



Chapter 4 Identification of Water Needs

4.1 Introduction

Water needs are identified by calculating the difference between currently available supplies developed in Chapter 3 and the projected demands developed in Chapter 2. This chapter outlines first and second tier water needs scenarios, where the first tier needs are based on all supply limitations identified in Chapter 3 and second tier needs are those needs after conservation and direct reuse strategies have been implemented.

This comparison of developed water supply to demands is made for the region, county, basin, wholesale water provider, and water user group. If the projected demands for an entity exceed the developed supplies, then a need is identified (represented by a negative number). For some users, the supplies may exceed the demands (positive number). For groundwater users, this water is not considered surplus, but a supply that will be available for use after 2070.

4.2 First Tier Water Needs Analysis

As discussed in Chapter 3, the Texas Water Development Board (TWDB) specifies that the currently available supplies be defined as the most restrictive of current water rights, contracts and available yields for surface water and historical use and/or modeled available groundwater (MAG) for groundwater. For the PWPA, geographical and hydrogeological constraints were also considered for irrigation and municipal users of the Ogallala aquifer. For some counties in the region, these constraints are more restrictive than current groundwater regulations. However, this approach provides a reasonable assessment of water demands that may exceed long-term availability.

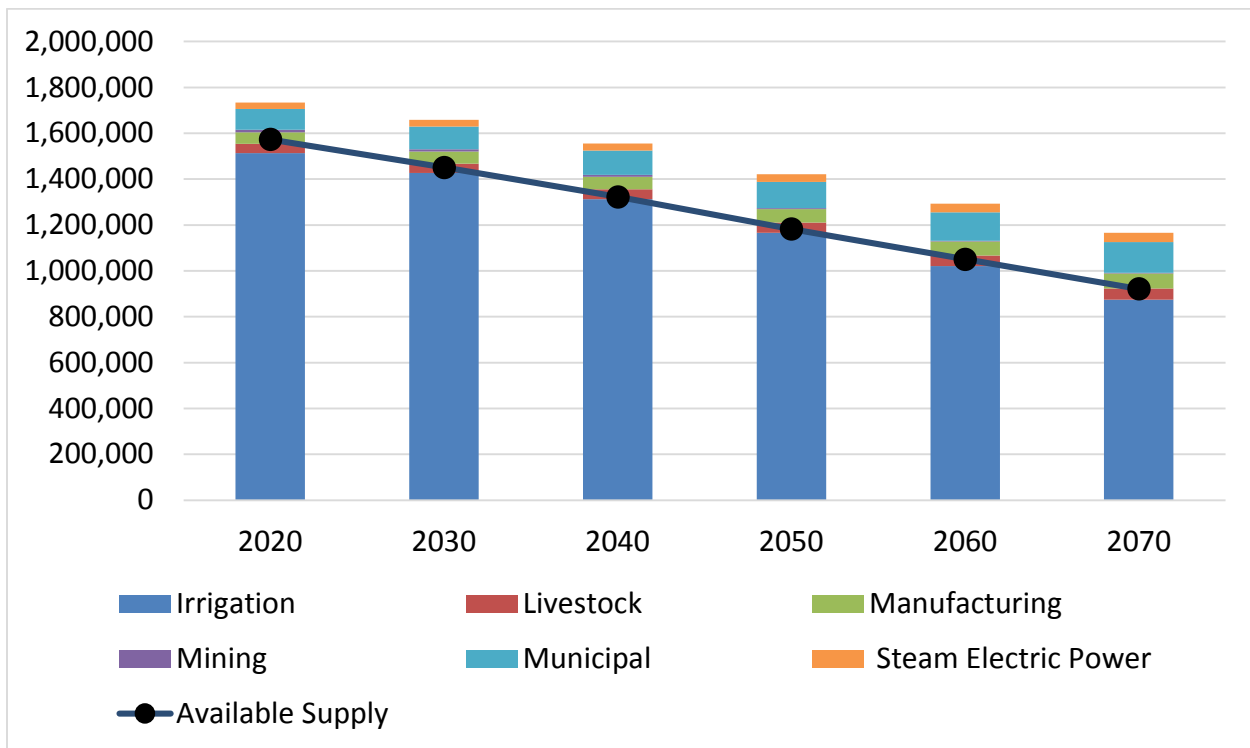
Considering only developed and connected supplies for the PWPA, on a regional basis there is a projected regional need of over 160,000 acre-feet per year in 2020, increasing to a maximum need of nearly 245,000 in 2070. This is shown in Table 4-1 and graphically on Figure 4-1.

