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CHAPTER 2.0: POPULATION PROJECTIONS AND WATER DEMAND PROJECTIONS

A key task in the preparation of the Senate Bill 1 (SB 1) regional water plan for the Lower Colorado Region is to estimate current and future water demands within the region. In subsequent chapters of this plan, these projections are compared with estimates of currently available water supply to identify the location, extent, and timing of future water shortages.

Table 2.1 below is a summary of regional population and water demand projections for the Lower Colorado Region.

Table 2.1: Population and Water Demand Projections for the Lower Colorado Region

Regional Total Projection	2000	2010	2020	2030	2040	2050
Population	1,041,948	1,243,247	1,505,722	1,751,931	1,923,941	2,107,106
Municipal Water Demand (ac-ft/yr)	227,616	258,794	302,075	346,430	375,510	409,297
Manufacturing Water Demand (ac-ft/yr)	33,833	55,841	57,903	60,165	63,185	66,962
Irrigation Water Demand (ac-ft/yr)	588,635	559,238	538,196	517,895	498,331	479,453
Steam Electric Water Demand (ac-ft/yr)	81,000	90,500	95,500	110,500	110,500	118,500
Mining Water Demand (ac-ft/yr)	34,554	26,879	28,353	30,072	32,229	34,820
Livestock Water Demand (ac-ft/yr)	14,275	14,275	14,275	14,275	14,275	14,275
TOTAL WATER DEMAND	979,913	1,005,527	1,036,302	1,079,337	1,094,030	1,123,307

As indicated, the population in the Lower Colorado Region is projected to more than double over the next 50 years. This projected increase in population is the principal “driver” underlying the projected increase in total water demand from approximately 980,000 acre-feet in the year 2000 to 1,123,000 acre-feet in the year 2050.

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

2.1 TWDB GUIDELINES FOR REVISIONS TO POPULATION AND WATER DEMAND PROJECTIONS

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

“ In developing regional water plans, regional water planning groups shall use:

(1) state population and water demand projections contained in the state water plan or adopted by the board after consultation with the Texas Natural Resource Conservation Commission and the Texas Parks and Wildlife Department, in preparation for revision of the state water plan; or

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

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

2.2 POPULATION PROJECTIONS

The population and water demand projections presented in this chapter were developed by revising the State’s “default” projections to reflect more current information, in accordance with TWDB guidelines. This section describes the methodology applied by the planning group to develop the TWDB-approved population projections for the Lower Colorado Region (TWDB approved on August 18, 1999).

2.2.1 Methodology

Municipal water demand projections are calculated as the product of three variables: current and projected population, per capita water use rates, and assumptions regarding the effects of certain water conservation measures.

The following describes the procedures followed in the development of the population projections presented in this chapter:

Identify the initial baseline projection: The baseline population projection for SB 1 regional water planning is the state’s “most likely” scenario for each county, each city of 500 population and greater, and for cities of less than 500 population and rural areas (“County-Other”). These projections represent “default” values, which are used except where revisions were justified per TWDB guidelines.

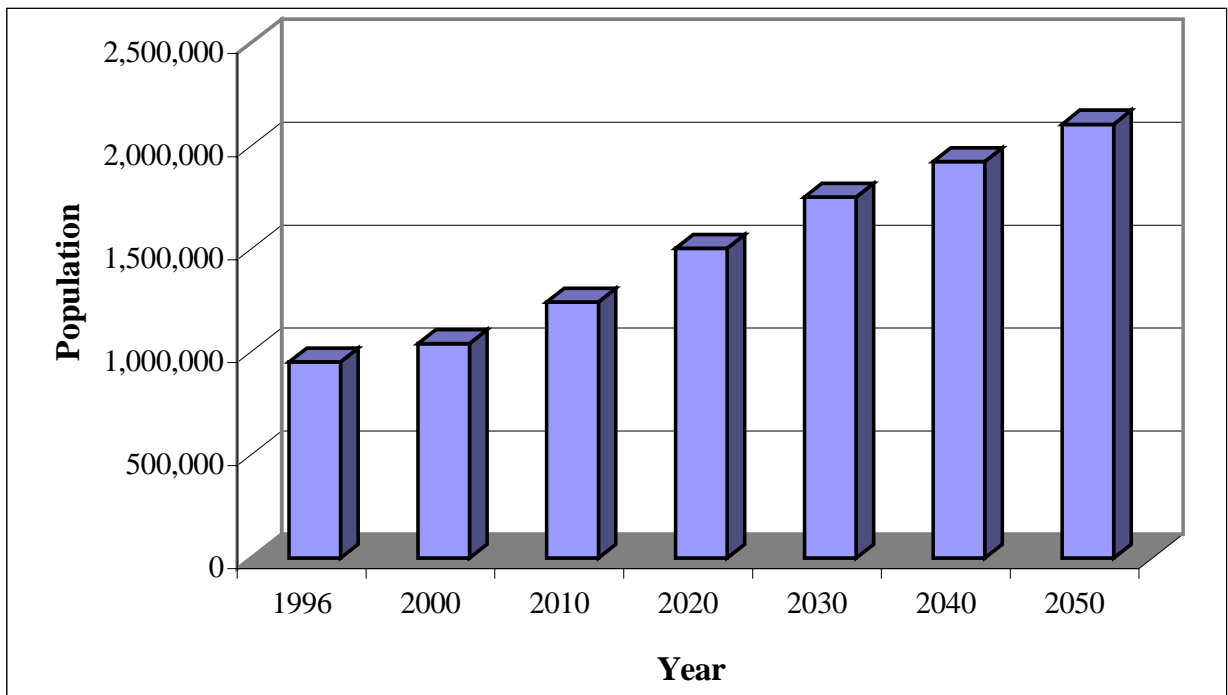
Evaluate recent population growth trends: As indicated in above, TWDB guidelines allow for adjustments of population projections if new or better information warrants such a revision. Using the 1990 census and a January 1998 population estimate provided by the State Data Center (SDC), the planning group calculated the growth rate for this period and extrapolated the trend to the year 2000. This adjusted year 2000 population estimate was then used as the starting point for the development of a revised population projection through 2050 using the growth rates in state’s projections for each decade.

Select proposed population projection: Proposed population projections were determined after the TWDB default projections, the SDC revised projections, and other available projections were compared. The higher of either the TWDB or the SDC projection was selected as the proposed projection, except in cases where better information was available. These population projections are summarized in the following section.

2.2.2 Regional Population Projection

Projections of population growth for the Lower Colorado Region indicate a doubling of the region’s population from approximately 1.0 million in 2000 to 2.1 million in the year 2050 (Figure 2.1). Table 1 presents these projections by county for each decade of the 50-year planning period. Each of the 14 counties in the region are projected to grow significantly over the planning period, with Travis County continuing to account for nearly 75 percent of the total population for the region, as shown in Table 2.2.

Figure 2.1: Lower Colorado Region Population Projections



As discussed in Chapter 1, the Lower Colorado Region covers a portion of four major river basins and two coastal basins. Of these, the Colorado River Basin is projected to contain approximately 92 percent of the region’s population in the year 2050. Table 2.3 presents the population projections by river basin for the Lower Colorado Region.

Table 2.2: Population Projection by County

County	1996	2000	2010	2020	2030	2040	2050
Bastrop	46,738	51,627	63,901	77,030	89,779	97,624	106,153
Blanco	7,352	8,253	9,874	11,644	12,964	13,688	13,799
Burnet	29,426	33,874	40,994	48,782	55,228	57,511	59,891
Colorado	19,574	20,462	21,496	22,972	23,664	24,481	25,094
Fayette	21,757	22,964	25,600	29,127	32,647	36,352	40,994
Gillespie	19,700	21,710	23,820	26,644	28,435	32,841	36,006
Hays (p)	17,662	22,111	33,448	42,429	53,138	65,106	73,578
Llano	12,852	13,685	14,207	15,474	15,770	16,368	17,865
Matagorda	38,183	41,146	45,947	51,165	57,008	63,405	71,119
Mills	4,964	5,575	5,708	5,898	6,021	6,074	6,129
San Saba	5,565	5,802	5,802	5,802	5,802	5,802	5,802
Travis	680,540	744,080	892,047	1,096,329	1,288,441	1,413,420	1,550,521
Wharton (p)	27,799	29,130	31,918	34,687	37,655	40,652	43,969
Williamson (p)	19,771	21,529	28,485	37,739	45,379	50,617	56,186
TOTAL	951,883	1,041,948	1,243,247	1,505,722	1,751,931	1,923,941	2,107,106

(p) Denotes that only the portion of the county in the Lower Colorado Region is considered.

