CHAPTER 2
POPULATION AND WATER DEMAND

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2 POPULATION AND WATER DEMAND

Planning for the wise use of the existing water resources in the Plateau Region requires a reasonable estimation of current and future water needs for all water-use categories. Regional population and water demand data was initially provided to the Plateau Water Planning Group (PWPG) ~~planning groups~~ at the beginning of the planning period, which incorporated data from the State Data Center and the U.S. Census Bureau's 2010 census count. The Plateau Water Planning Group (PWPG) requested revisions to specific water demand categories for use in the ~~*2016*~~*2021 Plateau Region Water Plan*, which were subsequently approved by the TWDB. Thus, the population and water demand projections shown in this chapter are derived from a combination of TWDB data and approved revisions.

The PWPG made available the draft population and water demand summary tables to municipalities, water providers, county judges, and non-municipal water use representatives, and solicited all entities within the Region to submit desired changes to the projections. After thoughtful consideration, the PWPG chose to accept ~~not to modify~~ the draft population and water demand estimates. However, the PWPG did voice reservations with the way that these population numbers are used to calculate county rural water demand projections as further expressed in Section 2.2.1 below. Requested revisions in draft water-demand projections fell into ~~three~~ two categories, City of Kerrville and Kerr County-Other. ~~irrigation in Kinney County, mining in Edwards County, and livestock in all counties~~. ~~All of the~~ Both of the ~~requested~~ revision~~s~~ requests were subsequently granted by the TWDB.

Population projections and associated water demand projections have been reassembled by utility service areas rather than political boundaries in order to better plan for the actual water-supply service entity. Previous regional and State water plans have been aligned with political boundaries, such as city limits rather than water utility service areas. Recent TWDB rule changes now define a municipal water user group (WUG) as being utility-based, and thus emphasis of the development of population and municipal water demands for the 2021 regional water plans transition from political boundaries to utility-service area boundaries.

2.1 POPULATION

2.1.1 Population Projection Methodology

County population projections are ~~based on~~ prepared by the Texas State Data Center / Office of the State Demographer ~~county-level population projections~~. ~~These projections~~ and are based on recent and projected demographic trends, including birth and survival rates and net migration rates of population groups defined by age, gender, and race/ethnicity. Because the fifth cycle of regional water planning falls within an inter-census planning cycle, no new decennial census data is available in time for the use of this *Plan*. Population projections are therefore based on the 2017 State Water Plan population data.

The projected ~~county~~ municipal population is ~~then~~ allocated to water systems or utilities that provide an average of more than 100 acre-feet per year for municipal use. This newly defined (municipal WUG) includes water systems that vary from privately-owned, systems serving institutions, facilities owned by the State and Federal government, and all other retail public utilities that meet the 100-acre feet criteria. ~~cities with a 2010 population greater than 500. 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 r~~Rural "county-other" population is calculated as the difference between the total projected population of the ~~cities~~ utility service areas ~~and major utilities,~~ and the total projected county population. Population is ~~thus~~ then projected from the 2010 base year by decade to the year 2070. However, a new set of 2010 population estimates were developed to reflect a utility based boundary (not political boundary) as a baseline population to be projected for the use of this *Plan*. A more detailed explanation of the TWDB population projection methodology is available at ~~http://www.twdb.texas.gov/waterplanning/data/projections/index.asp.~~

http://www.twdb.texas.gov/waterplanning/rwp/planningdocu/2021/doc/current_docs/project_docs/20170405_pop_muni_proj_method_summ.pdf?d=75388.485.

The PWPG expresses concern that the population projections do not recognize the impact to the municipal and rural population and its related water demand that occurs as the result of seasonal vacationers, hunters, and absentee land-owner homes, especially in the rural counties. The PWPG recommends that for future regional water plans, that a region be allowed to adjust the total regional population rather than having to adjust individual county populations to achieve a non-changeable total population.

2.1.2 ~~Year - 2020~~ Current and Projected Population

In the year 2010, the U.S. Census Bureau performed a census count, which provides the base year for future population projections. Although the PWPG accepts the 2010 census count, members again expressed concern that the census does not recognize the significant seasonal population increase that occurs as the Region draws large numbers of hunters and recreational visitors, as well as absentee land owners who maintain vacation, retirement, and hunting properties. Therefore, an emphasis is being made in this planning document, especially for the rural counties, to recognize a need for more water than is justified simply from the population-derived water demand quantities.

The approved projections may also underestimate population and subsequent water demand in Kerr County. The cohort-component model used to project population growth does not adequately account for expected business and market factors that can influence population growth. Several Kerr County organizations are actively pursuing market development and business growth in order to maintain a consistent double-digit growth rate not reflected in the long-term population forecast. Similar underestimations may also occur elsewhere in the Region.

Population projections by decade for ~~communities,~~ water utilities, and county rural areas in the Plateau Region are listed in Table 2-1. The projected year-2020 population for the entire Region is 141,476 of which 76 percent reside in Kerr and Val Verde Counties (Figure 2-1). Del Rio ~~(including Laughlin AFB),~~ with a year-2020 projected population of ~~39,839~~ 37,775 is the largest community in the Region. The Regional population is projected to increase by 30 percent to 184,595 by the year 2070, which is an increase of 43,119 citizens (Figure 2-2). The water demand table (Table 2-2) depicts water demand for county-other use as equally distributed throughout the rural portion of each county; whereas in reality, county-other population and water demand are often concentrated in smaller areas of the county, such as unincorporated communities, subdivisions and mobile home parks.

Population estimates do not consider rural population density, which concentrates water demand and strains available local water supplies. Figure 2-3 shows the concentration of rural population in the eastern portions of both Kerr and Bandera Counties. The challenge of meeting the water needs for these concentrated rural areas is addressed in water management strategies provided in Chapter 5.

Table 2-1. Plateau Region Population Projection

	2020	2030	2040	2050	2060	2070
Bandera County - Guadalupe Basin						
County-Other	150	173	186	190	194	196
Guadalupe Basin Total Population	**150**	**173**	**186**	**190**	**194**	**196**
Bandera County - Nueces Basin						
County-Other	1,373	1,581	1,696	1,744	1,772	1,787
Nueces Basin Total Population	**1,373**	**1,581**	**1,696**	**1,744**	**1,772**	**1,787**
Bandera County - San Antonio Basin						
Bandera	1,875	2,160	2,316	2,380	2,420	2,442
Bandera County FWSD #1	679	781	838	862	876	883
County-Other	20,914	24,085	25,845	26,566	27,003	27,229
San Antonio Basin Total Population	**23,468**	**27,026**	**28,999**	**29,808**	**30,299**	**30,554**
Bandera County Total Population	**24,991**	**28,780**	**30,881**	**31,742**	**32,265**	**32,537**
Edwards County - Colorado Basin						
Rocksprings	844	844	844	844	844	844
County-Other	196	196	196	196	196	196
Colorado Basin Total Population	**1,040**	**1,040**	**1,040**	**1,040**	**1,040**	**1,040**
Edwards County - Nueces Basin						
Rocksprings	415	415	415	415	415	415
County-Other	563	563	563	563	563	563
Nueces Basin Total Population	**978**	**978**	**978**	**978**	**978**	**978**
Edwards County - Rio Grande Basin						
County-Other	105	105	105	105	105	105
Rio Grande Basin Total Population	**105**	**105**	**105**	**105**	**105**	**105**
Edwards County Total Population	**2,123**	**2,123**	**2,123**	**2,123**	**2,123**	**2,123**
Kerr County - Colorado Basin						
County-Other	628	661	681	700	714	725
Colorado Basin Total Population	**628**	**661**	**681**	**700**	**714**	**725**
Kerr County - Guadalupe Basin						
Kerrville	25,658	26,638	27,217	27,792	28,203	28,522
Kerrville South Water	2,821	2,969	3,057	3,143	3,206	3,254
County-Other	23,191	24,775	25,715	26,645	27,314	27,825
Guadalupe Basin Total Population	**51,670**	**54,382**	**55,989**	**57,580**	**58,723**	**59,601**
Kerr County - Nueces Basin						
County-Other	8	8	8	8	9	9
Nueces Basin Total Population	**8**	**8**	**8**	**8**	**9**	**9**
Kerr County - San Antonio Basin						
County-Other	338	356	366	377	384	390
San Antonio Basin Total Population	**338**	**356**	**366**	**377**	**384**	**390**
Kerr County Total Population	**52,644**	**55,407**	**57,044**	**58,665**	**59,830**	**60,725**