Table 4-1: Comparison of Supplies and Demands for the PWPA

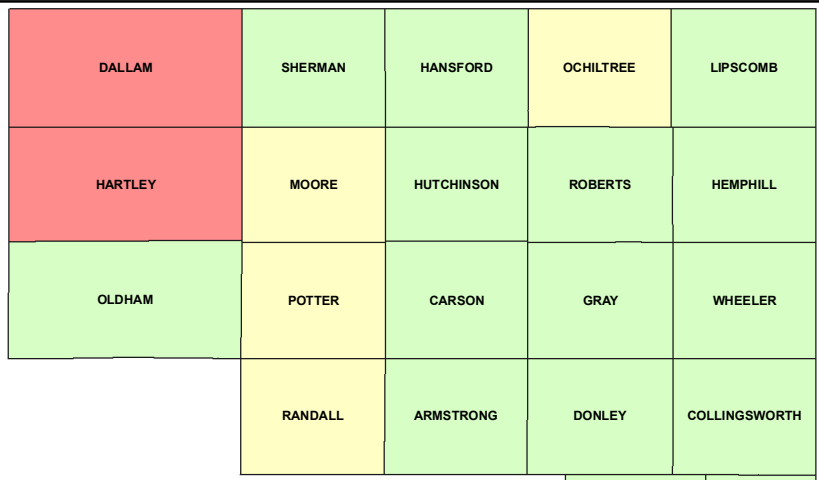
	2020	2030	2040	2050	2060	2070
Supply (Acre-feet)	1,573,184	1,450,997	1,322,418	1,182,693	1,050,684	921,597
Demand (Acre-feet)	1,733,659	1,658,045	1,554,977	1,421,114	1,292,717	1,166,209
Surplus/Need (ac-ft)	-160,475	-207,048	-232,559	-238,421	-242,033	-244,612

Note: This calculation aggregates surpluses and needs for all water users across the region. Consideration of only the needs for individual entities will be higher.

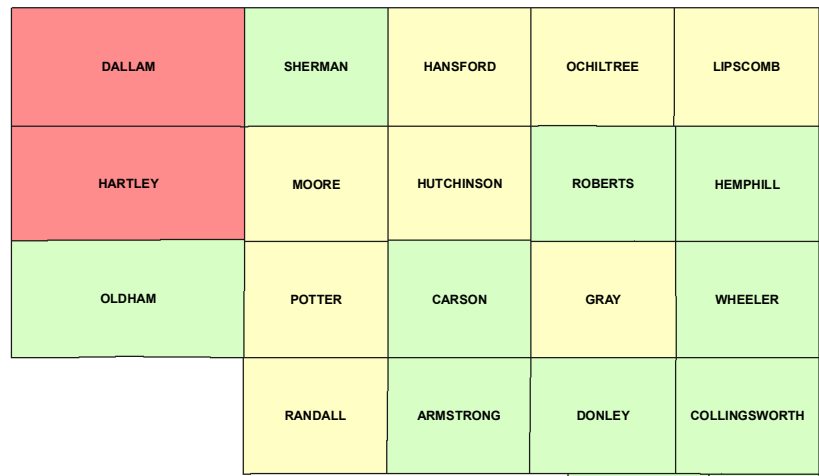
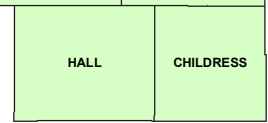
Figure 4-1: PWPA Supplies and Demands (acre-feet/year)