* Population projections by city, county, and portion of a river basin within a county for each of the 14 counties in the Lower Colorado Region are provided in Appendix 2A.

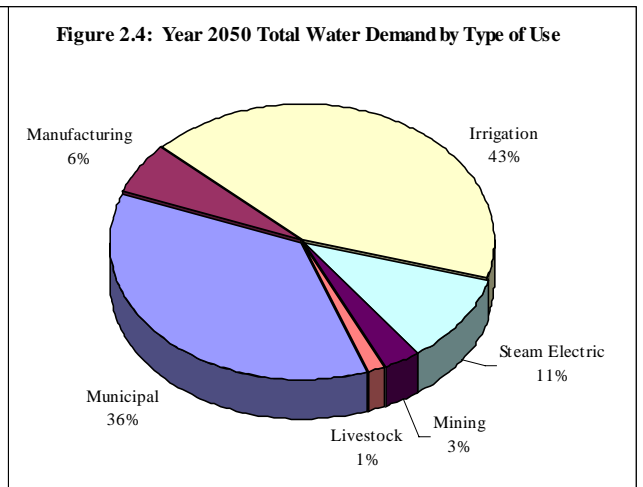
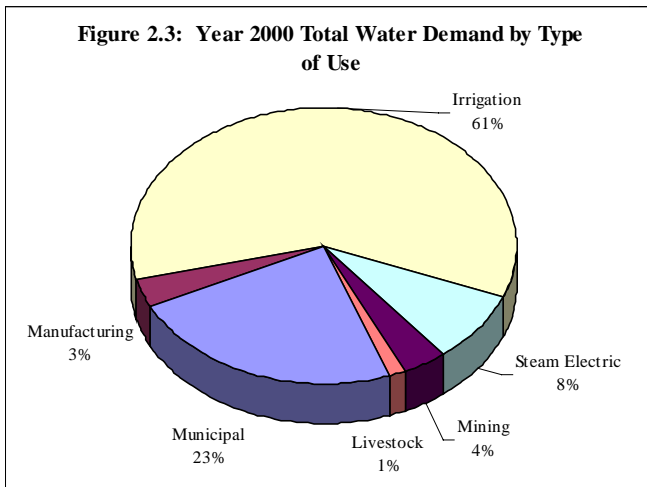
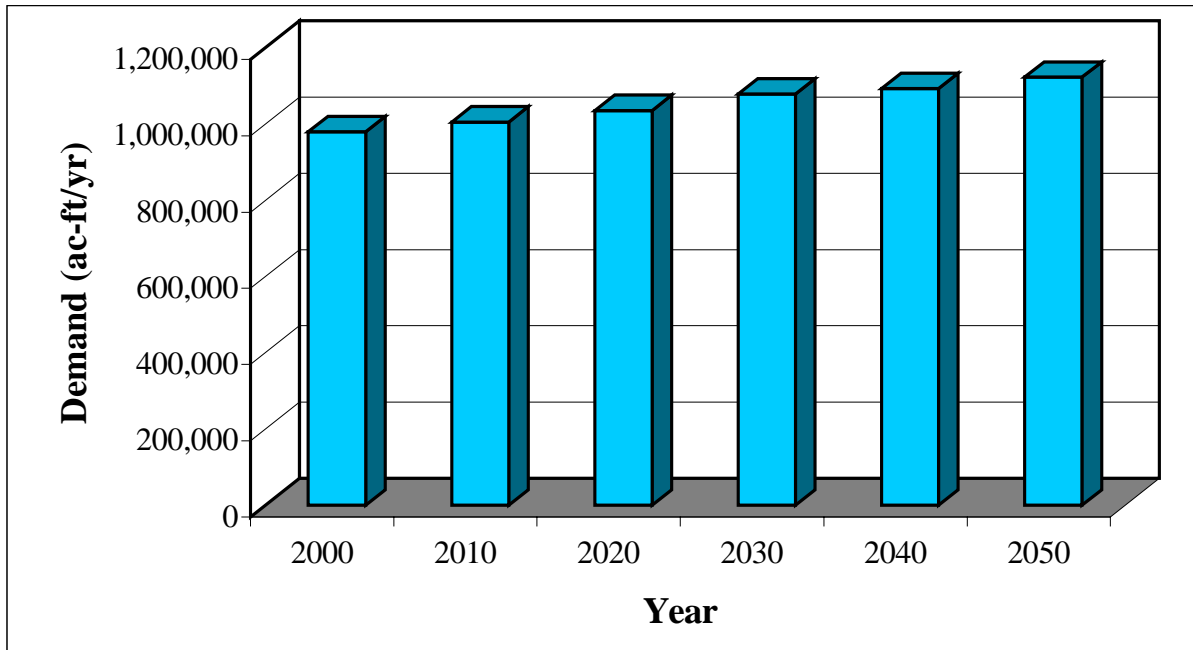
Table 2.3: Population Projection by River Basin

River Basin	1996	2000	2010	2020	2030	2040	2050
Brazos	21,116	23,391	25,878	28,472	31,058	32,787	34,164
Brazos-Colorado	48,976	52,078	57,494	63,365	69,479	76,110	83,682
Colorado	855,143	938,388	1,128,689	1,379,310	1,613,311	1,773,516	1,943,950
Colorado-Lavaca	11,144	12,102	13,513	15,026	16,707	18,534	20,840
Guadalupe	6,618	6,952	7,953	9,064	10,017	10,721	11,149
Lavaca	8,886	9,037	9,720	10,485	11,359	12,273	13,321
TOTAL	951,883	1,041,948	1,243,247	1,505,722	1,751,931	1,923,941	2,107,106

2.3 WATER DEMAND PROJECTIONS

Total water demand for the Lower Colorado Region is projected to increase by approximately 143,000 acre-feet over the 50-year planning period. This relatively small increase (approximately 15 %) is largely due to the counter-effect of projected increases in municipal, manufacturing, and steam electric water demand and the projected decrease in irrigation water demand. The following figures (Figure 2.2 – 2.4) show the relative portion of projected water demand by type of use for the year 2000 and the year 2050.

Figure 2.2: Lower Colorado Region Total Water Demand Projections



2.3.1 Municipal Water Demand Projections

2.3.1.1 Methodology

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

1. **Identify TWDB projected per capita use rate:** Estimated per capita water use for the year 2000 under a “below normal rainfall” and “no conservation” scenario was identified. This value is based on historical per capita use values reported to the TWDB between 1982 and 1991.
2. **Identify reported 1996 per capita water use rate:** Using data provided by the TWDB, per capita water use for 1996 was calculated. This value was selected as a more recent measure of per capita use under “below normal rainfall” conditions, as drought conditions affected the entire region for much of 1996.
3. **Select per capita water use rate:** In order to provide a conservative starting point for revised municipal water demand projections, the greater of the 1996-reported per capita use and the TWDB projected per capita use was selected. For the great majority of cities and “County-Other” areas, the value selected was the TWDB per capita water use rate described in Step 1 above.
4. **Apply “expected case” conservation:** Projected per capita water savings due to “expected case” water conservation assumptions was applied to the per capita use values determined in the previous step to determine the proposed per capita use projections for the years 2000-2050. Expected case conservation includes water savings from three components: increases in plumbing efficiency due to new plumbing code, seasonal conservation due to water conservation programs, and other water savings including leak detection and water efficient washing machines and dishwashers.
5. **Determine proposed municipal water demand projections:** The proposed municipal water demand projections are the product of the proposed population projections and the proposed per capita projections described above.

