6. Water Demand

This section presents information on the Northeast New Mexico Water Planning Region's current and projected future water demand. Section 6.1 discusses current and historical water uses, and demographic and economic trends are included in Section 6.2. Based on historical uses and trends, projected future water demands for the Northeast Region are presented in Section 6.3.

6.1 Present and Historical Water Use

Water use is generally analyzed in terms of withdrawals (also referred to as diversions) and depletions. Withdrawals are the total amount of water diverted (from a surface water source) or pumped (from a groundwater source). Some of the total withdrawal amounts eventually return to the surface water or groundwater system, becoming "return flow." For example, flow in agricultural drainage ditches is considered return flow because that water either seeps into the ground (in unlined ditches) or discharges to a surface water body. The amount of water withdrawn less any water that returns to surface water or groundwater systems is referred to as a depletion.

Historical water use (Table 6-1; Figure 6-1) data were obtained from water use reports published by the OSE, which tracks water use in New Mexico and reports the data every five years. The OSE data have been supplemented with information supplied by users in the region. The OSE estimates withdrawals, depletions, and return flow in several use categories, including public water supply and self-supplied domestic, irrigated agriculture, self-supplied commercial, industrial, mining, power, and reservoir evaporation. Table 6-1 shows diversions and depletions in each category from 1975 through 2000 based on the OSE five-year inventories (Sorensen, 1977; Sorensen, 1982; Wilson, 1986; Wilson, 1992; Wilson and Lucero, 1997; Wilson et al., 2003), and Appendix E1 presents the same data, subdivided by county. Figure 6-1 shows diversions by category for 1975 through 2000.

The OSE has made changes in the categorization and reporting of water demand data over time. These changes include:

Table 6-1. Northeast New Mexico Water Planning Region Water Use, 1975 Through 2000

Use Category	Withdrawal (acre-feet)		Depletion (acre-feet)		Return Flow (acre-feet)		Withdrawal (acre-feet)	Total Depletion (acre-feet)	Total Return Flow (acre-feet)
	Surface Water	Groundwater	Surface Water	Groundwater	Surface Water	Groundwater			
2000 Water Year									
Commercial (self-supplied)	0	392	0	388	0	4	392	388	4
Domestic (self-supplied)	0	849	0	849	0	0	849	849	0
Industrial (self-supplied)	0	0	0	0	0	0	0	0	0
Irrigated agriculture	114,339	431,985	37,831	360,195	76,508	71,790	546,324	398,026	148,298
Livestock (self-supplied)	562	11,932	562	11,932	0	0	12,494	12,494	0
Mining (self-supplied)	0	0	0	0	0	0	0	0	0
Power (self-supplied)	0	17	0	17	0	0	17	17	0
Public water supply	0	15,782	0	8,974	0	6,808	15,782	8,974	6,808
Reservoir evaporation	33,417	0	33,417	0	0	0	33,417	33,417	0
Total	148,318	460,957	71,810	382,355	76,508	78,602	609,275	454,165	155,110
1995 Water Year									
Commercial (self-supplied)	0	392	0	325	0	67	392	325	67
Domestic (self-supplied)	0	831	0	374	0	457	831	374	457
Industrial (self-supplied)	0	19	0	19	0	0	19	19	0
Irrigated agriculture	123,113	509,326	41,793	419,756	81,320	89,570	632,439	461,549	170,890
Livestock (self-supplied)	472	7,431	472	7,057	0	374	7,902	7,528	374
Mining (self-supplied)	0	54	0	22	0	32	54	22	32
Power (self-supplied)	0	13	0	13	0	0	13	13	0
Public water supply	81	17,535	70	9,776	11	7,760	17,616	9,845	7,771
Reservoir evaporation	33,417	0	33,417	0	0	0	33,417	33,417	0
Total	157,082	535,601	75,751	437,341	81,331	98,260	692,683	513,092	179,591

Table 6-1. Northeast New Mexico Water Planning Region Water Use, 1975 Through 2000

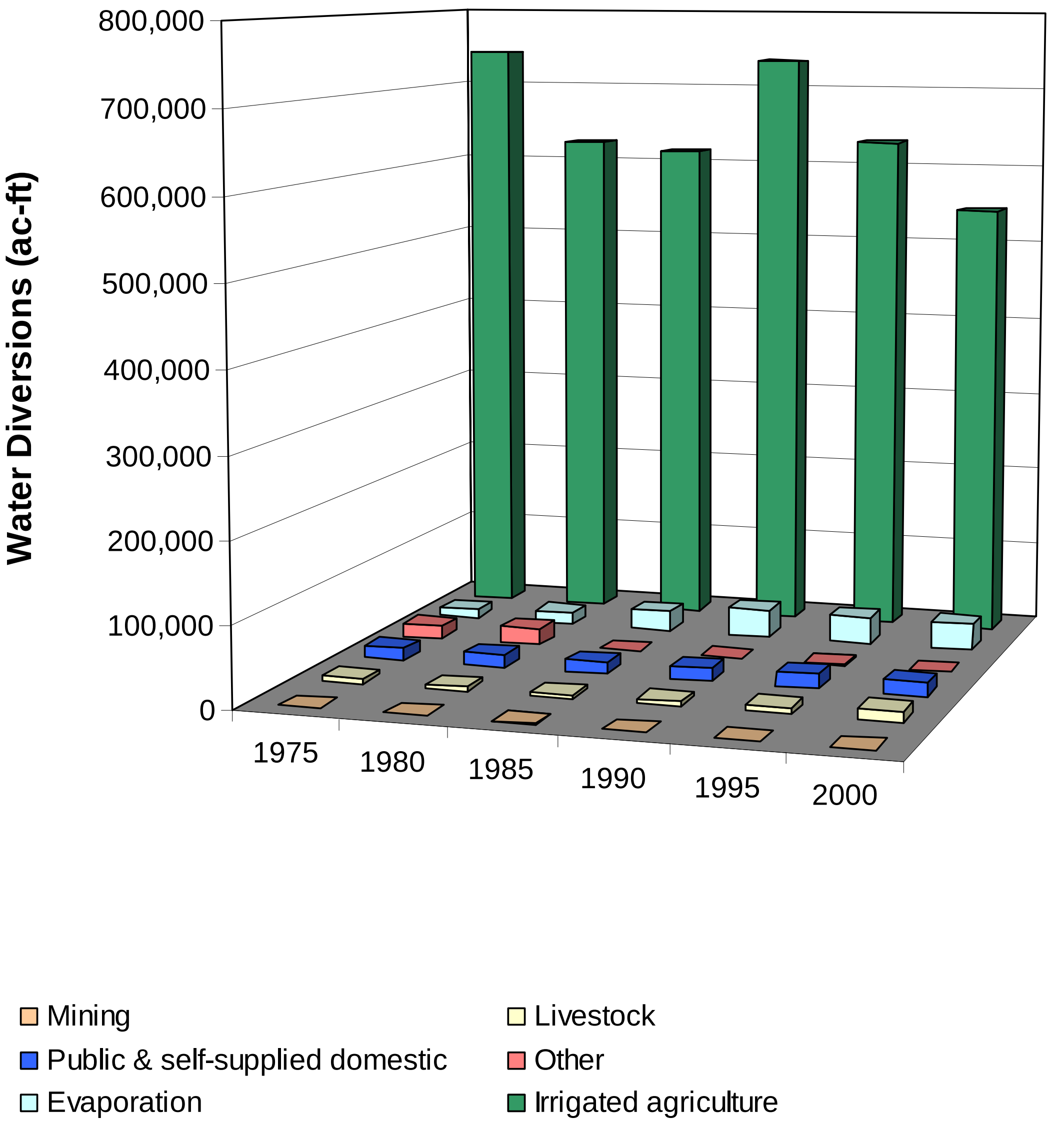
Use Category	Withdrawal (acre-feet)		Depletion (acre-feet)		Return Flow (acre-feet)		Withdrawal (acre-feet)	Total Depletion (acre-feet)	Total Return Flow (acre-feet)
	Surface Water	Groundwater	Surface Water	Groundwater	Surface Water	Groundwater			
1990 Water Year									
Commercial (self-supplied)	0	372	0	328	0	44	372	328	44
Domestic (self-supplied)	0	857	0	386	0	471	857	386	471
Industrial (self-supplied)	0	52	0	52	0	0	52	52	0
Irrigated agriculture	85,442	650,534	34,784	537,829	50,658	112,705	735,976	572,613	163,363
Livestock (self-supplied)	463	4,857	463	4,739	0	118	5,320	5,201	118
Mining (self-supplied)	0	88	0	22	0	66	88	22	66
Power (self-supplied)	0	0	0	0	0	0	0	0	0
Public water supply	81	15,808	70	8,666	11	7,142	15,889	8,736	7,154
Reservoir evaporation	34,534	0	34,534	0	0	0	34,534	34,534	0
Total	120,520	672,568	69,850	552,022	50,669	120,547	793,088	621,872	171,216
1985 Water Year									
Commercial	0	0	0	0	0	0	0	0	0
Urban	0	12,013	0	5,897	0	6,116	12,013	5,897	6,116
Rural	0	1,628	0	804	0	824	1,628	804	824
Industrial	0	28	0	15	0	13	28	15	13
Irrigated agriculture	83,151	533,144	24,807	331,778	58,344	201,366	616,295	356,585	259,710
Livestock	2,010	2,579	2,010	2,469	0	110	4,589	4,479	110
Minerals	0	717	0	82	0	635	717	82	635
Power	0	0	0	0	0	0	0	0	0
Stockpond evaporation	10,613	0	10,613	0	0	0	10,613	10,613	0
Military	0	1,330	0	798	0	532	1,330	798	532
Fish and wildlife	221	0	221	0	0	0	221	221	0

Table 6-1. Northeast New Mexico Water Planning Region Water Use, 1975 Through 2000

Use Category	Withdrawal (acre-feet)		Depletion (acre-feet)		Return Flow (acre-feet)		Withdrawal (acre-feet)	Total Depletion (acre-feet)	Total Return Flow (acre-feet)
	Surface Water	Groundwater	Surface Water	Groundwater	Surface Water	Groundwater			
1985 Water Year (cont.)									
Recreation	121	606	87	402	34	204	727	489	238
Reservoir evaporation	14,116	0	14,116	0	0	0	14,116	14,116	0
Total	110,232	552,045	51,854	342,245	58,378	209,800	662,277	394,099	268,178
1980 Water Year									
Commercial	0	34	0	20	0	14	34	20	14
Urban	0	12,014	0	5,894	0	6,120	12,014	5,894	6,120
Rural	0	1,502	0	738	0	764	1,502	738	764
Industrial	0	17	0	10	0	7	17	10	7
Irrigated agriculture	82,490	543,240	32,540	378,490	49,950	164,750	625,730	411,030	214,700
Livestock	2,160	2,490	2,160	2,425	0	65	4,650	4,585	65
Minerals	0	668	0	67	0	601	668	67	601
Power	0	54	0	6	0	48	54	6	48
Stockpond evaporation	10,613	0	10,613	0	0	0	10,613	10,613	0
Military	0	2,198	0	1,319	0	879	2,198	1,319	879
Fish and wildlife	20,221	0	20,221	0	0	0	20,221	20,221	0
Recreation	102	535	96	405	6	130	637	501	136
Reservoir evaporation	4,694	0	4,694	0	0	0	4,694	4,694	0
Total	120,280	562,752	70,324	389,374	49,956	173,378	683,032	459,698	223,334
1975 Water Year									
Manufacturing	0	260	0	157	0	103	260	157	103
Urban	0	11,956	0	5,380	0	6,576	11,956	5,380	6,576
Rural	0	1,317	0	650	0	667	1,317	650	667

Table 6-1. Northeast New Mexico Water Planning Region Water Use, 1975 Through 2000
Page 4 of 4

Use Category	Withdrawal (acre-feet)		Depletion (acre-feet)		Return Flow (acre-feet)		Withdrawal (acre-feet)	Total Depletion (acre-feet)	Total Return Flow (acre-feet)
	Surface Water	Groundwater	Surface Water	Groundwater	Surface Water	Groundwater			
1975 Water Year (cont.)									
Irrigated agriculture	67,060	676,970	24,680	372,280	42,380	304,690	744,030	396,960	347,070
Livestock	3,029	3,028	3,029	3,028	0	0	6,057	6,057	0
Minerals	0	706	0	91	0	615	706	91	615
Power	0	146	0	146	0	0	146	146	0
Stockpond evaporation	9,601	0	9,601	0	0	0	9,601	9,601	0
Military	0	1,765	0	1,059	0	706	1,765	1,059	706
Fish and wildlife	15,928	0	15,928	0	0	0	15,928	15,928	0
Recreation	0	0	0	0	0	0	0	0	0
Reservoir evaporation	1,900	0	1,900	0	0	0	1,900	1,900	0
Playa lake evaporation	10,000	0	10,000	0	0	0	10,000	10,000	0
Total	107,518	696,148	65,138	382,791	42,380	313,357	803,666	447,929	355,737



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NORTHEAST NEW MEXICO REGIONAL WATER PLAN

Historical Water Diversions
1975 Through 2000

Daniel B. Stephens & Associates, Inc.