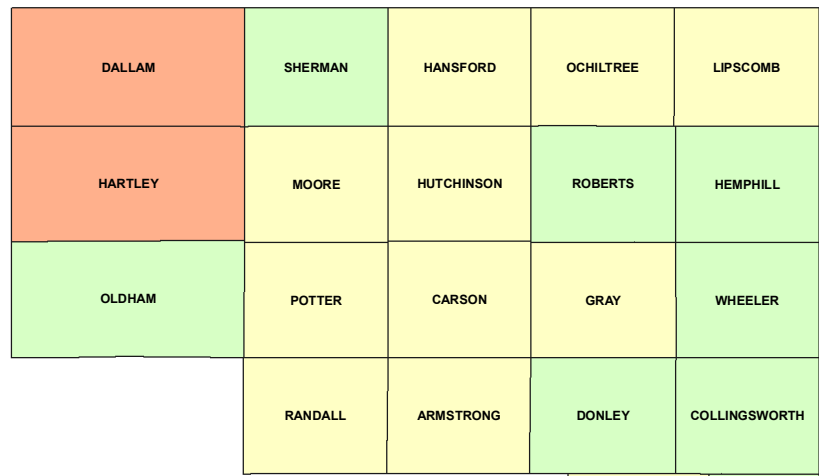
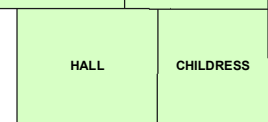
On a county-basis, there are thirteen counties with needs over the planning period. These include Armstrong, Carson, Dallam, Gray, Hall, Hansford, Hartley, Hutchinson, Lipscomb, Moore, Ochiltree, Potter, and Randall. Table 4-2 presents first tier water needs by county. Figure 4-2 shows the spatial distribution of needs in the region for years 2020, 2040 and 2070. Typically the counties with the largest needs are those with large irrigation demands. Based on this analysis, there are significant irrigation needs over the 50-year planning period. The municipal needs shown are attributed to growth, reduction of surface water supplies, limitations in developed water rights, or infrastructure limitations. A brief discussion of these needs is presented in the following section.



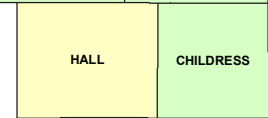
2020



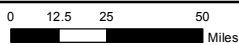
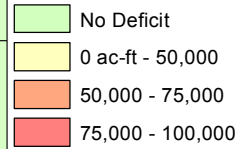
2040



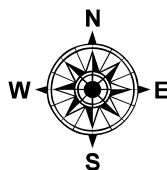
2070



**Needs
(Acre-feet per year)**



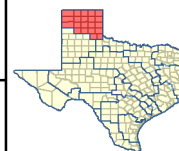
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**PANHANDLE WATER
PLANNING AREA**

NEEDS IN PWPA

Location Map



FIGURE

4-2

Table 4-2: Identification of Water Needs by County (acre-feet/year)

	2020	2030	2040	2050	2060	2070
County	Surplus/Need					
Armstrong	116	67	22	-18	-55	-93
Carson	946	369	191	101	-28	-176
Childress	216	217	217	217	219	219
Collingsworth	965	956	953	953	946	940
Dallam	-79,909	-92,468	-95,342	-88,952	-79,729	-70,514
Donley	186	194	201	203	204	204
Gray	1,356	-816	-1,546	-1,384	-2,280	-3,214
Hall	165	128	116	48	15	-20
Hansford	177	109	-16	-388	-651	-896
Hartley	-77,545	-93,712	-99,092	-93,227	-84,020	-74,803
Hemphill	64	65	67	64	61	58
Hutchinson	137	-1,402	-2,850	-4,329	-5,632	-6,930
Lipscomb	94	91	-6	-240	-365	-483
Moore	-2,600	-4,352	-6,003	-8,931	-15,697	-20,759
Ochiltree	-454	-938	-1,414	-1,856	-2,322	-2,771
Oldham	828	796	801	800	798	795
Potter	-4,895	-11,184	-18,316	-25,217	-31,490	-38,529
Randall	-3,118	-7,716	-12,976	-18,328	-23,677	-28,921
Roberts	451	448	451	369	302	234
Sherman	813	785	773	615	416	219
Wheeler	1,531	1,315	1,208	1,079	951	828
Total	-160,475	-207,048	-232,559	-238,421	-242,033	-244,612

Note: Supply values are shown for the county in which it is used, which may differ from the county of the supply source.

