Pueblo County Food System Assessment
Natural Resources & Agriculture Report

September 2013

This Food System Assessment was conducted on behalf of the Pueblo City-County Health Department's Health Disparities Program. The Health Disparities Program strives to reduce the risk of developing chronic cardiovascular disease precursors such as obesity by providing education and opportunities for the disparate populations in Pueblo County through a grant from the Colorado Department of Public Health and Environment. Colorado State University and WPM Consulting, LLC conducted the research and analysis to inform this assessment.

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I. Introduction

A key component of this food system assessment involves evaluating the natural resource base and the agricultural economy to better understand available food production resources, market development, the constraints, and the opportunities influencing both where and how food is produced in a region. This report assesses changes in agricultural inputs and outputs for Pueblo County and the 5 adjacent counties that comprise the Lower Arkansas River Basin—Bent, Crowley, Fremont, Otero and Prowers Counties. The six-county region is the basis for the 2013 Pueblo City-County Health Department Food System Assessment that analyzes how food production and consumption are impacting health outcomes for diverse populations in the region.

Information presented in this report includes findings on water availability, population, farm structure, agricultural labor, and crop and livestock production throughout the region, and the potential for viability and resiliency in the agriculture sector in the coming years.

This report, its supporting materials, and Pueblo County food system maps are available to view and download at www.pueblohealthdept.org.

II. Study Region

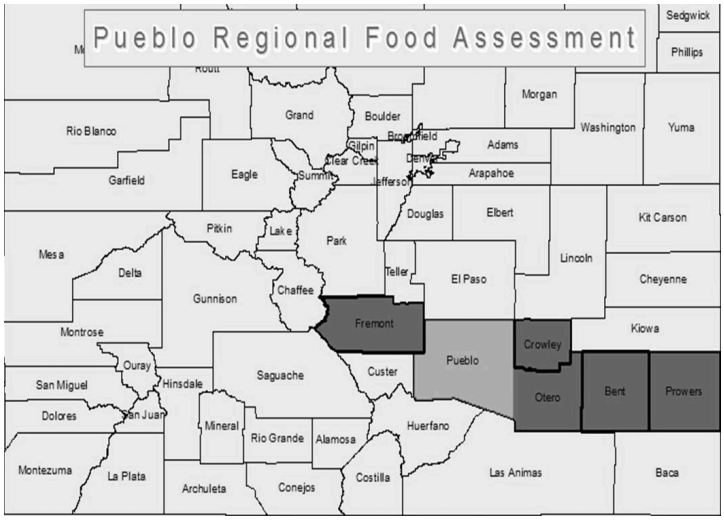
The Arkansas River Basin is known historically as one the state's premier agriculture areas, and has long produced Rocky Ford cantaloupes, livestock, and field and vegetables crops (Arkansas Valley Research Center, 2012). However, the climate, soils, water availability and access to markets have all shaped the region's agricultural economy. In 1896, the Rocky Ford Melon Growers Association was organized to bring producers together for joint marketing, and the first Rocky Ford melons were shipped by rail across the country (Sutherland, 2008). The Rocky Ford area produced melons on the largest acreage in the US, until California's Imperial Valley cantaloupe industry was launched at the turn of the 20th century. The region was also home to a strong sugar beet industry that included processing facilities.

Today, farmers grow a variety of fresh vegetables, but the region is still known for its Rocky Ford melons and many chile pepper varieties. The region grows significant amounts of food crops, including beans, melons, onion and sweet corn, as well as commodity production of barley, corn for grain, alfalfa and other hay, sorghum, and winter wheat. According to the 2011 Colorado Agricultural Statistics, Prowers County ranked 5th in the state in winter wheat acreage planted, and 10th in total production for 2011. Prowers also ranked 2nd in the state in acreage under alfalfa and other hay production

According to the 2007 Census of Agriculture, the land area comprising the six-county study region is 5,877,753 acres, with nearly 4.2 million acres (71%) designated for agriculture. As of 2011, there were more than 251,000 residents in the Lower Arkansas Valley's six-county area, with 64% of the region's population located in Pueblo County. Overall, the region's population has increased slowly since 1991, at a rate of 1% to 2% per year. However, the population in two counties—Otero and Prowers—decreased by 6.5% and 13.5% since 2000, while Pueblo and Crowley Counties have each grown by 13.1%. The population in Bent County increased by 5.8%. Note that the group quarters population (inmates of prisons or nursing homes or group quarters such as military barracks or college dormitories) has grown markedly over this time in both Bent (66%) and Crowley (129%), so this growth does not reflect more residents choosing to live and work there.

Spatially, population growth has occurred differently in each of the six counties. In Bent, Crowley, Fremont and Pueblo Counties, a greater share of the population growth has occurred in unincorporated areas, while Otero and Prowers have gradually lost residents from their unincorporated areas. As more people move into the rural areas of Fremont and Pueblo Counties (the two counties with the least growth among institutionalized populations), this may cause fragmentation of existing agricultural lands, but it may also signal transformation in the agriculture sector. This is important to note since these two counties also show growth in the numbers of fruit and vegetable operations and in total sales from these crops (as discussed later in the agricultural production section).

Figure 1: The Study Region



III. Agricultural Inputs

A. Agricultural Land

According to the 2011 Statewide Water Quality Management Plan, land ownership in the region is predominantly private (70%), with 20% under federal and 10% under state ownership. However, some counties have even greater proportions of land that is publicly managed, such as Otero (37%) and Fremont (53%). See Appendix A for a map depicting land ownership for the six-county region and throughout the Arkansas Basin. Table 1 below shows the total agricultural land for each county since 1987.

Although there are notable changes based on each five-year Census, there are clearly shifts in land use occurring in the region. It is also important to note that 2002 and 2007 data for land in farms are not always comparable to previous Census years, since NASS began adjusting the data to account for farms missed or misclassified as of 2002. Therefore, focusing on data from the most recent years, the six-county area appears to have had an 18% increase in land in farms, with most of that increase in Crowley and Prowers (20% each), followed by Bent (19% from 2002), and Pueblo (18% from 2002).

Table 1: Land in Farms, by County, 1987-2007

	1987	1992	1997	2002	2007
Bent	761,037	796,892	784,273	735,826	877,142
Crowley	408,649	423,785	389,724	375,413	451,225
Fremont	305,137	331,639	331,639	264,650	295,893
Otero	731,609	633,279	579,647	546,396	624,123
Prowers	882,165	822,584	862,953	861,778	1,037,336
Pueblo	892,183	896,994	822,584	774,352	910,566
Region	**3,980,780**	**3,905,173**	**3,770,820**	**3,558,415**	**4,196,285**

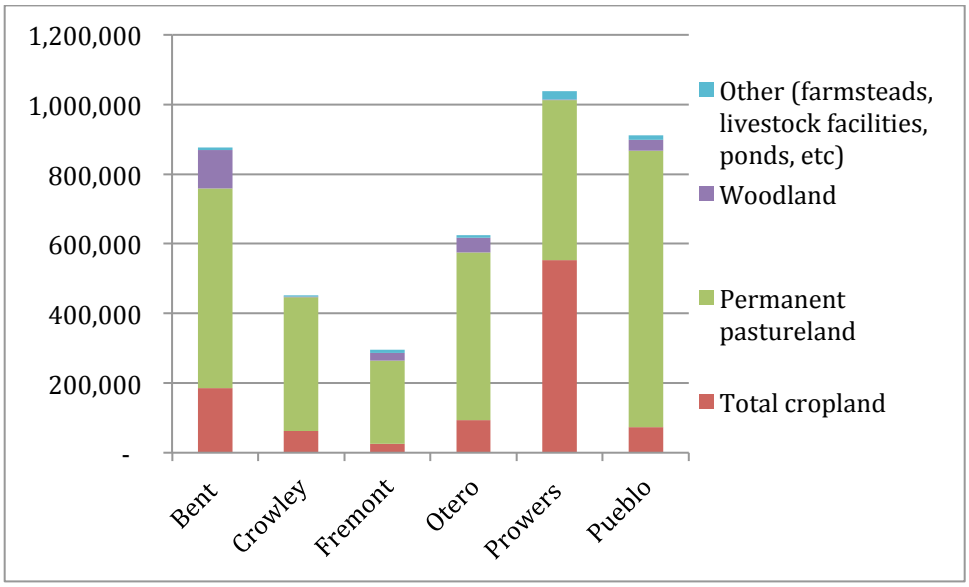
Source: US Census of Agriculture, 1987-2007.

Grassland and forest are the predominant land cover types, with the grassland areas concentrated in the center of the region, and forestland in the western part (see Land Cover map in Appendix B). In terms of production agriculture, the lower elevations in the eastern parts of the region (Bent and Prowers) are more heavily grazed, while the more irregular shaped plains in Crowley and Otero Counties contain a higher percentage of cropland (US Census of Agriculture, 2002 and 2007).

Overall, 2.9 million acres of permanent pastureland lie within the six-county area, comprising 70% of all agricultural land (US Census of Agriculture, 2007). However, while Pueblo, Fremont and Crowley each have 90-91% of their agricultural lands used for some pasture (with permanent pasture comprising between 81-87%), Otero has 88%, Bent has 83%, and Prowers only has 49% used for pasture. Total cropland makes up over 992,000 acres, with 25% in Prowers County, 22% in Pueblo County, and 21% in Bent. Data on harvested cropland are incomplete due to National Agriculture Statistics Service (NASS) policy of not disclosing individual farming operation's information; however, available data

do show that harvested cropland makes up about 10% of the region's total agricultural land (416,994 acres), with most of that cultivated in Prowers County (256,849 acres).

Figure 2: Agricultural Land Use by County, 2007



Source: US Census of Agriculture. 2007.