2.3.1.2 Regional Municipal Water Demand Projections

Municipal water demand for the Lower Colorado Region is projected to increase by approximately 182,000 acre-feet per year over the 50-year planning period. While this is a significant increase in municipal water use over the planning period, this increase (approximately 80 %) is less than the increase in population over the same period (approximately 102 %). This is due to projected reductions in per capita water use associated with the adoption of various water conservation measures. Figure 2.5 and Table 2.4 present the projected municipal water demand by county for each of the 14 counties in the Lower Colorado Region.

As with population, the large majority of current and projected municipal water demand occurs in the Colorado River Basin (approximately 95 % in the year 2050). Table 2.5 presents these municipal water demand projections by river basin.

Figure 2.5: Lower Colorado Region Municipal Water Demand Projections

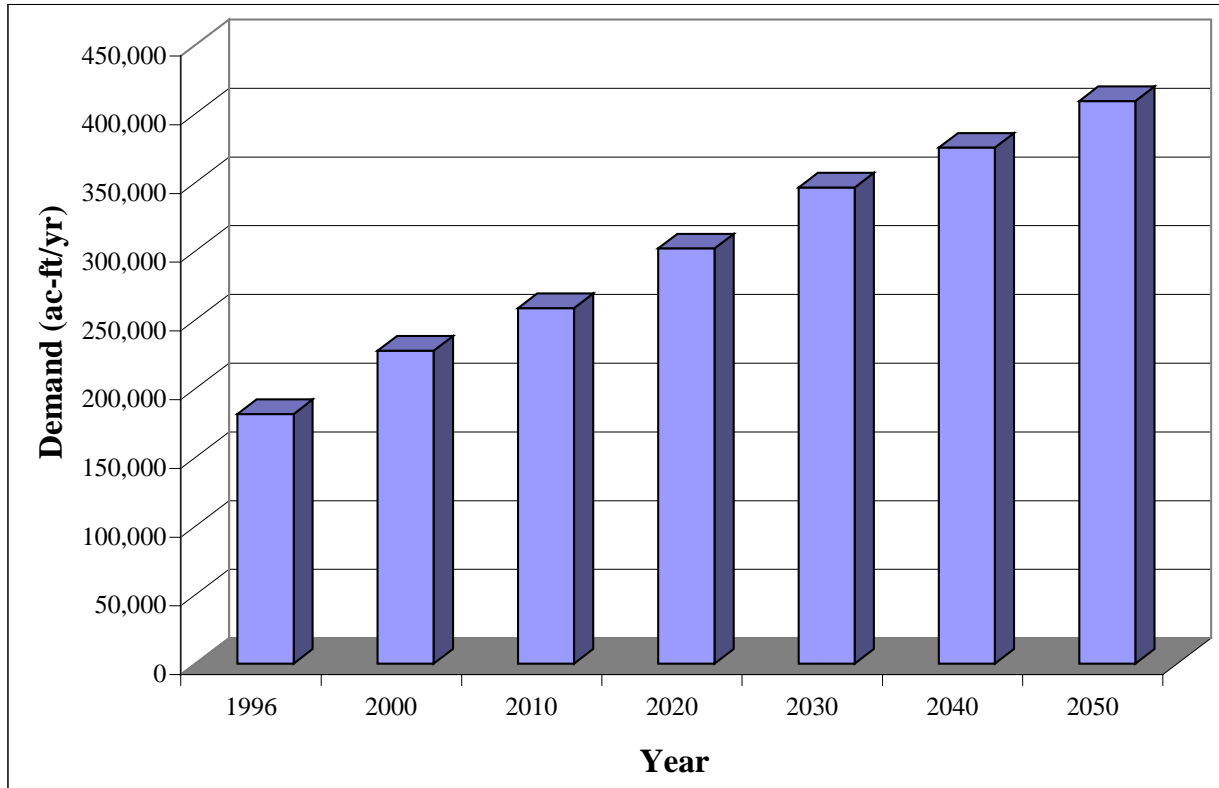


Table 2.4: Municipal Water Demand Projections by County (ac-ft/yr)

County	1996	2000	2010	2020	2030	2040	2050
Bastrop	7,884	9,186	10,660	12,203	13,924	14,902	16,138
Blanco	1,078	1,362	1,495	1,633	1,764	1,812	1,823
Burnet	5,301	5,564	6,270	6,962	7,646	7,826	8,086
Colorado	3,082	3,286	3,283	3,318	3,390	3,433	3,523
Fayette	3,506	3,857	4,056	4,343	4,728	5,165	5,756
Gillespie	3,520	4,130	4,259	4,487	4,675	5,268	5,768
Hays (p)	2,991	3,421	4,667	5,571	6,807	8,249	9,231
Llano	2,852	3,067	3,020	3,103	3,086	3,140	3,393
Matagorda	5,460	6,072	6,363	6,649	7,200	7,777	8,606
Mills	936	999	964	941	933	914	916
San Saba	1,032	1,100	1,040	985	957	927	927
Travis	136,472	177,264	202,958	240,232	278,011	301,638	329,189
Wharton (p)	4,070	4,494	4,644	4,804	5,053	5,323	5,754
Williamson (p)	3,383	3,814	5,115	6,844	8,256	9,136	10,187
TOTAL	181,567	227,616	258,794	302,075	346,430	375,510	409,297

(p) Denotes that only the portion of the county in the Lower Colorado Region is considered.

* Municipal water demand projections by city, county, and portion of a river basin within a county for each of the 14 counties in the Lower Colorado Region are provided in Appendix 2A.

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

River Basin	1996	2000	2010	2020	2030	2040	2050
Brazos	3,324	3,395	3,538	3,666	3,876	3,986	4,124
Brazos-Colorado	7,026	8,091	8,417	8,750	9,350	9,980	10,893
Colorado	166,973	211,746	242,278	284,914	328,129	356,151	388,450
Colorado-Lavaca	1,747	1,631	1,705	1,779	1,920	2,065	2,295
Guadalupe	1,109	1,258	1,330	1,406	1,507	1,577	1,641
Lavaca	1,388	1,496	1,526	1,560	1,648	1,751	1,894
TOTAL	181,567	227,617	258,794	302,075	346,430	375,510	409,297

2.3.2 Manufacturing Water Demand Projections

2.3.2.1 Methodology

For SB 1 regional water planning purposes, manufacturing water use is considered to be the cumulative water demand by county and river basin for all industries within specified industrial classifications (SIC) determined by the TWDB. Manufacturing water use projections that were developed by the TWDB and used in the 1997 State Water Plan are used as the default projections except where new information warranted a revision.

2.3.2.2 Regional Manufacturing Water Demand Projections

Annual manufacturing water demand for the Lower Colorado Region is projected to increase from 33,833 acre-feet in the year 2000 to 66,962 acre-feet per year in the year 2050. These demands are predominately from existing and future industries in Travis and Matagorda counties. The expected usage of manufacturing water rights that have already been purchased in Matagorda County is responsible for the large increase in manufacturing demand from the year 2000 to the year 2010. Figure 2.6 and Table 2.6 present the projected manufacturing water demand for each of county in the Lower Colorado Region.

