4.0 EXISTING GROUND WATER SUPPLIES

Significant quantities of variable quality ground water occur throughout most of the Sabine Basin. Much of the recoverable ground water within the Basin has already been developed and is considered “existing supply”. The vast majority of ground water in East Texas is contained in two major aquifers: the Carrizo-Wilcox aquifer and the Gulf Coast series of aquifers including the Catahoula, Jasper, Evangeline, and Chicot. Additional quantities of ground water can be obtained from lower yielding minor aquifers including the Nacatoch, Queen City, Sparta, and Yegua. General locations of these aquifers are shown on Figure 4.1. Outcrop locations for these aquifers are shown on Figure 4.2. For the purposed of this study, outcrop locations were considered equivalent to recharge zones.

Currently there are 182 entities in the Sabine Basin that use ground water for all or a portion of their water supply. As shown on Table 4.1, most of these users are rural water supply corporations. Very few cities and even fewer industries rely on ground water due to limitations in quantity and quality. Based on the water use projections, much of the growth in demands is expected to occur in the larger cities and manufacturing sector. Large demands most likely cannot be met by local ground water sources. Also, much of the ground water that is available for future development is not near the location of need or is not of adequate quality. Therefore, ground water is considered a limited option for future water supply. This is discussed further in Section 8.0.

Table 4.1: Existing Ground Water Users

Entity	**Upper Basin**	**Lower Basin**
Cities > 5,000	3	2
Cities < 5,000	18	6
Water Supply Corporations	87	31
Other (resorts, camps, schools)	23	12
Total	**131**	**51**

Ground water occurs in several distinct geologic formations, or aquifers, that generally extend in bands perpendicular to the axis of the river. Differences in thickness and permeability result in the variable ability of each aquifer to produce water. Some aquifers produce only enough to supply individual households while others may produce hundreds of gallons per minute to large capacity wells. This combination of permeability and thickness is referred to as the aquifer's transmissivity, and plays an important role in how much water can be extracted from the aquifer. The higher the transmissivity, the greater amount of water can be produced. The chemical quality of the water in each aquifer also differs throughout their extent. Quality differences are the result of the solubility of the minerals present in the formation and the length of time that water is in contact with the minerals. It is the productivity and quality of the ground water supply that ultimately determines the type and suitability of use.