Table 2: Agricultural Land Use by County, 2007

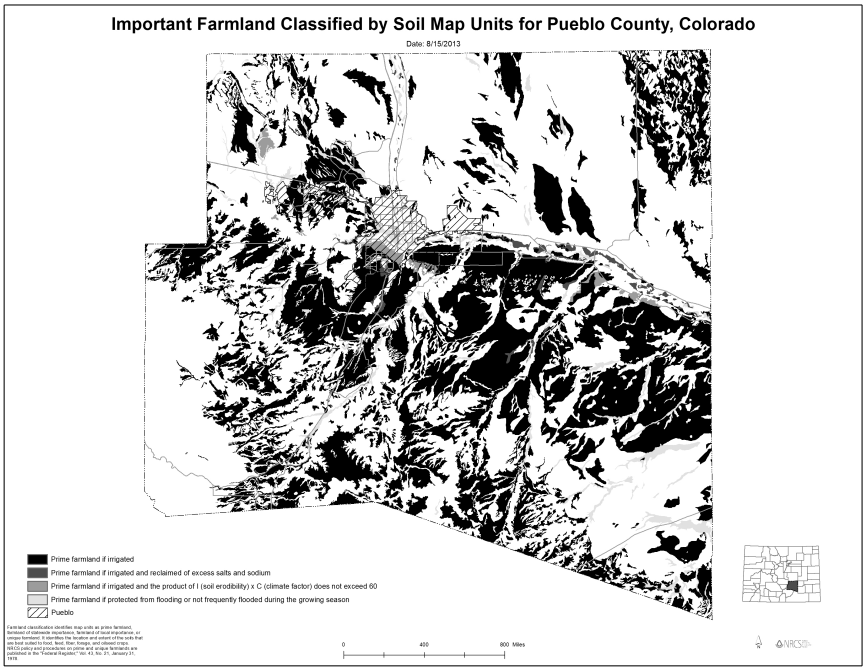
	Land in farms	Total cropland	Permanent pastureland	Woodland	Other (farmsteads, livestock facilities, ponds, etc.)
Bent	877,142	185,702	572,694	110,434	8,312
Crowley	451,225	62,368	383,710	1,765	3,382
Fremont	295,893	25,569	239,421	22,150	8,753
Otero	624,123	92,911	482,255	41,351	7,606
Prowers	1,037,336	552,476	459,603	1,970	23,287
Pueblo	910,566	73,537	793,511	32,211	11,307
Region	4,196,285	992,563	2,931,194	209,881	62,647

Source: US Census of Agriculture, 2007.

Figure 3 below shows important farmland for Pueblo County. Prime farmland is land that has the best combination of physical and chemical characteristics for producing crops, and is also available to support that production. However, prime farmland must have an adequate and dependable water supply. The darkest areas on the maps below depict land

that is prime farmland, if irrigated, followed by those lands that are prime when salinity is managed appropriately. Overall, this map shows how essential irrigation is to crop production in Pueblo County, and to similar soils throughout the Arkansas River Basin.

Figure 3: Important Farmland by Soil Map Units in Pueblo County, Colorado

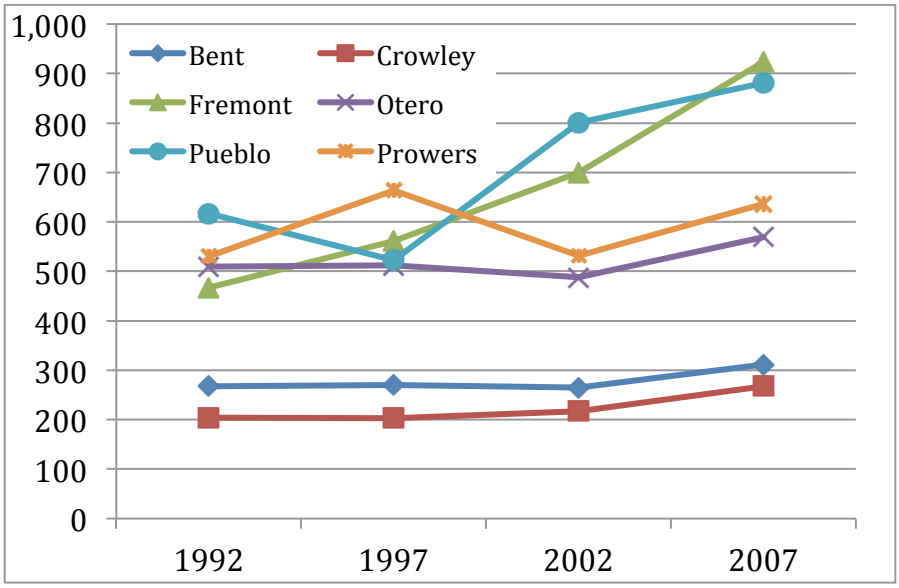


Source: Natural Resources Conservation Service, 2013.

Farms and Farm Size

The total number of farms increased substantially in the region from 2,595 to 3,589 from 1992 to 2007, or 38% overall (see Figure 4 below). The greatest increases in numbers of farm units occurred in Fremont County (98%) and in Pueblo County (48%). Although a small amount of this increase may be due to changes in Census of Agriculture data collection methods, there is certainly a restructuring that will influence agricultural production potential and land management throughout the region, as a greater number of smaller holdings are created and managed for different purposes.

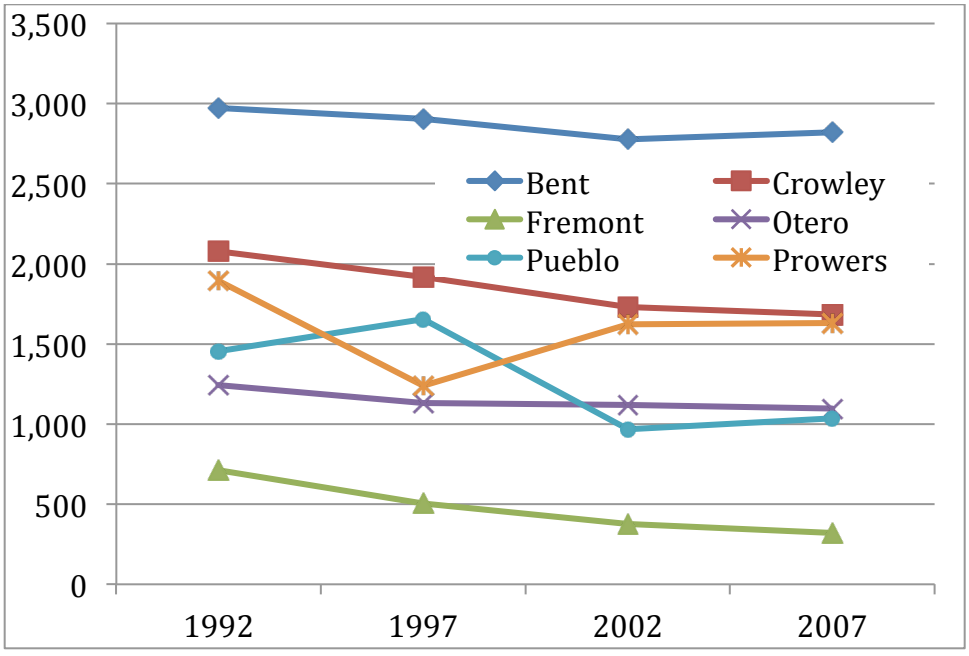
Figure 4: Total Number of Farms, 1992-2007



Source: US Census of Agriculture, 1992-2007.

In 2007, the average farm size in the region was 1,431 acres, down 17% from 1,736 in 1992 (see Figure 5 below). Bent County still has the largest farms, at 2,820 acres on average, followed by Crowley County, with an average 1,684 acres per farm. The greatest changes in farm size occurred in Fremont County, where average farm size decreased by half to 320 acres in 2007, and in Pueblo County, where it decreased by 29% to 1,034 acres over the same period.

Figure 5: Average Farm Size, 1992-2007



Source: US Census of Agriculture, 1992-2007.

As of 2007, Fremont County had the greatest number of farm units across the six-county region (924), but they were small operations in terms of land area (320 acres on average). On the other hand, in 2007, Bent County had 311 farms averaging 2,820 acres each.

Table 3: Summary of Changes in Farm Size and Numbers of Farms, 1992-2007

County	Average farm size	Number of farms
Bent	-5%	16%
Crowley	-19%	31%
Fremont	-55%	98%
Otero	-12%	12%
Pueblo	-29%	43%
Prowers	-14%	20%
Region	-17%	38%

Source: US Census of Agriculture, 1992-2007.

Clearly, the agricultural land base for the region is changing, especially in terms of the size of holdings. However, the greatest change to agriculture is the availability of water and its influence on the degree to which existing agricultural land uses can provide economic returns now and in the future.

B. The Role of Water in Agriculture

Population growth and changes in water demand from different sectors of Colorado's economy have long had many impacts on the six-county region's agricultural economy. 2005 data from the Statewide Water Quality Management Plan (Colorado Department of Public Health and Environment (CDPHE), 2011) indicate that agriculture withdraws 84% of the 16-county Arkansas River Basin's total water, with competition from public supply (also known as municipal uses-10.2%); industrial (3.3%); thermoelectric (1.67%); and other domestic, mining, and irrigation uses at less than 1.0% each. In addition, the Basin supports significant recreational uses—especially water-based activities, such as rafting and kayaking. Furthermore, environmental uses, such as maintaining in-stream flows that support aquatic life, streamside vegetation, and habitat for non-aquatic species, are important water uses recognized by the State of Colorado. Although local governments must secure adequate water for current and proposed housing, industrial and commercial uses, agricultural landowners need long-term water security before they will make investments in annual production and long-term agricultural infrastructure, such as irrigation equipment. Therefore, an important cornerstone of the region's agricultural production is the availability of irrigation water.

