

CHAPTER 2

POPULATION AND WATER DEMAND

2.1 INTRODUCTION

Planning for the wise use of the existing water resources in Far West Texas requires a reasonable estimation of current and future water needs for all water-use categories. The Texas Water Development Board (TWDB) regional planning rules specify in Section 357.5 (d) that in developing regional water plans, the Regional Planning Groups shall use for population and water-demand projections one of the following:

- *State population and water demand projections contained in the state water plan or adopted by the board (TWDB) after consultation with the Texas Commission on Environmental Quality, Texas Department of Agriculture (TDA), Texas Parks and Wildlife Department (TPWD), and regional planning groups in preparation for revision of the state water plan; or*
- *Population or water demand projection revisions that have been adopted by the board (TWDB), after coordination with TCEQ, TDA, TPWD, and regional planning groups when the requesting regional planning group demonstrates that the population and water demand projections developed pursuant to paragraph (1) of this subsection no longer represent a reasonable projection of anticipated conditions based on changed conditions and availability of new information.*

Regional population and water demand data was initially provided to the Far West Texas Water Planning Group (FWTWPG) at the beginning of the planning period. This information incorporated data from the State Data Center and from the U.S. Bureau of the Census' 2000 census count. In accordance with the second criteria above, the FWTWPG requested and was given approval to revise specific population and water-demand data for use in the regional plan. Thus, the population and water demand projections shown in this chapter are derived from a combination of TWDB data and approved revisions.

2.2 POPULATION AND WATER DEMAND PROJECTION REVISIONS

The FWTWPG solicited all entities within the Region to submit desired changes to the draft population and water-demand projections. Revision requests, along with required back-up documentation, were prepared and submitted to the TWDB. Following review by the TWDB, the FWTWPG was granted formal approval to use the revised population and water-demand projection estimates in the regional planning process. The result of the approved population revisions was a net increase of 5,158 in the year 2000 to 6,955 by the year 2060. Entities affected by the population revision include:

- City of Fort Davis
- Jeff Davis County rural
- City of Marfa
- Presidio County rural
- Fort Bliss
- Lower Valley Water District
- El Paso County WCID #4
- El Paso County rural

Requested revisions in draft water-demand projections fell into two categories, municipal and irrigation. Revised municipal projections for the Cities of El Paso and Van Horn were based on documented changes to per-capita water use; while revisions for Fort Bliss and Presidio County rural were based on a change in the estimated reduction from plumbing code savings.

Projected water demand for irrigation use was also revised in five counties. Irrigation needs were increased in Brewster, Jeff Davis and Presidio Counties as a result of the addition of previously un-surveyed irrigation sources. Culberson County irrigation demand was increased based on documentation of actual metered groundwater withdrawals; while

Hudspeth County irrigation was decreased based on both estimated groundwater withdrawals and measured diversions from the Rio Grande.

2.3 POPULATION

2.3.1 POPULATION PROJECTION METHODOLOGY

Starting with the 2000 census year count, TWDB staff used a cohort-component procedure to calculate population projections. Separate cohorts (age, sex, race, and ethnic groups) and components of cohort change (fertility rates, survival rates, and migration rates) are used to estimate county populations. The projected county population is then allocated to each city containing 500 or more people on the basis of each city's historic share of the county population. In some cases, the water user group (WUG) is a utility. In these cases, the population reported for the utility represents the population served by that utility. The rural "County Other" population is calculated as the difference between the total projected population of the cities and the total projected county population. Population is then projected from the 2000 base year by decade to the year 2060.

2.3.2 CURRENT AND PROJECTED POPULATION

Although the FWTWPG was legally mandated to utilize the 2000 census numbers for the purposes of calculating current and projected population figures, representatives from both urban and rural areas expressed concerns that the census represents a significant undercount of actual residents in the Region. This is especially true in the rural areas, where serious flaws existed with the U.S. Census Bureau's information-gathering techniques. Therefore, an emphasis is being made in this planning document to recognize a need for more water than is justified simply from the population-derived water demand quantities.

Current and projected population by decade for communities, water utilities, and county rural areas in Far West Texas is listed in Table 2-1. The year-2000 population for the entire Region is 705,399 of which 96 percent reside in El Paso County and 80 percent in the City of El Paso (Figure 2-1). The regional population is projected to more than double to 1,527,713 by the year 2060, which is an increase of 822,314 citizens; 80 percent of which will occur in El Paso County (Figures 2-2 and 2-3).

TABLE 2- 1. FAR WEST TEXAS POPULATION PROJECTIONS

COUNTY	WATER USER GROUP*	2000	2010	2020	2030	2040	2050	2060
BREWSTER	Alpine	5,786	6,320	6,742	6,929	7,055	7,398	7,474
	County-Other	3,080	3,148	3,202	3,226	3,242	3,286	3,296
	BREWSTER TOTAL	8,866	9,468	9,944	10,155	10,297	10,684	10,770
CULBERSON	Van Horn	2,435	2,743	2,943	3,031	3,060	3,060	3,060
	County-Other	540	608	653	672	678	678	678
	CULBERSON TOTAL	2,975	3,351	3,596	3,703	3,738	3,738	3,738
EL PASO	Anthony	3,850	4,586	5,422	6,156	6,789	7,422	8,055
	Clint	980	980	980	980	980	980	980
	City of El Paso (EPWU)**	566,858	637,481	717,651	788,014	848,699	909,384	970,069
	El Paso County WCID #4	8,343	12,507	17,234	21,383	24,961	28,539	32,117
	Fort Bliss	8,264	13,422	13,422	13,422	13,422	13,422	13,422
	Homestead MUD	3,202	4,898	6,823	8,513	9,970	11,427	12,884
	Horizon Regional MUD***	11,866	23,177	36,018	47,288	57,007	66,726	76,445
	Lower Valley Water District	5,144	12,505	19,752	26,113	31,599	37,085	42,571
	San Elizario	11,046	20,444	31,112	40,475	48,551	56,627	64,703
	Socorro	27,152	33,017	39,675	45,519	50,559	55,599	60,639
	El Paso County Tornillo WID	2,767	5,542	8,692	11,457	13,842	16,227	18,612
	Vinton	1,892	3,708	5,769	7,578	9,138	10,698	12,258
	County-Other	28,258	53,795	83,893	110,308	133,092	155,876	178,660
	EL PASO TOTAL	679,622	826,062	986,443	1,127,206	1,248,609	1,370,012	1,491,415
HUDSPETH	Sierra Blanca	533	608	661	688	688	688	688
	County-Other	2,811	3,207	3,485	3,626	3,626	3,626	3,626
	HUDSPETH TOTAL	3,344	3,815	4,146	4,314	4,314	4,314	4,314
JEFF DAVIS	Fort Davis	1,050	1,554	1,717	1,897	1,897	1,897	1,897
	County-Other	1,157	1,235	1,249	1,249	1,249	1,249	1,249
	JEFF DAVIS TOTAL	2,207	2,789	2,966	3,146	3,146	3,146	3,146
PRESIDIO	Marfa	2,121	2,585	2,855	3,154	3,154	3,154	3,154
	Presidio	4,167	5,360	6,589	7,746	8,777	9,286	9,577
	County-Other	1,016	880	740	608	490	432	399
	PRESIDIO TOTAL	7,304	8,825	10,184	11,508	12,421	12,872	13,130
TERRELL	Sanderson	861	921	956	956	956	956	956
	County-Other	220	235	244	244	244	244	244
	TERRELL TOTAL	1,081	1,156	1,200	1,200	1,200	1,200	1,200
REGION TOTAL		705,399	855,466	1,018,479	1,161,232	1,283,725	1,405,966	1,527,713

*Water User Groups are incorporated cities with a year-2000 population of 500 or more, and utilities that provided more than 280 acre-feet of water to its service area.