4.1 Aquifer Descriptions

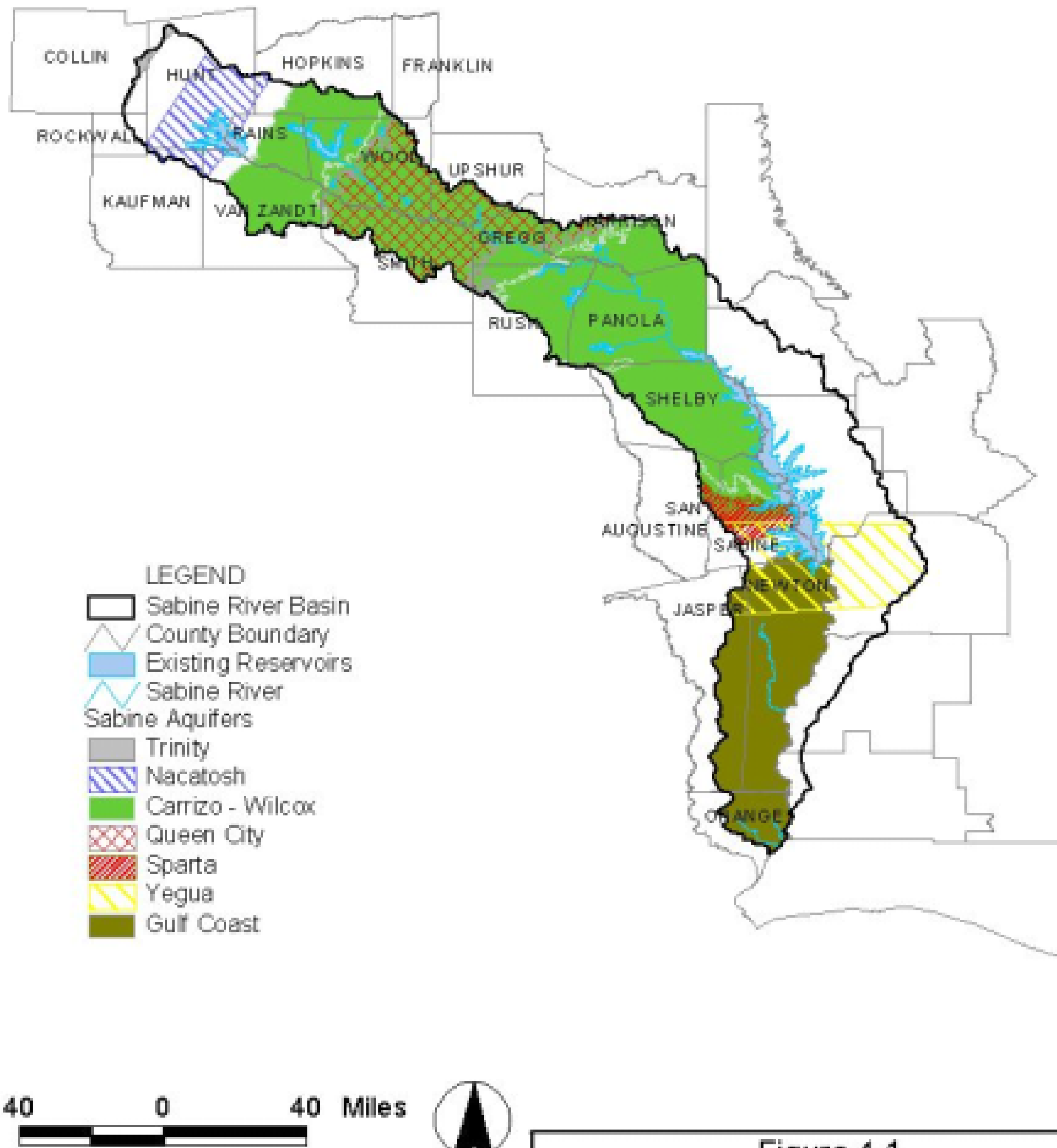
Major Aquifers

Carrizo-Wilcox Aquifer

The Carrizo-Wilcox is the most extensive and productive aquifer in the Sabine Basin, extending from Van Zandt County in the Upper Basin to Sabine County in the Lower Basin. This aquifer is composed of two separate and distinct geologic units, the Wilcox Group and the Carrizo Formation. Since these two units are hydrologically connected over much of their extent, they are considered one aquifer. The Carrizo consists of massive sand beds and ranges in total thickness from 40 to 180 feet. The underlying Wilcox Group ranges in total thickness from 1,000 to 2,400 feet, and is characterized by interbedded sand, clay and shale.

Transmissivity of the aquifer ranges from approximately 600 gallons per day per foot (gpd/ft) to as much as 70,000 gpd/ft, depending on the location. In general, higher transmissivities are located in the productive Carrizo zones. Ground water velocities in the Carrizo-Wilcox are about 10 feet per year. Properly constructed wells in the Carrizo-Wilcox can produce as much as 800 gallons per minute (gpm) in many areas. The overall rate of recharge to the Carrizo-Wilcox is estimated to be approximately one percent of the average annual rainfall over the outcrop area, which corresponds to between 40,000 and 50,000 acre-feet per year. About half of the water recharged within this area moves to the adjoining Neches River Basin.