3/21/07

Figure 6-1

- Fish and wildlife and recreation were previously reported as separate categories (1975 through 1985), but are now included as part of the commercial category.

- Rural, urban, and military uses were separate categories until 1990, when they were replaced with the public water supply and self-supplied domestic categories.

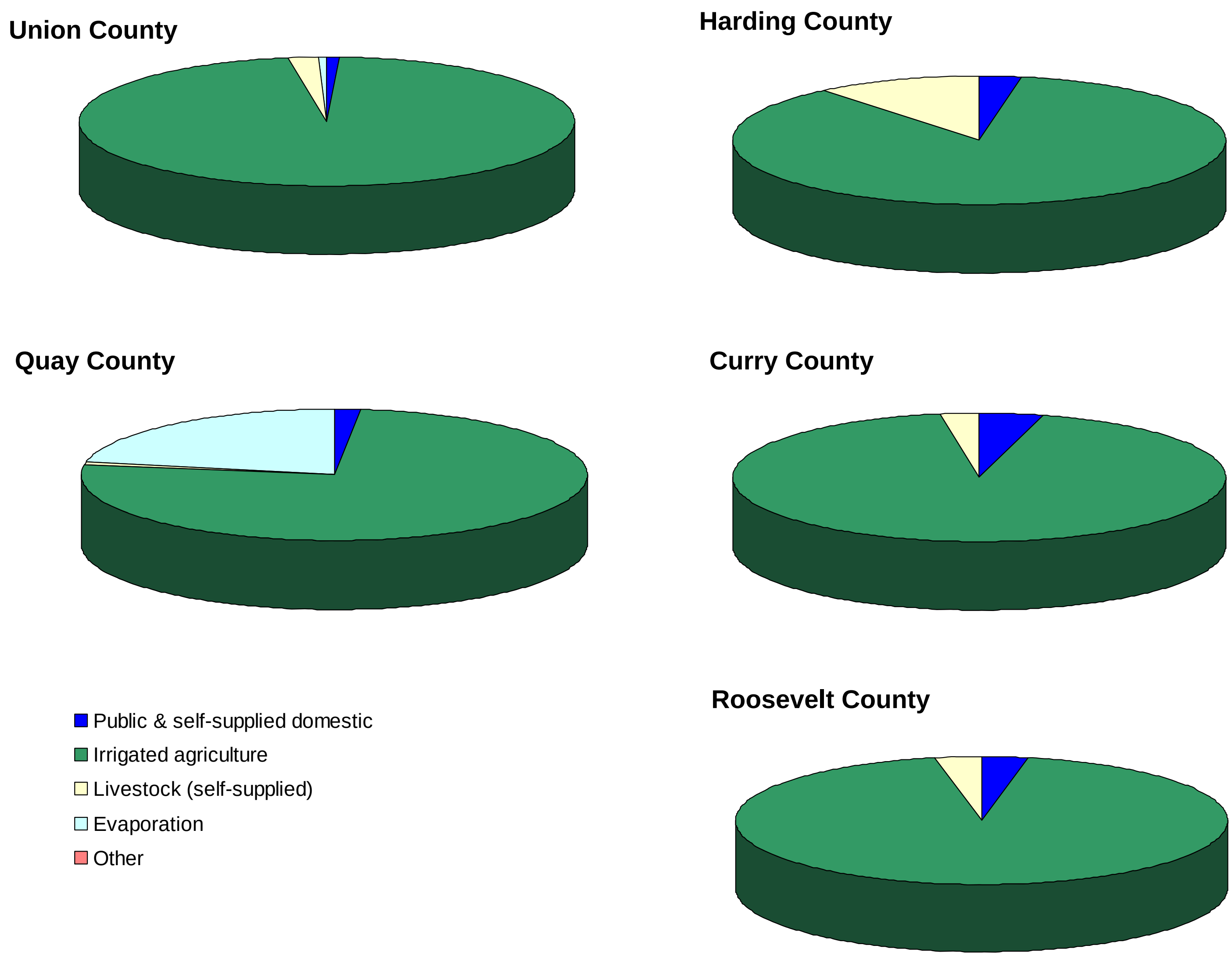
- The OSE stopped reporting stock pond evaporation as a separate category after 1985.

The OSE data include only the amount of water use due to human activities, either direct use by people or indirect use through man-made structures (e.g., reservoir evaporation), and thus do not include natural riparian consumption (estimates of riparian consumption are provided in Section 7). Information for each of the current OSE categories is summarized and discussed in Sections 6.1.1 through 6.1.6; water use in 2000 in each category is illustrated by county in Figure 6-2. Surface water use in the Dry Cimarron and Canadian River basins, and groundwater use by county are discussed in Section 7.

6.1.1 Public Water Supply

This category includes community water systems that rely on surface water and/or groundwater diversions other than private domestic wells and that consist of common collection, treatment, storage, and distribution facilities operated for the delivery of water to multiple service connections (Wilson et al., 2003). Water used for the irrigation of self-supplied golf courses, playing fields, and parks, or water used to maintain the water level in ponds and lakes owned and operated by a municipality or water utility is also included in this category. Inclusion of these uses allows comparison of the total amount of water used by the system to the water rights owned by these public water suppliers.

A detailed water use survey was prepared and discussed with public water suppliers in the region, and water use data, including pumped and metered water quantities for the years 2000 through 2004 (Table 6-2 and Appendix E2), were obtained from selected communities in the region. Information compiled from surveys is summarized in Table 6-2 and Appendix E2, Table E2-1. Of the 25 entities contacted; all but 2 (the Village of Floyd and Cannon AFB) responded. None of the counties in the region operate a water system.



NORTHEAST NEW MEXICO REGIONAL WATER PLAN

Water Diversions in 2000

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3/21/07

Figure 6-2

Table 6-2. Summary of Municipal Water System Use

Location	Estimated Population Served [a]	2000 Water Use (ac-ft)			2001 Water Use (ac-ft)			2002 Water Use (ac-ft)			2003 Water Use (ac-ft)			2004 Water Use (ac-ft)		
		Produced	Sold	NRW (%)	Produced	Sold	NRW (%)	Produced	Sold	NRW (%)	Produced	Sold	NRW (%)	Produced	Sold	NRW (%)
Union County																
Clayton	2,400	767	NM	---	512	NM	---	601	NM	---	527	NM	---	429	NM	---
Des Moines	250	---	---	---	---	---	---	---	---	---	---	---	---	31	22	32
Grenville	28	---	---	---	---	---	---	---	---	---	---	---	---	2	2	3
Harding County																
Roy	296	---	---	---	---	---	---	---	---	---	---	---	---	55	NM	---
Mosquero	120	---	---	---	---	---	---	---	---	---	---	---	---	16	14	13
Quay County																
Logan	1,097	377	NM	---	262	NM	---	306	NM	---	334	NM	---	265	243	8
Tucumcari	5,989	1,725	NM	---	1,603	NM	---	1,646	NM	---	1,465	NM	---	1,333	243	10
San Jon	308	67	NM	---	59	NM	---	59	NM	---	---	---	---	63	53	16
House	75	14	NM	---	21	NM	---	24	NM	---	38	NM	---	21	---	---
Curry County																
Clovis	32,667	---	---	---	---	---	---	---	---	---	7,039	5,860	17	6,256	5,429	13
Melrose	753	172	NM	---	148	NM	---	135	NM	---	149	NM	---	141	NM	---
Cannon AFB [b]	6,200 [d]	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Texico	1,000	237	NM	---	211	NM	---	228	NM	---	236	NM	---	185	NM	---
Grady	98	---	---	---	NM	18	---	NM	15	---	NM	16	---	NM	20	---
Roosevelt County																
Portales	17,721	4,408	3,905	11	4,172	3,775	10	4,255	3,873	9	4,505	4,138	8	4,506	4,139	8
Floyd [b]	78	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Elida	183	---	---	---	---	---	---	---	---	---	33 c	NM	---	37	NM	---
Dora	160	40	NM	---	39	NM	---	31	NM	---	36	NM	---	26	22	14
Causey	75	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Source: DBS&A water system survey (Barnes, 2005), unless otherwise noted

NRW = Non-revenue water (difference between produced and sold water)
--- = No data provided
NM = Not measured

[a] Estimated population in the water service area may differ from the estimated population in the incorporated community discussed in Section 6.2.
[b] No information received for this water system
[c] Incomplete data (no data for January through March)
[d] Source CH2MHill, 2005c

All of the 25 responding municipalities rely entirely on groundwater for their water supply. In many cases, the population reported by the water system coincides with the census, but some variations from census data sometimes occur when water systems serve areas outside of incorporated boundaries. For the entities that didn't respond to the survey, the Village of Floyd population served by the water system was assumed to be the population reported in the 2000 U.S. Census, and the Cannon AFB water system population was taken from a recent technical memorandum (CH2M Hill, 2005c). Community contact and infrastructure data are provided in Appendix E2, Table E2-1. Monthly water demand data were available for Clovis, Des Moines, Dora, Elida, Grady, Grenville, House, Logan, Melrose, Mosquero, Texico, and Tucumcari and are presented in Appendix E2, Table E2-2.

Table 6-3 shows the overall per capita demand for each county based on the total diversions for all public water supply systems in the county, as reported by the OSE. The per capita demands shown include commercial use supplied by the municipal systems as well as watering of public parks, golf courses, and other landscaping; consequently they are not representative of individual residential water use. The municipal well withdrawals listed in this table are for the most recent year of record (2000).

Table 6-3. Summary of Per Capita Demand for Public Supply Wells

County	Municipal Well Withdrawals [a] (ac-ft/yr)	Per Capita Demand					
		Based on 2004 Population Data			Based on 2000 Census Data		
		Population Served [b]	(ac-ft/yr)	(gpd)	Population Served [c]	(ac-ft/yr)	(gpd)
Union	584.60	2,678	0.22	195	2,726	0.21	191
Harding	83.59	416	0.20	179	424	0.20	176
Quay	2,172.44	7,469	0.29	260	7,461	0.29	260
Curry	8,416.64	34,518	0.24	218	34,566	0.24	217
Roosevelt	4,524.90	16,801	0.27	240	11,574	0.39	349

[a] Wilson et al., 2003 (withdrawals for 2000)
[b] Data for 2004 supplied by individual water systems (Barnes, 2005)
[c] U.S. Census, 2000

ac-ft/yr = Acre-feet per year
gpd = Gallons per day

Per capita demand was calculated using (1) population data supplied by the municipalities, which reflect the number of people served by public wells in 2004, and (2) 2000 Census data (Table 6-3). The 2004 service area populations and 2000 U.S. Census populations are very similar, resulting in near identical calculations of per capita demand, except for Roosevelt County. The Roosevelt County difference is largely due to a difference in the 2004 reported service population of 15,005 for Portales, compared to a population of 11,131 reported on the 2000 U.S. Census. This discrepancy can be explained by the fact that Portales serves a significant population that lives outside the city limits. Because the Census municipal populations do not reflect the entire population served by public systems in Roosevelt County, use of these figures results in an artificially high per capita demand for the county; the 2004 populations supplied by the water systems (Table 6-3) are thought to be more accurate, even though the supply data are for the year 2000.

6.1.2 Self Supplied Domestic

This category includes self-supplied residences, which may be single- dwellings or multi-family dwellings, with wells permitted by the OSE under NMSA Section 72-12-1 (Section 4.1.2; Appendix C).

Diversions from domestic wells are estimated by applying an average per capita water demand for each county to the population in that county that is presumed to be served by domestic wells (Table 6-4). The domestic well population is calculated by subtracting the population served by municipal wells (as reported on community surveys) from the 2000 U.S. Census Bureau population estimate for each of the five counties. The average per capita demand value is based on the average household size for each county from the 2000 U.S. Census, an indoor per capita requirement of 85 gallons per capita per day (Wilson, 1996), and calculated outdoor requirements based on the assumption that the typical rural household uses a total of approximately 0.5 ac-ft/yr irrigating an average 3,700 ft^2 per lot using flood or sprinkler irrigation (Wilson, 1996). The differences in per capita use in each county are due to differences in landscape irrigation requirements as published by Wilson (1996). These calculations indicate approximate residential demands and are lower than the system per capita demands (Table 6-3) which, as noted above, include commercial and public landscaping uses.

