2 POPULATION AND WATER DEMANDS

In April 2018[1], the Texas Water Development Board (TWDB) approved population and water demand projections for Region F for use in the 2021 Regional Water Plan. The water demand projections include both municipal and non-municipal water use over the planning period of 2020 to 2070. As part of the 2021 Regional Water Plan update, the TWDB redefined municipal water users based on retail service area rather than by political city limit boundaries. This resulted in minor changes to population and municipal water demands for many municipal water providers. Non-municipal water demands were initially developed by the TWDB using updated information and new protocols. The Region F RWPG reviewed and revised the projections as needed to more accurately reflect the expected water demands for the region.

Continued interest in oil and gas production in the Permian Basin resulted in significant increases in projected mining water demand for 2020-2040 in parts of Region F. Municipal water demand projections were also revised to reflect the new population projections in certain counties due to oil and gas activities. In most cases, the baseline per capita usage from the 2016 Plan was maintained for the 2021 Plan, which was based on 2011 per capita use to represent dry year demands. However, due to prolonged extreme drought, some users experienced restricted deliveries during 2011, and the historical use was not representative of a dry year demand and was thus adjusted. Furthermore, some entities have experienced a declining trend in per capita usage in recent years due to permanent conservation measures implemented as a response to the recent drought. These include conservation-oriented rate structures and changed behavior patterns. These entities' baseline per capita use numbers were adjusted downward to capture the recent trends. Despite an increase in population,

municipal water demands for the region decreased slightly from the previous plan.

Overall, water demand projections in Region F are estimated to be roughly 765,200 acre-feet in 2020 and decrease to about 744,400 acre-feet in 2070. Irrigation, steam electric power, livestock, and manufacturing demands are predicted to remain steady over the planning horizon. Mining demand is predicted to continue its upward trend, peaking at about 109,800 acre-feet in 2040. However, mining demand is expected to significantly decrease after 2040, with a predicted demand of only 34,500 acre-feet by 2070. This sizeable decrease in mining demand more than offsets the increase in municipal demand, which is projected to grow from roughly 137,700 acre-feet in 2020 to 190,300 acre-feet by 2070. Despite the increase in population and municipal demand over the planning horizon, the reduction in heavy mining demand results in an overall decreasing trend in total water demand over the planning horizon.

A Water User Group (WUG) is one of the following:

- Privately-owned utilities that provide an average of more than 100 acre-feet per year for municipal use for all owned water systems,
- Water systems serving institutions or facilities owned by the state or federal government that provide more than 100 acre-feet per year for municipal use,
- All other retail public utilities that provide more than 100 acre-feet per year for municipal use,
- Rural/unincorporated areas of municipal water use, known as County Other (aggregated on a county/basin basis),
- Manufacturing (aggregated on a county/basin basis),
- Steam electric power (aggregated on a county/basin basis),
- Mining (aggregated on a county/basin basis),
- Irrigation (aggregated on a county/basin basis), or
- Livestock (aggregated on a county/basin basis).

More detailed discussion of the development of population and water demands is presented in the following subsections. To understand the data development and presentation, it is important to understand the terminology used for regional water planning. The TWDB distributes its population and demand projections into Water User Groups (WUGs). Each WUG has an associated water demand. Only municipal WUGs have population projections.

The Region F Water Plan also recognizes wholesale water providers (WWPs) and major water providers (MWPs). A wholesale water provider is an entity that sells water wholesale to another water provider. These providers are considered in the development and understanding of how water is distributed in the region. However, demands for wholesale water providers are not specifically developed and presented in this chapter unless the WWP is also identified by the region as a MWP. The MWP is an entity selected by the RWPG as having a significant role in providing water in the region. A MWP may be a WUG or WWP. Region F has identified five MWPs for the 2021 Plan. Projected water demands for each MWP are discussed in Section 2.3.

To simplify the presentation of these data, all WUG projections in this chapter are aggregated by county. Projections divided by WUG, county and basin may be found in Appendix I, *Database (DB22) Reports*. The projections were developed by decade and cover the period from 2020 to 2070.
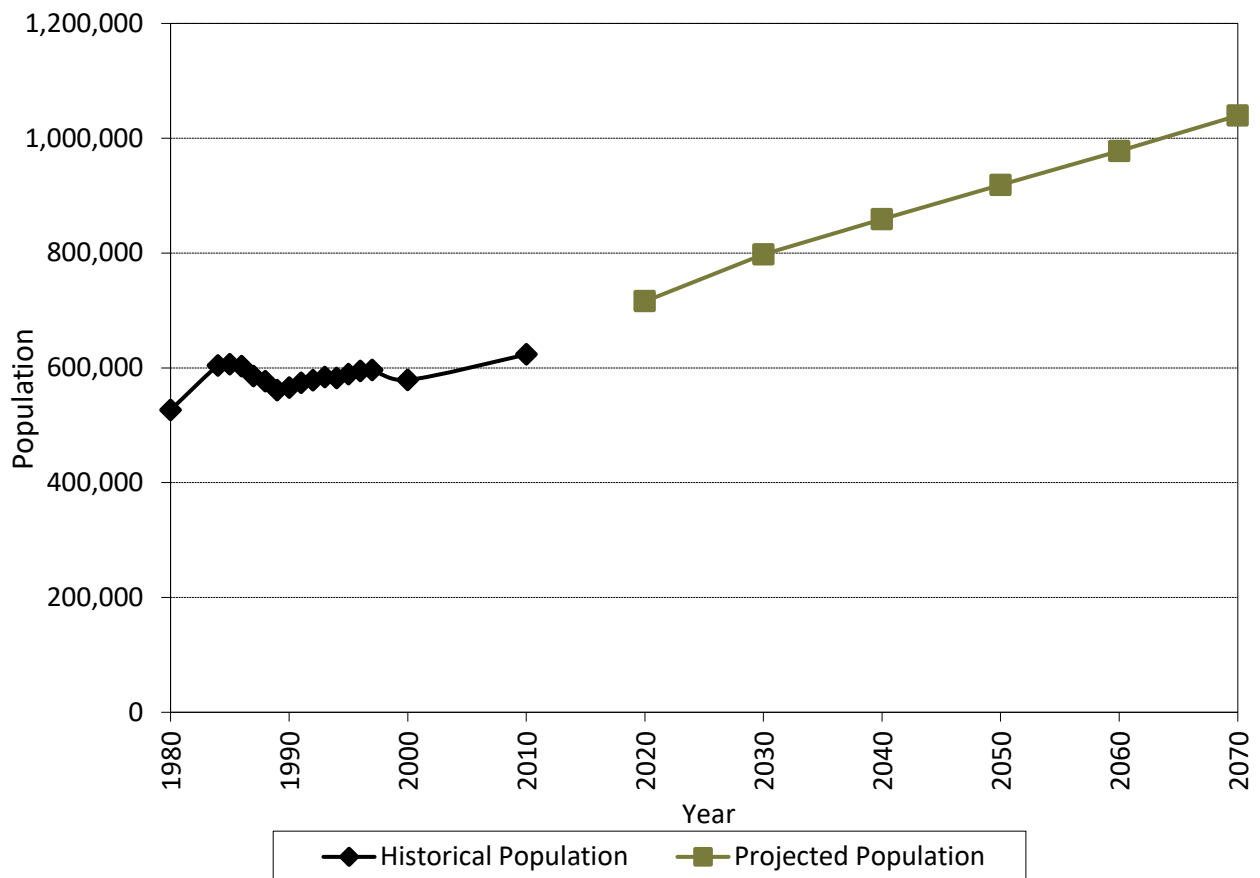
2.1   Population Projections

Table 2-1 presents the historical year 2010 and projected populations for the counties in Region F. Figure 2-1 compares the region's historical population from 1980 to 2010 and the projected population through 2070. Figure 2-2 shows the geographical distribution of the population projections for the years 2010 and 2070. Population projections divided by WUG, county and basin are included in the Appendix 2A at the end of this chapter.

Table 2-1
Historical and Projected Population by County

County	Historical[2]	Projected Population					
	2010	2020	2030	2040	2050	2060	2070
Andrews	14,786	19,089	22,847	26,246	30,111	34,526	39,574
Borden	641	659	671	671	671	671	671
Brown	38,106	39,761	40,717	40,717	40,717	40,717	40,717
Coke	3,320	3,320	3,320	3,320	3,320	3,320	3,320
Coleman	8,895	9,103	9,307	9,307	9,307	9,307	9,307
Concho	4,087	2,781	2,852	2,852	2,852	2,852	2,852
Crane	4,375	5,056	5,713	6,241	6,737	7,151	7,501
Crockett	3,719	4,111	4,386	4,446	4,486	4,500	4,506
Ector	137,130	164,289	187,604	210,926	233,048	255,083	278,740
Glasscock	1,226	1,341	1,429	1,429	1,429	1,429	1,429
Howard	35,012	37,310	38,936	39,603	39,603	39,603	39,603
Irion	1,599	1,684	1,702	1,702	1,702	1,702	1,702
Kimble	4,607	4,710	4,754	4,754	4,754	4,754	4,754
Loving	82	82	82	82	82	82	82
Martin	4,799	5,433	5,986	6,382	6,735	7,000	7,205
Mason	4,012	4,012	4,012	4,012	4,012	4,012	4,012
McCulloch	8,283	8,635	9,000	9,030	9,125	9,152	9,165
Menard	2,242	2,242	2,242	2,242	2,242	2,242	2,242
Midland	136,872	169,062	195,286	213,581	232,357	250,264	269,070

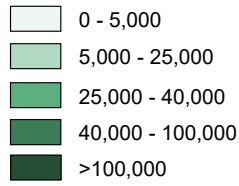| County	Historical[2] 2010	Projected Population					
		2020	2030	2040	2050	2060	2070
Mitchell	9,403	10,531	11,329	11,566	11,706	11,826	11,930
Pecos	15,507	17,718	19,224	20,802	22,021	23,109	24,090
Reagan	3,367	3,853	4,303	4,571	4,812	4,980	5,102
Reeves	13,783	15,125	16,193	17,057	17,650	18,106	18,443
Runnels	10,501	10,883	11,300	11,300	11,300	11,300	11,300
Schleicher	3,461	3,811	4,106	4,259	4,350	4,406	4,440
Scurry	16,921	19,911	22,497	24,249	26,236	28,246	30,322
Sterling	1,143	1,215	1,260	1,275	1,275	1,275	1,275
Sutton	4,128	3,817	4,094	4,198	4,279	4,322	4,347
Tom Green	110,224	123,052	137,486	145,685	154,230	163,215	172,642
Upton	3,355	3,690	3,990	4,128	4,272	4,360	4,421
Ward	10,658	11,454	12,144	12,634	13,029	13,329	13,557
Winkler	7,110	8,033	8,817	9,459	10,147	10,702	11,181
Total	*623,354*	*715,773*	*797,589*	*858,726*	*918,597*	*977,543*	*1,039,502*