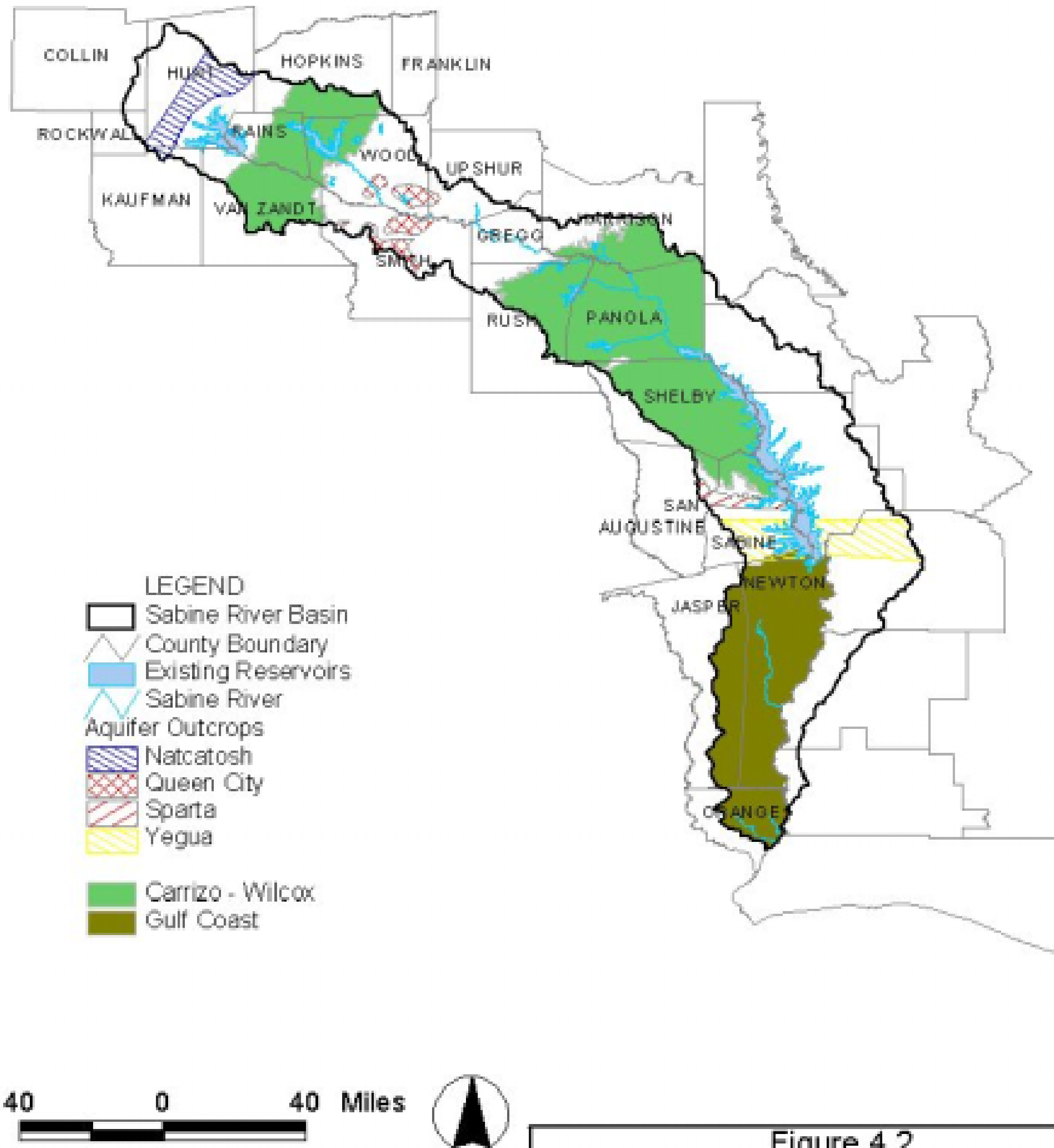
Within the Sabine Basin, only a few areas have seen significant water level declines in the Carrizo-Wilcox over time. In some areas just outside the Basin large declines have been observed in localized areas. Water level declines of 300 to 400 feet have been reported in the



Source: Texas Natural Resources Information System
www.tnris.state.tx.us/gispage.html

Figure 4.1
Aquifer Locations

Comprehensive Sabine
Watershed Management Plan



Source: Texas Natural Resources Information System
www.tnris.state.tx.us/gispage.html

Figure 4.2
Aquifer Outcrop Locations

Comprehensive Sabine
Watershed Management Plan

Tyler and Lufkin-Nacogdoches areas since 1940. However, the increased use of surface water has reduced and even reversed the water level declines in many areas. The largest declines observed in the Sabine Basin have occurred in Smith County, showing greater than 100 feet of decline from 1960 to the present. Other wells in Smith County completed in the Carizzo-Wilcox showed relatively stable water levels, indicating that these observed declines are localized occurrences near heavy ground water pumping centers. Declines ranging from 50 to 75 feet have been reported for some wells in Gregg, parts of Rusk, and Wood Counties. Smaller declines have been observed in Hopkins, Rains and parts of Rusk Counties. For all cases there were many other wells that did not show any water level declines. Based on these data, the declines observed in the Carrizo-Wilcox in the Sabine Basin are not large, and are only significant near large well fields and pumping centers.

Water from the Carrizo-Wilcox aquifer generally meets drinking-water standards throughout most of its extent. However, in some areas elevated levels of dissolved solids and high acidity pose a problem. Quality deteriorates with depth naturally, especially in the Wilcox. Total dissolved solids increase rapidly in the artesian downdip direction and exceed 3,000 mg/l in southern Sabine County. In the outcrop areas, shallow water sands are susceptible to contamination from surface activities, and may contain high levels of nitrate.