4.2.1 Identified Needs for Water User Groups

A need occurs when developed supplies are not sufficient to meet projected demands. In the PWPA there are thirty-three water user groups (accounting for basin and county designations) with identified needs during the planning period. Of these, there are twenty-five cities and county other water users in fourteen counties that are projected to experience a water need before 2070. The largest needs are attributed to high irrigation use or significant increase in municipal demand and comparably limited groundwater resources in Dallam, Hartley, Moore, Potter, and Randall Counties.

Total needs for all water user groups are projected to be approximately 160,475 acre feet per year in 2020, increasing to 232,559 acre feet per year in 2040 and approximately 244,612 acre-feet per year by the year 2070. Of this amount, irrigation represents approximately 92 percent in the 2020 projections and over 59 percent of the total need in 2070 with needs ranging from 79,000 to 74,000 acre-feet per year. The needs attributed to the other water use categories total approximately 103,000 acre-feet per year in 2070.

A summary of when the individual water user group needs begin by county and demand type is presented in Table 4-3. To account for the level of accuracy of the data, a need is defined as a demand greater than the current supply by more than or equal to 10 acre-feet per year.

Table 4-3: Decade Need Begins by County and Category

County	Irrigation	Municipal	Manufacturing	Mining	Steam Electric Power	Livestock
Armstrong	-	2050	-	-	-	-
Carson	-	2020	-	-	-	-
Childress	-	-	-	-	-	-
Collingsworth	-	-	-	-	-	-
Dallam	2020	2020	-	-	-	-
Donley	-	-	-	-	-	-
Gray	-	2030	-	-	-	-
Hall	-	2050	-	-	-	-
Hansford	-	2040	-	-	-	-
Hartley	2020	2020	-	-	-	-
Hemphill	-	-	-	-	-	-
Hutchinson	-	2020	2030	-	-	-
Lipscomb	-	2040	2040	-	-	-
Moore	2060	2020	2020	-	-	-
Ochiltree	-	2020	-	-	-	-
Oldham	-	-	-	-	-	-
Potter	-	2020	2020	-	-	-
Randall	-	2020	2020	-	-	-
Roberts	-	-	-	-	-	-
Sherman	-	-	-	-	-	-
Wheeler	-	2070	-	-	-	-

Irrigation

Irrigation needs are identified for Dallam, Hartley, and Moore Counties. All of these counties rely heavily on the Ogallala for irrigation supplies. Needs are observed in two counties starting in 2020.

Table 4-4: Projected Irrigation Needs in the PWPA (acre-feet/year)

COUNTY	2020	2030	2040	2050	2060	2070
Dallam	79,399	91,675	94,226	87,452	77,836	68,218
Hartley	77,305	93,368	98,650	92,699	83,415	74,130
Moore					3,882	6,171
Total	156,704	185,043	192,876	180,151	165,133	148,520

Municipal

Municipal supplies in the PWPA are typically groundwater while surface water is used in counties with limited groundwater and by river authorities and their member cities to supply their customers. For some cities, there is additional groundwater supply but it is not fully developed. A list of the municipalities indicating a need is presented in Table 4-5.

Table 4-5: Projected Municipal Needs in the PWPA (acre-feet/year)

	2020	2030	2040	2050	2060	2070
Amarillo	4,508	12,441	21,815	31,334	39,861	49,182
Booker	0	0	79	264	359	451
Borger	93	532	952	1,343	1,647	1,927
Cactus	583	778	974	1,170	1,347	1,529
Canyon	1,009	1,589	2,176	2,770	3,779	4,313
Claude	0	0	0	35	72	110
County-Other Moore	0	0	0	13	21	30
County-Other Potter	683	956	1,262	1,583	1,953	2,548
County-Other Randall	637	978	1,339	1,731	2,172	2,638
Dalhart	749	1,138	1,558	1,982	2,399	2,807
Dumas	290	1,021	1,785	2,679	3,550	4,437
Gruver	0	0	111	196	272	344
Happy	1	0	1	1	3	6
Lake Tanglewood	172	200	225	248	266	284
McLean	0	0	0	89	135	182
Memphis	0	0	0	68	100	133
Pampa	0	1,752	2,491	2,190	2,985	3,806
Panhandle	89	521	582	577	576	576
Perryton	478	963	1,438	1,877	2,341	2,786
Spearman	0	0	0	283	466	634
Stinnett	0	0	0	115	165	216
Sunray	0	232	501	633	752	847
TCW Supply	75	251	375	466	535	569
Texline	0	0	0	46	99	161
Wheeler	184	249	308	365	412	453
Total	9,551	23,600	37,971	52,058	66,265	80,969