Figure 2-1
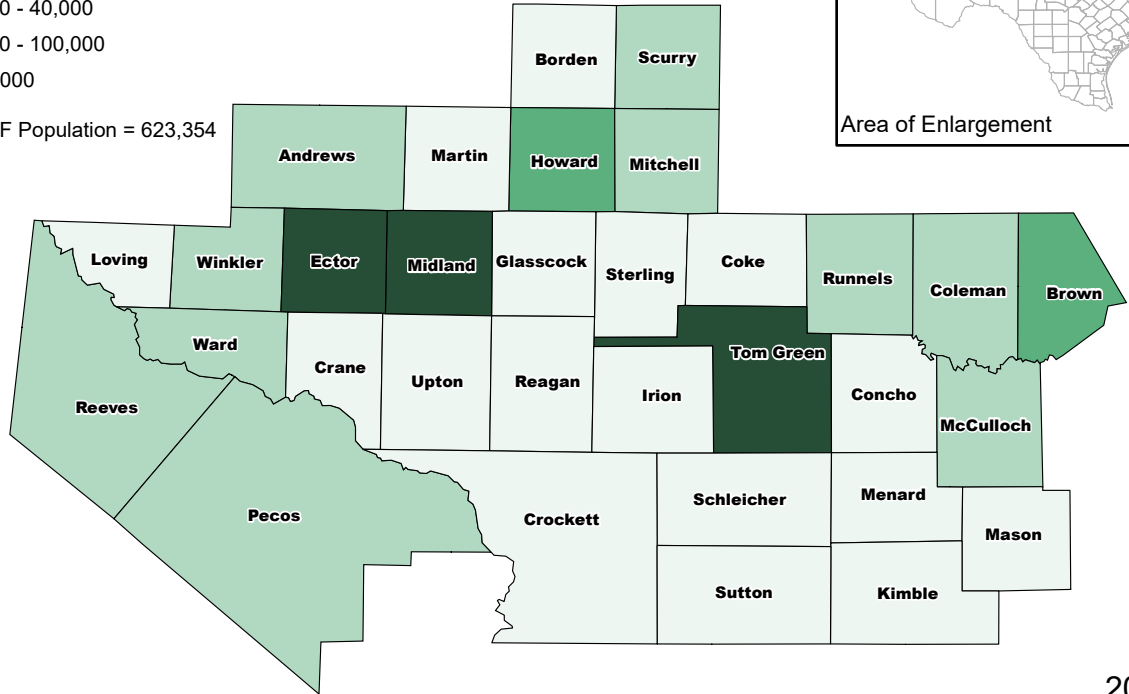**Historical and Projected Population of Region F**

Historical data provided by the Texas Water Development Board.[3] Some historical data are not available. Projected population was approved by TWDB for this round of regional water planning and adopted for this plan.
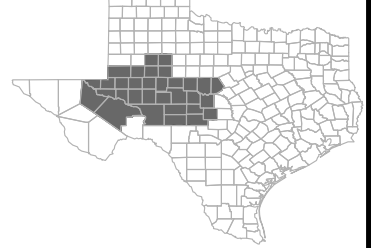
Legend

Population (2010)

- ☐ 0 - 5,000
- ☐ 5,000 - 25,000
- ☐ 25,000 - 40,000
- ☐ 40,000 - 100,000
- ☐ >100,000

Total Region F Population = 623,354

Area of Enlargement

Borden

Scurry

Andrews

Martin

Howard

Mitchell

Loving

Winkler

Ector

Midland

Glasscock

Sterling

Coke

Runnels

Coleman

Brown

Ward

Crane

Upton

Reagan

Irion

Tom Green

Concho

McCulloch

Reeves

Pecos

Crockett

Schleicher

Menard

Mason

Sutton

Kimble

2010

Legend

Projected Population (2070)

- ☐ 0 - 5,000
- ☐ 5,000 - 25,000
- ☐ 25,000 - 40,000
- ☐ 40,000 - 100,000
- ☐ >100,000
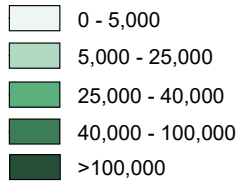
Total Region F Population = 1,039,502

Borden

Scurry

Andrews

Martin

Howard

Mitchell

Loving

Winkler

Ector

Midland

Glasscock

Sterling

Coke

Runnels

Coleman

Brown

Ward

Crane

Upton

Reagan

Irion

Tom Green

Concho

McCulloch

Reeves

Pecos

Crockett

Schleicher

Menard

Mason

Sutton

Kimble
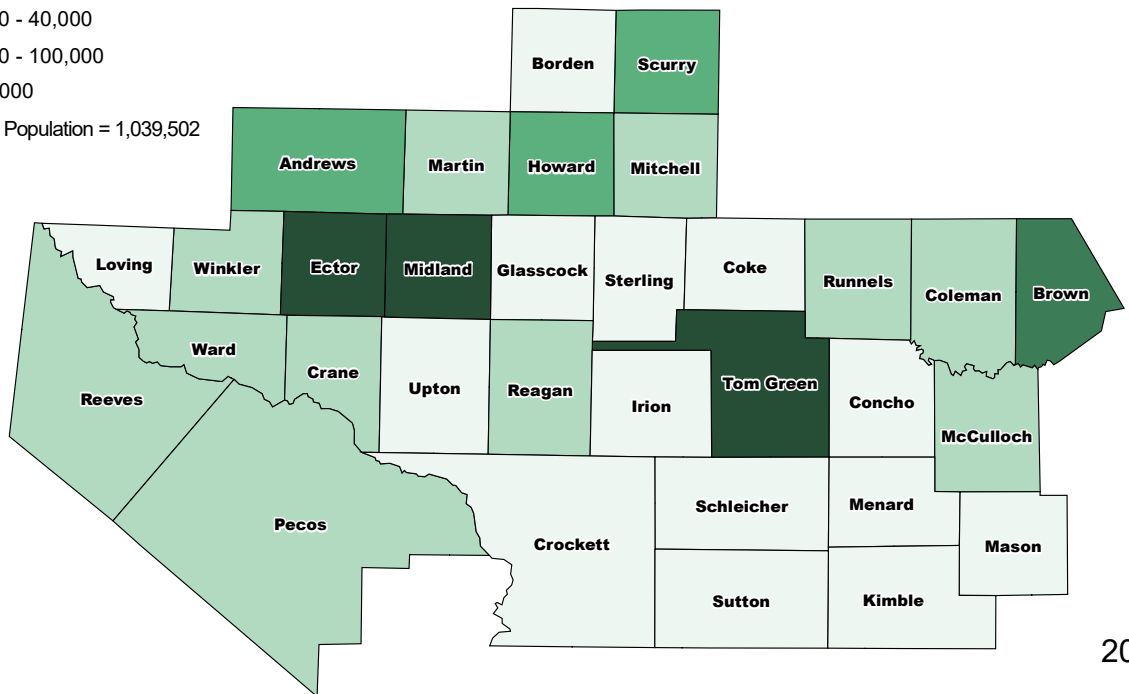
2070

Region F

Population Distribution by County
2010-2070

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SCALE	1:3,500,000
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2-2

FIGURE

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The population projections for each county are derived from the 2010 U.S. Census. The projections use a standard methodology known as the cohort-component method. This method is based upon historical birth and survival rates of the region's population. More information on the methodology used for the population projections may be found in the TWDB publication Projection Methodology – Draft Population and Municipal Water Demands.[4]

TWDB projects the region's total population to increase from 715,773 in 2020 to 1,039,502 in 2070, an average growth rate of 0.90 percent per year. TWDB projects the total population for Texas to increase from 29,683,671 in 2020 to 51,458,748 in 2070, an average growth rate of 1.47 percent per year.

The relative distribution of population in Region F is expected to remain stable throughout the 50-year planning period. Almost 80 percent of the people in Region F live in urban areas or small- to moderate-sized rural communities. Three counties, Midland, Ector and Tom Green,

account for more than half of the region's population. These counties contain the cities of Midland, Odessa and San Angelo, respectively. Each of these cities had a year 2010 population between 93,000 and 112,000, and a 2016 population estimate between 100,000 and 134,000. Some of the more rural communities are poised for growth should the oil and gas activities continue and expand into the adjoining shales in the Permian Basin.

Twenty-nine of the thirty-two counties that comprise Region F are generally rural. Twenty-one counties have populations of less than 10,000. Two of these counties, Loving and Borden, have populations of less than 1,000. These twenty-nine counties are expected to remain primarily rural throughout the planning period. The Permian Basin portions of Region F are experiencing or are expected to experience a population increase due to renewed interest in the exploration and production of oil, especially in Midland and Ector counties. This population growth is expected to continue as the oil play develops over the planning horizon.

2.2   Historical and Projected Water Demands

Municipal water use is the only category subdivided into individual water utilities. All other categories are aggregated into county/basin units.

Each category has annual water demand projections for the years 2020, 2030, 2040, 2050, 2060, and 2070. These projections are not the same as the average day and peak-day projections used in planning for municipal water supply distribution systems.

The average day projection is the amount of water expected to be delivered during a normal day. A peak-day projection is the maximum amount of water expected to be delivered during the highest demand day, typically expressed in million gallons per day (MGD). The TWDB water demand projections are the

TWDB Uses Six Water Use Categories

- **Municipal** – residential and commercial uses, including landscape irrigation,
- **Manufacturing** – various types of heavy industrial use,
- **Irrigation -** irrigated commercial agriculture,
- **Steam Electric Power Generation** – water consumed in the production of electricity,
- **Livestock Watering** – water used in commercial livestock production, and
- **Mining** – water used in the commercial production of various minerals, as well as water used in the production of oil and gas.

volumes of water expected to be used during a dry year and are usually expressed in acre-feet per year (one acre-foot equals 325,851 gallons). These projections would be comparable to a year's worth of average day deliveries.

The water demand projections for the 2021 Region F Plan were developed in conjunction with the TWDB and regional stakeholders. The Region F RWPG solicited input from retail water providers, including cities, water supply corporations, special utility districts, and other providers identified as a WUG. Region F representatives for non-municipal water use were also contacted for input on non-municipal demands. The projections were then compared to historical data and other projections and evaluated for anomalies such as recent water use exceeding future predictions, changes in trends in per capita water use, etc. The final recommended demands were approved by the region and the TWDB for the 2021 Region F Water Plan.

Figure 2-3 and Figure 2-4 present the TWDB-approved total water demand projections for the region by water-use type through 2070. Table 2-2 and Figure 2-5 summarize the water demand projections in the region by use category.