Table 6-4. Estimated Self-Supplied Domestic Use

County	Total Population	Population Served By		Average Per Capita Use [a] (gpcd)	Total Self-Supplied Domestic Use	
		Public Water Systems	Domestic Wells		(gpd)	(ac-ft/yr)
Union	4,174	2,678	1,496	105	157,000	176
Harding	810	416	394	116	45,700	51
Quay	10,155	7,726	2,429	123	299,000	335
Curry	45,044	40,938	4,106	115	472,000	529
Roosevelt	18,018	16,801	1,217	118	143,600	161
Total	78,201	68,559	9,642	116	1,117,300	1,251

[a] Based on calculated water use (Wilson, 1996) for self-supplied wells (no measured data are available)

gpd = Gallons per day
ac-ft/yr = Acre-feet per year

6.1.3 Irrigated Agriculture

Irrigated agriculture is the largest water use in all five counties in the planning region. Table 6-5 compares total irrigated crop acreage data from three of the major sources for irrigated agricultural data: OSE, WRRI (Lansford et al., 1991, 1992, 1993, 1995, 1996, and 1997), and the National Agricultural Statistics Service (NASS). The total cropland acreage provided in the WRRI reports is based on the acreages reported by the U.S. Bureau of Reclamation (for Reclamation projects), acreages set forth in adjudications and court decrees and in State Engineer licenses and permits, and where these data are lacking, recent aerial photography. As shown in Table 6-5, the data presented by the OSE and by WRRI significant differences that are difficult to reconcile (such as the difference between the Harding County acreages reported by the two agencies).

Table 6-5. Total Irrigated Acreage by County

County	Total Acres Irrigated		
	2000, OSE [a]	1996, WRRI [b]	2002, NASS [c]
Union	55,645	48,915	54,200
Harding	2,300	860	(D)
Quay	36,217	31,800	13,800
Curry	145,420	139,180	127,500
Roosevelt	87,342	92,891	96,000

[a] Wilson et al, 2003
[b] Lansford et al., 1996
[c] USDA, 2004
(D) = Withheld at source to avoid disclosing data for individual farms.

The NASS generally under-reports total irrigated acreages relative to the other two data sources, in part because it does not include all crop types; this is not the case, however, for Union and Roosevelt Counties in 2002. Census of Agriculture documents are published every five years, and the 2002 Census is the most recent. More recent NASS data (for 2004) are available on the USDA web site (http://www.nass.usda.gov/Statistics_by_State/New_Mexico/index.asp) and were evaluated in an effort to compile the most current data. The 2004 data were not used, as they reflected changes in irrigated acreage from a 34 percent reduction to a 53 percent gain in acreage from 2002. For Union County, the current irrigated acreage assessed by the Union County tax assessor is 54,456 acres (Trujillo, 2006).

Water used for agriculture in the Northeast Region irrigates a variety of crops (Table 6-6), predominantly grains and grasses. In Union, Curry, Quay, and Roosevelt Counties, the top crops (in terms of irrigated acreage) are corn, wheat, and sorghum. Roosevelt County also devotes significant irrigated acreage to cotton. No data are available from NASS on crops cultivated in Harding County.

Table 6-6. Irrigated Acreage by Crop and County for 2002

Crop	Irrigated Acres				
	Union	Harding	Quay	Curry	Roosevelt
Wheat	25,000	---	10,000	65,000	47,000
Corn for grain	25,000	---	---	24,000	17,500
Corn for silage	2,000 [a]	---	---	17,500 [a]	15,500 [a]
Sorghum for grain	1,700	---	1,300	14,000	7,000
Cotton upland	---	---	2,500	7,000	9,000
Total	54,200	---	13,800	127,500	96,000

Source: USDA, 2004
[a] The number of acres harvested; planted acreage unavailable. --- = No data available

Irrigation practices in the five counties in the Northeast Region, as reported by OSE, are summarized in Sections 6.1.3.1 through 6.1.3.5.

6.1.3.1 Union County

Cropland in Union County is irrigated with both surface water and groundwater. Surface water is supplied by the Dry Cimarron River and Tramperos Creek. Groundwater is withdrawn primarily from the Clayton declared groundwater basin, except in the southwest portion of the county, where groundwater is withdrawn from the Tucumcari groundwater basin. Surface water accounts for about 7.6 percent of total withdrawals for irrigation and 4.2 percent of total depletions for irrigation. Table 6-7 summarizes the irrigated land area and combined use of surface water and groundwater for irrigation as reported by the OSE (Sorenson, 1977 and 1982; Wilson, 1986 and 1992; Wilson and Lucero, 1997; Wilson et al., 2003). Based on the OSE information in Table 6-7, the consumptive water use from 1975 to 2000 ranged from 1.15 to 1.46 feet per irrigated acre, with an average of 1.32 feet per acre. Union County is a large user of water for irrigation, with more than 80,000 acre-feet withdrawn in 1999.

Table 6-7. Irrigation Surface Water and Groundwater Use in Union County

Reporting Year	Total Acres Irrigated	Total Withdrawal (acre-feet)	Total Depletion (acre-feet)	Consumptive Use (feet per acre)
1975	45,040	95,000	52,000	1.15
1980	52,720	102,120	63,220	1.20
1985	54,195	124,989	75,077	1.39
1990	45,390	80,775	66,414	1.46
1995	48,165	83,578	70,102	1.46
1999 [a]	55,645	83,570	69,145	1.24

[a] Wilson et al. (2003) lists agriculture uses from 1999 because of severe drought during 2000.

6.1.3.2 Harding County

Cropland in Harding County is irrigated entirely with groundwater, withdrawn primarily from the Tucumcari groundwater basin, as well as from the Clayton groundwater basin in the northeast portion of the county and the Canadian River groundwater basin in the western portion of the county. Table 6-8 summarizes the irrigated land area and irrigation water use as reported by the OSE (Sorenson, 1977 and 1982; Wilson, 1986 and 1992; Wilson and Lucero, 1997; Wilson et al., 2003).

Table 6-8. Irrigation Groundwater Use in Harding County

Reporting Year	Total Acres Irrigated	Total Withdrawal (acre-feet)	Total Depletion (acre-feet)	Consumptive Use (feet per acre)
1975	6,550	9,330	5,120	0.78
1980	570	1,390	1,040	1.82
1985	2,090	3,540	2,236	1.07
1990	2,290	3,697	2,714	1.19
1995	2,630	3,905	3,321	1.26
1999 [a]	2,300	3,654	3,167	1.38

[a] Wilson et al. (2003) lists agriculture uses from 1999 because of severe drought during 2000.

Based on the OSE information, the consumptive water use from 1975 to 2000 ranged from 0.78 to 1.82 feet per irrigated acre, with an average of 1.25 feet per acre. Harding County uses the least amount of water for irrigation in the region, with less than 4,000 acre-feet withdrawn in 1999.

6.1.3.3 Quay County

Cropland in Quay County is irrigated by both surface water and groundwater:

- Surface water accounts for about 94 percent of total withdrawals for irrigation and 99 percent of total depletions for irrigation and is supplied by the Canadian River, primarily within the Arch Hurley Conservancy District. Arch Hurley, which is administered by the U.S. Bureau of Reclamation, provides flood control and irrigation water for approximately 33,000 acres of cropland (approximately 90 percent of the total irrigated land area in Quay County), controlling the Canadian River by means of the Conchas Dam and its associated system of canals.

- Groundwater is withdrawn from the Clayton, Tucumcari, Ft. Sumner, and Curry groundwater basins.

Table 6-9 summarizes the irrigated land area and combined use of surface water and groundwater for irrigation as reported by the OSE (Sorenson, 1977 and 1982; Wilson, 1986 and 1992; Wilson and Lucero, 1997; Wilson et al., 2003).

Table 6-9. Irrigation Surface Water and Groundwater Use in Quay County

Reporting Year	Total Acres Irrigated	Total Withdrawal (acre-feet)	Total Depletion (acre-feet)	Consumptive Use (feet per acre)
1975	53,600	95,600	40,020	0.75
1980	44,030	97,860	43,340	0.98
1985	37,920	83,179	28,230	0.74
1990	42,895	97,070	45,882	1.07
1995	36,479	147,356	61,464	1.68
1999 [a]	36,217	114,500	40,435	1.12

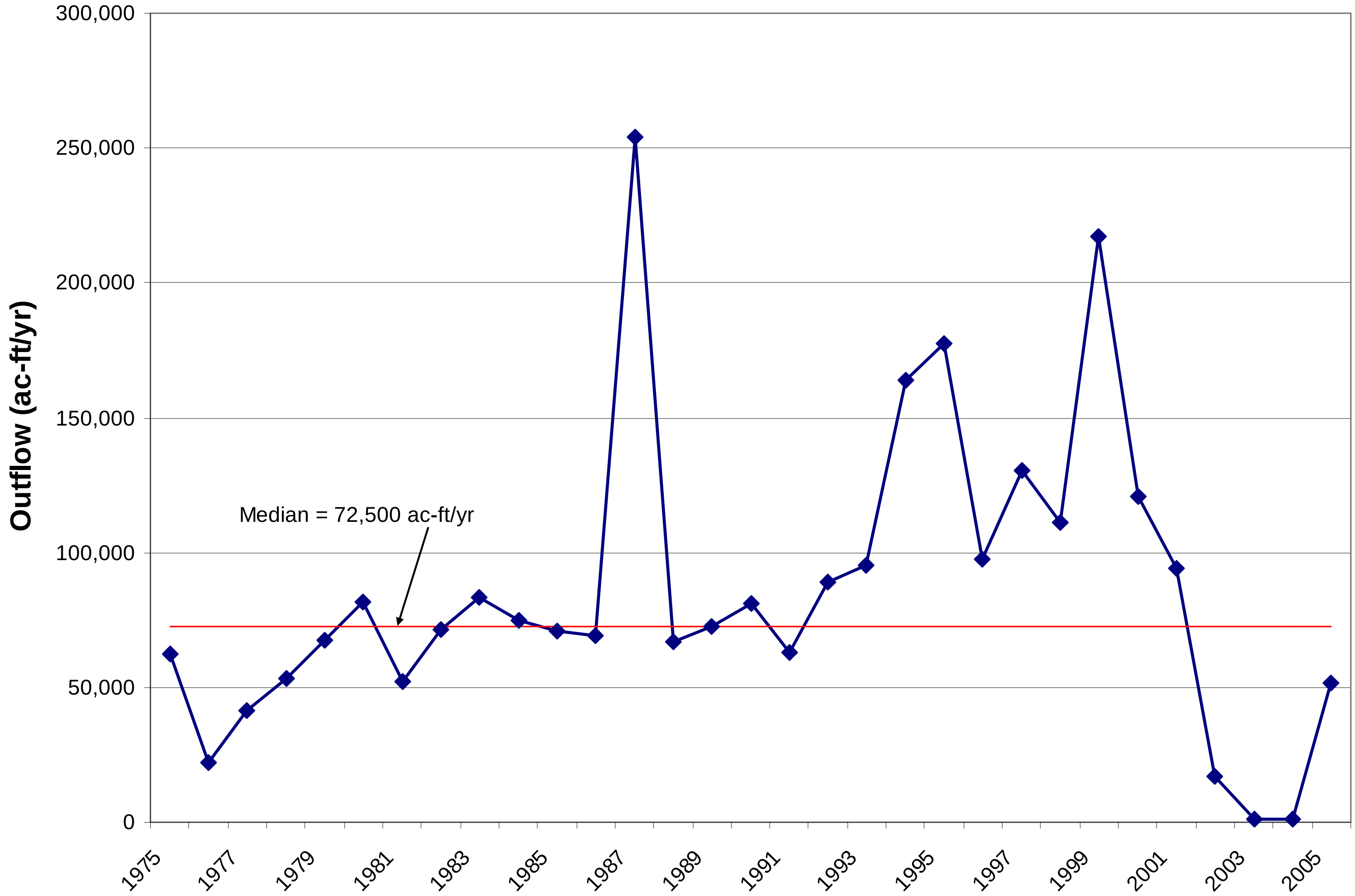
[a] Wilson et al. (2003) lists agriculture uses from 1999 because of severe drought during 2000.

Quay County is a large user of water for irrigation, with more than 100,000 acre-feet withdrawn in 1999.

Figure 6-3 shows the outflow from Conchas Reservoir from 1975 to 2005. The outflow includes diversions for Arch Hurley and Bell Ranch and releases to the Canadian River (which then flow into Ute Reservoir). The majority of the outflow (96 percent) for the period 1991 to 2005 is for Arch Hurley (Figure 6-4). The median total outflow from 1975 to 2001 is 72,500 ac-ft/yr; however, the median diversion for Arch Hurley from 1991 to 2005 was 93,400 ac-ft/yr. The *Quay County Forty Year Water Plan* (Barnes, 2004) summarizes Arch Hurley water use and irrigated acreage from 1946 through 2003. Irrigation diversions for this time period averaged 81,424 ac-ft/yr with an off-farm irrigation efficiency of 51 percent, resulting in an average delivery of 42,743 ac-ft/yr to member farms. While the acreage irrigated varied from year to year, a median 33,000 acres received 1.34 ac-ft/yr of Arch Hurley water. Wilson et al. (2003) shows a consumptive irrigation requirement (CIR) of 0.861 ac-ft/yr for Arch Hurley and an on-farm efficiency of 60 percent, which result in an on-farm requirement of 1.44 acre- feet per acre per year, or about 7 percent more than average project deliveries.

