

Running on Empty?

El Paso County Growth and the Denver Basin

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I. Introduction

El Paso County, on the Front Range of the Colorado Rockies, covers approximately 2,158 square miles and has an estimated 2005 population of 561,701.¹ In this semi-arid region, water supply is managed through many separate water districts, each with its own exclusive supply of water. Districts range in size both by population and water availability. Colorado Springs Utilities (CSU) is the largest of the districts². CSU serves approximately 69% of El Paso County's current population, including all residents of the city of Colorado Springs and selected unincorporated areas. This paper focuses on portions of the county not served by CSU, especially in the northern region.

Water can be obtained through wells that tap ground water (alluvial aquifers), from surface water (stream systems, lakes, and reservoirs) and from transbasin diversion resources. CSU obtains most of its water from reservoirs on Pikes Peak that collect snow melt and transmountain diversion pipelines which bring water from the Western Slope of the Rocky Mountains. The area studied in this report – the northern unincorporated parts of El Paso County – obtains virtually all its water from the Denver Basin, a sedimentary bedrock aquifer that is renewable only to the degree that it is recharged by precipitation and seasonal runoff (see Appendix A). New housing starts are booming in this portion of El Paso County. Yet future water supplies are uncertain because groundwater from the basin is currently being pumped with very little recharge. Despite this, El Paso County's population is projected to grow 54% from 2000 to 2030, and a substantial portion of the growth is expected to be in this part of the county.³

The water districts in the county vary greatly in size (see Appendix B). Both the size and location of these districts affect their long-term viability, for reasons outlined later in this paper. An additional problem facing the northern part of the county is the location of many of its wells on the outer edge or “margin zone” of certain aquifers in the Denver Basin.

The information in the *El Paso County Water Report* suggests that the county's reliance on well water is depleting aquifers closest to the surface. Table 1 includes historical usage of water and estimated future water demands.

¹ *El Paso County 2005 Demographic and Economic Profile*, Pikes Peak Area Council of Governments.

² In 2003, CSU had a supply of water rights of 220,900 acre-feet per year and a demand of 68,355 acre-feet (22,273,418,904 gallons). *Fact Book 2004-2005*, Colorado Springs Utilities, 2004.

³ Colorado Statewide Water Supply Initiative Water Demand Forecast, August 6, 2004.

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Table 1. Historical water usage and future water demands for El Paso County Water Providers
(Source: El Paso County Water Authority (GMS, Inc., 1999))

Water Provider	Historical Usage				Estimated Build-out Year	Estimated Annual Water Demand at Build-out (ac-ft)	Estimated Annual Water Demand at 2020 (ac-ft)
	1995 (ac-ft)	1996 (ac-ft)	1997 (ac-ft)	1998 (ac-ft)			
Academy Water & Sanitation	86	—	94.8	286	1998	—	286 ¹
Calhan, town of	130	132.04	155.9	—	1997	—	450 ²
Cherokee Metro Dist.	2,447.8	2,726.9	2,608.9	3,311	2005	3,400	4,200
Colorado Springs Utilities	68,584	78,744	75,146	69,766	2040+	182,000	131,000
Donala Water & San. Dist.	545	725	583	846	2010	2,400	2,400
Forest Lakes Metro Dist.	—	—	—	—	2006	607	607
Monument, town of	210	243.6	241.9	245.4	2030	1,000	771
Paint Brush Hills Metro District	60	80	110	186	2020	677	677
Park Forest Water District	—	—	—	76.7	—	80.7	80.7
Sage Water Users Ass'n	78.78	66.65	81.21	84	—	198	198
Triview Metro. District	0	0	0	27.1	2035	2,350	1,408
Woodman Hills Metro District	—	—	—	—	—	—	— ³
Woodmoor Water & San District	734	862	724	922	2015	1,516	1,516
Individual well users	—	—	—	—	—	—	2,240 ⁴

¹ Assumes current demand equals build-out demand and/or 2020 demand.

² Extrapolated from 1995 through 1998 historic usage.

³ No data available.

⁴ Estimated as 25,000 people x 0.090 acre-foot/capita/year (80 gped)

In doing this research, I found that water districts in the county use different units and time frames in collecting and reporting data. The lack of standardization makes comparison between the districts difficult. As I show later in the paper, because these districts are small, their ability to raise the funds needed for planning and building new water infrastructure is severely limited.

The primary goal of this research was to compare existing estimates of future water supply and future water demand in aquifer-based water districts of El Paso County to the financial capability of these districts to construct delivery and storage facilities. This information would be useful to developers, municipal planners, and current and prospective residents served by these water districts

II. Methodology

For this study, estimates of water supply and demand in El Paso County were taken from the *El Paso County Water Report*.⁴ The report provided trend analyses for future water demand from water districts within the county other than Colorado Springs Utilities.⁵ The total demand (water usage) and total supply available were calculated by summing the district data for demand and supply trends of the various districts.

⁴ *El Paso County Water Report*, December 2002.

⁵ CSU took the estimated build-out date of 2040 provided by the city of Colorado Springs and averaged out the consumption to its maximum point in 2040.

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Mill levy and property value numbers were obtained from the County Assessor's Office and the El Paso County Treasurer's Office. This data was then compared to water demand and supply data to assess the financial capability of the individual water district to construct a \$10 million reservoir for storing water obtained from tributary flow. The \$10 million figure is a hypothetical construction cost used here to highlight differences among various levying entities.⁶ This analysis shows the problems that would be encountered by small water districts in financing even a modest investment in new infrastructure. This study shows how much each district's mill levy would have to increase to cover this expense, based on the most recent figures for total assessed property value.

As part of this research, I consulted several sources on the history of Colorado water law and policy and how it developed. I especially relied on "Colorado Water Law: An Historical Overview" by Gregory J. Hobbs, Jr., and the "Citizens Guide to Colorado Water Law," from the Colorado Foundation for Water Education. Below I focus primarily on aspects related to the central focus of this paper, which is dependence of parts of El Paso County on nonrenewable Denver Basin water.

III. History of Colorado Water Policy

Congress created the Colorado Territory in 1861, and early territorial legislation focused on giving settlers the broadest possible access to land and water. The Homestead Act of 1862 turned over vast amounts of Western territory to private citizens. The 1866 Mining Act⁷ and the 1877 Desert Lands Act⁸ established water property rights granted by the state or territory. This legislation guaranteed the water rights of the individual who first found the water and established the right of the individual over that of commerce and industry. These legal principals gradually evolved into a framework known as the Colorado Doctrine, which establishes all surface and groundwater as a public resource for "beneficial use" and creates private water rights.

The Colorado Constitution of 1876 states that "unappropriated water is property of the public . . . dedicated to the use of the people of the state, subject to appropriation."⁹ The constitution further states that "the right to appropriate the unappropriated waters of the natural streams of the state for beneficial use in order of priority shall never be denied ... When the waters of any natural stream are not sufficient for the service for all of those

⁶ Costs quoted by several area districts for pipe construction to existing reservoirs or other infrastructure upgrades such as reservoirs range from \$7,500,000 to \$115,000,000. The projects suggested in the most recent *El Paso County Water Report* (p. 70) range from \$8 million to \$82 million in cost.