Manufacturing

There are five counties with manufacturing needs identified in the PWPA. Most manufacturing interests buy water from retail providers or develop their own groundwater supplies. For each of these counties, much of the need is associated with wholesale water providers. For Moore County, these needs are the result of limited groundwater supplies for the city of Cactus. In Potter and Randall Counties, the needs are associated with needs identified with the city of Amarillo. In Hutchinson County the need is associated with the city of Borger. In Lipscomb County the need is associated with the city of Booker.

Table 4-6: Projected Manufacturing Needs in the PWPA (acre-feet/year)

	2020	2030	2040	2050	2060	2070
Hutchinson	120	994	1,739	2,614	3,487	4,416
Lipscomb	0	0	21	69	97	124
Moore	1,877	2,346	2,754	4,445	6,147	7,746
Potter	2,296	3,783	5,239	6,714	8,130	9,633
Randall	57	182	295	401	508	619
Total	4,017	6,986	10,048	14,242	18,369	22,538

Mining

There are no mining needs in the PWPA.

Steam Electric Power

There are no steam electric needs in the PWPA

Livestock

There are no identified livestock needs in the PWPA. This is because it was assumed if there was sufficient supply available within the county, this supply would be developed by livestock producers. For most counties, water for livestock is from groundwater and/or local stock ponds. In the heavily pumped counties, there will be competition for groundwater supplies. It is assumed that the decrease in water used for irrigation will be available for livestock use.

4.2.2 Identified Needs for Wholesale Water Providers

There are six wholesale water providers located in the PWPA. Of these entities, four are projected to have needs within the planning period: CRMWA, City of Amarillo, City of Borger, and City of Cactus. Much of the early needs are associated with the loss of Lake Meredith as a reliable supply and infrastructure constraints associated with current well field production. These needs increase over the planning cycle due to growth and reduced availability from the Ogallala aquifer with current well fields. Table 4-7 shows the projected water supply needs for the wholesale water providers in the PWPA. Greenbelt MIWA and

the Palo Duro River Authority do not show a water need. However, both water providers are considering developing water management strategies to help meet their customers’ needs and prepare for potential impacts to current water sources associated with the ongoing drought.

Table 4-7: Projected Needs for Wholesale Providers in the PWPA (ac-ft/yr)

Wholesale Provider	2020	2030	2040	2050	2060	2070
Amarillo	5,298	14,566	25,428	36,325	45,436	55,926
Borger	0	1,335	2,679	3,982	5,190	6,438
Cactus	2,518	3,199	3,821	4,384	4,914	5,465
CRMWA	31,450	48,351	58,636	70,974	75,959	80,936

4.2.3 Summary of First Tier Water Needs

On a water user group basis, the total demands exceed the total developed supply starting in 2020, largely attributed to the geographical constraints of the demand centers and developed supplies. Most of the needs are associated with large irrigation demands that cannot be met with groundwater sources beneath currently irrigated lands. Other needs are due to limitations of infrastructure and/or growth. The evaluation of regional water supplies indicates that groundwater supplies could be further developed. However, often the needed infrastructure is not developed or the potential source is not located near a water supply need. The first tier needs report provided by TWDB is provided in Attachment 4-1 at the end of this chapter. Further review of the region’s options and strategies to meet needs is explored in more detail in Chapter 5 and the impacts of these strategies on water quality are discussed in Chapter 6.

4.3 Second Tier Water Needs Analysis

(To be provided in final report.) The second tier water needs analysis compares currently available supplies with demands after reductions from conservation and direct reuse. Conservation and direct reuse are both considered water management strategies and are discussed further in Chapter 5.