Gulf Coast Aquifer

The Gulf Coast aquifer system occurs throughout much of the Lower Basin of the Sabine River in Newton, Jasper, and Orange counties. Formations comprising the aquifer system consist of interbedded clays, silts, sands, and gravels, all of which are hydrologically connected to form a large, leaky aquifer system. This system is comprised of four aquifers that include, from deepest to shallowest: the Catahoula, the Jasper, the Evangeline, and the Chicot.

The Catahoula sandstone is primarily composed of interbedded and interlensing sand and clay. The Catahoula can yield moderate to large quantities of water in southeast Sabine County. Productivity from the aquifer decreases to the west. Aquifer tests on Catahoula wells indicate a transmissivity of about 19,000 gpd/ft.

The Jasper aquifer is primarily interbedded sands and clays. It ranges in thickness from 200 to 3,200 feet. Fresh water is available from this aquifer from the outcrop to between 50 and 75 miles downdip. This aquifer furnishes water for the towns of Jasper and Newton, as well as other towns within the Sabine Basin. In southeast Texas, the Jasper is little used, but is capable of producing more than 3,000 gpm from properly constructed wells. Transmissivities in the Jasper range from less than 19,000 gpd/ft in the outcrop area to 260,000 gpd/ft east of the Sabine River.

The Evangeline aquifer includes all sediments between the Berkville aquiclude and the Chicot aquifer, and has a high sand to clay ratio. Fresh water is found to depths of 1,500 feet below sea level; the downdip limit of fresh water is in Orange County. Transmissivities are between 16,000 and 111,000 gpd/ft, averaging about 62,000 gpd/ft. The thickness of the Evangeline in Jasper and Newton counties is about 300 feet and the thickness increases rapidly downdip.

The Chicot aquifer is the uppermost formation and has a greater sand to clay ratio than the Evangeline. Transmissivities range from 90,000 to 500,000 gpd/ft, which are the greatest of the four formations. The thickness of the Chicot in the Jasper and Newton county area is about 225 feet, and as with the Evangeline and other Gulf Coast formations, it increases in thickness rapidly in the downdip direction.

Recharge to the Gulf Coast aquifer system is derived from precipitation that falls on the formation outcrops of each of the four individual aquifers. Approximately four percent of the approximately 54 inches of average annual rainfall infiltrates downward into the aquifers, while another one inch per year enters the outcrop and is discharged to streams. Due to the leaky artesian nature of the system an undetermined amount of interformational leakage occurs between the aquifers.

Water level declines in the Gulf Coast aquifer vary with formation and location. For the deepest formations, the Catahoula and Jasper, there are limited data on the water levels. Data available since 1980 for the Jasper indicate that water levels have remained essentially stable. In the Evangeline aquifer, years of heavy pumping have produced significant water-level declines for the past 50 years. Since 1967, the water level declines have decreased due to the increased use of surface water in the region to meet demands. Declines in the Chicot aquifer are generally less than have been observed in the Evangeline. The largest amount of decline in the Chicot has occurred in Orange County. Recent data show significant recovery in water levels since the mid-1970s. In some cases the water levels returned to the same level as in the early 1940s.

Water quality is generally good in the shallower portions of the Gulf Coast aquifer, and generally declines at greater depths. Overall, there is little difference among the chemical compositions of ground waters from the different aquifers that comprise the Gulf Coast aquifer. These aquifers are characterized by ground waters with wide, overlapping ranges of chemical compositions.

Minor Aquifers

Nacatoch Aquifer

The Nacatoch is the westernmost significant aquifer in the Sabine Basin occupying primarily the southeastern half of Hunt County and overlapping into the Basin's portion of Hopkins, Kaufman, and Rains counties. It consists of 200 to 300 feet of sand bed sequences separated by impermeable layers of mudstone or clay. Net sand thickness is greatest (100 to 120 feet) near the outcrop and thins in a southeasterly direction to a minimum of about 40 feet. Pumping tests conducted on City of Commerce municipal wells in Hunt and Delta counties demonstrated well yields in excess of 200 gallons per minute and an average transmissivity of 2,506 gpd/ft. These wells are located where the aquifer is most productive and are not representative of other areas of the aquifer. Within the Sabine Basin, Nacatoch well yields are generally less than 100 gpm and extended pumping will likely result in local water-level declines. Prior to 1980, the City of Commerce and local industries relied heavily on the Nacatosh for water supply, but major water level declines forced the city to abandon its ground water use in favor of surface water sources.