Table 2-1. (continued) Plateau Region Population Projection

	2020	2030	2040	2050	2060	2070
Kinney County - Nueces Basin						
County-Other	81	81	81	81	81	81
Nueces Basin Total Population	**81**	**81**	**81**	**81**	**81**	**81**
Kinney County - Rio Grande Basin						
Brackettville	1,958	1,971	1,971	1,971	1,971	1,971
Fort Clark Springs MUD	1,259	1,267	1,267	1,267	1,267	1,267
County-Other	397	401	401	401	401	401
Rio Grande Basin Total Population	**3,614**	**3,639**	**3,639**	**3,639**	**3,639**	**3,639**
Kinney County Total Population	**3,695**	**3,720**	**3,720**	**3,720**	**3,720**	**3,720**
Real County - Colorado Basin						
County-Other	35	35	35	35	35	35
Colorado Basin Total Population	**35**	**35**	**35**	**35**	**35**	**35**
Real County - Nueces Basin						
Camp Wood	747	747	747	747	747	747
Leakey	1,415	1,415	1,415	1,415	1,415	1,415
County-Other	1,132	1,132	1,132	1,132	1,132	1,132
Nueces Basin Total Population	**3,294**	**3,294**	**3,294**	**3,294**	**3,294**	**3,294**
Real County Total Population	**3,329**	**3,329**	**3,329**	**3,329**	**3,329**	**3,329**
Val Verde County - Rio Grande Basin						
Del Rio	37,775	40,196	42,540	44,948	47,242	49,453
Laughlin AFB	1,767	1,951	2,129	2,239	2,239	2,239
County-Other	15,152	18,242	21,233	24,379	27,479	30,469
Rio Grande Basin Total Population	**54,694**	**60,389**	**65,902**	**71,566**	**76,960**	**82,161**
Val Verde County Total Population	**54,694**	**60,389**	**65,902**	**71,566**	**76,960**	**82,161**
Region J Total Population	**141,476**	**153,748**	**162,999**	**171,145**	**178,227**	**184,595**