**El Paso County WCID-Westway has been incorporated into the City of El Paso.

***Horizon City and El Paso County Water Authority have merged into the Horizon Regional MUD.

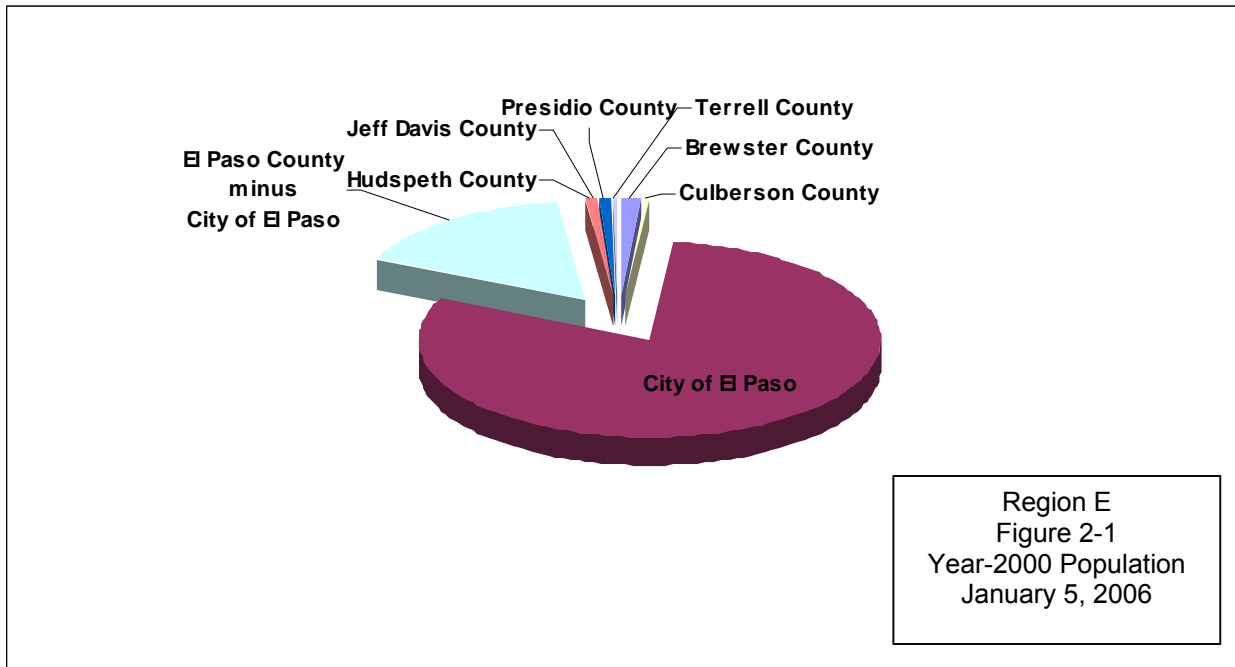


FIGURE 2- 1. YEAR-2000 POPULATION

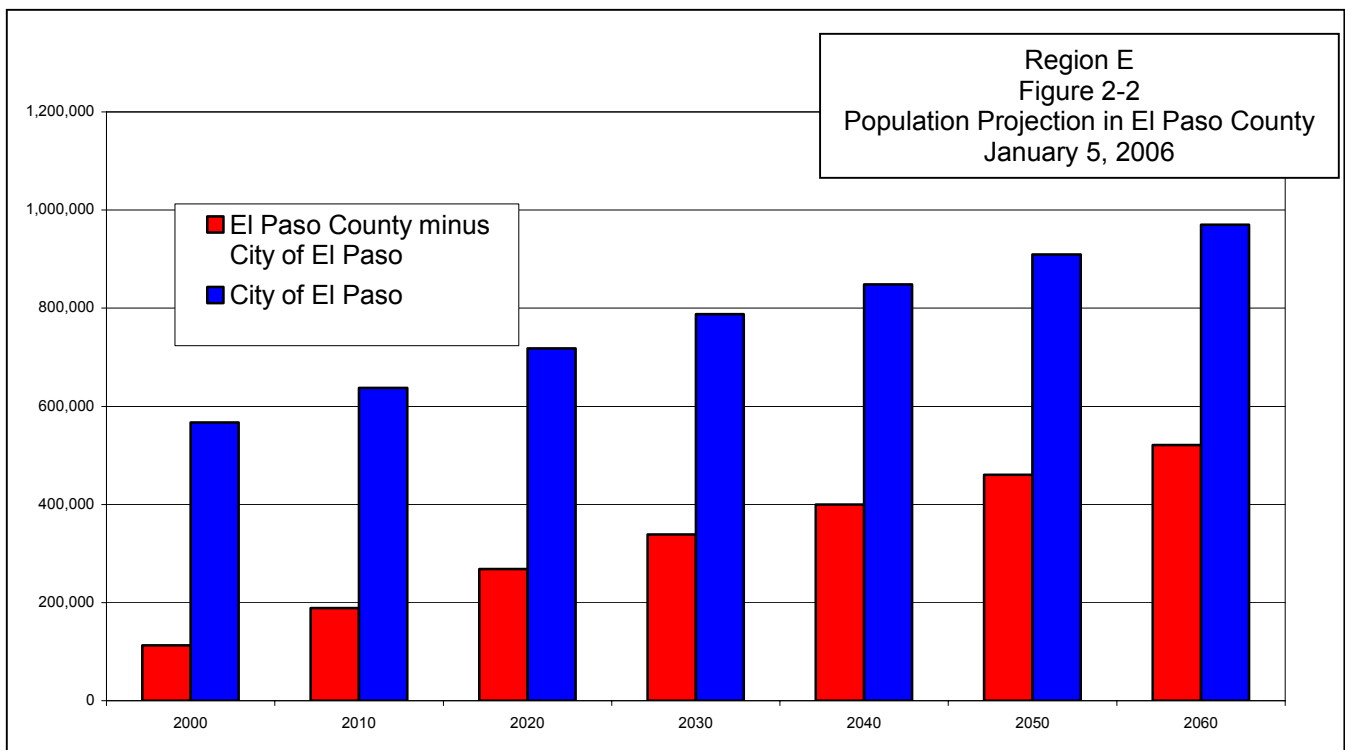


FIGURE 2- 2. POPULATION PROJECTION DISTRIBUTION IN EL PASO COUNTY

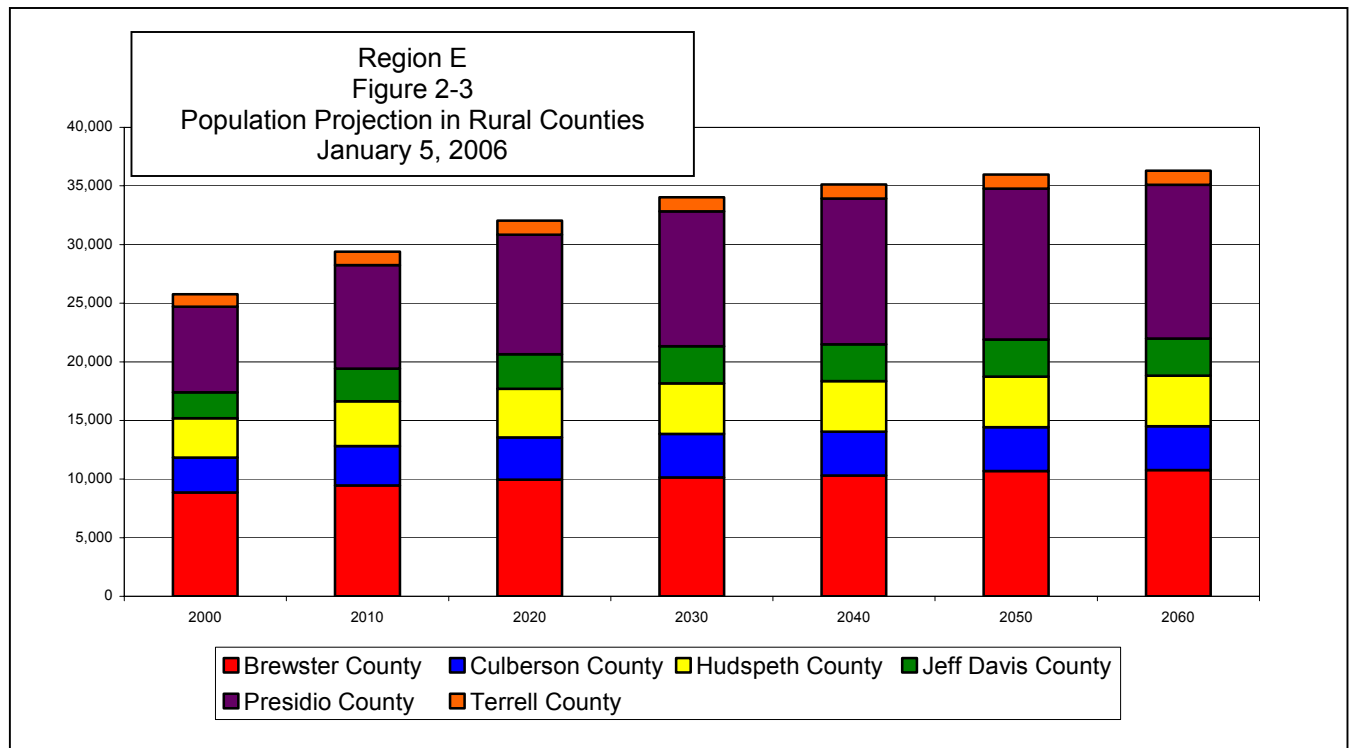


FIGURE 2- 3. POPULATION PROJECTION DISTRIBUTION IN RURAL COUNTIES

2.4 WATER DEMAND

A major component of water planning is the establishment of accurate water demand estimates for all water-use categories. Categories of water use include (1) municipal and rural domestic, (2) manufacturing, (3) irrigation, (4) steam electric, (5) livestock, and (6) mining. Table 2-2 lists the current and future projected regional water demands by county and water-use category. The percent distribution of year-2000 water demand in the Region by the six water-use categories is shown in Figure 2-4 and by county in Figure 2-5. Other water use categories that are not quantified in this plan but are addressed (Section 2.5) include environmental and recreational needs. An additional use that is not quantified but may be of significance is water that is used in road construction for both compaction and dust suppression.

Figure 2-6 illustrates current and future projected regional water demand estimates by water-use category, while Figure 2-7 illustrates water demand projections by county. From the year 2000 to 2060 the total water demand in the region is projected to increase from 665,793 acre-feet to 721,071 acre-feet.

The potential role of conservation is an important factor in projecting future water supply requirements. Water demands listed in the *2001 Far West Texas Regional Water Plan* included demand adjustments based on expected conservation practices. In this 2006 regional plan, conservation is only included in the municipal projections as a measure of expected savings based on requirements of the State plumbing code. All other conservation practices are discussed in terms of water supply strategies in Chapter 4 and as a component of drought management plans in Chapter 6.

The following sections present an overview of water supply needs for wholesale water providers and for each of the six designated water-use categories and include methods and assumptions used in the State's consensus water planning process. This information has been taken from the 2002 State Water Plan (*Water For Texas – 2002*) and Exhibit B – Guidelines for Regional Water Plan Development. The 2002 State Water Plan can be found on the TWDB web page (<http://www.twdb.state.tx.us>).