The study region receives its irrigation water from the Arkansas River (see Figure 6), which begins in Colorado's central Rocky Mountains, and flows to the east and southeast into Kansas. Like all of Colorado, the stream-flow is based on the annual snowfall that accumulates in the winter and early spring. Spatially, the river is the largest in Colorado and covers 27% of the state's surface area or 28,268 square miles (CDPHE, 2011). The

Food System Assessment's six-county region lies in the central part of the entire Arkansas River Basin.

Figure 6: Arkansas River Basin

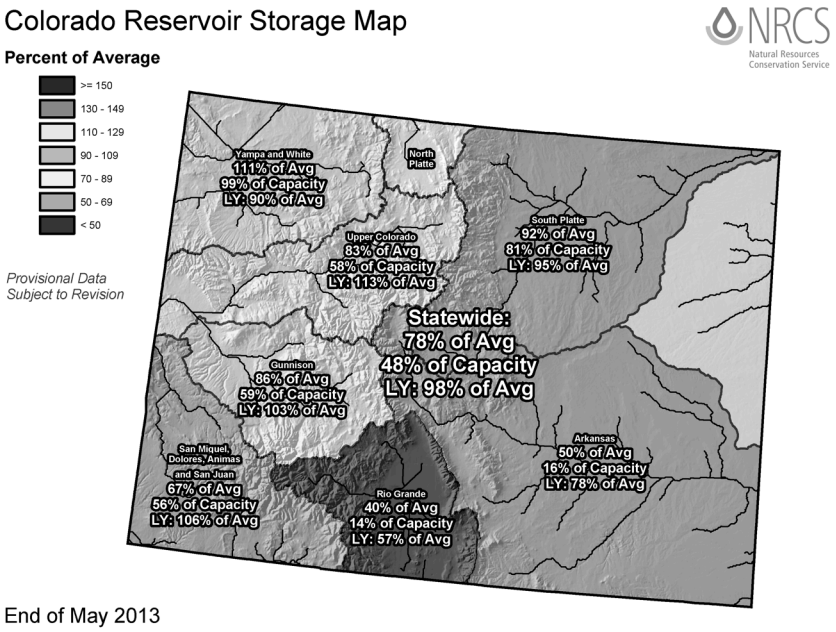
Source: Statewide Water Supply Initiative Fact Sheet for Arkansas Basin, Colorado Water Conservation Board, 2006.

The 1949 Arkansas River Compact determines the allocation between Colorado (60%) and Kansas (40%), based on the inflow to the John Martin Reservoir, located in Bent County (Thorvaldson and Pritchett, 2005). A 2005 study on water withdrawals in the Arkansas Basin found that agriculture (both crop and livestock production) used 84% of the total basin withdrawals, followed by municipalities (10%) and industrial (3.3%) (CDPHE, 2011).

Irrigation for agriculture is applied by center-pivots, flooding, and drip systems (USGS 2011), therefore water shortages are frequent (Thorvaldson and Pritchett, 2005). In addition, there are plans under the Statewide Water Supply Initiative to dry up approximately 72,000 acres of irrigated land in the Arkansas Basin, creating further shortages for agricultural uses (Thorvaldson and Pritchett, 2005).

The three main reservoirs in the Arkansas Basin—the John Martin, Pueblo, and the Great Plains System—account for over a million acre-feet of water storage capacity (Colorado Decision Support System, 2013). However, normal storage capacity varies greatly both year-to-year, and season-to-season. For example, at the end of May 2013, after several years of drought, the Arkansas Basin was at 50% of normal capacity and only 16% of total capacity. In May 2012, the basin was at 78% of normal capacity.

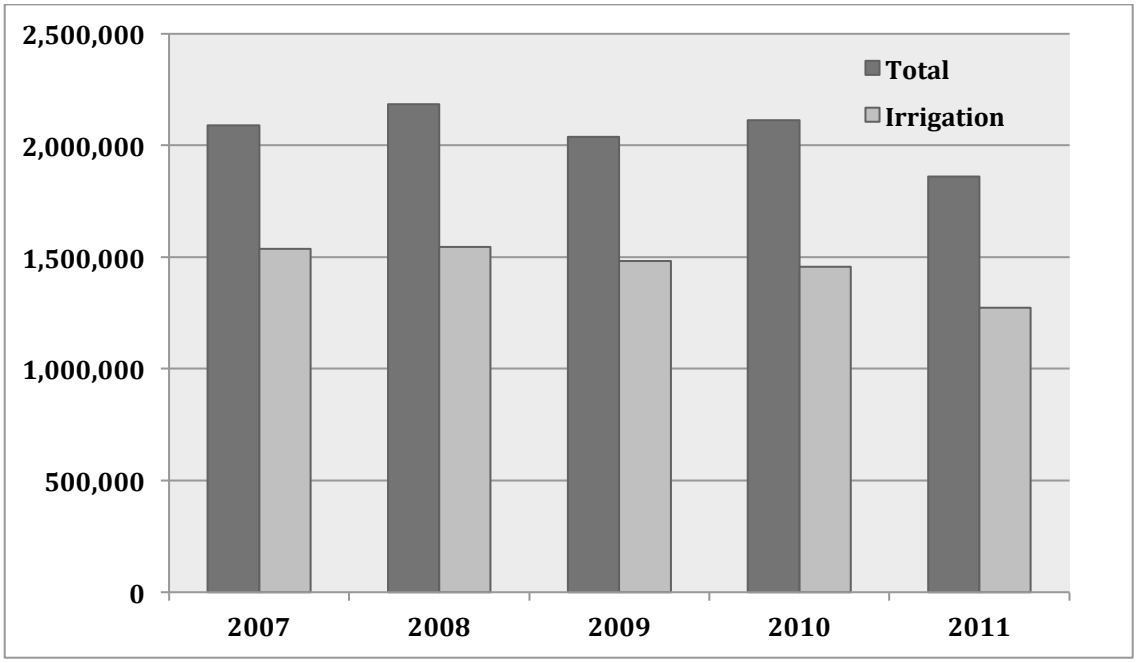
Figure 7: Colorado Reservoir Storage Map



Source: Natural Resources Conservation Service, 2013.

Figure 8 below indicates continued competition for water among agricultural users in the greater Arkansas Basin, as surface water deliveries have declined by 10% since 2007, and irrigation has fallen by 17% (Colorado Division of Water Resources, 2013). The Lower Arkansas Water Conservancy District is promoting the idea of the major canal companies implementing a rotating fallowing system, as opposed to drying up agricultural land, to meet municipal water needs (Colorado Division of Water Resources, 2013). The water from the fallowed land would then be leased to municipalities, thereby providing some revenue to agricultural producers, but removing the irrigation water from agricultural use for that year.

Figure 8: Arkansas River Basin, Surface Water Deliveries and Irrigation in Acre Feet 2007-2011



Source: Colorado Division of Water Resources, Cumulative Yearly Statistics, 2011.

In the study region, there were about 254,000 acres of irrigated land in 2007 (see Table 4), or 6% of all land in farms, up from 206,000 in 2002. The most recent Census data show increases in irrigated acreage in all counties except Fremont and Pueblo, with Bent and Crowley Counties bringing an additional 23,693 acres under irrigation conditions. This, combined with a decreasing supply of irrigation water, will result in further decreases in total irrigated acreage.

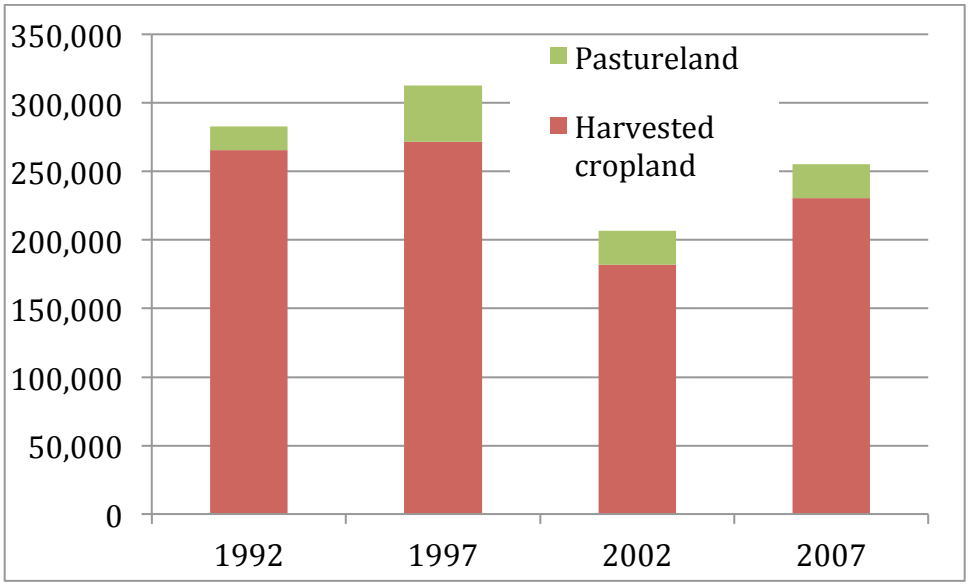
Table 4: Irrigated Land by County, 1992-2007

	1992	1997	2002	2007
Bent	52,877	62,709	30,219	50,219
Crowley	11,552	21,647	6,156	9,849
Fremont	12,779	19,272	11,882	11,845
Otero	60,432	63,001	39,230	55,217
Prowers	113,922	111,091	94,175	103,205
Pueblo	31,515	35,638	24,734	24,606
Region	283,077	313,358	206,396	254,941

Source: US Census of Agriculture, 1992-2007.

