marion County, through NETMWD, is projected to have supply available to meet the long term needs of DWSC for the planning period.

- **Harmony ISD**

Description / Discussion of Needs

Harmony ISD is located in western Upshur County on State Highway 154 and serves the Harmony School Campus. The system is bounded on the south by Pritchett WSC, on the north by Sharon WSC, and on the east and west by Texas Water Systems Rosewood and Rhonesboro Systems. In 1999 the system had an enrollment of 936 students. The population equivalent is projected to increase from 200 persons in 2000 to 850 persons in 2050. The HISD is included in the County Other WUG for Upshur County. The system's current water supply consists of one water well which provides water from the Carrizo-Wilcox Aquifer. The total rated capacity of the well is 30 GPM which equates to 24 ac-ft/yr on an annual average basis for a school district. HISD does not have either a water conservation plan or a drought contingency plan. Harmony ISD is projected to have a water supply deficit of 2 ac-ft/yr in 2000 and increasing to a deficit of 66 ac-ft/yr in 2050.

Evaluated Strategies

Advanced conservation was not considered because the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because the HISD indicated the downstream landowner was already utilizing their discharge for irrigation on pastures. Surface water alternatives were not considered since there is generally not a supply source within close proximity to the HISD and surface water treatment is not economically feasible for a system of this size.

Recommendations

The recommended strategy that is cost effective and reliable for the Harmony ISD to meet their projected deficit of 1.9 ac-ft in the year 2000 and 65.9 ac-ft in the year 2050 would be to construct one additional water well similar to their existing wells just prior to each decade as the deficits occur. The recommended supply source will be the Carrizo-Wilcox Aquifer in Upshur County. Three wells at 30 GPM each would provide approximately 24 ac-ft each or 73 ac-ft/yr total. The Carrizo-Wilcox Aquifer in Upshur County is projected to have a more than ample supply availability to meet the needs of HISD for the planning period.

- **Pritchett WSC**

Description / Discussion of Needs

Pritchett WSC is located in southwestern Upshur County and eastern Wood County and serves an area around the communities of Pritchett, Center Point, Latch, Shady Grove, and Wilkins. The system is bounded on the west by Fouke WSC, on the north by Sharon WSC and the City of Gilmer, on the south by the cities of Gladewater and Big Sandy, and on the east by Union Grove WSC and Glenwood WSC. In 1999 the system had 2,124 members with 99 percent in Upshur County and 1 percent in Wood County. The population is projected to increase from 4,660 persons in 2000 to 9,702 persons in 2050. The PWSC is included in the County Other WUG for Upshur and Wood Counties. The system's current water supply consists of 14 water wells from the Carrizo-Wilcox Aquifer. The total rated capacity of these wells is 934 GPM, or 504 ac-ft/yr. PWSC does not have either a water contingency plan or a drought management plan. Pritchett WSC is projected to have a water supply deficit of 95 ac-ft/yr in 2000 and increasing to a deficit of 529 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered because the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was omitted because the PWSC does not have centralized sewerage collection system. One surface water alternative was completed which included participation in a regional system sponsored by the Northeast Texas Municipal Water District and purchasing treated water from a proposed water plant on the south side of Lake O' The Pines. The regional system sponsored by NETMWD is proposed to be constructed in approximately 10 years. There are alternative sources of surface water available to PWSC such as the City of White Oak, the City of Gilmer and the City of Gladewater, all of which have been discussing potential contract arrangements with PWSC. All of these alternatives or combination of alternatives have merit and should be evaluated in more detail with council by the WSC engineer, financial advisor, and attorney.

Recommendations

The recommended strategy that is cost effective and reliable for the Pritchett WSC to meet their projected water needs is to construct an emergency connection to either the City of Gilmer, White Oak, or Gladewater to meet the immediate deficits until the NETMWD Lake O' The Pines south side project can be developed. The long term recommended strategy would be to purchase treated water from the NETMWD. The recommended supply source will be the Lake O' The Pines Reservoir in Marion County. The system should provide the projected demand of approximately 532 ac-ft/yr. The NETMWD through Lake O' The Pines in Marion County is projected to have supply to meet the long term needs of PWSC for the planning period.

- **Steam Electric in Upshur County**

Description / Discussion of Needs

The Steam Electric WUG in Upshur County has a demand that is projected to grow from a current demand of 0 ac-ft/yr in 2000 to 5,601 ac-ft/yr in 2050. The projected demand is the result of an expected steam electric generating facility near the City of Gilmer. There are not any existing steam electric facilities in Upshur County. A steam electric utility is currently in negotiations. The Steam Electric WUG in Upshur County is projected to have a water supply deficit of 5,601 ac-ft/yr in 2010 and remaining at a deficit of 5,601 ac-ft/yr to 2050.

Evaluated Strategies

Advanced conservation was not considered because it is not applicable for steam electric utilities. Water reuse was not considered because there would be no net change in demand required by an entity if reuse were implemented, and the entities are projected entities only, and cannot be construed to benefit from reuse. Groundwater was not considered due to questionable reliability and the large quantity required for a steam electric facility. Surface water was considered because the City of Gilmer recently completed construction of Lake Gilmer and has the available supply.

Recommendations

The recommended strategy that is cost effective and reliable for the Upshur County steam electric WUG to meet projected demands during the planning period is to purchase raw water from the City of Gilmer. The City of Gilmer will have an ample supply of water to meet the needs of steam electric in Upshur County once Lake Gilmer is fully operational.

- **Union Grove WSC**

Description / Discussion of Needs

Union Grove WSC is located in southern Upshur County and serves an area around the communities of Union Grove and West Mountain along US Highway 271. The system is bound on the north and west by Pritchett WSC, on the south by the City of Gladewater, and on the east by the City of East Mountain. In 1999 the system had 735 members. The population is projected to increase from 1,637 persons in 2000 to 3,337 persons in 2050. The UGWSC is included in the County Other WUG for Upshur County. The system's current water supply consists of three water wells from the Carrizo-Wilcox Aquifer. The total rated capacity of these three wells is 464 GPM, or 249 ac-ft/yr. UGWSC does not have either a water conservation plan nor a drought contingency plan. Union Grove WSC is projected to have a water supply deficit of 29 ac-ft/yr in 2020 and increasing to a deficit of 106 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered because the per capita use per day was below the 115 gallons per capita per day threshold set by the water Regional Water Planning Group. Water reuse was not considered because the UGWSC does not have a centralized sewerage collection system. Two surface water alternatives were considered including participation in a regional system sponsored by the Northeast Texas Municipal Water District and purchasing treated water from the City of Gladewater. The regional system sponsored by NETMWD was determined to be too costly at this time and was not evaluated further

Recommendations

The recommended strategy that is cost effective and reliable for the Union Grove WSC to meet their projected water needs is to construct one additional water well similar to their existing wells just prior to each decade as the deficits occur. The recommended supply source will be the Carrizo-Wilcox Aquifer in Upshur County. Two wells with rated capacity of 155 gpm each would provide approximately 83 ac-ft each or 167 ac-ft/yr. The Carrizo-Wilcox Aquifer in Upshur County is projected to have supply available to meet the needs of UGWSC for the planning period.

5.3 (t) Van Zandt County

- **Ben Wheeler WSC**

Description / Discussion of Needs:

Ben Wheeler WSC provides water service in Van Zandt and Smith Counties. The system is bordered by the City of Van to the North and Edom WSC to the South. The service area extends to FM 1995 in the north, SH 64 in the south, FM 773 in the west, county line in the east and along FM 1995 and local roads in Smith County. In 1998, the WSC served 617 connections. The estimated population is 1,417 in the year 2000 and is projected to be 2,479 in the year 2050. Ben Wheeler WSC is included in the County Other water user group for Van Zandt (99 percent) and Smith (1 percent) counties. The system relies on three wells, which provide water from the Carrizo-Wilcox Aquifer with a total pumping capacity of 400 GPM or 215 ac-ft/yr on an annual average basis. The WSC is planning to drill one more well about 700 feet deep, which is expected to yield 250 GPM. Ben Wheeler WSC has a drought contingency plan. BWWSC is projected to have a water supply deficit of 7 ac/ft/yr in 2020 and increasing to a deficit of 50 ac-ft/yr in 2050.

Evaluated Strategies

Advanced conservation was not considered as the per capita use per day was below 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered as the WSC does not have a centralized sewerage collection system. Surface water alternatives were not considered since there is not a supply source within close proximity to the WSC.

Recommendations

The recommended strategy that is cost effective and reliable for Ben Wheeler WSC to meet their projected water needs is to construct one additional well. The recommended supply source will be the Carrizo-Wilcox Aquifer in Van Zandt County. A well with a rated capacity of 250 GPM would provide approximately 134 ac-ft/yr. This supply is enough to meet the needs of Ben Wheeler WSC.

- **City of Canton**

Description / Discussion of Needs

City of Canton provides water service in Van Zandt County. The system is bordered by Myrtle Springs WSC to the Northwest and Mac Bee WSC to the Southwest. In 1998, the city served 1,175 connections. The estimated population is 3,559 in the year 2000 and is projected to be 6,232 in the year 2050. The city relies on its groundwater wells from the Carrizo-Wilcox with a total pumping capacity of 205 GPM, or 112 ac-ft/yr and 706 ac-ft/yr from Mill Creek Lake. Lake Canton, is not used due to inadequate treatment capacity. The City of Canton is projected to have a water supply deficit of 73 ac-ft/yr in 2030 and increasing to a deficit of 221 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not evaluated as the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered as the city does not have a demand for non-potable water at this time. Surface water alternatives were not considered since the city lake is no longer being used because it has no treatment capacity. The city has indicated a preference to use groundwater wells.

Recommendations

The recommended strategy that is cost effective and reliable for the City of Canton to meet their projected water needs is to construct an additional well. The first additional well (which is in progress) will take care of the water shortage in the year 2030. The city will still have water shortages of 45 ac-ft in the year 2040 and 113 ac-ft in the year 2050. These shortages can be met by constructing an additional well similar to the other well. The recommended wells will be in the Carrizo-Wilcox Aquifer in Van Zandt County.

- **City of Van**

Description / Discussion of Needs

City of Van provides water service to Van and surrounding area located in Van Zandt (98 percent) and Smith (2 percent) Counties. The city is bordered on the south by Ben Wheeler WSC and Corinth WSC in the northwest. In 1998, they served 1,161 connections. The estimated population is 2,255 in the year 2000 and is projected to be 3,949 in the year 2050. The city relies on three wells with a total pumping capacity of 1,070 GPM, or 575 ac-ft/yr on an average annual basis. Surface water is available from an abandoned supply lake, but the city has not used the treatment plant since 1970 and the plant would require reconstruction and two miles of supply pipeline. The City of Van is projected to have a water supply deficit of 30 ac-ft/yr in 2020 and increasing to a deficit of 207 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered as the per capita use per day was below 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered as the city has no identified use for reuse water. Surface water alternative was not considered as it was cost prohibitive to utilize existing lake and there were no other supply sources in close proximity

Recommendations

The recommended strategy that is cost effective and reliable for the City of Van to meet their projected water needs is to construct one additional well. The recommended supply source will be the Carrizo-Wilcox Aquifer in Van Zandt County. A well with a rated capacity of 500 GPM would provide approximately 269 ac-ft on an annualized basis.

- **City of Grand Saline**

Description / Discussion of Needs

City of Grand Saline provides water service in Van Zandt County. The City is bounded by Golden WSC to the East, Pruitt Sandflat and Corinth WSC to the South, and Fruitvale WSC to the West. In 1998, the city served 1,332 connections. The estimated population is 3,010 in the year 2000 and is projected to be 5,270 in the year 2050. The City relies on four wells in the Carrizo-Wilcox Aquifer with a total pumping capacity of 1,090 GPM, or 586 ac-ft/yr. The City of Grand Saline is projected to have a water supply deficit of 50 ac-ft/yr in 2010 and increasing to a deficit of 294 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was omitted from consideration because the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered as the city does not have a centralized sewer collection system. Surface water alternatives were not considered because there was no viable supply source within close proximity to the city.

Recommendations

The recommended strategy that is cost effective and reliable for the City of Grand Saline to meet their projected water needs is to construct two wells. These two wells, 500 feet deep and with a total pumping capacity of 323 ac-ft will take care of the water shortage in the City of Grand Saline. The recommended wells will be in the Carrizo-Wilcox Aquifer in Van Zandt County.

- **Corinth WSC**

Description / Discussion of Needs

Corinth WSC provides water service in Van Zandt County. In 1997, the WSC served 274 connections. The system is bordered by Pruitt-Sandflat WSC to the East, Fruitvale WSC to the West, City of Grand Saline to the North, and City of Van and Ben Wheeler WSC to the South. The estimated population is 678 in the year 2000 and is projected to be 2,074 in year 2050. The system relies on one groundwater well, which provide water from the Carrizo-Wilcox Aquifer with a total pumping capacity of 258 GPM or 139 ac-ft/yr. Corinth WSC is included in the County Other water user group for Van Zandt County. CWSC is projected to have a water supply deficit of 9 ac-ft/yr in 2020 and increasing to a deficit of 82 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered as the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered as the WSC does not have a centralized sewerage collection system. Surface water alternatives not considered since there is not a supply source within close proximity to the WSC.

Recommendations

The recommended strategy that is cost effective and reliable for Corinth WSC to meet their projected water need is to construct one additional well in the Carrizo-Wilcox aquifer about 200 feet deep. A well with a total pumping capacity of 108 ac-ft will suffice to meet their shortages through the year 2050.

- **Crooked Creek WSC**

Description / Discussion of Needs

Crooked Creek WSC provides water service in Van Zandt County. In 1998, the WSC served 231 connection. The WSC is adjacent to rural roads between FM 859 and State Highway 9. The estimated population is 541 in the year 2000 and is projected to be 1,653 in the year 2050. Crooked Creek WSC is included in the County Other water user group for Van Zandt County. The system relies on one well in the Carrizo-Wilcox Aquifer with a total pumping capacity of 200 GPM, or 106 ac-ft/yr. CCWSC is projected to have a water supply deficit of 12 ac-ft/yr in 2020 and increasing to a deficit of 70 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered as the per capita use per day was below the 115 gallons per capita per day threshold set by the water planning group. Water reuse was not considered as the WSC does not have a demand for nonpotable water at this time. The WSC is considering connections with the City of Canton for surface water.

Recommendations

The recommended strategy that is cost effective and reliable for the Crooked Creek WSC would be to construct a groundwater well. The recommended supply source will be the Carrizo-Wilcox Aquifer in Van Zandt County. A well with a rated capacity of 200 GPM would provide approximately 108 ac-ft on an annualized basis.

- **Edom WSC**

Description / Discussion of Needs

Edom WSC provides water service in Van Zandt and Henderson Counties. In 1998, the WSC served 435 connections. The system is bordered by Ben Wheeler WSC to the northwest and RPM WSC to the northeast. The estimated population is 795 in the year 2000 and is projected to be 2,433 in the year 2050. Edom WSC is included in the County Other water user group for Van Zandt County. The system relies on four wells with a total pumping capacity of 340 GPM, or 183 ac-ft/yr. Edom WSC is planning a future well with a total pumping capacity of 85 GPM, or 46 ac-ft/yr. EWSC is projected to have a water supply deficit of 22 ac-ft/yr in 2030 and increasing to a deficit of 76 ac-ft/yr in 2050.

Evaluated Strategies:

Advanced municipal water conservation was not considered as the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse not considered as the WSC does not have a centralized sewerage collection system. Surface water alternatives were considered since Edom WSC is negotiating with City of Tyler, which is 16 miles away. The cost of this connection would be shared by five other WSC's. The approximate cost of hooking up Edom WSC with the City of Tyler is $ 253,440.

Recommendations

The recommended strategy that is cost effective and reliable for Edom WSC to meet their projected water needs is to construct one additional well similar to their existing wells. The recommended supply source will be the Carrizo-Wilcox Aquifer in Van Zandt County. A well with a total rated capacity of 85 GPM would provide approximately 46 ac-ft/yr. This is enough to meet their projected shortages for the year 2030 but falls short of meeting their projected shortages for the year 2040 and 2050 by 4 ac-ft and 30 ac-ft respectively. To meet these additional shortages, it is recommended that they construct another well similar to the other wells.

- **Fruitvale WSC**

Description / Discussion of Needs

Fruitvale WSC provides water service in Van Zandt County. The system is bordered on the west by MacBee WSC, on the south by Corinth WSC and Crooked Creek WSC, and in the north by South Tawakoni WSC and Grand Saline WSC. In 1998, the WSC served 994 connections. The estimated population is 2,324 in the year 2000 and is projected to be 7,111 in the year 2050. Fruitvale WSC is included in the County Other water user group for Van Zandt County. The system relies on 11 wells with a total pumping capacity of 666 GPM, or 358 ac-ft/yr. FWSC is projected to have a water supply deficit of 51 ac-ft/yr in 2010 and increasing to a deficit of 400 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered as the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because the WSC does not have a centralized sewer collection system. Surface water alternatives were not considered since there is no viable supply source within close proximity to the City. The system plans to continue adding water wells, which are 500 feet deep and have an average capacity of 100 GPM to meet their requirements.

Recommendations

The recommended strategy that is cost effective and reliable for Fruitvale WSC to meet their projected water needs is to construct eight additional wells. Five additional wells will take care of the water shortage till the year 2030. The other additional wells have to be drilled prior to the year 2040 to take care of the water shortages for year 2040 onwards. The five wells with a total rated capacity of 500 GPM would provide 269 ac-ft on an annualized basis. The recommended wells will be in the Carrizo-Wilcox aquifer in Van Zandt County.

- **Little Hope-Moore WSC**

Description / Discussion of Needs

Little Hope-Moore WSC provides water service in Van Zandt County. The WSC is bounded by City of Canton to the southwest, MacBee WSC to the south, and Corinth WSC to the east. In 2000, the WSC served about 500 connections representing a population of approximately 1,282. The population is projected to increase to 3,922 in the year 2050. Little Hope-Moore WSC is included in the County Other water user group for Van Zandt County. The system relies on four groundwater wells, which provide water from the Carrizo-Wilcox Aquifer. The four wells have a total pumping capacity of 345 GPM, or 186 ac-ft/yr. LHMWSC is projected to have a water supply deficit of 39 ac-ft/yr in 2010 and increasing to a deficit of 231 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered as the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered as the WSC does not have a centralized sewer collection system. Groundwater alternative was not considered because of high iron content in the water.

Recommendations

The recommended strategy that is cost effective and reliable for Little Hope-Moore WSC to meet their projected water needs is to buy surface water from the City of Tyler. A contract amounting to 145 ac-ft will take care of the water shortage in Little Hope-Moore WSC. The shortages in the year 2040 and the year 2050 can be avoided by buying more water from the City of Tyler at a cost of $ 73,316 and $140,116 respectively.

5.3 (u) <u>Wood County</u>

- **City of Mineola**

Description / Discussion of Needs

The City of Mineola is located in southwestern Wood County and serves the incorporated city limits and approximately 175 connections adjacent to the city. The system is bounded on the north and west by Ramey WSC, on the east by New Hope WSC and on the south by the Sabine River. In 1999 the system had 2,109 connections. The population is projected to increase from 5,128 persons in 2000 to 8,223 persons in 2050. The City of Mineola is included in the City and County Other water user groups for Wood County. The system's current water supply consists of three water wells in the Carrizo-Wilcox Aquifer. The total rated capacity of these three wells is 1800 GPM which equates to 967 ac-ft/yr on an annual average basis. The City of Mineola does have a water conservation plan and a drought contingency plan. The City of Mineola is projected to have a water supply deficit of 49 ac-ft/yr in 2020 and increasing to a deficit of 276 ac-ft/yr in 2050.

Evaluated Strategies

Water reuse was not considered as the city does not have a demand for nonpotable water at this time. Surface water alternatives were not considered surface water treatment is not economically feasible for a system when groundwater is readily available .

Recommendations

The recommended strategy that is cost effective and reliable for the City of Mineola to meet their projected water needs to construct one additional water well similar to their existing three wells. The recommended supply source will be the Carrizo-Wilcox Aquifer in Wood County. A well with rated capacity of 600 gpm would provide approximately 323 ac-ft on an annualized basis. The Carrizo-Wilcox Aquifer in Wood County is projected to have a more than ample supply availability to meet the needs of the City of Mineola for the planning period. The City of Mineola is under construction of a new well at this time and it is expected to be complete in the year 2000.

- **Fouke WSC**

Description / Discussion of Needs

Fouke WSC is located in south eastern Wood County and serves an area north of the Sabine River, east of Lake Fork Creek, and south of State Highway 154. The system is bound on the east by Pritchett WSC, on the south by the Sabine River, on the west by New Hope WSC, and on the north by Jones WSC and Sharon WSC. In 1999 the system had 1,704 members. The population is projected to increase from 2,837 persons in 2000 to 5,487 persons in 2050. The FWSC is included in the County Other WUG for Wood and Upshur Counties. The system's current water supply consists of five water wells, which provide water from the Carrizo-Wilcox Aquifer. The total rated capacity of these five wells is 1146 GPM, or 616 ac-ft/yr. FWSC does not have either a water conservation plan but does have a drought contingency plan. Fouke WSC has a projected water supply surplus of 81 ac-ft/yr in 2030 and a deficit of 27 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered as the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered as the FWSC does not generally have a centralized sewerage collection system. Surface water alternatives were omitted since there is not a supply source within close proximity to the FWSC and surface water treatment is not economically feasible for a system of this size.