⁷ Mining Act of 1866, Chapter 2662, Stat. 253 (1866)

⁸ Desert Lands Act, Chapter 107 19, Stat. 377 (1877)

⁹ Colorado Constitution, Article 16

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desiring the use of the same, those using the water for domestic use purposes shall have preference over those claiming for any other purpose.”¹⁰

The intention was to give the people of Colorado the right to consume water within the state and to establish property rights to that water. This approach differs significantly from the way neighboring Western states use and allocate water. Other Western states do not have exclusivity clauses in their water laws. Water is treated as a public good, and allocation and use is largely determined by state or local governments. Colorado law, however, has created a private sector environment that permits buying and selling of water rights, although any change must be approved judicially.

As more people moved into Colorado, many settlers made large claims to land in an attempt to monopolize water supplies. The federal, state, and local governments had no viable way of determining if the water was being used or hoarded, making it impossible to reallocate supplies to those who actually needed it.

Soon after Colorado became a state, legislation was passed that “provided for the identification of irrigation rights by priority and quantity through judicial decree proceedings, and for the administration of these court judgments to occur under the watch of state water officials.”¹¹ Colorado still uses this mix of executive, judicial, and legislative authority to allocate and maintain its water supplies.

In the early part of the last century, the state’s population expanded rapidly and placed a strain on the water supply.¹² The acts were amended to include domestic use of water. Water was required to be diverted for the use of the public over that of industry or commerce. The amendment also designated the state or city as the entity that would finance water projects and decide what to do with their water.

Agriculture felt threatened as cities expanded and required more water. In response, the Colorado General Assembly required just compensation for water rights if allocated to domestic use and the right to sell water rights altogether. Thus, modern Colorado water policy was born.

In the late 1800s, federal legislation had established protection for Western watersheds and forests and made large amounts of water unavailable for private ownership. As a compromise, the 1902 Reclamation Act made low-interest loans available to Westerners to build water collection and storage facilities, and the federal government agreed to allow

¹⁰ Colorado Constitution, Article 17

¹¹ Hobbs, 1997, page 9.

¹² El Paso County’s population increased from 31,602 in 1900 to 43,321 in 1910, an increase of over 27%. The state’s population rose from 539,700 in 1900 to 799,024 in 1910, an increase of over 26% (U.S. Census Bureau, 2005).

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use of water from national forest land. The availability of year-round water supplies gave Colorado agriculture the ability to expand.

The Reclamation Act also established water districts that could levy money and maintain and construct new water facilities. Groups formed into independent water districts to represent their area's specific concerns. The federal government funded operation and construction of water projects while the districts allocated the money and chose the projects. An example of this partnership between the federal government and a local water district was the construction in the 1970s of the Pueblo Reservoir. The water districts were then given the responsibility of maintaining the infrastructure and constructing any future improvements. The districts were also given the power to levy taxes on property in their area to fund water-related infrastructure and maintenance.

This period of infrastructure building and allocation of water led to a period of ready availability of water in Colorado. Based on these investments in infrastructure and storage there appeared to be a foundation for sustainable growth into the future. However, after 1960, population growth outstripped the capabilities of the water supply and infrastructure. El Paso County population grew from 143,741 in 1960 to 561,701 in 2005.¹³

The 1965 Ground Water Management Act made non-tributary water available to the overlying landowner and allowed the owner to withdraw water at a rate of 1% per year as long as pumping would not affect surface levels within 100 years. The act also required all new wells that diverted tributary, nontributary, Denver Basin groundwater, or geothermal resources to have a permit, issued by the State Engineer's Office.¹⁴

The 1965 legislation also established the Colorado Ground Water Commission, which was authorized to create designated groundwater basins for water management purposes. These basins are areas where groundwater has historically been the main water supply. There are eight designated basins on Colorado's eastern plains, and one – the Upper Black Squirrel Creek basin – supplies much of northern El Paso County's water. The Pikes Peak Area Council of Governments has noted that during the period of 1964-1974, water levels in this aquifer dropped by as much as 46 percent.¹⁵ Most of the significant growth in the aquifer area has occurred in the past ten years.

IV. Current Issues

The northern part of El Paso County with its rapid population growth and reliance on aquifer-based (Denver Basin) water is rapidly depleting its water supply. The area studied

¹³ *El Paso County 2005 Demographic and Economic Profile*, Pikes Peak Area Council of Governments.

¹⁴ *Citizens Guide to Colorado Water Law*, Colorado Foundation for Water Education, 2003.

¹⁵ *Pikes Peak Area Council of Governments 2003 Water Quality Management (208) Plan*.

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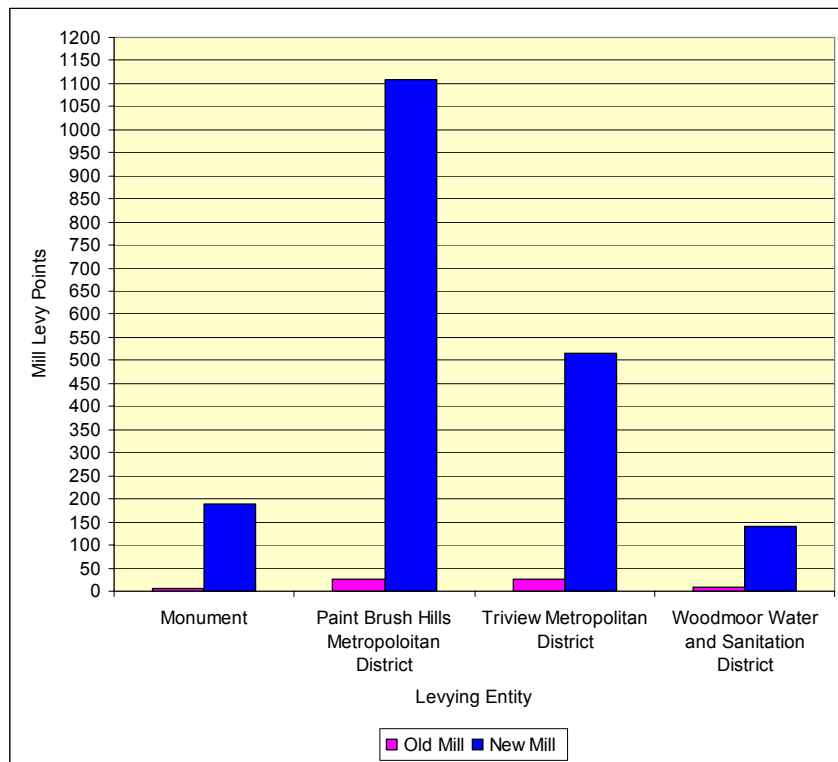
here includes the following water districts: the town of Monument, Paint Brush Hills Metropolitan District, Triview Metropolitan District, and Woodmoor Water and Sanitation District.¹⁶

These districts all face similar problems, outlined below.