Figure 2-3
2020 Water Demand in Region F by Use
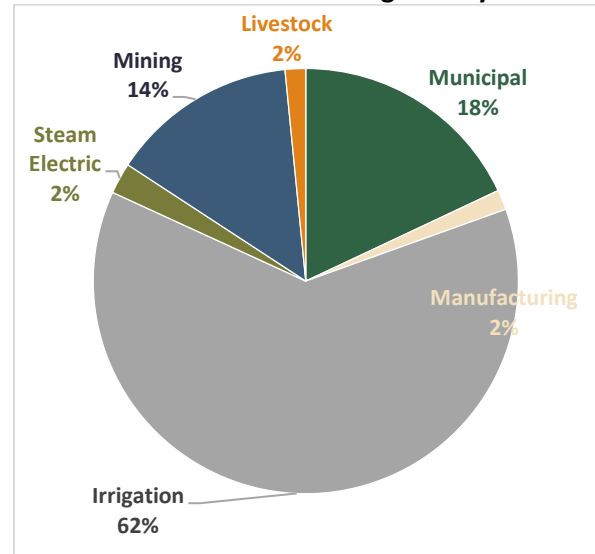
Figure 2-4
2070 Water Demand in Region F by Use
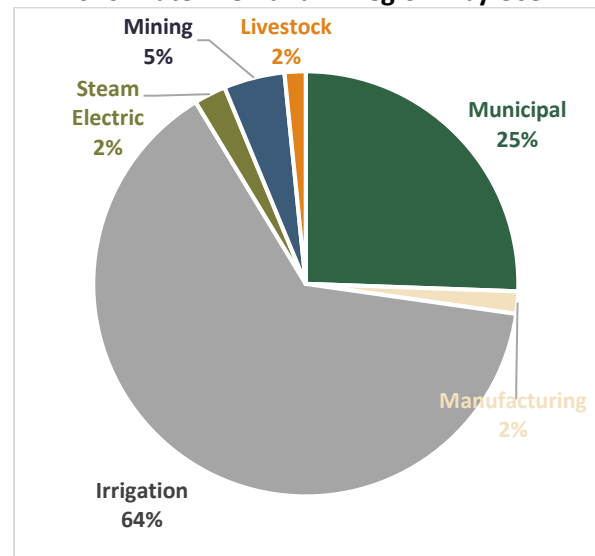
Water Demand by Use Category in Region F

Irrigated agriculture is by far the largest water use category in Region F throughout the planning horizon.
Municipal water use is the second largest water use category and it is projected to grow over time.
Mining is a significant water use in the early decades but is expected to decline over time as oil and gas deposits are fully developed.
Manufacturing, livestock, and steam electric power are all relatively small use categories in Region F over the planning horizon.

Table 2-2
Water Demand Projections for Region F by Use Category
-Values in Acre-Feet per Year-

Use Category	Historical	Projected					
	2010	2020	2030	2040	2050	2060	2070
Municipal	115,407	137,727	150,060	158,957	168,702	179,098	190,290
Manufacturing	9,753	11,591	12,607	12,607	12,607	12,607	12,607
Irrigation	458,658	476,941	476,941	476,941	476,941	476,941	476,941
Steam Electric	6,068	18,092	18,092	18,092	18,092	18,092	18,092
Mining	22,354	108,841	109,847	90,970	66,812	46,251	34,478
Livestock	13,905	11,958	11,958	11,958	11,958	11,958	11,958
Total	*626,145*	*765,150*	*779,505*	*769,525*	*755,112*	*744,947*	*744,366*

Source: Data are from the TWDB[5].

Figure 2-5
Projected Water Demand in Region F by Use Category

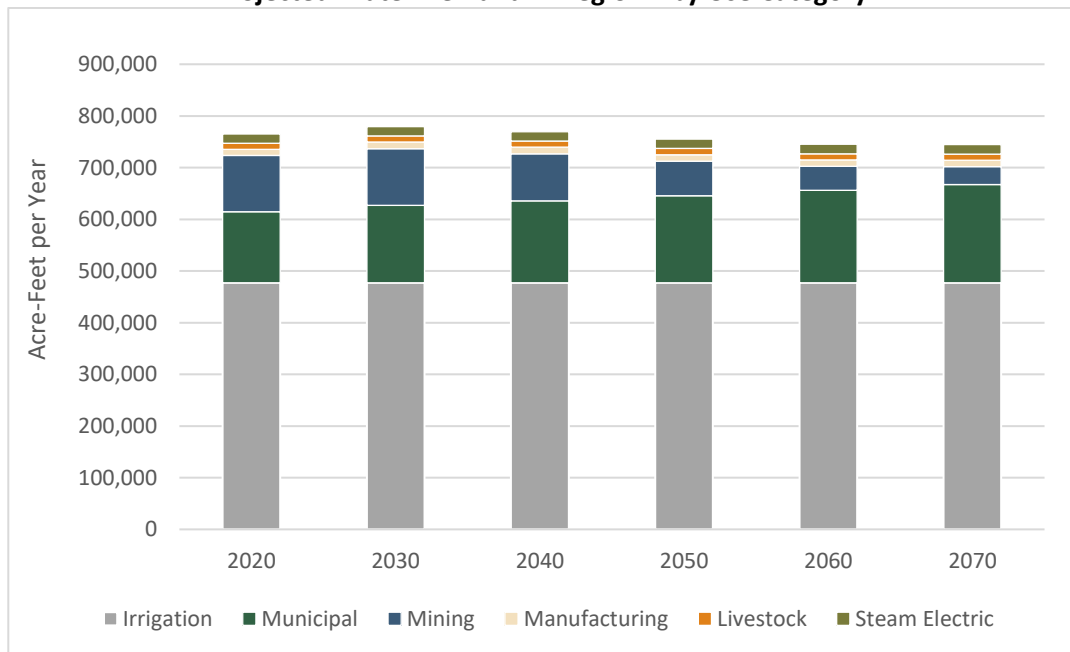Table 2-3 summarizes the historical year 2010 use and the projected water use by county. Figure 2-6 shows the geographical distribution of the year 2010 historical water use and year 2070 total water demand projections by county. A discussion of the demand projections by each use type is presented in Sections 2.3.1 through 2.3.6.

Table 2-3
Total Historical and Projected Water Demand by County
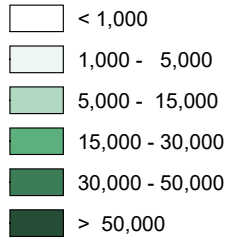-Values in Acre-Feet per Year-

County	Historical	Projected					
	2010	2020	2030	2040	2050	2060	2070
Andrews	28,083	29,833	30,505	30,772	31,059	31,608	32,472
Borden	2,180	3,981	4,229	4,083	3,793	3,543	3,420
Brown	17,423	16,790	16,878	16,753	16,683	16,665	16,661
Coke	2,028	2,169	2,148	2,083	2,024	1,975	1,933
Coleman	2,769	2,650	2,633	2,588	2,568	2,556	2,548
Concho	8,224	6,178	6,173	6,112	6,053	6,004	5,963
Crane	1,547	2,575	2,926	3,040	2,967	2,890	2,838
Crockett	2,315	6,736	6,838	5,450	4,066	2,871	2,574
Ector	28,743	39,201	43,140	46,313	49,433	52,781	56,583
Glasscock	58,316	57,487	57,499	56,094	54,794	53,693	53,093
Howard	15,934	22,067	22,237	21,247	20,193	19,379	19,079
Irion	2,268	6,096	6,092	4,786	3,483	2,483	1,983
Kimble	4,812	4,481	4,570	4,552	4,544	4,542	4,542
Loving	258	7,542	7,542	6,641	5,441	4,341	3,441
Martin	37,706	44,682	44,742	42,982	41,125	39,564	38,694
Mason	5,864	7,634	7,535	7,288	7,140	7,030	6,942
McCulloch	13,203	14,330	13,876	12,146	11,141	10,353	9,721
Menard	3,048	5,485	5,459	5,331	5,204	5,093	4,998
Midland	42,420	62,184	66,621	67,009	67,389	68,341	70,719
Mitchell	14,832	26,225	26,502	26,407	26,284	26,186	26,122
Pecos	132,030	158,139	158,559	159,011	157,851	156,781	155,982
Reagan	21,002	33,614	33,685	30,827	27,573	24,905	23,829
Reeves	63,896	76,288	76,518	76,225	74,174	72,188	70,677
Runnels	5,657	5,493	5,487	5,415	5,376	5,345	5,322
Schleicher	2,587	3,730	3,866	3,704	3,541	3,396	3,307
Scurry	9,365	11,244	11,709	11,895	12,011	12,150	12,340
Sterling	1,337	2,221	2,399	2,258	1,967	1,715	1,585
Sutton	2,728	3,199	3,538	3,599	3,427	3,255	3,137
Tom Green	67,915	66,035	67,983	68,945	70,090	71,501	73,026
Upton	12,014	19,091	19,189	17,722	15,864	14,390	13,708
Ward	10,747	10,954	11,091	10,983	10,687	10,368	10,131
Winkler	4,894	6,816	7,336	7,264	7,167	7,055	6,996
Total	626,145	765,150	779,505	769,525	755,112	744,947	744,366

Source: Data are from the TWDB.[5]

2-6

Area of Enlargement

Legend

Historical Demand (2010)
Ac-Ft

- < 1,000
- 1,000 - 5,000
- 5,000 - 15,000
- 15,000 - 30,000
- 30,000 - 50,000
- > 50,000

Total Region F Demand = 626,145

Borden Scurry

Andrews Martin Howard Mitchell

Loving Winkler Ector Midland Glasscock Sterling Coke Runnels Coleman Brown

Ward Crane Upton Reagan Irion Tom Green Concho McCulloch

Reeves

Pecos Crockett Schleicher Menard Mason

Sutton Kimble
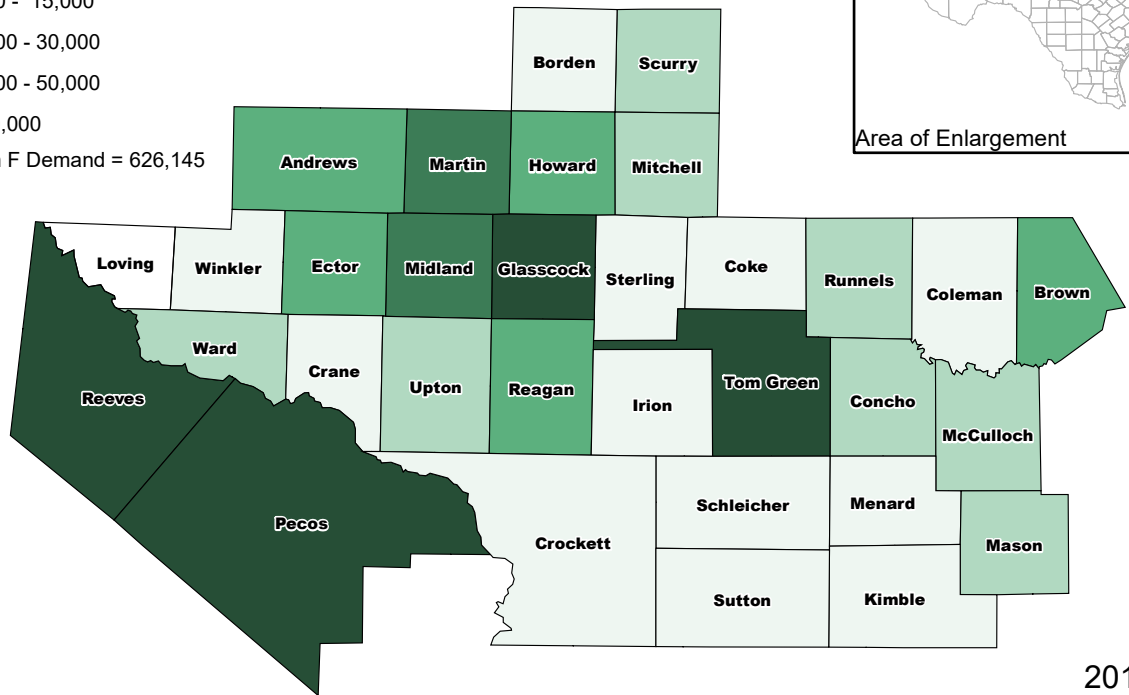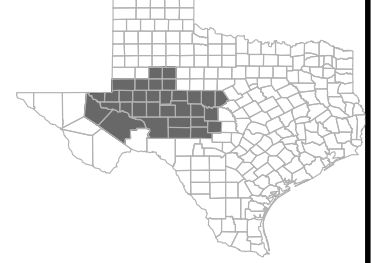
2010