As shown in Figure 9 below, most of the region's irrigated land is in harvested crops (90%), although this amount varies from county-to-county, with Prowers County at 95% of its irrigated land in crops, and Crowley County at 77%, as of 2007.

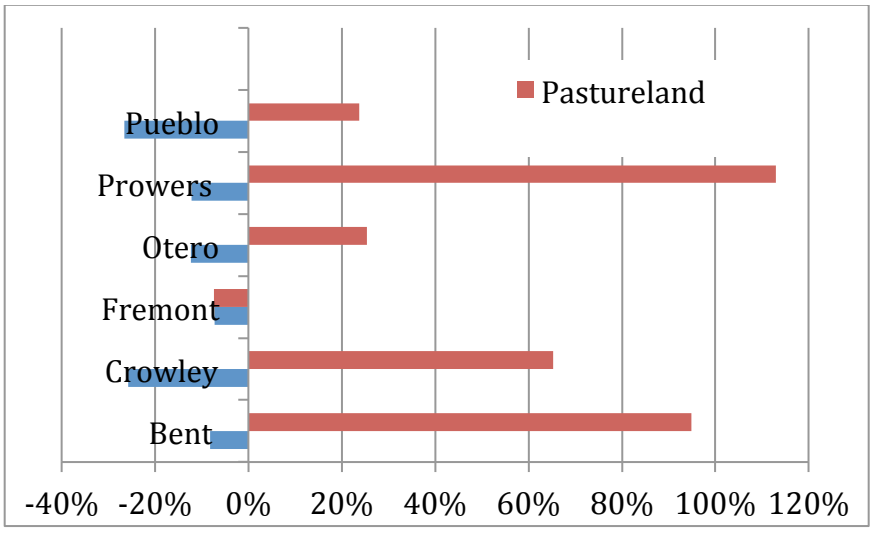
Figure 9: Total Irrigated Acres in Pastureland and Cropland, 1992-2007



Source: US Census of Agriculture, 1992-2007.

Of greater concern for the region's food production potential is the fact that, according to Census of Agriculture data through 2007, producers appear to be shifting available irrigation water away from crop production and into pasture. From 1992 to 2007, irrigated pasture increased by 43%, while irrigated harvested cropland decreased by 13%. This is likely due to the fact that decreased supplies of water cannot be allocated to the high-value, water-consumptive specialty crops, for which the region is known (melons, chiles); rather available water can be applied to maintain pasture—thus obtaining some, but not all of the maximum return on the water resource.

Figure 10: Change in Acreage Under Irrigation, Cropland and Pastureland, 1992-2007

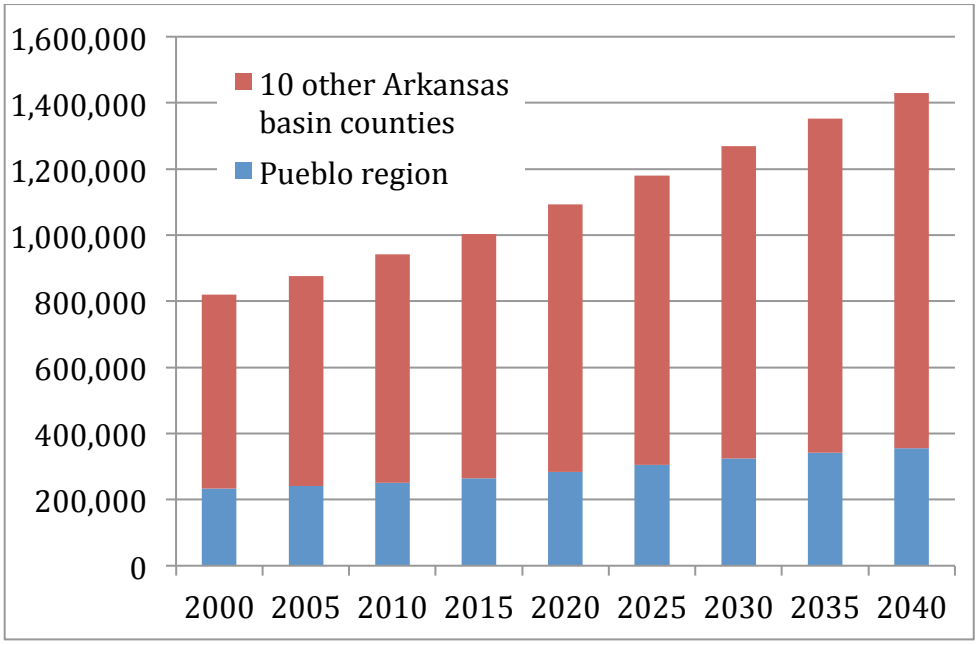


Source: US Census of Agriculture, 1992-2007.

C. Impact of Population Growth on Agriculture

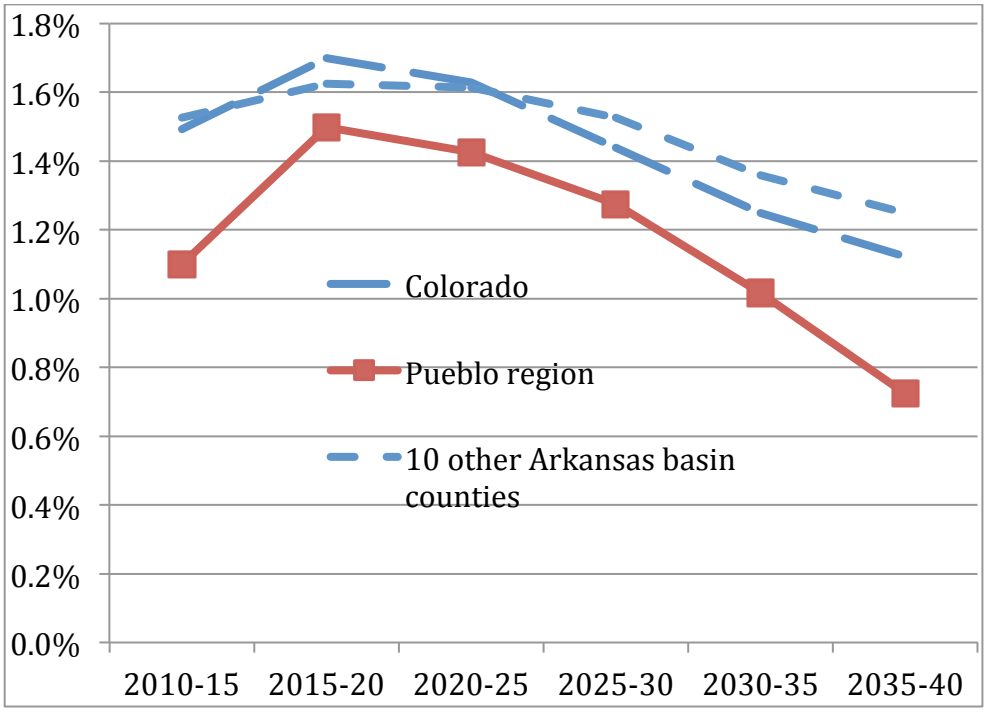
Colorado's Front Range population growth continues to spur the demand for water—water that must now be supplied from outside the state's urban areas. The population within the six-county study region is expected to grow below state rates, according to recent projections from the State Demographer's Office (see Figure 11 below). This means that population growth, and the resulting demand for municipal water, will occur outside the study region, but water from within the six-county region and the entire Arkansas Basin will certainly be targeted to supply growth in other parts of the state, such as Colorado Springs in the Southern Delivery System.

Figure 11: Population Estimates and Projections, Arkansas Basin Region, 2000-2040



Source: Colorado State Demography Office, 2000-2040.

Figure 12: Population Growth Rates for Colorado and the Arkansas River Basin, 2010-2040



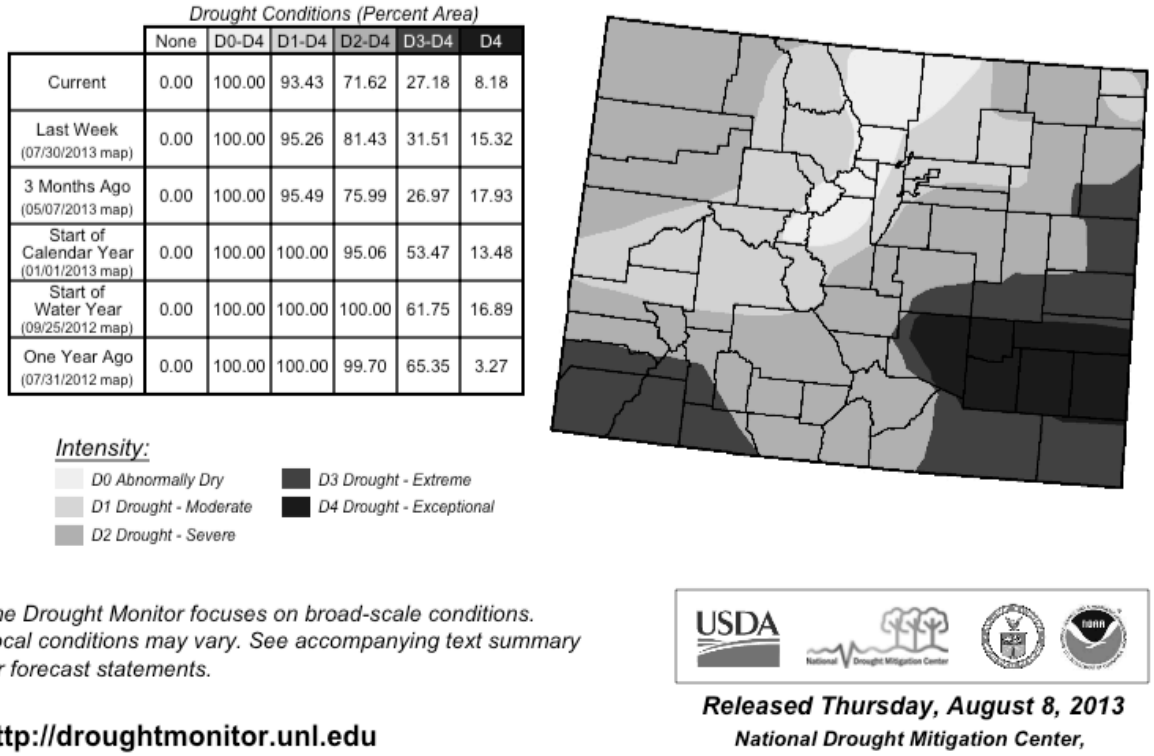
Source: Colorado State Demography Office- Population Forecasts, 2000-2035.