1. The small size of water districts in El Paso County significantly increases the per capita cost of water infrastructure and storage construction within a district.

Larger water districts have the capability to spread the cost of construction for storage and infrastructure out among a much bigger population base. Figure 1 shows how much of an increase in the mill levy would be needed to finance a \$10 million water construction project in four small districts, based on the most recent figures for total assessed valuation. While some argue that more development is needed to increase the value of the tax base, this will also increase the need for more water.

Figure 1. Mill levies needed to finance \$10 million project in four water districts



¹⁶ According to the previously cited *El Paso County Water Report*, Monument obtains 66.7% of its water from the basin; Paint Brush Hills, 100%; Triview, 100%; and Woodmoor, 84.6%.

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2. Water districts that obtain their water primarily from the Denver Basin will pay more for their water than districts with renewable water supplies.

The unincorporated northern areas of El Paso County rely on the deep groundwater of the Denver Basin. The Denver Basin is composed of four aquifers that are layered one on top of the other. These bedrock formations are called the Dawson, Denver, Arapahoe, and Laramie-Fox Hills aquifers. Between each aquifer is a “confining layer,” which isolates each aquifer from the other. Because of these confining layers and the limited connection between the four aquifers and surface water, the ground water in these aquifers is not renewable.¹⁷ A study by the U.S. Geological Survey estimates that 467 million acre-feet of water are stored in the Denver Basin aquifers, but only 259 million acre-feet of this water are recoverable. Since aquifers cannot be completely drained by wells, this estimate is theoretical at best.¹⁸

The finite nature of the Denver Basin as a water source is forcing water districts within northeastern El Paso County to pay more than in the past in order to obtain the same amount of water. As water levels in the basin go down, erosion, sediment movement, and depressurization make pumping more difficult. Denver Basin groundwater is currently being pumped at a rate in excess of annual recharge rates (which are extremely low to begin with). This condition is called mining.

3. The way the state of Colorado determines viability of water supply for formation of a district does not take into account geological and economic factors.

El Paso County has a more stringent requirement than does the state of Colorado. A water district must multiply its land area by the yield of water as determined by geological surveys and the district’s engineer’s office; this sum is then multiplied by the saturated thickness of the supply of water in the ground. This supply is then compared to expected population and water demand over 300 years to determine the feasibility of establishing a water district. The state only requires a 100-year water supply.

However, providing evidence that water is underground does not constitute sustainability. The 300-year rule does not consider the capability to extract this water or the price of that extraction. Pumps, infrastructure, and pressure are all needed for the water underground to be used. Districts in this area make a distinction between “wet water” – water that is ready to use – and “paper water” – water that the district owns but cannot access.

¹⁷ Colorado Division of Water Resources, www.water.state.co.us/groundwater/denbasin.asp

¹⁸ Robson, SG, Romero, *Bedrock Aquifers in the Denver Basin, Colorado: A Quantitative Water Resources Appraisal*, USGS.

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Property rights on groundwater become more expensive over time when the aquifers are depleted.¹⁹ Geological characteristics such as sandstone impediments, erosion, elevation, and hydraulic pressure affect how much water can be extracted from the ground. Eventually water districts within the Denver Basin area will need to build infrastructure to maintain pumping levels and also build storage facilities to replace groundwater supplies with renewable tributary supplies from other districts.²⁰

4. Water districts can affect the longevity of supply in neighboring districts by drawing from different parts of the Denver Basin.

The state assigns property rights based on a static volume of water within the basin, meaning that damage to a water district's supply must be shown as a direct loss of water and that changes in pressure from one district to another will not have any effect. When an aquifer is under pressure, many individual wells and pumps (such as are present in the districts of northern El Paso County) leads to depressurization at a faster rate than one large single well.

The *El Paso County Water Report* states:

“Because of the concentration of Denver Basin aquifer pumping in the northern portion of El Paso County, even though there is significant water supply availability, the need for additional wells may occur sooner than in other areas of the Basin. This would be related to well interference effects caused by multiple wells pumping in the same aquifer in close proximity to each other.”²¹

The effect of these numerous small wells is much like punching a hole in a hose. If multiple holes are punched, the amount of water coming out of each hole decreases with the static amount of pressure that is in the hose coming from the water faucet. The hose, however, has a constant rate of renewable pressure coming from the faucet, while an aquifer has a limited amount of pressure that releases at a faster rate if multiple holes are punched. As the pressure decreases, the water available for pumping decreases. If one water district digs a well in close proximity to another, the pressure used to push water up to the surface decreases for both. This condition is called a “drawdown effect.”²²

However, looking at the map of the Denver Basin in Appendix A, one can see that multiple aquifers exist in the basin. A user drawing from the Arapahoe Aquifer may not have

¹⁹ *South Metro Water Supply Study* (2003) and the *El Paso County Water Report* (2002)

²⁰ *El Paso County Water Report*, pages 21-22, 37-38, 69-70.

²¹ *El Paso County Water Report*, page 20.

²² *El Paso County Water Report*, pages 36-38.

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much effect on a user of the Dawson Aquifer, since there is limited flow between the different aquifers.²³

El Paso County's water rights on the Denver Basin are on higher elevations of the aquifer and in general are closer to the edge of the basin than Douglas County's rights. This area, called the "margin zone," is more sensitive to pressure changes and geological activity.²⁴ Douglas County pumps its water from the center of the basin, which results in a decrease in water pressure and water level along the southern edge of the basin, where northeast El Paso County draws its water. (See Appendix C for a map showing the margin zone.)

The *El Paso County Water Report* states, "We believe that aquifer longevity is an issue in the Margin Zone, as it is likely that long-term reliability cannot be achieved due to the elevation issue. This puts water users in the Margin Zone at risk, as water development in the Central Basin will impact individual well production rates and, ultimately, longevity."²⁵

It appears that geological impacts and efficient methods of drilling and pumping are largely ignored in favor of traditional property rights. If water was extracted from the basin by drilling from the outer edges and working into the middle, larger amounts of water could be extracted more efficiently. This is just one example of how I found that Colorado water law seems to work against maximizing the yield of water from scarce resources. More extensive pumping stations and infrastructure will be needed in the future to maintain current rates of water delivery.

5. The presence of multiple water districts with a lack of standardization in reporting leads to confusion.

Colorado law permits a variety of institutions to levy taxes for financing water infrastructure. A water district can be part of a city, part of a sanitation district, or an independent entity. A water district can be government-run, quasi-private-run but answering to the government, or totally independent. Depending on the structure or governance of each water district or entity it is subject to different regulations concerning terms of operation and use of water.

For instance, Colorado Springs Utilities (CSU) pays most of its infrastructure costs through its charges for water use, is also a levying entity, and encompasses special districts that finance projects that specifically benefit that district. The city of Fountain finances water construction through city property taxes. The city also has a sanitation district that functions independently of the city with a different mill levy for sanitation purposes. The neighboring

²³ "Stratigraphy and Water Levels in the Arapahoe Aquifer, Douglas County Area, Denver Basin, Colorado", R. Raynolds, *The Mountain Geologist* 41:4.