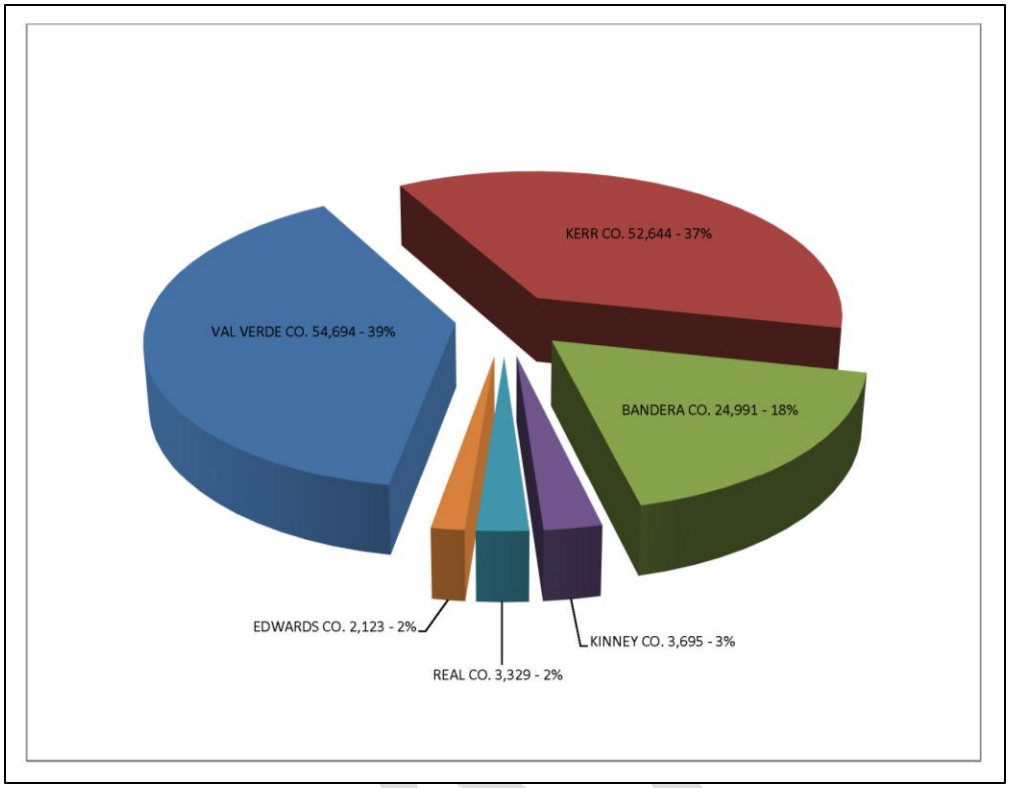

Figure 2-1. Year 2020 Population Projection

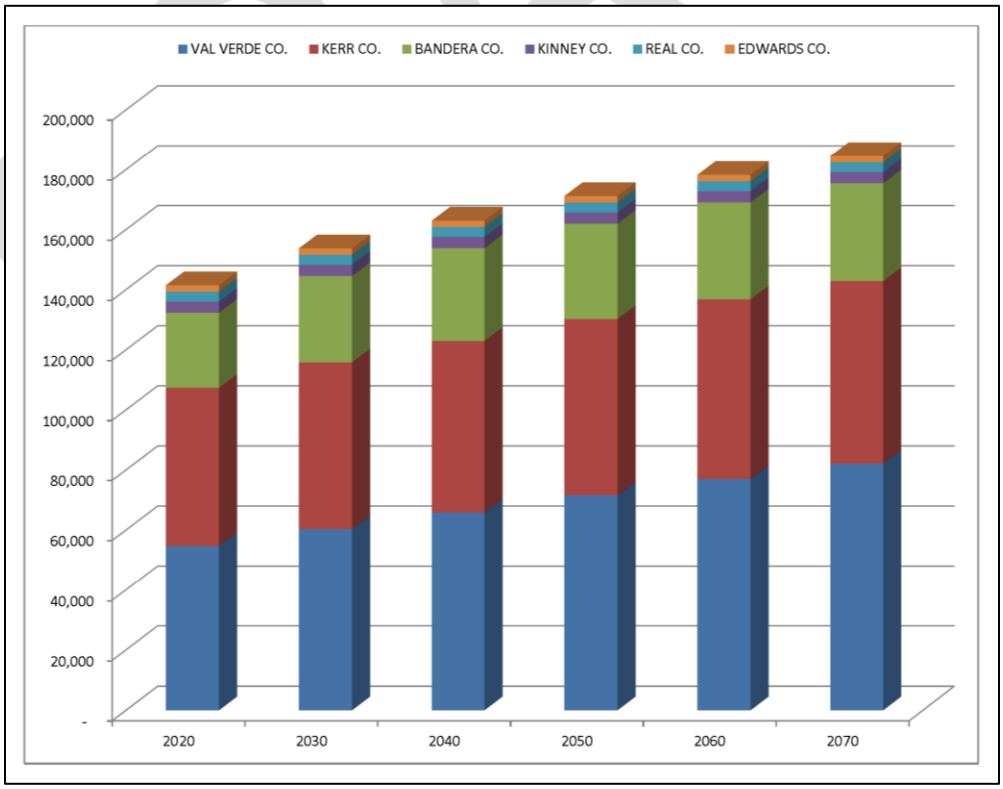

Figure 2-2. Regional Population Projection

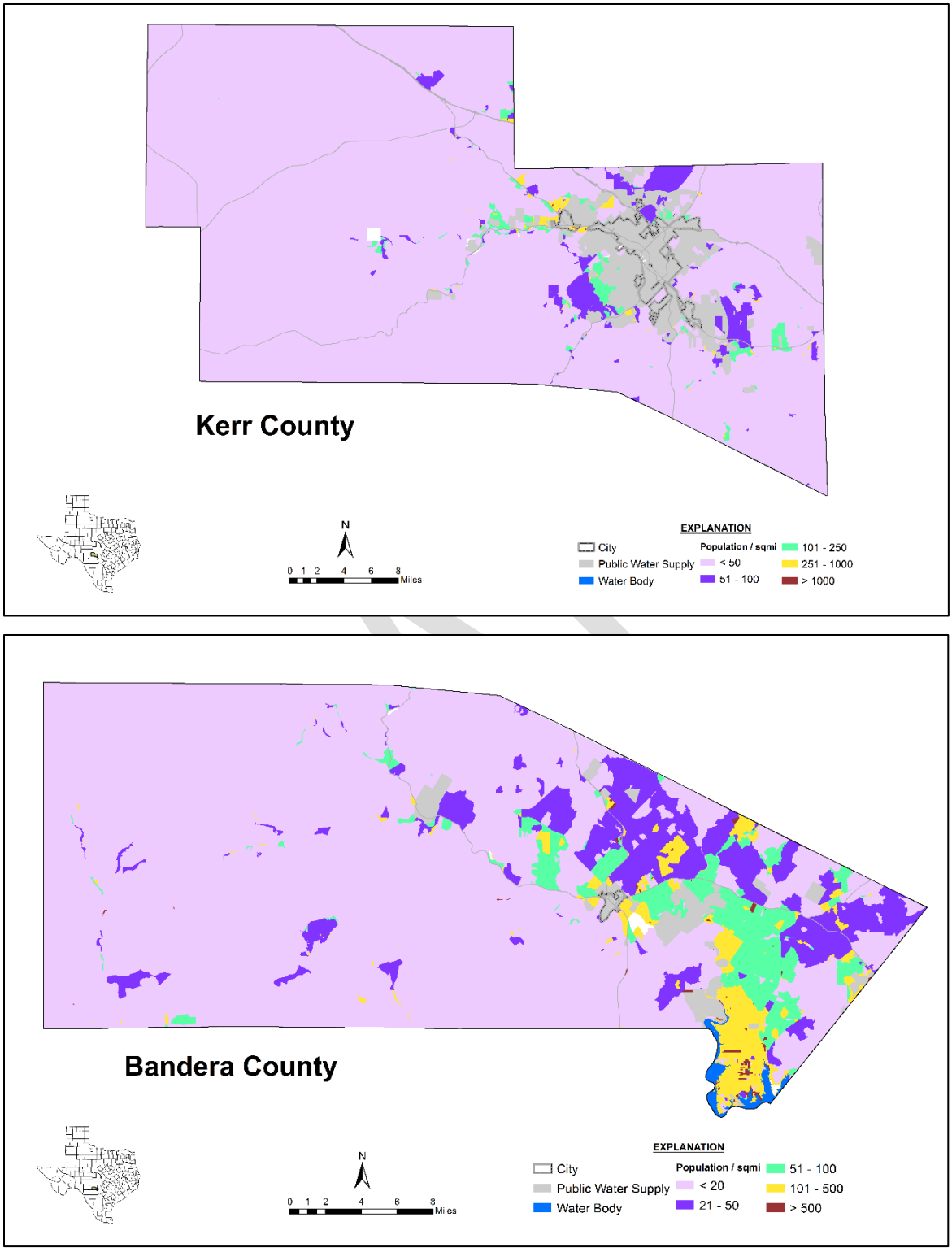

Figure 2-3. Rural Population Concentration in Kerr and Bandera Counties

2.2 WATER DEMAND

2.2.1 Water Demand Projections

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, (2) county-other (rural domestic), (3) manufacturing, (4) irrigation, (5) livestock, and (6) mining. There is no recognized water use in the Plateau Region for "steam-electric power generation". Other water use categories that are not quantified in this *Plan* include environmental and recreational needs and are addressed in Section 2.3.

In early 2016, the TWDB contracted CDM Smith to review the projection methodologies previously used, provide insight on how projections were developed in other state planning efforts, and recommend alternative methodologies. The TWDB determined that the water demand projections methodologies for three of the categories – manufacturing, irrigation and steam-electric power – should be revised to better reflect reported historical water use. Summaries of the methodologies are provided in the following subsections. A more descriptive report can be found here: http://www.twdb.texas.gov/waterplanning/rwp/planningdocu/2021/current_docs.asp.

Table 2-2 lists the current and future projected Regional water demand by county and water-use category. ~~The municipal category includes cities and retail public utilities.~~ The percent distribution of water demand in the Region by the ~~five~~ six water-use categories is shown in Figure 2-4. Water demand is reported in "acre-feet"; one acre-foot is equivalent to a quantity of water one-foot deep occupying one acre, or 325, 851 gallons.

Figure 2-5 and Figure 2-6 show projected water demand by county in acre-feet per year. From the year 2020 to 2070 the total water demand in the Region is projected to increase from ~~39,802~~ 37,517 acre-feet to ~~44,937~~ 43,310 acre-feet. ~~Water demand methodologies and trends for each of the five water-use categories are provided in the following subsections.~~

The potential role of conservation is an important factor in projecting future water supply requirements. ~~Water demands listed in this *Plan* included demand adjustments based on expected conservation practices.~~ In this *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 management strategies in Chapter 5 and as a component of drought management plans in Chapter 7.

As stated previously, the PWPG is concerned that the population and subsequent water demand projections throughout the Region may be understated due to the large number of temporary residents in the Region including hunters, tourists and absentee landowners. In addition to these factors, water demand may be understated in Kerr County (as well as elsewhere in the Region) because the cohort-component model does not reflect market and business factors that are expected to increase water demand in the county, especially in the municipal and manufacturing use category. Population estimates do not consider population density, which concentrates water demand and strains available local water supplies.

The following sections present an overview of water supply needs for major water providers and for each of the seven-designated water-use categories and include methods and assumptions used in the State's consensus water planning process.