6.1.3.4 Curry County

Cropland in Curry County is irrigated entirely by groundwater, withdrawn primarily from the Curry groundwater basin, except for a very small portion of the southwest where the county overlaps the Portales groundwater basin. Table 6-10 summarizes the irrigated land area and water use for irrigation as reported by the OSE (Sorenson, 1977 and 1982; Wilson, 1986 and 1992; Wilson and Lucero, 1997; Wilson et al., 2003). Curry County is one of the largest users of water for irrigation in the region, with almost 200,000 acre-feet withdrawn in 1999.



Source: USACE, 2006

NORTHEAST NEW MEXICO REGIONAL WATER PLAN

Total Outflow from Conchas Reservoir
1975 to 2005

Figure 6-3

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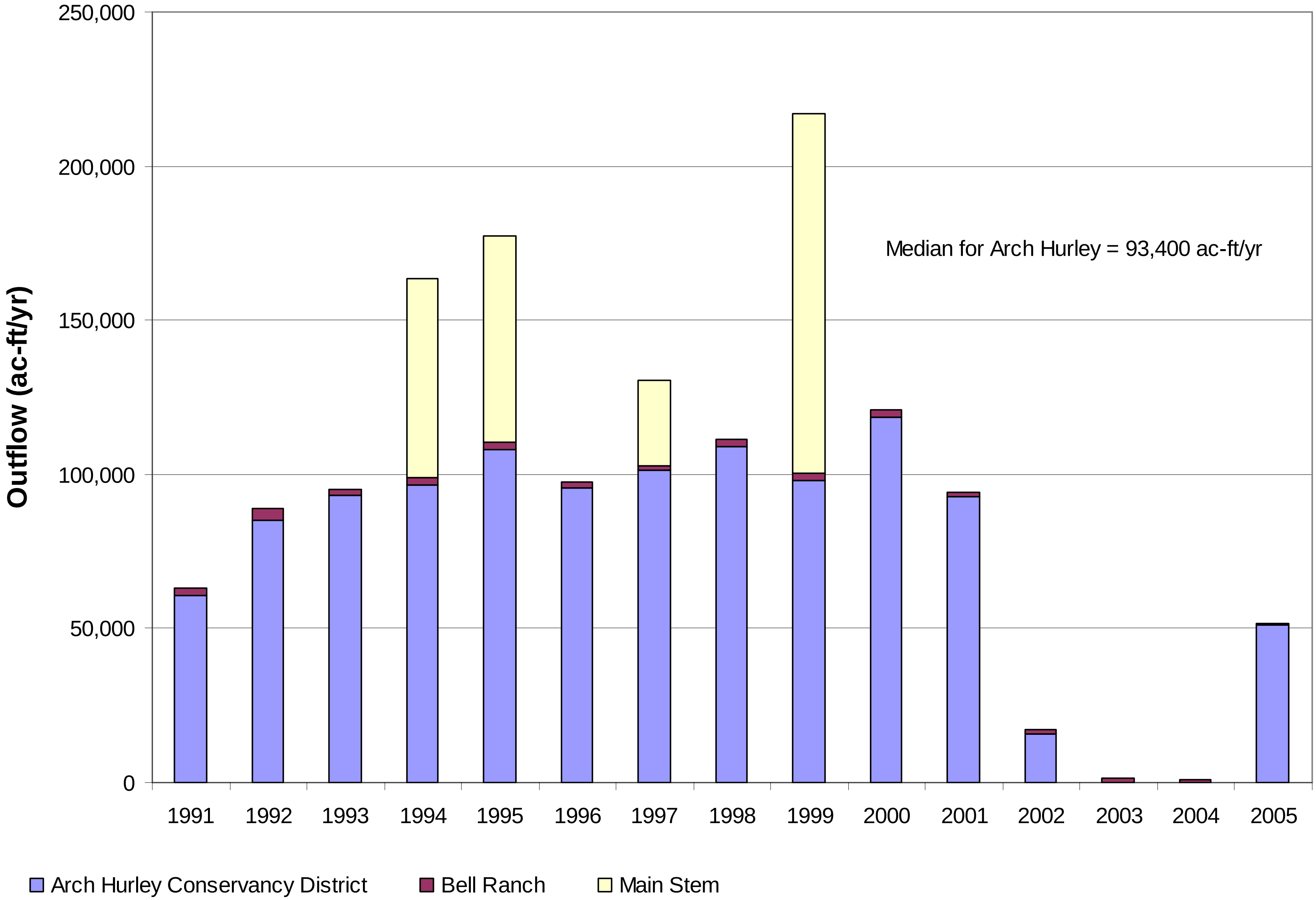

Source: USACE, 2006

NORTHEAST NEW MEXICO REGIONAL WATER PLAN

Components of Outflow from Conchas Reservoir
1991 to 2005

Figure 6-4

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Table 6-10. Irrigation Groundwater Use in Curry County

Reporting Year	Total Acres Irrigated	Total Withdrawal (acre-feet)	Total Depletion (acre-feet)	Consumptive Use (feet per acre)
1975	198,630	305,240	168,150	0.85
1980	152,940	255,410	171,860	1.12
1985	111,201	195,594	120,725	1.09
1990	139,990	329,831	272,656	1.95
1995	147,190	245,049	199,264	1.35
1999 [a]	145,420	195,886	157,883	1.09

[a] Wilson et al. (2003) lists agriculture uses from 1999 because of severe drought during 2000.

6.1.3.5 Roosevelt County

Cropland in Roosevelt County is irrigated entirely by groundwater, withdrawn from the Portales, Causey Lingo, Fort Sumner, and Roswell groundwater basins. Table 6-11 summarizes the irrigated land area and water use for irrigation as reported by the OSE (Sorenson, 1977 and 1982; Wilson, 1986 and 1992; Wilson and Lucero, 1997; Wilson et al., 2003). Roosevelt County is one of the largest users of water for irrigation in the region, with almost 150,000 acre-feet withdrawn in 1999.

Table 6-11. Irrigation Groundwater Use in Roosevelt County

Reporting Year	Total Acres Irrigated	Total Withdrawal (acre-feet)	Total Depletion (acre-feet)	Consumptive Use (feet per acre)
1975	135,000	238,860	131,670	0.98
1980	101,530	168,950	131,570	1.30
1985	96,600	208,993	130,317	1.35
1990	89,422	224,603	184,947	2.07
1995	107,635	152,551	127,398	1.18
1999	87,342	148,714	127,396	1.46

[a] Wilson et al. (2003) lists agriculture uses from 1999 because of severe drought during 2000.

6.1.4 Livestock

Livestock use represents a relatively small proportion (less than 3 percent) of the total depletions in the region (Table 6-1). The total withdrawals and depletions for self-supplied livestock in the region, as presented in the OSE water use reports (Sorensen, 1977 and 1982; Wilson, 1986 and 1992; Wilson and Lucero, 1997; Wilson et al., 2003), are provided in Table 6-12.

Virtually all the livestock in the region are cattle. The number of cattle in each county in recent years is listed in Table 6-13. For range cattle water withdrawals are assumed to equal depletions (Wilson et al., 2003). For dairy cows, the amount of water consumed per cow per day ranges from 28 to 55 gallons per capita per day (gpcd) and is approximately 45 gpcd on average (Bradley, 2006). Total use includes 20 gpcd for cleaning and/or cooling, bringing the total use per dairy cow to 65 to 70 gpcd. Much of the cleaning and cooling water is reused, often to irrigate (Bradley, 2006). Water used to irrigate livestock feed is not included in the livestock category, but is accounted for under the irrigation category.

Table 6-12. Livestock Water Use

Reporting Year	Union	Harding	Quay	Curry	Roosevelt
Total Withdrawal [a] (acre-feet)					
1975	1,898	519	1,268	1,259	1,113
1980	1,323	573	665	1,167	922
1985	1,344	525	678	1,262	780
1990	1,289	550	720	1,285	1,475
1995	1,254	599	732	2,617	2,699
2000	1,767	453	878	4,767	4,629
Total Depletion [b] (acre-feet)					
1975	1,898	519	1,268	1,259	1,113
1980	1,320	572	663	1,154	876
1985	1,340	524	676	1,244	695
1990	1,287	549	718	1,273	1,374
1995	1,254	599	732	2,472	2,471
2000	1,767	453	878	4,767	4,629

[a] Includes both surface water and groundwater
[b] Depletions for individual animals are assumed to be equal to withdrawals (Wilson et al., 2003). Depletion rates for dairies will vary depending on the type of operation (Wilson et al., 2003)

Table 6-13. Estimated Number of Cattle by County

Year	Union	Harding	Quay	Curry	Roosevelt
2000	157,000	40,000	77,000	155,000	97,000
2001	156,000	35,000	71,000	160,000	99,000
2002	155,853	23,726	59,431	198,404	149,002
2003	155,000	22,000	58,000	197,000	148,000
2004	155,000	20,000	56,000	198,000	148,000

Source: NASS, 2005

6.1.5 Self Supplied Commercial, Industrial, Mining, and Power

Wilson et al. (2003) define these categories as follows:

- Commercial includes self-supplied businesses (e.g., motels, restaurants, recreational resorts, campgrounds) and institutions. Self-supplied golf courses that are not watered by a public water supply are also included, as are off-stream fish hatcheries engaged in the production of fish for release.

- Industrial includes self-supplied enterprises engaged in the processing of raw materials or the manufacturing of durable or non-durable goods. Water used for the construction of highways, subdivisions, and other construction projects is also included.

- Mining includes self-supplied enterprises engaged in the extraction of minerals occurring naturally in the earth's crust, including (1) solids, such as coal and smelting ores, (2) liquids, such as crude petroleum, and (3) gases, such as natural gas. Water used for drilling and/or processing at a mine site is also included.

- Power includes all self-supplied power-generating facilities. Water used in conjunction with coal mining operations that are contiguous with a power-generating facility that owns and/or operates the mines is also included.

As shown in Table 6-1, the self-supplied commercial, industrial, mining and power categories are a very small part of the planning region's water demand (less than 1 percent).

6.1.6 Reservoir Evaporation

Since 1990, the OSE has reported reservoir evaporation only for reservoirs with 5,000 or more acre-feet of storage, and this change has reduced the amount of evaporation reported for Union and Harding Counties between 1985 and 1990 (Table 6-1). Almost all reservoir evaporation for the region (98.6 percent) occurs in Quay County, off the 8,200 surface acres of water at Ute Reservoir. Reservoir evaporation reported for Quay County in 1985 was much less than the amount reported in 1990 because of the difference in reservoir surface area between these two years. The new spillway on Ute Reservoir was completed in 1984, and the reservoir water level was reduced by 45 feet during construction, creating a pool with a surface area of approximately 2,500 acres. The reservoir level was still down in 1985 but by 1987 was filled, creating a surface area of approximately 8,000 acres (Terry, 2006). No reservoirs are located in Curry or Roosevelt Counties.

All reservoir evaporation is a consumptive use; there is no return flow in this category. Reservoir evaporation may vary due to climatic variability and changing reservoir levels; however, it has remained fairly consistent since 1990.

6.2 Population Projections

Future water demand in the Northeast Region depends on the future growth of the region's population and economy. Accordingly, Sites Southwest projected growth in 10-year increments from 2000 to 2040. The projections were based on two different growth scenarios: a low growth scenario and a high growth scenario. The results of Sites Southwest's analysis are provided in Appendix E3 and summarized below.

To develop the projections, Sites Southwest reviewed UNM Bureau of Business and Economic Research (BBER) projections and prepared population projections for each county based on historical trends, more recent trends (since 2000), new and pending economic activity, and the potential for job growth given the activities of local governments and economic growth organizations. The low- and high growth scenarios are based on slow and fast growth periods over the past 30 years, weighted toward more recent trends. The population projections developed by Sites Southwest are summarized in Table 6-14 and depicted on Figures 6-5a and 6-5b. Sites Southwest projected populations to 2040; projections for 2050 have been calculated assuming that growth from 2040 to 2050 occurs at the same rate as from 2030 to 2040.

For Union County, the high growth scenario (Figure 6-5a) assumes that economic growth, as reflected in the County's job growth, continues as it has since 2000. Potential future job growth could come from development in travel and tourism, construction of a prison, development of a cheese manufacturing plant in Dalhart, Texas, possible relocation of an ice and bottled water plant to Clayton, attraction of wind farms, further revitalization of downtown Clayton, and possible construction of senior (assisted/independent living) housing. The low growth scenario assumes that economic growth is at the slower rate that occurred from 1970 to 2000.