²⁴ *El Paso County Water Report*, pages 17-21.

²⁵ *El Paso County Water Report*, page 21.

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city of Security has a water district and a sanitation district; both are independent of the city's levying capability.

Other groups such as the El Paso Water Authority can advise water districts on sustainability of supplies and ways to work out issues. They can act as mediators in disputes between districts and also offer guidance when questions arise. Entities such as the State Engineer's Office, the US Army Corp of Engineers, and specially created conservation districts act to ensure water quality, environmental protection, and the capability to draw funds for conservation. The US Army Corp of Engineers intervenes when federal public money is used or when environmental degradation that may conflict with federal environmental law is occurring. The State Engineer's Office issues well permits and estimates water supply feasibility and capital construction costs. Conservation districts are levying entities within a water district that act to draw funds for conservation of water and resources.

For the average citizen seeking to obtain information on water use, this complicated structure of multiple districts and taxing entities presents a formidable challenge. An individual looking for information must become familiar with water terminology, contact a variety of public and private groups, and obtain and interpret data that is not standardized among these groups. For instance, the *El Paso County Water Report* was produced by the El Paso County Water Authority (EPCWA), which is a group of 16 water providers in the county. The EPCWA estimates that there are approximately 32 water providers in the county. Thirteen EPCWA members and nine other water providers supplied data and information for the study.

Each district is affected by surrounding districts in terms of water supply and future needs, but each district operates as a self-contained entity and rarely works with other districts. Lack of communication and cooperation between districts rules out efficient long-term planning that would enable districts to benefit from economies of scale and pooling of resources. Growth issues and plans for increasing water supply and infrastructure – matters that affect the entire county should be communicated to the entire county but often are not in the current environment.

In an article in the *Denver Post*, Chuck Plunckett and David Olinger stated that the competitive environment of water rights is leading to large amounts of stockpiling and is endangering many districts that are in need of water now. They further noted that the consolidation of water districts would result in significant economies of scale.²⁶

²⁶ "Lawmakers urge cities to pool water resources," *Denver Post*, November 26, 2005.

V. Impact on El Paso County of Denver Basin collapse

A. *Unincorporated northern El Paso County*

Faced with the future depletion of the Denver Basin, water districts in northern El Paso County must find a way to finance new appropriations of water from districts with renewable surplus supplies. Storage facilities and reservoirs will have to be constructed. Infrastructure such as pipelines and connections is also needed to transport water effectively from one district to another. To do this, districts will need to develop plans to ensure future water supply and find financial resources to wean the northern districts off the Denver Basin.²⁷

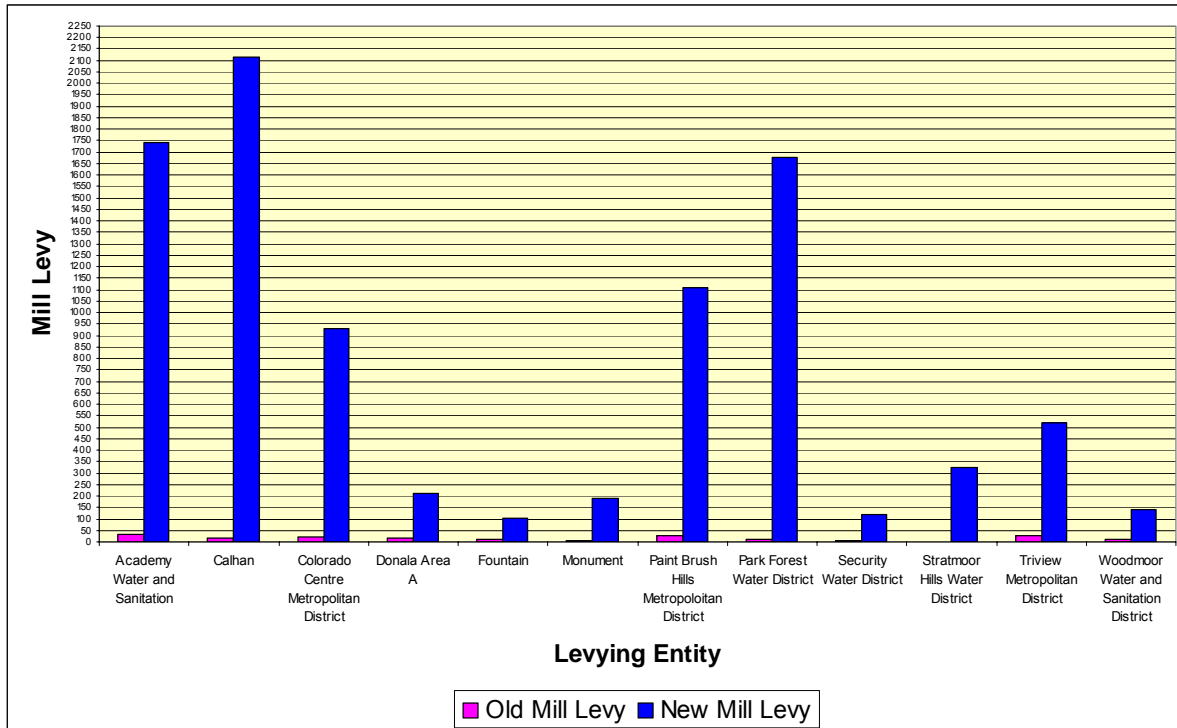
The revenue available to water districts in northern El Paso County is based primarily on district mill levies applied to assessed land value supplemented by tap fees on new users. Even if mill levy overrides are approved by the voters in these districts, they may not generate property tax revenues sufficient to cover the large overhead of constructing facilities and pipelines and paying for their maintenance.²⁸ As seen in Figure 2, mill levies would need to increase substantially to finance any large-scale storage facility. The calculations below reflect the most recent property value data available at the time of this report. As additional property is developed and more assessed valuation is added the burden on property owners will drop accordingly.

²⁷ *El Paso County Water Report*, pages 54.

²⁸ Mill levies are a conversion unit used in taxation of real property. The County Assessor assesses the value of property within a set geographical limit such as a water district or city. One mill levy point equals .1% of the assessed valuation of the district or levying entity. This value is then multiplied by the legal mill levy in order to determine the annual taxes paid to a levying entity.

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Figure 2. Increase in mill levies needed to finance \$10 million project in independent water districts



Although this graph shows a one-time, one-year mill levy increase, the cost of such a facility could easily cause severe problems for water districts in northern El Paso County even if the bill was extended further out over time. For example, in two small Denver Basin districts, Paint Brush Hills and Monument, the mill levy would need to increase dramatically. Monument's mill levy would go from 6.408 points to 188.98 points. Paint Brush Hills' mill levy would go from 24.7 points to 1108.59 points, again based on the most recent figures for total assessed valuation.

The difference in mill levy change is largely attributed to the size of the assessed valuation of the district. These two water districts in unincorporated El Paso County serve small rural areas and thus would have to assess high mill levies on less valuable property to purchase water from other districts and to build infrastructure.²⁹ These rural districts also lack a strong base of commercial property, which has a higher effective tax rate than residential development and thus more easily generates revenues.