This certain increase in population outside, but adjacent to, the Pueblo region will impact water availability throughout the Arkansas River Basin. In fact, earlier estimates from 2000 indicated an anticipated 38% increase in water demand—an additional 98,000 acre-feet would be required by 2030. As described in Thorvaldson and Pritchett (2005), the Arkansas Basin is over-appropriated, and there is no viable way to procure new sources of water for municipal uses, except from existing agricultural water rights.

D. Impact of Drought on Agriculture

Concerns over agricultural water transfers and their impacts on rural economies are significant in the lower portion of the basin downstream from Pueblo (Colorado Water Conservation Board, 2006). However, drought events can also have far-reaching impacts on rural communities. Persistent drought, such as the event that began in the fall of 2010 in southeastern Colorado, decreases crop and livestock producers' revenues, as well as expenditures at businesses and in towns throughout the region. According to the US Drought Monitor (Figure 13) the study region is still under significant drought conditions when compared to the rest of the state—categorized as extreme to exceptional drought conditions.

Figure 13: US Drought Monitor for Colorado, August 6, 2013



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	93.43	71.62	27.18	8.18
Last Week (07/30/2013 map)	0.00	100.00	95.26	81.43	31.51	15.32
3 Months Ago (05/07/2013 map)	0.00	100.00	95.49	75.99	26.97	17.93
Start of Calendar Year (01/01/2013 map)	0.00	100.00	100.00	95.06	53.47	13.48
Start of Water Year (09/25/2012 map)	0.00	100.00	100.00	100.00	61.75	16.89
One Year Ago (07/31/2012 map)	0.00	100.00	100.00	99.70	65.35	3.27

A recent report by researchers in the Department of Agricultural and Resource Economics at Colorado State University attempts to quantify the impact of the drought on Southern Colorado's agricultural economy (Pritchett, et al. 2013). For 2011, producers reported lost revenues of $104.7 million, and estimated employment losses at 1,309 jobs, based on crop losses to corn, hay, sorghum, sunflower, and wheat. Table 5 shows producers' estimated losses in revenues and employment, by major crop, compared to 2010.

For 2012, the researchers estimated the losses to a wider range of crops across the state, based on historic average yields, and 2012 commodity prices (which were higher than those observed in years prior to 2011). Foregone revenues, based on impacts of the ongoing drought and abandoned planted acres, are estimated at $409 million for 2012 (Goemans, et al., 2013). This signals lost revenues that would otherwise have been spent by farmers on inputs and, therefore, would have circulated in the local economy. The impact of this total loss of economic activity is estimated at $726 million for the state, which demonstrates that there would have been a significant impact for southeastern Colorado's economy overall (Goemans et al., 2013).

Table 5: 2011 Economic Activity Change in the Arkansas Basin

(Self-reported by producers, compared to 2010)

	Total Impact in $	Employment Loss (workers)
Corn (grain)	($48,087,345)	(630)
Hay	($21,176,058)	(236)
Sorghum	($14,750,428)	(193)
Sunflowers	($3,178,128)	(21)
Wheat	($17,548,434)	(230)
Total	($104,740,393)	(1,309)

Source: 2011 Colorado State University producer survey (received from J. Pritchett, 2013).

Agricultural producers have different strategies for managing drought, and its impacts on an already water-deficient landscape. A 2013 CSU report highlights how Colorado producers have responded to the state's ongoing drought conditions (Pritchett et al., 2013). In addition to asset sales (breeding livestock, equipment or land), which signal a significant negative response, producers reported taking on additional work by custom farming (12%); seeking off-farm income (25%); reducing family expenses (59%); and seeking federal assistance (18%).

In particular, breeding livestock are the cornerstone to successful, long-term cow-calf operations because they are the "productive assets" these operations have invested years to develop, and thus, sales of breeding stock highlight the difficult decisions producers made due to water and feed shortages. Between 2010 and 2011, there is a significant increase in ranchers' intentions to sell breeding stock, followed by selling equipment and then selling land (see Table 6).

Table 6: 2011 Livestock Management Decisions, 2010-2011

(Self-reported by producers, compared to 2010)

	2010	2011
Sold/Will Sell Breeding Livestock	29%	41%
Sold/Will Sell Equipment	19%	13%
Sold/Will Sell Land	9%	2%

Source: 2011 Colorado State University producer survey (received from J. Pritchett, 2013).

Livestock producers also report reducing the number of cows (breeding animals), and increasing culling to further reduce the number of animals on feed on their operations. Producers estimated that cow condition is 18% below average, which is an indication that future reproduction may be negatively impacted by current breeding animal health and nutrition. Other indicators of changes in management to reduce costs include reducing the number of animals weaned and thus retained on feed. These cost reductions are all the more necessary as producers report that average costs per cow increased by 40% over 2010, an indication of the impact of higher feed costs on the financial viability of livestock operations.

Table 7: Changes in Livestock Management from Typical Strategies, 2010-2011

(Self-reported by producers, compared to 2010)

Production metric:	Change from typical conditions, from 2010-2011
Number of Cows	-48%
Culling Rate	+21%
Cow Condition at Present	-18%
Weaning Percentage	-1%
Average Weaning Weight	-16%
Average Cost Per Cow	+40%

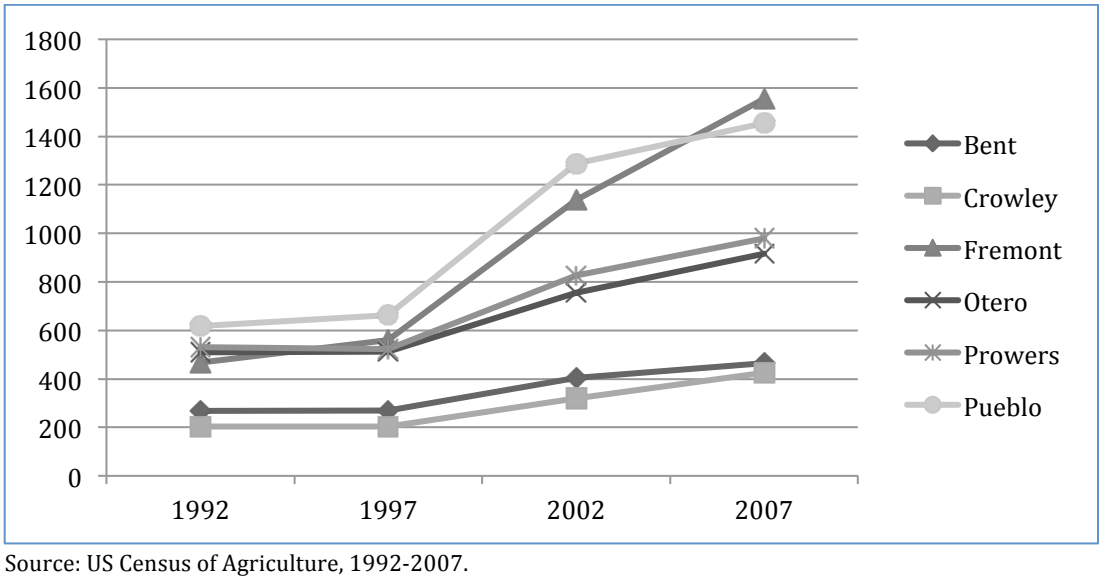
Source: 2011 Colorado State University producer survey (received from J. Pritchett, 2013).

E. Agricultural Management and Labor

Farm Operators

In 2007, the region was home to 5,796 farm operators—more than double the total number in 1992 (see Figure 14). Today, Fremont County has the greatest number of farm operators (1,554), followed by Pueblo (1,454). Bent and Crowley Counties have the fewest operators at 466 and 426, respectively. Although several of the region's counties boast a greater number of farmers, it is important to note that the average age of those farmers is increasing, meaning that they have a shorter management horizon before they must transition their operation to an incoming farmer. For the study region, the average age of farmers is 57, with a small range from 54 years in Otero County to 59 years in Crowley County.

Figure 14: Number of Farm Operators, 1992-2007

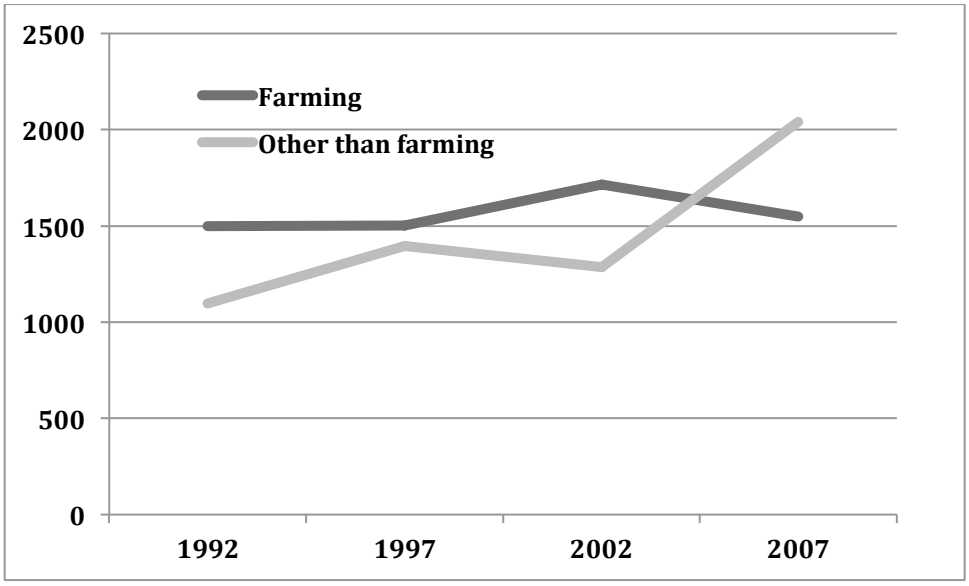


Source: US Census of Agriculture, 1992-2007.