Legend

Estimated Demand (2070)
Ac-Ft

- < 1,000
- 1,000 - 5,000
- 5,000 - 15,000
- 15,000 - 30,000
- 30,000 - 50,000
- > 50,000
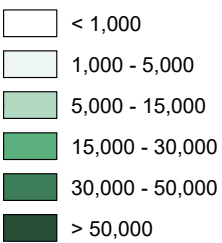
Total Region F Demand = 1,488,732

Borden Scurry

Andrews Martin Howard Mitchell

Loving Winkler Ector Midland Glasscock Sterling Coke Runnels Coleman Brown

Ward Crane Upton Reagan Irion Tom Green Concho McCulloch

Reeves

Pecos Crockett Schleicher Menard Mason

Sutton Kimble

N
W   E
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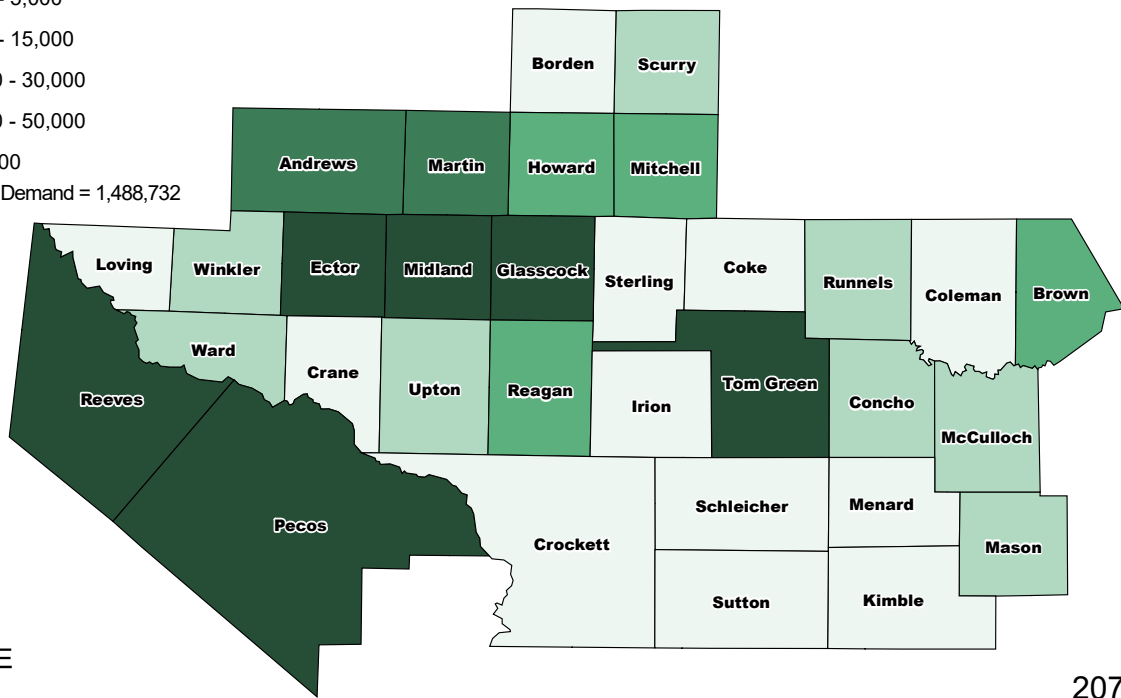
2070

Region F

Water Demand Distribution by County 2010-2070

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2-6

FIGURE

2.2.1 Municipal Water Demand Projections

Municipal water demand consists of both residential and commercial use, including water used for landscape irrigation. Residential use includes water used in single and multi-family households. Commercial use includes business establishments, public spaces and institutions, but does not include most industrial water use. Industrial water demand projections are included in the manufacturing category.

Municipal projections were developed for each retail water provider that provided an average of 100 acre-feet per year or more of municipal water supplies. TWDB aggregates rural populations that use less than 100 acre-feet per year into the County Other classification. The municipal projections are the only projections developed for individual water providers such as cities and other retail water providers. TWDB aggregates all other demand categories by county and river basin.

TWDB used a four-step process to calculate municipal water demands. First, population projections were developed for each municipal WUG. (Population projections are discussed in Section 2.2). Second, per capita water use projections were developed based on historical water use. Third, estimates of water savings associated with implementation of plumbing fixtures were calculated and per capita use was adjusted. Finally, the adjusted per capita water demand projections were multiplied by the population projections to determine the annual municipal water demand for each WUG.

Per Capita Water Use Projections

Future water use is calculated by multiplying the population of a region, county or city by a calculated per capita water use. Per capita water use, expressed in gallons per capita per day (gpcd), is the average daily municipal water use divided by the population of the area. It includes the amount of water used by each person in their daily activities, water used for commercial purposes, and landscape watering. This definition of per capita water use does not include water used for manufacturing or other non-municipal purposes (if it can be distinguished from other uses), or water sold to another entity. (This definition of per capita use is not the same as the definition adopted by the Water Conservation Implementation Task Force. The Task Force definition does not differentiate between municipal use and non-municipal use or outside sales.[6])

2011 was the worst single year drought for the State of Texas. The TWDB based the per capita water demand projections on year 2011 annual municipal water use divided by the 2011 population. For the 2021 Plan, the per capita use was adjusted to reflect service area use and population in 2011, resulting in some minor changes from the 2016 Plan, which also used 2011 per capita as its base gpcd. In some cases, the per capita water use was adjusted if the year 2011 water use was not indicative of historical water use by a WUG. In Region F, some WUGs were under water use restrictions in 2011 and their per capita water use was adjusted based on use in other years. For some WUGs in Region F, the drought of 2011 caused water conservation-oriented behavior changes, resulting in a trend towards lower per capita

$$\textit{Municipal Water Demand}$$

$$= \textit{projected population} \times (\textit{historical gpcd} - \textit{estimated water savings})$$

usage. This trend is even greater than the expected plumbing code savings already incorporated into these plans. This is partially caused by the implementation of increasing rate structures by some providers to encourage water conservation. Thus, in some cases, the base per capita usage was lowered to reflect these changes.

The TWDB assumes that per capita water use will show a downward trend over the planning period as a result of the State Water-Efficiency Plumbing Act[7]. Among other things, the Plumbing Act requires that only water-saving plumbing fixtures may be sold in Texas. The TWDB determined the per capita water demand savings based upon the expected rate of replacement of old plumbing fixtures with water-conserving models and the number of new housing units expected in the region. The actual amount of estimated savings can vary somewhat depending upon the age of housing units in a WUG's service area.

Table 2-4 shows the average per capita water use for each decade in Region F and compares

these values to average values for the state. Average per capita water use for Region F is expected to decline from 172 gpcd in 2020 to 163 gpcd in 2070, a reduction of seven percent. This compares to the statewide average of 157 gpcd in 2020 declining to 148 gpcd by 2070.

Demand

The TWDB calculated the municipal water demand projections by multiplying the population projections by the per capita water use projections. As shown in Table 2-5, the total municipal water demand for Region F is expected to increase from 137,727 acre-feet per year in 2020 to 190,290 acre-feet per year in 2070, an increase of 38 percent over the planning period. This compares to an expected 63 percent increase in municipal demand statewide.

The total estimated water savings associated with the implementation of the State Water-Efficiency Plumbing Act by county is presented in Table 2-6. Water-saving plumbing fixtures are expected to save over 20,300 acre-feet per year by 2070.

Table 2-4
Comparison of Per Capita Water Use and Municipal Conservation Trends

Region F	2020	2030	2040	2050	2060	2070
Per Capita Use (gpcd)	172	168	165	164	164	163
Statewide	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Per Capita Use (gpcd)	157	153	151	150	149	148

Source: Data are from TWDB.[5]

Municipal Water Demand Projections

Over the planning horizon, per capita water demands are expected to decline due to municipal conservation. However, increased permanent population growth causes an overall increase in water demand through 2070.

Table 2-5
Municipal Water Demand Projections for Region F Counties
-Values in Acre-Feet per Year-

County	Historical	Projected					
	2010	2020	2030	2040	2050	2060	2070
Andrews	3,105	4,719	5,603	6,403	7,358	8,487	9,797
Borden	108	178	178	175	175	175	175
Brown	5,991	6,055	6,035	5,907	5,836	5,822	5,822
Coke	635	686	671	658	653	652	652
Coleman	1,465	1,370	1,354	1,319	1,310	1,307	1,307
Concho	487	414	415	406	402	400	400
Crane	1,138	1,431	1,546	1,639	1,735	1,819	1,891
Crockett	1,419	1,560	1,661	1,673	1,689	1,694	1,697
Ector	24,669	29,280	32,803	36,214	39,686	43,336	47,334
Glasscock	144	161	165	160	160	159	159
Howard	4,992	7,405	7,552	7,562	7,508	7,494	7,494
Irion	194	205	200	194	191	191	191
Kimble	845	880	868	850	842	840	840
Loving	4	10	10	9	9	9	9
Martin	676	872	932	972	1,015	1,054	1,084
Mason	814	931	914	900	892	890	890
McCulloch	1,619	1,905	1,945	1,921	1,930	1,933	1,936
Menard	390	442	431	422	420	419	419
Midland	25,446	32,253	36,494	39,282	42,362	45,514	48,892
Mitchell	1,462	2,139	2,270	2,281	2,297	2,317	2,338
Pecos	4,771	5,994	6,394	6,846	7,186	7,516	7,817
Reagan	603	800	871	913	959	991	1,015
Reeves	3,731	4,097	4,308	4,515	4,664	4,778	4,867
Runnels	1,618	1,401	1,397	1,354	1,345	1,340	1,340
Schleicher	617	909	934	942	949	955	959
Scurry	2,576	2,788	3,047	3,206	3,442	3,698	3,967
Sterling	226	308	313	313	312	312	312
Sutton	929	1,186	1,251	1,269	1,287	1,299	1,306
Tom Green	19,095	20,511	22,323	23,246	24,398	25,787	27,290
Upton	932	1,178	1,253	1,286	1,328	1,354	1,372
Ward	2,891	3,302	3,439	3,531	3,635	3,716	3,779
Winkler	1,815	2,357	2,483	2,589	2,727	2,840	2,939
Total	*115,407*	*137,727*	*150,060*	*158,957*	*168,702*	*179,098*	*190,290*