As districts in northern El Paso County experience rapid growth, they are faced with a dilemma: they need funds for infrastructure in order to supply water for their growing population, but they cannot continue to grow without water. More population would provide a large tax base but would also require more water. To build the new infrastructure

²⁹ Conversation with Donna Dobson, El Paso County Assessor's Office, 2004.

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needed to continue to get the current amount of water, area citizens must face paying much higher property taxes. . However, property values are too low to finance the large amounts of infrastructure needed. Even spread out over long periods of time, the money needed is largely not there.³⁰

Centennial Water and Sanitation District in Douglas County (also dependent on deep groundwater of the Denver Basin) spent \$39,195,000 for partial construction of a 6,400-acre-foot-capacity reservoir to supplement depleted groundwater by pulling water from the South Platte River in wet years. These costs show future risks related to northern El Paso County's growing population and its ability to pay for new infrastructure. Centennial District, with a population of over 82,000, finds the cost of the reservoir a strain on its budget.³¹ Parker Water District, in Douglas County, is also constructing a reservoir capable of holding 16,400 acre-feet of water, with an estimated cost of \$105 million.³²

When drought conditions and increasing population affect a district, they are less willing to sell water. Since each district has exclusive rights to certain amounts of water, they are not required to sell excess water unless it serves their interests.³³ The districts in northern El Paso County try to maintain a large excess capacity to draw on in times of drought or increased demand. As supplies in the Denver Basin are depleted, districts will have to pay more to construct larger storage facilities.³⁴

B. Other Regions of El Paso County

Districts in other areas of the county that may be interested in selling their water are also experiencing increased demand from population growth. Smaller districts may put pressure on the city of Colorado Springs and municipally owned CSU to accommodate the needs of water-starved residents in the rest of the county. This could cause future water shortages and/or price increases for customers of the city-owned utility.³⁵

³⁰ For instance, if Monument, with a population of 2,500 and little commercial property financed \$75,000,000 over ten years, the cost would be over \$3,000 per person per year based only on residential payers.

³¹ Centennial Water and Sanitation District Adopted Budget, 2005.

³² Parker Water District Adopted Budget, 2005.

³³ Jesse Schaefer, Woodmoor Sanitation, personal interview, December 19, 2005.

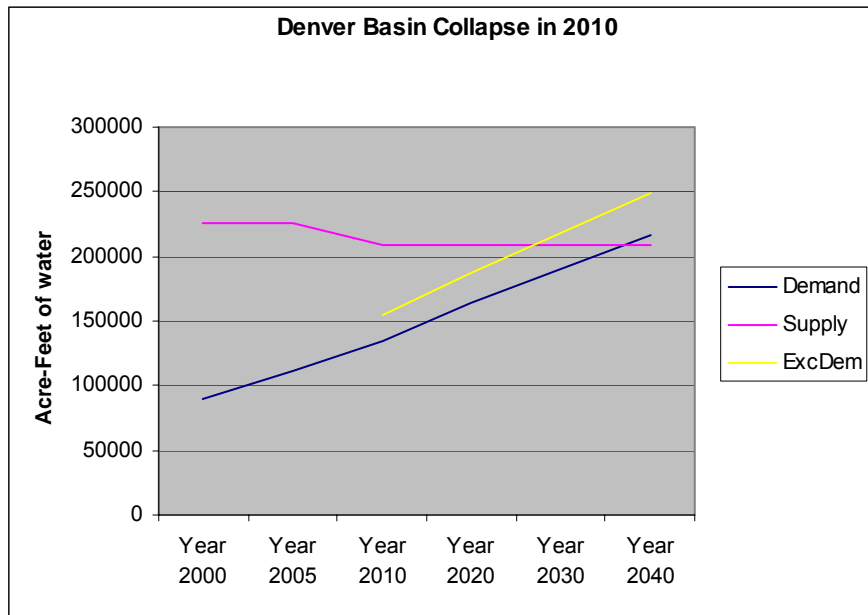
³⁴ Douglas County has begun to address the Denver Basin issue (*South Metro Water Supply Study*). Ideas range from upgrading pumping infrastructure until the basin runs out to a mixed use of pumping from the basin and importing water from elsewhere. Estimated infrastructure costs range from \$1.67 billion to \$2.31 billion for the entire county, highlighting the escalating costs in the area.

³⁵ "Fat cat subsidies decried," *Colorado Springs Independent*, November 10-16, 2005.

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The timing of the depletion of the Denver Basin is crucial in maintaining a water supply for all in the county.³⁶ To illustrate the impact, Figures 3-6 show the Denver Basin water supply collapsing at different time intervals relative to the same trend projection of demand at the time of collapse, starting in 2010 and progressing in ten-year intervals. Based on estimated growth, most districts with renewable supplies will be using all of their available water by 2040 under trend demand and the most optimistic scenario. If demand increases faster than the past trend (the higher line labeled Excess Demand) and the basin collapses (i.e., runs completely out of water) this can occur as early as 2028 (see Fig. 3). Former Denver Basin users trying to buy water may find no water available to buy (other than excess water stored during wet periods). With such tight supplies, these users will most likely be competing with others for any excess water available.

Figure 3. 2010 Denver Basin collapse



³⁶ Over 220,000 acre feet of water supply (owned by CSU and for the use of CSU customers) is unaffected in these graphs. Beyond a certain period, however, total demand outruns total supply.

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Figure 4. 2020 Denver Basin collapse