**TABLE 2- 2. FAR WEST TEXAS WATER DEMAND PROJECTIONS
(Acre-Feet/Year)**

COUNTY	WATER USER GROUP	2000	2010	2020	2030	2040	2050	2060
BREWSTER	Alpine	1,672	1,791	1,888	1,917	1,928	2,014	2,034
	County-Other	455	451	448	441	432	431	432
	Manufacturing	3	4	4	4	4	4	4
	Irrigation	621	1,622	1,613	1,605	1,596	1,588	1,580
	Mining	696	576	554	546	539	532	523
	Livestock	707	707	707	707	707	707	707
	BREWSTER TOTAL	4,154	5,151	5,214	5,220	5,206	5,276	5,280
CULBERSON	Van Horn	758	839	890	907	905	901	901
	County-Other	68	74	78	78	77	76	76
	Manufacturing	0	0	0	0	0	0	0
	Irrigation	29,593	28,960	28,340	27,733	27,140	26,559	25,991
	Mining	1,380	1,514	1,560	1,577	1,594	1,610	1,632
	Livestock	344	344	344	344	344	344	344
	CULBERSON TOTAL	32,143	31,731	31,212	30,639	30,060	29,490	28,944
EL PASO	Anthony	621	719	826	924	1,004	1,089	1,182
	Clint	276	270	268	268	267	267	267
	City of El Paso (EPWU)*	116,775	127,996	140,698	151,719	161,402	171,836	183,205
	El Paso County WCID #4	1,121	1,583	2,124	2,587	2,992	3,389	3,813
	Fort Bliss	5,214	8,419	8,419	8,404	8,404	8,389	8,389
	Homestead MUD	420	614	841	1,030	1,195	1,370	1,544
	Horizon Regional MUD**	1,900	3,593	5,527	7,224	8,684	10,165	11,646
	Lower Valley Water District	490	1,121	1,726	2,282	2,725	3,199	3,672
	San Elizario	1,101	1,924	2,858	3,718	4,405	5,138	5,871
	Socorro	2,585	2,959	3,466	3,977	4,361	4,795	5,230
	El Paso County Tornillo WID	282	534	818	1,078	1,287	1,509	1,730
	Vinton	210	399	614	798	962	1,126	1,291
	County-Other	3,070	5,664	8,551	10,873	12,672	14,492	16,610
	Manufacturing	7,745	9,181	9,994	10,692	11,367	11,941	12,855
	Mining	169	157	153	151	149	147	146
	Steam Electric Power	2,962	3,131	6,937	8,111	9,541	11,284	13,410
	Irrigation	270,424	247,111	242,798	240,848	232,380	228,579	224,840
Livestock	1,742	1,742	1,742	1,742	1,742	1,742	1,742	
EL PASO TOTAL	417,107	417,117	438,360	456,426	465,539	480,457	497,443	
HUDSPETH	Sierra Blanca	110	123	130	134	132	131	131
	County-Other	264	287	297	301	288	284	284
	Manufacturing	2	2	2	2	2	2	2
	Irrigation	186,494	182,627	178,840	175,132	171,501	167,945	164,463
	Mining	1	1	1	1	1	1	1
	Livestock	613	613	613	613	613	613	613
	HUDSPETH TOTAL	187,484	183,653	179,883	176,183	172,537	168,976	165,494