Table 2-2. Plateau Region Water Demand Projections
(TWDB has not provided the basin split for non-municipal)
(Acre-Feet per Year)

	2020	2030	2040	2050	2060	2070
Bandera County - Guadalupe Basin						
County-Other	16	17	18	19	19	19
Guadalupe Basin Total Water Demand	**16**	**17**	**18**	**19**	**19**	**19**
Bandera County - Nueces Basin						
County-Other	143	159	167	170	172	174
Nueces Basin Total Water Demand	**143**	**159**	**167**	**170**	**172**	**174**
Bandera County - San Antonio Basin						
Bandera	342	383	404	413	419	423
Bandera County FWSD #1	141	158	167	171	174	175
County-Other	2,177	2,423	2,548	2,592	2,628	2,649
San Antonio Basin Total Water Demand	**2,660**	**2,964**	**3,119**	**3,176**	**3,221**	**3,247**
Bandera County Total Water Demand	**2,819**	**3,140**	**3,304**	**3,365**	**3,412**	**3,440**
Edwards County - Colorado Basin						
Rocksprings	198	194	191	190	190	190
County-Other	21	21	20	20	20	20
Mining	19	19	19	19	19	19
Colorado Basin Total Water Demand	**238**	**234**	**230**	**229**	**229**	**229**
Edwards County - Nueces Basin						
Rocksprings	98	96	94	94	94	94
County-Other	62	59	56	56	56	56
Mining	25	25	25	25	25	25
Nueces Basin Total Water Demand	**185**	**180**	**175**	**175**	**175**	**175**
Edwards County - Rio Grande Basin						
County-Other	12	11	11	11	10	10
Mining	45	45	45	45	45	45
Rio Grande Basin Total Water Demand	**57**	**56**	**56**	**56**	**55**	**55**
Edwards County Total Water Demand	**480**	**470**	**461**	**460**	**459**	**459**
Kerr County - Colorado Basin						
County-Other	53	53	53	53	54	55
Mining	14	15	18	19	20	22
Colorado Basin Total Water Demand	**67**	**68**	**71**	**72**	**74**	**77**
Kerr County - Guadalupe Basin						
Kerrville	5,087	5,162	5,183	5,230	5,307	5,367
Kerrville South Water	341	346	347	352	358	363
County-Other	1,688	1,718	1,718	1,759	1,788	1,821
Mining	62	65	82	83	91	98
Guadalupe Basin Total Water Demand	**7,178**	**7,291**	**7,330**	**7,424**	**7,544**	**7,649**

Table 2-2. (continued) Plateau Region Water Demand Projections
(Acre-Feet per Year)

	2020	2030	2040	2050	2060	2070
Kerr County - Nueces Basin						
County-Other	1	1	1	1	1	1
Nueces Basin Total Water Demand	**1**	**1**	**1**	**1**	**1**	**1**
Kerr County - San Antonio Basin						
County-Other	29	29	28	29	29	30
San Antonio Basin Total Water Demand	**29**	**29**	**28**	**29**	**29**	**30**
Kerr County Total Water Demand	**7,275**	**7,389**	**7,430**	**7,526**	**7,648**	**7,757**
Kinney County - Nueces Basin						
County-Other	11	11	10	10	10	10
Nueces Basin Total Water Demand	**11**	**11**	**10**	**10**	**10**	**10**
Kinney County - Rio Grande Basin						
Brackettville	608	602	594	593	592	592
Fort Clark Springs MUD	618	616	612	610	609	609
County-Other	53	52	52	52	51	51
Rio Grande Basin Total Water Demand	**1,279**	**1,270**	**1,258**	**1,255**	**1,252**	**1,252**
Kinney County Total Water Demand	**1,290**	**1,281**	**1,268**	**1,265**	**1,262**	**1,262**
Real County - Colorado Basin						
County-Other	4	4	3	3	3	3
Colorado Basin Total Water Demand	**4**	**4**	**3**	**3**	**3**	**3**
Real County - Nueces Basin						
Camp Wood	143	139	136	135	135	135
Leakey	193	186	180	178	177	177
County-Other	120	116	113	111	111	111
Nueces Basin Total Water Demand	**456**	**441**	**429**	**424**	**423**	**423**
Real County Total Water Demand	**460**	**445**	**432**	**427**	**426**	**426**
Val Verde County - Rio Grande Basin						
Del Rio	10,558	11,053	11,554	12,130	12,733	13,326
Laughlin AFB	1,018	1,114	1,215	1,277	1,276	1,276
County-Other	1,976	2,307	2,637	3,002	3,376	3,741
Mining	190	249	259	223	192	171
Rio Grande Basin Total Water Demand	**13,742**	**14,723**	**15,665**	**16,632**	**17,577**	**18,514**
Val Verde County Total Water Demand	**13,742**	**14,723**	**15,665**	**16,632**	**17,577**	**18,514**
Region J Total Water Demand	**26,066**	**27,448**	**28,560**	**29,675**	**30,784**	**31,858**