Recharge to the Nacatoch aquifer is limited because only about one-third to one-sixth of the Nacatoch outcrop contains permeable sand beds. In a regional aquifer study conducted by the TWDB, recharge is estimated to equate to one-half of one percent of the annual rainfall falling on the rechargeable outcrop area. Limiting factors to recharge are listed as low hydraulic conductivity of the soil cover and poor transmissivity of the formation.

Nacatoch water quality is generally alkaline, with an average pH of 8.4. Water is generally suitable for domestic and livestock use but is unsuitable for irrigation due to its high sodium adsorption ratio and high residual sodium carbonate characteristic. Water with total dissolved solids less than 1,000 mg/l in the Nacatosh is restricted to the outcrop and a small downdip area in Hopkins County.

Queen City Aquifer

The Queen City aquifer primarily occurs in Smith, Upshur, Wood, and Gregg counties where it supplies small to moderate quantities of water to wells. The formation consists of inter-fingering beds of sand, silt, clay, and minor amounts of lignite, and increases in thickness toward the center of its extent, reaching a maximum of approximately 600 feet in northern Smith County. Transmissivities of the Queen City typically range from 3,000 to 12,000 gpd/ft.

The Queen City is generally unconfined and recharges rapidly. Water levels respond quickly to rainfall fluctuations, and based on the limited data available, the Queen City aquifer is not showing any regional declines in water levels. The annual effective recharge to the Queen City aquifer within the Sabine Basin is estimated to be close to 138,000 acre-feet. This is a significant amount of water and exceeds the total amount of estimated annual effective recharge for any of the other aquifers in the study area. However, most of this water is discharged to springs and seeps that form the base flow of area streams and rivers.

The water quality in the Queen City aquifer is generally good, well within safe drinking water standard limits. The ground water tends to be slightly acidic, with an average pH of 6.6. The median nitrate concentration in this aquifer is 1.5 mg/l with a reported high concentration in excess of 100 mg/l. As with all of the East Texas and coastal aquifers, water quality deteriorates in the down dip direction.

Sparta Aquifer

The Sparta aquifer crops out over approximately 119 square miles in Smith, Wood, and Upshur counties and attains a thickness of up to 270 feet. The formation also crops out over 45 square miles, in an east-west trending belt in Sabine County. The Sparta aquifer consists of loosely consolidated fine to medium grained sands interbedded with clay and shale, with as much as 60 to 70 percent water-bearing sand. Typically Sparta transmissivities range from 1,000 to 5,000 gpd/ft. Most Sparta wells yield less than 100 gpm of fresh to slightly saline water.

Loose sandy soils on the outcrop contribute to a high recharge potential estimated to be at least 5 percent of the average annual rainfall. Water levels are relatively shallow in outcrop areas and respond rapidly to fluctuating precipitation conditions. Well data show fairly stable water levels. Some wells do show lowering of water levels, probably due to low permeabilities and high pumpage.

Water in the outcrop areas is generally of excellent quality although high iron concentrations and acidity cause problem in isolated areas. High iron content commonly appears in wells that are completed in sand beds at the base of the formation. The aquifer water quality deteriorates rapidly with depth in the downdip direction, towards the south and east. Nitrate concentrations are often high in areas where the water table is shallow, with a maximum concentration of 75 mg/l.

Yegua Aquifer

Within the Sabine Basin, the extent of the Yegua aquifer is limited to the southern half of Sabine County. The Yegua consists of alternating beds of sand, silt, and clay, the aquifer is capable of producing as much as 1,000 gpm. Water-bearing sand thickness ranges up to 350 feet with a significantly thick sand bed occurring at the base of the formation. Well tests have indicated transmissivities of 18,000 gpd/ft.

Loose sandy soils over the outcrop area provide for reasonably good recharge to the aquifer. Water quality in the Yegua aquifer in the Sabine Basin is generally good in the outcrop area and for a short distance downdip. Elevated levels of nitrate, especially in shallow wells, are a local problem. The Yegua is used almost exclusively for rural domestic and livestock supply with a total demand of about 10 acre-feet per year.

4.2 Aquifer Demands and Ground Water Availability

Approximately 48,000 acre-feet per year of ground water is projected by TWDB in the development of the 1997 State Water Plan to be used within the Sabine Basin by the year 2000. Table 4.2 presents the 1996 historical ground water use and the year 2000 projected use by county. The distribution of the projected ground water use by type is shown on Table 4.3. As shown on these tables, the Carrizo-Wilcox aquifer is the most heavily developed aquifer in the Basin, with water being used in 13 counties. Usage of the Carrizo-Wilcox is heaviest in Smith County and slightly less in Panola, Rusk, Van Zandt, and Wood counties. Municipal use (including rural domestic use) accounts for nearly 75 percent of the total Carrizo-Wilcox ground water use within the Basin.