COUNTY	WATER USER GROUP	2000	2010	2020	2030	2040	2050	2060
JEFF DAVIS	Fort Davis	251	366	398	433	427	425	425
	County-Other	157	162	159	155	151	150	150
	Manufacturing	0	0	0	0	0	0	0
	Irrigation	579	576	572	569	566	563	559
	Mining	0	0	0	0	0	0	0
	Livestock	508	508	508	508	508	508	508
	JEFF DAVIS TOTAL	1,495	1,612	1,637	1,665	1,652	1,646	1,642
PRESIDIO	Marfa	737	886	969	1,060	1,049	1,042	1,042
	Presidio	831	1,039	1,255	1,458	1,642	1,727	1,781
	County-Other	94	81	66	52	42	37	34
	Manufacturing	0	0	0	0	0	0	0
	Irrigation	20,475	20,068	19,670	19,279	18,896	18,521	18,154
	Mining	10	7	7	7	7	7	7
	Livestock	622	622	622	622	622	622	622
PRESIDIO TOTAL	22,769	22,703	22,589	22,478	22,258	21,956	21,640	
TERRELL	Sanderson	191	200	205	201	198	197	197
	County-Other	37	38	39	38	37	37	37
	Manufacturing	0	0	0	0	0	0	0
	Irrigation	80	78	77	75	73	72	70
	Mining	26	18	17	17	17	17	17
	Livestock	307	307	307	307	307	307	307
	TERRELL TOTAL	641	641	645	638	632	630	628
REGION TOTAL		665,793	662,608	679,540	693,249	697,884	708,431	721,071

*El Paso County WCID-Westway has been incorporated into the City of El Paso.

** Horizon City and El Paso County Water Authority have been merged into Horizon Regional MUD.

While Table 2-2 lists TWDB approved water demand projections, Table 2-3 provides what the FWTWPG considers to be a more realistic outlook of future irrigation and livestock use in Jeff Davis and Presidio Counties. Although not presently in operation, existing irrigation wells in Jeff Davis and Presidio Counties could be placed back in use. Likewise, livestock numbers in Jeff Davis County suppressed by a number of years of drought conditions, will likely increase as weather and rangeland conditions improve.

**TABLE 2- 3. REGIONAL PLANNING GROUP PERSPECTIVE ON
PROJECTED IRRIGATION AND LIVESTOCK DEMANDS
IN JEFF DAVIS AND PRESIDIO COUNTIES
(Acre-Feet/Year)**

COUNTY	WATER USER GROUP	2000	2010	2020	2030	2040	2050	2060
JEFF DAVIS	Irrigation	3,184	3,119	3,057	2,995	2,935	2,875	2,816
	Livestock	547	547	547	547	547	547	547
PRESIDIO	Irrigation	25,678	25,156	24,646	24,145	23,655	23,175	22,705