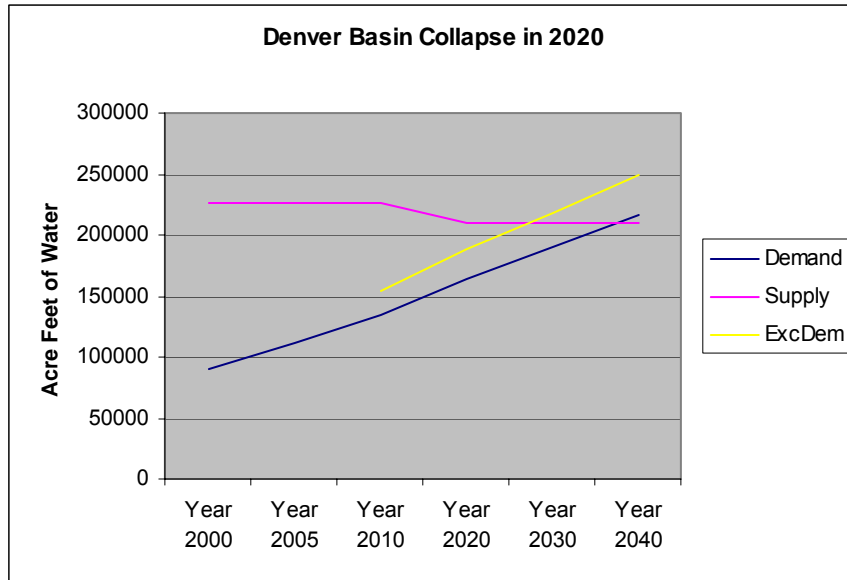
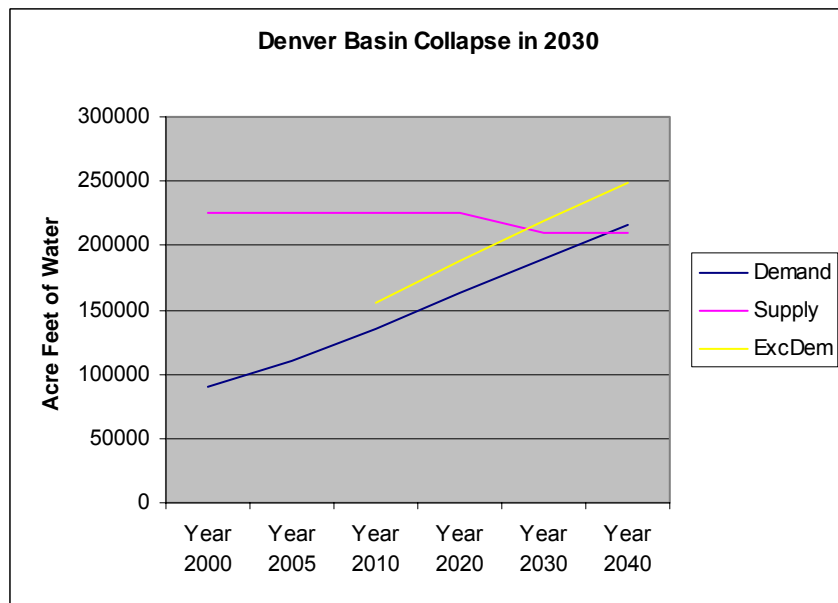
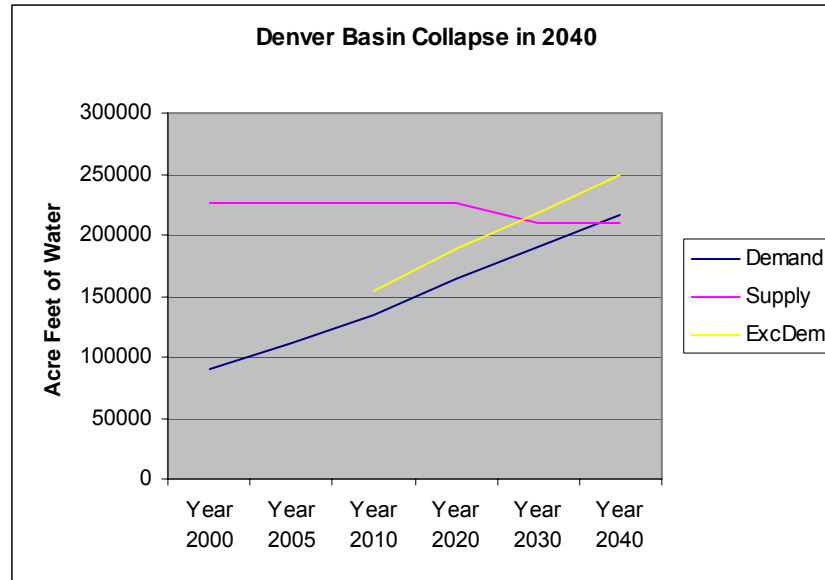


Figure 5. 2030 Denver Basin collapse



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Figure 6. 2040 Denver Basin collapse



The response to this issue is up to the individual water districts in the county. Districts with excess renewable supplies could reserve and sell water to outlying nonrenewable groundwater districts without the collapse of the Denver Basin, or they could funnel it into increased growth within their own district. The choices that each district makes will affect the rest of the county. If the water districts dependent on nonrenewable water do continue growth while the basin exists, the county runs the risk of not having enough water for all its residents in another twenty years and no later than 2040, unless population growth and water use increase at a rate lower than past trends indicate.

VI. Conclusions

After depletion of water from the Denver Basin, much of northern El Paso County may be unable to finance the infrastructure for the water it needs. People living in these water districts will depend on neighboring districts for water. Despite this, potential home buyers receive little or no information about the long-term water supply situation. Problems with long-term water supply are exacerbated by lack of planning for long-term sustainability and by inefficient allocation of water property rights. Are planners and developers assuming that outside water sources (perhaps those developed by Colorado Springs Utilities for city residents) will be made available once the Denver Basin runs dry? Recent recommendations by consultants to the El Paso County Water Authority include a list of infrastructure projects, including storage facilities for renewable water, but do not identify a funding source. They conclude that “renewable part in whole, or in part, is the ultimate solution to a secure water supply for the residents of El Paso County.”³⁷

³⁷ El Paso County Water Report, p. 69–70.

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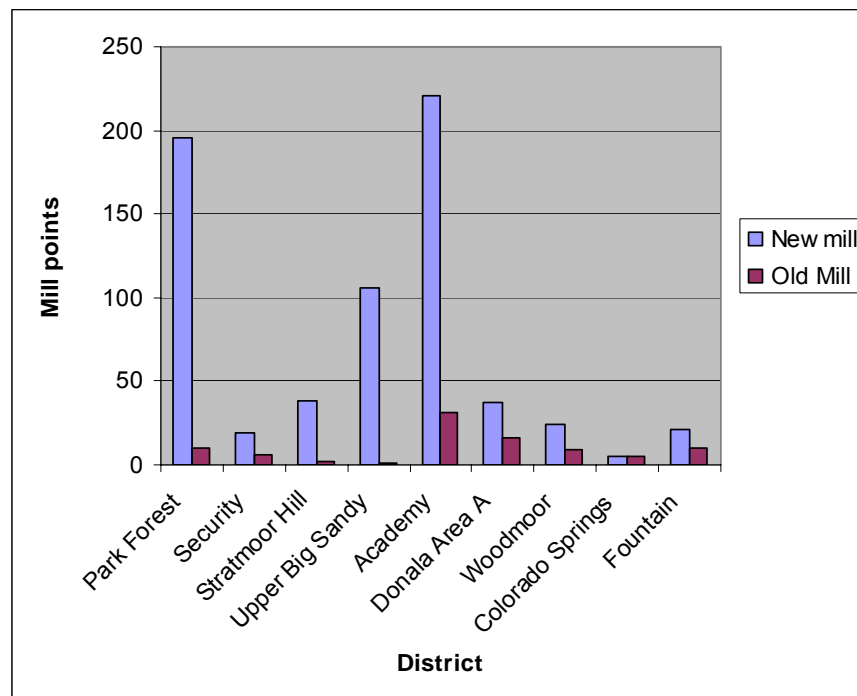
Placing multiple property rights on an aquifer in a sequence that is not based on economic and geological conditions contributes to the problem. Assigning exclusive and multiple property rights too close to each other causes inefficiencies in infrastructure and considerable strain on the county's water resources.

VII. Possible solutions

A. Consolidation

By sharing water rights and revenues, the many small and economically inefficient county water districts could spread the costs of building the new infrastructure necessary to access water. As shown in Figure 7, the same districts that would finance one \$10 million storage facility alone could make considerable gains by acting together and pooling revenue.