For Harding County, the high growth scenario (Figure 6-5a) assumes that the County achieves its goal of creating jobs to retain its population over the next 40 years and achieves economic growth similar to that experienced in recent years. Potential future job growth could come from the development of Solano Business Park, construction of a County-owned metal products manufacturing facility, transportation improvements, construction of a heritage museum and gift shop now proposed along the scenic byway, enhanced vocational education and creation of a Head Start program, alternative energy development, construction of an airport near Solano, and further housing development. The low growth scenario assumes that the current trend of population decline continues, but at a slower rate.

For Quay County, both the high and low growth scenarios reflect values presented in the Quay County 40-year plan (Barnes, 2004). Whereas under the low growth scenario, the population was projected to remain static, the high growth scenario (Figure 6-5a) assumes that the local economy is reinvigorated, with a relatively slower rate of growth to 2010 that increases after 2010 and slows somewhat after 2030. Potential future job growth could come from:

- Increasing development of water-oriented recreation at Ute Lake and Conchas Lake State Parks

Table 6-14. Estimated Population Growth, 2000 to 2040
Northeast New Mexico Water Planning Region

County	Current (2000) Population	Growth Scenario		Estimated Population				
		Type	Description [a]	2010	2020	2030	2040	2050 [b]
Union	4,174	Low	Economic growth continues at the slower rate that occurred from 1970 to 2000	4,300	4,500	4,600	4,800	4,900
		High	Economic growth continues at the rate that it has since 2000	4,800	5,600	6,500	7,600	8,800
Harding	810	Low	Assumes that population decline continues, but more slowly than the current rate	800	800	800	700	700
		High	Economic growth similar to that experienced in recent years	1,000	1,400	1,800	2,400	3,100
Quay	10,155	Low	Population projected to remain static	10,400	10,600	10, 800	10,900	11,000
		High	Assumes that the local economy is reinvigorated with significant job creation	12,300	14,900	18,000	19,800	21,800
Curry	45,044	Low	Takes Cannon AFB anticipated changes into account along with new job creation at a rate comparable to the long-term average	51,600	60,000	69,800	81,200	94,400
		High	Takes Cannon AFB anticipated changes into account, and assumes that industry and retail business attraction continues at the recent rate	54,600	63,500	73,800	85,800	99,800
Roosevelt	18,018	Low	Assumes that economic growth will be reflective of the trend from 1970 to 2000	21,100	27,100	34,800	44,700	57,500
		High	Assumes that future growth is similar to recent trends	24,400	31,300	40,200	51,600	66,300
Total Northeast Region	78,201	Low	Sum of low population projections for five counties	88,200	103,000	120,800	142,300	168,500
		High	Sum of high population projections for five counties	97,100	116,600	140,300	167,200	199,900

[a] More detailed descriptions of the low and high growth scenarios are provided in Appendix E4.
[b] Values calculated assuming the same growth rate for 2040-2050 as for 2030-2040.

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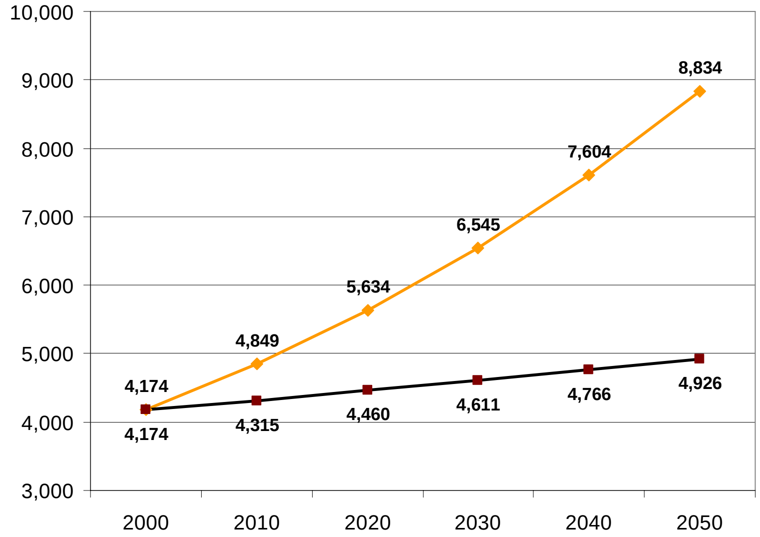
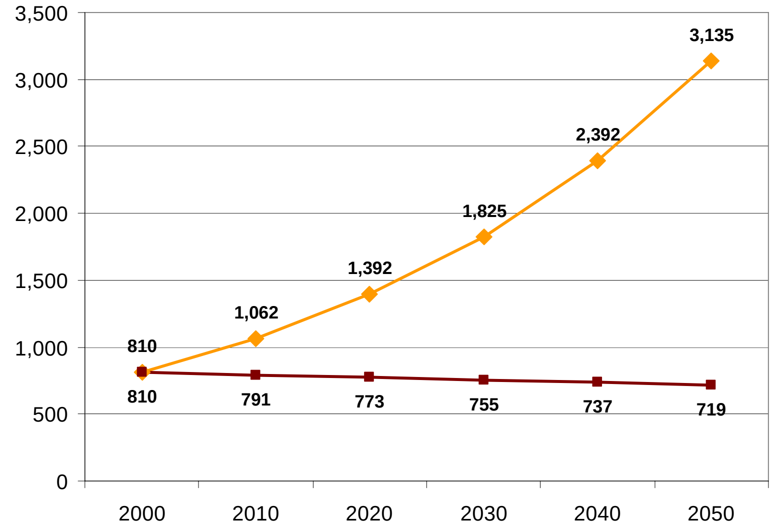
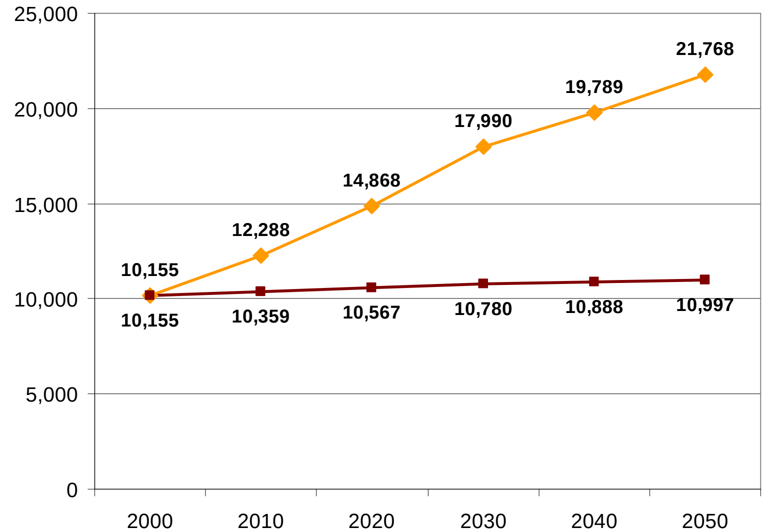


Union County



Harding County



Quay County

Note: Values for 2050 calculated using the same growth rate for 2040 to 2050 as for 2030 to 2040.

High
Low

Figure 6-5a

NORTHEAST NEW MEXICO REGIONAL WATER PLAN

Projected Population

Union, Harding, and Quay Counties

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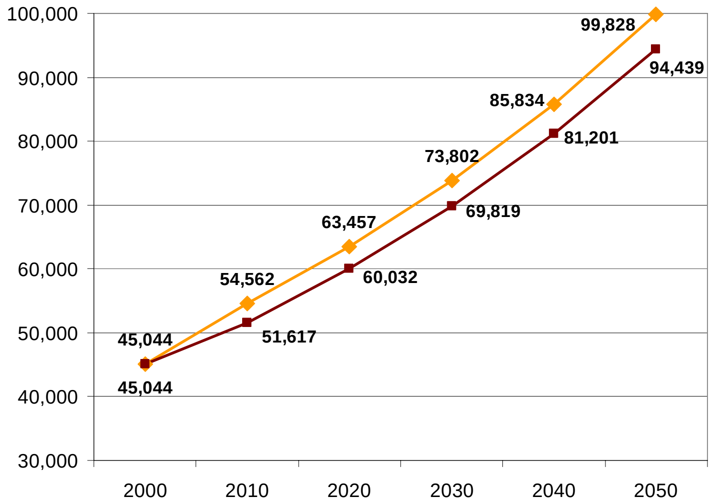
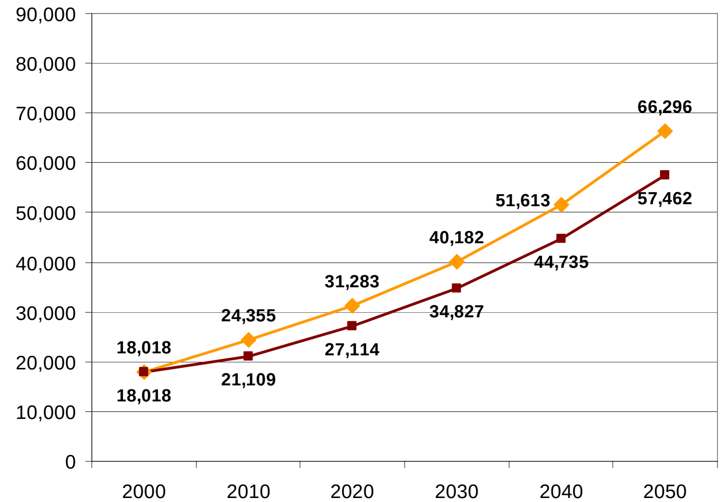


Curry County



Roosevelt County

High
Low

Note: Values for 2050 calculated using the same growth rate for 2040 to 2050 as for 2030 to 2040.

Figure 6-5b

NORTHEAST NEW MEXICO REGIONAL WATER PLAN

Projected Population
Curry and Roosevelt Counties

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- Ute Lake Ranch development and associated job creation (Current Ute Lake Ranch development projections include 134 lots during Phase 1 and 733 lots during Phase 2, with a long-term projection of more than 10,000 homes [McCasland, 2006]. Actual build-out may never reach this projection, although the development may hit 1,000 homes within the next 5 to 6 years [McCasland, 2006]. In addition to homes, the Ute Lake Ranch development plans include a clubhouse, golf course, equestrian center and associated horse trails, marina and beach club [Ute Lake Ranch, 2006], although the ISC will have discretion over whether and where the marina is built.)

- Revitalization of the City of Tucumcari

- Expansion of the wind farm industry

- Development of the Tucumcari Industrial Park, Trailiner Building or Worley Mills acre park

- Expansion of the Tucumcari Mountain Cheese Factory

- Attraction of ancillary industries related to cheese or dairy

- Attraction of shipping enterprises

- Construction of a proposed railway truck terminal

- Expansion of the ethanol plant

- Development of the North American Wind Research and Training Center (NAWRTC) at Mesalands Community College.

For Curry County, the high growth scenario (Figure 6-5b) takes into account anticipated changes due to Cannon AFB's new mission, and assumes that new jobs are created at a rate commensurate with recent successes in attracting industry and retail businesses to the County.

Potential future job growth will come from Cannon AFB expansion and may include continued development of the Southwest Cheese, Westway Feed Products, and Mesa Ingredients Corporation facilities as well as the attraction of other businesses due to the presence of these companies, opening of the SEI Customer Support Center (a bilingual service facility), development of alternative energy, and downtown revitalization in Clovis. In addition, new retail enterprises in Clovis include Lowe’s Home Improvement, Payless Shoes, Applebee’s, Chili’s Bar & Grill, All About Sports, Hobby Lobby, and Hastings Book Store. The low growth scenario also factors in anticipated changes due to Cannon AFB’s new mission, but assumes that new job creation will occur at a rate comparable to the long-term average.

For Roosevelt County, the high growth scenario (Figure 6-5b) assumes that future economic growth is similar to recent trends. Potential future job growth will come from the expansion of Cannon AFB and potentially from industrial park expansion including the creation of a second industrial park, alternative energy development, increased manufacturing development in the dairy and cheese industries, additional transport firms to distribute food and agricultural products, and an increase in transportation, warehousing, and wholesale trade jobs. The low growth scenario assumes a slower-growing economy, reflective of the trend from 1970 to 2000.

6.3 Projected Water Uses

This section provides estimates of future water use in the region. To assist in bracketing the uncertainty of the projections, low and high water use estimates were developed, based on growth projections in the various sectors (Section 6.2; Appendix E3) and input from the steering committee. Sections 6.3.1 through 6.3.7 describe the methods or assumptions used in projecting future water use for the various use sectors. Projections of future water use for each sector, segregated by County and showing the growth rates and assumptions used to project future water use, are included in Appendix E3.

6.3.1 Public Water Supply

The public water supply projections (Table 6-15) are based on the county population growth estimates developed by Sites Southwest (Section 6.2; Appendix E3) multiplied by per capita water use for individual communities. The per capita water use values used in the calculation were based on community-provided water use records and the number of connections in 2004, as discussed in Section 6.1.1, and varied from about 70 gallons per capita per day (gpcd) to almost 250 gpcd. These per capita values differ from per capita values shown in Table 6-3, which were based on OSE data, but were used to more accurately reflect current and future water use by communities.