Source: Data are from the TWDB.[5]

Table 2-6
Expected Savings from Implementation of Plumbing Code for Region F Counties
-Values in Acre-Feet per Year-

County	2020	2030	2040	2050	2060	2070
Andrews	235	386	515	630	732	844
Borden	7	11	13	14	14	14
Brown	419	597	724	795	809	809
Coke	35	51	64	68	69	69
Coleman	99	147	182	191	194	194
Concho	27	38	46	51	52	52
Crane	58	93	121	139	149	157
Crockett	50	75	91	93	95	95
Ector	1,564	2,524	3,369	4,009	4,455	4,891
Glasscock	16	24	29	29	30	30
Howard	396	588	717	772	785	786
Irion	18	26	32	35	35	35
Kimble	49	70	88	96	98	98
Loving	1	1	2	2	2	2
Martin	63	99	127	145	152	157
Mason	39	56	70	78	80	80
McCulloch	89	134	165	177	181	181
Menard	23	34	43	45	46	46
Midland	1,845	2,939	3,850	4,533	4,962	5,360
Mitchell	120	182	222	234	240	243
Pecos	198	307	401	461	491	513
Reagan	46	74	90	97	102	105
Reeves	167	258	295	313	327	334
Runnels	119	181	224	233	236	237
Schleicher	39	59	74	82	84	85
Scurry	239	381	489	554	606	653
Sterling	14	21	25	26	26	26
Sutton	43	66	81	88	90	91
Tom Green	1,361	2,168	2,715	3,105	3,341	3,548
Upton	43	68	82	87	90	91
Ward	131	202	257	270	281	286
Winkler	91	141	179	194	206	214
Total	*7,646*	*12,002*	*15,383*	*17,644*	*19,059*	*20,323*

Source: Data are from the TWDB.[5]

2.2.2 Manufacturing Demand Projections

Manufacturing use is the water used by industries in producing various products. In Region F, much of the manufacturing water use is associated with the generation of products from sand and gravel operations and the energy industry. The 2020 manufacturing water demand for each county is based on the highest aggregated manufacturing water use in the county in the most recent five years of data from the annual water use survey. The most recent ten-year projections of employment growth from the Texas Workforce Commission were used to calculate the 2030 projection. The manufacturing demand was held constant for the remaining decades of the planning horizon. Adjustments were made to the manufacturing demands in Ector, McCulloch, Pecos, and Tom Green counties due to closures and openings of facilities. Altogether, these adjustments

lowered the overall manufacturing demand in the region by roughly 400 acre-feet per year over the planning period.

Manufacturing water demand accounts for only two percent of the region's total water use and is concentrated in a few counties. Total manufacturing water use is expected to increase from 11,591 acre-feet in 2020 to 12,607 acre-feet by 2070, an increase of nine percent (see Table 2-7). Ector, Howard, Midland, and Tom Green Counties are expected to have the largest manufacturing demands for the region with a combined total use of over 8,000 acre-feet per year by 2070. While manufacturing is expected to remain a relatively small amount of the region's total demands, the statewide manufacturing demand volume is expected to increase by 14 percent over the same period (maintaining eight percent of overall statewide water demand over the planning period).

Table 2-7
Manufacturing Water Demand Projections for Region F Counties
-Values in Acre-Feet per Year-

County	Historical	Projected					
	2010	2020	2030	2040	2050	2060	2070
Andrews	580	580	617	617	617	617	617
Borden	0	0	0	0	0	0	0
Brown	351	548	651	651	651	651	651
Coke	0	0	0	0	0	0	0
Coleman	1	2	2	2	2	2	2
Concho	0	0	0	0	0	0	0
Crane	131	455	468	468	468	468	468
Crockett	10	14	15	15	15	15	15
Ector	1,930	2,152	2,381	2,381	2,381	2,381	2,381
Glasscock	3	25	33	33	33	33	33
Howard	3,171	3,723	3,746	3,746	3,746	3,746	3,746
Irion	1	6	7	7	7	7	7
Kimble	518	605	706	706	706	706	706
Loving	0	0	0	0	0	0	0
Martin	0	0	0	0	0	0	0
Mason	0	0	0	0	0	0	0
McCulloch	1	523	609	609	609	609	609

County	Historical	Projected					
	2010	2020	2030	2040	2050	2060	2070
Menard	0	0	0	0	0	0	0
Midland	156	981	1,177	1,177	1,177	1,177	1,177
Mitchell	0	4	5	5	5	5	5
Pecos	247	413	433	433	433	433	433
Reagan	0	0	0	0	0	0	0
Reeves	286	286	305	305	305	305	305
Runnels	7	10	11	11	11	11	11
Schleicher	0	0	0	0	0	0	0
Scurry	156	156	186	186	186	186	186
Sterling	0	0	0	0	0	0	0
Sutton	0	3	3	3	3	3	3
Tom Green	2,029	850	962	962	962	962	962
Upton	126	184	207	207	207	207	207
Ward	7	7	7	7	7	7	7
Winkler	42	64	76	76	76	76	76
Total	*9,753*	*11,591*	*12,607*	*12607*	*12,607*	*12,607*	*12,607*

Source: Data are from the TWDB.[5]

2.2.3 Irrigation Demand Projections

Irrigation use for agriculture is the largest user of water in Region F. Irrigation use can vary substantially from year to year depending on the number of irrigated acres, weather, crop prices, government programs, and other factors.

The irrigation projections proposed for Region F by the TWDB for 2020 were based on a five-year average (2010-2015) of the historical TWDB annual irrigation water use estimates. The estimates were developed by multiplying the number of reported irrigated acres by the water need for each crop type. The baseline dry-year irrigation demand, as determined by the five-year average volume, is held constant over the planning period. Table 2-8 summarizes the irrigation demands for the region for each decade and compares these to statewide totals.

Table 2-9 shows the irrigation water demands by county in Region F. Figure 2-7 compares historical irrigation water use data to the Region F irrigation projections.

Agricultural use accounted for 73 percent of Region F's total water use in 2010. In 2070, irrigation is expected to still be a major water use and could be as much as 64 percent of the region's total water demand. Statewide irrigation demand is projected to be 53 percent of total demand in the year 2020 and 40 percent of statewide demand in 2070. The counties with the largest irrigation water use are Andrews, Glasscock, Martin, Midland, Pecos, Reagan, Reeves, and Tom Green. These counties are expected to account for 82 percent of the region's irrigation demand in 2070. Pecos County alone is expected to have 30 percent of the regional irrigation demand.

Table 2-8
Comparison of Region F Irrigation Demand Projections to Statewide Projections

Region F	2020	2030	2040	2050	2060	2070
Irrigation (ac-ft)	476,941	476,941	476,941	476,941	476,941	476,941
Statewide	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Irrigation (ac-ft)	9,448,246	9,382,611	8,703,497	8,153,688	7,737,353	7,594,132
Decline from Year 2020	0	65,635	744,749	1,294,558	1,710,893	1,854,114
% Decline	0%	1%	8%	14%	18%	20%

Source: Data are from the TWDB.[5]

Figure 2-7
Comparison of Historical Water Use to Projected Irrigation Water Demand for Region F
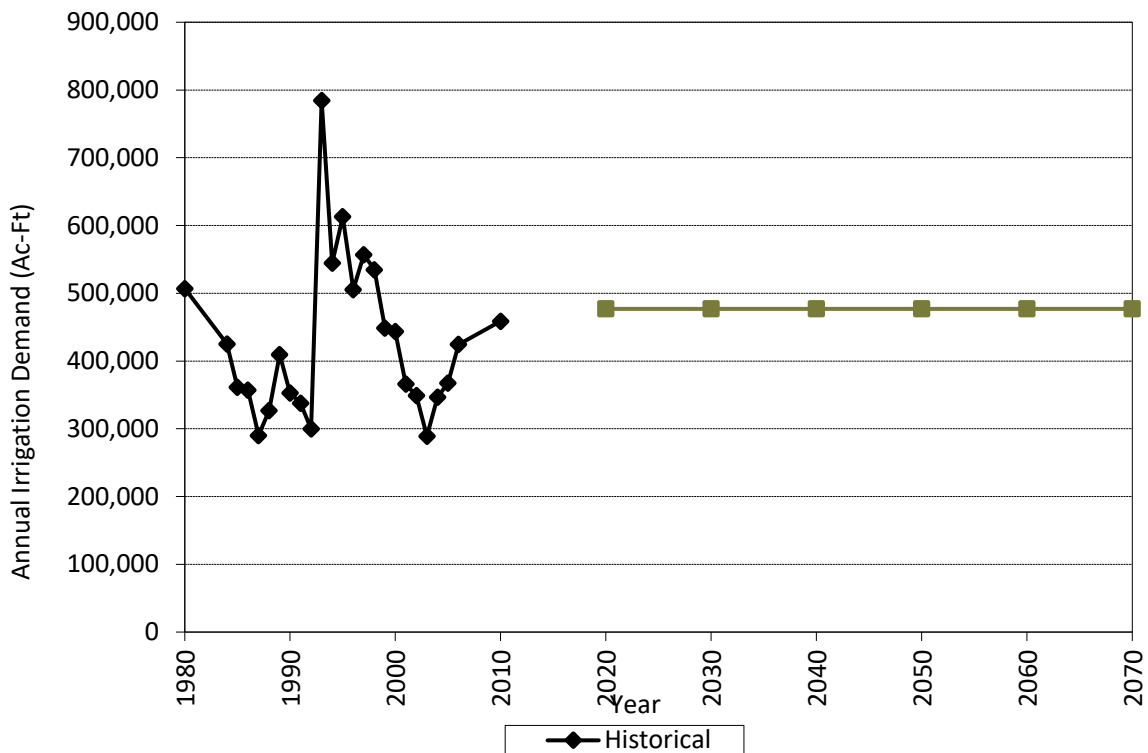
Irrigation Water Demand

Irrigation is the largest category of water use in Region F, accounting for over 475,000 acre-feet per year of water demand, which represents over 60 percent of the water demand for the REgion. It accounts for over 475,000 acre-feet of water demand. Most of this demand is centered in Andrews, Glasscock, Martin, Midland, Pecos, Reagan, Reeves, and Tom Green counties.