Recommendations

The recommended strategy that is cost effective and reliable for Fouke WSC to meet their projected water needs is to construct one additional water well similar to their existing five wells. The recommended supply source will be the Carrizo-Wilcox aquifer in Wood County. A well with rated capacity of 200 gpm would provide approximately 108 ac-ft on an annualized basis. The Carrizo-Wilcox Aquifer in Wood County is projected to have a more than ample supply availability to meet the needs of the Fouke WSC for the planning period. Fouke WSC is nearing construction of a new well at this time, and it is expected to be complete in the year 2000.

- **Lake Fork WSC**

Description / Discussion of Needs

Lake Fork WSC is located in northwestern Wood County and serves an area north of Lake Fork and south of Hopkins County. The system is bounded on the east, south, and west by Lake Fork, and on the north by Martin Springs WSC. The City of Yantis is completely surrounded by LFWSC. In 1999 the system had 855 members. The population is projected to increase from 1,396 persons in 2000 to 4,996 persons in 2050. The LFWSC is included in the County Other WUG for Wood and Hopkins Counties. The system's current water supply consists of two water wells from the Carrizo-Wilcox Aquifer. The total rated capacity of these wells is 340 GPM, or 182 ac-ft/yr. LFWSC does not have a water conservation plan, but does have a drought contingency plan. Lake Fork WSC has a projected water supply deficit of 16 ac-ft/yr in 2000 and increasing to a deficit of 405 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered because the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because the LFWSC does not have a centralized sewerage collection system. Surface water alternatives were not considered for the near term deficits since no supply source with the available capacity is within close proximity and surface water treatment is not economically feasible for a system of this size. In addition, LFWSC is constructing three new water wells with expected completion in 2000. The groundwater component was broken into two strategies to accommodate the groundwater development project in construction. Surface water alternatives should be considered for the long term deficits since LFWSC is located on Lake Fork, a surface water supply, and as the system grows it will become more feasible to operate a surface water treatment facility. If surface water becomes available from the Lake Fork Reservoir this study should be re-evaluated.

Recommendations

The recommended strategy that is cost effective and reliable for the Lake Fork WSC to meet their projected water needs is to construct eight additional water wells similar to their existing two wells. The recommended supply source will be the Carrizo-Wilcox Aquifer in Wood County. Eight wells with rated capacity of 800 gpm would provide approximately 430 ac-ft on an annualized basis. The Carrizo-Wilcox Aquifer in Wood County is projected to have a more than ample supply availability to meet the needs of the LFWSC for the planning period. The LFWSC is under construction of three new wells with a rated capacity of 300 GPM at this time and it is expected to be complete in the year 2000.

5.3 (v) TNRCC Minimum Installed Capacity Requirements

Specific strategies have been evaluated herein for entities that show a projected supply deficiency based upon evaluation of the overall system and consideration of its projected annual demand. It should be noted however, that some systems may require additional installed capacity for specific pressure planes within their system in order to comply with the TNRCC minimum supply requirement for public water supply systems of 0.6 gpm per meter installed capacity in each pressure plane. Two specific examples of this situation are the Campbell WSC in Hunt County and the Sharon WSC in Wood County. These and other projects that are identified in response to this minimum installed capacity requirement should be considered consistent with this regional plan.

5.4 Regional Drought Preparedness

As noted at the outset of this chapter, TWDB rules for S.B. 1 regional planning require the North East Texas Regional Water Planning Group to "…provide water management strategies to be used during a drought-of-record." Individually and in the aggregate, implementation of the recommended water management strategies will, by definition, meet all of the identified water needs in the region under drought-of-record hydrologic conditions. TWDB guidelines for S.B. 1 regional planning require that the water supply yield of recommended water management strategies be based on the estimated firm or dependable yield of the water source under drought-of-record conditions.

TWDB rules also require the North East Texas Regional Water Planning Group to identify, for each source of supply within a region, "…factors specific to each source of water supply to be considered in determining whether to initiate a drought response; and actions to be taken as part of the response." For surface water supplies within the region, water availability is based on the estimated firm yield of the source during a repeat of the drought-of-record. As such, the primary factor to consider in determining whether to initiate a drought response would be whether and at what point a drought exceeds or becomes worse than the historical drought-of-record. When cumulative inflows are below historical levels by some amount and/or for some defined period (i.e., six months, one-year), it could be determined that a drought worse than the drought-of-record is in progress and some drought response is warranted (i.e., pro rata reduction of contractual water deliveries). A second factor is the actual amount of demand placed on the water source during drought. For example, a drought response indicator for a reservoir might be a comparison of cumulative inflows over a defined time period in comparison to historical cumulative inflows for a similar time period from the drought-of-record. If actual annual demand on the reservoir is well below it's firm yield, drought response measures may not be warranted even if hydrologic conditions are worse than the historical drought-of-record. In any event, these considerations are source and water supplier specific and are best addressed in the individual drought contingency plans of wholesale and retail water suppliers in the region. Such plans are required for all wholesale water suppliers and public water supply systems in the region (Texas Water Code, Section 11.1272).

For water users within the region with needs that are to be met through the development of additional groundwater supplies, water availability estimates for those groundwater sources indicated that there are ample supplies to meet needs under drought-of-record conditions. However, location specific factors could become a constraint on groundwater production during extreme drought. For example, while a groundwater supply may be adequate, production infrastructure (i.e., well capacity and depth of pumps) may limit the amount of water that could be withdrawn if an aquifer were drawn-down significantly during drought. These types of considerations can only be assessed and addressed effectively in local drought contingency plans.

Communities should also encourage their customers to use good water conservation practices and water efficient plumbing fixtures. However, the RWPG does not believe that advanced conservation programs should be prescribed across-the-board for all the public water supply systems in the region. Per capita water use rates in the region are generally low to begin with, and advanced measures, such as incentive-based plumbing fixture retrofits are not considered cost-effective. The RWPG believes such decisions should be made by the local water providers based on their own circumstances but does encourage all public water systems to educate their customers about the long-range importance of conservation. This issue is also addressed in the responses to public comments in Section 7.2 of this plan.

Drought Trigger Conditions by Source

Drought contingency plans the 12 designated major water providers have been filed with the TNRCC. These plans include source-specific "triggering" criteria for most of the major surface water supply sources within the North East Texas Region and define the actions to be taken by each water supplier when triggering criteria are met. This information is summarized in Table 5.4.

Table 5.4 Drought Trigger Conditions by Source and Drought Response Actions for Designated Major Water Providers

Major Water Provider	Source(s)	Drought Response Triggers	Drought Response Actions
City of Greenville	City-owned lakes and contract with the Sabine River Authority for supply from Lake Tawokoni.	Triggers based on City reservoir levels, Lake Tawakoni level, Palmer Drought Severity Index, recharge frequency of the city reservoirs and water demand.	Stage I - voluntary conservation, begin pumping from Tawakoni. Stage II - mandatory water use schedules, limits on fire hydrant water use, pump from Tawakoni. Stage III - Further mandatory water use schedules and restrictions, pump from Tawakoni. Stage IV - Even further mandatory water use schedules and increased restrictions, pump from Tawakoni. If deemed necessary, water rationing is an option. Wholesale customers will be rationed at stages 2-4.

City of Longview	Sabine River Lake Cherokee	Water demand and pumping volume. No source specific triggers.	Staged implementation of voluntary water conservation, mandatory lawn watering schedule, rationing and ban on non-essential uses.
City of Marshall	Big Cypress Bayou	Water demand and source-specific triggers. Stage 1 when water level is 3 feet above city's raw water intake; Stage 2 when water level is 2 feet above intake; Stage 3 when water level is 1 foot above intake.	Staged implementation of voluntary water conservation, terminate water main flushing, unspecified mandatory lawn watering schedule.
City of Mt. Pleasant	Lake Bob Sandlin Lake Cypress Springs Lake Tankersley	Water demand and non-specific source triggers (i.e., declining water levels in Lake Bob Sandlin).	Staged implementation of voluntary water conservation, mandatory lawn watering schedule, and ban on non-essential uses.
City of Paris	Pat Mayse Lake Lake Crook	Water demand and source-specific triggers. State 1 when combined reservoir storage is at or below 80%; Stage 2 when reservoirs at or below 70%; Stage 3 when reservoirs at or below 60%; Stage 4 when reservoirs are at or below 50%.	Staged implementation of voluntary water conservation, mandatory lawn watering schedule, ban on non-essential uses.
City of Sulphur Springs	Cooper Reservoir Lake Sulphur Springs	Water demand and non-specific source triggers (i.e., declining water levels in reservoirs).	Staged implementation of voluntary water conservation, mandatory lawn watering schedule, and ban on non-essential uses.
City of Texarkana	Wright Patman Reservoir	Water demand and source specific triggers. Reservoir elevation at 220.6 feet msl and falling or raw water supply.	Staged implementation of voluntary water conservation, mandatory lawn watering schedule (unspecified), and ban on non-essential uses.

Cherokee Water Company	Lake Cherokee	None specified.	None specified.
Franklin County Water District	Lake Cypress Springs	Stage 1 when lake level is 2 feet below top of inlet structure (90% of conservation storage). Stage 2 when lake level 5 feet below top of inlet structure (75% of storage). Stage 3 when lake level is 8 feet below top of inlet structure (65% of storage).	Regular notification of wholesale customers and media. Request for customer implementation of mandatory lawn water schedule and ban on non-essential use, pro rata allocation of supply.
Northeast Texas Municipal Water District	Lake O' the Pines	Water demand triggers for treated water and source-specific triggers. Stage 1 when reservoir is at or below 50% of capacity. Stage 2 when reservoir is at or below 40% of capacity. Stage 3 when reservoir is at or below 25% of capacity.	Regular notification of wholesale customers and media. Request for customer implementation of voluntary and mandatory lawn water schedule, pro rata allocation of supply.
Sabine River Authority	Sabine River Lake Fork Lake Tawakoni	Stage 1 when combined capacity of Lake Fork and Tawakoni is at or below 75%. Stage 2 when combined capacity is at or below 66% of capacity. Stage 3 when combined storage is at or below 50% of capacity.	Regular notification of wholesale customers and media. Request for customer implementation of voluntary and mandatory lawn water schedule, pro rata allocation of supply.
Titus County Freshwater Supply District No. 1	Lake Bob Sandlin	Stage 1 when reservoir storage is less than 139,000 ac-ft (68%). Stage 2 when reservoir storage is less than 105,800 ac-ft (52%). Stage 3 when reservoir storage is less than 77,750 ac-ft (38%).	Regular notification of wholesale customers and media. Request for customer implementation of voluntary and mandatory lawn water schedule, pro rata allocation of supply.

5.5 Navigation

This regional plan is considered to have negligible effects upon use of the Region's waters for navigation. Only Cypress Creek and the Red River are considered feasible for navigation projects and the plan does not propose additional reservoirs in either basin. As noted in Chapter 1, navigation in the Cypress Basin, Shreveport to Daingerfield, is presently considered infeasible by the U.S. Army Corps of Engineers, both economically and because of significant environmental impacts. Studies continue regarding making the Red River navigable from Shreveport to Texarkana. Current planning, however, envisions the necessary water for this purpose will be taken from existing Corps projects and does not rely on the development of new supply sources.

5.6 Effects of Water Reuse on Future Water Availability

In some areas of Texas, beneficial reuse of reclaimed water (i.e., appropriately treated wastewater) offers significant potential as a strategy to extend available water supplies. However, reuse of reclaimed water also has potential impacts on future water availability in that return flows to a stream may be diminished, thereby potentially effecting water availability for downstream users and instream uses. Current state law and policy allows direct beneficial reuse of reclaimed water under some circumstances without regard for these potential impacts. However, within the North East Texas Region, the effects of reuse on water availability does not appear to be a concern, either now or in the foreseeable future. There are no documented examples of water reuse occurring within the region at present and this regional water plan does not recommend that reuse be implemented as a strategy for meeting any identified water supply needs. Should local water supply entities elect to consider beneficial reuse of reclaimed water as a strategy in the future, the potential adverse effects on return flows and water availability should be evaluated and considered. Also, the completion of new surface water availability models for the river basins within the North East Texas Region will allow for future assessment of the potential effects of reuse on return flows and surface water availability.

5.7 Effects of Instream Flow Requirements on Future Water Availability

Provisions added to the Texas Water Code in 1985 require that instream flow requirements be considered by the TNRCC in its review of applications for new surface water rights permits. Since that time, it has become increasingly common for new water rights permits to include conditions relating to maintenance of instream flows. In some cases, this has been expressed as reservoir release or pass-through requirements or limitations on the amount of water that can be diverted directly from a stream. The intent of such requirements is to provide sufficient instream flows to maintain aquatic and riparian habitat. Reservoir pass-through requirements or limitations on new run-of-the river diversions to maintain instream flows reduce the amount of water available for other beneficial uses.

Under the so-called “four corners” doctrine, conditions placed on existing water rights must be explicitly stated within the permit. Accordingly, surface water supplies currently available for use within the North East Texas Region are determined by existing water rights permits and the conditions attached to each permit. Any instream flow requirements included in existing permits should therefore be reflected in the water supply yield estimates presented in Chapter 3.

Texas Water Development Board rules for regional water planning require that evaluations of water management strategies include consideration of any “…effects on environmental water needs” (31 TAC 357.7(a)(7)). Furthermore, TWDB guidelines require that the State’s Consensus Environmental Guidelines are to be used in the evaluation of new surface water supplies. As part of the *Reservoir Site Assessment Study* performed for the North East Texas Region, the State’s Consensus Environmental Guidelines were applied in the yield analyses for three previously proposed new reservoir projects, the Marvin Nichols I and George Parkhouse II reservoirs in the Sulphur River Basin and the Prairie Creek reservoir in the Sabine River Basin. Specifically, firm yield estimates were determined for each potential project using the State’s guidelines for pass-through of flows from new reservoir projects. These potential reservoir sites are described in Chapter 6.

Relatively minor reductions in the estimated firm yield of the three previously proposed reservoirs result from the application of the State’s Consensus Environmental Guidelines. For the Marvin Nichols I reservoir, the estimated firm yield of the project without pass-through of environmental flows is 557,239 ac-ft/yr. This estimate is reduced to 550,842 ac-ft/yr with the application of the pass-through criteria.

This represents a reduction in future potential firm water supply of 6,397 ac-ft/yr (1.1 percent). The estimated firm yield of the Parkhouse I reservoir is 133,478 ac-ft/yr without environmental pass-through and 131,850 with environmental pass-through criteria applied. This is a reduction of 1,628 ac-ft/yr of future potential firm water supply (1.2 percent). For the proposed Prairie Creek reservoir, the estimated firm yield of the project without pass-through of environmental flows is 20,675 ac-ft/yr, which is reduced to 17,215 ac-ft/yr with pass-through. This represents a 3,460 ac-ft/yr decrease (1.7 percent) in potential future firm water supply.

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6.0 Additional Recommendations Legislative Designation of Unique Reservoir Sites, Ecologically Unique Streams, and Policy Issues

In addition to making recommendations regarding strategies for meeting current and future water needs, TWDB rules for S.B. 1 regional planning allow the regional water planning groups (RWPG) to include recommendations in the regional water plan with regard to unique sites for reservoir development, legislative designation of ecologically unique streams, and policy issues. The North East Texas RWPG elected to consider recommendations in each of these areas, which are presented in this chapter.

6.1 Reservoir Sites

TWDB rules (31 TAC, Section 357.9) for the preparation of regional water supply plans provide that the regional water planning groups *"...may recommend sites of unique value for construction of reservoirs by including descriptions of the sites, reasons for the unique designation and the expected beneficiaries of the water supply to be developed at the site."* TWDB rules further specify that the following criteria are to be applied to determine whether a site is unique for reservoir construction:

(1) site-specific reservoir development is recommended as a specific water management strategy or in an alternative long term scenario in an adopted regional water plan;

(2) the location, hydrologic, geologic, topographic, water availability, water quality, environmental, cultural, and current development characteristics, or other pertinent factors make the site uniquely suited for:

(a) reservoir development to provide water supply for the current planning period; or
(b) where it might reasonably be needed to meet needs beyond the 50 year planning period.

Pursuant to TWDB rules, the approved scope of work for the preparation of the North East Texas Regional Water Plan included a subtask to *"...determine which sites for future reservoir development to include in the regional water plan."* Accordingly, consultants to the North East Texas RWPG conducted a "reconnaissance-level" assessment of previously identified reservoir sites in the region. This assessment was based on a review and limited update of information contained in previous studies for 17 reservoir sites. It should be noted that the "proposed" and "potential" designations used here and in the *Reservoir Site Assessment Study* (Appendix B) were made only to assist in the planning process and are not intended to convey a relative priority among the various reservoir sites.

The 1997 State Water Plan recommended development of two new reservoirs within the North East Texas Region – the George Parkhouse II reservoir project (Lamar County) and the Marvin Nichols I reservoir project (Red River, Franklin, Morris and Titus counties), both of which are located within the Sulphur River Basin. It is noted in the 1997 State Water Plan that development of the Nichols I reservoir could eliminate or significantly delay the need for the Parkhouse II reservoir. Also, the recently completed *Comprehensive Sabine Watershed Management Plan* includes a recommendation that the Sabine River Authority develop the Prairie Creek Reservoir and Pipeline Project (Gregg and Smith counties) to supply projected needs within portions of the North East Texas Region. It should be noted that the Prairie Creek Reservoir and Pipeline Project is being pursued at this time because of the federal fish and wildlife conservation easement limitation on the Waters Bluff reservoir site. If the conservation easement were removed, the Waters Bluff reservoir would be the Sabine River Authority's top priority project to meet projected water needs in the upper Sabine River Basin.

In addition to the Martin Nichols I, George Parkhouse II, and Prairie Creek reservoir sites, available information on 14 other reservoir sites within the North East Texas Region were also reviewed. These are:

Cypress Creek Basin

Black Cypress (Cass and Marion)
Caddo Lake Enlargement (Marion and Harrison)
Little Cypress (Harrison)

Red River Basin

Barkman (Bowie)
Big Pine (Lamar and Red River)
Liberty Hills (Bowie)
Pecan Bayou (Red River)

Sabine River Basin

Big Sandy (Wood and Upshur)
Carl Estes (Van Zandt)
Carthage (Harrison)
Kilgore II (Gregg and Smith)
Waters Bluff (Wood)

Sulphur River Basin

Marvin Nichols II (Titus)
Parkhouse I (Delta and Hopkins)

Figure 6.1 shows the approximate location of the previously proposed and potential reservoir sites in the North East Texas Region.

The *Reservoir Site Assessment Study* (Appendix B) provided information on various characteristics of each reservoir site, including:

- Location;
- Impoundment size and volume;
- Site geology and topography;
- Dam type and size;
- Hydrology and hydraulics;
- Water quality;
- Project firm yield for water supply;
- Other potential benefits (e.g., flood control, hydro power generation, recreation);
- Land acquisition and easement requirements;
- Potential land use conflicts;
- Environmental conditions and impacts from reservoir development;
- Local, state, and federal permitting requirements; and,
- Project costs updated to second quarter 1999 price levels using the *Engineering News Record* Construction Cost Index.

6.1(a) <u>Cypress Creek Basin</u>

As indicated above, three potential reservoir sites in the Cypress Creek Basin were included in the *Reservoir Site Assessment Study* (Appendix B) for the North East Texas Region – Black Cypress, the enlargement of Caddo Lake, and Little Cypress. Each potential site is briefly described below.

Insert Figure 6.1

6.1(b) Black Cypress

The Black Cypress reservoir site is located on the Black Cypress Bayou in Cass and Marion counties, north of Lake O' the Pines and about seven miles northwest of the City of Jefferson. The dam site is located at River Mile 17.0. Preliminary analyses of the site describe a conservation pool at an elevation of 253.0 feet mean sea level (msl), which would give the reservoir a conservation storage capacity of 447,262 ac-ft and a surface area of 21,951 acres. The reservoir would also have a flood pool of 230,000 ac-ft at an elevation of 262.0 feet msl with a surface area of 29,214 acres. The maximum design water surface elevation would be 270.98 feet msl, which would give the reservoir a total storage capacity of 972,206 ac-ft and a total surface area of 38,329 acres.

Previous studies describe a 74.59 foot high earth filled dam with a top elevation of 274.59 feet msl. The spillway would be a high crest ogee overflow, 600 feet long with a vertical upstream face, and a crest length of 600 feet. The outlet works would consist on a single 10 foot diameter conduit and two 4.5 foot by 10 foot gates.