4.3.1 Summary of Second Tier Water Needs for Water User Groups

(To be provided in final report.)

4.3.2 Summary of Second Tier Water Needs for Wholesale Water Providers

(To be provided in final report.)



Attachment 4-1

DB17 WUG (NEEDS)/SURPLUS

WUG (NEEDS)/SURPLUS

REGION A	WUG (NEEDS)/SURPLUS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
GRAY COUNTY						
CANADIAN BASIN						
PAMPA	304	(1,752)	(2,491)	(2,190)	(2,985)	(3,806)
COUNTY-OTHER	0	0	0	0	0	0
MANUFACTURING	238	173	225	208	189	162
MINING	0	0	0	0	0	0
STEAM ELECTRIC POWER	0	0	0	0	0	0
LIVESTOCK	205	202	199	196	193	189
IRRIGATION	0	0	0	0	0	0
RED BASIN						
MCLEAN	40	18	1	(89)	(135)	(182)
COUNTY-OTHER	0	0	0	0	0	0
MANUFACTURING	12	9	12	11	10	9
MINING	0	0	0	0	0	0
LIVESTOCK	557	534	508	480	448	414
IRRIGATION	0	0	0	0	0	0
HALL COUNTY						
RED BASIN						
MEMPHIS	45	12	0	(68)	(100)	(133)
COUNTY-OTHER	50	47	49	50	50	50
LIVESTOCK	70	69	67	66	65	63
IRRIGATION	0	0	0	0	0	0
HANSFORD COUNTY						
CANADIAN BASIN						
GRUVER	61	2	(111)	(196)	(272)	(344)
SPEARMAN	0	0	0	(283)	(466)	(634)
COUNTY-OTHER	62	55	43	33	24	14
MANUFACTURING	32	30	30	36	41	46
MINING	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	22	22	22	22	22	22
HARTLEY COUNTY						
CANADIAN BASIN						
DALHART	(240)	(344)	(442)	(528)	(605)	(673)
COUNTY-OTHER	0	0	0	0	0	0
MANUFACTURING	0	0	0	0	0	0
MINING	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	(77,305)	(93,368)	(98,650)	(92,699)	(83,415)	(74,130)
HEMPHILL COUNTY						
CANADIAN BASIN						
CANADIAN	0	0	0	0	0	0
COUNTY-OTHER	17	20	23	23	23	23
MANUFACTURING	0	0	0	0	0	0
MINING	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	0	0	0	0	0	0
RED BASIN						
COUNTY-OTHER	47	45	44	41	38	35

WUG (NEEDS)/SURPLUS

REGION A	WUG (NEEDS)/SURPLUS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
HEMPHILL COUNTY						
RED BASIN						
MINING	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	0	0	0	0	0	0
HUTCHINSON COUNTY						
CANADIAN BASIN						
BORGER	38	(397)	(952)	(1,343)	(1,647)	(1,927)
FRITCH	0	0	0	0	0	0
STINNETT	55	15	0	(115)	(165)	(216)
TCW SUPPLY INC	(75)	(251)	(375)	(466)	(535)	(569)
COUNTY-OTHER	143	129	120	113	106	102
MANUFACTURING	(120)	(994)	(1,739)	(2,614)	(3,487)	(4,416)
MINING	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	96	96	96	96	96	96
LIPSCOMB COUNTY						
CANADIAN BASIN						
BOOKER	0	0	(77)	(257)	(348)	(434)
COUNTY-OTHER	28	25	26	20	14	9
MANUFACTURING	0	0	(21)	(69)	(97)	(124)
MINING	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	66	66	66	66	66	66
MOORE COUNTY						
CANADIAN BASIN						
CACTUS	(583)	(777)	(974)	(1,170)	(1,347)	(1,530)
DUMAS	(290)	(1,021)	(1,785)	(2,679)	(3,550)	(4,437)
FRITCH	3	2	2	2	2	1
SUNRAY	105	(232)	(501)	(633)	(752)	(847)
COUNTY-OTHER	35	16	2	(13)	(21)	(30)
MANUFACTURING	(1,877)	(2,346)	(2,754)	(4,445)	(6,147)	(7,746)
MINING	0	0	0	0	0	0
STEAM ELECTRIC POWER	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	7	7	7	7	(3,882)	(6,171)
OCHILTREE COUNTY						
CANADIAN BASIN						
BOOKER	0	0	(2)	(7)	(11)	(17)
PERRYTON	(478)	(963)	(1,438)	(1,877)	(2,341)	(2,786)
COUNTY-OTHER	24	25	26	28	30	32
MINING	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	0	0	0	0	0	0
OLDHAM COUNTY						
CANADIAN BASIN						
VEGA	18	5	9	11	11	11
COUNTY-OTHER	299	282	286	286	287	287
MINING	0	0	0	0	0	0