Table 6-15. Estimated Northeast Region Future Public Water Supply Diversions

County	Average 2004 [a]	Growth Scenario	Projected Diversions (ac-ft/yr)				
			2010	2020	2030	2040	2050
Union	101	Low	451	448	444	439	434
		High	527	612	711	827	960
Harding	134	Low	64	61	57	53	50
		High	90	118	154	202	265
Quay	174	Low	1,676	1,640	1,601	1,544	1,487
		High	2,071	2,505	3,031	3,334	3,668
Curry	166	Low	8,191	9,281	10,508	11,888	13,438
		High	8,882	10,330	12,014	13,973	16,251
Roosevelt	141	Low	3,948	4,868	5,992	7,362	9,025
		High	4,738	6,086	7,817	10,041	12,897
		Low	14,332	16,297	18,602	21,286	24,434
		High	16,308	19,651	23,728	28,377	34,041

[a] Average 2004 per capita use (Barnes, 2005), incorporating decreases in per capita use as discussed in Section 6.3.1, were used for low growth scenario projections. Average 2004 per capita use, without incorporating decreases, was used for the high growth scenario projections.

gpcd = Gallons per capita per day
ac-ft/yr = Acre-feet per year

Average 2004 per capita water use was used to project demand because it was the most current data available, and because this was the only year of data available for many of the municipalities. Data for multiple years were received for nine municipalities, and Table 6-16 compares the multiple-year per capita use (of two to five years) and the 2004 per capita use for those municipalities. As shown in this table, the 2004 per capita use was less than the multiple-year average per capita use for eight of the nine municipalities, most likely due to extreme drought in 2002 and 2003, which led to higher use in those years. For consistency, however, average 2004 per capita water use, which is more representative of average conditions, was used to project demand for all 24 water systems.

Table 6-16. Comparison of Multiple Year Average and 2004 Demand Totals

Municipality	2004 Population [a]	Difference [a,b]		Years Averaged
		gallons	gpcd	
Clayton	2,400	–45,096,400	–51	2000-2004
Clovis	32,667	–70,249,500	–6	2003-2004
Dora	160	–2,734,560	–47	2000-2004
Grady	98	883,625	25	2001-2004
House	75	–932,820	–34	2000-2004
Logan	1,097	–14,134,131	–35	2000-2004
Melrose	753	–2,484,980	–9	2000-2004
Texico	1,000	–11,298,600	–31	2000-2004
Tucumcari	5,989	–72,306,200	–33	2000-2004

[a] Based on data provided by the communities (Barnes, 2005)
[b] Difference between multiple-year water diversion average and 2004 diversion

gpcd = Gallons per capita per day

6.3.2 Self-Supplied Domestic

Water withdrawals from domestic wells were estimated by assuming that indoor use was 85 gpcd (for a non-conserving home) (Vickers, 2001). Outdoor demand was calculated using a procedure outlined by Wilson (1996), resulting in estimated demand for landscape watering in the five counties ranging from 20 gpcd in Union County to 38 gpcd in Quay County. The total current demand from domestic wells (combining indoor and outdoor estimates) was therefore calculated to be 105 to 123 gpcd.

Both the low and high water use scenarios for the self-supplied domestic sector assume that per capita demand in this sector will not change. Thus, the low and high projections were calculated by multiplying the per capita estimates of domestic use by the population growth projections for each county (Table 6-17).

Table 6-17. Estimated Northeast Region Future Self-Supplied Domestic Diversions

County	Estimated Per Capita Use (gpcd)	Growth Scenario	Projected Diversions (ac-ft/yr)				
			2010	2020	2030	2040	2050
Union	105	Low	182	188	194	201	208
		High	204	237	276	320	372
Harding	116	Low	50	49	48	47	45
		High	67	88	115	151	198
Quay	123	Low	341	348	355	359	362
		High	405	471	570	627	689
Curry	115	Low	606	705	820	953	1,109
		High	641	745	866	1,008	1,172
Roosevelt	118	Low	188	242	311	399	513
		High	217	279	359	461	592
Total		Low	1,368	1,532	1,728	1,959	2,237
		High	1,534	1,821	2,186	2,567	3,024

gpcd = Gallons per capita per day ac-ft/yr = Acre-feet per year

6.3.3 Commercial

Commercial water use accounts for less than 1 percent of water use in the region. (Commercial enterprises that are supplied by public water systems are included in the public water system category.) The low and high projections for this sector (Table 6-18) assumed growth rates that are proportional to the low and high population projections (Section 6.2; Appendix E3).

6.3.4 Industrial

The low and high projections for the industrial sector (Table 6-19) were assumed growth rates that are proportional to the population projections (Section 6.2; Appendix E3) except in Harding County, where a metal fabrication plant is being added, and in Quay County where the existing ethanol plant is being expanded. The high growth scenario projections for Harding County are speculative, as there has not been any industrial water use in Harding County since the OSE began estimating water use in 1975. The high growth scenario projections for Quay County are based on historical industrial use in Quay County.

Table 6-18. Estimated Northeast Region Future Commercial Diversions

County	2000 Diversion (ac-ft/yr)	Growth Scenario	Projected Diversions (ac-ft/yr)				
			2010	2020	2030	2040	2050
Union	8.19	Low	8	9	9	9	10
		High	10	11	13	15	17
Harding	0.06	Low	<1	<1	<1	<1	<1
		High	<1	1	1	1	1
Quay	10.54	Low	11	11	11	11	11
		High	15	18	24	27	31
Curry	232.10	Low	232	246	261	276	293
		High	262	296	335	378	428
Roosevelt	157.9	Low	169	181	194	209	224
		High	206	270	356	471	626
Total		Low	421	448	476	506	538
		High	493	597	729	893	1,103

ac-ft/yr = Acre-feet per year

Table 6-19. Estimated Northeast Region Future Industrial Diversions

County	2000 Diversion (ac-ft/yr)	Growth Scenario	Projected Diversions (ac-ft/yr)				
			2010	2020	2030	2040	2050
Union	0	Low	0	0	0	0	0
		High	0	0	0	0	0
Harding	0	Low	0	0	0	0	0
		High	0.10	0.30	0.50	0.70	0.90
Quay	0	Low	0	0	0	0	0
		High	2.0	3.0	4.0	5.0	6.0
Curry	0	Low	0	0	0	0	0
		High	0	0	0	0	0
Roosevelt	0.11	Low	0.12	0.13	0.14	0.15	0.16
		High	0.15	0.20	0.26	0.35	0.48
Total		Low	0.12	0.13	0.14	0.15	0.16
		High	2.25	3.50	4.76	6.05	7.38

ac-ft/yr = Acre-feet per year

6.3.5 Irrigated Agriculture

The low and high projections for the irrigated agriculture sector (Table 6-20) were estimated by county, with current irrigated water demand defining the high estimate and the low estimates incorporating declines due to drought, increased gas prices, or other issues that affect agricultural economics. Maximum declines were projected to be at a rate of 6 percent every 10 years for all five counties, reducing irrigated acreage by 30 percent between 2000 and 2050. This maximum decrease was determined after discussing trends in irrigated agriculture with the steering committee. Some members of the committee felt that the low projection should reflect decreases of much more than 6 percent per 10-year period, in response to reduced or nonexistent supply from the Ogallala aquifer. Despite indications that the available water supply will not be adequate to meet the projected demands in the future, water demand was projected without taking into account water shortages (Table 6-20) to allow for an unbiased determination of what demands would be if sufficient supplies were available; the comparison between supply and demand is discussed in Section 7.

Table 6-20. Estimated Northeast Region Future Irrigated Agriculture Diversions

County	2000 Diversion (ac-ft/yr)	Growth Scenario	Projected Diversions (ac-ft/yr)				
			2010	2020	2030	2040	2050
Union	83,570	Low	78,556	73,842	69,412	65,247	61,332
		High	83,570	83,570	83,570	83,570	83,570
Harding	3,654	Low	3,435	3,229	3,035	2,853	2,682
		High	3,654	3,654	3,654	3,654	3,654
Quay	114,500	Low	107,630	101,172	95,102	89,396	84,032
		High	114,500	114,500	114,500	114,500	114,500
Curry	195,886	Low	184,133	173,085	162,700	152,938	143,762
		High	195,886	195,886	195,886	195,886	195,886
Roosevelt	148,714	Low	139,791	131,404	123,519	116,108	109,142
		High	148,714	148,714	148,714	148,714	148,714
Total		Low	513,545	482,732	453,768	426,542	400,949
		High	546,324	546,324	546,324	546,324	546,324

ac-ft/yr = Acre-feet per year

6.3.6 Livestock

Large increases in water use for ranching are not anticipated; however, the dairy and cheese industries have seen tremendous increases in the past. As a result, water demand for livestock use has approximately doubled in each of the last two 5-year periods (1990 to 1995 and 1995 to 2000) in Curry and Roosevelt Counties (Wilson et al., 2003); however, this rate of increase is not expected to continue (Bradley, 2006). No dairies are present in Union, Harding, or Quay Counties, and currently there are no specific plans for future development (Bradley, 2006), although dairies may locate in Union County in the future as a result of the development of a cheese manufacturing plant to the east in Dalhart, Texas.

Curry and Roosevelt Counties have 64 dairies, housing approximately 120,000 dairy cows at an average of 1,900 to 2,000 cows per dairy. Approximately two dozen dairies have opened in Clovis and Portales since the Southwest Cheese plant opened, and the current concentration of dairies in Curry and Roosevelt Counties is approaching saturation (Hartz, 2006a). Further increases are expected to add 8,000 to 10,000 dairy cows to the region (Bradley, 2006), representing an approximately 10 percent increase for Curry and Roosevelt Counties combined (more significant increases continue in west Texas [Bradley, 2006]).

Given these trends, the low water use projection for livestock assumes no change in demand (Table 6-21). The high water use projection assumes that the maximum increase in livestock demand in Union, Harding, and Quay Counties will be 5 percent between 2000 and 2010 with no further increases to 2050.

The high water use projection for Curry and Roosevelt Counties assumes a maximum increase of 10 percent between 2000 and 2010, 5 percent between 2010 and 2020, and no further increase to 2050.

6.3.7 Mining

Mining water use accounts for less than 1 percent of water use in the region. Both the low and high projections (Table 6-22) assume that water demand in the mining sector will not change from the OSE 2000 estimates (Section 6.2; Appendix E3).

Table 6-21. Estimated Northeast Region Future Livestock Diversions

County	2000 Diversion (ac-ft/yr)	Growth Scenario	Projected Diversions (ac-ft/yr)				
			2010	2020	2030	2040	2050
Union	1,767	Low	1,770	1,770	1,770	1,770	1,770
		High	1,860	1,860	1,860	1,860	1,860
Harding	453	Low	450	450	450	450	450
		High	480	480	480	480	480
Quay	878	Low	880	880	880	880	880
		High	920	920	920	920	920
Curry	4,767	Low	4,770	4,770	4,770	4,770	4,770
		High	5,240	5,510	5,510	5,510	5,510
Roosevelt	4,629	Low	4,630	4,630	4,630	4,630	4,630
		High	5,090	5,350	5,350	5,350	5,350
Total		Low	12,500	12,500	12,500	12,500	12,500
		High	13,590	14,120	14,120	14,120	14,120

ac-ft/yr = Acre-feet per year

Table 6-22. Estimated Northeast Region Future Mining Diversions

County	2000 Diversion (ac-ft/yr)	Growth Scenario	Projected Diversions (ac-ft/yr)				
			2010	2020	2030	2040	2050
Union	0.12	Low	0.12	0.12	0.12	0.12	0.12
		High	0.12	0.12	0.12	0.12	0.12
Harding	0.30	Low	0.30	0.30	0.30	0.30	0.30
		High	0.30	0.30	0.30	0.30	0.30
Quay	0	Low	0	0	0	0	0
		High	0	0	0	0	0
Curry	0	Low	0	0	0	0	0
		High	0	0	0	0	0
Roosevelt	0	Low	0	0	0	0	0
		High	0	0	0	0	0
Total		Low	0.42	0.42	0.42	0.42	0.42
		High	0.42	0.42	0.42	0.42	0.42

ac-ft/yr = Acre-feet per year

6.3.8 Power

Demand in the power sector accounts for less than 1 percent of water use in the region. Additional wind farms are being added in the region; however, they do not require any water and are not included here. Both the low and high projections (Table 6-23) assume that water demand in the power sector will not change from the OSE 2000 estimates (Section 6.2; Appendix E3).