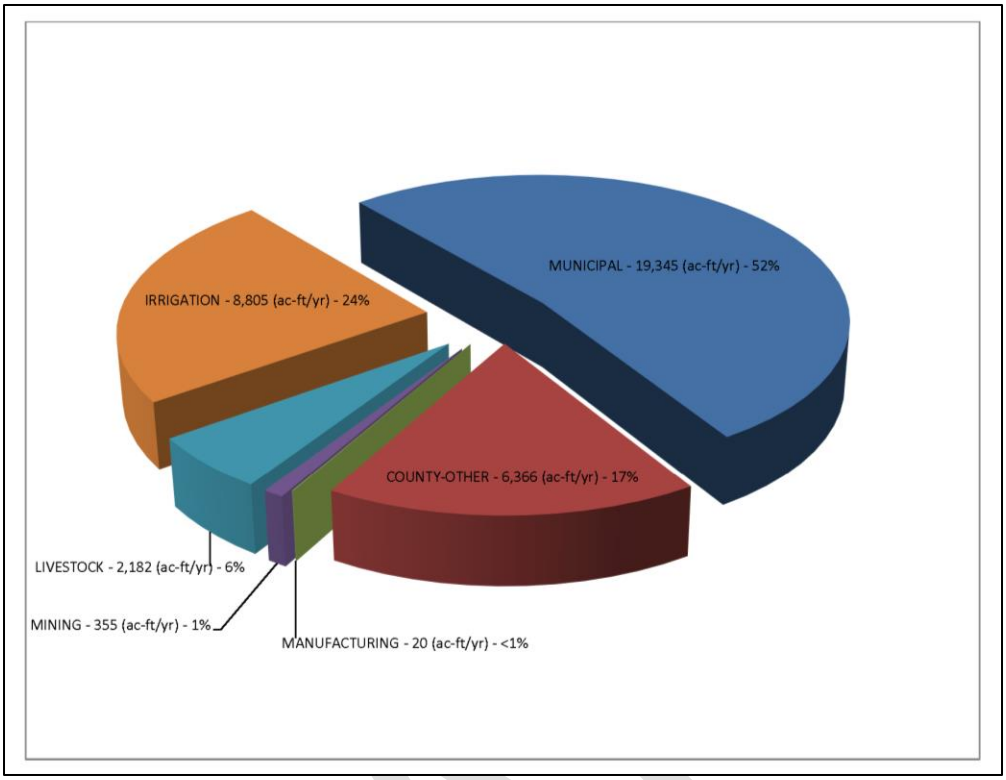

Figure 2-4. Year 2020 Projected Water Demand by Water-Use Category

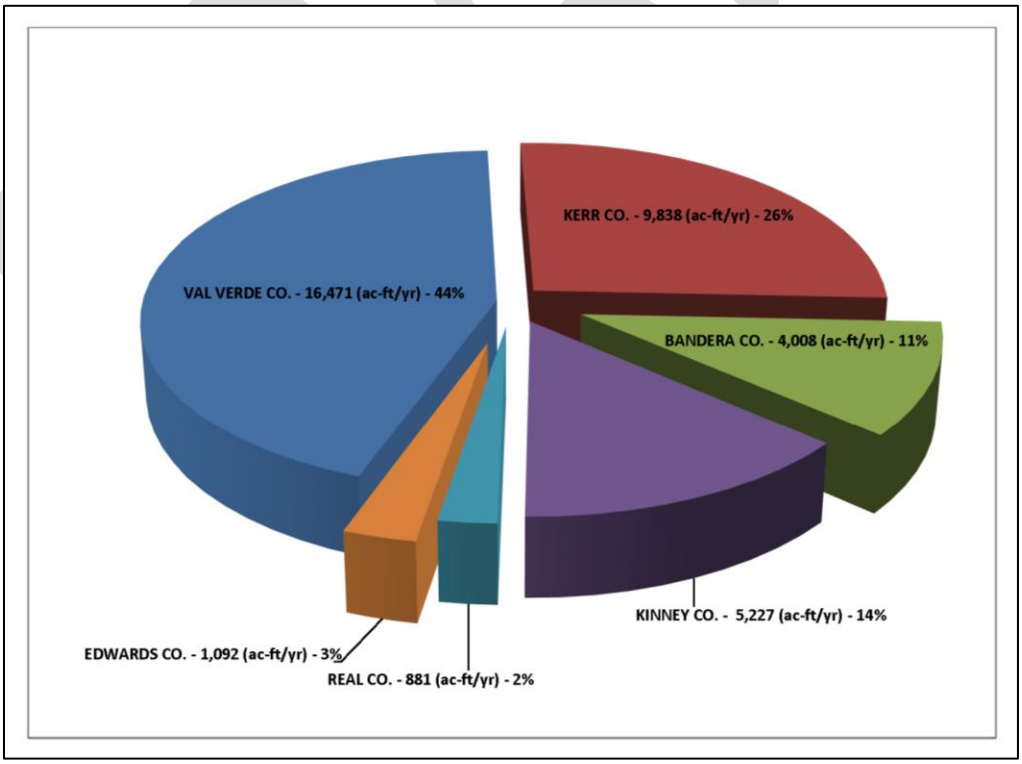

Figure 2-5. Year 2020 Projected Water Demand by County

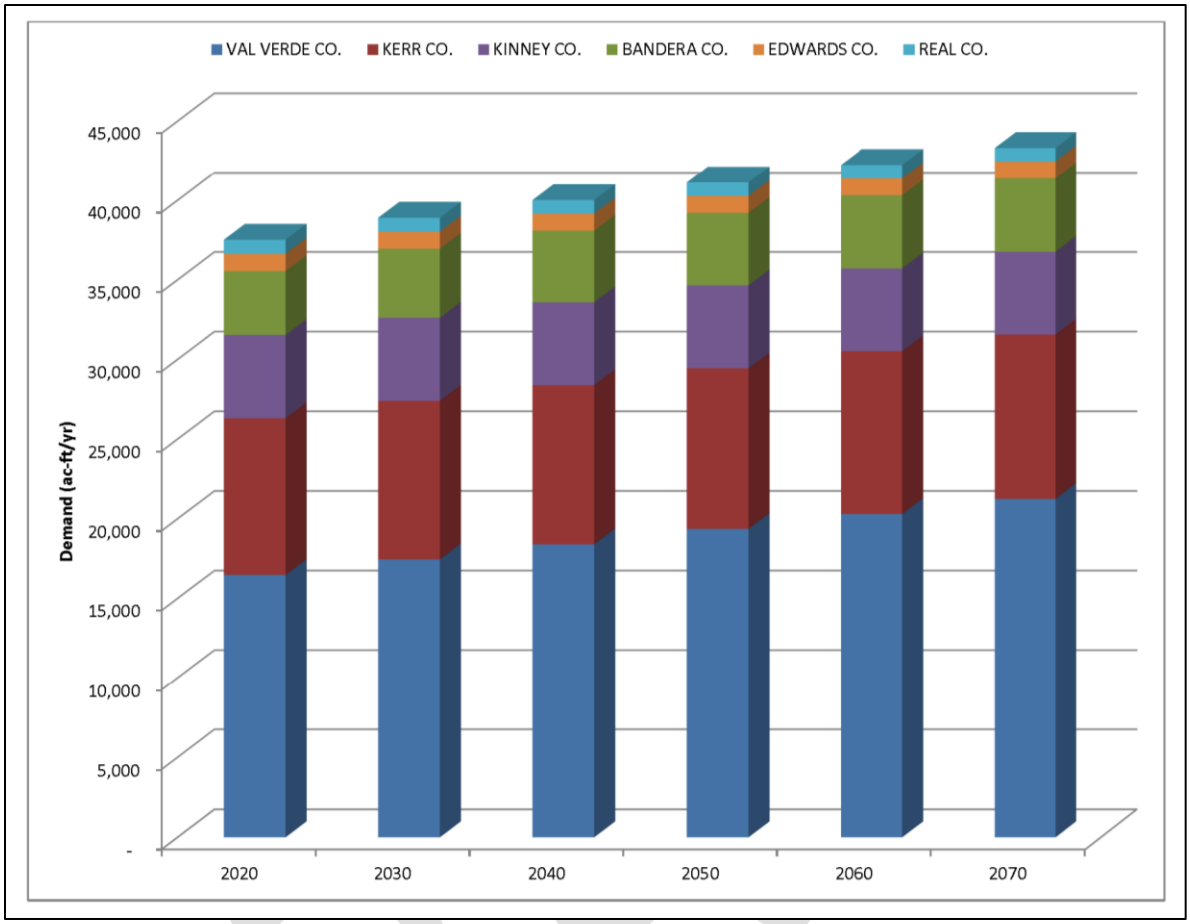

Figure 2-6. Projected Water Demand by County

2.2.2 Municipal and County-Other

The quantity of water used for municipal and county-other (rural domestic) ~~(County-Other) 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 supplied to golf courses from municipal supply sources. Water use within a ~~city~~ utility service area that is not included in the quantification of municipal demand, is that used in manufacturing and industrial processes that are self-supplied.

Municipal and county-other water demand is calculated based on utility service boundaries designated in the population projections process and include rural domestic use. Projected municipal and county-other water demand is based on the year-2010 per-capita water use, which is calculated with year-2010 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 commercial customers will appear abnormally high. The year-2010 per-capita water use is reduced slightly over time to simulate expected conservation savings due to State-mandated plumbing code implementation. Table 2-3 presents municipal savings due to the expected instillation of more water efficient fixtures and appliances. 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. Table 2-4 presents the municipal and county-other projected water use for each decade in the current planning cycle.