The estimated firm yield of the project would be 176,770 ac-ft/yr. However, it should be noted that this estimate does not reflect application of the state environmental water needs criteria. Total costs to develop the reservoir are estimated to be approximately $350.6 million, with an annualized unit cost of $149 per ac-ft ($.046/1,000 gallons) firm yield. Potential beneficiaries of the project include municipal and industrial users within the Cypress Creek Basin and/or water users outside of the basin. In addition to water supply, other potential benefits of the project include recreation, flood control, and hydroelectric power generation.

Based on available information, there are no wetland mitigation banks or conservation easements within or adjacent to the reservoir site. However, the Texas Parks & Wildlife Department has identified Black Cypress Bayou as a potential ecologically unique stream segment that would be in conflict with the development of the reservoir. Analysis also indicates that there are three municipal solid waste landfill site and one Superfund site in the reservoir study area. There are no permitted industrial or hazardous waste locations or air quality monitoring stations in or near the reservoir site. State and federal agency listings for threatened, endangered, or rare plant or animal species indicate that several species potentially occur or have habitat in the project location. The reservoir site is also within and adjacent to an area that has been classified by the U.S. Fish & Wildlife Service as having excellent quality bottomlands of high value to waterfowl. Also, available data indicates that there are two hydric soil associations within the reservoir site. The number of hydric soil associations does not indicate the number of potential wetlands, but rather that a wetland area could occur where these hydric soil associations exist.

6.1(c) Caddo Lake Enlargement

Caddo Lake is located in the Cypress Creek basin and forms part of the boundary between Harrison and Cass counties. The lake currently has a storage capacity of 128,600 ac-ft and has a surface area of 25,400 acres at a mean lake elevation of 168.5 msl. Raising the elevation of Caddo Lake by two feet would provide an additional 186,500 ac-ft of storage and, based on previous studies, would increase the firm yield of the reservoir by approximately 94,160 ac-ft/yr. The total cost to increase the storage capacity of Caddo Lake is estimated to be nearly $214 million (1999 dollars). The total annualized cost considering debt service and operation and maintenance is approximately $18 million, which results in a cost per ac-ft of firm yield of $195 ($0.60/1,000 gallons). Potential beneficiaries of the project include municipal and industrial users within the Cypress Creek Basin and/or water users outside of the basin. In addition to water supply, other potential benefits of the project could include recreation and some amount of flood control.

Based on readily available information, there are no wetland mitigation banks or conservation easements within or adjacent to the reservoir site. However, the Texas Parks & Wildlife Department has identified Black Cypress Bayou and Cypress Creek as potential ecologically unique stream segments that would be in conflict with the enlargement of the reservoir. Analysis also indicates that there is one municipal solid waste landfill site and one Superfund site in the reservoir study area. There are no permitted industrial or hazardous waste locations or air quality monitoring stations in or near the reservoir site. State and federal agency listings for threatened, endangered, or rare plant or animal species indicate that several species potentially occur or have habitat in the project location. The reservoir site is also within and adjacent to an area that has been classified by the U.S. Fish & Wildlife Service as having excellent quality bottomlands of high value to waterfowl and is within or adjacent to an area classified as having good quality bottomlands with moderate waterfowl benefits. Also, available data indicates that there are three hydric soil associations within the reservoir site. The number of hydric soil associations does not indicate the number of potential wetlands, but rather that a wetland area could occur where these hydric soil associations exist.

6.1(d) Little Cypress

The Little Cypress reservoir site is located approximately nine miles northwest of the City of Marshall, within Harrison County. The dam site is at River Mile 21.3 on the Little Cypress Bayou. Previous studies have evaluated a reservoir with a conservation pool elevation of 233.1 feet msl, with a storage capacity of 217,234 ac-ft. The maximum design water surface elevation would be 252.0 feet msl. An earth fill dam 58 feet high and with a crest length of 7,000 feet would be constructed to form the reservoir. The dam would have an ogee weir type spillway with a crest elevation of 233.1 and a 400 foot crest length. The outlet works would consist of a single conduit with a 10 foot diameter and two 4.5 foot by 10 foot gates.

Previous studies of the Little Cypress reservoir site have evaluated a project with a firm yield of 144,900 ac-ft/yr. In current dollars (1999), the total cost to develop the reservoir would be approximately $290.8 million with an annualized cost of nearly $22 million. The unit cost of water from the project on an annualized basis would be $151 per ac-ft ($0.47/1,000 gallons) of firm yield.). Potential beneficiaries of the project include municipal and industrial users within the Cypress Creek Basin and/or water users outside of the basin. In addition to water supply, other potential benefits of the project could include recreation and some amount of flood control.

Based on readily available information, there are no potential ecologically unique stream segments of high importance, wetland mitigation banks, or conservation easements within or adjacent to the reservoir site. The potential Little Cypress reservoir is within and adjacent to the Little Cypress Bayou site and listed as priority two: good quality bottomlands with moderate waterfowl benefits. Analyses indicate that there are no municipal solid waste landfill sites, Superfund sites, permitted industrial or hazardous waste locations, or air quality monitoring stations in or near the reservoir site. State and federal agency listings for threatened, endangered, or rare plant or animal species indicate that several species potentially occur or have habitat in or near the project location. Also, available data indicates that there are five hydric soil associations within the reservoir site. The number of hydric soil associations does not indicate the number of potential wetlands, but rather that a wetland area could occur where these hydric soil associations exist.

A summary of key characteristics of the three reservoir sites that were examined in the Cypress Creek Basin is provided in Table 6.1.

Table 6.1 Potential Reservoir Sites in the Cypress Creek Basin

Reservoir Site	Conservation Storage (ac-ft)	Surface Area (acres)	Firm Yield (ac-ft/yr)	Total Project Development Cost ($1,000)	Annualized Cost Per ac-ft
Black Cypress	447,262	21,951	176,770	$ 350,631	$ 149
Caddo Lake	186,500	3,350	94,090	$ 213,752	$ 195
Little Cypress	217,324	15,763	144,900	$ 290,759	$ 151

6.1(e) Red River Basin

The scope of work for the *Reservoir Site Assessment Study* (Appendix B) identified Barkman, Liberty Hills, and Big Pine as potential reservoir sites within the portion of the Red River Basin that lies within the North East Texas Region. These sites are also listed in the 1997 State Water Plan as potential sites. However, a thorough search for previous studies and reports on these sites found little documentation on the Barkman and Liberty Hills sites. The Liberty Hills site is, also located in Bowie County.

Potential beneficiaries of new reservoirs in the Red River Basin portion of the North East Texas Region include municipal and industrial users within the basin and/or users outside of the basin. Other potential benefits include recreation, hydroelectric power generation, and flood control.

6.1(f) Barkman

The Barkman site is located near the City of Texarkana in Bowie County. This site has apparently not been studied in detail as no information was found with regard to type and size of the dam, project firm yield, or costs.

The U.S. Fish and Wildlife Service (USFWS) and TPWD combined lists for threatened, endangered, or rare species identify eight birds, three fish, two mammals, three reptiles, and one vascular plant to potentially occur or have habitat within the potential Barkman reservoir project location. Current Natural Resource Conservation Service (NRCS) data shows six hydric soil associations are within the potential Barkman reservoir footprint. The number of hydric soil associations does not indicate the number of potential wetlands, but rather that a wetland area could occur where these hydric soil associations exist. There are no known existing or proposed wetland mitigation bank projects, no designated bottomland hardwood areas, no high importance ecologically unique stream segments, and no conservation easements that are located near or adversely affected by the potential Barkman reservoir. The analyses indicate that there are no recorded Superfund sites, municipal solid waste landfill sites, permitted industrial and hazardous waste locations, or air quality monitoring stations located within reservoir study area.

6.1(g) Liberty Hill

The Liberty Hill site is also located in Bowie County on Mud Creek. The preferred alternative site is located about three miles upstream of the authorized site, near the Davenport Road crossing at river mile 7.8. This site has apparently not been studied in detail as no information was found with regard to type and size of the dam, project firm yield or costs.

The USFWS and TPWD combined lists for threatened, endangered, or rare species lists eight birds, three fish, two mammals, three reptiles, and one vascular plant to potentially occur or have habitat within the potential Liberty Hills project location. There are no known existing or proposed wetland mitigation bank projects, no designated bottomland hardwood areas, no high importance ecologically unique stream segments, and no conservation easements that are located near or adversely affected by the potential Barkman reservoir. The analyses indicate that there are no recorded Superfund sites, municipal solid waste landfill sites, permitted industrial and hazardous waste locations, or air quality monitoring stations located within reservoir study area. Current NRCS (Natural Resource Conservation Service) data shows one hydric soil association is within the potential Liberty Hills reservoir footprint. The number of hydric soil associations does not indicate the number of potential wetlands, but rather that a wetland area could occur where these hydric soil associations exist.

6.1(h) Big Pine

The Big Pine site is located on Pine Creek primarily in Red River County with a small portion of the reservoir area located in Lamar County. The land area required for the reservoir is 9,200 acres. No information was found regarding the type and size of the dam. The project has an estimated firm yield of 35,840 ac-ft/yr and a project development cost of approximately $52.4 million dollars. The cost per ac-ft of firm yield on an annualized basis is $129 ($0.39/1,000 gallons). This site has apparently not been studied in detail as no information was found with regard to type and size of the dam, project firm yield or costs.

The USFWS and TPWD combined lists for threatened, endangered, or rare species lists seven birds, four fish, three mammals, one mollusk, four reptiles, and one vascular plant to potentially occur or have habitat within the potential project location. There are no known existing or proposed wetland mitigation bank projects, ecologically unique stream segments of high importance, and no conservation easements that are located near or adversely affected by the potential Barkman reservoir. The analyses indicate that there are no recorded Superfund sites, municipal solid waste landfill sites, permitted industrial and hazardous waste locations, or air quality monitoring stations located within reservoir study area. Current NRCS (Natural Resource Conservation Service) data shows no hydric soil associations within the potential Big Pine reservoir footprint. The potential Big Pine reservoir is located within the Red River basin, which represents a negligible quantity of the remaining bottomland hardwood in Texas. The potential Big Pine reservoir is within and adjacent to the Sulphur River Bottom West site and listed as priority one: excellent quality bottomlands of high value to waterfowl.

6.1(i) Sabine River Basin

A number of potential reservoir sites in the upper portion of the Sabine River Basin have been previously studied and were reviewed in the *Reservoir Site Assessment Study* (Appendix B). These are the Big Sandy, Carl Estes, Carthage, Kilgore II, Prairie Creek, and Waters Bluff sites, each of which is described below.

6.1(j) Big Sandy

The Big Sandy reservoir site is located in Upshur and Wood counties at River Mile 10.6 of the Big Sandy Creek north of the City of Big Sandy. At an elevation of 336 feet msl, the conservation storage capacity of the reservoir would be 69,300 ac-ft and it would cover 4,400 surface acres. An earth fill dam 54 feet high and with a crest length of 2,175 feet would be constructed to create the impoundment. The outlet works would consist of a 10 foot diameter conduit controlled by two 4.5 foot by 10 foot gates.

The estimated firm yield of the Big Sandy Reservoir would be 46,600 ac-ft/yr. Total cost to develop the project is estimated to be $79.6 million. The annualized cost per ac-ft of firm yield would be $133 ($0.41/1,000 gallons). Potential beneficiaries of the project include municipal and industrial water users within the upper portion of the Sabine River Basin and/or water users outside of the basin. Recreation is another potential benefit of the project.

Based on available information, there are no potential ecologically unique streams of high importance, wetland mitigation banks, or conservation easements within or adjacent to the site. Analysis also indicates that there is one municipal solid waste landfill site and no Superfund sites, permitted industrial and hazardous waste locations, or air quality monitoring stations located within or adjacent to the reservoir study area. State and federal agency listings for threatened, endangered, or rare species lists seven birds, four fish, three mammals, one mollusk, four reptiles, and one vascular plant to potentially occur or have habitat within the proposed project location. The reservoir site is also within and adjacent to two areas that have been classified by the U.S. Fish & Wildlife Service as having good quality bottomlands with moderate waterfowl benefits. The marsh area has previously been identified as a significant stream segment by TPWD. Also, available data indicates that there are two hydric soil associations within the reservoir site. The number of hydric soil associations does not indicate the number of potential wetlands, but rather that a wetland area could occur where these hydric soil associations exist.

6.1(k) Carl Estes

The Carl L. Estes reservoir site is located on the main-stem of the Sabine River at River Mile 479.7, approximately eight miles west of the City of Mineola. The reservoir would inundate land in portions of Rains, Wood, and Van Zandt Counties. The conservation storage capacity of the reservoir at an elevation of 379.0 feet msl would be 393,000 ac-ft and the reservoir would inundate 24,900 surface acres. The reservoir would have a flood pool elevation of 403.0 feet msl, which would store 1,205,200 ac-ft with a surface area of 44,000 acres. The dam would be approximately 15,800 feet in length and constructed of compacted earth fill. The flood spillway would be an uncontrolled ogee shaped spillway with a crest elevation of 403.0 feet msl. The outlet works for the dam would consist of a multilevel opening to a 180 inch diameter conduit through the dam and a stilling basin.

The optimal project size in terms of unit costs of water would provide a firm yield of 95,630 ac-ft/yr. The estimated cost to develop the reservoir is $374.9 million. The project would provide water at a unit cost of approximately $300 per ac-ft ($0.93/1,000 gallons) of firm yield. Estimated costs may not accurately reflect bottomland hardwood mitigation costs. Potential beneficiaries of the project include municipal and industrial water users within the upper portion of the Sabine River Basin and/or water users in the Trinity River Basin. In addition to water supply, other potential benefits of the project include recreation, hydroelectric power generation, and flood control.

Based on readily available information, there are no potential ecologically unique streams of high importance or conservation easements within or adjacent to the reservoir site. The potential Carl Estes reservoir is within and adjacent to the Sulphur River Bottom West site and is listed as Priority 2 bottomland hardwoods: good quality bottomlands with moderate waterfowl benefits. There is a proposed wetland mitigation bank project that is located near the reservoir site. Analysis also indicates that there are two municipal solid waste landfill site but no Superfund sites, permitted industrial and hazardous waste locations, or air quality monitoring stations located within or adjacent to the reservoir study area. State and federal agency listings for threatened, endangered, or rare plant or animal species indicate that seven birds, four fish, three mammals, one mollusk, four reptiles, and one vascular plant species potentially occur or have habitat in the project location. Also, available data indicates that there are four hydric soil associations within the reservoir site. The number of hydric soil associations does not indicate the number of potential wetlands, but rather that a wetland area could occur where these hydric soil associations exist. The project may negatively impact two downstream reaches of the Sabine River identified by TPWD as “significant stream segments” due to unique federal holdings and the bottomland hardwood.

6.1(l) Carthage

The Carthage reservoir site is located on the main stem of the Sabine River immediately upstream of the U.S. Highway 59 crossing and downstream of the City of Longview. The reservoir site is located in portions of four counties: Gregg, Harrison, Panola, and Rusk counties. At an elevation of 244 feet msl, the reservoir would have a conservation storage capacity of 651,914 ac-ft and surface area of 41,200 acres. The estimated firm yield of the project is 537,000 ac-ft/yr and the total cost to develop the project is approximately $462.4 million. On an annualized basis, the unit cost of water from the project would be approximately $65 per ac-ft of firm yield ($0.20/1,000 gallons). The potential beneficiaries of the project are municipal and industrial water users in the upper portions of the Sabine Basin and/or users outside of the basin. Other potential benefits include recreation, hydroelectric power generation, and flood control.

Based on available information, there are no, conservation easements within or adjacent to the reservoir site. There is one existing mitigation bank consisting of 175 acres that is located near the reservoir site. The potential Carthage reservoir is within and adjacent to the Lower Sabine River Bottom West site listed as priority one bottomland hardwood area described as excellent quality bottomlands of high value to waterfowl. There is one potential ecologically unique stream segment that was included on the TPWD list of candidate segments that would be impounded by the reservoir. Analyses also indicates that there are four municipal solid waste landfill sites, one Superfund site, and two permitted industrial and hazardous waste locations within or adjacent to the reservoir study area. There are no air quality monitoring stations in the area. State and federal agency listings for threatened, endangered, or rare plant or animal species lists seven birds, four fish, three mammals, one mollusk, four reptiles, and one vascular plant species that potentially occur or have habitat in or near the project location. Also, available data indicates that there are four hydric soil associations within the reservoir site. The number of hydric soil associations does not indicate the number of potential wetlands, but rather that a wetland area could occur where these hydric soil associations exist.

6.1(m) Kilgore II

The Kilgore II reservoir site is located on a tributary of the Sabine River, the upper portion of Wilds Creek near the City of Kilgore. The reservoir site is located within portions of Gregg, Rusk, and Smith counties. With a conservation pool elevation of 398 feet msl, the reservoir would have a conservation storage capacity of 16,270 ac-ft and a surface area of 817 acres. The estimated firm annual yield of the project is 5,500 ac-ft. Previous studies examined as part of the *Reservoir Site Assessment Study* (Appendix B) did not include cost estimates from which to prepare updated costs of reservoir development. The reservoir site has been previously studied as a potential local water supply source for the City of Kilgore.

Based on readily available information, there are no potential ecologically unique streams of high importance, bottomland hardwoods, wetland mitigation banks, or conservation easements within or adjacent to the reservoir site. Analysis also indicates that there are no Superfund sites, municipal solid waste landfill sites, permitted industrial and hazardous waste locations, or air quality monitoring stations located within or adjacent to the reservoir site. However, state and federal agency listings for threatened, endangered, or rare plant or animal species indicate that two fish species potentially occur or have habitat in or near the project location. Available data indicates that there are no hydric soil associations (i.e., potential wetlands) within the reservoir site.

6.1(n) Prairie Creek

As indicated previously, the Prairie Creek Reservoir is included as a recommended project in the Sabine River Authority's *Comprehensive Sabine Watershed Management Plan.* Development of the project would provide additional water supplies to municipal and industrial water users within the upper portion of the Sabine River Basin, particularly in Longview area. The reservoir site is located approximately 11 miles west of the City of Longview in Gregg and Smith counties. The location of the dam site is immediately upstream of the FM 2207 crossing of Prairie Creek, which is a tributary of the Sabine River. With a conservation pool elevation of 318.0 feet msl, the storage capacity and surface area of the reservoir would be 45,164 ac-ft and 2,280 acres, respectively. At the probable maximum flood (PMF) elevation of 339.5 feet msl, the reservoir surface area would be 4,282 acres.

Previous studies of the Prairie Creek site envision a compacted earth fill dam, approximately 3,000 feet in length and a maximum height of 87 feet, which corresponds to an elevation of 245.0 feet msl. The spillway for the dam would be ogee shaped with a crest elevation of 300 feet msl with two 20 foot by 20 foot tainter gates for controlled floodwater releases. The outlet works would consist of a multilevel opening with a 66-inch diameter conduit through the dam and a stilling basin.

As part of the *Reservoir Site Assessment Study* (Appendix B), the firm yield of the proposed Prairie Creek Reservoir was reevaluated using the TWDB Daily Reservoir Analysis Model. This was performed to determine the firm yield of the project with consideration of the environmental pass-through requirements contained in the S*tate Consensus Environmental Guidelines Planning Criteria.* Previous studies estimated a firm yield of the project of 19,700 ac-ft/yr. Consideration of the environmental pass-through requirements reduces the estimated yield to 17,215 ac-ft/yr.

The Sabine River Authority is considering the Prairie Creek Reservoir as the first component of a larger project that would be developed in phases. The second phase would include diversion of flows from the Sabine River to the reservoir to develop a firm yield of approximately 29,685 ac-ft/yr and, ultimately, construction of a 90 inch pipeline from the Toledo Bend Reservoir to develop a total firm yield of 115,000 ac-ft/yr. The cost to develop the reservoir as a stand-alone project is estimated to be $56.4 million, which would provide water at an annualized cost of $257 per ac-ft of firm yield ($0.79/1,000 gallons). The addition of the diversion of flows from the Sabine River would increase the project development costs to $60.2 million and would reduce the unit cost of water to $161 per ac-ft ($0.50/1,000 gallons) of firm yield. The addition of supplies delivered to the Prairie Creek Reservoir from the Toledo Bend Reservoir would provide water supply at a unit cost of $167 per ac-ft of firm yield ($0.51/1,000 gallons).

Based on available information, there are no potential ecologically unique streams of high importance, wetland mitigation banks, or conservation easements within or adjacent to the site. There are no USFWS priority designated bottomland hardwood areas located within or adjacent to the proposed Prairie Creek reservoir; however, TPWD as estimated 12 percent of the area is of this habitat type. Analysis also indicates that there are no Superfund sites, municipal solid waste landfill sites, permitted industrial and hazardous waste locations, or air quality monitoring stations located within or adjacent to the reservoir study area. However, state and federal agency listings for threatened, endangered, or rare plant or animal species indicate that seven birds, four fish, three mammals, one mollusk, four reptiles, and one vascular plant species potentially occur or have habitat in or near the project location Also, available data indicates that there are four hydric soil associations within the reservoir site. The number of hydric soil associations does not indicate the number of potential wetlands, but rather that a wetland area could occur where these hydric soil associations exist.