Figure 2.6: Lower Colorado Region Manufacturing Water Demand Projections

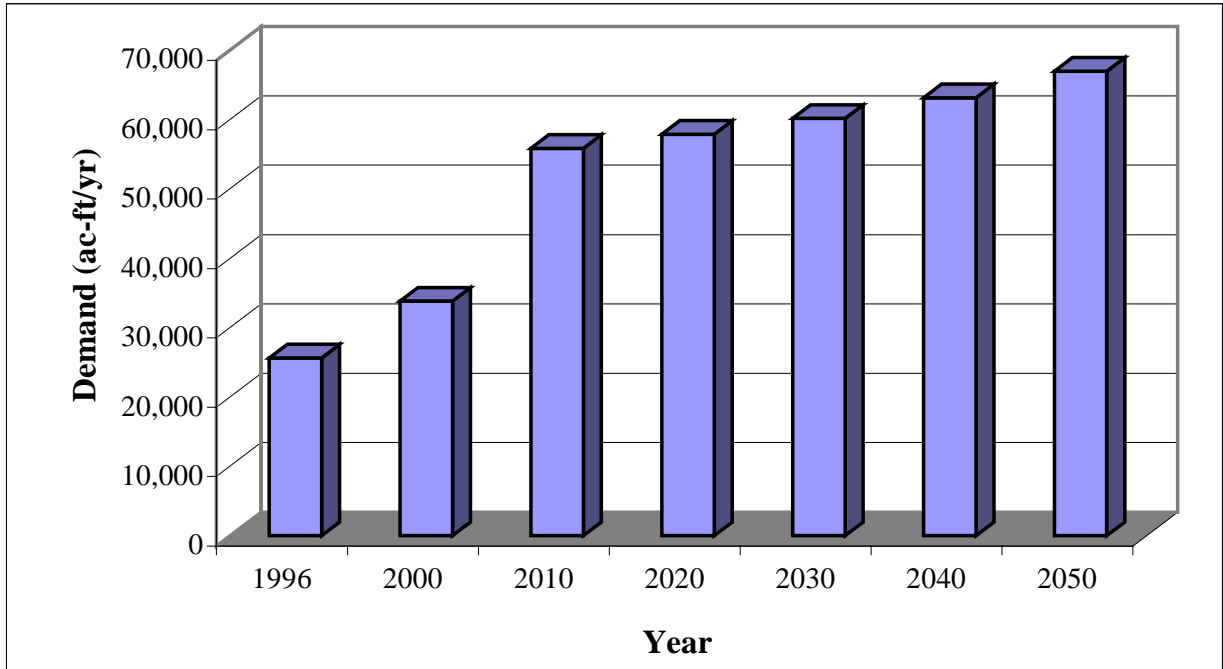


Table 2.6: Manufacturing Water Demand Projections by County (ac-ft/yr)

County	1996	2000	2010	2020	2030	2040	2050
Bastrop	81	33	40	48	57	67	78
Blanco	0	0	0	0	0	0	0
Burnet	542	1,246	1,377	1,514	1,655	1,800	1,947
Colorado	176	1,150	1,224	1,297	1,369	1,438	1,508
Fayette	124	37	44	50	55	63	71
Gillespie	305	502	556	608	657	727	795
Hays (p)	395	288	340	389	435	478	523
Llano	2	0	0	0	0	0	0
Matagorda	10,536	13,022	32,532	32,715	32,835	33,352	33,849
Mills	1	0	0	0	0	0	0
San Saba	11	0	0	0	0	0	0
Travis	13,245	17,186	19,320	20,843	22,633	24,757	27,654
Wharton (p)	233	369	408	439	469	503	537
Williamson (p)	5	0	0	0	0	0	0
TOTAL	25,656	33,833	55,841	57,903	60,165	63,185	66,962

(p) Denotes that only the portion of the county in the Lower Colorado Region was considered.

* Manufacturing water demand projections by city, county, and portion of a river basin within a county for each of the 14 counties in the Lower Colorado Region are provided in Appendix 2A.

Manufacturing water demand in the Lower Colorado Region is predominately in the Colorado and Brazos-Colorado River Basins. Table 2.7 presents these demands by river basin for the Lower Colorado Region.

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

River Basin	1996	2000	2010	2020	2030	2040	2050
Brazos	315	663	722	772	815	856	892
Brazos-Colorado	4,908	3,589	8,891	8,950	8,986	9,140	9,283
Colorado	20,189	29,405	46,013	47,946	50,109	52,908	56,476
Colorado-Lavaca	116	139	171	185	200	218	240
Guadalupe	4	0	0	0	0	0	0
Lavaca	124	37	44	50	55	63	71
TOTAL	25,656	33,833	55,841	57,903	60,165	63,185	66,962

2.3.3 Irrigation Water Demand Projections

2.3.3.1 Methodology

The irrigation water use projections that were developed by the TWDB and used in the 1997 State Water Plan were used as the default projections except in cases where better, more current information was submitted. The TWDB projections were determined with assistance from the Texas Agricultural Extension Service and they assume expected case water conservation practices with no reduction in Federal farm program subsidies.

2.3.3.2 Regional Irrigation Water Demand Projections

Irrigation water demand for the Lower Colorado Region is projected to decrease from 588,635 acre-feet in 2000 to 479,453 acre-feet per year in the year 2050. Irrigation water demand in the Lower Colorado Region is concentrated in Colorado, Matagorda, and Wharton counties and is largely used to meet irrigation needs for rice farming. Over the next 50 years a decrease in irrigation water demand is projected due to improvements in irrigation efficiency and reductions in irrigated acres due to forecasted unfavorable farming economics. Figure 2.7 and Table 2.8 present the projected irrigation water demands by county for the Lower Colorado Region.

Figure 2.7: Lower Colorado Region Irrigation Water Demand Projections

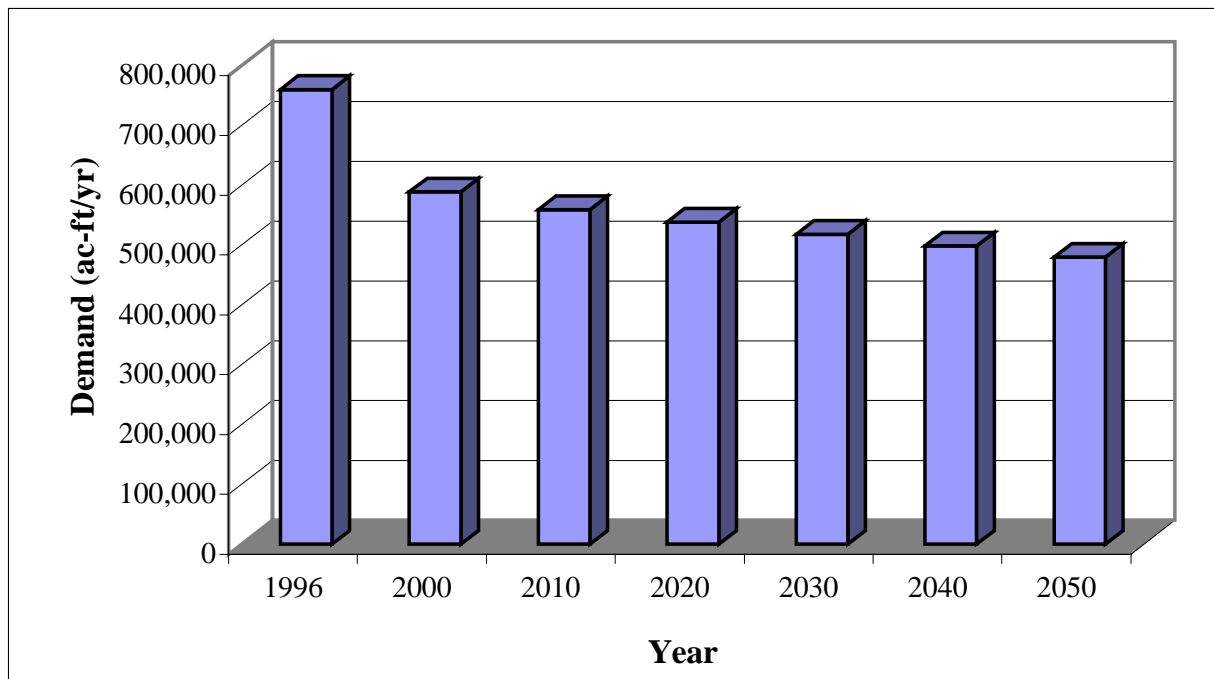


Table 2.8: Irrigation Water Demand Projections by County (ac-ft/yr)

County	1996	2000	2010	2020	2030	2040	2050
Bastrop	738	563	491	429	374	327	285
Blanco	504	458	435	413	392	362	353
Burnet	213	295	290	285	280	275	271
Colorado	218,833	176,879	168,953	161,922	155,121	148,537	142,135
Fayette	608	375	351	329	308	288	270
Gillespie	3,720	1,184	1,169	1,154	1,139	1,124	1,110
Hays (p)	81	23	22	22	22	22	22
Llano	1,442	1,103	1,085	1,067	1,049	1,031	1,014
Matagorda	275,314	192,987	180,861	174,326	168,031	162,000	156,197
Mills	3,613	2,416	2,364	2,312	2,262	2,213	2,165
San Saba	3,245	5,549	5,369	5,196	5,028	4,866	4,708
Travis	1,165	736	677	622	572	526	484
Wharton (p)	250,417	206,067	197,171	190,119	183,317	176,760	170,439
Williamson (p)	0	0	0	0	0	0	0
TOTAL	759,893	588,635	559,238	538,196	517,895	498,331	479,453

(p) Denotes that only the portion of the county in the Lower Colorado Region was considered.