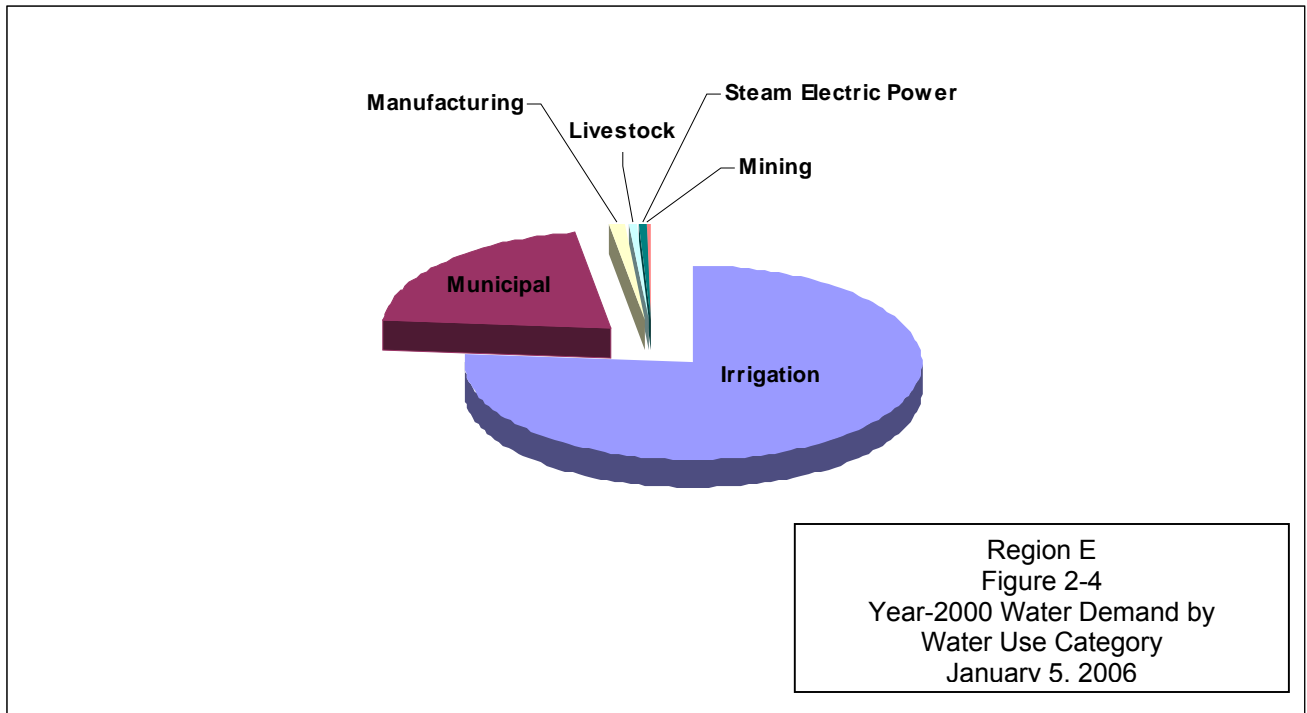


FIGURE 2- 4. YEAR-2000 WATER DEMAND BY WATER USE CATEGORY

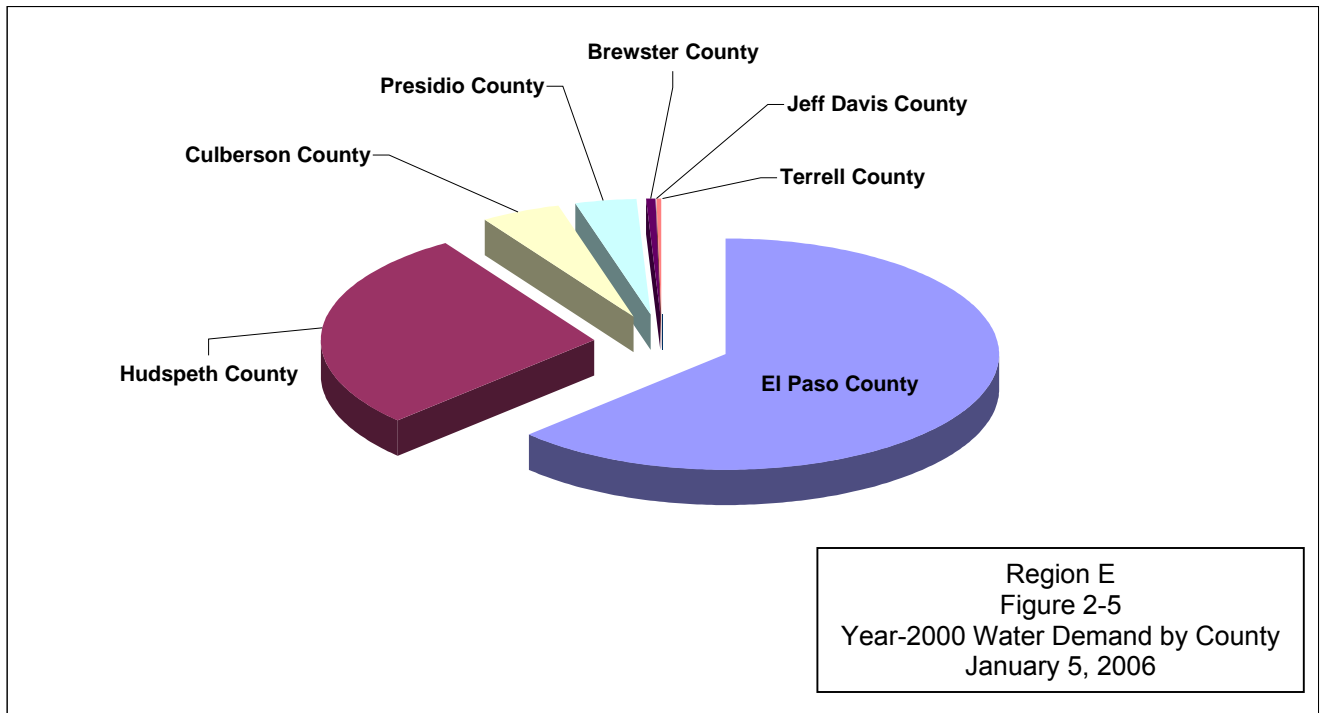


FIGURE 2- 5. YEAR-2000 WATER DEMAND BY COUNTY

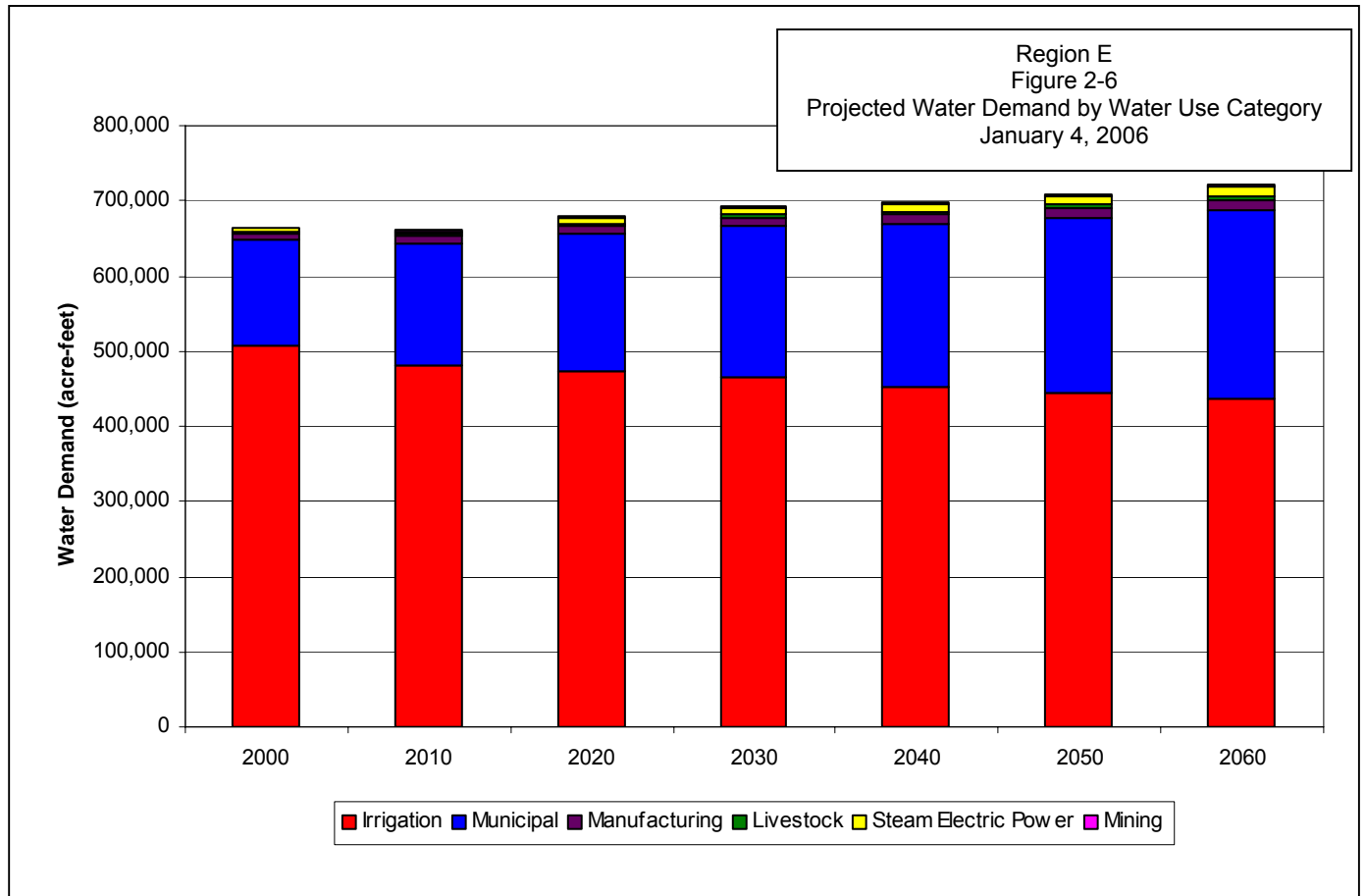


FIGURE 2- 6. PROJECTED WATER DEMAND BY WATER USE CATEGORY

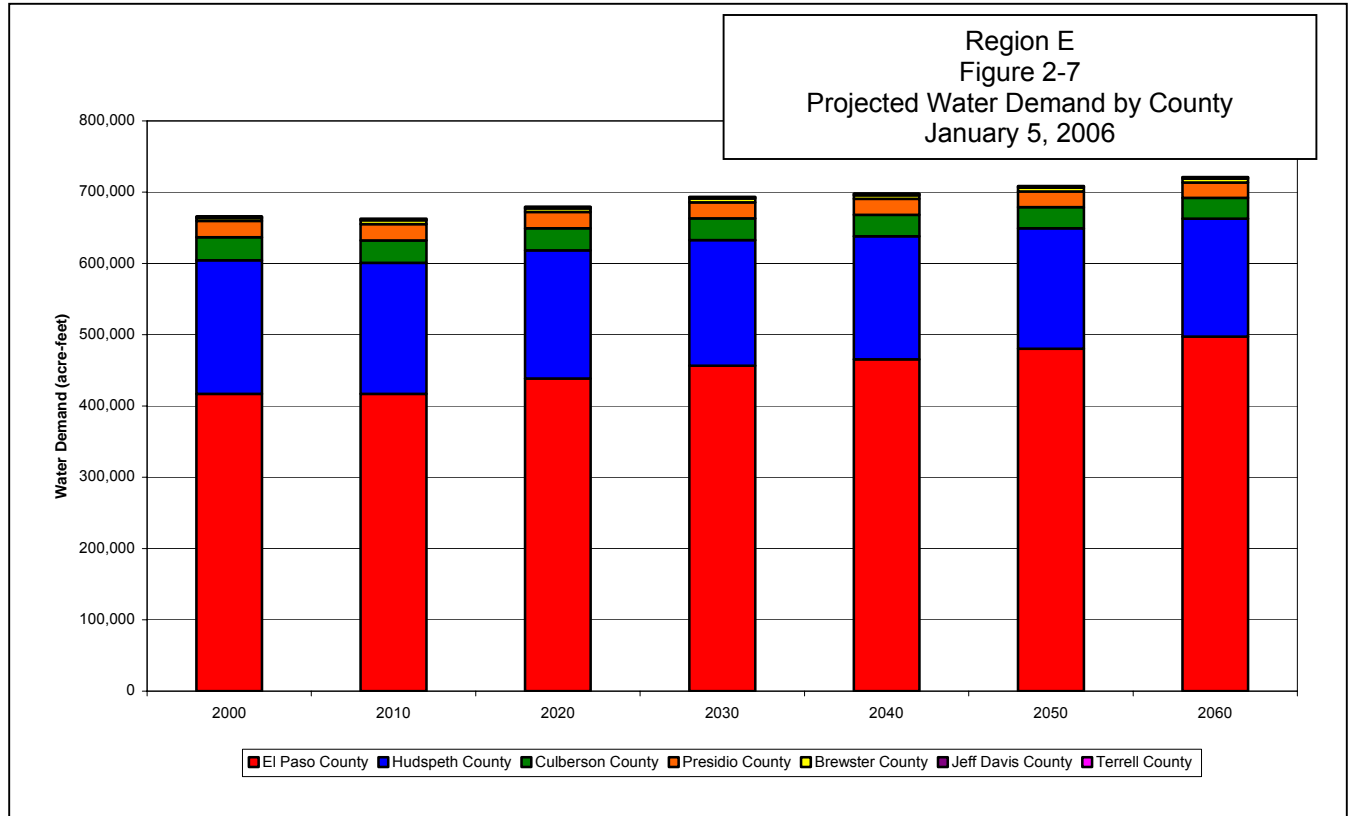


FIGURE 2-7. PROJECTED WATER DEMAND BY COUNTY

2.4.1 WHOLESALE WATER PROVIDERS

A wholesale water provider is defined as any entity that had contracts to sell more than 1,000 acre-feet of water wholesale in any one year during the five years immediately preceding the adoption of the last regional water plan (2001), or that is expected to enter into contracts to sell more than 1,000 acre-feet of water per year wholesale during the period covered by this Plan (2001–2006). Table 2-4 lists projected water demands for wholesale water providers in Far West Texas and their customers.

**TABLE 2- 4. WHOLESALE WATER PROVIDER WATER DEMAND
(Acre-Feet/Year)**

Contractual Obligation Indicated by ©

Wholesale Water Provider / Receiving Entities	2,000	2,010	2,020	2,030	2,040	2,050	2,060
El Paso County WID #1							
El Paso Water Utilities ©	7,855	7,855	7,855	7,855	7,855	7,855	7,855
El Paso Water Utilities							
City of El Paso	116,775	127,996	140,698	151,719	161,402	171,836	183,205
Fort Bliss ©	521	842	842	840	840	839	839
Homestead MUD ©	420	614	841	1,030	1,195	1,370	1,544
Lower Valley Water District ©	4,452	6,274	8,318	10,245	11,758	13,399	15,040
Vinton ©	210	399	614	798	962	1,126	1,291
Manufacturing	7,745	9,181	9,994	10,692	11,367	11,941	12,855
Mining	169	157	153	151	149	147	146
Steam Electric Power	2,962	3,131	6,937	8,111	9,541	11,284	13,410
Lower Valley Water District							
San Elizario ©	1,101	1,924	2,858	3,718	4,405	5,138	5,871
Socorro ©	2,585	2,959	3,466	3,977	4,361	4,795	5,230
Clint ©	276	270	268	268	267	267	267
County Other	490	1,121	1,726	2,282	2,725	3,199	3,672
El Paso County WCID #4							
(Fabens)	1,121	1,583	2,124	2,587	2,992	3,389	3,813
Horizon Regional MUD							
(Horizon City)	1,900	3,593	5,527	7,224	8,684	10,165	11,646

2.4.2 MUNICIPAL

The quantity of water used for municipal and rural domestic purposes is heavily dependent on population growth, climatic conditions, and water-conservation measures. For planning purposes, municipal water use comprises both residential and commercial. Commercial water use includes business establishments, public offices, and institutions. Residential and commercial uses are categorized together because they are similar types of uses: i.e., they both use water primarily for drinking, cleaning, sanitation, air conditioning,