Labor on Farms

According the Economic Research Service, off-farm farm income received by farm operators and their spouses has risen steadily in recent decades. In general, this is attributed to technological progress on farm and a need to "smooth out household income flows" (Fernandez-Cornejo, 2007). Similarly, many farm operators in the study region continue to seek off-farm work (see Figure 15). In 2007, 43% of all producers said that farming was their primary occupation. Bent County reported the highest rate of producers with farming as their primary occupation (56%), followed by Crowley (50%), Otero and Prowers (47%), Pueblo (39%), and Fremont (36%).

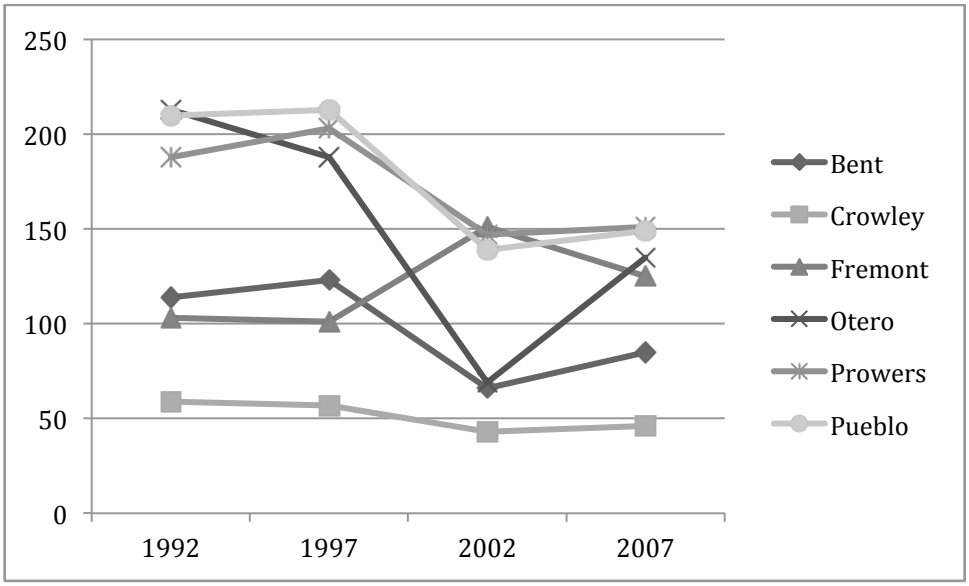
Figure 15: Farming as a Primary Occupation, 1992-2007



Source: US Census of Agriculture, 1992-2007.

The amount of hired labor in the region has also been changing. The number of farms hiring labor in the region fell by 22% from 1992 to 2007, while the total number of workers hired fell by 7% over this same period. The greatest changes have occurred in Otero County, where the number of hired workers has nearly tripled since 1992 to 767, and in Pueblo County, where the number of workers decreased by more than half over this same time period. Bent and Prowers County also reported increases in the number of hired workers, while Crowley and Fremont producers reported hiring fewer workers.

Figure 16: Number of Farms Hiring Labor, 1992-2007



Source: US Census of Agriculture, 1992-2007.

Employment in agriculture may be classified into three major categories: jobs in production, input supply (seed, fertilizer, irrigation supplies, etc.), and processing and marketing. These categories help us to understand what part of the supply chain for agriculture is supported through employment in a region, and what areas are lacking. According to data estimated for 2007, overall, agriculture (or agribusiness) provides nearly 5% of all employment in the region, but this proportion varies by county. By sector, half of all the region's jobs in agriculture were in production, followed by processing and marketing (37%), and input supply (13%). For comparison, agribusiness comprises 3.3% of the state's total employment, and most agricultural jobs in the state are in the processing and marketing sector. In the study region, Pueblo County has the greatest number of jobs in processing and marketing, while Prowers has the most in production. We might infer from the dearth of employment on the input side that some types of suppliers are not available within the region, and producers likely incur greater costs of production when they have to access their inputs out of the region or even out of state.

Table 8: County-level Agricultural Employment Estimates by Sector, 2007

	Farm Production	Ag. Inputs	Processing/ Marketing	Total Agribusiness	Total County Employment	Agribusiness % of Total County Employment
Colorado	29,666	13,583	51,142	94,392	2,890,559	3.3%
Bent	424	40	3	467	1,975	23.6%
Crowley	206	38	1	244	1,586	15.4%
Fremont	398	76	177	651	18,039	3.6%
Otero	499	153	519	1,171	8,386	14.0%
Prowers	559	254	186	999	6,446	15.5%

	Farm Production	Ag. Inputs	Processing/ Marketing	Total Agribusiness	Total County Employment	Agribusiness % of Total County Employment
Pueblo	533	138	1,062	1,733	69,836	2.5%
6-county region	2,619	699	1,948	5,265	106,268	4.95%

Source: Colorado State Demographer's Office, based on 2007 data.

Table 9 below illustrates how income is received from agricultural employment throughout the region, by county. 2007 estimates show that 46% of earnings are in production, followed by 41% in processing and marketing, and 12% in input supply. Overall, agribusiness represents 3.3% of all income in the 6-county region. Clearly production agriculture is still an important source of income for business owners and farm labor. Prowers has, by far, the greatest earnings and employment in production agriculture, while Pueblo has the greatest earnings in processing and marketing, whereas Bent and Crowley Counties have very limited employment and earnings in this area. Of the region's six counties, Otero has the most balanced employment in agriculture which indicates the presence of more support businesses for all supply chain functions.

Table 9: County-level Earnings from Agriculture, by Sector, 2007

	Farm Production ($1000s)	Ag. Inputs ($1000s)	Processing/ Marketing ($1000s)	Total Agribusiness ($1000s)	Total County Earnings ($1000s)	Agribusiness as % of Total County Income
Colorado	1,099,827	663,250	3,551,980	5,315,056	222,992,537	2.38%
Bent	14,621	3,499	99	18,218	138,261	13.18%
Crowley	8,485	823	81	9,388	96,258	9.75%
Fremont	(246)	1,906	8,891	10,550	1,257,635	0.84%
Otero	24,718	6,177	21,304	52,198	583,530	8.95%
Prowers	55,793	14,168	7,554	77,515	405,209	19.13%
Pueblo	9,599	3,356	63,062	76,017	4,901,178	1.55%
6-county region	112,969	29,929	100,990	243,887	7,382,070	3.30%

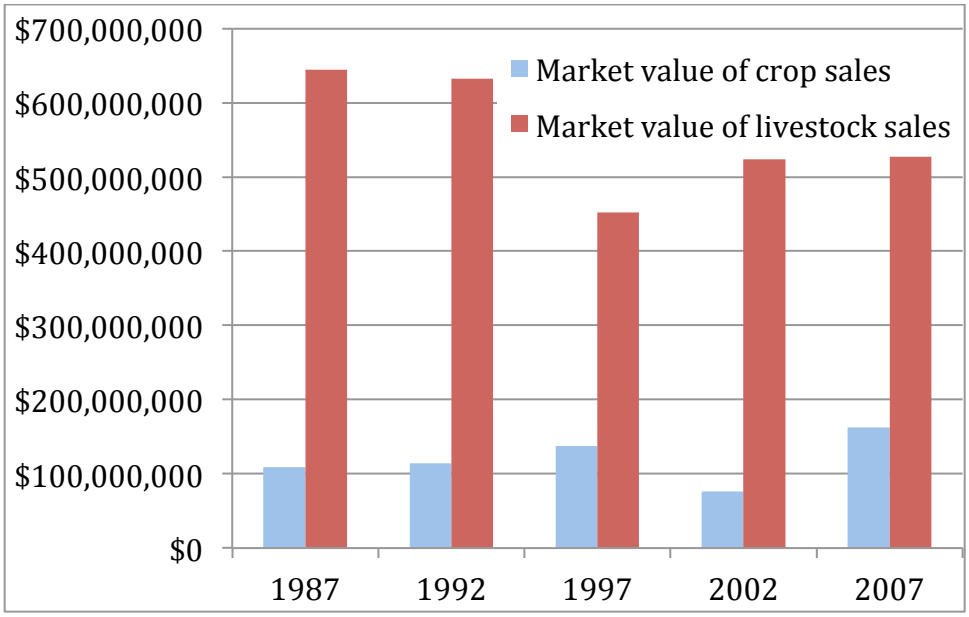
Source: Colorado State Demographer's Office, 2007 data adjusted to 2011 dollars.