* Irrigation water demand projections by city, county, and portion of a river basin within a county for each of the 14 counties in the Lower Colorado Region are provided in Appendix 2A.

Because irrigation water demand is concentrated in the Lower Colorado Region's lower three counties, projected demand is greatest in the Brazos-Colorado and Colorado-Lavaca Coastal Basins. The Colorado and Lavaca River Basins also constitute a significant portion of irrigation water demand. Table 2.9 presents these projected irrigation water demands for the Lower Colorado Region.

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

River Basin	1996	2000	2010	2020	2030	2040	2050
Brazos	396	31	27	24	21	18	16
Brazos-Colorado	353,917	251,385	238,748	229,983	221,532	213,394	205,530
Colorado	124,965	106,642	101,729	97,810	94,032	90,379	86,866
Colorado-Lavaca	157,896	126,164	118,975	114,727	110,630	106,700	102,926
Guadalupe	381	98	93	89	84	78	76
Lavaca	122,338	104,315	99,666	95,563	91,596	87,762	84,039
TOTAL	759,893	588,635	559,238	538,196	517,895	498,331	479,453

2.3.4 Steam Electric Water Demand Projections

2.3.4.1 Methodology

The steam electric water use projections that were developed by the TWDB and used on the 1997 State Water Plan were used as the default projections except where better, more current information indicated the need for revision.

2.3.4.2 Regional Steam Electric Water Demand Projections

Steam electric water demand is projected to increase from 81,000 acre-feet per year in the year 2000 to 118,500 acre-feet per year in the year 2050. Of the 14 counties in the Lower Colorado Region, only Bastrop, Fayette, Llano, Matagorda, and Travis counties have or are projected to have any steam-electric water demand. Figure 2.8 and Table 2.10 present the projected steam electric water demand by county for each of counties in the Lower Colorado Region.

Figure 2.8: Lower Colorado Region Steam Electric Water Demand Projections

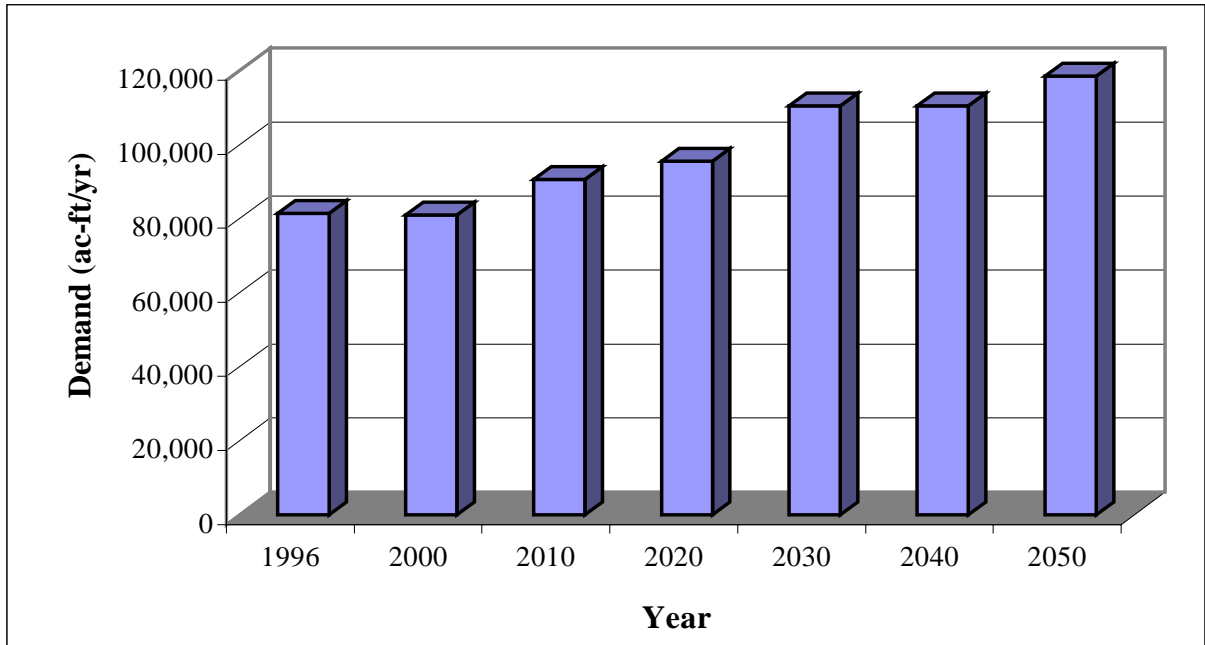


Table 2.10: Steam Electric Water Demand Projections by County (ac-ft/yr)

County	1996	2000	2010	2020	2030	2040	2050
Bastrop	5,715	4,500	8,000	8,000	8,000	8,000	8,000
Blanco	0	0	0	0	0	0	0
Burnet	0	0	0	0	0	0	0
Colorado	0	0	0	0	0	0	0
Fayette	24,334	15,000	20,000	25,000	40,000	40,000	45,000
Gillespie	0	0	0	0	0	0	0
Hays (p)	0	0	0	0	0	0	0
Llano	1,976	1,000	2,000	2,000	2,000	2,000	2,000
Matagorda	40,362	47,000	47,000	47,000	47,000	47,000	47,000
Mills	0	0	0	0	0	0	0
San Saba	0	0	0	0	0	0	0
Travis	9,028	13,500	13,500	13,500	13,500	13,500	16,500
Wharton (p)	0	0	0	0	0	0	0
Williamson (p)	0	0	0	0	0	0	0
TOTAL	81,415	81,000	90,500	95,500	110,500	110,500	118,500

(p) Denotes that only the portion of the county in the Lower Colorado Region was considered.

* Steam electric water demand projections by city, county, and portion of a river basin within a county for each of the 14 counties in the Lower Colorado Region are provided in Appendix 2A.

Since each of the Lower Colorado Region's steam-electric power generation facilities are located along the Colorado River, all of the projected steam-electric water demand is located within the Colorado River Basin. Table 2.11 shows the projected steam-electric water demand by basin.

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

River Basin	1996	2000	2010	2020	2030	2040	2050
Brazos	0	0	0	0	0	0	0
Brazos-Colorado	0	0	0	0	0	0	0
Colorado	81,415	81,000	90,500	95,500	110,500	110,500	118,500
Colorado-Lavaca	0	0	0	0	0	0	0
Guadalupe	0	0	0	0	0	0	0
Lavaca	0	0	0	0	0	0	0
TOTAL	81,415	81,000	90,500	95,500	110,500	110,500	118,500

2.3.5 Mining Water Demand Projections

2.3.5.1 Methodology

The TWDB mining water use projections that were used in the 1997 State Water Plan were developed based on projected future production levels by mineral category and expected water use rates. These production projections were derived from state and national historic rates and were constrained by accessible mineral reserves in each region. The TWDB's 1997 State Water Plan mining water demand projections were used except where better, more current information was available.

2.3.5.2 Regional Mining Water Demand Projections

Mining water demand for the Lower Colorado Region is projected to experience a decline from the year 2000 to the year 2010. This decline is followed by a projected increase in mining water demand from 2010 to 2050. The effect is projected mining water demand that is relatively constant over the 50-year planning period. Table 2.12 presents the projected mining water demand by county for each of the counties in the Lower Colorado Region.