The Gulf Coast aquifer is the other major water supply aquifer in the Sabine Basin.

Approximately 84 percent of the ground water pumped from the Gulf Coast aquifer is used for public supply, with Orange County accounting for 72 percent of that municipal demand. The City of Orange is the largest user of the aquifer with an annual demand of over 4,000 acre-feet per year. Approximately 2,200 acre-feet per year of Gulf Coast aquifer ground water is used for irrigation in Newton County, and minor amounts are also used in all counties for manufacturing, mining, and livestock.

The four lower yielding aquifers, Nacatoch, Queen City, Sparta and Yegua, provide less than one tenth of the total projected ground water use in the year 2000. Ground water from the Nacatoch aquifer is currently used primarily for rural domestic supply and to a much lesser extent for minor irrigation use. Prior to around 1980, the City of Commerce and local industries relied heavily on the Nacatoch. However, major water-level declines in the aquifer forced the city to abandon its ground water use in favor of surface water sources. The Queen City aquifer is the largest producer of the lower yielding aquifers. Most pumpage from the Queen City aquifer is for rural domestic and livestock supply and mining in Wood County. Only the community of Big Sandy in Upshur County uses water from the Queen City for municipal supply at a rate of about 220 acre-feet per year. Due to their limited extents, the Sparta and Yegua aquifers provide water for only 17 acre-feet per year of demand, which is used mostly for rural domestic and livestock supply. There are no municipal wells reported pumping from these aquifers.

A few wells in the Basin have been completed in aquifers listed as “other” in Table 4.2. These specific aquifers were not identified due to their relative insignificance within the Basin. A minor amount of ground water is produced from the Trinity aquifer in Collin and Rockwall counties. In Harrison and Sabine counties, the aquifer terminology of Cypress Springs and Cain River have been used in older reports to depict aquifer units that are currently incorporated in aquifer units used in this report. Ground water associated with the Cypress Springs and Cain River are likewise incorporated into the current aquifer usage. These “other” ground water sources provide approximately 470 acre-feet per year in the Sabine Basin.

Table 4.2: Ground Water Demand by County

		Projected Year 2000 Pumpage (ac-ft/yr)[1]							
County	**1996 Pumpage**	**Carrizo-Wilcox**	**Gulf Coast**	**Nacatoch**	**Queen City**	**Sparta**	**Yegua**	**Other[2]**	**Total**
Upper Basin:									
Collin	195							11	11
Rockwall	148							50	50
Hunt	812			352					352
Kaufman	194			5					5
Van Zandt	3,476	3,714							3,714
Rains	562	114							114
Hopkins	1,791	557		319					876
Wood	5,574	3,950			2,601				6,551
Smith	4,734	4,567			491				5,058
Franklin									
Upshur	1,502	955			295				1,250
Gregg	2,930	1,126			400			410	1,936
Rusk	3,720	3,256			137				3,393
Harrison	1,348	2,606							2,606
Panola	5,225	3,661							3,661
Total Upper Basin	**32,211**	**24,506**	**0**	**676**	**3,924**	**0**	**0**	**471**	**29,577**
Lower Basin:									
Shelby	2,290	2,793							2,793
San Augustine	88	103							103
Sabine	113	351				7	10		368
Jasper	1,820		1,838						1,838
Newton	3,048		4,144						4,144
Orange	12,739		9,243						9,243
Total Lower Basin	**20,098**	**3,247**	**15,225**	**0**	**0**	**7**	**10**	**0**	**18,489**

1. Projected ground water use in year 2000 reported in 1997 State Water Plan.
2. Other aquifers include limited portions of the Trinity, Cypress Springs and Cain River that are located within the Sabine River.