6.1(o) Waters Bluff

The Waters Bluff reservoir site is located on the main stem of the Sabine River approximately 3.5 miles upstream of the U.S. Highway 271 crossing and approximately four miles west of the City of Gladewater. The reservoir site lies within portions of Smith, Upshur, and Wood counties. The reservoir would have a conservation storage capacity of 525,163 ac-ft at a conservation pool elevation of 303 feet msl and would cover 36,396 surface acres. The maximum flood pool elevation would be 314.7 feet msl. The dam for the Waters Bluff Reservoir would be a homogeneous earthen embankment 70 feet high with a crest elevation of 320 feet msl and a crest length of 11,000 feet. The spillway would be a concrete gravity ogee with a crest elevation of 276.0 feet msl, with eleven 40 foot wide by 28 foot high tainter gates for control.

As reported from previous studies, the estimated firm yield of Waters Bluff Reservoir would be 324,000 ac-ft/yr. Updated estimates of the costs to develop the reservoir are $466.5 million, with an annualized unit cost of water of $109 per ac-ft of firm yield ($0.34/1,000 gallons). The potential beneficiaries of the project are municipal and industrial water users in the upper portions of the Sabine Basin and/or users outside of the basin. Other potential benefits include recreation, hydroelectric power generation, and flood control.

There are two stream segments in or near the Waters Bluff reservoir site that the TPWD has identified as potential ecologically unique streams. There are also four existing or proposed wetland mitigation banks and two existing conservation easements within or near the reservoir site. The U.S. Fish & Wildlife Service has also identified areas within or near the site that are classified as having excellent quality bottomlands of high value to waterfowl habitat and good quality bottomlands with moderate waterfowl benefits. In addition, analyses indicate that there are six municipal solid waste landfill sites, but no Superfund sites, permitted industrial and hazardous waste locations, or air quality monitoring stations located within or adjacent to the reservoir study area. State and federal agency listings for threatened, endangered, or rare plant or animal species lists seven birds, four fish, three mammals, one mollusk, four reptiles, and one vascular plant species that potentially occur or have habitat in or near the project location. Also, available data indicates that there are six hydric soil associations within the reservoir site. The number of hydric soil associations does not indicate the number of potential wetlands, but rather that a wetland area could occur where these hydric soil associations exist.

A summary of key characteristics of the six reservoir sites that were examined in the Sabine River Basin is provided in Table 6.2.

Table 6.2 Potential Reservoir Sites in the Sabine River Basin

Reservoir Site	Conservation Storage (ac-ft)	Surface Area (acres)	Firm Yield (ac-ft/yr)	Total Project Development Cost ($1,000)	Annual Cost Per ac-ft
Big Sandy	69,300	4,405	46,600	$ 100,100	$ 133
Carl Estes	393,000	24,900	95,630	$ 245,000	$ 301
Carthage	651,914	41,200	537,000	$ 495,838	$ 65
Kilgore II	16,270	817	5,500	NA	NA
Prairie Creek	45,164	2,280	17,215	$ 56,403	$ 257
Prairie Creek with Diversion	45,164	2,280	29,685	$ 60,248	$ 161
Prairie Creek with Pipeline	45,164	2,280	115,000	$ 174,553	$ 167
Waters Bluff	525,163	36,396	324,000	$ 466,549	$ 109

6.1(p) Sulphur River Basin

Five reservoir sites in the Sulphur River Basin were examined as part of the *Reservoir Site Assessment Study* (Appendix B): Marvin Nichols I, Marvin Nichols II, George Parkhouse I, George Parkhouse II, and Pecan Bayou. Each is described below.

6.1(q) Marvin Nichols I

The Marvin Nichols I reservoir site is located on the main stem of the Sulphur River at River Mile 114.7. The dam site is located upstream of the confluence of the Sulphur River and White Oak Creek. The reservoir site is located in Red River and Titus Counties about 120 miles east of the City of Dallas and about 45 miles west of the City of Texarkana. According to the 1997 *State Water Plan,* the potential beneficiaries of the Marvin Nichols I reservoir include municipal and industrial water users in the vicinity of the project within the Sulphur River Basin, water users in the Cyresss Creek Basin, and/or water users in the Dallas-Ft. Worth Metroplex. Other potential benefits include recreation, hydroelectric power generation, and flood control.

With a conservation pool elevation of 312.0 feet msl, the conservation storage capacity of the Marvin Nichols I reservoir would be 1,369,717 ac-ft and the surface area would be 62,128 acres. At the probable maximum flood (PMF) elevation of 319.1 feet msl, the reservoir would store 1,864,788 ac-ft and have a surface area of 77,612 acres.

As envisioned in previous studies of the site, the dam for the Marvin Nichols I reservoir would consist of a 25,000 foot long earthen embankment dike built along the low stream divide between the Sulphur River and the White Oak Bayou. In addition, four dikes would be required at low points along the stream divide varying in length from 2,000 feet to 8,000 feet. The main dam would have a maximum height of 71 feet at the flood plain crossing. The flood spillway crest would be 940 feet long and would include nineteen 40 foot by 40 foot gates at a crest elevation of 285 feet msl.

Previous studies of the Marvin Nichols I site have estimated the firm yield of the project to be 624,000 ac-ft/yr. However, additional yield studies were performed as part of the *Reservoir Site Assessment Study* (Appendix B) using the recently completed TNRCC Water Availability Model (WAM) for the Sulphur River Basin and the TWDB Daily Reservoir Analysis Model. Reservoir operations simulations performed with these models, and with environmental releases as specified in the *Consensus Environmental Guidelines Planning Criteria,* indicate a firm yield of 550,842 ac-ft/yr for the Marvin Nichols I reservoir.

The yield for Marvin Nichols I Reservoir differs from the value given in the Region C report, which is 619,000 acre-feet per year. The difference in yield is the result of different assumptions with regards to the operation of the project:

- The North East Region's yield of 550,842 acre-feet is based on the assumption that Marvin Nichols I will impound only available unappropriated flows, after satisfying the environmental flow requirements in accordance with the Consensus Water Planning (CWP) criteria. This assures that Wright Patman Reservoir, with a senior water right downstream of Marvin Nichols I, is full before Marvin Nichols I can impound any water.

- Regions C's yield of 619,100 acre-feet per year is based on an assumption that Marvin Nichols I could impound inflows so long as the ability to divert water from Lake Wright Patman is protected.

The yield simulation performed for the North East Texas RWPG involves application of TNRCC's Sulphur River Basin WAM, which considers the seasonal variation of conservation storage in Lake Wright Patman, and a daily reservoir operations model used by the TWDB (SIMDLY), which allows passage of environmental flows in accordance with the state's criteria. The assumption used by Region C would require the negotiation of an of a written agreement between the operators of Marvin Nichols I and Wright Patman reservoirs (including the City of Texarkana, the water rights holder) before any application can be filed with the TNRCC for water right for Marvin Nichols I Reservoir. Should that agreement happen in future, it will enhance the yield of Marvin Nichols I Reservoir..

During the next planning period, the Region C and the North East Texas RWPG will continue to cooperate on studies of the Marvin Nichols I reservoir site. Other concerns that should also be addressed in a future evaluation of cooperative joint reservoir operating policies include maintaining base environmental flows, navigation potential, minimum lake levels, recreational impacts, and water supply needs for the paper manufacturing plant down stream. As part of this cooperative effort, the regions will examine potential operation of Marvin Nichols I Reservoir and reach agreement on a method of operation and the resulting yield.

Additional information concerning the firm yield of the Marvin Nichols I reservoir site can be found in Appendix B.

The estimated cost to develop the Marvin Nichols I reservoir, updated to 1999 dollars, is $446.5 million. The total annualized cost of the project, including debt service and operations and maintenance costs, is $31.6 million, which results in a unit cost of roughly $61 per ac-ft of firm yield ($0.19/1,000 gallons).

Based on available information, there do not appear to be potential ecologically unique streams of high importance, wetland mitigation banks, or conservation easements within or adjacent to the site. However, two reaches of the Sabine River within the project boundary has previously been identified by TPWD as significant stream segments based on the presence of unique federal holdings and a USFWS priority 1 bottomland woodland site. Additionally, TPWD has included one reach of these reaches on a recommended list of ecologically unique streams segments. A review of available information also indicates that there are no Superfund sites, municipal solid waste landfill sites, permitted industrial and hazardous waste locations, or air quality monitoring stations located within or adjacent to the reservoir study area. However, state and federal agency listings for threatened, endangered, or rare plant or animal species identify seven birds, four fish, three mammals, one mollusk, four reptiles, and one vascular plant species that potentially occur or have habitat in or near the project location. The reservoir site is also within and adjacent to the Sulphur River Bottom west site, which is listed by the U.S. Fish & Wildlife Service as having excellent quality bottomlands of high value to waterfowl. Also, available data indicates that there are six hydric soil associations within the reservoir site. The number of hydric soil associations does not indicate the number of potential wetlands, but rather that a wetland area could occur where these hydric soil associations exist.

6.1(r) Marvin Nichols II

The Marvin Nichols II reservoir site is located on White Oak Creek, which is a tributary of the Sulphur River located primarily in Titus County. The site is immediately south of the proposed Marvin Nichols I reservoir site described above. Potential beneficiaries of the project include municipal and industrial water users in the vicinity of the project within the Sulphur River Basin, water users in the Cypress Creek Basin, and water users in the Dallas-Ft. Worth Metroplex. Other potential benefits include recreation, hydroelectric power generation, and flood control.

At an elevation of 312.0 feet msl, the reservoir would have conservation storage capacity of 772,000 ac-ft and a surface area of 35,900 acres. The estimated firm yield of the project is 280,100 ac-ft/yr and the cost to develop the project is approximately $250 million in 1989 dollars.

Based on readily available information, there do not appear to be potential ecologically unique streams of high importance, or wetland mitigation banks, within or adjacent to the site. There is one conservation easement located within or adjacent to the footprint of the potential Marvin Nichols II reservoir. A review of available information also indicates that there are no Superfund sites, municipal solid waste landfill sites, permitted industrial and hazardous waste locations, or air quality monitoring stations located within or adjacent to the reservoir study area. However, state and federal agency listings for threatened, endangered, or rare plant or animal species lists seven birds, four fish, three mammals, one mollusk, four reptiles, and one vascular plant several species that potentially occur or have habitat in or near the project location. The reservoir site is also within and adjacent to the Sulphur River Bottom west site, which is listed by the U.S. Fish & Wildlife Service as having excellent quality bottomlands of high value to waterfowl. Also, available data indicates that there are eight hydric soil associations within the reservoir site. The number of hydric soil associations does not indicate the number of potential wetlands, but rather that a wetland area could occur where these hydric soil associations exist.

6.1(s) George Parkhouse I

The George Parkhouse I reservoir site is located approximately 110 miles east of the City of Dallas on the South Fork of the Sulphur River, which forms the border between Delta and Hopkins Counties. The dam site would be located at River Mile 3.0 downstream of the existing Cooper Reservoir. Potential beneficiaries of the project include municipal and industrial water users within the Sulphur River Basin and/or water users in the Dallas-Ft. Worth Metroplex. Other potential benefits include recreation, hydroelectric power generation, and flood control.

The conservation storage capacity of the George Parkhouse I reservoir would be 685,706 ac-ft and the reservoir would have a surface area of 29,740 acres at a pool elevation of 401.0 feet msl. At an elevation of 414.2 feet msl, which is the elevation for the probable maximum flood (PMF), the reservoir surface area would be 31,240 acres. The dam would consist of a 20,000 foot long earthen embankment constructed across the South Sulphur River with an additional half mile long earthen dike built across the low stream divide between the North Sulphur River and the South Sulphur River. The dam would have a gated ogee shaped flood spillway with a crest elevation of 390.0 feet msl and four 40 foot gated bays to discharge flood flows.

The estimated firm yield of the Parkhouse I reservoir is 113,500 ac-ft/yr. The cost to develop the project would be $224.7 million and the project would provide water at an annualized unit cost of approximately $151 per ac-ft of firm yield ($0.47/1,000 gallons).

Based on available information, there are no potential ecologically unique streams of high importance, bottomland hardwoods, wetland mitigation banks, or conservation easements within or adjacent to the reservoir site. Analyses also indicates that there are no Superfund sites, municipal solid waste landfill sites, permitted industrial and hazardous waste locations, or air quality monitoring stations located within or adjacent to the reservoir study area. However, state and federal agency listings for threatened, endangered, or rare plant or animal species lists seven birds, four fish, three mammals, one mollusk, four reptiles, and one vascular plant several species that potentially occur or have habitat in or near the project location. Also, available data indicates that there are two hydric soil associations within the reservoir site. The number of hydric soil associations does not indicate the number of potential wetlands, but rather that a wetland area could occur where these hydric soil associations exist.

6.1(t) George Parkhouse II

The George Parkhouse II reservoir site is located on the North Sulphur River at River Mile 5.0. The reservoir site is approximately 110 miles east of the City of Dallas and would straddle the county line between Delta and Lamar Counties. The Parkhouse II site is recommended for development in the 1997 *State Water Plan*. Potential beneficiaries of the project include municipal and industrial water users within the Sulphur River Basin and/or water users in the Dallas-Ft. Worth Metroplex. Other potential benefits include recreation, hydroelectric power generation, and flood control. It should be noted that the development of the Marvin Nichols I reservoir would significantly delay or eliminate the need for this reservoir as a supply source for the Dallas-Ft. Worth Metroplex.

Previous studies have investigated a reservoir with a conservation pool elevation of 401.0 feet msl, which would have a conservation storage capacity and surface area of 243,600 ac-ft and 12,300 acres, respectively. With a probable maximum flood elevation of 415.7 feet msl, the Parkhouse II reservoir would have a surface area of 17,400 acres. The dam would have a gated ogee shaped flood spillway with a crest elevation of 390.0 feet msl. Flood discharges would be through eight 40 foot gated bays.

Previous studies of the George Parkhouse II reservoir site estimated the firm yield of the project to be 136,700 ac-ft without consideration of potential environmental pass-through requirements. A reevaluation of the project firm yield using the TNRCC WAM for the Sulphur River Basin and the TWDB Daily Reservoir Analysis Model indicates a firm yield with environmental releases of 131,850 ac-ft. At a cost of approximately $192 million to develop the reservoir, the annualized cost of water from the project would be $93 per ac-ft of firm yield ($0.29/1,000 gallons).

Based on available information, there do not appear to be major natural resource conflicts at the reservoir site. There are no potential ecologically unique streams of high importance, wetland mitigation banks, priority designated bottomland hardwoods, or conservation easements within or adjacent to the site. A review of available information also indicates that there are no Superfund sites, municipal solid waste landfill sites, permitted industrial and hazardous waste locations, or air quality monitoring stations located within or adjacent to the reservoir study area. However, state and federal agency listings for threatened, endangered, or rare plant or animal species identify seven birds, four fish, three mammals, one mollusk, four reptiles, and one vascular plant species that potentially occur or have habitat in or near the project location. Also, available data indicates that there are six hydric soil associations within the reservoir site. The number of hydric soil associations does not indicate the number of potential wetlands, but rather that a wetland area could occur where these hydric soil associations exist.

6.1(u) Pecan Bayou

The Pecan Bayou reservoir site is located in Red River County on Pecan Bayou, which is a tributary of the Sulphur River. Previous studies have examined 20 alternative sites, of which three were chosen for evaluation. The alternative that would produce the greatest firm yield would have a storage capacity of 688 ac-ft and a surface area of 122 acres. This alternative would have an earthen dam approximately 2,950 feet long with a top elevation of 384 feet msl. The estimated firm yield of the project is 1,866 ac-ft/yr. The total cost to develop the project would be $13.9 million. The unit cost of water from the reservoir would be $637 per ac-ft of firm yield ($1.96/1,000). Potential beneficiaries of this project include municipal and industrial water users in the vicinity of the site in Red River County.

Based on a review of readily available information, there are no potential ecologically unique streams of high importance, bottomland hardwoods, wetland mitigation banks, or conservation easements within or adjacent to the reservoir site. Analyses also indicates that there are no Superfund sites, municipal solid waste landfill sites, permitted industrial and hazardous waste locations, or air quality monitoring stations located within or adjacent to the reservoir study area. However, state and federal agency listings for threatened, endangered, or rare plant or animal species lists seven birds, four fish, three mammals, one mollusk, four reptiles, and one vascular plant species that potentially occur or have habitat in or near the project location. Also, available data indicates that there are three hydric soil associations within the reservoir site. The number of hydric soil associations does not indicate the number of potential wetlands, but rather that a wetland area could occur where these hydric soil associations exist.

A summary of key characteristics of the five reservoir sites that were examined in the Sulphur River Basin is provided in Table 6.3.

Table 6.3 Potential Reservoir Sites in the Sulphur Basin

Reservoir Site	Conservation Storage (ac-ft)	Surface Area (acres)	Firm Yield (ac-ft/yr)	Total Project Development Cost ($1,000)	Annualized Cost Per ac-ft
Nichols I	1,369,717	62,128	550,842	$ 446,518	$ 61
Nichols II	772,000	35,900	280,100	$ 250,316	
Parkhouse I	685,706	29,740	113,500	$ 224,726	$ 151
Parkhouse II	243,600	12,300	131,850	$ 160,022	$ 93
Pecan Bayou	688	112	1,866	$ 13,858	$ 637

6.1(v) Recommendations for Reservoir Development and Reservoir Site Preservation

The North East Texas RWPG recommends that the Marvin Nichols I site be developed to provide a source of future water supply for water users both within the North East Texas Region and the Dallas-Ft. Worth Metroplex (Region C). The Region C RWPG has indicated that the Marvin Nichols 1 site is their preferred option for reservoir development within the Sulphur River Basin. Should this site prove not feasible, the Region C RWPG has indicated that its secondary preference would be to develop an equivalent amount of water supply through the construction of the George Parkhouse I and II sites and the Marvin Nichols II site.
The development of the Marvin Nichols I reservoir site as a future water source for the Dallas-Ft. Worth Metroplex would require interbasin transfer authorizations from the Texas Natural Resource Conservation Commission. Among its many provisions, S.B. 1 includes provisions (Texas Water Code, Section 11.085) requiring the TNRCC to weigh the benefits of a proposed new interbasin transfer to the receiving basin against the detriments to the basin supplying the water. S.B. 1 also established the following criteria to be used by the TNRCC in its evaluation of proposed interbasin transfers:

- The need for the water in the basin of origin and in the receiving basin;
- Factors identified in the applicable regional water plan(s);
- The amount and purposes of use in the receiving basin;
- Any feasible and practicable alternative supplies in the receiving basin;
- Water conservation and drought contingency measures proposed in the receiving basin;
- The projected economic impact that is expected to occur in each basin;
- The projected impacts on existing water rights, instream uses, water quality, aquatic, and riparian habitat, and bays and estuaries;
- Proposed mitigation and compensation to the basin of origin.

The North East Texas RWPG supports the full application of the criteria for authorization of interbasin transfers contained in current state law. With regard to compensation to the basin of origin, the North East Texas RWPG recommends that a portion of the firm yield of the Marvin Nichols I reservoir, or other projects developed in the Sulphur River Basin for interbasin transfer, be reserved for future use within the basin. The specific terms of such compensation, along with other issues associated with development of the project (e.g., financing, operation of the reservoir, etc.), should be addressed by the appropriate representatives of the Sulphur Basin Authority, in coordination with the Franklin County Water District and the Titus County Freshwater Supply District No. 1, and with the entities in Region C and within the North East Texas Region that are seeking the additional water supply.

The North East Texas RWPG also endorses the recommendation contained in the recently adopted *Comprehensive Sabine Watershed Management Plan* that the Sabine River Authority (SRA) develop the Prairie Creek Reservoir. Located centrally in the upper portion of the Sabine Basin, the proposed reservoir would enable the SRA to supply projected future manufacturing needs in Harrison County. As previously noted, the Prairie Creek Reservoir and Pipeline Project is being pursued by the Sabine River Authority at this time due to the conservation easement limitation on the Waters Bluff reservoir site. If the conservation easement were removed, the Water Bluff Reservoir would become the Sabine River Authority's top priority project to meet projected water needs in the upper Sabine River Basin.

The North East Texas RWPG also recommends that 15 of the 17 reservoir sites identified within the region, and described above, be designated by the Texas Legislature as unique for future reservoir development. However, the North East Texas RWPG also requests that the Texas Legislature clarify the intent and implications of such designations, particularly with regard to potential impacts on private landowners. The Black Cypress reservoir site and the enlargement of Caddo Lake should not be considered for this designation.

The North East Texas RWPG also has concerns about local property owners who would be directly impacted by reservoir construction. A particular concern is that landowners be compensated fairly for the value of any land acquired for reservoir development.