Table 2-3. Municipal Savings Due to Plumbing Fixture Requirements
(Acre-Feet per Year) – Eliminate unless new data is available

County	Entity Name	2020	2030	2040	2050	2060	2070
Bandera	Bandera	13	21	27	28	29	30
Bandera	County-Other, Bandera	243	377	464	508	524	529
Edwards	County-Other, Edwards	10	14	18	18	18	18
Edwards	Rocksprings	14	20	25	26	26	26
Kerr	County-Other, Kerr	233	349	435	491	513	523
Kerr	Ingram	18	26	33	37	38	38
Kerr	Kerrville	240	356	448	503	519	526
Kerr	Loma Vista Water System	35	52	65	73	76	77
Kinney	Brackettville	19	28	35	36	37	37
Kinney	County-Other, Kinney	5	8	9	10	10	10
Kinney	Fort Clark Springs MUD	13	18	22	25	25	25
Real	Camp Wood	7	11	14	15	15	15
Real	County-Other, Real	24	34	42	46	47	47
Val Verde	County-Other, Val Verde	160	263	354	432	495	552
Val Verde	Del Rio	404	614	794	918	981	1,030
Val Verde	Laughlin AFB	23	35	39	42	43	43
Total		**1,461**	**2,226**	**2,823**	**3,208**	**3,396**	**3,526**

Municipal (and county-other) water demand in the Plateau Region is projected to increase from ~~a year 2020 level of 25,567~~ 25,711 acre-feet in 2020 to ~~31,315~~ 31,478 acre-feet by ~~the year~~ 2070 (Table 2-4). Because municipal water demand is directly related to population, Val Verde County has the highest demand in the Region. ~~Bandera County, with the greatest projected percentage population increase, will likewise see the greatest percentage municipal water demand increase over the 50-year period, 122 percent.~~

Table 2-~~3~~4. Municipal and County-Other Water Demand Projections
(Acre-Feet per Year)

County	2020	2030	2040	2050	2060	2070
Bandera	2,819	3,140	3,304	3,365	3,412	3,440
Edwards	391	381	372	371	370	370
Kerr	7,199	7,309	7,330	7,424	7,537	7,637
Kinney	1,290	1,281	1,268	1,265	1,262	1,262
Real	460	445	432	427	426	426
Val Verde	13,552	14,474	15,406	16,409	17,385	18,343
County Total Demand	**25,711**	**27,030**	**28,112**	**29,261**	**30,392**	**31,478**

A significant portion of the municipal water demand in Bandera and Kerr Counties is assigned to the county-other (rural) category. This category represents the aggregation of utilities that provide less than an average of 100 acre-feet per year, as well as rural areas not served by a water utility in a given county. Table 2-5 presents a listing of water systems that comprise the county other category along with the corresponding annual water use survey data (2010-2015).

A water user group (WUG) within county-other can be further divided into a "sub-WUG" at the discretion of the planning group for a more detailed analysis. This option allows for a higher resolution in water needs analyses to better account for present water supplies and needs within certain county-other systems of interest, that would otherwise be aggregated at the county level. Table 2-5 indicates in green the water systems that the Plateau Region Water Planning Group designated as official sub-WUGs.

Table 2-5. County-Other Water Supply Entities
(Acre-Feet per Year)

	2010	2011	2012	2013	2014	2015
Bandera County-Other						
Medina WSC	49	58	45	41	48	46
Lake Medina Shores	112	110	106	116	43	59
Bandera River Ranch 1	36	46	64	65	65	48
Enchanted River Estates	21	23	26	29	22	55
Flying L Ranch PUD	66	65	73	50	52	47
Lakewood Water	28	28	28	28	63	59
The Falls WSC	19	25	23	22	22	13
Ranch Hills WSC	15	18	13	13	14	13

Table 2-5. (continued) County-Other Water Supply Entities
(Acre-Feet per Year)

	2010	2011	2012	2013	2014	2015
River Bend Estates	0	12	11	8	12	13
Blue Medina Water	15	15	12	11	11	13
Elmwood Estates	10	10	10	10	9	7
Bandina	4	5	5	6	5	5
Bear Springs Trails Subdivision	5	4	4	4	4	5
Bandera Homestead Condominiums	4	4	3	3	3	3
Comanche Cliffs	3	3	3	3	9	11
Medina Highlands	3	2	2	2	2	2
San Julian Creek Estates	0	0	0	0	4	5
TPWD Lost Maples SNA	3	2	3	3	0	3
*Medina Childrens Home						
Bandera ISD - Bandera High School	3	3	3	0	0	0
Bandera ISD - Alkek Elementary	0	4	0	0	0	0
Cielo Rio Ranch Water System	0	35	0	0	10	9
Bridlegate	0	9	0	24	11	32
Edwards County-Other						
Barksdale WSC	17	16	16	17	18	15
Kerr County-Other						
Ingram Water Supply	373	373	373	373	373	373
Woodcreek Utility CO2	331	331	331	331	273	273
Guadalupe Heights Utility	69	69	69	69	69	69
Canyon Springs Water Works	65	81	65	67	67	67
VA Hospital Kerrville	93	98	95	89	66	66
Oak Forest South Water Supply	62	62	62	62	62	62
Erlund Subdivision	54	54	54	54	54	54
Southern Hills Wiedenfeld Water Works	50	55	51	50	50	50
Woods WSC	45	55	44	39	43	38
Community Water Group WSC	25	43	28	34	32	36
Bumblebee Hills	0	0	0	3	37	31
Mary Mead Water System	31	32	24	28	28	28
Sleepy Hallow	27	27	27	27	27	27
Fremont Water	33	40	41	30	29	25
Westwood Water System	23	27	25	25	24	24
Aqua Vista Utilities	35	35	24	24	24	24
White Oak Ranch Section One	24	24	24	24	24	24
Northwest Hills Subdivision	22	22	22	22	22	22
Kamira Water System	24	25	24	21	27	20

Table 2-5. (continued) County-Other Water Supply Entities
(Acre-Feet per Year)

	2010	2011	2012	2013	2014	2015
The Wilderness	13	16	12	14	17	17
Bear Paw Water System	17	17	17	17	17	17
Royal Oaks Water	15	15	15	15	15	15
Nickerson Farm Water System	14	14	14	14	14	14
Verde Park Estates Wiedenfeld Water Works	12	12	12	13	14	13
Hill River Country Estates	11	12	13	0	0	13
Hills & Dales Wiedenfeld Water Works	18	17	14	13	13	12
Shalako Water Supply	11	14	13	12	12	12
Horseshoe Oaks Subdivision Water System	10	10	10	10	10	10
Castlecomb Water System	0	11	12	12	10	10
Center Point Wiedenfeld Water Works	11	11	11	9	9	9
Four Seasons	9	9	9	9	9	9
Village West Water System	7	8	10	8	8	8
Camp Honey Creek	4	5	8	8	8	8
Oak Ridge Estates Water System	8	8	8	8	8	8
Pecan Valley	8	8	8	8	8	8
Ranchero Estates	5	5	7	7	8	8
Verde Hills WSC	11	11	7	7	7	7
Split Rock Water System	10	10	8	7	7	6
Rustic Hills Water	6	9	7	6	6	6
Real Oaks Subdivision	6	6	6	6	6	6
Heritage Park Water System	5	6	5	4	5	5
Cherry Ridge Water	4	4	4	4	4	4
Windwood Oaks Water System	4	5	4	4	4	4
Shermans Mill	0	6	4	3	6	3
Park Place Subdivision	3	3	3	3	3	3
Vista Hills	0	0	0	2	3	2
Wood Trail Water Supply	0	0	0	0	0	0
Woodhaven Mobile Home Park	6	6	5	0	0	0
Cedar Springs Mobile Home Park	7	7	7	0	0	0
Oak Grove Mobile Home Park	22	0	0	0	0	0
Ingram Oaks Retirement Community	40	49	0	0	0	0
Hill Country Ranch Estates	0	6	5	5	6	0
Generis Water Works	0	17	17	17	17	0
*Cypress Springs						
*TX Dot Kerr County SRA						
Scenic Valley Mobile Home Park	23	0	0	0	0	0

Table 2-5. (continued) County-Other Water Supply Entities
(Acre-Feet per Year)