Table 2-9
Irrigation Water Demand Projections for Region F Counties
-Values in Acre-Feet per Year-

	Historical	Projected					
County	2010	2020	2030	2040	2050	2060	2070
Andrews	23,354	20,365	20,365	20,365	20,365	20,365	20,365
Borden	1,616	2,949	2,949	2,949	2,949	2,949	2,949
Brown	8,901	8,125	8,125	8,125	8,125	8,125	8,125
Coke	871	689	689	689	689	689	689
Coleman	470	465	465	465	465	465	465
Concho	7,167	4,902	4,902	4,902	4,902	4,902	4,902
Crane	0	0	0	0	0	0	0
Crockett	148	135	135	135	135	135	135
Ector	1,050	756	756	756	756	756	756
Glasscock	57,164	51,254	51,254	51,254	51,254	51,254	51,254
Howard	6,721	6,883	6,883	6,883	6,883	6,883	6,883
Irion	1,386	1,053	1,053	1,053	1,053	1,053	1,053
Kimble	2,975	2,657	2,657	2,657	2,657	2,657	2,657
Loving	0	0	0	0	0	0	0
Martin	36,160	36,491	36,491	36,491	36,491	36,491	36,491
Mason	3,922	4,966	4,966	4,966	4,966	4,966	4,966
McCulloch	2,558	2,324	2,324	2,324	2,324	2,324	2,324
Menard	2,074	3,663	3,663	3,663	3,663	3,663	3,663
Midland	14,969	18,107	18,107	18,107	18,107	18,107	18,107
Mitchell	9,443	12,787	12,787	12,787	12,787	12,787	12,787
Pecos	126,033	143,345	143,345	143,345	143,345	143,345	143,345
Reagan	19,385	22,031	22,031	22,031	22,031	22,031	22,031
Reeves	58,369	58,937	58,937	58,937	58,937	58,937	58,937
Runnels	3,053	3,105	3,105	3,105	3,105	3,105	3,105
Schleicher	1,442	1,811	1,811	1,811	1,811	1,811	1,811
Scurry	5,978	7,559	7,559	7,559	7,559	7,559	7,559
Sterling	688	899	899	899	899	899	899
Sutton	1,143	1,120	1,120	1,120	1,120	1,120	1,120
Tom Green	44,366	42,493	42,493	42,493	42,493	42,493	42,493
Upton	9,609	10,403	10,403	10,403	10,403	10,403	10,403
Ward	5,040	3,160	3,160	3,160	3,160	3,160	3,160
Winkler	2,603	3,507	3,507	3,507	3,507	3,507	3,507
Total	*458,658*	*476,941*	*476,941*	*476,941*	*476,941*	*476,941*	*476,941*

Source: Data are from the TWDB.[5]

2.1.1 Steam Electric Power Generation Demand Projections

The steam electric power water demand, as determined by the TWDB, uses the highest county water use in the most recent five years of data from the annual water use survey of steam electric power water users. Unlike previous plans, the water use data for the 2021 Plan includes water use from reuse and brackish or saline water sources. In addition to the historical highest county water use, anticipated water use for new facilities was added and use from retiring facilities was subtracted. Near-term plans for new and retiring plants were based on the Electric Reliability Council of Texas (ERCOT) Capacity, Demand, and Reserves Report (CDR). The demand is held constant over the planning horizon. Based on

the adopted projections, steam electric water demand in Region F is expected to increase to 18,092 acre-feet per year by 2020. Most of this increase is associated with a proposed new FGE Texas, LLC. facility in Mitchell County. Table 2-10 summarizes the projections for steam electric demands. Statewide, steam electric demand is expected to increase only marginally, from 929,116 acre-feet in 2020 to 932,907 acre-feet in 2070[4].

Table 2-10
Steam Electric Water Demand Projections for Region F Counties
-Values in Acre-Feet per Year-

County	Historical 2010	Projected 2020	2030	2040	2050	2060	2070
Andrews	0	0	0	0	0	0	0
Borden	0	0	0	0	0	0	0
Brown	0	0	0	0	0	0	0
Coke	0	0	0	0	0	0	0
Coleman	0	0	0	0	0	0	0
Concho	0	0	0	0	0	0	0
Crane	0	0	0	0	0	0	0
Crockett	0	0	0	0	0	0	0
Ector	0*	4,837	4,837	4,837	4,837	4,837	4,837
Glasscock	0	0	0	0	0	0	0
Howard	387	427	427	427	427	427	427
Irion	0	0	0	0	0	0	0
Kimble	0	0	0	0	0	0	0
Loving	0	0	0	0	0	0	0
Martin	0	0	0	0	0	0	0
Mason	0	0	0	0	0	0	0
McCulloch	0	0	0	0	0	0	0
Menard	0	0	0	0	0	0	0
Midland	0	0	0	0	0	0	0
Mitchell	3,179	10,326	10,326	10,326	10,326	10,326	10,326
Pecos	0	0	0	0	0	0	0
Reagan	0	0	0	0	0	0	0
Reeves	0	0	0	0	0	0	0
Runnels	0	0	0	0	0	0	0
Schleicher	0	0	0	0	0	0	0
Scurry	0	0	0	0	0	0	0
Sterling	0	0	0	0	0	0	0
Sutton	0	0	0	0	0	0	0
Tom Green	0	0	0	0	0	0	0
Upton	0	0	0	0	0	0	0
Ward	2,502	2,502	2,502	2,502	2,502	2,502	2,502
Winkler	0	0	0	0	0	0	0
Total	*6,068*	*18,092*	*18,092*	*18,092*	*18,092*	*18,092*	*18,092*

Source: Data are from the TWDB.[5]

*Historical water use for Ector County does not include the Odessa Ector Power Partners facility that has been in operation since 2001. This facility uses approximately 2 to 3 MGD.

2.1.2 Mining Demand Projections

The mining category includes water used in both the production of minerals and the production of oil and gas. (Water used in the processing of minerals or oil and gas into a finished product is considered under the manufacturing use category.) The TWDB mining water demand projections are based on a study conducted by the Bureau of Economic Geology (BEG) Report[8]. The original study was published in 2011 and was updated in 2012 to better account for the increased activities in the oil and gas sector of mining. The BEG reports used data collected from trade organizations, government agencies, and other industry representatives. Using this study, the TWDB predicts that water demand for oil and gas production will increase through 2020 and 2030 as the shale oil plays develop. The expected water demand will then decline after 2040 and continue to decrease through 2070.

Since the BEG report was updated in 2012, the oil and gas industry has continued to play an important role in the development of West Texas and still accounts for a large percentage of its total payroll. Region F lies in the heart of the Permian Basin, which is one of the largest oil and gas shale formations in the country. Over the past five years the region has seen increased mining activity as the price of crude

oil has increased, with activities focused predominately within the Delaware and Midland Basins. For select counties where oil and gas activity has greatly increased since the publication the BEG's report, Region F examined the historical water use trend over the past 5 years and extended the trend line to establish an estimated 2020 demand. For planning purposes, it was assumed that the projected demands for 2020 would be maintained through 2030 to 2040, and then decline from 2040 to 2070 at the same rate developed by the TWDB. Other mining activities, such as sand, gravel and stone production, represent a small portion of the region's economy and water demands.

The mining demands for Region F are projected to be 108,841 acre-feet in 2020 (nearly double the 2020 projection in the 2016 plan), and then decrease to 34,478 acre-feet in 2070. This water use represents about 14 percent of the total water demand in Region F in 2020, and only five percent in 2070. Statewide, mining use is expected to account for 2 percent of the state's water demands. Table 2-11 compares Region F's mining projections to statewide projections. A summary of the projected mining demands by county is presented in Table 2-12.

Table 2-11
Comparison of Region F Mining Projections to Statewide Totals

Region F	2020	2030	2040	250	2060	2070
Mining (ac-ft)	108,841	109,847	90,970	66,812	46,251	34,478
Change from Yr 2020	0	1,006	-17,871	-42,029	-62,590	-74,363
% Increase	0%	1%	-16%	-39%	-58%	-68%
Statewide [a]	2010	2020	2030	2040	2050	2060
Mining (ac-ft)	406,830	408,772	364,596	323,178	287,150	281,061
Change from Yr 2020	0	1,942	-42,234	-83,652	-119,680	-125,769
% Change	0%	0%	-10%	-21%	-29%	-31%

Source: Data are from the TWDB.[5]

Table 2-12
Mining Water Demand Projections for Region F Counties
-Values in Acre-Feet per Year-

County	Historical	Projected					
	2010	2020	2030	2040	2050	2060	2070
Andrews	821	3,959	3,710	3,177	2,509	1,929	1,483
Borden	239	679	927	784	494	244	121
Brown	942	943	948	951	952	948	944
Coke	146	488	482	430	376	328	286
Coleman	42	108	107	97	86	77	69
Concho	124	480	474	422	367	320	279
Crane	201	617	840	861	692	531	407
Crockett	146	4,500	4,500	3,100	1,700	500	200
Ector	845	1,977	2,164	1,926	1,574	1,272	1,076
Glasscock	832	5,900	5,900	4,500	3,200	2,100	1,500
Howard	415	3,400	3,400	2,400	1,400	600	300
Irion	412	4,600	4,600	3,300	2,000	1,000	500
Kimble	21	19	19	19	19	19	19
Loving	223	7,500	7,500	6,600	5,400	4,300	3,400
Martin	723	7,200	7,200	5,400	3,500	1,900	1,000
Mason	560	1,023	941	708	568	460	372
McCulloch	7,849	8,927	8,347	6,641	5,627	4,836	4,201
Menard	264	1,086	1,071	952	827	717	622
Midland	1,593	10,600	10,600	8,200	5,500	3,300	2,300
Mitchell	351	593	738	632	493	375	290
Pecos	239	7,700	7,700	7,700	6,200	4,800	3,700
Reagan	798	10,600	10,600	7,700	4,400	1,700	600
Reeves	1,207	12,600	12,600	12,100	9,900	7,800	6,200
Runnels	77	272	269	240	210	184	161
Schleicher	84	621	732	562	392	241	148
Scurry	107	280	456	483	363	246	167
Sterling	173	780	953	812	522	270	140
Sutton	169	446	720	763	573	389	264
Tom Green	984	1,056	1,080	1,119	1,112	1,134	1,156
Upton	1,242	7,200	7,200	5,700	3,800	2,300	1,600
Ward	205	1,900	1,900	1,700	1,300	900	600
Winkler	320	787	1,169	991	756	531	373
Total	*22,354*	*108,841*	*109,847*	*90,970*	*66,812*	*46,251*	*34,478*

Source: Data are from the TWDB.[5]

2.1.3 Livestock Watering

Livestock watering accounted for two percent of the water use in Region F in 2010 and is predicted to remain the same. The livestock projections are based on the water needs per head for each type of livestock and each type of livestock operation. The number of head in each county was estimated from information provided by the Texas Department of Agriculture and the National Agricultural Statistics Service. TWDB used the average of the 2010-2014 water use estimates as a base. Projections are only available for counties and are not available for specific livestock operations.

Livestock demand in Region F is expected to remain constant at 11,958 acre-feet per year throughout the planning period (see Table 2-13). Statewide livestock demand is expected to be 382,200 acre-feet per year in 2070, which represents two percent of total statewide demand.