IV. Agricultural Production

US Census of Agriculture data show that total sales of crop and livestock products were $690 million in 2011 (in 2011 inflation-adjusted dollars), approximately 8% less than the $758 million reported in 1987. Prowers County sales represent 41% of this total, while Crowley and Otero each make up 17%, Bent 13%, Pueblo 8%, and Fremont 3%. Overall, livestock sales comprise between 77%-87% of all commodity sales, and have been the dominant source of sales receipts for the region's producers (looking back over the last 20 years of Agriculture Census data). In contrast to livestock sales, regional crop sales have

always represented from 14-25% of total sales. However, at the county level, Pueblo producers have derived as much as 42% of all sales from crop production, and Fremont as high as 32% of all sales from crops, while Crowley has had the lowest proportion of crop sales (from 1-6%).

Figure 17: Market Value of Crops and Livestock Sales for the Region, 1987-2007



Source: US Census of Agriculture 1987-2007. All data in 2011 dollars.

Table 10: Market Value of Crop and Livestock Sales, by County (in $US), 1987-2007

	1987	1992	1997	2002	2007
Bent	70,311,026	83,429,442	71,075,118	102,719,226	89,197,966
Crowley	166,770,497	151,671,093	102,771,195	66,748,992	120,335,888
Fremont	18,869,777	21,554,383	17,056,122	18,302,708	20,944,489
Otero	150,709,130	164,231,122	140,064,820	132,525,206	120,623,379
Prowers	273,784,799	268,129,533	211,416,032	228,283,702	285,668,907
Pueblo	72,993,941	57,408,345	47,073,216	52,079,818	53,431,990
Region	753,439,170	746,423,918	589,456,504	600,659,651	690,202,618

Source: US Census of Agriculture 1987-2007. All data in 2011 dollars.

More recent data from the Bureau of Economic Analysis show gains in receipts from crop sales across all counties after two years of declines, but this may be a result of higher commodity prices, rather than a reflection of a true increase in sales volume. From 2010 to

2011, Otero showed the greatest increase in crop sales receipts (36%), followed by Pueblo (23%), and Bent (14%).

Table 11: Changes in Cash Receipts from Crop Sales, by County, 2007-2011

	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011
Bent	159%	36%	-5%	3%	14%
Crowley	-5%	15%	-4%	-4%	7%
Fremont	-11%	5%	-5%	-11%	13%
Otero	26%	21%	-9%	-6%	36%
Prowers	44%	2%	-5%	5%	8%
Pueblo	11%	11%	4%	-4%	23%

Source: US Bureau of Economic Analysis, 2013.

Furthermore, BEA data also show increases in cash receipts from livestock sales since 2009, which reflect high beef prices combined with increased cattle sales. Recent research indicates that, as a result of the drought in southeastern Colorado, cattle producers are selling more of their herds, instead of retaining them, due to increases in hay prices and decreases in forage quality.

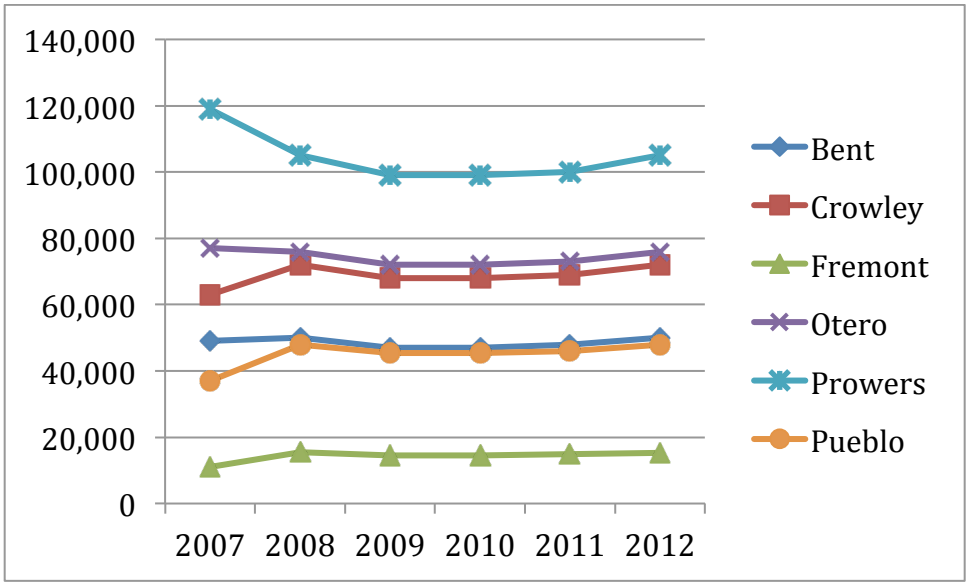
Table 12: Changes in Cash Receipts from Livestock Sales, by County, 2007-2011

	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011
Bent	-19%	-12%	-15%	18%	9%
Crowley	-6%	-10%	-11%	8%	4%
Fremont	32%	-4%	-24%	17%	15%
Otero	-22%	-10%	-11%	8%	4%
Prowers	-22%	-10%	-11%	8%	5%
Pueblo	2%	-10%	-12%	8%	5%

Source: US Bureau of Economic Analysis, 2013.

Indeed, the value of inventory changes for livestock over the last few years show that livestock held for sale increased in total value from $6.6 million to over $15.7 million from 2010 to 2011 for the region (US Bureau of Economic Analysis, 2013). Figure 18 below shows the estimated value of the net change in the farm inventories of livestock commodities that are held for sale during a given calendar year. Colorado's annual agricultural statistics for 2007 through 2012 (Figure 18 below) also show that livestock inventories began to increase in 2011, from several years of steady inventories, at a rate of nearly 6% in each of the study region's six counties, again indicating greater likelihood that producers are selling more of their livestock due to ongoing drought conditions, rather than retaining them.

Figure 18: Livestock Inventories by County, 2007-2012



Source: Colorado Agricultural Statistics, 2012.

As Table 13 below shows, data on fresh fruit and vegetable production for each county are more difficult to come by, due to the fact that there are relatively few producers in the region (and thus their data must be kept confidential). However, available data do show that, as of 2007, Fremont and Pueblo led the region in total value of fruit and vegetable production. In Fremont, fresh produce represented 71% of all crop production grown in the county, while it comprised 58% of all crops grown in Pueblo. Overall, however, fruits and vegetables have made up a declining share of the total value of crop production, falling from 41% in 1992, to 25% in 2007. Meanwhile, the land base devoted to fruits and vegetables was only 2% of harvested cropland in 2007 (US Census of Agriculture, 2007).

Table 13: Market Value of Vegetables, Fruits, and Nursery Crops, by County (in $US), 1992-2007

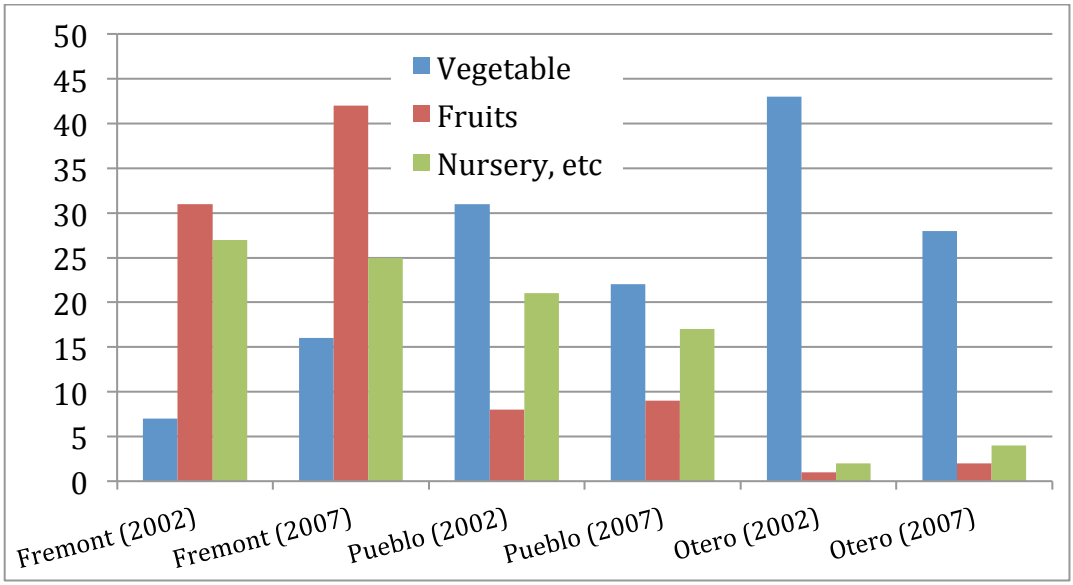
	1992	1997	2002	2007
Bent	(D)	(D)	(D)	1,085
Crowley	405,628	1,579,478	(D)	(D)
Fremont	2,616,539	3,552,775	4,862,634	3,676,623
Otero	8,535,818	9,091,460	6,454,336	(D)
Prowers	(D)	(D)	(D)	(D)
Pueblo	12,011,711	11,658,988	6,458,087	9,902,688
Region	23,569,695	25,882,701	17,775,057	13,580,396

Source: US Census of Agriculture, 1992-2007. All data in 2011 dollars. Note: (D) means data are not disclosed to protect individual business information.

Figure 19 clearly shows that, for the counties with the greatest value of sales in vegetable, fruit, and nursery production, only Fremont County has an increasing number of producers

growing vegetables and fruits. In Pueblo County, the number of vegetable and nursery growers has declined, while the number of reporting fruit growers increased very slightly. Otero County shows a decrease in vegetable producers from 43 to 28 between the two Census periods, but a slight increase in both fruit and nursery production. In the past few years, Full Circle Farms has been helping farmers build and operate greenhouses in the Pueblo region. Although this growth in vegetable production under cover occurred after 2007 Ag Census data were collected, hopefully this new production will appear in the 2012 data.

Figure 19: Numbers of Farms Reporting Vegetable, Fruit, and Nursery Production



Source: US Census of Agriculture, 2002-2007.