	2010	2011	2012	2013	2014	2015
River Front Village	20	24	24	0	0	0
Kerr Villa Mobile Home Park	12	9	10	0	0	0
Ingram Tom Moore High School	16	24	14	0	0	0
Hideaway Mobile Home Park	7	6	5	0	0	0
*Country Hills Water						
City of Kerrville Schreiner Park	5	4	5	0	0	0
Cherokee Mobile Home Park	5	29	7	0	0	0
Camp Flaming Arrow	4	7	6	0	0	0
*Blue Ridge Mobile Home Park						
*Armadillo Junction RV Park						
Center Point North Water System	6	8	7	6	6	7
Center Point Taylor System	11	13	14	12	11	11
Falling Water Subdivision	1	12	12	9	18	7
Saddlewood Subdivision	12	22	18	14	16	14
Westcreek Estates Water System	19	22	24	18	17	13
Kinney County-Other						
City of Spofford	17	17	17	14	14	11
Real County-Other						
Oakmont Saddle Mountain Water System	16	16	15	16	16	17
Real WSC	38	32	20	18	19	17
Twin Forks Estates WSC	18	23	17	16	18	15
Frio Canon Water Co, LLC			5	10	10	16
*H.E.B. Family Foundation						
*Crown Mountain Water Supply						
Val Verde County-Other						
Val Verde County WCID Comstock	89	89	101	68	82	65
Upper San Pedro Canyon Subdivision	38	38	38	38	38	34
Del Grande Mobile Home Park	26	26	26	26	26	26
Langtry WSC	8	10	10	23	23	23
La Caleta Estates	52	52	52	18	18	18
Devils Shores WSC	0	15	18	16	13	13
Amistad Village Water System	14	25	33	41	19	13
Lago Vista Water System	0	0	0	0	7	7
*Lake Ridge Water System	0	0	0	0	0	0
*TPWD Seminole Canyon SHP	0	0	0	0	0	0
*Seguro Water Company	0	0	0	0	0	0
Laughlin AFB Recreation Area	0	9	4	2	2	0

Note: *No survey data provided. Green highlighted areas indicate designated sub-WUGs.

2.2.3 Major Water Providers

Recent TWDB rule changes (31TAC §357.30(4)) now require regional water planning groups to identify "major water providers" as opposed to "wholesale water providers" as performed in previous plans. A major water provider (MWP) is defined as a significant public or private WUG or wholesale water provider (WWP) whose significance is determined by the RWPG, and provides water for any water use category in a regional water planning area. This rule revision gives regional water planning groups more flexibility in identifying which large water providers ought to be reported in their regional water plan.

The Plateau Region Water Planning Group has developed and adopted the following definition of a MWP, and feels that this definition captures all significant municipal WUGs or WWPs that provide water for other water use categories within the Region.

> *"An entity that currently provides significant water supplies (>10,000 acre-feet per year) to other users and which will continue to develop new supplies to meet future needs of those whom they supply during the period covered by this Plan."*

~~**Wholesale Water Provider** – A wholesale water provider is any person or entity that has 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*.~~

~~The City of~~ Del Rio Utilities is the only entity in the Plateau Region to meet this criterion. In addition to its own use, the ~~city~~ utility provides water to Laughlin Air Force Base and subdivisions outside of the Ceity. Del Rio also provides water and wastewater services to two colonias, Cienegas Terrace and Val Verde Park Estates. Table 2-6 shows the distribution of water demand supplied by the City of Del Rio in the Rio Grande River Basin.

Table 2-~~4~~6. Del Rio Wholesale / Major Water Provider Water Demand (Acre-Feet per Year)

County	Basin	Water User Group	2020	2030	2040	2050	2060	2070
Val Verde	Rio Grande	~~City of~~ Del Rio Utilities	10,558	11,053	11,554	12,130	12,733	13,326
		Laughlin AFB	1,018	1,114	1,215	1,277	1,276	1,276
		County Other	1,976	2,307	2,637	3,002	3,376	3,741
Total Wholesale Water Demand			**13,552**	**14,474**	**15,406**	**16,409**	**17,385**	**18,343**

~~Municipal water demands incorporate anticipated future water savings due to the natural instillation of plumbing fixtures and appliances to more water-efficient fixtures and appliances (Table 2-5).~~

2.2.4 Manufacturing

Manufacturing and industrial water use that is self-supplied is quantified separately from municipal use even though the demand centers may be located within a ~~city limits~~ utility service area. Draft manufacturing water demand projections are based on the highest county aggregated manufacturing water use in the most recent five years (2010-2015) of reported annual water use survey data. The most recent 10-year projections for employment growth from the Texas Workforce Commission was used as proxy

for growth by manufacturing sectors between 2020 and 2030. After 2030, the manufacturing water use was held constant through 2070. ~~utilized 2004-2008 data from TWDB's Water Use Survey (WUS). In counties where reported employment from the companies returning surveys was low compared to manufacturing employment data reported by the Bureau of Economic Analysis (BEA), surveyed water use was adjusted to account for non-responses. The rate of change for projections from the *2011 Regional Water Plan* was then applied to the new base year estimate.~~ In the Plateau Region, the use of water for manufacturing purposes is only recognized in Kerr County (Table 2-~~6~~7).

Table 2-~~6~~7. Manufacturing Water Demand Projection
(Acre-Feet per Year)

County	2020	2030	2040	2050	2060	2070
Bandera	0	0	0	0	0	0
Edwards	0	0	0	0	0	0
Kerr	20	21	21	21	21	21
Kinney	0	0	0	0	0	0
Real	0	0	0	0	0	0
Val Verde	0	0	0	0	0	0
County Total Demand	**20**	**21**	**21**	**21**	**21**	**21**

2.2.5 Irrigation

Draft irrigation water demand projections utilize~~d~~ an average of TWDB's ~~2005-2009~~ 2010-2015 irrigation water use estimates as a base. Those values are held constant between 2020 and 2070. Annual water use estimates are developed at the county level by applying a calculated evapotranspiration-based "crop water need" estimate to reported irrigated acreage from Farm Service Agency (FSA). These estimates are then adjusted based on surface water release data from TCEQ and Texas Water Masters and comments from Groundwater Conservation Districts. ~~The rate of change for projections from the *2011 Regional Water Plan* was then applied to the new base.~~ In counties where the total groundwater availability over the planning period is projected to be less than the groundwater portion of the baseline water demand projections, the irrigation water demand projections will begin to decline in 2030 or later, to be compatible with the groundwater availability. However, this approach to a 'groundwater constrained' area presently does not occur in the Plateau Region.

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.

~~In lieu of the above process, irrigation demand in Kinney County is more accurately based on actual measured diversions or pumping withdrawals as monitored by the Kinney County Groundwater Conservation District. Future irrigation use is then projected from this 2010 base year at a rate established for the same county irrigation projection in the previous *Regional Water Plan*. Although Table 2-7 shows a level Kinney County irrigation demand in future decades, local sources suggest that there is a recent~~

~~surge in agricultural interest that may significantly increase future irrigation activity in the county. Water supply availability Table 3-1 in Chapter 3 illustrates that there is sufficient unused groundwater in both the Edwards-Trinity (Plateau) Aquifer and the Edwards (BFZ) Aquifer to accommodate additional irrigation demands.~~

Kinney County has the highest irrigation water use in the Region (~~62~~ 42 percent) and is the only county in which irrigation use is greater than municipal use (Table 2-8). Elsewhere in the Region, most irrigation that occurs is for the watering of pastures and hay fields. Because of the typically rocky and uneven terrain throughout much of the Region, irrigation of commercial row crops is minimal. On a regional basis, water used for irrigation is projected to be held constant at approximately 8,805 acre-feet per year ~~decline slightly~~ over the 50-year planning horizon.~~,~~ ~~from the year 2020 level of 10,929 acre-feet to 10,282 acre-feet by 2070.~~ 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 PWPG is concerned about the accuracy of the irrigation surveys and believes that there is significantly more irrigation water use than is documented. For example, numerous small irrigated exotic and wildlife feed plots are likely not identified. Also, groundwater used to irrigate golf courses, if not provided by municipalities, may not be accounted for in the irrigation survey estimates. These withdrawals may have a significant impact on local supplies.