Table 2-13
Livestock Water Demand Projections for Region F Counties
-Values in Acre-Feet per Year-

County	Historical	Projected					
	2010	2020	2030	2040	2050	2060	2070
Andrews	223	210	210	210	210	210	210
Borden	217	175	175	175	175	175	175
Brown	1,238	1,119	1,119	1,119	1,119	1,119	1,119
Coke	376	306	306	306	306	306	306
Coleman	791	705	705	705	705	705	705
Concho	446	382	382	382	382	382	382
Crane	77	72	72	72	72	72	72
Crockett	592	527	527	527	527	527	527
Ector	249	199	199	199	199	199	199
Glasscock	173	147	147	147	147	147	147
Howard	248	229	229	229	229	229	229
Irion	275	232	232	232	232	232	232
Kimble	453	320	320	320	320	320	320
Loving	31	32	32	32	32	32	32
Martin	147	119	119	119	119	119	119
Mason	568	714	714	714	714	714	714
McCulloch	1,176	651	651	651	651	651	651
Menard	320	294	294	294	294	294	294
Midland	256	243	243	243	243	243	243
Mitchell	397	376	376	376	376	376	376
Pecos	740	687	687	687	687	687	687
Reagan	216	183	183	183	183	183	183
Reeves	303	368	368	368	368	368	368
Runnels	902	705	705	705	705	705	705
Schleicher	444	389	389	389	389	389	389
Scurry	548	461	461	461	461	461	461
Sterling	250	234	234	234	234	234	234
Sutton	487	444	444	444	444	444	444
Tom Green	1,441	1,125	1,125	1,125	1,125	1,125	1,125
Upton	105	126	126	126	126	126	126
Ward	102	83	83	83	83	83	83
Winkler	114	101	101	101	101	101	101
Total	*13,905*	*11,958*	*11,958*	*11,958*	*11,958*	*11,958*	*11,958*

Source: Data are from the TWDB.[5]

2.3 Major Water Providers

As part of the development of the 2021 Regional Water Plan, demands were identified for major water providers (MWPs) in Region F. An MWP is defined by the TWDB as a water user group or a wholesale water provider of particular significance to the region's water supply, as determined by the RWPG . The major water providers in Region F are the Colorado River Municipal Water District (CRMWD), the Brown County Water Improvement District Number 1 (BCWID), and the cities of Odessa, Midland and San Angelo. The sections below contain descriptions of the identified demands and the associated volumes for each Region F MWP. Attachment 2A contains projected water

demands for each of these MWPs broken down by category of use for each decade.

2.3.1 Colorado River Municipal Water District

The Colorado Municipal Water District (CRMWD) provides wholesale raw water supplies to multiple member cities and customers. CRMWD's operations and contractual obligations are challenging to represent under the existing regional planning framework required by TWDB rule. For planning purposes, the demands on CRMWD are described as two separate systems: the Lake Ivie Non-System Demands and the CRMWD System demands.

The Lake Ivie Non-System Demands represent contractual demands from Midland, San Angelo, and Abilene for a percentage of the yield of Lake Ivie and an 1,100-acre-foot reservoir contract with Millersview-Doole WSC. These users can only be supplied by Lake Ivie and CRMWD would not provide them other water supplies if supply from Lake Ivie is inadequate. Table 2-14 shows the projected water demands CRMWD's Lake Ivie Non-System customers.

Region F Major Water Providers

- Colorado Municipal Water District
- Brown County Water Improvement District No. 1
- City of Odessa
- City of Midland
- City of San Angelo

Table 2-14
Expected Lake Non-System Demands for the Colorado River Municipal Water District
-Values in Acre-Feet per Year-

WUG Name	County(ies)	Basin	2020	2030	2040	2050	2060	2070
Abilene	Jones, Taylor	Brazos	5,020	4,850	4,679	4,509	4,338	4,168
San Angelo	Tom Green	Colorado	5,020	4,850	4,679	4,509	4,338	4,168
Midland	Midland	Colorado	5,020	4,850	4,679	4,509	4,338	4,168
Millersview-Doole WSC[a]	Concho, McCulloch, Runnels, Tom Green	Colorado	600	600	600	600	600	600
Ballinger	Runnels	Colorado	500	500	500	500	500	500
Ivie System Total	Jones, Taylor	Brazos	**16,160**	**15,650**	**15,137**	**14,627**	**14,114**	**13,604**

[a] Millersview-Doole WSC contract expires in October 2041.

CRMWD's System demands include both its member cities and others through various contracts. CRMWD operates its main system conjunctively using multiple groundwater, surface water, and reuse sources as needed. CRMWD provides all the water used by its member cities: Odessa, Big Spring and Snyder. The remaining municipal contract holders rely entirely on CRMWD for water. Manufacturing water is provided through municipal users. Table 2 15 shows the projected water demands for current CRMWD system customers. Potential future customers are discussed in Chapter 5D.

Table 2-15
Expected Main System Demands for the Colorado River Municipal Water District
-Values in Acre-Feet per Year-

WUG Name	County(ies)	Basin	2020	2030	2040	2050	2060	2070
Odessa	Ector	Colorado	24,523	27,724	30,382	33,254	36,278	39,632
Odessa	Midland	Colorado	481	605	709	817	924	1,037
Ector County UD	Ector	Colorado	2,385	2,645	2,935	3,240	3,556	3,880
Manufacturing	Ector	Colorado	1,902	1,952	1,952	1,952	1,952	1,952
Irrigation	Ector	Colorado	1,197	1,194	1,192	1,191	1,190	1,189
Irrigation	Midland	Colorado	23	26	28	29	30	31
Steam Electric Power	Ector	Colorado	1,121	1,121	1,121	1,121	1,121	1,121
Big Spring	Howard	Colorado	6,227	6,368	6,379	6,327	6,316	6,316
Coahoma	Howard	Colorado	526	534	537	537	536	536
Manufacturing	Howard	Colorado	1,500	1,500	1,500	1,500	1,500	1,500
Steam Electric Power	Howard	Colorado	209	209	209	209	209	209
Snyder	Scurry	Colorado	1,980	2,201	2,320	2,499	2,686	2,882
County-Other, Scurry	Scurry	Colorado	300	300	300	300	300	300
Rotan	Fisher	Brazos	178	170	165	164	163	163
Midland[a]	Midland	Colorado	18,798	0	0	0	0	0
Stanton[b]	Martin	Colorado	320	320	320	320	320	320
Irrigation	Ector	Colorado	400	400	400	400	400	400
County-Other, Ward	Ward	Rio Grande	100	--	--	--	--	--
Grandfalls	Ward	Rio Grande	135	141	145	149	--	--
CRMWD Total Demand			**62,305**	**47,410**	**50,594**	**54,009**	**57,481**	**61,468**
Additional Supply for Odessa (Losses)			3,930	3,930	3,930	3,930	3,930	3,930
Howard County Manufacturing (Sales from Big Spring)				500	500	500	500	500
Greater Gardendale WSC (Sales from Odessa)				375	445	445	445	445
Ector County - Other (ECUD Expanded Service Area, Sales from Odessa)				1,200	2,500	2,500	2,500	2,500
Scurry County-Other (Sales from Snyder)			373	414	447	491	547	607
CRMWD Potential Future Demand			**4,303**	**6,419**	**7,822**	**7,866**	**7,922**	**7,982**
CRMWD Total (Current and Potential Future)			**66,608**	**53,829**	**58,416**	**61,726**	**65,403**	**69,450**

a. Midland 1966 contract expires in December 2029 but will continue for 3 months into 2030.
b. Contract expires in 2019.

A secondary demand scenario for CRMWD's main system, shown in Table 2-16, was developed based on historical gpcd data reported by CRMWD for the years 2012 – 2016. The demand projections for certain entities were adjusted based on the historical gpcds, which are lower than the dry year demands used in the Region F Water Plan. The secondary demand scenario is included here for comparison. No secondary demand scenario was developed for the Lake Ivie Non-System since those demands are based on contracts.

Table 2-16
Secondary Demand Scenario for the Colorado River Municipal Water District a
-Values in Acre-Feet per Year-

WUG Name	County(ies)	Basin	2020	2030	2040	2050	2060	2070
Odessa and Customers[b]	Ector, Midland	Colorado	17,852	19,694	21,715	23,910	26,256	28,644
Big Spring and Customers[b]	Howard	Colorado	6,825	7,006	7,038	6,992	6,983	6,983
Snyder and Customers[b]	Scurry	Colorado	2,421	2,638	2,755	2,939	3,132	3,335
Midland[c]	Midland	Colorado	16,071	0	0	0	0	0
Stanton	Martin	Colorado	320	320	320	320	320	320
Irrigation	Ector	Colorado	400	400	400	400	400	400
County-Other, Ward	Ward	Rio Grande	100					
Grandfalls	Ward	Rio Grande	135	141	145	149		
CRMWD Total for Secondary Demand Scenario			*44,124*	*30,199*	*32,373*	*34,710*	*37,091*	*39,682*

a. Does not include potential new customers identified in the planning process or contract renewals.
b. Demand projections were updated based on historical gpcds for 2012 – 2016.
c. 2020 demand is based on the historical gpcds for 2012 – 2016; system contract expires in 2029 but extends 3 months into 2030.

Figure 2-8
CRMWD Main System Demand and Secondary Demand Scenarios
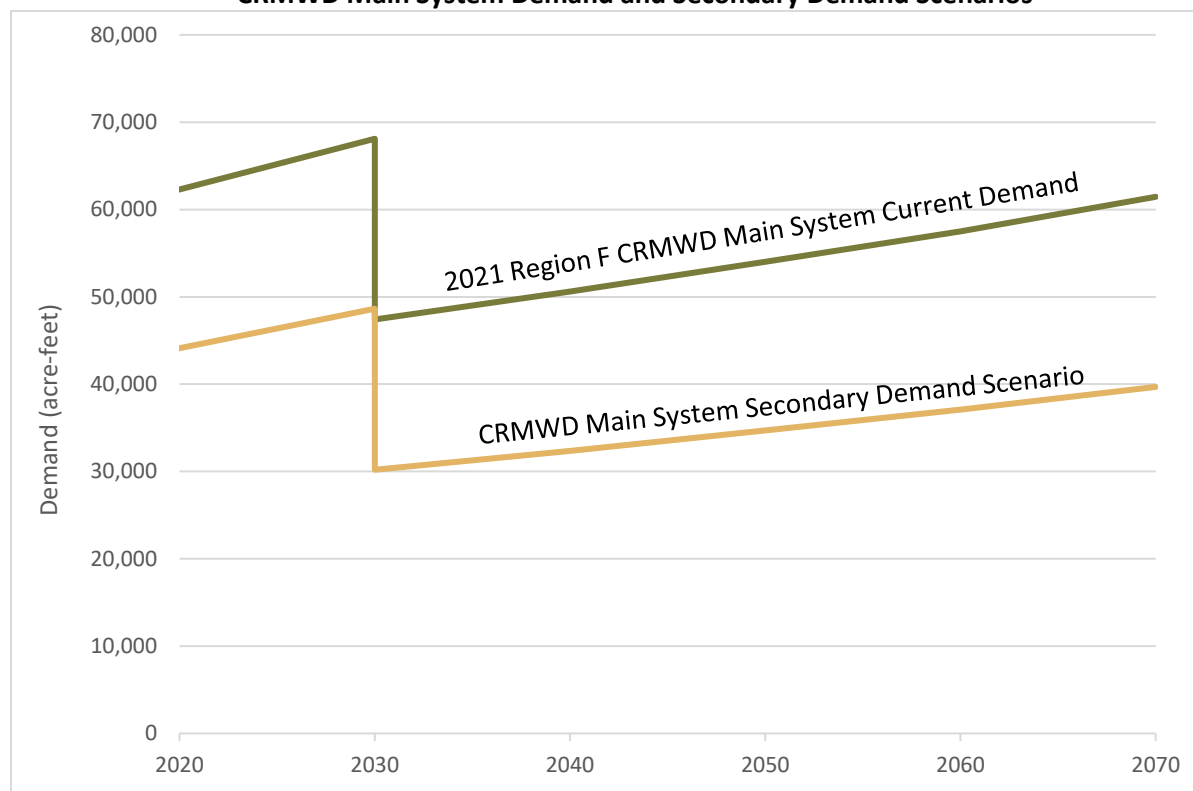
2.3.2 Brown County Water Improvement District No. 1

BCWID provides both raw and treated water for municipal, manufacturing, and irrigation purposes. Most BCWID customers are in Brown County. BCWID provides treated water to the Cities of Brownwood, Bangs, and Early and to Brookesmith SUD and Zephyr WSC. BCWID provides water to the City of Santa Anna in Coleman County, Coleman County SUD, and to users in Coleman and Mills Counties through Brookesmith SUD. Coleman County SUD has customers in Coleman, Brown, Runnels, Callahan and Taylor Counties. For the purposes of this plan, it is assumed that half of the demand for Coleman County SUD will be met by supplies from BCWID. BCWID also currently provides raw water to industries and irrigation. The demands in Table 2-17 are for current BCWID customers.