Table 4.3: Ground Water Demand by Use Type – Year 2000

	Aquifer Demand (ac-ft/yr)					
Aquifer	**Municipal**	**Manufacturing**	**Mining**	**Irrigation**	**Livestock**	**Total**
Carrizo-Wilcox	20,657	793	3,349	122	2,832	**27,753**
Gulf Coast	12,740	122	33	2,200	130	**15,225**
Nacatoch	319	200	46	106	5	**676**
Queen City	2,096		1,223	226	379	**3,924**
Sparta	7					**7**
Yegua	10					**10**
Other	460				11	**471**
Total	**36,289**	**1,115**	**4,651**	**2,654**	**3,357**	**48,066**

4.2.1 Ground Water Availability

Ground water availability can be estimated using several different methods, which have varying results. The TWDB developed a ground water model for a large area that included the upper portions of the Sabine Basin. To determine water availability to meet future needs, the model was run assuming all future demand was met by ground water. This resulted in large availability numbers for counties where large demands were projected (e.g., Harrison County was projected to have an annual ground water availability of 183,500 acre-feet per year). These high availability estimates include both effective recharge and the removal of ground water from storage. While the TWDB model does demonstrate that there is a significant amount of water contained in the Carrizo-Wilcox aquifer, the model was not run to simulate levels of pumpage that might be considered based on reasonable and practical economic assumptions.

Another method to estimate the ground water availability uses the annual effective recharge for each aquifer. This methodology is the most conservative since these availability estimates do not include the removal of water from storage. This approach allows for the assessment of long-term availability of the aquifer without incurring large water level declines.

For this Plan, the estimated ground water availability in the Sabine Basin is based on a modified water budget approach. The components of the budget consist of input to the aquifer system as recharge, water held in storage within the aquifer, and output or withdrawal from the aquifer as pumpage and spring flow. Annual effective recharge for the aquifers within the Sabine Basin were derived from estimates based on TWDB aquifer analyses and include consideration of input to the aquifer from both precipitation and seepage from streams. Water in storage is based on estimates of saturated thickness and storage coefficient of the aquifer medium. Total discharge from the aquifer includes pumpage and water that is naturally rejected from underground in the form of spring flow.

In quantifying availability, consideration was made concerning the historical use of each aquifer in each county. If water level records suggested a relatively static condition, then annual effective recharge was considered an appropriate availability estimate. However, if the aquifer in a particular county had been or is expected to be heavily used and recharge alone is insufficient to meet forecasted demands, then recharge along with a specified depletion of storage was assigned as availability. The availability estimates for the Gulf Coast, Sparta and Yegua aquifers are based solely on annual effective recharge, while estimates for the Carrizo-Wilcox, Queen City and Nacatoch aquifers include, for some counties, the depletion of a specified amount of water in storage.

Estimated ground water availability from the Carrizo-Wilcox aquifer in the Sabine Basin is based on the annual effective recharge throughout the aquifer extent, and also includes a three-percent per year depletion of storage in most counties. Nacatoch aquifer availability consists of effective recharge in outcrop counties and a combination of recharge and/or storage depletion in the downdip counties of Hopkins and Rains.

Water availability from the Queen City aquifer is limited to effective recharge in Harrison and Rusk counties where recharge is less relative to other counties. In the other counties, effective recharge estimates are significantly higher (Table 4.5) and do not realistically equate to availability. For these counties availability is based on recoverability estimates for the portion of the aquifer with sufficient saturated thickness to support well yields of 200 gpm or more. Availability was estimated by establishing a conceptual well field over the designated area with wells spaced one mile apart and allowed to withdraw water at a rate of 12 hours per day for 365 days. This method allowed for a much more reasonable availability estimate in Gregg, Smith, Upshur and Wood counties. The total amount of water that is determined to be available from the Queen City aquifer in the Sabine Basin is about 32,000 acre-feet per year.

A total of 138,492 acre-feet of ground water per year are estimated to be available in the Sabine Basin. Summaries of these estimates by county and aquifer are shown in Tables 4.4 and 4.5. Of the six primary aquifers in the basin, the Gulf Coast (53,003 acre-feet), the Carrizo-Wilcox (44,820 acre-feet) and the Queen City (32,012 acre-feet) contain 94 percent of the total annual available ground water.

Since there is ample surface water supply already developed in the lower basin, it is unlikely that future well fields in the Gulf Coast aquifer will be developed for regional supply. Ninety seven percent of the calculated availability from the Carrizo-Wilcox is located in the upper basin. The Queen City aquifer, located totally in the upper basin, has the greatest annual water recharge at 137,800 acre-feet per year. However, as previously discussed, much of the water is released from the aquifer to local streams and springs. Proper development of well fields could reduce the amount of lost recharge, but probably could never capture the recharge quantity indicated in Tables 4.4 and 4.5.