Figure 2.9: Lower Colorado Region Mining Water Demand Projections

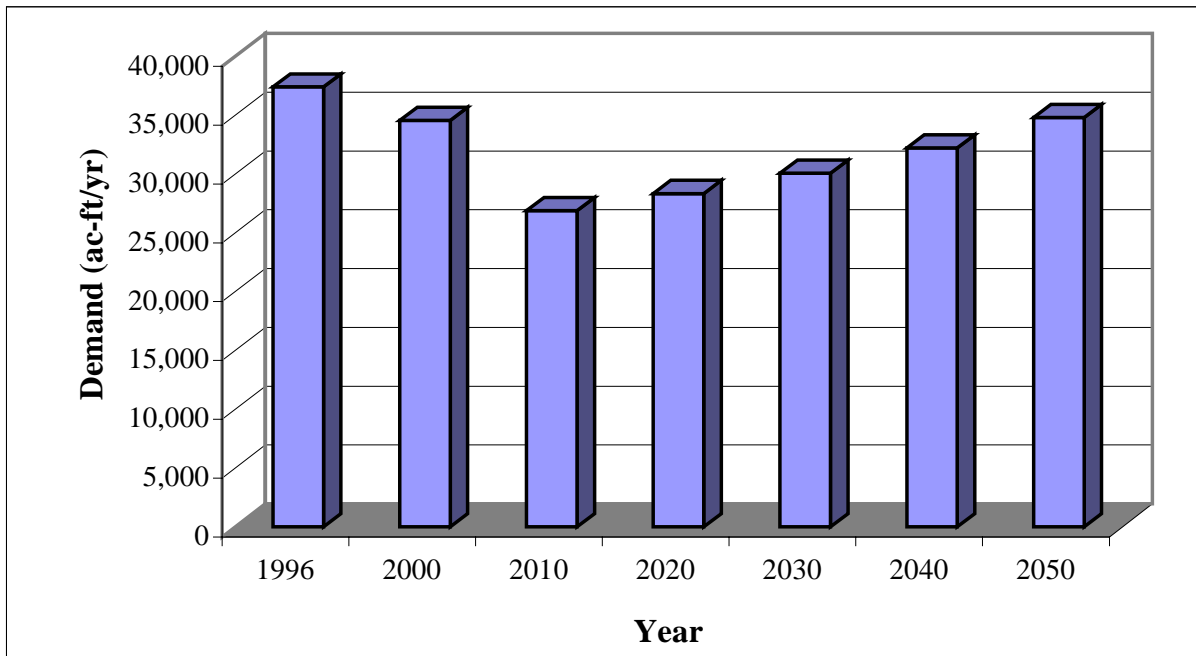


Table 2.12: Mining Water Demand Projections by County

County	1996	2000	2010	2020	2030	2040	2050
Bastrop	28	56	46	38	33	34	43
Blanco	6	13	9	5	1	0	0
Burnet	1,359	1,013	987	1,006	1,028	1,058	1,091
Colorado	31,244	20,486	11,378	12,334	13,473	14,926	16,677
Fayette	46	92	64	46	17	7	3
Gillespie	9	5	3	1	0	0	0
Hays (p)	6	12	8	4	1	0	0
Llano	152	143	112	99	95	92	95
Matagorda	277	5,299	6,956	6,945	6,942	6,942	6,949
Mills	0	0	0	0	0	0	0
San Saba	163	172	133	124	123	122	126
Travis	3,312	4,880	4,746	5,246	5,791	6,407	7,116
Wharton (p)	809	2,370	2,428	2,500	2,567	2,641	2,720
Williamson (p)	6	13	9	5	1	0	0
TOTAL	37,417	34,554	26,879	28,353	30,072	32,229	34,820

(p) Denotes that only the portion of the county in the Lower Colorado Region was considered.

* Mining water demand projections by city, county, and portion of a river basin within a county for each of the 14 counties in the Lower Colorado Region are provided in Appendix 2A.

Mining water demand for the Brazos, Colorado, Guadalupe, and Lavaca River basins is projected to decrease slightly over the 50-year planning period. Mining water demand for the Brazos-Colorado and the Colorado-Lavaca Coastal basins is projected to increase over this period. Table 2.13 presents the mining water demand projections by river basin.

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

River Basin	1996	2000	2010	2020	2030	2040	2050
Brazos	71	111	80	53	28	20	20
Brazos-Colorado	979	2,627	2,645	2,653	2,626	2,670	2,750
Colorado	34,315	24,925	15,879	17,402	19,179	21,196	23,577
Colorado-Lavaca	281	5,158	6,806	6,839	6,915	6,942	6,949
Guadalupe	14	28	20	12	6	2	0
Lavaca	1,757	1,705	1,449	1,394	1,318	1,399	1,524
TOTAL	37,417	34,554	26,879	28,353	30,072	32,229	34,820

2.3.6 Livestock Water Demand Projections

2.3.6.1 Methodology

For all 14 counties in the Lower Colorado Region the livestock water use projections developed by the TWDB and used in the 1997 State Water Plan were used as the default projections. These projections were developed using Texas Agricultural Statistics Service projections of number of livestock by type and county and Texas Agricultural Extension Service estimates of water use rates by type of livestock.

2.3.6.2 Regional Livestock Water Demand Projections

Livestock water demand for the Lower Colorado Region represents approximately 1.5 percent of the total regional water demand. Livestock water demand is projected to remain constant over the 50-year planning period. This constant projected demand of 14,275 acre-feet is approximately 20 percent less than the value reported by the TWDB for 1996. Table 2.14 presents the projected livestock water demand by county for each of the 14 counties in the Lower Colorado Region.

Figure 2.10: Lower Colorado Region Livestock Water Demand Projections

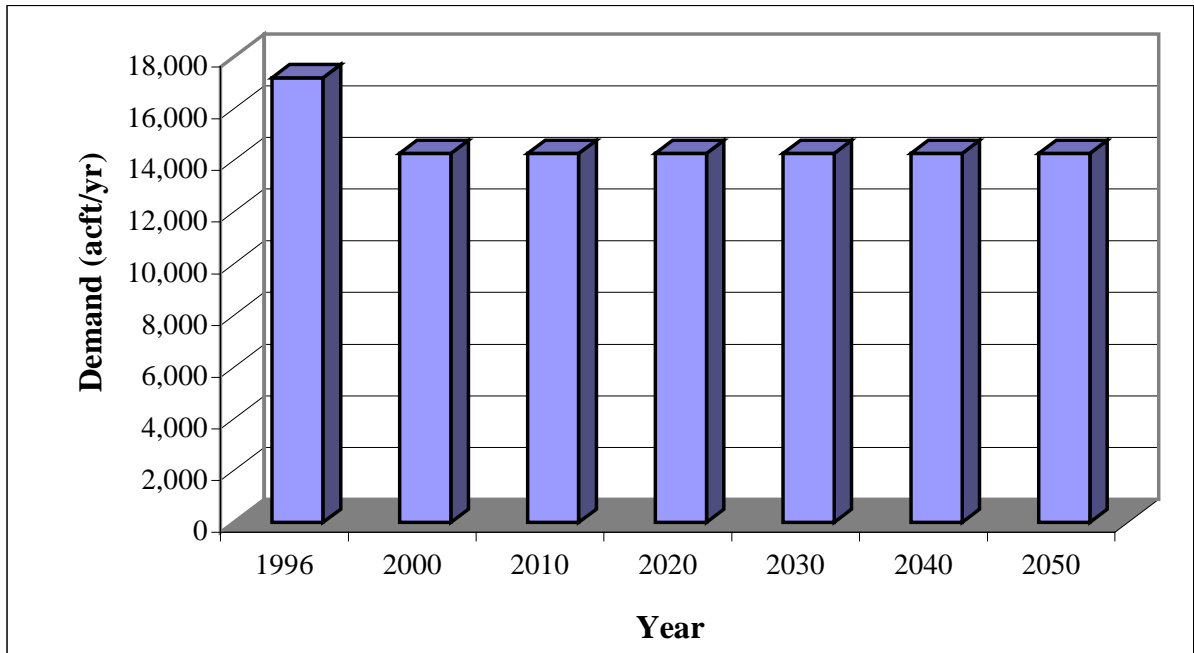


Table 2.14: Livestock Water Demand Projections by County (ac-ft/yr)