Figure 7. Change in mill levy with consolidation of districts



If these nine districts shared the cost of constructing a \$10 million storage facility, each district would pay \$1,111,000. Park Forest's mill levy is currently 10.437 and would increase to 1675.694 in order to finance the storage facility by itself. With the costs shared between these nine districts, Park Forest's mill levy would only increase to 195.466. Academy's mill levy is currently 30.911 and would increase to 1741.716 to finance the storage facility alone. With costs shared, Academy's mill levy would only increase to 221.

Multiple wells have been drilled into the Denver Basin in close proximity to each other. Each district drilled into the aquifer independently. If these various districts

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constructed one main well and pumping system to serve multiple districts, a large number of consumers could experience long-term benefits.

B. Cooperation

Other sizable gains could be made through cooperation if districts within the area were more aware of other districts' needs. For instance, a large district with surplus capacity such as Colorado Springs Utilities could aid in the construction of a storage facility in northern El Paso County and significantly lower the cost of building such a facility. In return, percentages of that storage facility's water holdings could be used for CSU customers. Both CSU and northern El Paso County would benefit.

Another possible solution is for CSU to run lines of renewable water to northern El Paso County in exchange for storage facilities in the north for CSU water. Northern El Paso County could use its groundwater supplies as a reserve in times of drought, sharing these reserves with CSU.

The conversion to more sustainable supplies in conjunction with Douglas County could turn the liability of the Denver Basin into an asset. If the two counties could work together to find a way for northern El Paso County to receive renewable water as Douglas County switches to renewable supplies, the draw rate of water from the basin could slow and allow the aquifer to recharge. More reliable tributary streams could be used as the main water supply for the counties, while groundwater could be used in times of drought.

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VIII. Glossary

Acre-feet: roughly the amount of water required to cover an acre of land in a foot of water; approximately 326,000 gallons. One acre-foot of water will supply the indoor and outdoor uses of two average urban households for a year.

Appropriation: when a public agency, private person, or business places water to a beneficial use according to procedures prescribed by law. The appropriator must have a plan to divert, store, and control the water.

Aquifer: A subsurface water-bearing geological structure capable of storing and yielding water to streams, springs, or wells.

Denver Basin: A bowl-shaped basin which consists of a group of geologic formations that underlie a 6,700-square-mile area along the Front Range of Colorado. The basin is comprised of the Dawson, Denver, Arapahoe, and Laramie-Fox Hills aquifers (see Appendix A)

Depressurization: the loss of water pressure over time in groundwater aquifers.

Dewatering: the complete inability to draw water from an underground source that was previously used.

Margin zone: Designation given to the areas along the edges of the Denver Basin where the formations either subcrop or outcrop and water levels are currently declining below the top of the aquifers.

Mill levy: Rate of assessment used to determine how much revenue a levying entity draws from an assessed valuation.

Non-tributary: Water that is not drawn from a river.

Recharge rate: the quantity of water per unit of time that replenishes or refills an aquifer.

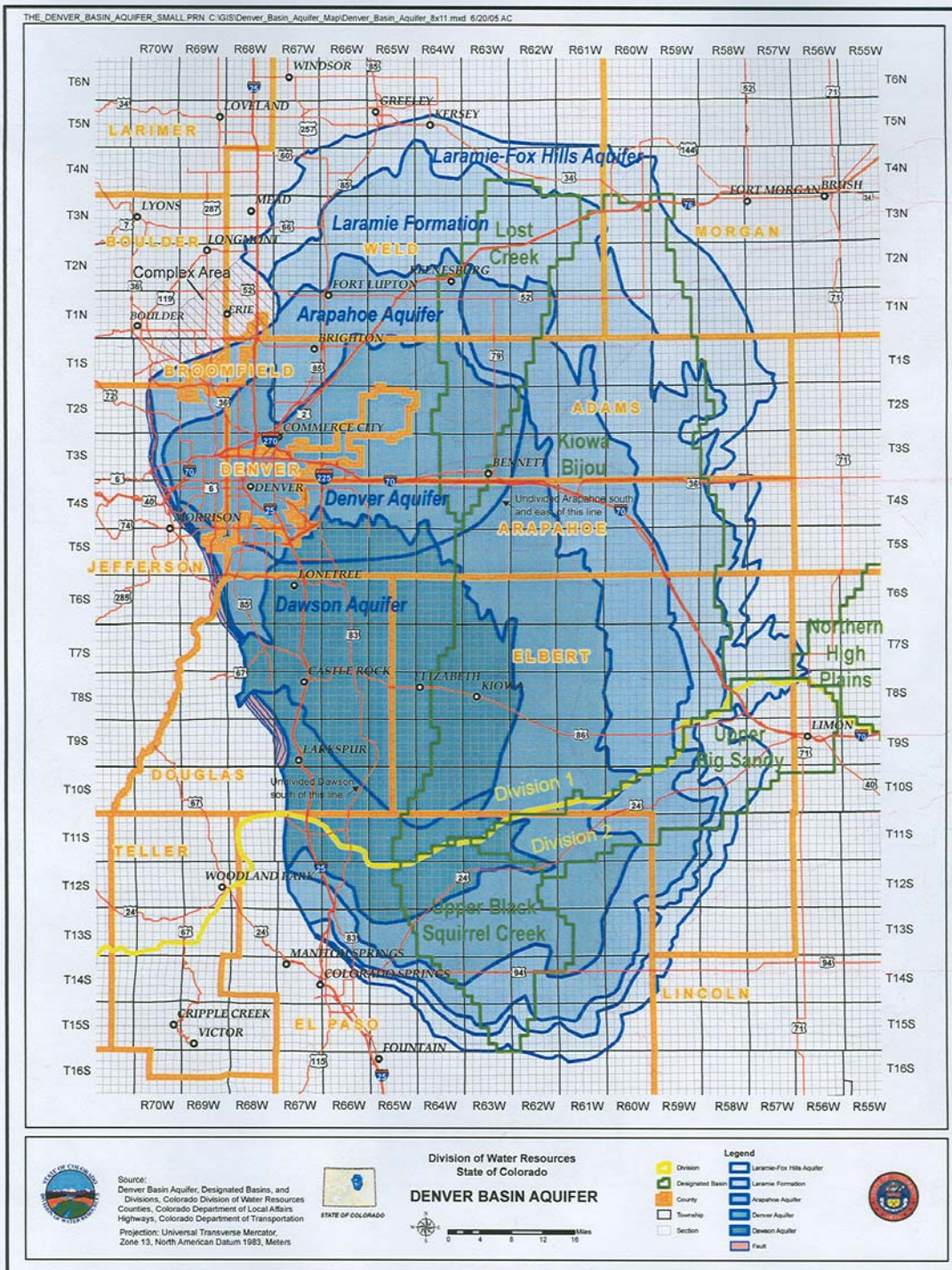
Tributary: Water obtained from free-flowing surface water rivers.

Water district: A levying entity with the capability to construct and maintain water infrastructure and water itself.