6.2 Legislative Designation of Ecologically Unique Stream Segments

TWDB rules for S.B. 1 regional water planning describe the process by which RWPGs may prepare and submit recommendations for legislative designation of ecologically unique river and stream segments. This process involves multiple steps with the North East Texas RWPG, the Texas Parks and Wildlife Department (TPWD), the TWDB and, ultimately, the Texas Legislature each having a role. According to state law, the North East Texas RWPG may recommend legislative designation of river or stream segments within the North East Texas Region as "ecologically unique." TWDB rules (30 Texas Administrative Code 357.8) state:

> *Regional water planning groups may include in adopted regional water plans recommendations for all or parts of river and stream segments of unique ecological value located within the regional water planning area by preparing a recommendation package consisting of a physical description giving the location of the stream segment, maps, and photographs of the stream segment and a site characterization of the segment documented by supporting literature and data.*

According to state law (Texas Water Code Sections 6.101 and 10.053), state agencies and local units of government cannot develop a water supply project that would destroy the ecological value of a river or stream segment that has been designated by the Texas Legislature as ecologically unique. Also, the TWDB is prohibited from financing water supply projects that would be located on a stream segment that has been designated as ecologically unique.

TWDB rules provide that the RWPGs forward any recommendations regarding legislative designation of ecologically unique streams to the TPWD and include TPWD's written evaluation of such recommendations in the adopted regional water plan. The RWPG's recommendation is then to be considered by the TWDB for inclusion in the state water plan. Finally, the Texas Legislature will consider any recommendations presented in the state water plan regarding designation of stream segments as ecologically unique.

6.2(a) Criteria for Designation of Ecologically Unique Stream Segments

TWDB rules also specify the criteria that are to be applied in the evaluation of potential ecologically unique river or stream segments. These are:

- Biological Function: Stream segments that display significant overall habitat value, including both quantity and quality, considering the degree of biodiversity, age, and uniqueness observed, and including terrestrial, wet land, aquatic or estuarine habitats;

- Hydrologic Function: Stream segments that are fringed by habitats that perform valuable hydrologic functions relating to water quality, flood attenuation, flow stabilization or groundwater recharge and discharge;

- Riparian Conservation Areas: Stream segments that are fringed by significant areas in public ownership including state and federal refuges, wildlife management areas, preserves, parks, mitigation areas or other areas held by governmental organizations for conservation purposes, or segments that are fringed by other areas managed for conservation purposes under a governmentally approved conservation plan;

- High Water Quality/Exceptional Aquatic Life/High Aesthetic Value: Stream segments and spring resources that are significant due to unique or critical habitats and exceptional aquatic life uses dependent on or associated with high water quality; or

- Threatened or Endangered Species/Unique Communities: sites along streams where water development projects would have significant detrimental effects on state- or federally-listed threatened and endangered species, and sites along segments that are significant due to the presence of unique, exemplary, or unusually extensive natural communities.

6.2(b) Candidate Stream Segments

To assist each of the 16 RWPGs, the TPWD developed a list of candidate stream segments in each region that appear to meet the criteria for designation as ecologically unique. For the North East Texas Region, TPWD prepared a report entitled *Ecologically Significant River and Stream Segments of Region D, Regional Water Planning Area* (May 2000) that presents information on 15 stream segments within the region that meet one or more of the criteria for designation as ecologically unique. TPWD staff have provided further guidance by identifying five of the 15 stream segments as having "high importance" for consideration. The information provided to the North East Texas RWPG by TPWD is summarized in Table 6.4, and figure 6.2 shows the location.

Table 6.4 – Potential Ecologically Unique River and Stream Segments in the North East Texas Region

River Segment Number	Basin	Waterway	Location	Justification	Biological Function	Hydrologic Function	Riparian Conservation Areas	High Water Quality, Exceptional Aquatic Life, High Aesthetic Value	Threatened or Endangered Species, Unique Communities	TNRCC Segment Identification
1	**Red River**	Sanders Creek[1]	Lamar County	Pat Mayse State Wildlife Management Area			✓			--
2		Red River[2]	Lake Texoma Dam downstream to Louisiana border	Paddlefish and blue sucker					✓	0202, 0201
3	**Sulphur River**	Sulphur River and White Oak Creek[2]	Hwy IH-30 crossing downstream to Wright Patman Reservoir	TPWD Proposed acquisition, White Oak Creek Wildlife Management Area			✓			0303
4		Sulphur River[1, 2]	From a point 0.9 miles downstream of Basset Creek in Bowie/Cass County upstream to the IH-30 bridge in Bowie/Morris County	Paddlefish					✓	--
5	**Cypress Creek**	Big Cypress Creek[1]	From a point 0.6 miles downstream of US 259 in Morris/Upshur County to Fort Sherman Dam in Camp/Titus County	Paddlefish					✓	0404

Table 6.4 – Potential Ecologically Unique River and Stream Segments in the North East Texas Region (cont.)

River Segment Number	Basin	Waterway	Location	Justification	Biological Function	Hydrologic Function	Riparian Conservation Areas	High Water Quality Exceptional Aquatic Life, High Aesthetic Value	Threatened or Endangered Species, Unique Communities	TNRCC Segment Identification
6	**Cypress Creek**	*Black Cypress Bayou[1, 2]	From US 59 in central Marion County upstream to the point where Black Cypress Creek becomes Black Cypress Bayou east of Avinger in south Cass County	Priority bottomland hardwood habitat	✓					--
7		Frazier Creek[1]	From the confluence with Jim Bayou in Marion County upstream to its headwaters located three miles north of Almira in west Cass County	Eco-region stream and fish	✓			✓		--
8		Black Cypress Bayou[2]	Headwaters to Caddo Lake	Paddlefish; Chestnut lamprey; Cypress minnow; Mud, Black-side, River and Goldstriped darters; and Iron-colored shiner					✓	
9		*Black Cypress Creek[1, 2]	From the point where Black Cypress Creek becomes Black Cypress Bayou east of Avinger in south Cass County upstream to its headwaters located four miles northeast of Daingerfield in the eastern part of Morris County	Priority bottomland hardwood habitat; eco-region stream; benthic macroinvertebrates; and fish	✓			✓		0402
10		Cypress Creek[2]	Caddo Lake State Park	Unique State holdings			✓			0402

Table 6.4 – Potential Ecologically Unique River and Stream Segments in the North East Texas Region (cont.)

River Segment Number	Basin	Waterway	Location	Justification	Biological Function	Hydrologic Function	Riparian Conservation Areas	High Water Quality, exceptional Aquatic Life, High Aesthetic Value	Threatened or Endangered Species, Unique Communities	TNRCC Segment Identification
11	**Cypress Creek**	*Big Cypress Bayou[1, 2]	From upper Caddo Lake in Marion/Harrison county upstream to SH 43 in Marion/Harrison County	Priority bottomland hardwood habitat and Caddo Lake State Park	✓		✓			0402
12		Cypress Creek[2]	Lake O' the Pines to Caddo Lake	Paddlefish; Chestnut lamprey; Cypress minnow; Mud, Black-side, River and Goldstriped darters; and Iron-colored shiner					✓	0402
13		Little Cypress Bayou[1]	From the confluence with Big Cypress Creek in Harrison County to a point 0.6 mile upstream of FM 2088 in Wood County	Eco-region stream and benthic macroinvertebrates				✓		0409
14		*Sabine River[1]	From US 59 in south Harrison County upstream to Easton along the Rusk/Harrison County line	Texas Natural Rivers System nominee; diverse riparian assemblage including hardwood forest and wetlands; natural areas; exceptional aesthetic value; priority bottomland hardwood habitat; and paddlefish	✓			✓	✓	0505

Table 6.4 – Potential Ecologically Unique River and Stream Segments in the North East Texas Region (cont.)

River Segment Number	Basin	Waterway	Location	Justification	Biological Function	Hydrologic Function	Riparian Conservation Areas	High Water Quality, Exceptional Aquatic Life, High Aesthetic Value	Threatened or Endangered Species, Unique Communities	TNRCC Segment Identification
15	**Sabine River**	Glade Creek[1,2]	From the confluence with the Sabine River in the northwestern corner of Gregg County near Gladewater upstream to its headwaters located about five miles southwest of Gilmer in Upshur County	Significant bio-diversity; unique habitat-swamp/bog area	✓				✓	--
16		Sabine River[1, 2]	From FM 14 in Wood/Smith County upstream to FM 1804 in Wood/Smith County	Priority bottomland hardwood habitat; Paddlefish	✓				✓	0506
17		Sabine River[2]	Little Sandy Hunting and Fishing Club south of Crow and Hawkins (Wood County)	Unique Federal holdings				✓		0506
18		Little Sandy Creek[1, 2]	From Lake Hawkins in Wood County upstream to its headwaters in Wood County	Significant bio-diversity; unique swamp/bog area	✓				✓	--
19		Purtis Creek[1]	Van Zandt County	Purtis Creek State Park			✓			--

NOTE: Information regarding potential ecologically unique river and stream segments was obtained from the following sources:

[1] *Draft* list provided by the Texas Parks and Wildlife Department (TPWD) - May 1999 and report prepared by TPWD entitled, *Ecologically Significant River and Stream Segments of Region D Regional Water Planning Area* – May 2000.

[2] *A Natural Resource Survey for Proposed Reservoir Sites and Selected Stream Segments in Texas* (TPWD Report for the Texas Water Development Board) – May 1991

* TPWD Higher Priority Sites

Insert Figure 6.2

6.2(c) Recommendation

At the regular meeting on May 17, 2000, the North East Texas RWPG considered nominations for legislative designation of river or stream segments in the region as ecologically unique. It was decided that the RWPG would not offer any recommendations in the initial water plan for the North East Texas Region. Rather, the North East Texas RWPG requests the Texas Legislature to reconsider and possibly amend current state law to clarify the implications of stream segment designation. Specifically, the North East Texas RWPG has concerns regarding the potential impacts of stream designation on private property owners and on governmental activities other than water development. With such legislative clarification, the North East Texas RWPG intends to reconsider the issue of ecologically unique stream segment designations in the first five year update of the regional water plan.

6.3 Policy Recommendations

TWDB rules for S.B. 1 regional water planning (31 TAC Chapter 357.7(a)(9)) also provide that regional water planning groups may include in their regional water plans:

> *…regulatory, administrative, or legislative recommendations the regional water planning group believes are needed and desirable to: facilitate the orderly development, management, and conservation of water resources and preparation for and response to drought conditions in order that sufficient water will be available at a reasonable cost to ensure public health, safety, and welfare; further economic development; and protect the agricultural and natural resources of the state and the regional water planning area. The regional water planning group may develop information as to the potential impact once proposed changes in law are enacted.*

The approved scope of work for the development of the regional water plan for the North East Texas Region includes three tasks relating to the development of regulatory, administrative, or legislative recommendations:

Task 10: Identification and definition of water policy issues;

Task 14: Evaluation of policy issues; and

Task 19: Development of policy recommendations for inclusion in the regional water plan.

Throughout the planning process, several major policy issues arose repeatedly in meetings of the North East Texas RWPG and through public outreach efforts. These issues are future interbasin transfers from the North East Texas Region; conversion from groundwater to surface water supplies; groundwater policy; various regulatory policies of the Texas Natural Resource Conservation Commission; and, improvements to the S.B. 1 regional water supply planning process. Each of these issues is briefly discussed in the section below. Also presented are the recommendations adopted by the North East Texas RWPG on each issue.

6.3(a) Future Interbasin Transfers from the North East Texas Region

The North East Texas Region currently supplies surface water to other areas of the state through interbasin transfers and is identified in the current state water plan as a likely source of additional future water supply for various entities in Region C. Specifically, the 1997 State Water Plan includes recommendations that one or more new reservoirs be developed in the Sulphur River Basin as a source of future water supply for the Dallas-Ft. Worth Metroplex. In addition to potential future water transfers from the North East Texas Region to Region C, there may also be water management strategies for meeting needs within the North East Texas Region that will involve conveyance of supplies from one river basin to another within the region.

Among its many provisions, S.B. 1 includes provisions (Texas Water Code, Section 11.085) requiring the Texas Natural Resource Conservation Commission (TNRCC) to weigh the benefits of a proposed new interbasin transfer to the receiving basin against the detriments to the basin supplying the water. However, these provisions relate only to river basins of origin, not to the water planning regions of origin. S.B. 1 established the following criteria to be used by the TNRCC in its evaluation of proposed interbasin transfers:

- The need for the water in the basin of origin and in the receiving basin;
- Factors identified in the applicable regional water plan(s);
- The amount and purposes of use in the receiving basin;
- Any feasible and practicable alternative supplies in the receiving basin;
- Water conservation and drought contingency measures proposed in the receiving basin;
- The projected economic impact that is expected to occur in each basin;
- The projected impacts on existing water rights, instream uses, water quality, aquatic and riparian habitat, and bays and estuaries;
- Proposed mitigation and compensation to the basin of origin.

As an added protection to water rights and water users in a basin of origin, S.B. 1 also included a requirement that amending an existing water right for a new interbasin transfer would result in the water right acquiring a new priority date. The effect of this requirement is to give all other water rights in the basin of origin a higher priority than the amended right.

Current state law and policy regarding interbasin transfers of surface water provide a useful starting point for inter-regional discussions on the development of a new reservoir in the Sulphur River Basin. Several of the criteria that TNRCC is to consider in its review of interbasin transfers are of particular relevance, including:

- Future needs for water supply in the Sulphur River Basin;
- Economic impacts of future reservoir development and interbasin transfer on the Sulphur River Basin;
- Environmental impacts; and
- Mitigation of impacts to Sulphur River Basin and compensation for the interbasin transfer.

6.3(b) Future Water Needs

A widely held view within the North East Texas Region is that future water needs within the region must be assured before additional interbasin transfers are permitted. Many residents of the region express support for future reservoir development and interbasin transfers provided the region's long term water demands are met. This sentiment is supported by TWDB rules for regional water planning, which require that the evaluation of interbasin transfer options include consideration of "…the need for water in the basin of origin and in the proposed receiving basin."

The results of the supply and demand assessment for the North East Texas Region indicate that at the regional level, currently available surface and groundwater supplies are adequate to meet projected needs through 2050 and beyond. This conclusion also applies for each of the river basins within the region. More importantly, however, the supply and demand assessment indicates that 131 individual water user groups are projected to experience shortages during the planning period, including several in the Sulphur River Basin. However, most of these shortages are projected to occur in small communities and rural areas and it is generally believed that local water supply options will be the preferred strategy for meeting those needs.

The issue of how much water is needed in the basins of North East Texas Region for local use is not as simple as just comparing estimates of existing water supply to projections of future water demand. It should be remembered that the water demand projections adopted by the NETRWPG and the TWDB for development of the regional plan are based largely on an extrapolation of past growth trends. While this is a common and accepted method for forecasting future conditions, there are nonetheless significant uncertainties in the projections.

Shifting demographics and economic and technological change could result in substantially higher demand for water in the North East Texas Region than is currently projected. For example, there is an observed trend over the past decade in many areas of the U.S. of higher population growth in small and medium sized cities and rural areas. This has been attributed in part to advancements in telecommunications and the evolving information and service based economy, which no longer requires a concentration of labor in large cities. Another factor is the aging of the population and the trend toward retirement in rural areas. Also, development of a new reservoir in the Sulphur Basin could, itself, act as a significant catalyst for economic development and growth in the area. In fact, some in the planning region have expressed interest in building reservoirs as part of an overall regional economic development strategy.

Such factors suggest that the RWPG may want to review a possible policy recommendation regarding the definition of "need" in the basin of origin. Some members have also suggested broadening the test of need for interbasin transfers to consideration of projected needs throughout the *region* of origin, not just the basin of origin.

6.3(c) Economic and Environmental Impacts

It is also important that the NETRWPG consider potential economic and environmental impacts associated with reservoir development. For example, a significant amount of taxable private property could be removed from local tax roles thereby increasing the tax burden on other property owners. New development induced by construction of a reservoir could more than offset these effects over time, but there could be a long interval between removal of private property from tax rolls and the new development. Additional recreational and tourism opportunities could also provide an economic stimulus in areas in proximity to a new reservoir.

Reservoir development would also alter the natural environment, perhaps resulting in significant losses of ecologically valuable wetlands and riparian areas. However, state and federal regulations require that such impacts be minimized and mitigated to the extent possible, often through the set-aside and protection of other valuable ecological resources. Some water planners in the region have expressed the concern that mitigation requirements for large reservoirs in one basin might have to be met by restricting uses of riparian areas in other basins, thus limiting future possibilities for development at those sites.

6.3(d) Compensation

Perhaps the most important consideration in inter-regional discussions regarding reservoir development and interbasin transfers is the question of compensation. A common view is that future interbasin transfers should be of direct benefit to both the basin-of-origin and the receiving basin. As noted in the case of future water needs, RWPG members have also expressed strong interest in the distribution of benefits to the region as well as the basin of origin. In essence, it is a question of equity or fairness. There are several ways that compensation for the transfer of additional water supplies from the Sulphur Basin could be approached. Examples include:

- Retaining ownership of the water rights by an entity in the basin of origin with a portion of the water transferred out of basin under long term contract;
- Reserving some portion of the yield of a new reservoir for future use within the basin of origin;
- Setting rates on water sales sufficient to cover both the costs of developing and operating a new reservoir plus additional revenues for other purposes (e.g., supporting the functions of the local project sponsor); and
- Direct payments to governmental entities in the impacted area.

Given the significance and implications of new reservoir development and future interbasin transfers across regional lines, the North East Texas RWPG should consider adopting a policy statement addressing the issue of future water needs within the basins of origin and/or within the North East Texas Region as a whole, economic and environmental impacts of reservoir development, and inter-regional equity and compensation issues. It should be noted the issue of compensation is applicable to all reservoir development whether an interbasin transfer is contemplated or not.

6.3(e) Recommendations

At its meeting on June 21, 2000, the North East Texas RWPG adopted the following recommendation with regard to the development of new reservoirs in the Sulphur River Basin and future exports of water supplies from that basin to the Dallas-Ft. Worth Metroplex:

The North East Texas RWPG recommends that the Marvin Nichols I site be developed to provide a source of future water supply for water users both within the North East Texas Region and the Dallas-Ft. Worth Metroplex (Region C). The Region C RWPG has indicated that the Marvin Nichols 1 site is their preferred option for reservoir development within the Sulphur River Basin. Should this site prove not to be feasible, the Region C RWPG has indicated that its secondary preference would be to develop an equivalent amount of water supply through the construction of the Parkhouse I and II sites and the Marvin Nichols II site.

The development of the Marvin Nichols I reservoir site as a future water source for the Dallas-Ft. Worth Metroplex would require interbasin transfer authorizations from the Texas Natural Resource Conservation Commission. Among its many provisions, S.B. 1 includes provisions (Texas Water Code, Section 11.085) requiring the Texas Natural Resource Conservation Commission (TNRCC) to weigh the benefits of a proposed new interbasin transfer to the receiving basin against the detriments to the basin supplying the water. S.B. 1 also established the following criteria to be used by the TNRCC in its evaluation of proposed interbasin transfers:

- The need for the water in the basin of origin and in the receiving basin;
- Factors identified in the applicable regional water plan(s);
- The amount and purposes of use in the receiving basin;
- Any feasible and practicable alternative supplies in the receiving basin;
- Water conservation and drought contingency measures proposed in the receiving basin;
- The projected economic impact that is expected to occur in each basin;
- The projected impacts on existing water rights, instream uses, water quality, aquatic, and riparian habitat, and bays and estuaries;
- Proposed mitigation and compensation to the basin of origin.

The North East Texas RWPG supports the full application of the criteria for authorization of interbasin transfers contained in current state law. With regard to compensation to the basin of origin, the North East Texas RWPG recommends that a portion of the firm yield of the Marvin Nichols I reservoir, or other projects developed in the Sulphur River Basin for interbasin transfer, be reserved for future use within the basin. The specific terms of such compensation, along with other issues associated with development of the project (e.g., financing, operation of the reservoir, etc.) should be addressed by the appropriate representatives of the Sulphur River Basin Authority, in coordination with the Franklin County Water District and the Titus County Freshwater Supply District No. 1, and with the entities in Region C and Region D seeking the additional water supply.

6.3(f) Conversion of Public Water Supplies from Groundwater to Surface Water

Many water suppliers in the North East Texas Region rely solely on local groundwater supplies. Most of these suppliers will likely continue to use groundwater for future needs. However, in some areas, groundwater supplies will not be adequate to meet future needs and alternative sources of supply need to be considered. Also, in many areas of the region, groundwater supplies are of poor quality and do not meet current state and federal drinking water standards. Where groundwater supplies are available but are of poor quality, one supply strategy could be to develop additional groundwater with advanced treatment. However, because of the cost of treatment, and particularly the cost of disposal of the waste streams, acquisition of surface water supplies may be the most economically viable alternative.

Acquisition of surface water supplies would require that there be both legal and physical access to surface water supplies. Some communities may be in relatively close proximity to an existing surface water source but do not have access to those supplies because the water is fully committed to other users. In other cases, the physical infrastructure required to transport surface water from its source to a user does not exist and may be too costly.

Building regional water supply systems may offer the potential for significant cost savings in acquiring new water supplies and improving the reliability and quality of supplies. For some small water systems, regional approaches to water supply may be the only economically viable approach to conversion from groundwater to surface water. Connecting a number of independent systems can take many forms. It can include the development of regional water supply facilities, the physical consolidation or interconnection of two or more existing water systems, or the management of two or more independent systems by a single entity. Some local water providers and customers may object to loss of direct local control over the system, or they may feel that cost sharing formulas are unfair. For such reasons, each proposal for a regional system must be considered on a case-by-case basis.