WUG (NEEDS)/SURPLUS

REGION A	WUG (NEEDS)/SURPLUS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
OLDHAM COUNTY						
CANADIAN BASIN						
LIVESTOCK	503	501	499	497	495	492
IRRIGATION	0	0	0	0	0	0
RED BASIN						
COUNTY-OTHER	0	0	0	0	0	0
MINING	0	0	0	0	0	0
LIVESTOCK	8	8	7	6	5	5
IRRIGATION	0	0	0	0	0	0
POTTER COUNTY						
CANADIAN BASIN						
AMARILLO	2,979	474	(3,195)	(6,913)	(9,969)	(13,396)
COUNTY-OTHER	(271)	(446)	(642)	(847)	(1,084)	(1,336)
MANUFACTURING	924	543	171	(136)	(444)	(753)
MINING	0	0	0	0	0	0
STEAM ELECTRIC POWER	0	0	0	0	0	0
LIVESTOCK	164	163	161	160	158	155
IRRIGATION	181	37	0	0	0	7
RED BASIN						
AMARILLO	(5,467)	(7,322)	(8,813)	(10,316)	(11,949)	(13,661)
COUNTY-OTHER	(412)	(510)	(620)	(736)	(869)	(1,212)
MANUFACTURING	(3,023)	(4,154)	(5,410)	(6,578)	(7,686)	(8,880)
MINING	0	0	0	0	0	0
LIVESTOCK	30	30	30	29	29	29
IRRIGATION	0	0	1	121	323	519
RANDALL COUNTY						
RED BASIN						
AMARILLO	(2,020)	(5,593)	(9,807)	(14,105)	(17,944)	(22,125)
CANYON	(1,009)	(1,589)	(2,176)	(2,770)	(3,779)	(4,313)
HAPPY	4	5	5	5	3	1
LAKE TANGLEWOOD	(172)	(200)	(225)	(248)	(266)	(284)
COUNTY-OTHER	(637)	(978)	(1,339)	(1,731)	(2,172)	(2,638)
MANUFACTURING	(41)	(169)	(295)	(401)	(508)	(619)
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	762	814	868	927	994	1,063
ROBERTS COUNTY						
CANADIAN BASIN						
MIAMI	317	316	318	237	171	104
COUNTY-OTHER	12	10	12	12	12	12
MINING	0	0	0	0	0	0
LIVESTOCK	103	103	102	101	100	99
IRRIGATION	0	0	0	0	0	0
RED BASIN						
COUNTY-OTHER	4	4	4	4	4	4
MINING	0	0	0	0	0	0
LIVESTOCK	15	15	15	15	15	15
IRRIGATION	0	0	0	0	0	0

WUG (NEEDS)/SURPLUS

REGION A	WUG (NEEDS)/SURPLUS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
SHERMAN COUNTY						
CANADIAN BASIN						
STRATFORD	781	753	741	583	384	187
COUNTY-OTHER	0	0	0	0	0	0
MINING	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	32	32	32	32	32	32
WHEELER COUNTY						
RED BASIN						
SHAMROCK	607	559	515	451	382	312
WHEELER	(184)	(249)	(308)	(365)	(412)	(453)
COUNTY-OTHER	95	94	92	83	72	60
MINING	0	0	0	0	0	0
LIVESTOCK	118	15	13	11	8	6
IRRIGATION	895	896	897	899	901	903