and landscape watering. Also included in this category is water applied to municipally owned golf courses. Water use within a city limit that is not included in the quantification of municipal demand is that used in manufacturing and industrial processes.

Municipal water demand is calculated for the communities and utilities designated in the population projections process and includes rural domestic use. Projected municipal water demand is based on the year-2000 per-capita water use, which is calculated with year-2000 population counts divided into reported water use for the same year. Per-capita water use in communities with significant non-residential water demands, such as for commercial customers, will appear abnormally high. The year-2000 per-capita water use is reduced slightly over time to simulate expected conservation savings due to state-mandated plumbing code implementation. The conservation adjusted per-capita water use is then applied to each of the decade population estimates to produce the projected water demand for each entity.

Rural communities (outside of El Paso County) are relatively small and are generally reliant on self-provided water supplies. Water demand within these communities is related directly to their population trends and is thus relatively stable or moderately increasing over the next 50 years. Projected water-demand growth for the numerous communities within El Paso County is significantly greater and thus will require a level of coordinated intercommunity planning.

Municipal Water Use Projection (in acre-feet/yr)

	2000	2010	2020	2030	2040	2050	2060
Brewster	2,127	2,242	2,336	2,358	2,360	2,445	2,466
Culberson	826	913	968	985	982	977	977
El Paso	134,065	155,795	176,736	194,882	209,460	226,764	244,450
Hudspeth	374	410	427	435	420	415	415
Jeff Davis	408	528	557	588	578	575	575
Presidio	1,662	2,006	2,290	2,570	2,733	2,806	2,857
Terrell	228	238	244	239	235	234	234

A significant portion of the municipal water demand in Brewster, Jeff Davis, and Presidio Counties, is assigned to the County Other (Rural) category. This category includes small communities of less than 500 population, rural water utilities, and privately owned well use. Listed below are the active public water suppliers (restaurants and motels not included) in these counties that fall into the County Other category.