Table 4.4 Ground Water Availability by Aquifer

Aquifer	Year 2000 Projected Pumpage	Effective Recharge (ac-ft/yr)	Annual Availability (ac-ft/yr)
Upper Basin:			
Carrizo-Wilcox	24,506	40,040	40,766
Nacatosh	676	222	234
Queen City	3,924	137,800	32,012
Other	61	0	26
Total Upper Basin	**29,167**	**178,062**	**73,038**
Lower Basin:			
Carrizo-Wilcox	3,247	3,960	4,054
Gulf Coast	15,225	53,003	53,003
Sparta	7	7,400	7,400
Yegua	10	997	997
Total Lower Basin	**18,489**	**65,360**	**65,454**

Table 4.5: Ground Water Availability by County

County	Aquifer	Year 2000 Projected Pumpage	Effective Recharge (ac-ft/yr)	Annual Availability (ac-ft/yr)
Upper Basin:				
Collin	Other	11	0	26
Rockwall	Other	50	0	0
Hunt	Nacatoch	352	198	198
Kaufman	Nacatoch	5	5	5
Van Zandt	Carrizo-Wilcox	3,714	2,803	2,892
Rains	Carrizo-Wilcox	114	1,202	1,202
	Nacatoch	0	0	2
Hopkins	Carrizo-Wilcox	557	2,002	2,066
	Nacatoch	319	19	29
Wood	Carrizo-Wilcox	3,950	7,207	7,437
	Queen City	2,601	53,742	10,920
Smith	Carrizo-Wilcox	4,567	4,404	4,404
	Queen City	491	46,852	9,100
Franklin	None	0	0	0
Upshur	Carrizo-Wilcox	955	2,002	2,066
	Queen City	295	22,048	4,550
Gregg	Carrizo-Wilcox	1,126	2,402	2,402
	Queen City	400	9,646	1,930
Rusk	Carrizo-Wilcox	3,256	4,004	4,130
	Queen City	137	2,756	2,756
Harrison	Carrizo-Wilcox	2,606	4,805	4,958
	Queen City	0	2,756	2,756
Panola	Carrizo-Wilcox	3,661	9,209	9,209
Total Upper Basin		**29,167**	**178,062**	**73,038**
Lower Basin:				
Shelby	Carrizo-Wilcox	2,793	1,030	1,030
San Augustine	Carrizo-Wilcox	103	198	204
	Sparta	0	888	888
Sabine	Carrizo-Wilcox	351	2,732	2,820
	Yegua	10	997	997
	Sparta	7	6,512	6,512
Jasper	Gulf Coast	1,838	10,134	10,134
Newton	Gulf Coast	4,144	28,765	28,765
Orange	Gulf Coast	9,243	14,104	14,104
Total Lower Basin		**18,489**	**65,360**	**65,454**

4.2.2 Current Ground Water Problems

Through the course of this planning effort, visits were made to major water users and providers throughout the Basin. During these visits, it was discovered that a number of entities, particularly in the Upper Basin, were experiencing difficulty with their current ground water systems. Table 4.6 lists those entities and associated ground water problems.

Table 4.6: Identified Ground Water Problems – Upper Basin

Entity	County	Aquifer	Problem
White Oak	Gregg		No good quality ground water available. Currently on surface water.
East Mountain	Upshur	Carrizo-Wilcox	Saline ground water
Elderville WSC	Gregg, Rusk	Carrizo-Wilcox	Decreasing ground water quality and quantity
Tryon Road WSC	Gregg	Carrizo-Wilcox	Decreasing ground water quality and quantity
Gum Springs WSC	Harrison	Carrizo-Wilcox	Decreasing ground water quality and quantity
Hallsville	Harrison	Carrizo-Wilcox	Decreasing ground water quality and quantity
MacBee WSC	Van Zandt	Carrizo-Wilcox	Iron and manganese levels limit portion of service area
Bright Star-Salem WSC	Wood, Rains	Carrizo-Wilcox	Decreasing ground water quality; have requested surface water from SRA.
Combined Consumers WSC	Hunt	Nacatosh	Last well went out of service in May 1997. High iron and sodium concentrations for municipal use.
City of Quinlan	Hunt	Nacatosh	Water quality issues. TNRCC has advised the City to slowly discontinue ground water use.
North of Quinlan	Hunt	Nacatosh	Ground water quality deteriorates going north from Quinlan.

There appears to be a pattern of decreasing water quality and in some cases water quantity. This could possibly be attributed to over pumping of the water supply wells, which would cause water level declines and allow poorer quality water to enter the wells.