

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) Physiography

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) Blossom Aquifer

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) Other Aquifers

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) Springs

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

Lake/Reservoir	County	Built	Conservation Pool		
			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

<i>Segment Number</i>	<i>Water Body Name</i>	<i>Priority</i>	<i>Basin Group</i>	<i>PS</i>	<i>NPS</i>	<i>Summary of Impairment</i>
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 3,381 acre 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	<p>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).</p>
0307	Cooper Lake	M	A	Y	Y	<p>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 than 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).</p>
0401	Caddo Lake	M	A	Y	Y	<p>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).</p>

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 is 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.

<i>Segment Number</i>	Water Body Name	Priority	Basin Group	PS	NPS	Summary of Impairment
0409	Little Cypress Bayou (Creek)	M	A	Y	Y	<p>Dissolved oxygen concentrations are sometimes lower than the standard established to assure optimum conditions for aquatic life (L/NS).</p> <p>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.</p>

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) 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 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:

<u>Category</u>	<u>Usage</u>	<u>Percent of Total</u>
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:

<u>City</u>	<u>1998 Population</u>	<u>1998 Use*</u>
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:

<u>Lake</u>	<u>1998 Visitors</u> (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) 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 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) 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. 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 county 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 additional 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	<i>Falco Peregrinus Anatum</i>
Arctic Peregrine Falcon	<i>Falco Peregrinus Tundrius</i>
Bachman's Sparrow	<i>Aimophila Aestivalis</i>
Bald Eagle	<i>Haliaeetus Leucocephalus</i>
Brown Pelican	<i>Pelecanus Occidentalis</i>
Eskimo Curlew	<i>Numenius Borealis</i>
Interior Least Tern	<i>Sterna Antillarum Athalassos</i>
Reddish Egret	<i>Egretta Rufescens</i>
White-Faced Ibis	<i>Plegadis Chihi</i>
Wood Stork	<i>Mycteria Americana</i>

Fishes

Blue Sucker	<i>Cycleptus Elongatus</i>
Blackside Darter	<i>Percina Maculata</i>
Bluehead Shiner	<i>Notropis Hubbsi</i>
Creek Chubsucker	<i>Erimyzon Oblongus</i>
Paddlefish	<i>Polyodon Spathula</i>
Shovelnose Sturgeon	<i>Scaphirhynchus Platyrinchus</i>

Mammals

Black Bear	<i>Ursus Americanus</i>
Louisiana Black Bear	<i>Ursus Americanus Luteolus</i>
Rafinesque's Big-Eared Bat	<i>Corynorhinus Rafinesquii</i>

Mollusks

Ouachita Rock-Pocketbook Mussel	<i>Arkansia Wheeleri</i>
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Reptiles

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