Table 2-17
Expected Demands for the Brown County Water Improvement District No. 1
-Values in Acre-Feet per Year-

WUG Name	County(ies)	Basin	2020	2030	2040	2050	2060	2070
Bangs	Brown	Colorado	310	305	296	291	290	290
Brookesmith SUD	Brown	Colorado	1,199	1,195	1,170	1,156	1,153	1,153
Brookesmith SUD	Coleman	Colorado	6	6	6	6	6	6
Brookesmith SUD	Mills	Colorado	7	7	7	7	8	8
Santa Anna	Coleman	Colorado	156	154	149	149	148	148
Coleman County SUD	Brown	Colorado	12	12	12	12	12	12
Coleman County SUD	Coleman	Colorado	182	179	174	171	170	170
Coleman County SUD	Runnels	Colorado	10	10	10	10	10	10
Coleman County SUD	Callahan	Colorado	15	16	16	16	16	16
Coleman County SUD	Taylor	Colorado	10	10	10	10	10	10
Brownwood	Brown	Colorado	3,717	3,713	3,640	3,600	3,593	3,593
County-Other, Brown	Brown	Colorado	129	129	129	129	129	129
Early	Brown	Colorado	292	287	277	271	270	270
Zephyr WSC	Brown	Colorado	343	339	330	325	324	324
Zephyr WSC	Mills	Colorado	3	3	3	3	3	3
Manufacturing	Brown	Colorado	548	651	651	651	651	651
Irrigation	Brown	Colorado	5,000	5,000	5,000	5,000	5,000	5,000
		BCWID Total	**11,939**	**12,016**	**11,880**	**11,807**	**11,793**	**11,793**

2.3.3 City of Odessa

Table 2-18 shows the expected demands for the City of Odessa. The City of Odessa is a CRMWD member city. Odessa sells treated water to the Ector County Utility District, Ector County-Other, and manufacturing and steam electric power in Ector County. A portion of the City's wastewater is sold to the Gulf Coast Water Authority (GCA) who treats the effluent and sells the supply to the mining industry. The remainder of the City of Odessa's effluent is treated by the City and sold to Pioneer Natural Resources (mining). The City also provides water for manufacturing in Ector County, which is supplied by raw water. Odessa also provides raw water to irrigation customers in Ector and Midland counties. Potential future customers are discussed in Chapter 5D.

Table 2-18
Expected Demands for the City of Odessa
-Values in Acre-Feet per Year-

WUG Name	County(ies)	Basin	2020	2030	2040	2050	2060	2070
Odessa	Ector	Colorado	24,523	27,724	30,382	33,254	36,278	39,632
Odessa	Midland	Colorado	481	605	709	817	924	1,037
Ector County UD	Ector	Colorado	2,385	2,645	2,935	3,240	3,556	3,880
Manufacturing	Ector	Colorado	450	500	500	500	500	500
Steam Electric Power	Ector	Colorado	1,121	1,121	1,121	1,121	1,121	1,121
Subtotal Treated Water Demand			*28,960*	*32,595*	*35,647*	*38,932*	*42,379*	*46,170*
Mining (Reuse)	Ector	Colorado	9,530	9,530	9,530	9,530	9,530	9,530
Subtotal Reuse Demand			*9,530*	*9,530*	*9,530*	*9,530*	*9,530*	*9,530*
Manufacturing	Ector	Colorado	1,452	1,452	1,452	1,452	1,452	1,452
Irrigation	Ector	Colorado	1,197	1,194	1,192	1,191	1,190	1,189
Irrigation	Midland	Colorado	23	26	28	29	30	31
Subtotal Raw Demand			*2,672*	*2,672*	*2,672*	*2,672*	*2,672*	*2,672*
Greater Gardendale WSC			0	375	445	445	445	445
Ector County - Other (ECUD Expanded Service Area)			0	1,200	2,500	2,500	2,500	2,500
Additional Supply for Odessa (Losses)			3,930	3,930	3,930	3,930	3,930	3,930
Total Future Potable Demand			*3,930*	*5,505*	*6,875*	*6,875*	*6,875*	*6,875*
City of Odessa Total Demand			**45,092**	**50,302**	**54,724**	**58,009**	**61,456**	**65,247**

2.3.4 City of Midland

The City of Midland is the largest city in Region F. It provides retail water service to over 134,000 people, and small quantities of water to manufacturing within the city limits. The City has experienced rapid growth within its service area in recent years, primarily due to increased oil and gas activities within the Permian Basin. The City is also home to many workers that commute from other areas of the State during the work week. While these workers are not considered in Midland's permanent population estimate, they do contribute to the water demands on the City. Recent reports indicate the oil and gas activities will continue in the Permian Basin for several decades, contributing to the expected growth of the City and its water demands.

Midland also has a contract to sell treated effluent to Pioneer Resources for mining use. The contract is for up to 15 MGD, but actual wastewater discharges average 10 MGD. Improvements at the wastewater treatment plant are expected to be completed by 2020, which will increase the City's treatment capacity and quality. As shown in Table 2-19, the expected demands on Midland are 39,329 acre-feet per year in 2020 and increase to 53,619 acre-feet year by 2070.

Table 2-19
Expected Demands for the City of Midland
-Values in Acre-Feet per Year-

WUG Name	County(ies)	Basin	2020	2030	2040	2050	2060	2070
Midland	Midland	Colorado	27,972	31,803	34,256	36,811	39,405	42,232
Manufacturing	Midland	Colorado	147	177	177	177	177	177
Subtotal Treated Water Demand			*28,119*	*31,980*	*34,433*	*36,988*	*39,582*	*42,409*
Mining	Midland	Colorado	2,803	2,803	2,803	2,803	2,803	2,803
Mining	Martin	Colorado	2,803	2,803	2,803	2,803	2,803	2,803
Mining	Reagan	Colorado	2,803	2,803	2,803	2,803	2,803	2,803
Mining	Upton	Colorado	2,801	2,801	2,801	2,801	2,801	2,801
Subtotal Reuse Demand			*11,210*	*11,210*	*11,210*	*11,210*	*11,210*	*11,210*
City of Midland Total			**39,329**	**43,190**	**45,643**	**48,198**	**50,792**	**53,619**

2.3.5 City of San Angelo

Table 2-20 shows the expected demands for current customers of the City of San Angelo. The City provides water to the Upper Colorado River Authority (UCRA) in exchange for UCRA's O.C. Fisher water rights. UCRA then sells to several entities outside of the City. The City also provides water to the Goodfellow Air Force Base located in San Angelo and about half of the water used for manufacturing in Tom Green County.

Table 2-20
Expected Demands for the City of San Angelo
-Values in Acre-Feet per Year-

WUG Name	County(ies)	Basin	2020	2030	2040	2050	2060	2070
San Angelo	Tom Green	Colorado	17,924	19,657	20,494	21,556	22,847	24,250
UCRA			1,000	1,000	1,000	1,000	1,000	1,000
Goodfellow Air Force Base	Tom Green	Colorado	513	568	596	629	666	707
Manufacturing	Tom Green	Colorado	425	481	481	481	481	481
City of San Angelo Total			*19,862*	*21,706*	*22,571*	*23,666*	*24,994*	*26,438*

ATTACHMENT 2A

WATER DEMANDS BY DECADE AND CATEGORY OF USE FOR
MAJOR WATER PROVIDERS

Major Water Provider Demands by Category of Use in Each Decade
(acre-feet per year)

Major Water Provider	Category of Use	2020	2030	2040	2050	2060	2070
BCWID #1	Irrigation	5,000	5,000	5,000	5,000	5,000	5,000
	Livestock	0	0	0	0	0	0
	Manufacturing	548	651	651	651	651	651
	Mining	0	0	0	0	0	0
	Municipal	6,391	6,365	6,229	6,156	6,142	6,143
	Steam Electric Power	0	0	0	0	0	0
	Total	**11,939**	**12,016**	**11,880**	**11,807**	**11,793**	**11,794**
CRMWD	Irrigation	1,620	1,620	1,620	1,620	1,620	1,620
	Livestock	0	0	0	0	0	0
	Manufacturing	3,402	3,952	3,952	3,952	3,952	3,952
	Mining	0	0	0	0	0	0
	Municipal	76,416	62,577	66,651	69,600	72,615	76,152
	Steam Electric Power	1,330	1,330	1,330	1,330	1,330	1,330
	Total	**82,768**	**69,479**	**73,553**	**76,502**	**79,517**	**83,054**
Midland	Irrigation	0	0	0	0	0	0
	Livestock	0	0	0	0	0	0
	Manufacturing	147	177	177	177	177	177
	Mining	11,210	11,210	11,210	11,210	11,210	11,210
	Municipal	27,972	31,803	34,256	36,811	39,405	42,232
	Steam Electric Power	0	0	0	0	0	0
	Total	**39,329**	**43,190**	**45,643**	**48,198**	**50,792**	**53,619**
Odessa	Irrigation	1,220	1,220	1,220	1,220	1,220	1,220
	Livestock	0	0	0	0	0	0
	Manufacturing	1,902	1,952	1,952	1,952	1,952	1,952
	Mining	9,530	9,530	9,530	9,530	9,530	9,530
	Municipal	31,319	36,479	40,901	44,186	47,633	51,424
	Steam Electric Power	1,121	1,121	1,121	1,121	1,121	1,121
	Total	**45,092**	**50,302**	**54,724**	**58,009**	**61,456**	**65,247**
San Angelo	Irrigation	0	0	0	0	0	0
	Livestock	0	0	0	0	0	0
	Manufacturing	425	481	481	481	481	481
	Mining	0	0	0	0	0	0
	Municipal	19,437	21,225	22,090	23,185	24,513	25,957
	Steam Electric Power	0	0	0	0	0	0
	Total	**19,862**	**21,706**	**22,571**	**23,666**	**24,994**	**26,438**

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