Table 6-23. Estimated Northeast Region Future Power Diversions

County	2000 Diversion (ac-ft/yr)	Growth Scenario	Projected Diversions (ac-ft/yr)				
			2010	2020	2030	2040	2050
Union	0	Low	0	0	0	0	0
		High	0	0	0	0	0
Harding	0	Low	0	0	0	0	0
		High	0	0	0	0	0
Quay	0	Low	0	0	0	0	0
		High	0	0	0	0	0
Curry	0	Low	0	0	0	0	0
		High	0	0	0	0	0
Roosevelt	17	Low	17	17	17	17	17
		High	17	17	17	17	17
Total		Low	17	17	17	17	17
		High	17	17	17	17	17

ac-ft/yr = Acre-feet per year

6.3.9 Reservoir Evaporation

The reservoir evaporation water use category is not driven by population growth, but instead is dependent on climatic conditions. Two scenarios, based on OSE-estimated average and maximum reservoir surface areas and pan evaporation rates, were used to bracket probable conditions. OSE estimates of reservoir evaporation depletions are for Clayton Lake in Union County and Ute Reservoir in Quay County (although water from Conchas Reservoir, located on the Canadian River upstream of the planning region, is used within the planning region, evaporation from Conchas Reservoir is accounted for in the Mora-San Miguel-Guadalupe planning region). The values used in calculating evaporation from these two reservoirs were:

- For Clayton Lake, Wilson et al. (2003) cites a maximum surface area of 175 acres and an average surface area of 140 acres. No pan evaporation rate has been established for Clayton Lake, and so the Capulin National Monument value was used instead (WRCC, 2006b).

- For Ute Reservoir, an average surface area of 5,146 acres corresponding to the historical average surface area for Ute Reservoir for the period of 1965 to 2005 (Gates, 2006b), a maximum surface area of 7,264 acres corresponding to the surface area of the reservoir when the water is at the spillway (Roepke, 2006), and the pan evaporation rate for Ute Reservoir (WRCC, 2006b) were used to project future demand. The average surface area includes the period prior to 1984 when the spillway was raised, increasing the capacity of the reservoir. Increased capacity since 1984 and the possibility of the ENMRWS being built (Sections 4.8 and 8.7) will impact surface area in the future. In addition, past climatic conditions may not be representative of future climatic conditions.

Projected reservoir evaporation was calculated by multiplying average (for the low growth projection) and maximum (for the high growth projection) surface areas (acres) times the pan evaporation rate (feet per year) and then multiplying that amount by 0.7 to correct for the difference between evaporation rates measured in a pan and those that would occur in a large lake (Table 6-24).

Table 6-24. Estimated Northeast Region Future Reservoir Evaporation

County	2000 Diversion [a] (ac-ft/yr)	Growth Scenario	Projected Diversions (ac-ft/yr)				
			2010	2020	2030	2040	2050
Union	479	Low	400	400	400	400	400
		High	500	500	500	500	500
Harding	0	Low	0	0	0	0	0
		High	0	0	0	0	0
Quay	32,938	Low	26,800	26,800	26,800	26,800	26,800
		High	37,900	37,900	37,900	37,900	37,900
Curry	0	Low	0	0	0	0	0
		High	0	0	0	0	0
Roosevelt	0	Low	0	0	0	0	0
		High	0	0	0	0	0
	Total	Low	27,200	27,200	27,200	27,200	27,200
		High	38,400	38,400	38,400	38,400	38,400

[a] For reservoir evaporation, diversions are equal to depletions

ac-ft/yr = Acre-feet per year

6.4 Summary of Present and Future Water Demand

Total projected water use by county for the low and high use scenarios is shown on Table 6-25 and Figures 6-6 through 6-10. Agriculture dominates water use in each of the five counties in the planning region. Reservoir evaporation is projected to account for approximately 25 to 50 percent of future water demand in Quay County, while livestock use and public water supply plus domestic use are also significant in all five counties.

Table 6-25. Estimated Northeast Region Future Water Use

County	2000 Diversion (ac-ft/yr)	Growth Scenario	Projected Diversions (ac-ft/yr)				
			2010	2020	2030	2040	2050
Union	86,500	Low	81,300	76,600	72,200	68,000	64,100
		High	86,600	86,800	86,900	87,100	87,200
Harding	4,200	Low	4,000	3,800	3,600	3,400	3,200
		High	4,300	4,300	4,400	4,500	4,600
Quay	150,600	Low	137,400	130,900	124,800	119,000	113,600
		High	155,800	156,300	156,900	157,300	157,700
Curry	209,600	Low	197,900	188,100	179,100	170,800	163,400
		High	210,900	212,800	214,600	216,800	219,200
Roosevelt	158,300	Low	148,700	141,300	134,600	128,700	123,500
		High	159,000	160,700	162,600	165,000	168,200
Total	609,300	Low	569,400	540,700	514,300	490,000	467,800
		High	616,600	620,900	625,400	630,600	636,900

ac-ft/yr = Acre-feet per year

NORTHEAST NEW MEXICO REGIONAL WATER PLAN

Projected Water Diversions in Union County

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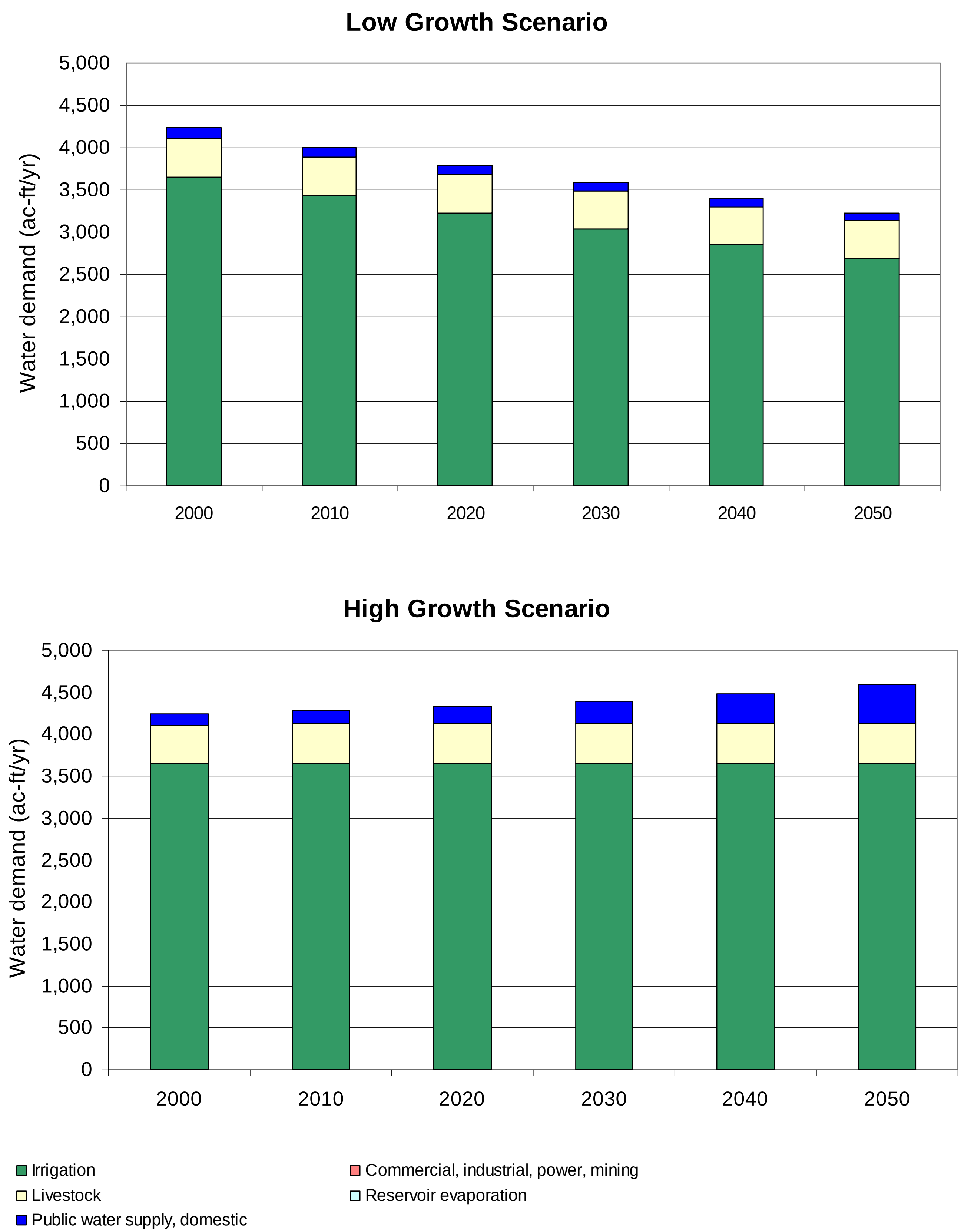
Figure 6-6



NORTHEAST NEW MEXICO REGIONAL WATER PLAN

Projected Water Diversions in Harding County

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Figure 6-7

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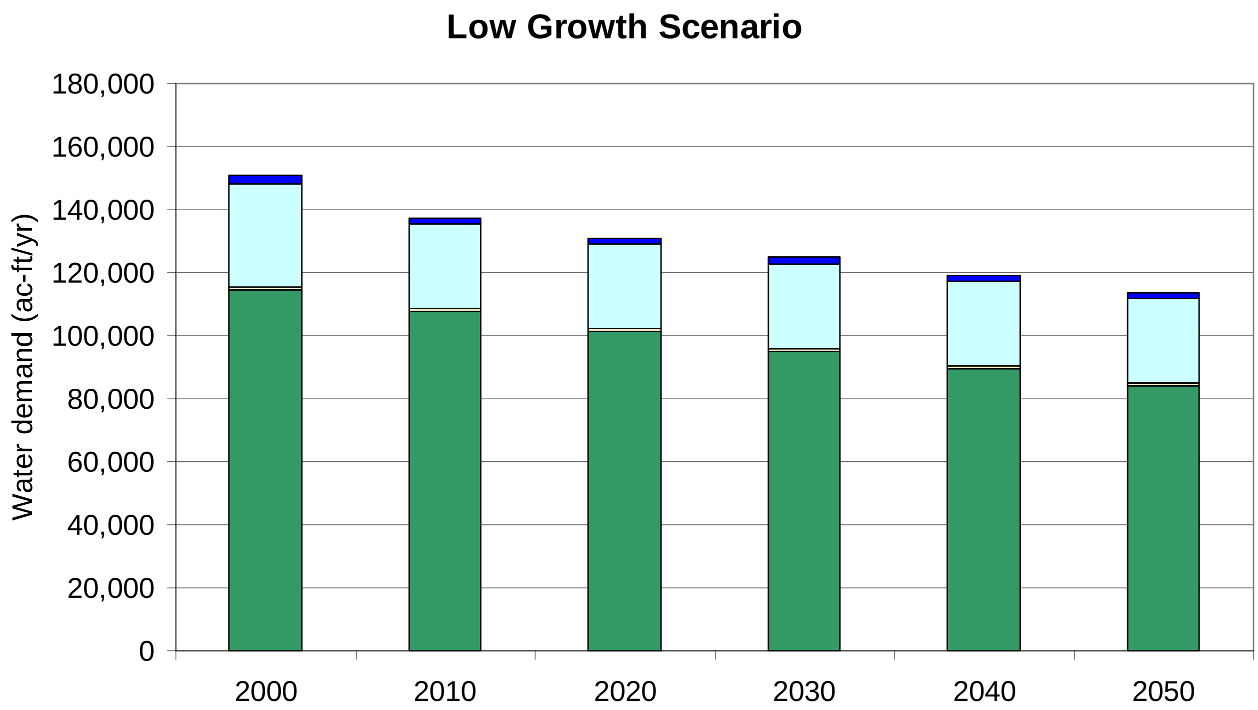