6.3(g) Recommendations

Given the potential limitations on both the quantity and quality of groundwater supplies within the North East Texas Region, the North East Texas RWPG recommends the following:

- The TWDB should provide funding support for an in-depth assessment of groundwater-supplied public water systems that have or may have difficulty achieving compliance with state and federal drinking water standards due to the quality of source waters. The assessment should identify and evaluate alternative means of achieving or maintaining compliance with state and federal standards including the potential for acquisition of alternative water supplies and regionalization of systems of public water supply systems within the North East Texas Region. This assessment should be completed on a schedule that will allow the results to be incorporated, as appropriate, into the first update of the North East Texas Regional Water Plan.

6.3(h) Groundwater Policy

The North East Texas RWPG has concerns about policies relating to groundwater availability. The concerns relate to the methods prescribed by the TWDB to estimate water availability from the major and minor aquifers within the region.

The Carrizo-Wilcox formation is the major aquifer in the region for water supply purposes. The methodology used in the past by the TWDB indicates that there are large quantities of groundwater available from this formation which may, in fact, be unavailable at the locations, depths, or standards of quality that permit economically feasible development by water users. That is, the variability of the aquifers is such that suitable areas for groundwater development could be great distances from the areas of need, requiring construction of expensive pipelines to transport the groundwater. Alternatively, a suitable groundwater supply formation may be at such depths below the surface that drilling and energy costs to develop the source would be prohibitive, especially for small rural water systems. In some areas, groundwater quality is poor and would require costly treatment to achieve compliance with state and federal drinking water standards (i.e., removal of natural contaminants such as iron, fluoride, hydrogen sulfide, salts, or other elements). These same concerns also apply to other smaller aquifers within the North East Texas Region.

Another area of concern regarding groundwater has been the role it should play in planning for overall water supply. Some have proposed reserving this resource for agriculture and/or rural water users while directing other users to surface water supplies. Another suggestion is to reserve groundwater primarily as a backup supply in periods of drought and use renewable surface water supplies as the primary source under normal conditions. Since the management of water across the region is divided among hundreds of mostly small water providers, such policies would have the effect only of articulating broad planning goals to work toward in the future.

6.3(i) Recommendations

The North East Texas RWPG supports the completion of the TWDB's Groundwater Availability Modeling (GAM) Program. It is hoped that the development of new modeling tools will result in more accurate and realistic assessments of groundwater availability within the North East Texas Region. In particular, TWDB is urged to consider water quality and economic factors in future estimates of groundwater availability. Specifically, any groundwater availability model developed for aquifers within the North East Texas Region should have the ability to generate estimates of the quantities of groundwater that are available that meets current state and federal drinking water standards for total dissolved solids without treatment (i.e., 1,000 mg/l).

6.3(j) Texas Natural Resource Conservation Commission Regulations

The TNRCC minimum requirement of 0.6 gallons per minute per connection for public drinking water systems is a significant issue for many water providers in the North East Texas Region. Currently, this requirement is not reflected in TWDB rules relating to regional water planning. Many providers indicate that this requirement exceeds the real needs of water users and would require major additions to supplies, storage, and delivery capacities. In areas of marginal groundwater quantity, numerous wells may be required. Well spacing of approximately one half mile between wells means new well fields would occupy extensive geographic areas. In order to protect the investment in a new field from the effects of the rule of capture, providers must also purchase enough land to provide a buffer around the targeted supply. These new well fields might have to be located at remote sites, possibly triggering complaints, common in other parts of the state, of one population mining groundwater at the expense of the exporting area. Costs of new pipeline construction are also a major concern.

MTBE and other contaminants pose a significant threat to water supply sources in the North East Texas Region, as the incident this spring at Lake Tawakoni illustrated all too well. There are two dimensions to this issue. On the one hand, the North East Texas RWPG has urged TNRCC to phase out the use of the MTBE specifically, and both the state and federal regulators across the country are looking for substitute components for reformulated gasoline. Aside from the regulatory imposition of the use of MTBE (and this is only one of many potential contaminants that can find their way into drinking water sources), there is the additional lesson from the Tawakoni experience that those providers with more than one water source were best able to deal with that crisis. It is desirable for water user groups with vulnerable sources to plan on emergency access to backup supplies.

TNRCC regularly updates its list of streams, lakes and other water bodies that fail to meet the water quality standards established for specific water uses. Many of these water bodies are drinking water sources. This issue differs from the MTBE contamination episode at Lake Tawakoni, which was an accidental spill that was removed from the system in a matter of weeks. That temporary circumstance did not have a long term effect on overall water quality of the lake. The planning process needs to take account, however, of continuing problems in drinking water sources that may lead to placement on the state list.

6.3(k) Recommendations

The North East Texas RWPG adopted the following recommendations with regard to TNRCC regulatory policies:

- There should be consistency between TWDB rules for regional water supply planning and TNRCC rules for public drinking water systems with regard to minimum requirements for water supply;

- TNRCC should expedite the effort to replace MTBE in reformulated gasoline with additives that do not pose risks to drinking water supplies.

It should be noted that the issue of compensation is applicable to all reservoir development whether an inner basin transfer is contemplated or not.

6.3(l) Improvements to the Regional Water Supply Planning Process

The North East Texas RWPG believes that the regional water planning process should provide greater flexibility in development of water demand projections. TWDB rules and guidelines regarding population and water demand projections tend to confine rural and smaller urban areas to past rates of growth without allowing for consideration of alternative scenarios for future growth and economic development initiatives. Because the region has a relatively small population and water demands, the impact of a major new water user, such as a paper mill or a power plant, could dramatically alter the water supply and demand equation at a county or even basin level. There is no mechanism in the current process to provide for these potential increases, until the five year review period.

TWDB rules also build into municipal water demand projections conservation assumptions which may be unrealistic. In rural areas that already have low rates of per capita use, there often is an increase in per capita use as development takes hold in the area. Assumptions about conservation in these areas that already use far less on a per capita basis than the very large and rapidly growing urban areas could have the effect of limiting future development. There are more than 30 water user groups in the North East Texas Region with per capita usage levels well below the 115 gallons per capita per day (gpcd) level set as the "floor" approved municipal water demand projections. Some usage rates are in the 70-80 gpcd range, a sharp contrast with large urban areas where 200 gpcd or more is not uncommon. Landscape watering, a prime target for urban water conservation programs, is much less prevalent in rural areas. Further, the housing stock is not undergoing rapid growth or replacement, thus reducing the potential impact of plumbing fixture efficiency standards.

The North East Texas RWPG also has concerns about the TWDB requirement that regional water plans include specific recommendations as the strategies to be implemented to meet the water needs of individual water users. In many cases it is believed that while there may be a "preferred strategy," flexibility is necessary to allow for changing circumstances and conditions.

6.3(m) Recommendations

The North East Texas RWPG offers the following recommendations with regard to improvements to the S.B. 1 regional water planning process:

- TWDB should revise its rules for regional water planning to permit greater flexibility in the calculation of future water demands to allow for the consideration of alternative scenarios of population growth and economic development;

- TWDB should revise procedures for calculating water demand reduction projections contained in its conservation scenarios by recognizing a floor for the application of demand reduction for rural and small city areas where the per capita water consumption levels are already very low;

- TWDB should revise its rules for regional water planning to allow multiple options to be put forth as recommended strategies for meeting the needs of individual water user groups.

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7.0 Plan Adoption.

This chapter summarizes the public participation process used in the development and adoption of the North East Texas Regional Water Plan, the RWPG's responses to public comments, procedural approaches used in facilitating adoption of the plan, and recommendations concerning issues of plan implementation.

7.1 Public Participation Process

(1) Public Comment Opportunities at NETRWPG Meetings.

Every meeting of the North East Texas RWPG was noticed as a public meeting under the Texas Open Meetings Act and was attended by 25-50 persons. Those attending represented many sectors of the public, including water provider organizations, local government officials, members of the business community, farmers, representatives of area councils of government, utility officials, environmentalists, community activists and members of the general public. Comments and responses from these meetings have been included in meeting minutes and press release summaries.

(2) Public Hearing Prior to Submission of TWDB Funding Proposal.

As required by TWDB rules, the North East Texas RWPG held a public hearing to gather comment and ideas from the public before submitting a proposed scope of work and budget for the regional planning process. The hearing was held in Gilmer, a central location in the North East Texas Region, in June 1998 and was attended by approximately 70 people. The comments were summarized in the Scope of Work and addressed such issues as reservoir development, interbasin transfers, groundwater quality, the link between water planning and economic development, community concerns about displacement due to reservoir development and many other concerns.

(3) Outreach and Survey of Water Providers.

One of the exceptional aspects of the planning process in the North East Texas Region was the outreach process to involve every water provider in the region. This was done for two reasons. First, the RWPG wanted a review of population and water demand data provided by the TWDB, especially relating to the "County Other" category, referring to the large portion of the population of the North East Texas Region that is located in rural areas and small towns. Second, the consultant team surveyed water providers to gather a large volume of information about current water supplies, current and projected water demands, and the management and policy problems encountered by these organizations in their day-to-day operations and long-term planning. This was an invaluable source of information for the public outreach process.

(4) Development of a Public Participation Plan with a Subcommittee of RWPG.

From the beginning of its work, the North East Texas RWPG emphasized the importance of public outreach and education. The consultant team's public outreach specialist worked closely with a subgroup of members to design the initial Public Involvement Plan. The members of the subgroup were: Tony Williams, Steve Dean, Gary Jackson, Billy Adams, Ruth Culver and Mendy Rabicoff (a RWPG). Given a limited budget for the outreach program, the subgroup recommended, and the RWPG approved, a program consisting of three elements: 1) presentations to community groups by RWPG members, using slides prepared by the public involvement specialist; 2) distribution of press releases prepared by the consultant on the day following each monthly meeting to all daily and weekly papers in the region; and 3) outreach interviews with members of the RWPG and key stakeholders to identify issues of special importance.

(5) Hosting by RWPG Members of Community Meetings.

Many members of the North East Texas RWPG made presentations to business clubs, membership organizations, professional associations, County Commissioner Courts and other groups. Hundreds of people heard about the basic elements of the regional planning process through these presentations. The issues and concerns raised by the public at these sessions were forwarded to the consultant team for inclusion in their research. Several members of the consultant team also made presentations at these meetings.

(6) Development of Slide Presentations for Public Information.

The public involvement specialist prepared three different slide presentations for use by the North East Texas RWPG members. In addition, these slides were posted on the Internet site of the Northeast Texas Municipal Water District, the administrative agency for the North East Texas RWPG.

(7) Preparation and Distribution of News Briefs After RWPG Meetings.

The public involvement specialist prepared a summary of each meeting in the form of a press release that was distributed to daily and weekly papers across the region. These press releases were often used as the basis for news stories in papers in Longview, Mount Pleasant, Texarkana, Mount Vernon, Paris and other towns and counties.

(8) Interviews With RWPG Members.

An important method of identifying issues of public concern was a series of in-depth interviews conducted by the public involvement specialist over a six-month period in 1999. These interviews identified issues but also other organizations and individuals with particular interest in issues involved in regional water planning. The consultant prepared a report summarizing the issues revealed through the interview process.

(9) Contacts with Media.

In addition to distributing press releases, the consultant team contacted reporters and editors at major papers in the region. Through their efforts, several major stories helped to educate the public about the regional planning process. The lack of a large city in the region made television coverage impractical.

(10) Public Meetings and Public Hearing Prior to Submission of Initially Prepared Regional Plan.

The North East Texas RWPG conducted a series of five public meetings and one public hearing to gather public input on the Initially Prepared Regional Water Plan. These sessions took place in September 2000. All oral and written comments were recorded and were considered by the RWPG in the Adopted Regional Water Plan.

7.2 Responses to Public Comments

The North East Texas RWPG approved the *Initially Prepared Regional Water Plan* for release to the public on August 25, 2000. TWDB planning rules at §357.12 (a) (3) require "a public hearing following preparation, but before submittal to the board, of an initially prepared regional water plan, to be held in a central location within the regional water planning area…" Pursuant to the rules, the North East Texas RWPG made copies of the report available for public inspection in the County Clerk's office of each county within the North East Texas Region and in at least one public library in each county.

In order to provide opportunities for all residents of the region to comment on the Initially Prepared Regional Water Plan, the NETRWPG held a series of five public meetings in addition to the required public hearing. The informal meetings took place as follows:

September 12	Paris (Lamar County) and Longview (Gregg County)
September 14	Texarkana (Bowie County)
September 21	Greenville (Hunt County) and Canton (Van Zandt County)

Each public meeting began at 6:30 PM and included a presentation on the principal elements of the Initially Prepared Regional Water Plan, followed by a question and answer period. The sessions ended by 9 PM. The public hearing took place on September 28, 2000, at 1 PM in Gilmer (Upshur County). Approximately 200 persons attended the six events, and the consultant team recorded all questions either on video tape, audio tape or notes recorded by at least two persons.

Following the public hearing on September 28th, the NETRWPG approved submittal of the Initially Prepared Regional Water Plan to the TWDB.

All public comments provided either orally or in writing at the public meetings and hearing as well as comments received by interested parties who were not able to attend any of the public sessions were summarized and considered by the North East Texas RWPG prior to adoption of the final Regional Water Plan.

Following is a written summary of comments received with responses. In some cases, general responses are provided to a group of questions; in other cases, the general responses are accompanied by answers to specific questions.

Copies of comments submitted to the Planning Group in writing are reproduced in full in Appendix A, *Supplemental Data and Information.* Names of participants at the public meetings and hearing are also listed in Appendix A, but because comments have been summarized, in most cases, names are omitted from the responses provided below.

Comments are grouped into the following issue areas:

(a) Marvin Nichols 1 Reservoir and Related Issues
(b) Other Reservoir Sites
(c) Water Policy
(d) Condemnation and Property Rights
(e) Groundwater
(f) Ecologically Unique Stream Segments and Environmental Protection
(g) Conservation and Alternative Technologies
(h) Regional Water Planning Process, Strategies and Terminology
(i) Public Participation Process

7.2 (a) Marvin Nichols I Reservoir and Related Issues

The recommendation involved in the Initially Prepared Regional Water Plan in support of Region C's strategy to build Marvin Nichols I Reservoir drew a large number of comments. Questions and comments illustrating public concerns are grouped below in four categories, and responses are provided to each category rather than to each question.

Benefits, Ownership and Water Uses in Region D for the Proposed Marvin Nichols I Reservoir:

1. How would the Marvin Nichols I reservoir help the North East Texas Region if all the water goes to Region C?

2. Who would own the reservoir – would we have any control? Will the Army Corps of Engineers own the lake?

3. What would cause Region C to switch to the three alternative reservoirs?

4. What portion of Marvin Nichols I would be reserved for the North East Texas Region? Could the percentage be changed?

5. Can any of the portion of the yield of Marvin Nichols I be used for agriculture within the North East Texas Region?

6. Since they're flooding my land, why can't water be used to irrigate land?

7. Would water from the Marvin Nichols I reservoir be provided to Dallas under a contract or would they own water rights?

Response:

The Region C Regional Water Plan proposes construction of the Marvin Nichols I Reservoir to meet needs of the Dallas-Fort Worth metropolitan area over the next 50 years. The North East Texas Regional Water Plan supports that strategy by recommending construction of the proposed reservoir, or construction of an alternative group of reservoirs (Marvin Nichols II and George Parkhouse I and II) if Marvin Nichols I cannot be built. The North East Texas Plan also recommends that a portion of the water yield of Nichols I (the yield is estimated at approximately 561,300 acre-feet) be reserved for the North East Texas Region. It is that portion of the project that would benefit this region.

None of the details of the proposed project have yet been determined, but it is likely that the Sulphur River Basin Authority will be the lead agency in developing the project. It is not anticipated at this time that the U.S. Army Corps of Engineers will build the project. Such Major Water Providers of Region C as Dallas Water Utilities and the North Texas Municipal Water District would be the major users of water from the project and would make the project financially viable. How much water would be retained in the North East Texas Region, what the uses and method of distribution of that water would be, how much it would cost this region, whether each participating agency would own a percentage of water rights or one public entity would own the rights and sell water to the others, are all questions that have not yet been answered.

Regarding questions about the future uses of water from the Marvin Nichols I Reservoir, it would be possible for water to be used for irrigation, provided that the irrigator obtained the appropriate contracts from the owner of the water rights stored in the reservoir.

Design and Location Issues of Marvin Nichols I:

8. How long will it take to construct the reservoir in the Region C plan? Does it filter the North East Texas Region?
9. Is Marvin Nichols I bigger or smaller than Ray Hubbard?
10. Clarify the difference between Marvin Nichols I and II.
11. Where would the Marvin Nichols I dam be built?
12. What is the conservation pool? What if the spillway were to be that high?
13. How high could the lake get? What is height of Marvin Nichols I and of the other Sulphur River basin lakes that might be built? How far upriver would Marvin Nichols I extend? Do you have the elevations yet?
14. Can they change the position of the dam?

Response:

The information available to the North East Texas Regional Water Planning Group about the design and specifications of the Marvin Nichols I reservoir project is contained in the Reservoir Site Assessment Study (Appendix B). That assessment had the limited purpose to "determine which sites for future reservoir development to include in the regional water plan." The study is a reconnaissance-level report, which is based on available information from prior studies updated to 1999 costs. The precise location of the dam, the elevation the water would be permitted for, and many other specifications are noted for most sites but are subject to change and would be closely reviewed by state and federal agencies during the permitting process.

Based on available information, the study reports that the dam would impound 1,369,717 acre-feet of water and cover 62,128 acres of land. Lake Ray Hubbard, by comparison, covers approximately 22,745 acres. The Marvin Nichols I conservation pool (the water stored to satisfy water rights) would rise to an elevation of 312 feet mean sea level. Levels above this would be reached under flood conditions. For example, the probable maximum flood elevation is 319.1 feet mean sea level, which would extend over 77,612 acres of land. The site of the dam would be on the mainstem of the Sulphur River at River Mile 114.7, upstream of the confluence with White Oak Creek. This location was chosen in the past as a result of engineering surveys as the best site for a reservoir of this size. Changing the location is possible but could affect the capacity and yield of the reservoir. The precise "footprint" of the reservoir, location of the dam, elevation and size of the conservation pool and many other issues will be determined by the agencies involved at the time they actually seek the relevant permits from the state and federal agencies.

Marvin Nichols II would be located on White Oak Creek, rather than on the mainstem of the Sulphur River, and the dam would be constructed at the confluence with the Sulphur River, contiguous to the site of the Nichols I dam. It is a much smaller project than Nichols I, and the Region C water providers have indicated that Nichols II would have to be built with the Parkhouse I and II projects (located upstream on the south and north forks of the Sulphur respectively) in order to equal the yield of Nichols I.

<u>*Influence of Marvin Nichols I on Lake Wright Patman and Downstream Water Users*</u>:

1. The installation of one or more reservoirs will cause a decrease in the water available to Wright Patman Lake subsequently reducing the water available for discharge from Wright Patman Dam. …[T]he ability for the [International Paper] Texarkana Mill to conduct normal operations will then be compromised. Local water supply [of approximately 10,000 persons] would also be affected.

2. Early estimates of the acreage required for construction and mitigation to wetland status would have a significantly negative impact on wood supply to the [International Paper Texarkana] mill. … The estimated costs to the mill could be devastating.

3. How do water rights work for new reservoirs? If Marvin Nichols I is built, would Wright Patman still get water?

4. What if the lake volume drops? Would they not be able to fulfill contracts?

5. Are you building a chain of lakes on the river? What will be the impact on Wright Patman?

6. How can you both sell water to Dallas from the Sulphur River and raise the level of Wright Patman?

<u>*Response*</u>:

Under current Texas water law, TNRCC could only issue a permit for new water storage rights if existing water rights were fully protected. In addition, state interbasin transfer policy would also come into play, requiring a full analysis of the economic impact of transferring the water out of basin as well as a hydrologic and water rights analysis. We believe TNRCC would require Nichols I to release all water necessary to satisfy the rights to water stored in Lake Wright Patman, as well as rights of the International Paper Mill at Texarkana, other downstream run-of-the-river rights and additional flows required for environmental purposes.

The concern about the impact of a new reservoir on the discharge of wastes into the stream of a particular facility, like the International Paper mill, is a significant issue but is well beyond the reconnaissance-level study of potential reservoir sites. The comments indicate that reducing the flow of unappropriated waters that now pass the discharge point would have the effect of raising the concentration levels of contaminants in the waste stream and put the paper mill into noncompliance with the levels specified in its discharge permit from TNRCC. If compliance with the permit depends on flows that would now be stored in a new upstream reservoir, there are several ways in which this problem could be dealt with, should the project proceed. First, the downstream impacts of all kinds associated with Nichols I (in fact, all the impacts within the Sulphur Basin) would be closely reviewed by TNRCC, and mitigation measures could be specified at that time. It is also possible that mitigation of impacts of this sort could be the subject of negotiations among the lead agencies in the course of determining how the benefits and costs of the project would be shared between regions. If these opportunities did not adequately protect the mill, it would be possible for the mill to purchase or lease additional water from either Lake Wright Patman or from Nichols I to assure its ability to meet discharge permit conditions.