County	1996	2000	2010	2020	2030	2040	2050
Bastrop	1,760	1,525	1,525	1,525	1,525	1,525	1,525
Blanco	477	670	670	670	670	670	670
Burnet	652	794	794	794	794	794	794
Colorado	1,762	1,447	1,447	1,447	1,447	1,447	1,447
Fayette	1,895	2,621	2,621	2,621	2,621	2,621	2,621
Gillespie	1,836	1,294	1,294	1,294	1,294	1,294	1,294
Hays (p)	222	213	213	213	213	213	213
Llano	713	689	689	689	689	689	689
Matagorda	1,746	1,023	1,023	1,023	1,023	1,023	1,023
Mills	1,936	1,048	1,048	1,048	1,048	1,048	1,048
San Saba	1,743	1,200	1,200	1,200	1,200	1,200	1,200
Travis	1,778	906	906	906	906	906	906
Wharton (p)	680	844	844	844	844	844	844
Williamson (p)	2	1	1	1	1	1	1
TOTAL	17,202	14,275	14,275	14,275	14,275	14,275	14,275

(p) Denotes that only the portion of the county in the Lower Colorado Region was considered.

* Livestock water demand projections by city, county, and portion of a river basin within a county for each of the 14 counties in the Lower Colorado Region are provided in Appendix 2A.

Livestock water demand in the Lower Colorado Region is located predominately in the Brazos and Brazos-Colorado River basins. Table 2.15 presents these demands by river basin for the Lower Colorado Region.

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

River Basin	1996	2000	2010	2020	2030	2040	2050
Brazos	1,390	1,061	1,061	1,061	1,061	1,061	1,061
Brazos-Colorado	1,226	943	943	943	943	943	943
Colorado	12,349	10,227	10,227	10,227	10,227	10,227	10,227
Colorado-Lavaca	883	617	617	617	617	617	617
Guadalupe	426	458	458	458	458	458	458
Lavaca	928	969	969	969	969	969	969
TOTAL	17,202	14,275	14,275	14,275	14,275	14,275	14,275

2.4 ENVIRONMENTAL WATER DEMANDS ¹

Although not recognized by SB 1, an additional use category that is recognized by the Lower Colorado Regional Water Planning Group is environmental water demands. These demands are considered necessary to preserve the aquatic ecosystem within the region. In particular, environmental water demands have been determined to protect the habitat associated with the Colorado River and the Lavaca-Colorado estuary.

2.4.1 Instream Flow Requirements for the Colorado River

In 1992, the Lower Colorado River Authority (LCRA) completed an analysis of instream flow needs for the Colorado River. This analysis considered water quality and physical habitat requirements for the fish community native to the Colorado River. From this analysis, two sets of flow requirements were determined: critical and target flows.

Critical flow requirements are those necessary to maintain species population during severe drought conditions. From the LCRA analysis, it is recommended that a flow of at least 46 cubic feet per second (cfs) be maintained at the Austin gage at all times. If this flow should occur for an extended period of time, then operational releases will be made by the LCRA to temporarily alleviate these low flow conditions. Specifically, if flow at the Austin gage is less than 65 cfs for 21 consecutive days, the LCRA will make operational releases from storage sufficient to maintain flow at the Austin gage of at least 200 cfs for two consecutive days. If this operational release condition persists for three consecutive cycles (69 days), then a minimum average daily flow of at least 75 cfs will be maintained for the next 30 days. In addition to the flow requirements at the Austin gage, a mean daily discharge of greater than 120 cfs will be maintained at the Bastrop gage. This minimum flow will be maintained at all times except March, April, and May (critical flow months) in order to provide adequate water quality conditions in the Colorado River.

Target flow requirements are those necessary to provide an optimal range of habitat complexity for the support of a well-balanced native aquatic community. These flow regimes (described in Table 2.16) are considered an optimal range and should be maintained whenever water resources are adequate. However, these flows should be classified as interruptible demand subject to curtailment during drought conditions.

Table 2.16: Instream Flow Requirements for the Colorado River

Month	Austin gage	Critical Flows (cfs)		Target Flows (cfs)	
		Bastrop gage	Bastrop gage	Eagle Lake	Egypt
January	46	120	370	300	240
February	46	120	430	340	280
March	46	500	560	500	360
April	46	500	600	500	390
May	46	500	1,030	820	670
June	46	120	830	660	540
July	46	120	370	300	240
August	46	120	240	200	160
September	46	120	400	320	260
October	46	120	470	380	310
November	46	120	370	290	240
December	46	120	340	270	220

¹ Taken from information provided by the LCRA.

In addition to critical and target flow requirements, periodic high flow conditions (or scouring flood flows) are needed to prevent siltation and dense macrophytic growth from occurring in the Colorado River.

2.4.2 Bay and Estuary Requirements

The Lavaca-Colorado estuary is the second largest estuary on the Texas Gulf Coast. This estuary, which is also known as the Matagorda Bay system, covers 352 square miles. While Matagorda Bay is the largest body of water, other major bays in the estuary system are Lavaca, East Matagorda, Keller, Carancahua, and Tres Palacios.

In 1985 the Texas Legislature directed the Texas Parks and Wildlife Department (TPWD) and the TWDB to continue studies of the estuaries to determine freshwater inflow requirements to be considered in the allocation of the state's water resources. These studies were to have been completed by December 31, 1989. However, due to a lack of funding, changes in priorities, and other factors, they have been delayed. To expedite the completion of this study, the LCRA entered into a cooperative agreement with TPWD, TWDB, and TNRCC in 1993. The LCRA agreed to modify existing methods used by the TPWD and TWDB and to apply those methods to compute alternative freshwater needs for the estuary.

The freshwater inflow needs are estimated by following a methodology that closely resembles the TPWD and TWDB study of the Guadalupe Estuary. The first major element in this process is the development of statistical relationships for the interactions between freshwater inflows and important indicators of estuarine ecosystem conditions. The parameters that were considered in this analysis are: salinity, species productivity, and nutrient inflows. The next major step in this process involves using the statistical functions to compute optimal monthly and seasonal freshwater inflow needs. This is accomplished using the TWDB's Texas Estuarine Mathematical Programming (TXEMP) Model. The TXEMP model estimates the freshwater inflow needs of an estuary by representing mathematically the varied and complex interactions between freshwater inflows and salinity, species productivity, and nutrient inflows. The third major element in the process of developing inflow needs is the simulation of the salinity conditions throughout the estuary using the TXBLEND model developed by the TWDB and modified by the LCRA. The application of the TWDB methodology and the resulting estimates of freshwater inflow needs are documented in "Freshwater Inflow Needs of the Matagorda Bay System" (LCRA: Martin, Q., D. Patek, J. and Gorham-Test, C., 1997).

The freshwater inflow needs for the estuarine ecosystem associated with Matagorda Bay system were estimated for two levels of inflow needs: target and critical. Target inflow needs were determined as the monthly and seasonal inflows that produced 98 percent of the maximum normalized population biomass for nine key estuarine finfish and shellfish species while maintaining specified salinity, population density, and nutrient inflow conditions. The critical inflow needs were determined by finding the minimum total annual inflow needed to keep salinity at or below 25 parts per thousand near the mouths of the Colorado and Lavaca Rivers. These inflow needs are termed critical since they provide a fishery sanctuary habitat during droughts.

Results of the needs analysis indicate that target inflows need to be approximately 2.0 million acre-feet per year. Of this, it is estimated that the Colorado River will need to contribute 1,033,100 acre-feet annually. For critical inflow needs approximately 171,000 acre-feet of the total required 287,400 acre-

feet per year must come from the Colorado River. Both the target and critical monthly freshwater inflow needs from the Colorado River are indicated in Table 2.17.