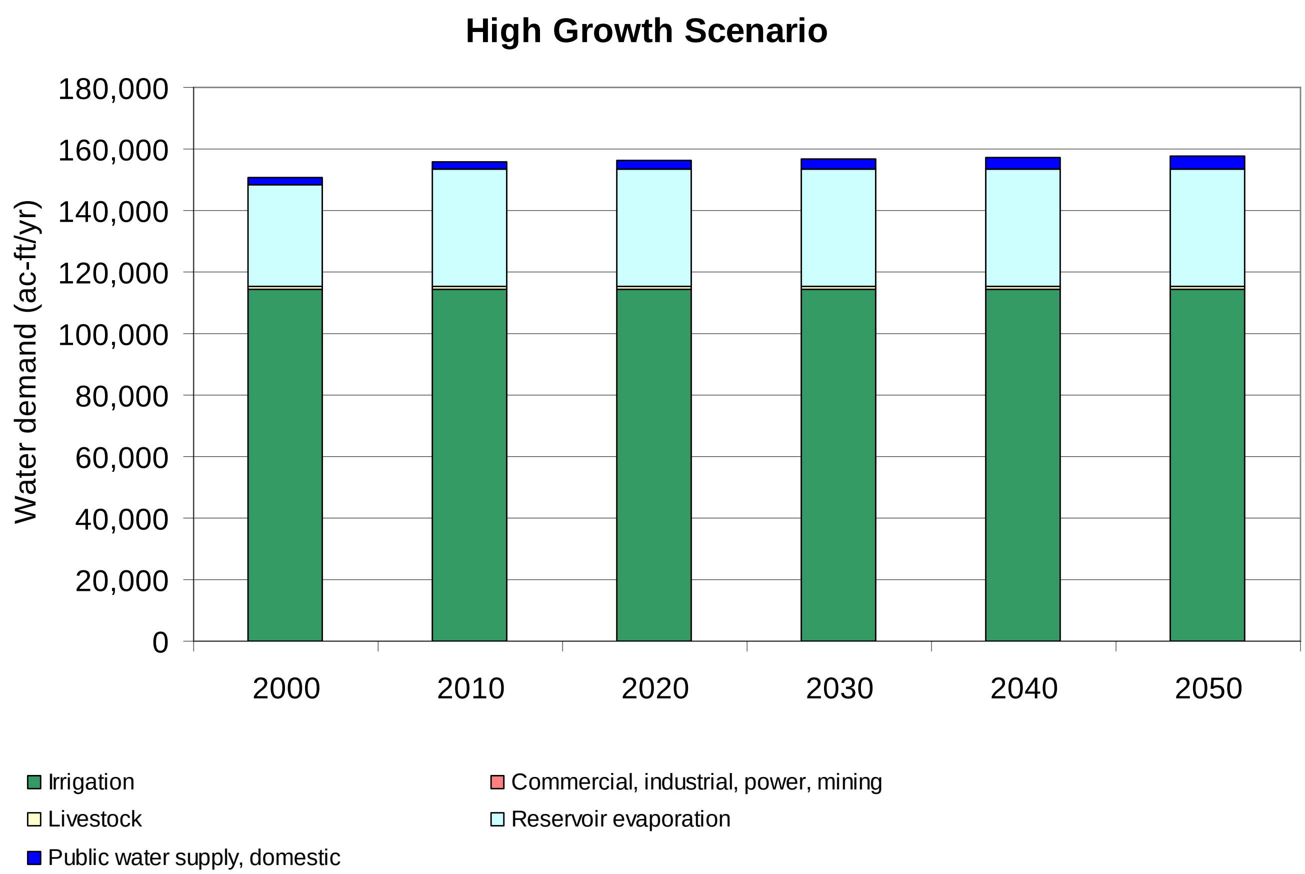

NORTHEAST NEW MEXICO REGIONAL WATER PLAN

Projected Water Diversions in Quay County

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Figure 6-8

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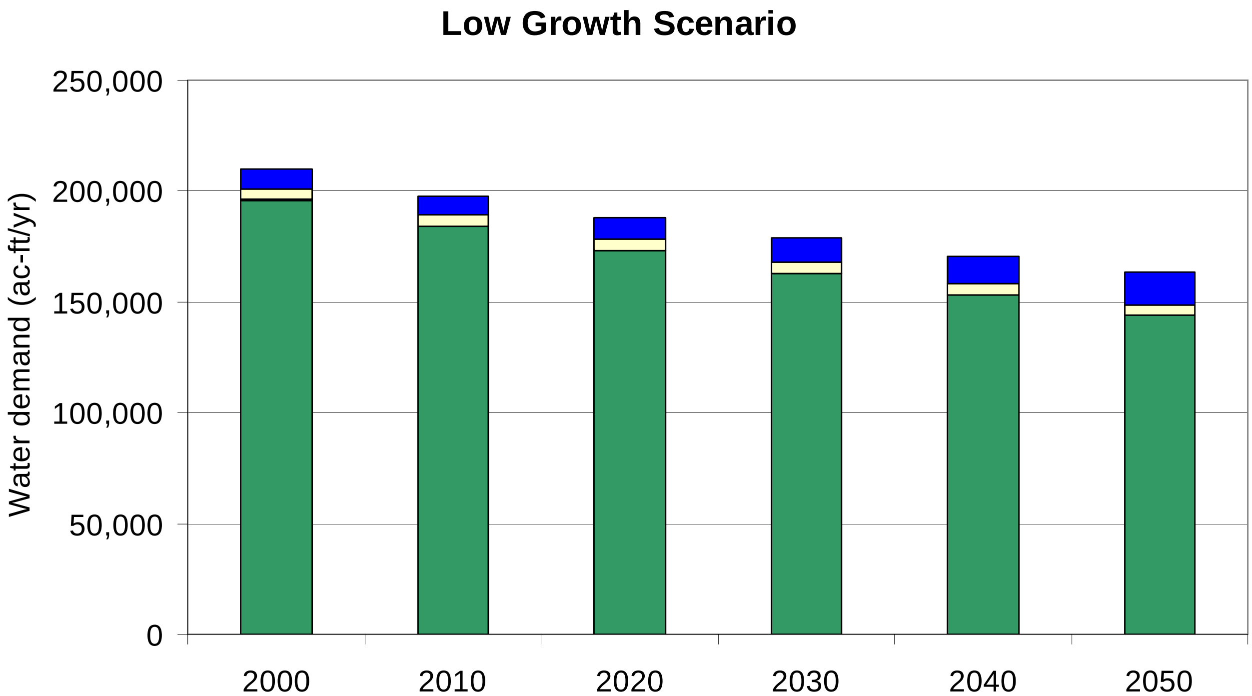

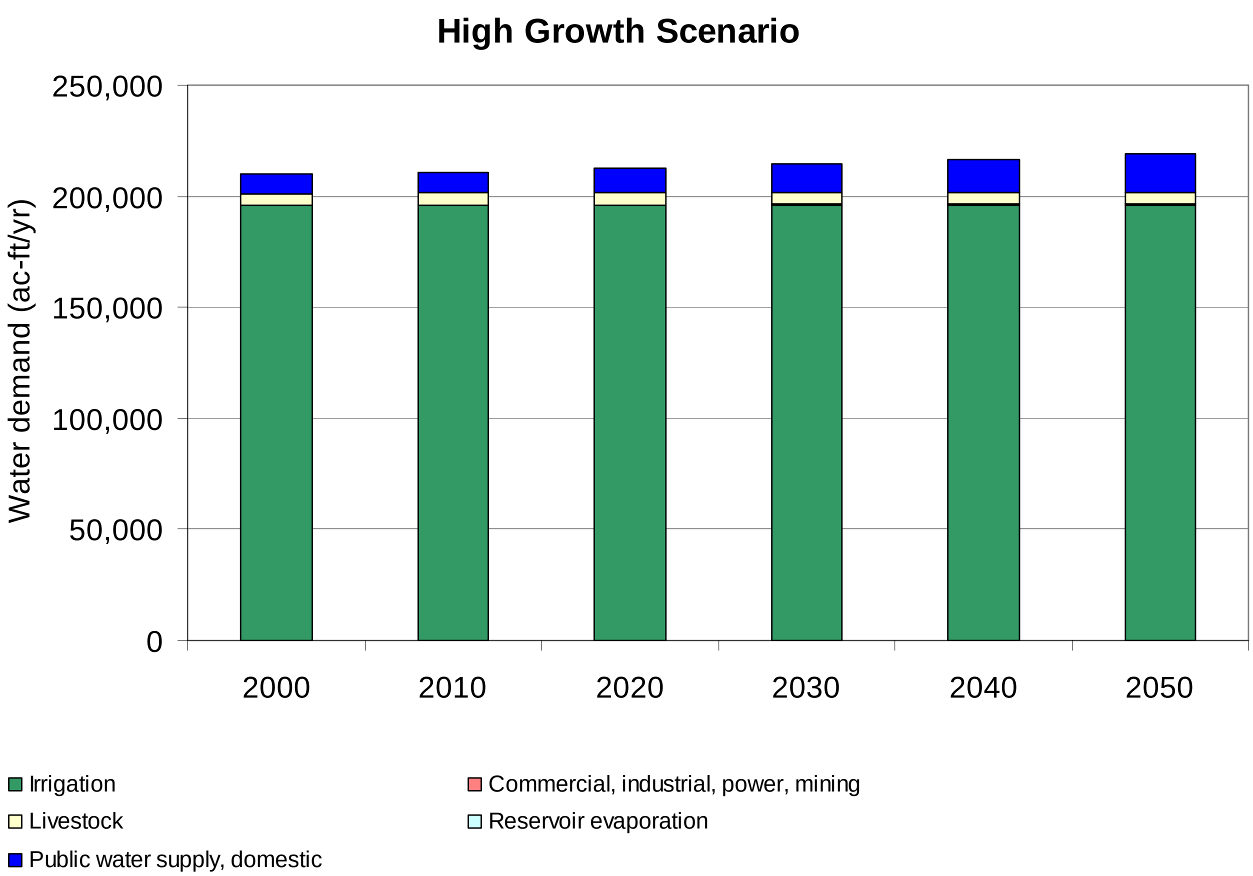

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NORTHEAST NEW MEXICO REGIONAL WATER PLAN

Projected Water Diversions in Curry County

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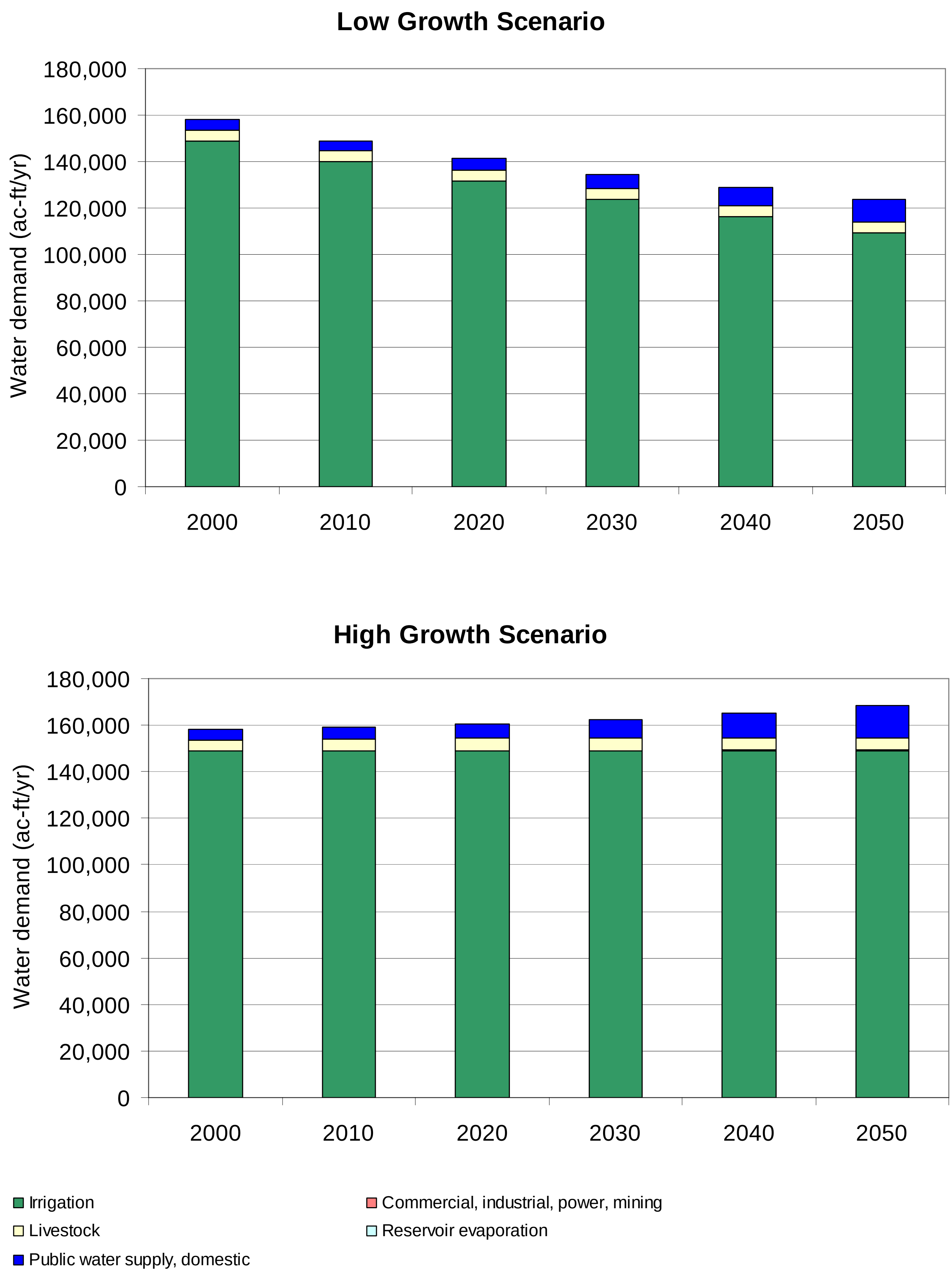
3/21/07

Figure 6-9



NORTHEAST NEW MEXICO REGIONAL WATER PLAN

Projected Water Diversions in Roosevelt County

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3/21/07

Figure 6-10