Table 2-~~7~~8. Irrigation Water Demand Projection
(Acre-Feet per Year)

County	2020	2030	2040	2050	2060	2070
Bandera	946	946	946	946	946	946
Edwards	215	215	215	215	215	215
Kerr	1,342	1,342	1,342	1,342	1,342	1,342
Kinney	3,713	3,713	3,713	3,713	3,713	3,713
Real	270	270	270	270	270	270
Val Verde	2,319	2,319	2,319	2,319	2,319	2,319
County Total Demand	**8,805**	**8,805**	**8,805**	**8,805**	**8,805**	**8,805**

2.2.6 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.

Draft livestock water demand projections are a combination of an average of the 2010-2014 water use survey information provided by the TWDB, which is based on livestock inventory data from the National Agricultural Statistical Service (NASS) and the Texas Department of Agriculture, and per head water use consumptions by animal class (Table 2-9). County level water use estimates are calculated by applying a water use coefficient for each livestock category to county level inventory estimates. ~~utilized an average of TWDB's 2005-2009 livestock water use estimates as the base. Water use estimates are calculated by applying a water use coefficient for each livestock category to county level inventory estimates from Texas Agricultural Statistics Service.~~ The rate of change for projections from the ~~2011~~*2016* *Regional*

Water Plan was then applied to the new base. Many counties chose to hold the base constant throughout the planning horizon.

Table 2-9. Estimated per Head Daily Water Use (in gallons)

TWDB	NASS Data Type	Per Head Daily Water Use
Cattle	Milk	75
	Fed & Other	15
Poultry	Hens	86* (per 1,000 head)
	Broilers	77* (per 1,000 head)
Horses	Horses, Ponies, & Burros	12
Hogs	Hogs	11
Sheep	Sheep	2
Goats	Milk, Meat, Angora	0.5

Source: University of Georgia – College of Agricultural and Environment

For water-supply planning purposes, in the Plateau Region Plan, 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. Kerr County has the greatest livestock water use in the Rregion (Table 2-810).

In recent years, an expanding use of groundwater in the Region has been to fill and maintain artificial lakes that primarily are intended to add aesthetic value to the property. Although not quantified, the amount of water pumped from local aquifers for this purpose is likely significant and is not reflected in the water demand estimates provided in this chapter. To manage the volume of groundwater used for this purpose, the Headwaters Groundwater Conservation District in Kerr County permits a maximum production of one acre-foot (325,851 gallons) per year.

Exotic game ranching has become commonplace throughout the Sstate, and is quite evident in the Plateau Region counties. Bandera and Kerr Counties have the largest population of exotic game in the State (Texas A&M Exotics on the Range). The total number of exotic game likely may equal or even exceed domestic livestock. Yet the livestock water demand projections reported in this *Plan* may not fully reflect this water use.

High game fences that come with the exotic game industry often block the ability of both native and exotic game to access surface water, thus requiring more wells and groundwater use. Groundwater is also often used to irrigate small acreage feed plots for these animals. Future water plans will need to attempt to quantity this specific use and include it in the overall total projected water needs in the State.

In an analysis report prepared for the PWPG during the previous planning period, Water Use by Livestock and Game Animals in the Plateau Regional Water Planning Area, the amount of water used by various exotic game species is estimated. However, the report states that there is insufficient data on the number of animals in the Region to make an estimate of total use. Estimates made by the Real-Edwards Conservation and Reclamation District find that approximately 602 and 233 acre-feet per year in Edwards and Real Counties is consumed by exotic game animals.

Table 2-~~8~~10. Livestock Water Demand Projection
(Acre-Feet per Year)

County	2020	2030	2040	2050	2060	2070
Bandera	243	243	243	243	243	243
Edwards	397	397	397	397	397	397
Kerr	757	757	757	757	757	757
Kinney	224	224	224	224	224	224
Real	151	151	151	151	151	151
Val Verde	410	410	410	410	410	410
County Total Demand	**2,182**	**2,182**	**2,182**	**2,182**	**2,182**	**2,182**

2.2.7 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.

Draft mining water demand projections were developed by combining annual reported water use data (2010-2014), including reuse ad additional oil and gas estimates provided by the TWDB using the FracFocus database. Oil and gas water use estimates are then broken down by water source based on ~~through~~ a TWDB-contracted study with the University of Texas Bureau of Economic Geology (BEG) as summarized in Table 2-11 below. The BEG study estimated current mining water use and projected that use across the planning horizon using data collected from trade, organizations, government agencies, and other industry representatives. County-level projections are compiled as the sum of individual projections for four sub-sector mining categories: oil and gas, aggregates, coal and lignite, and other.

Table 2-11. Estimated Percentages of Reuse and Brackish Water Use in Hydraulic Fracturing

Play	Fresh Water	Reuse / Recycle	Brackish
Permian Farwest	20%	0%	80%
Permian Midland	68%	2%	30%
Anadarko Basin	50%	20%	30%
Barnett Shale	92%	5%	3%
Eagle Ford Shale	80%	0%	20%
East Texas Basin	95%	5%	0%

Source: University of Texas Bureau of Economics Geology, 2012

Although the oil and gas industry is relatively minor compared to other parts of the ~~s~~State, in recent years increased oil and gas exploration activity has occurred in the Plateau Region. Railroad Commission of Texas files list ~~263~~ 90 wells drilled in Edwards County from ~~1999~~ 2010 through ~~2008~~ 2017. As a result, increased water demand is projected for the mining category in Edwards County (Table 2-~~9~~12).

Table 2-~~9~~12. Mining Water Demand Projection
(Acre Feet per Year)

County	2020	2030	2040	2050	2060	2070
Bandera	0	0	0	0	0	0
Edwards	89	89	89	89	89	89
Kerr	76	80	100	102	111	120
Kinney	0	0	0	0	0	0
Real	0	0	0	0	0	0
Val Verde	190	249	259	223	192	171
County Total Demand	**355**	**394**	**424**	**390**	**368**	**356**

2.3 ENVIRONMENTAL AND RECREATIONAL WATER NEEDS

Environmental and recreational water use in the Plateau Region 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 recreational resources are identified and described. In this section, the water resources needed to maintain these functions are discussed. Water-supply sources that serve environmental needs are characterized in Chapter 3 and potential water-supply strategy consequences on the environment are analyzed in Chapter 5.

All living organisms require water. The amount and quality of water required to maintain a viable population, whether it is 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.

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 this *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.

As discussed in Section 2.2.6~~5~~ (Livestock), an expanding use of groundwater in the Region has been to fill and maintain artificial lakes. Although this use may exert stress on the local aquifer system, the resulting impoundments do provide aesthetic value to the property and a water source for wildlife.

Recreational activities that involve human interaction with the outdoors environment are often directly dependent on water resources such as fishing, swimming and boating; while a healthy environment enhances many others, such as hunting, 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 the Plateau Region as well as the multitude of annual visitors to this Region.

In Chapter 5, each water management strategy contains an environmental impact assessment. A review of these strategies 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 a reduction or cessation of spring flow. Also of concern is that lowered water levels could deplete supplies in shallow livestock wells, which 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.