Impacts on wood supply available to the mill are also important and would be considered in the permitting process and in negotiations between the lead agencies of each region. The interbasin transfer provisions of SB-1 were designed to address just such concerns of economic impacts on important industries, such as agriculture and forest products, in the basin of origin. It is not possible to anticipate what remedies or mitigation measures might be possible at this stage.

As noted, it is beyond the scope of this planning effort to evaluate such site-specific impacts or to suggest exactly how those impacts might be avoided, minimized or mitigated. The concerns, however, are valid and need to be raised in the appropriate forums at such time as a project proposal is presented to state and federal permitting agencies.

<u>*Environmental and Socio-Economic Impacts of Marvin Nichols 1*</u>:

1. Construction of Marvin Nichols I would result in destruction of the White Oak Creek wildlife management area and other areas.

2. The proposed Marvin Nichols I reservoir will destroy the habitat of the paddlefish, a species that lives only in certain stream segments of the Sulphur River in Bowie County. Other endangered species or protected species likely to occur in the proposed reservoir area include Bachman's sparrow, creek chubsucker, alligator snapping turtle, interior least tern, bald eagle, American swallow-tailed kite, timber rattlesnake, and southeastern myotis. Endangered natural communities in the proposed reservoir area are the imperiled and very rare globally silveanus dropseed series and the Texas state-listed sugarberry-elm series.

3. Would Marvin Nichols I cover mined land and send pollution down this way?

4. I understand that fly ash was dumped on the Talco fault line. Would that come downstream if Marvin Nichols I were built? Can you dig out the fly ash and do something with it?

5. Marvin Nichols I will devastate the area and change our way of life. They need to find alternate sources of water, such as wells and dredging lakes.

6. We are concerned that there is not enough additional high valued bottomland hardwood habitat or lands suitable for habitat improvements available in the Sulphur River Basin to compensate for the large amount of habitat that would be lost due to the construction of the Marvin Nichols I Reservoir. … The Plan assumes that the amount of mitigation land required is equal to the amount of land required for the reservoir itself. The amount of mitigation land required may not be equal to the size of the project. Compensation may require more land than in the conservation pool, flood easements and lignite rights combined. The Texas Water and Wildlife assessment indicates that a minimum of approximately 163,620 acres of intensely managed mitigation land to 648,578 acres of minimally managed mitigation land would be required to compensate for habitat loss for the Marvin Nichols 1 Reservoir site alone.

<u>*Response:*</u>

These questions are representative of concerns about the impact of actual development of the Marvin Nichols I reservoir. As noted in the previous response, it is beyond the scope of this planning study to review these issues in detail or to suggest how they might be addressed or resolved. The Nichols I water management strategy has been selected by Region C as a means of meeting its water needs over the next 50 years. *The North East Texas Region is not required to evaluate the project according to the criteria specified in the TWDB rules on regional water planning because it is not proposing this option to meet* *any of its water needs over the next 50 years*. The North East Texas Regional Water Planning Group is supporting implementation of the Nichols I strategy (or a group of alternative reservoirs) provided a portion of the water is reserved for future use within the North East Texas Region, possibly beyond the 50 year planning horizon of this study. If such a surface water management strategy should be adopted in the future, the North East Texas RWPG would have to evaluate it under the TWDB rules and amend the regional plan to incorporate the option.

The Reservoir Site Assessment Study (Appendix B) identified a number of environmental issues relating to Nichols I. Within the site there are several rare, threatened or endangered species, though the scope of impact to each species has not been studied. There are also substantial wetland areas, and the US Fish and Wildlife Service has identified a Priority 1 Bottomland Hardwood Area and a Priority 5 area. Further study of these and other environmental issues will occur during the state and federal permitting processes once the details of a Nichols I proposal have been determined.

The exact language of the recommendation on Nichols I is important to quote here as a further response to the many concerns expressed about this aspect of the Initially Prepared Regional Water Plan:

> "The development of the Marvin Nichols I reservoir site as a future water source for the Dallas-Ft. Worth Metroplex would require interbasin transfer authorizations from the Texas Natural Resource Conservation Commission. Among its many provisions, S.B. 1 includes provisions (Texas Water Code, Section 11.085) requiring the TNRCC to weigh the benefits of a proposed new interbasin transfer to the receiving basin against the detriments to the basin supplying the water. S.B. 1 also established the following criteria to be used by the TNRCC in its evaluation of proposed interbasin transfers:

- The need for the water in the basin-of-origin and in the receiving basin.
- Factors identified in the applicable regional water plan(s).
- The amount and purposes of use in the receiving basin.
- Any feasible and practicable alternative supplies in the receiving basin.
- Water conservation and drought contingency measures proposed in the receiving basin.
- The projected economic impact that is expected to occur in each basin.
- The projected impacts on existing water rights, instream uses, water quality, aquatic and riparian habitat, and bays and estuaries.
- Proposed mitigation and compensation to the basin-of-origin.

> The North East Texas RWPG supports the full application of the criteria for authorization of interbasin transfers contained in current state law. With regard to compensation to the basin-of-origin, the North East Texas RWPG recommends that a portion of the firm yield of the Marvin Nichols I reservoir, or other projects developed in the Sulphur River Basin for interbasin transfer, be reserved for future use within the basin. The specific terms of such compensation, along with other issues associated with development of the project (e.g., financing, operation of the reservoir, etc.), should be addressed by the appropriate representatives of the Sulphur Basin Authority, in coordination with the Franklin County Water District and the Titus County Freshwater Supply District No. 1, and with the entities in Region C and within the North East Texas Region that are seeking the additional water supply."

7.2(b) Other Reservoir Sites

In addition to the Marvin Nichols I reservoir site, 14 other reservoir sites were recommended to the Legislature for designation as "unique reservoir sites". Included in this group were the Carthage and Waters Bluff sites, and there were several comments that focused on these two potential reservoirs. Other comments raised more general issues about reservoir construction. Following are numerous examples of the issues and concerns raised by these comments. Responses are provided to the questions about straightforward factual issues immediately following the question. Larger issues are dealt with following the questions.

1. Regarding Carthage Reservoir:

    a. What is the source of the iron and manganese in the Sabine River at the Carthage site?

Response:

As noted below, the Reservoir Site Assessment Study (Appendix B) did not include identification of the sources of particular substances or the current levels of concentration in streams where water would be impounded. The Study does note that the Carthage site includes within it or within a one mile buffer area one Superfund site, four municipal solid waste landfills, and two permitted industrial and hazardous waste sites. It also cites the 1997 Update to the Texas Water Plan regarding concerns about "elevated levels of lead in sediments" in the middle third of the reservoir site and "elevated levels of manganese" in the entire reservoir.

    b. Would there be a new bridge if the reservoir is built?

Response:

It is not possible to predict what improvements would be associated with the site if and when a reservoir is ever proposed for development. However, development of new reservoirs often involves highway and road relocations and replacement of bridges.

    c. Can you dig a deeper lake so it doesn't take up so many acres?

Response:

Lakes are not excavated because such an undertaking would be prohibitively expensive. A dam site is generally chosen because it provides a relatively narrow space on a stable bed where a dam can be built to back water up to fill a natural depression, usually a river valley or canyon. Some depressions are shallow and wide, others deep and narrow. Reservoir sites in this part of Texas tend to be shallow and extensive because of the terrain of prairies and woodlands within the Gulf Coastal Plain.

2. It won't do any good to have more dams without the necessary infrastructure improvements. … The answer for most East Texas water needs is additional wells, increased treatment capacity, additional pipelines and infrastructure. … When and if additional water is needed, we would like to see small non-mainstem reservoirs such as the proposed Prairie Creek Reservoir be built. …Giant mainstem reservoirs are not needed. What is needed is capital outlays for additional wells and infrastructure.

Response:

TWDB planning rules specifically exclude planning for local facility infrastructure improvements, except where such improvements to increase well or storage capacity are part of a recommended water management strategy. In fact, all the identified needs of Water User Groups in the North East Texas Region will be met from relatively small-scale and mostly local strategies, such as those mentioned in the comment. In the future, any reservoirs proposed for the recommended sites would include transmission facilities to the major customers. Local planning for handling new water sources through infrastructure improvements is a matter for decisions by local water providers.

3. Future dams should be built off the main stem of the rivers, like Prairie Creek….

Response:

Proposals for impoundments of water in other river basins of Texas have suggested that construction of artificial structures entirely away from river channels (known as "off-channel reservoirs") and construction on tributaries are viable strategies. In this case, the North East Texas RWPG is not proposing that reservoirs be built at all the recommended locations. It is only recommending that the Legislature protect the sites from actions by state and local agencies that would reserve the site lands for conservation purposes. Please see below for the discussion on the scope and intention of the current recommendation for designation of "unique reservoir sites."

4. It is ironic that the North East Texas RWPG concern for property owners leads to no designation of ecologically unique stream segments but to recommendations for designation of 15 unique reservoir sites.

   See section below on property rights.

5. We need to plan ahead for people moving into the region. It is important to plan new reservoirs now.

Response:

The Planning Group agrees and has taken the initial steps to ensure that future options are preserved for meeting needs through appropriate water management strategies, including the possibility of new reservoirs being developed in the future.

6. No more dams are needed on the Sabine River in this part of Texas.

   See discussion below.

7. Would there be mitigation for Cooper Lake? Would Parkhouse I be an extension of Cooper Lake?

Response:

Cooper Lake was built by the Army Corps of Engineers and there already exists a mitigation area to offset the loss of wetlands caused by the lake. Parkhouse I would be downstream of Cooper Lake but would be an independent structure, not an extension of Cooper.

8. Who were George Parkhouse and Marvin Nichols?

Response:

George Parkhouse was a state representative and senator from the Dallas area, serving during the 1940's through the 1960's. Marvin Nichols was an engineer and water planner from Fort Worth who had a major role in the development of many of the reservoirs in Texas.

9. What does "proposed" mean in relation to Parkhouse and Estes reservoirs?

   See discussion below.

10. The proposed Waters Bluff Reservoir and Belzora Landing Reservoir are not needed, should not be classified as a "unique reservoir site" and should easily be designated as "ecologically unique stream segment". … This area has been designated as a "priority one status" by US Fish and Wildlife Service, for hardwood forest quality.

Response:

These reservoirs are not "proposed" to be built by the North East Texas RWPG, the Sabine River Authority or any other appropriate entity. As noted, the RWPG is recommending the preservation of the site lands for potential future reservoir use. If the Legislature followed the recommendation and voted to designate the sites for "unique reservoir site" status, that decision would apply only to state and local agencies. It would not affect the ability of federal agencies to acquire conservation easements. See the discussion below.

11. Please do not build all those reservoirs and destroy so much of our East Texas forests.

    See discussion below.

12. What is the location of Ralph Hall Reservoir?

Response:

The Ralph Hall Reservoir is a project proposed by the Sulphur Valley Water Supply Corporation (SVWSC) to be located in Fannin County, within Region C, on the North Sulphur River. The dam would be located on the west side of State Highway 34, just north of the City of Ladonia. It is a medium-sized reservoir that would impound approximately 125,000 acre-feet of water and would have a firm annual yield, according to a study prepared for the SVWSC, of approximately 30,500 acre-feet.

13. What is the cost of moving graveyards when a reservoir is built?

Response:

The Reservoir Site Assessment Study (Appendix B) includes the methodology for identifying the need for and cost of relocation of all cultural resources, including cemeteries. The cost will vary depending on the size and condition of each cemetery. The assessment for each reservoir includes the cost of resolving identified land use conflicts of this type. For example, the cost given for relocating three cemeteries displaced by Marvin Nichols I is estimated at $1,532,700. All cost estimates follow assumptions provided by TWDB unless otherwise noted in that study.

14. Is there a preliminary elevation for any of the lakes?

Response:

The Reservoir Site Assessment Study, (Appendix B), includes information on reservoir elevations obtained from previous studies.

15. The National Wildlife Federation has submitted comments generally finding the discussion of reservoir impacts inadequate. It has also provided brief comments on each of the 15 recommended unique reservoir sites urging that recommendations for some be delayed until more detailed information is available and arguing that other sites are not appropriate for the reservoir site designation. (The comments are printed in full in Appendix C.)

General Response on Reservoir Site Recommendations:

The Initially Prepared Regional Water Plan discusses the nature of the unique reservoir site designation in Section 6.1 and is quoted, in part, here to help clarify the intention behind including 15 site recommendations for this designation.

> " Pursuant to TWDB rules, the approved scope of work for the preparation of the North East Texas Regional Water Plan included a subtask to "…determine which sites for future reservoir development to include in the regional water plan." Accordingly, consultants to the North East Texas RWPG conducted a "reconnaissance-level" assessment of previously identified reservoir sites in the region. This assessment was based on a review and limited update of information contained in previous studies for three previously "proposed reservoirs" and 14 "potential" reservoir sites. It should be noted that the "proposed" and "potential" designations used here and in the *Reservoir Site Assessment Study* were made only to assist in the planning process and are not intended to convey a relative priority among the various reservoir sites.
>
> The 1997 state water plan recommended development of two new reservoirs within the North East Texas Region – the George Parkhouse II reservoir project (Lamar County) and the Marvin Nichols I reservoir project (Red River and Titus counties), both of which are located within the Sulphur River Basin. It is noted in the 1997 state water plan that development of the Nichols I reservoir could eliminate or significantly delay the need for the Parkhouse II reservoir. Also, the recently completed *Comprehensive Sabine Watershed Management Plan* includes a recommendation that the Sabine River Authority develop the Prairie Creek Reservoir and Pipeline Project (Gregg and Smith counties) to supply projected needs within portions of the North East Texas Region. It should be noted that the Prairie Creek Reservoir and Pipeline Project is being pursued at this time due to the conservation easement limitation on the Waters Bluff reservoir site. If the conservation easement were removed, the Waters Bluff reservoir would be the Sabine River Authority's top priority project to meet projected water needs in the upper Sabine River Basin.
>
> In addition to the proposed reservoirs referenced above, 14 other reservoir sites within the North East Texas Region were also evaluated. These are:

Cypress Creek Basin	**Red River Basin**
Black Cypress (Cass and Marion)	Barkman (Bowie)

Caddo Lake Enlargement (Marion and Harrison)
Little Cypress (Harrison)

Big Pine (Lamar and Red River)
Liberty Hills (Bowie)

Sabine River Basin

Big Sandy (Wood and Upshur)
Carl Estes (Van Zandt)
Carthage (Harrison)
Kilgore II (Greg and Smith)
Waters Bluff (Wood)

Sulphur River Basin

Marvin Nichols II (Titus)
Parkhouse I (Delta and Hopkins)
Pecan Bayou (Red River)

Figure 6.1 shows the approximate location of the previously proposed and potential reservoir sites in the North East Texas Region.

The *Reservoir Site Assessment Study* provided information on various characteristics of each reservoir site, including:

- Location;
- Impoundment size and volume;
- Site geology and topography;
- Dam type and size;
- Hydrology and hydraulics;
- Water quality;
- Project firm yield for water supply;
- Other potential benefits (e.g., flood control, hydro power generation, recreation);
- Land acquisition and easement requirements;
- Potential land use conflicts;
- Environmental conditions and impacts from reservoir development;
- Local, state, and federal permitting requirements; and,
- Project costs updated to second quarter 1999 price levels using the *Engineering News Record* Construction Cost Index."

It must be borne in mind that the only reservoirs that are proposed for construction within the North East Texas Water Planning Region, according to the most recent planning documents, are Marvin Nichols I reservoir which is included in the Initially Prepared Regional Water Plan for Region C and Prairie Creek Reservoir, which is indicated as the top priority in the Upper Sabine Basin by the Sabine River Authority in its 1999 comprehensive management plan.

Thirteen additional reservoir sites are recommended not for construction but for designation by the Legislature for "unique reservoir status". Two other sites, Caddo Lake Enlargement and Black Cypress, were reviewed but excluded from this recommendation. The RWPG believes it is important to preserve the recommended sites for possible future development, beyond the 50-year planning horizon of the current Regional Water Plan. There are two further rounds of consideration of these sites. First, the TWDB will review the North East Texas Regional Water Plan to determine whether it agrees with the recommendations. It may decide to include all, some or none of the proposed sites when it assembles the new State Water Plan. The State Water Plan is due for presentation to the

Legislature in January 2002. If any recommendations for unique reservoir designation were included, the Legislature would begin its consideration in the session beginning January 2003. Both the TWDB and the Legislature will receive extensive public comment during their processes. Given the fact that actual construction at the recommended sites remains speculative, the North East Texas RWPG has nevertheless revised the Regional Water Plan to indicate potential Water User Group recipients from possible future reservoirs at these sites.

7.2(c) Water Policy

TWDB gives special attention to areas where there are conflicts between the plans of adjacent regions. Murray, Thomas & Griffin, the engineering firm working with the Sulphur Basin Joint Task Group of Region C and the North East Texas Region, points out that the Region C Plan calls for repeal of the interbasin transfer provisions of Texas Senate Bill 1 (75^{th} Texas Legislature), including the "Junior Water Rights" provision, while the North East Texas Regional Water Plan calls for the full implementation of those criteria.

Here are some of the concerns most frequently expressed during the public comments period.

1. We should have a policy to keep our water here. Keep the water here because we might need it in the next 50 years after this plan is over.

2. We have to be realistic about water supplies. The groundwater should be reserved for rural folks and agriculture. Surface water should be used for municipal and all other needs.

3. Region C believes the interbasin transfer provisions of Senate Bill 1 are a barrier to the movement of water and should be repealed while the North East Texas RWPG supports the enforcement of those provisions.

4. The purpose of this plan seems to be to supply water to the Dallas-Fort Worth area.

Response:

The question of interbasin transfers, especially transfers that would take Sulphur River Basin water to the Dallas-Fort Worth metropolitan area, has been central to the entire planning effort. With near unanimity, the North East Texas RWPG determined that the best policy for North East Texas Region was to seek to participate in such transfers and to receive appropriate benefits rather than to oppose future transfers of water from the region. The RWPG disagrees with those who prefer a policy of not allowing any exportation of surface water. At the same time, the RWPG supports full application of the many provisions of Senate Bill 1 that serve to protect the interests of the basin of origin when interbasin transfers are at issue. In this regard, the members disagree with Region C, which is recommending repeal of the interbasin transfer provisions of Senate Bill 1. The different approaches of the two regions reflect differing interests but will not be a barrier to continued discussions and cooperation about how best to meet future water needs.

The North East Texas RWPG also considered the future uses of groundwater but did not adopt any recommendation that uses be limited to preferred Water User Groups. Given the fact that there are no groundwater districts in the planning region, the rule of capture applies, and future uses of groundwater will depend on the decisions of private landowners. Local residents would have opportunities under existing law to approve or disapprove the formation of groundwater districts, but it is at that level of decision-making that policies about groundwater use would be determined.

7.2(d) Condemnation and Property Rights

A number of comments urge the North East Texas RWPG to adopt recommendations for fair treatment of property owners in the land acquisition phase of reservoir development. Following are examples of these questions:

1. We need stronger language on compensation for condemnation. We prefer cash payment or like-kind swaps.

2. Since water is a natural resource, why doesn't the landowner get royalties in the condemnation process? I'd like to keep the land and sell water.

3. When they take the land, will they compensate for the living as well?

4. Is there any proposed time for purchase of the land?

5. Can they come in on an easement and build something like a condominium?

Response:

As is the case regarding many other issues concerning reservoir development, the North East Texas RWPG is charged only with planning and identifying water management strategies that can meet water needs. The questions concerning compensation would arise at a much later time after the appropriate entities have applied for permits to construct a reservoir or pipeline project. With regard to interbasin transfers of surface water, like that contemplated for the proposed Marvin Nichols I Reservoir, the TNRCC must consider economic impacts within the basin of origin. That is one forum in which compensation issues could be raised. Others would likely arise well before any actual purchase of land for reservoir construction and/or habitat mitigation began. The Sulphur River Basin Authority is the agency that will likely have the lead responsibility should any of the proposed Sulphur Basin projects be implemented.

The North East Texas RWPG has adopted a new recommendation specifically urging the future developers of proposed and/or potential reservoirs to provide adequate and fair compensation for all property rights.

7.2(e) Groundwater

Most of the concerns about groundwater have been spurred by the proposal of the Ozarka Company to bottle spring water in Wood County for export. Many residents believe this will deplete shallow groundwater that supports domestic wells. Commenters urge policies for:

- Addressing the protection of shallow groundwater, especially relating to the Ozarka proposal in Wood County.
- Recommending the formation of groundwater districts in the North East Texas Region.
- Sustainable use of groundwater as a policy goal for the Carrizo-Wilcox and other aquifers of the region.

Examples of the questions and comments follow:

1. Shallow groundwater is not fully addressed in the plan. It should have protection.

2. If you drain the Queen City and Carrizo Wilcox aquifers, the Sulphur River will lose water. There will be a big effect on industry. Who would be using that water?

3. The Queen City aquifer should be used before the shallow groundwater. Water from the bigger aquifers can be used for industry and mining. Water from the shallow aquifers should be reserved for agriculture and residential use.