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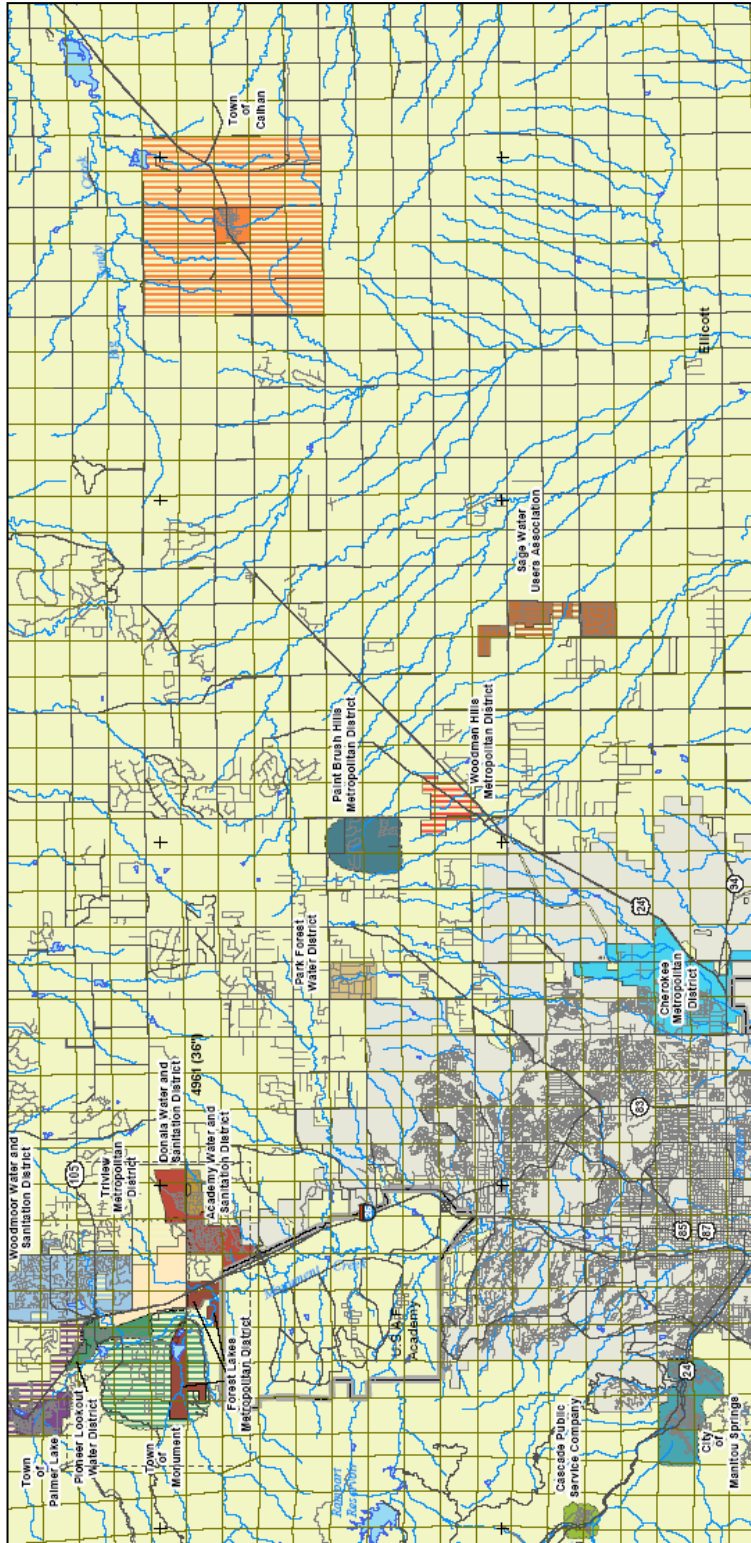
IX. Appendices

Appendix A: Map of the Denver Basin



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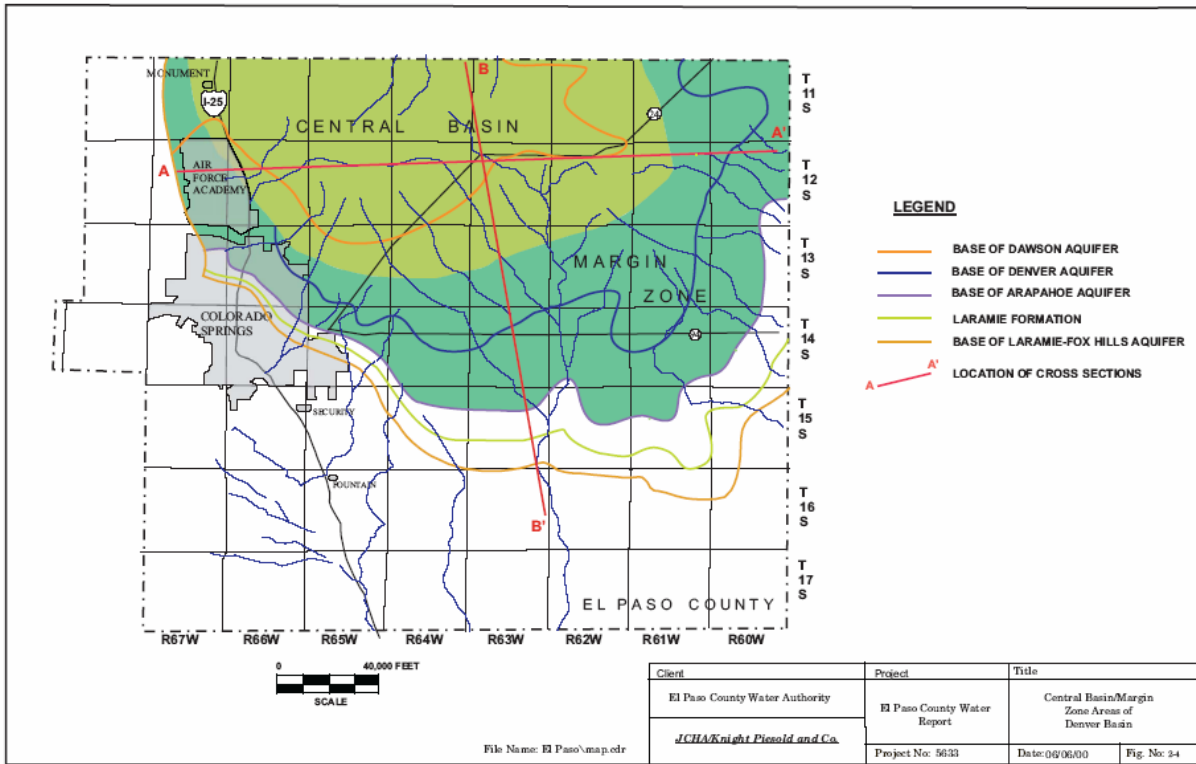
Appendix B: Water districts in Northern El Paso County*



Excerpted from Figure 1-1, El Paso County Water Report, 2002.

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Appendix C: The margin zone



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