V. Challenges and Opportunities

Analysis of the six-county region studied under this Food System Assessment shows that the area has a fragile agricultural economy that is greatly influenced by forces stemming both from within the region, and from outside of it. For example, the presence of good soils for irrigated crop production, and especially vegetable production, hinges on farmers' ability to obtain adequate and timely irrigation water. The trend away from irrigating crops to irrigating pasture signals that farmers are not going to invest in planting high-value crops without the assurance of irrigation water throughout the production season. Competition for water with municipalities outside the region will continue as residential, commercial, and industrial development occurs to support Colorado's growing Front Range population.

The drought's third year in southeastern Colorado has changed the structure of many livestock businesses (which are the agricultural backbone of several counties) by depleting some producers' assets (especially breeding stock), and making them more vulnerable to future economic and climatic stressors. Several years of higher-than-normal commodity and beef prices have mitigated the true economic impact of the drought, as have new direct

market opportunities for produce growers (markets that are, however, mostly located outside the region).

There is potential to expand fruit and vegetable production in Fremont and Pueblo Counties; however, these are areas where farm operators are not currently generating significant amounts of income or full-time jobs from agriculture. Growth in this sector is contingent on creating new market opportunities within the region, based on residents' food preferences, and a willingness to pay for preferred fruits and vegetables. From June to October every year, the region's farm stands feature a great variety of fresh produce, and many local residents shop at these stands. However, many of the stands are located outside of towns in the region, near farming areas, and are therefore not accessible to individuals without their own transportation.

The most common market outlets for large-scale produce growers in the region are wholesale buyers who have contracts to purchase melons, peppers, potatoes and onions. Farm stands are secondary markets for larger growers who cannot move much volume through local channels, but are primary markets for smaller-scale growers. However, since fresh produce price points are lower in the region's direct markets, some growers prefer to sell their produce other areas, such as El Paso County markets, and/or Denver area farmers' markets.

Technical and business development support for new farmers will be critical, so these new business entrants can take advantage of opportunities to enter agriculture and develop sustainable operations as older farmers transition out. Less water-consumptive vegetable crops, in addition to controlled growing environments such as greenhouses, which minimize water use, will be important elements to supporting the region's fruit and vegetable sector in the coming years.

For overall Pueblo City-County Health Department Food System Assessment next steps and project recommendations please read the Key Findings & Promising Opportunities report, as well as other issue area reports, available at www.pueblohealthdept.org.

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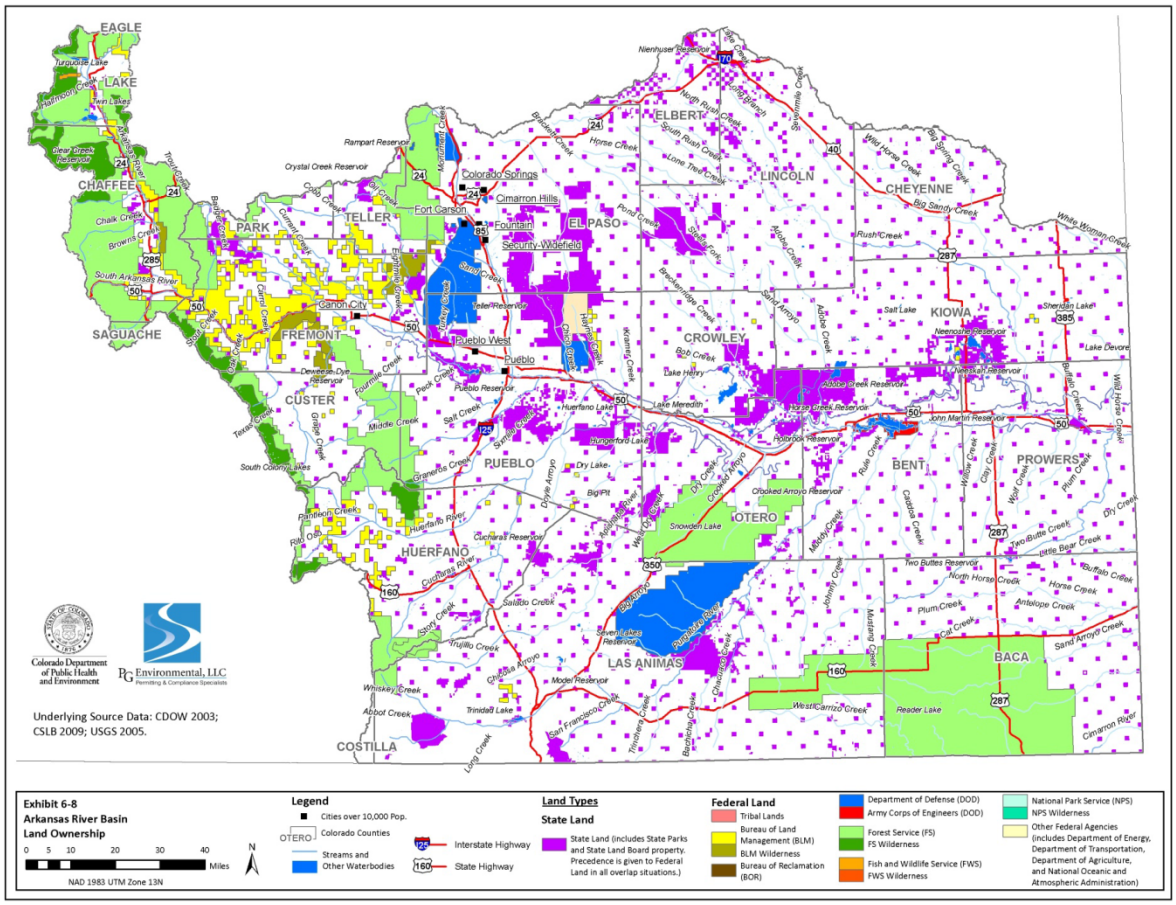
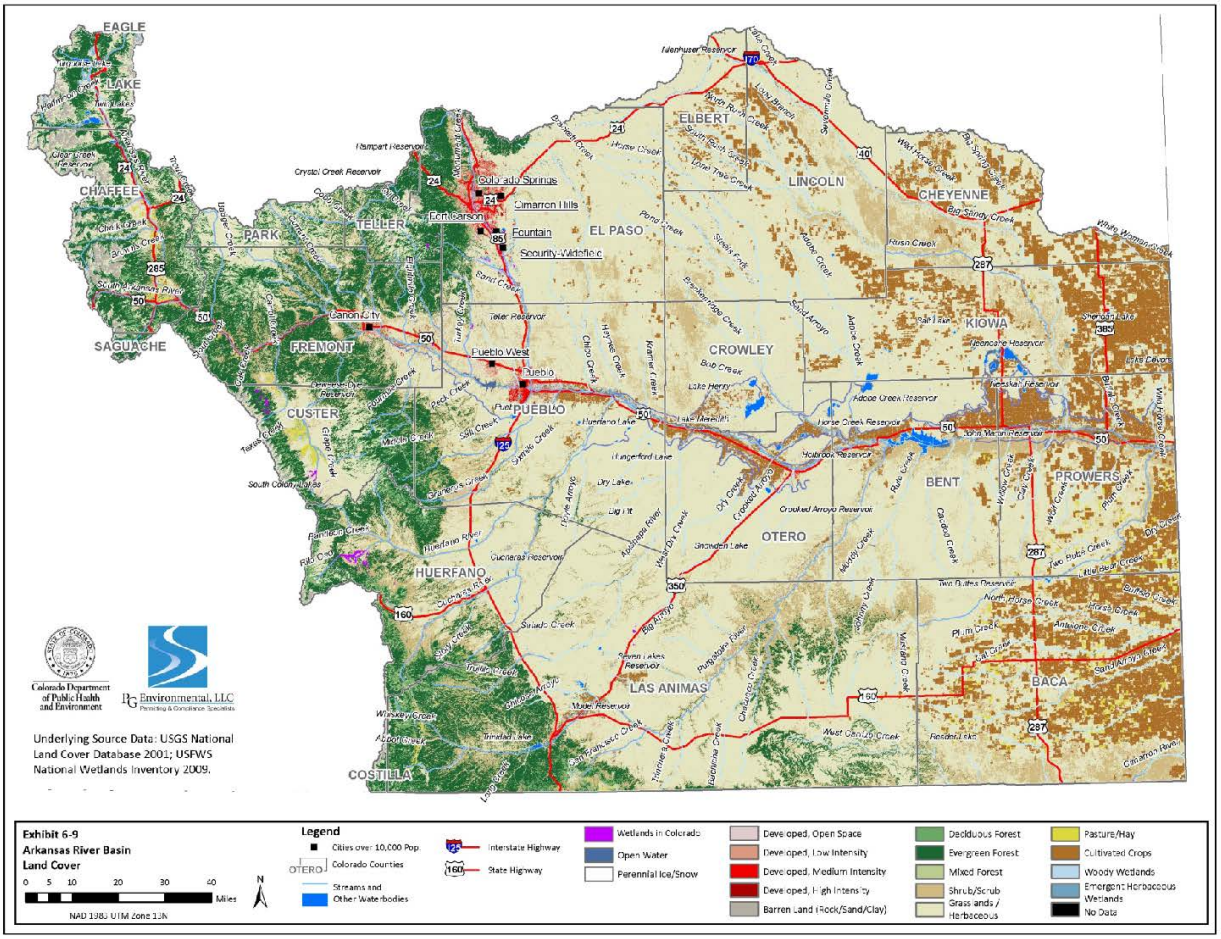
VII. Appendices

Appendix A. Land ownership, Arkansas River Basin, 2011



Source: Statewide Water Quality Management Plan, 2011.

Appendix B. Land cover, Arkansas River Basin, 2011



Source: Statewide Water Quality Management Plan, 2011.