4. The RWPG should recommend a transfer fee on groundwater exports. That would create an incentive for industry to locate here to use the water.

5. The plan should recommend groundwater rules to deal with the Ozarka situation.

Response:

The North East Texas RWPG members strongly agree that much more complete data on groundwater availability is needed. Several members expressed reservations about data provided by the TWDB concerning the major aquifers, citing the inability to distinguish groundwater with total dissolved solids concentrations requiring treatment from those that did not and TWDB reliance on groundwater models with little historical well data. The RWPG supports TWDB's current efforts to develop much more complete and accurate groundwater modeling data.

Regarding the regulation of groundwater, North East Texas is an area of the State that does not currently have any groundwater management districts. The formation of these districts depends primarily on a petition by local residents to the TNRCC to form a district and a confirmation election in each county that would be included in the proposed district. TNRCC may also initiate the district formation process, but a local election is still required. Given the importance of local acceptance for the initiation and creation of a new management structure, the RWPG believes it is not appropriate for this regional entity to propose district formation in any county. Residents of any county where a need for groundwater management may exist can make use of the existing laws to begin the process of forming a district. The RWGP also notes that the 2001 session of the Legislature may address a number of questions relating to the formation and powers of groundwater districts.

7.2(f) Ecologically Unique Stream Segments & Environmental Protection

Numerous comments address environmental issues and urge policies that would:

- Protect bottomland hardwoods located at reservoir sites
- Protect endangered and threatened species habitat
- Change some unique reservoir site recommendations to recommendations for ecologically unique stream segments
- Protect environmental stream flows from the impacts of reservoir development.

Examples of questions and comments follow:

1. There are conflicts between the plan and the areas indicated by the Texas Parks and Wildlife Department for ecologically unique stream segments.

2. The plan fails to protect natural resources. Indeed, recommendations to build Prairie Creek Reservoir…and to designate 15 sites as unique reservoir sites, despite the extensive

environmental harm they would cause and the lack of a demonstrated need for the water that would be produced, portend significant harm to natural resources and to agricultural resources.

3. Mitigation is a waste of taxpayers' money.

4. The plan should have an overall discussion of the impacts of dams on the environment.

5. The plan lacks discussion of non-point source pollution.

6. The plan should address the impacts on bottomland hardwoods if the reservoirs are built.

7. The plan should give serious consideration to recommending ecologically unique stream segment designations.

8. The [U.S. Fish and Wildlife] Service believes that your plan should recognize the need for appropriate instream flows for fish and wildlife resources as beneficial uses of water. The Plan should not only identify ecologically unique stream segments, as suggested by SB-1, but should go farther to identify conservation measures that should be taken to ensure protection of the quantity and quality of the aquatic habitats of those areas.

Response:

This group of public comments has raised important issues about environmental impacts and how they are to be addressed and mitigated. The National Wildlife Federation, in particular, has presented a thoughtful critique of the Initially Prepared Plan and finds it lacking in consideration of environmental water needs, instream flow impacts and the analysis of threats to natural resources. The North East Texas RWPG again draws attention to the fact that its recommendations about reservoirs are not equivalent to water management strategies, within the meaning of TWDB rules. Water management strategies are designed to meet the needs of specific Water User Groups over the next 50 years and must be evaluated according to a list of TWDB criteria that include the State Consensus Environmental Criteria relating to instream environmental flows. The water management strategies actually proposed in Chapter 5 to meet the identified shortages of specific Water User Groups are quite small in scale and typically involve adding another well to an existing system or seeking a water supply contract from an existing water supply source.

The North East Texas RWPG respectfully disagrees with the suggestions of several commenters regarding the inadequacy of the environmental review. The water management strategies recommended to meet the relatively isolated shortages identified in the region are quite local in nature, and few, if any, have any significant environmental impacts. The environmental impacts of significance are all associated with the reservoirs reviewed in Chapter 6 ("Additional Recommendations"). The proposed Marvin Nichols I is a water management strategy of Region C and is reviewed according to the full list of TWDB criteria in the Initially Prepared Plan of that region. The proposed Prairie Creek Reservoir is a top priority of the Sabine River Authority for the upper portions of the Sabine River Basin area but is not included in the Initially Prepared Plan as a water management strategy. At such time as that project is presented as a candidate water management strategy, it will be reviewed by the RWPG according to TWDB criteria. It is also important to note that the amendment process can be initiated at any time after adoption of the final Regional Water Plan. The openness of the process assures that additional studies can be completed in the future as changing needs and opportunities arise.

Detailed review of the environmental impacts of each water management strategy, and especially of reservoirs to be used for interbasin transfers as noted above, will occur during the permit reviews of state and federal agencies, including TNRCC and the Army Corps of Engineers.

7.2(g) Conservation and Alternative Technologies

Some commenters urge that conservation should be a centerpiece of the plan, that more information about specific water conservation measures be included in the plan and that the plan should address the role of conservation and drought management in meeting water supply needs. Quoted here are sample comments:

1. There is no attention given to conservation in the plan. The draft plan is devoid of any discussion of conservation measures that should be included in water conservation plans and of any discussion of what water savings might be realized through an advanced water conservation program.

2. The plan fails to recommend advanced conservation and action to reduce instream uses.

3. New water demands can be met by means of conservation.

4. The draft Plan lacks any meaningful analysis of drought management as a mechanism for limiting demand during water-short periods.

5. Desalination should be seriously considered. Dallas should use desalination and not take water from Region D.

6. Why not use turbines (for hydropower?) instead of power plants that use too much water?

Response:

There are three major issues presented in this group of comments: 1) the role of conservation in the Plan; 2) the requirements regarding drought management planning; and 3) proposals that the Plan consider alternative water management technologies, such as desalination.

1) In considering conservation, the RWPG had several concerns. First, it noted an unfortunate popular apathy about water conservation in a region that normally enjoys substantial rainfall. Several members felt that people thought about the issue only in times of drought; and that there was a great need for education at all levels regarding conservation. Second, there was concern that the conservation assumptions built into the TWDB water demand projection scenarios did not take into account those Water User Groups that already had low rates of water consumption. The RWGP agreed with TWDB on a floor of 115 gallons per capita per day (gpcpd) for applying the conservation projections. Without such a floor, it was feared, small water systems, especially in rural areas, that already have per capita levels well below 115 gpcpd, would have to incur unreasonable expense and would receive no credit for their already frugal use of the resource. It was also pointed out that the impact of spreading urbanization tended initially to increase rather than decrease water use in rural areas, but that increase was only due to the availability of improved water and sanitation systems and still fell well within TWDB targets. Finally, the RWGP felt strongly that conservation planning was a local affair and could not be imposed by a regional entity. The entire region has only seven cities with a population greater than ten thousand, and the water providers in those areas have taken steps already to initiate or to implement conservation programs. The Plan does, however, reflect conservation assumptions built into the water demand projections developed by the State. The Texas Water Development

Board's "expected case scenario" incorporates the assumption that under federal law requirements water-saving fixtures will be built into new construction, thus phasing in a reduction in water demand of approximately 15 percent. This level of demand reduction through conservation does not appear in the Regional Water Plan as a water management strategy but rather is reflected in the water demand projections, which would be 15 percent higher if the assumption had not been applied.

2) Drought management planning is a dimension of regional water planning that has largely been addressed through other forums, and recent communication by many Regional Water Planning Groups with TWDB seems to confirm this. TNRCC requires every public water supply system to file a drought management plan, and these are available for review through that agency. The larger water suppliers and wholesalers, and many of the smaller suppliers, already have drought management plans, and where these are lacking it has proven impractical for the Regional Water Planning Groups to undertake the detailed work needed to identify drought management trigger levels for every water source in the region. This is an issue, most of the Water Planning Regions agree, that needs to be revisited by the State in its review of the regional water planning rules. The Regional Water Plan has been revised to include this additional information on the drought contingency plans of designated “major water providers.”

3) Alternative technologies, such as desalination, suggested by some commenters are more appropriate for consideration by the large centers of demand in the state that lack adequate resources for the future. The planning study carried out by the North East Texas Regional Water Planning Group determined that, while there were isolated local shortages around the region, there were almost always relatively inexpensive and completely adequate ground or surface water sources readily available. The availability of these sources of inexpensive water makes alternative technologies economically impractical in the North East Texas Region.

7.2(h) Regional Planning Process, Strategies or Terminology

This is a set of varied questions about different aspects of the planning process, and each is answered separately.

1. The Sabine River Authority has submitted revisions to Table 4.34 concerning water supplies and demands for the Sabine River Authority. The requested revisions are in italics as follows:

Table 4.34 (Revised) – Water Supplies and Demands for Sabine River Authority

SUPPLIES (ACRE-FEET)	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Lake Tawakoni	238100	238100	238100	238100	238100	238100
Lake Fork	188660	188660	188660	188660	188660	188660
TOTAL	**426760**	**426760**	**426760**	**426760**	**426760**	**426760**

DEMANDS (ACRE-FEET)	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Commerce	*8401*	*8401*	*8401*	*8401*	*8401*	*8401*
Edgewood	840	840	840	840	840	840
Emory	2016	2016	2016	2016	2016	2016
Greenville	21283	21283	21283	21283	21283	21283
Quitman	1120	1120	1120	1120	1120	1120
Kilgore	6721	6721	6721	6721	6721	6721
Longview	20000	20000	20000	20000	20000	20000
Point	448	448	448	448	448	448
West Tawakoni	1120	1120	1120	1120	1120	1120
Wills Point	*2240*	*2240*	*2240*	*2240*	*2240*	*2240*
Ables Springs WSC	1120	1120	1120	1120	1120	1120
Cash WSC	*3564*	*3564*	*3564*	*3564*	*3564*	*3564*
Combined Consumers WSC	*1680*	*1680*	*1680*	*1680*	*1680*	*1680*
Community Water Company	92	92	92	92	92	92
Steam Electric (TXU)	*12000*	*12000*	*12000*	*12000*	*12000*	*12000*
Other Regions	*337462*	*337462*	*337462*	*337462*	*337462*	*337462*
Mac Bee WSC	*2240*	*2240*	*2240*	*2240*	*2240*	*2240*
South Tawakoni WSC	*1120*	*1120*	*1120*	*1120*	*1120*	*1120*
Manufacturing (Eastman)	3500	3500	3500	3500	3500	3500
TOTAL	***426967***	***426967***	***426967***	***426967***	***426967***	***426967***

DEFICIT **(ACRE-FEET)**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
TOTAL	***207***	***207***	***207***	***207***	***207***	***207***

Response:

Water demand numbers in Table 4.34 were submitted to the regional planning group for review and adoption over a several month period during the winter/spring of 2000. The regional planning group approved these numbers, which were then submitted to the TWDB with draft Chapter 4.

Subsequently, SRA has identified discrepancies in the demand numbers for Commerce, Wills Point, Cash WSC, Combined Consumers, Steam Electric, McBee WSC, South Tawakoni, and “other regions.” The net result of all changes is an increase in demand of 207 acre-feet. At this point in the planning process, it is too late to change supply or demand figures, which would require formal approval of the Texas Water Development Board, consultation with individual entities that are proposed for change, and consent from the regional planning group.

Revised Table 4.34 is included in Chapter 7, and revisions tabulated therein should be considered in the next round of the regional planning process.

2. Have all the regions been raising their population figures? Can't everyone do it the same way?

Response:

All population and water demand projections were initially provided by the State through the TWDB. The planning rules include a process by which each Region can provide additional data or considerations that would result in changes to the data. All these requests are subject to rigorous scrutiny by the TWDB staff and must be approved by the Board. Thus, all Regions do approach population and water demand data in the same way because they are starting with TWDB data, but each can also argue for changes based on factors unique to each region.

3. Elaborate on the meaning of "built-in water conservation"?

Response:

The water demand projection data provided by the State includes assumptions about conservation. The "expected case" scenario assumes that water will be conserved through the gradual introduction of water-saving plumbing fixtures as required by federal law. This assumption is "built-in" in the sense that the projections based on this assumption show a lower level of water use than would occur in the absence of the introduction of water-saving equipment. The saving has been estimated to be approximately 15%.

4. Ralph Hall Reservoir will meet part of the need in Hunt County and should be included in the Region D plan.

Response:

The use of this water management strategy to meet part of the need of Water User Groups in Hunt County has been noted, and the Regional Water Plan includes revised language to this effect.

5. How does the plan deal with loss of capacity and sedimentation of Lake Wright Patman?

Response:

The Plan makes use of the reservoir surveys prepared by the TWDB and is dependent on that agency's schedule in updating the material on sedimentation. The Plan holds the reservoir yields constant over the 50-year planning period.

6. There is another level of planning between regions. Aren't C and D meeting to look at needs between the regions?

Response:

There is one other level of planning - Regions C and D established a Joint Sulphur Basin Task Group early in the process in order to have a forum for reviewing the common interest of the two regions in that basin. Any discrepancies in planning between regions have to be resolved at the level of State water planning by the TWDB.

7. What is the cost of the Region D planning study?

Response:

The contract amount provided by TWDB to the North East Texas Regional Water Planning Group for the study covering a period of 27 months was $1,578,440. The State provides 100% of the planning funds, while the Region itself must pay 100% of all administrative costs incurred by the Administrative Agency, in this case, the Northeast Texas Municipal Water District.

8. Clarify the need to conform to the Regional Plan to obtain state funding.

Response:

The SB-1 planning process requires that the State agencies making grant or loan decisions (TWDB) and permit decisions (TNRCC) are to make a finding of "consistency" between the proposed water project and the approved Regional Water Plan. Grants and loans are not to be made to projects that are "inconsistent" though the TWDB can grant a waiver from this requirement.

9. What does "unique reservoir site" mean? Does that designation mean that other agencies, like the Fish and Wildlife Service can't protect the site?

Response:

See the discussion above about unique reservoir sites. The designation would have no impact whatsoever on federal agencies like Fish and Wildlife Service. Federal agencies cannot be controlled by state law.

10. What is the role of TNRCC in this plan?

Response:

TNRCC is involved in the planning process most directly as a source of data about public water supply systems and as the agency responsible for designing and applying a series of new Water Availability Models (WAMs). The WAM program will provide new and improved analyses of water availability in every surface water basin of the State. The first basin to be modeled under the WAM program was the Sulphur River Basin.

11. Who authored SB-1?

Response:

Senator Buster Brown is generally credited as being one of the major driving forces behind this legislation, along with Representative Ron Lewis in the Texas House of Representatives.

7.2(i) Public Participation Process

1. What is the importance of comments made at the public meetings before the hearing on September 27th? Is September 27th the last chance to comment?

Response:

The Planning Group decided that questions raised at all six meetings held around the region, including the five that preceded the meeting on September 27th, would be summarized and responded to in the Final

Regional Water Plan. The public comment period ended on September 27th, but the RWPG has responded herein to comments that arrived after that date.

2. There are supposed to be written public comments in chapter 7, but they are not there. Why?

Response:

The public comment period occurred in the 30-day period following publication of the Initially Prepared or Draft Plan. The comments are summarized and responded to in this, the Final Regional Water Plan.

3. Was the meeting notice put in the newspaper?

Response:

Yes, the notice that announced the availability of the Initially Prepared Plan included announcements of the six public meetings. The notice was required to be printed in newspapers of general circulation in each county and to be mailed to: 1) mayors of every municipality of 100 or greater population, 2) each county judge, 3) each special or general law district or river authority with responsibility to manage or supply water in the regional water planning area, 4) each retail public utility and community water system, and 5) each holder of record of a surface water right for diversions made within the planning area.

4. There is no time for the RWPG to consider public comments before it sends the plan to the state.

Response:

At the same time the Initially Prepared Plan was made available to the public it was also available to the Texas Water Development Board. However, the official submittal to TWDB of the Initially Prepared Plan occurred immediately following the public hearing on September 27th. The period for considering public comments, as well as comments from TWDB and other State agencies, *began* on September 27th. The months of October, November and December have been devoted to considering comments from all sources and to changing the Plan as the Planning Group determined necessary. Thus, there has been ample time for considering public comments.

5. Why were there no public meetings in Titus or Red River counties?

Response:

Almost every monthly meeting of the North East Texas Regional Water Planning Group has taken place in Mount Pleasant (Titus County). The site for the official public hearing and September meeting of the RWPG had to be moved to Gilmer because the facilities in Mount Pleasant were unavailable. The RWPG returned to Mount Pleasant in October, and each meeting has included opportunity for public comment. The Planning Group, however, has not met thus far in Red River County.

6. The RWPG has inadequate representation of women and minorities and also of environmental interests.

Response:

The North East Texas Regional Water Planning Group extended the scope of representation beyond the twelve interests identified in the SB-1 statute to include at least one representative from each County in the Water Planning Region. The Planning Group has complied with all statutory requirements relating to representation of interests in the Region, and its members believe they present the full spectrum of views.

7. The RWPG has not done its homework or taken its responsibility seriously.

Response:

The RWPG believes it has taken its responsibilities quite seriously and has carried out exactly the sort of regional planning intended by the Legislature. Its volunteer members have met at least monthly for the past three years and have worked hard to identify water management strategies that will take the North East Texas Region through the next 50 years.

8. Will there be any public meetings of the Sulphur River Authority?

Response:

As the presumed lead agency in developing the Marvin Nichols 1 project, the Sulphur River Authority will certainly hold public meetings in accordance with the Texas Open Meetings Act. The public will have many opportunities for a full review of specific reservoir and water management strategies to be implemented by that agency.

9. Who is the Bowie County representative on the RWPG?

Response:

As noted at the beginning of the Regional Water Plan, Mike Huddleston, Mayor of Wake Village and Chairman of the Sulphur River Authority, has served as the representative of Bowie County.

7.3 Facilitation and Plan Adoption

7.3(a) Sulphur Basin Task Group

From the outset, the North East Texas Regional Water Planning Group has worked with the neighboring Region C Planning Group to deal with issues of common concern. Region C includes the Dallas-Fort Worth Metroplex, and the major water provider organizations of that region have long contemplated the possibility of meeting some portion of their future water needs by construction of new reservoirs in the Sulphur Basin, most of which is located in Region D. The 1997 State Water Plan Update also recommended reservoirs in that basin to serve the future needs of the metroplex. The two planning groups therefore created the Sulphur River Joint Task Group in 1998 through a joint agreement and resolution. Consisting of members from the Regional Water Planning Groups of Region C and Region D, the Task Group was charged with making recommendations to both planning groups. The Task Group received funding from the planning budgets of the two RWPG's to hire an independent facilitation/engineering team.

The team's function was to review study data produced by C and D consultants for consistency, to identify areas of disagreement between the two regions and to facilitate agreement on those issues. The Joint Task Group met several times during the planning period and was a primary means of communication between the two planning groups and their consultants. In this forum, Region D members indicated their desire to receive an indication from Region C about priorities for future reservoir construction. Region C consultants presented a memo outlining a tentative prioritization of reservoir construction in the Sulphur River Basin, and this memo helped in the formulation of Region D recommendations concerning "proposed reservoirs" in Chapter 6 of this Plan.

7.3(b) County Representation

At its early meetings, the original, state-appointed members of the North East Texas RWPG determined that agreement on a regional plan would be facilitated by having representation not only from the 12 interests mentioned in SB-1 but also from each of the 19 counties in the region. The membership was therefore expanded to include such representation.

7.3(c) Role of Executive Committee

As the planning work of the RWPG intensified in the late 1999 through summer 2000 period, the RWPG made active use of the Executive Committee to review critical issues with consultants by conference calls, when necessary, and immediately prior to each regular RWPG meeting. This system facilitated the consideration of many issues and clarified areas that needed special attention and discussion during the RWPG meetings.

7.3(d) Initially Prepared Plan Approval Process

The above steps facilitated the resolution of inter-regional issues relating to the proposal of Region C to meet the major part of its defined water need by construction of a new reservoir in the North East Region's portion of the Sulphur River Basin. Early and continued sharing of information through the forum of the Sulphur River Joint Task Group and additional contacts between the Regions' consultants and the Co-Chairs of the Task Group helped the two Regions to craft plans that were consistent regarding the major reservoir construction proposal. Differences remained over the Interbasin Transfer provisions of SB-1, but these were not regarded as threatening in any way the cooperative problem-solving relationship for future implementation of the plans.

Each county government assumes special importance in the North East Texas Region where there are few municipalities large enough to support professional water resources staff and many residents turn to their county commissioners for information on critical issues, including water. It was therefore especially important that each County had its own representative on the Regional Water Planning Group. This step greatly facilitated communication across the region and kept the RWPG closely informed about emerging issues. The Chair of the RWPG facilitated decision-making throughout the process and helped resolve numerous differences of opinion with the aid of an active Executive Committee.

7.3(e) Final Plan Approval

The RWPG released the Initially Prepared Plan for public review on August 23, 2000. Following the public comment period, as documented above, the RWPG approved the Initially Prepared Plan for submittal to the Texas Water Development Board on September 27, 2000.

During the next three months, the RWPG discussed public and agency comments, provided direction to the Consultant Team on preparation of responses and approved the responses as well as the changes in the plan resulting from them. On December 13, 2000, the RWPG approved the final North East Texas Regional Water Plan.