Brewster County

Big Bend National Park

Marathon WS&SC

Lajitas Resort

Study Butte Terlingua WS

Terlingua Ranch Development

Twin Peaks Mobile Home Park

Jeff Davis County

Camp Miter Peak

Chihuahuan Desert Research Institute

City of Valentine

Davis Mountains State Park (TPWD)

Fort Davis Estates

Fort Davis WSC

High Frontier

Prude Ranch

Skyline Drive (TPWD)

UT McDonald Observatory

Valentine ISD

Village Farms (Fort Davis)

Presidio County
Big Bend Ranch State Park (TPWD)
Candelaria WSC
Cibolo Creek Ranch
Fort Leaton SHP (TPWD)
Howard Water Supply
Redford School
Redford Water Supply
USAF TARS
Village Farms (Marfa)

2.4.3 MANUFACTURING

Manufacturing and industrial water use is quantified separately from municipal use even though the demand centers may be located within a city limits. Future manufacturing and industrial water use is largely dependent on technological changes in the production process, on improvements in water-efficient technology, and on the economic climate of the marketplace. Technological changes in production affect how water is used in the production process, while improvements in water-efficient technology affect how much water is used in the production process. As older production facilities and accompanying production processes are modernized or retooled, the new production processes are anticipated to be more resource efficient.

The use of water for manufacturing purposes only occurs in Brewster, El Paso and Hudspeth Counties. Use in Brewster and Hudspeth Counties is minimal and is not anticipated to change significantly over time. Manufacturing water use in El Paso County, however, is expected to increase from 7,745 acre-feet in the year 2000 to 12,855 acre-feet by 2060. While a portion of this water is self-supplied, most will be purchased from various water supply entities, principally El Paso Water Utilities.

Manufacturing Water Use Projection (in acre-feet/yr)

	2000	2010	2020	2030	2040	2050	2060
Brewster	3	4	4	4	4	4	4
Culberson	0	0	0	0	0	0	0
El Paso	7,745	9,181	9,994	10,692	11,367	11,941	12,855
Hudspeth	2	2	2	2	2	2	2
Jeff Davis	0	0	0	0	0	0	0
Presidio	0	0	0	0	0	0	0
Terrell	0	0	0	0	0	0	0

2.4.4 IRRIGATION

A comprehensive irrigation survey was performed for the TWDB in 2000 that provided up-to-date crop and irrigation data. The acreage planted for each crop under irrigation, along with the water application rate for each crop, was estimated by the Natural Resource Conservation Service (NRCS) and computed to give total irrigation use for each county. Included in this projection is water applied to private (non-municipally owned) golf courses, greenhouse operations, and container-plant farms. Irrigation water demand includes estimates of surface water lost in the process of transportation to the field. In lieu of the above process, irrigation districts could provide more accurate estimates based on actual measured diversions or pumping withdrawals. Future irrigation use is then projected from this 2000 base year at a rate established for the same county irrigation projection in the previous regional water plan.

Statewide, irrigation water demands are expected to decline over time. More efficient canal delivery systems have improved water-use efficiencies of surface water irrigation. More efficient on-farm irrigation systems have also improved the efficiency of groundwater irrigation. Other factors that have contributed to decreased irrigation demands are declining groundwater supplies and the voluntary transfer of water rights historically used for irrigation to municipal uses.

Water used for agricultural irrigation in Far West Texas is significantly greater (76% of total) than all other water-use categories. On a regional basis, water used for the irrigation of crops is projected to decline slightly over the 50-year planning horizon. However, as any irrigator can attest, climate, water availability, and the market play key roles in how much water is actually applied on a year-by-year basis.

The quantity and quality of water needed for agricultural irrigation is dependent on the type of crop grown and on soil characteristics. Although a minimal amount of agriculture can persist on limited water supplies, most crops require significantly larger water applications to remain profitable. Irrigated farms along the Rio Grande corridor in El Paso and Hudspeth Counties are almost entirely dependent on water supplies derived from the River. When Rio Grande water is limited or not available, most farming temporarily ceases until water supplies once again become available. Irrigated farms in other areas within the region are dependent on groundwater supplies. Availability of these supplies depends on localized pumping, aquifer hydrologic characteristics, and energy cost.

Irrigation strategies principally involve various forms of conservation. Irrigation application equipment has been developed to insure that greater amounts of applied water reach the root system while minimizing loss to evaporation. Proper application timing is also critical in avoiding over-watering. The lining of canals that transport water from its source to the fields reduces losses due to seepage. Drought tolerant crop selection is also important when faced with limited water supplies.

Some farmers across the Region are using slightly-saline water for irrigation. In order to maintain long-term soil productivity with saline waters, producers must over irrigate to maintain a leaching fraction that minimizes salt buildup in the crop root zone. In some areas, high levels of sodium have reduced soil infiltration rates. Producers often manage this problem through application of soil amendments (such as gypsum or organic residues) or through mechanical mixing of the soil.

Irrigation Water Use Projection (in acre-feet/yr)

	2000	2010	2020	2030	2040	2050	2060
Brewster	621	1,622	1,613	1,605	1,596	1,588	1,580
Culberson	29,593	28,960	28,340	27,733	27,140	26,559	25,991
El Paso	270,424	247,111	242,798	240,848	232,380	228,579	224,840
Hudspeth	186,494	182,627	178,840	175,132	171,501	167,945	164,463
Jeff Davis	3,184	3,119	3,057	2,995	2,935	2,875	2,816
Presidio	25,678	25,156	24,646	24,145	23,655	23,175	22,705
Terrell	80	78	77	75	73	72	70

2.4.5 STEAM-ELECTRIC

In determining current and future water use for steam-electric power generation, the TWDB relies on several types of information. Current water use is obtained for each plant from the TWDB's water use survey. Future water demand is estimated using a combination of available information, including published documents on planned additions to existing plants, existing water rights permits, specific company information, lignite-resource ownership, and other related sources. Individual plant design, thermodynamic operating characteristics, energy-conservation strategies, and technological improvements are also evaluated to determine how water use will change over time.

El Paso Electric located in El Paso County is the only facility within the Region that uses water in the form of steam to generate electricity. Anticipated local population growth, as well as increasing commercial and manufacturing power needs, means that the quantity of water needed to produce electricity will likewise increase. El Paso Electric currently purchases most of its water supply from El Paso Water Utilities.

Steam Electric Power Generation Water Use Projection (in acre-feet/yr)

	2000	2010	2020	2030	2040	2050	2060
Brewster	0	0	0	0	0	0	0
Culberson	0	0	0	0	0	0	0
El Paso	2,962	3,131	6,937	8,111	9,541	11,284	13,410
Hudspeth	0	0	0	0	0	0	0
Jeff Davis	0	0	0	0	0	0	0
Presidio	0	0	0	0	0	0	0
Terrell	0	0	0	0	0	0	0

2.4.6 LIVESTOCK

Texas is the nation's leading livestock producer, accounting for approximately 11 percent of the total United States production. Although livestock production is an important component of the Texas economy, the industry consumes a relatively small amount of water.