Table 2.17: Colorado River Target & Critical Freshwater Inflow Needs for the Matagorda Bay System

Month	Target Needs (ac-ft)	Critical Needs (ac-ft)
January	44,100	14,260
February	45,300	14,260
March	129,100	14,260
April	150,700	14,260
May	162,200	14,260
June	159,300	14,260
July	107,000	14,260
August	59,400	14,260
September	38,800	14,260
October	47,400	14,260
November	44,400	14,260
December	45,200	14,260
Total	1,033,100	171,100

Total commitments of the Combined Firm Yield from the Highland Lakes for bays and estuaries (estuarine inflows) will be an average of 3,090 acre-feet (ac-ft) per year, with a maximum of 11,200 ac-ft in any one year; 19,700 ac-ft in any two consecutive years; 24,200 ac-ft in any three or four consecutive years; 28,200 ac-ft in any five consecutive years, and 30,900 ac-ft in any six to ten consecutive years.

2.5 MAJOR WATER PROVIDERS

The Lower Colorado Regional Water Planning Group has designated two entities as “major water providers”; the Lower Colorado River Authority (LCRA) and the City of Austin (COA). The COA is also a water customer of the LCRA, and together they supply a large portion of Region K’s water needs. This distinction was made to satisfy the TWDB guidelines that require each RWPG to identify and designate “major water providers”, which is defined by the TWDB as an entity “...which delivers and sells a significant amount of raw or treated water for municipal and/or manufacturing use on a wholesale and/or retail basis.”

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

2.5.1 City of Austin

The City of Austin provides water for municipal, manufacturing, and steam electric water uses. The City's existing service area covers portions of Travis and Williamson counties. The following table presents the aggregated demands of all users supplied by the City of Austin.

Table 2.18: Projected Water Demand for City of Austin Service Area (ac-ft/yr)

County/City	1996	2000	2010	2020	2030	2040	2050
Travis County							
Austin	107,515	152,755	176,336	210,137	243,955	265,274	289,942
Anderson Mill	28	35	34	34	33	32	34
Pflugerville	0	11,201	11,201	11,201	11,201	11,201	11,201
Rollingwood	372	454	508	588	675	726	793
Wells Branch	1,393	1,113	1,074	1,013	1,013	1,025	1,064
West Lake Hills	1,083	1,541	1,925	2,420	2,956	3,294	3,682
County-Other	10,605	3,885	4,009	4,373	4,742	4,935	5,211
Manufacturing	13,245	17,186	19,320	20,843	22,633	24,757	27,654
Steam Electric	9,028	13,500	13,500	13,500	13,500	13,500	16,500
Williamson County							
Austin	1,365	1,779	3,037	4,757	6,092	6,905	7,866
Anderson Mill	1,950	1,963	1,975	1,943	1,986	2,031	2,106
COA TOTAL	146,584	205,412	232,919	270,809	308,786	333,680	366,053

Travis County-Other water demand decreases between 1996 and 2000 due to annexations by the City of Austin, which correspondingly increases the City's water demand during that time period. In addition to the projected demands listed in the above table, the City of Austin currently has a water supply contract with the City of Round Rock to supply 6,161 acre-feet of water per year. This demand is not listed because this contract will expire in the year 2005.

The major water provider table indicates that the City of Austin is responsible for supplying a significant portion of the "County-Other" water in Travis County. This "County-Other" demand consists of demand for both individual service connections that are outside the city limits and demands for other public water systems served by the City of Austin. These wholesale water customers are listed in Appendix 2B.

The City of Austin has recently made commitments to provide treated water to the Spillar Ranch and Pflugger Ranch developments in Hays County, which will result in the expansion of the City's contractual water supply service area. This agreement (Mid-tex contract) is listed in Appendix 2C and corresponds to water supply option *Alternative H3* in Chapter 5.

2.5.2 Lower Colorado River Authority

The Lower Colorado River Authority (LCRA) supplies water for municipal, manufacturing, steam electric, and mining water uses. The LCRA currently supplies water to entities in Bastrop, Burnet, Colorado, Fayette, Llano, Matagorda, Travis, Wharton, and Williamson counties. Table 2.19 presents the projected water demands for each of the water user groups supplied by the LCRA.

Table 2.19: Projected Water Demand for the Lower Colorado River Authority (ac-ft/yr)

County/City	1996	2000	2010	2020	2030	2040	2050
Bastrop County							
Steam Electric	5,363	4,500	8,000	8,000	8,000	8,000	8,000
Burnet County							
Burnet	785	812	978	1,079	1,186	1,207	1,238
Cottonwood Shores	139	141	160	164	168	170	171
Granite Shoals	298	286	345	400	456	471	493
Marble Falls	1,275	1,372	1,624	1,874	2,105	2,177	2,264
County-Other	1,379	1,119	1,231	1,385	1,534	1,560	1,604
Colorado County							
Irrigation	146,716	139,260	129,790	123,460	114,310	111,590	104,700
Fayette County							
Steam Electric	18,813	15,000	20,000	25,000	40,000	40,000	45,000
Llano County							
Kingsland	540	522	502	472	463	472	493
County-Other	1,589	1,360	1,361	1,491	1,528	1,552	1,738
Steam Electric	1,606	1,000	2,000	2,000	2,000	2,000	2,000
Matagorda County							
Irrigation	178,491	166,770	158,810	151,610	146,090	140,230	136,020
Manufacturing	2,999	5,572	25,032	25,215	25,335	25,852	26,349
Mining	0	5,000	5,000	5,000	5,000	5,000	5,000
Steam Electric	38,905	47,000	47,000	47,000	47,000	47,000	47,000
Travis County							
Austin *	146,584	205,412	232,919	270,809	308,786	333,680	366,053
Jonestown	175	243	284	334	400	438	485
Lago Vista	849	1,821	2,128	2,519	2,995	3,291	3,630
Lakeway	1,042	1,587	1,868	2,240	2,693	2,964	3,287
County-Other	7,048	7,048	7,278	7,933	8,602	8,953	9,454
Wharton County							
Irrigation	127,031	120,360	112,150	107,010	102,110	96,740	91,320
Williamson County							
Cedar Park	5,400	16,100	16,100	16,100	16,100	16,100	16,100
Leander	0	4,000	4,000	4,000	4,000	4,000	4,000
LCRA TOTAL	687,027	746,285	778,560	805,095	840,861	853,447	876,399

* Note: The City of Austin is a water customer of the LCRA and is also a designated major water provider.

As with the City of Austin, the municipal “County-Other” water demands for Burnet, Llano, and Travis counties actually consist of water that is supplied to several smaller wholesale water customers. These LCRA wholesale water customers are listed in Appendix 2B.

The LCRA has recently made several commitments to entities in Bastrop, Travis, San Saba, and Williamson counties that will result in the expansion of the LCRA’s contractual water supply service area. These include two irrigation agreements for Pecan Grove Plantation and the City of Cedar Park; and, five municipal agreements with the City of Cedar Park, Lakeway MUD, Brazos River Authority, Lometa, and WTCRWS. These agreements are listed in Appendix 2C and correspond to several water supply options in Chapter 5.

LCRWPG ADOPTED PLAN

APPENDIX 2A

***LCRWPG POPULATION & WATER DEMAND PROJECTIONS
(By County/River Basin; and City/County)***

LOCATED IN VOLUME II OF THE LCRWPG REGIONAL WATER PLAN - APPENDICES

LCRWPG ADOPTED PLAN

APPENDIX 2B

LCRA AND COA WATER SUPPLY CUSTOMERS AND CONTRACTS

LOCATED IN VOLUME II OF THE LCRWPG REGIONAL WATER PLAN - APPENDICES

LCRWPG ADOPTED PLAN

APPENDIX 2C

***ADDENDUM: RECENT LCRA AND COA WATER SUPPLY
COMMITMENTS***

LOCATED IN VOLUME II OF THE LCRWPG REGIONAL WATER PLAN - APPENDICES

LCRWPG ADOPTED PLAN

APPENDIX 2D

TWDB-REQUIRED TABLES
(Exhibit B Data Tables 1, 2, & 3)

LOCATED IN VOLUME II OF THE LCRWPG REGIONAL WATER PLAN - APPENDICES