Estimating livestock water consumption is a straightforward procedure that consists of estimating water consumption for a livestock unit and the total number of livestock. Texas A&M University Cooperative Extension Service provides information on water-use rates, estimated in gallons per day per head, for each type of livestock: cattle, poultry, sheep and lambs, hogs and pigs, horses, and goats. The Texas Agricultural Statistics Service provides current and historical numbers of livestock by livestock type and county. Water-use rates are then multiplied by the number of livestock for each livestock type for each county.

For water-supply planning purposes, livestock water use is held constant throughout the 50-year planning period. However, reality dictates that during prolonged drought periods, when poor range conditions exist and/or during unfriendly market conditions, livestock herds are generally reduced thus resulting in significantly less water demand.

Livestock Water Use Projection (in acre-feet/yr)

	2000	2010	2020	2030	2040	2050	2060
Brewster	707	707	707	707	707	707	707
Culberson	344	344	344	344	344	344	344
El Paso	1,742	1,742	1,742	1,742	1,742	1,742	1,742
Hudspeth	613	613	613	613	613	613	613
Jeff Davis	547	547	547	547	547	547	547
Presidio	622	622	622	622	622	622	622
Terrell	307	307	307	307	307	307	307

2.4.7 MINING

Although the Texas mineral industry is foremost in the production of crude petroleum and natural gas in the United States, it also produces a wide variety of important nonfuel minerals. In all instances, water is required in the mining of these minerals either for processing, leaching to extract certain ores, controlling dust at the plant site, or for reclamation. For each category of mineral products, the requirements for mining water were determined as a function of production. TWDB's estimates of future production were calculated by analyzing both recent data, and state and national production trends. A water-use coefficient, computed from data collected by the TWDB's Water Use Survey, which reports the quantity of water used in the production of each increment of output, was applied to estimated mineral production levels. A rate of water consumption derived from U.S. Bureau of Mines data was then applied to the total water use for each mineral industry.

Much of the water used in the mining industry in Far West Texas is related to its use in the extraction of gravel and road base materials. The largest single water use occurs in Culberson County where it is employed in the mining of talc mineral aggregates. Very little petroleum exploration is occurring in this Region.

Mining Water Use Projection (in acre-feet/yr)

	2000	2010	2020	2030	2040	2050	2060
Brewster	696	576	554	546	539	532	523
Culberson	1,380	1,514	1,560	1,577	1,594	1,610	1,632
El Paso	169	157	153	151	149	147	146
Hudspeth	1	1	1	1	1	1	1
Jeff Davis	0	0	0	0	0	0	0
Presidio	10	7	7	7	7	7	7
Terrell	26	18	17	17	17	17	17

2.5 ENVIRONMENTAL AND RECREATIONAL WATER NEEDS

Environmental and recreational water use in Far West Texas is not quantified but is recognized as being an important consideration as it relates to the natural community in which the residents of this Region share and appreciate. In Chapter 1, environmental and eco-recreational resources are identified and described. In the following paragraphs, the water resources needed to maintain these functions is discussed. Water-supply sources that serve environmental needs, along with identified major springs, are characterized in Chapter 3, and potential water-supply strategy consequences on the environment are considered in Chapter 4. Chapter 8 contains a discussion and recommendations pertaining to “Ecologically Unique Stream Segments.”

In terms of combined area, Far West Texas contains most of the federal public land in Texas, and over half the land in the entire Texas State Park system. This conservation heritage has been preserved and protected “to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations”.

The presence of these protected public lands contributes greatly to the quality of life for area residents in a way that is not easily described in gallons, acre-feet or dollars and cents. It has been amply demonstrated that to attract 21st century enterprise that pays top salaries for skilled workers, quality of life is a critical issue. The spectacular natural and cultural heritage of the Region not only attracts many hundreds of thousands of temporary visitors per year to Far West Texas (more than 650,000 per year just to Guadalupe Mountains and Big Bend National Parks), it also helps to attract new residents and businesses to the Region. Providing sufficient water for recreation and habitat in Far West Texas is critical to long-term economic health.

Quantifying environmental and recreational needs is not always difficult. For the Rio Grande below Presidio, measured at the IBWC gage below Alamito Creek, a flow of 250 cubic feet per second is sufficient to support minimum needs. When flows fall below this point for any length of time, recreational, agricultural, and habitat values are seriously degraded.

Quantifying minimum flows at upland water sources that support wildlife and game through the year is impossible in terms of gallons and acre-feet, but is an observable fact that wildlife populations flux wildly over the years due to relative abundance or scarcity of rainfall and related spring productivity. It has also been observed that even major springs that historically have never run dry can disappear when local aquifers are pumped beyond sustainable levels. Even minor aquifer depletion can have a profound effect on wildlife habitat and recreational opportunities in affected local areas.

In terms of the regional planning process, discussion of environmental and recreational water needs has been largely considered a rural issue, and generally overlooked because of the perceived priority of other issues. However, every regional resident uses environmental and recreational water, be it for personal lawn and garden, a golf course, a swimming pool, or for canoeing the Rio Grande, hunting deer, or watching birds. In urban areas and small towns, environmental and recreational needs can constitute a third or more of total use during hot months. The FWTWPG recognizes the importance of supplying adequate

environmental and recreational water fairly to all users, and the goal of better quantifying those needs in the next planning cycle.

All living organisms require water. The amount and quality of water required to maintain a viable population, whether it be plant or animal, is highly variable. While some individuals are capable of migrating long distances in search of water (birds, larger mammals, etc.), others are stationary (plants, fishes, etc.) and must rely on existing supplies. In both cases, endemic wildlife to this desert region of Texas has adapted to the harsh climatic conditions.

Because most available water-supply sources in Far West Texas are relatively small in areal extent and are generally separated by great distances, wildlife dependent on isolated sources exist at the mercy of that water supply. The loss of the supply source, even for a short time, may result in the loss or degradation of the resident species.

Natural and environmental resources are often overlooked when considering the consequences of prolonged drought conditions. As water supplies diminish during drought periods, the balance between both human and environmental water requirements becomes increasingly competitive. A goal of the Far West Texas Water Plan is to provide for the health, safety, and welfare of the human community, with as little detrimental effect to the environment as possible. To accomplish this goal, the evaluation of strategies to meet future water needs includes a distinct consideration of the impact that each implemented strategy might have on the environment.

Recreation are those activities that involve human interaction with the outdoors environment. Many of these activities are directly dependent on water resources such as fishing, swimming, and boating; while a healthy environment enhances many others, such as hiking and bird watching. Thus, it is recognized that the maintenance of the regional environmental community's water supply needs serves to enhance the lives of citizens of Far West Texas as well as the thousands of annual visitors to this Region.

In Chapter 4, each water management strategy contains an environmental impact assessment. A review of this chapter reveals that while some strategies may contain variable levels of negative impact, other strategies may likely have a positive effect. Negative

environmental impacts are generally associated with the lowering of aquifer water levels due to increased groundwater withdrawals and its potential to cause springs to cease flowing. Also of concern is that lowered water levels could deplete supplies in shallow livestock wells that are often the only available source of water for some wildlife. The positive environmental aspect of the strategies is that during severe drought conditions when normal wildlife water supplies may naturally diminish, new supply sources might be developed such that wildlife could benefit.