

# Water Conservation Assessment for Southwest Colorado

Four Corners Office for Resource Efficiency



## Water Conservation Assessment for Southwest Colorado

*Four Corners Office for Resource Efficiency (4CORE)*

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A profile of water providers and water conservation efforts in Southwest Colorado

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## Executive Summary

This report provides an inventory and assessment of water providers in the Southwest Colorado region in order to understand current water use and conservation practices. Conservation is necessary in our region to prepare for future water supply shortages that could result from projected droughts, population growth, and reduced flow. Water conservation has the added benefit of saving energy from reduced pumping, treating and heating of water. Additionally, water conservation can save providers money by reducing the need for large capital investments to expand supply options and storage infrastructure.

The Colorado Water Conservation Act of 2004 requires water providers that sell 2,000 acre-feet per year or more to develop a water conservation plan. Of the 18 water providers in our region, three meet that criteria and all three have developed water conservation plans. The City of Durango, Pagosa Area Water and Sanitation District (PAWSD), and the City of Cortez all have water conservation plans in place, and have seen tangible results as an effect of their conservation activities. Water conservation plans have not been developed by other providers for a multitude of reasons, including: lack of available staff and resources, misperceptions of the cost of water conservation, the mindset of supply-side vs. demand-side, conservation reduces revenue from water sales, and providers do not foresee near-future water shortages. To address these issues, it is recommended to increase awareness of the economic benefits of water conservation and to increase the feasibility of water conservation planning through strategic collaborations.

It is also important to address conservation on the demand side through increased education and outreach to residential, commercial, and agricultural users. This education and outreach would be designed to increase user awareness of the benefits of water conservation and to promote best practices.

## Acknowledgements

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## Introduction and Regional Overview

The purpose of this document is to provide an overall understanding of the water use and conservation activities for water providers in the five counties of Southwest Colorado. This document is also meant to contribute to the Resource and Energy Action Plan (REAP)<sup>1</sup> in order to round out the information available on water resources.

The Southwest Colorado region consists of Archuleta, Dolores, La Plata, Montezuma, and San Juan Counties and the Southern Ute and Ute Mountain Ute Indian Reservations. The Colorado State Demographer's Office estimates the population at 91,716 in 2010.<sup>2</sup> The major municipalities located in the region include the cities of Cortez, Durango, and Pagosa Springs and the towns of Bayfield, Ignacio, Dolores, Dove Creek, Mancos, Silverton, and Towaoc.

## Why Conserve

Water is a vital resource in the State of Colorado, and will continue to be so due to periodic drought cycles and growing populations. Predictions for Colorado project that multiple factors, such as temperature and dust, will increase the rate at which water and snow pack is evaporated, thus resulting in lower runoff volume. The weather patterns of lower elevations are expected to migrate to higher elevations, lower-elevation snowpack is projected to decrease, runoff is expected to decline, and spring runoff is expected shift earlier with a reduction in late-summer flows.<sup>3,4</sup> No consistent long-term trends in precipitation have been detected.<sup>5</sup> The San Juan Mountains, in particular, are predicted to incur some of the steepest declines in runoff from spring snowmelt.<sup>6</sup>

In addition to these predicted changes, Colorado's population is projected to nearly double by 2050, with the Western slope in particular experiencing growth rates as high as 240%.<sup>7</sup> In June 2011, the Bureau of Reclamation released the "Colorado River Basin Water Supply & Demand Study Interim Report #1". As a result of continued climate change and increasing populations, this report predicts an increase in the frequency and duration of droughts in the Colorado River Basin and a 9% decrease in natural flow over the next 50 years. It is projected that droughts lasting five years or longer will occur 40% of the time.<sup>8</sup>

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<sup>1</sup> REAP document: <http://www.fourcore.org/docs/REAP/ResourceEnergyActionPlan.pdf>

<sup>2</sup> Census 2000 and 2010 Counts by Region and County, Available:

<http://dola.colorado.gov/dlg/demog/2010data/total%20pop%20change%20region.pdf>

<sup>3</sup> A multimodal ensemble approach to assessment of climate change impacts on the hydrology and water resources of the Colorado River Basin, Available: <http://www.hydrol-earth-syst-sci.net/11/1417/2007/hess-11-1417-2007.pdf>

<sup>4</sup> Climate Change in Colorado: A Synthesis to Support Water Resources Management and Adaptation, Available:

[http://www.colorado.edu/climate\\_change/ClimateChangeReportFull.pdf](http://www.colorado.edu/climate_change/ClimateChangeReportFull.pdf)

<sup>5</sup> Ibid

<sup>6</sup> Ibid

<sup>7</sup> SWSI 2010 Key Findings and Recommendations, Available: <http://cwcb.state.co.us/water-management/water-supply-planning/Documents/SWSI2010/SWSI2010FactSheet.pdf>

<sup>8</sup> Colorado River Basin Water Supply and Demand Study, Available: <http://www.usbr.gov/lc/region/programs/crbstudy/report1.html>

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Figure 1 displays the 2050 projected proportions of Colorado's water use by sector. As shown in the figure, agriculture will continue to use the majority of Colorado's water supply. However, if water use continues on projected trends, water will have to be diverted from agriculture to satisfy growing urban needs. This could result in the loss of 500,000 to 700,000 acres of irrigated agricultural land. Such a loss would have negative economic, as well as environmental, impacts.<sup>9</sup>

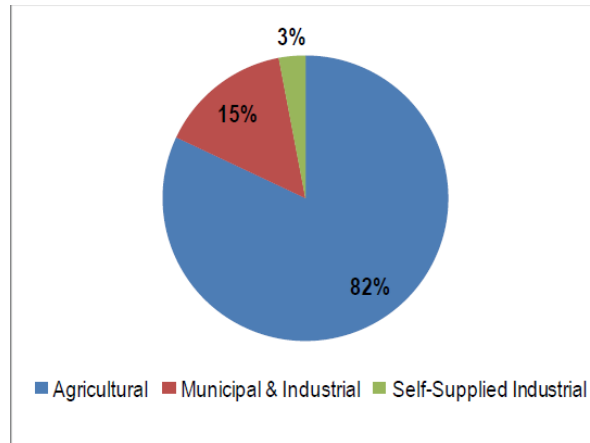


Figure 1: Projected 2050 Water Use in Colorado by Sector<sup>10</sup>

In order to cope with a reduction in water supply, our region should implement conservation practices to reduce demand and then look into improving supply options. Figure 2 below shows the relationship between our current supply and predicted demand. Conservation and planning are the most cost effective first steps.

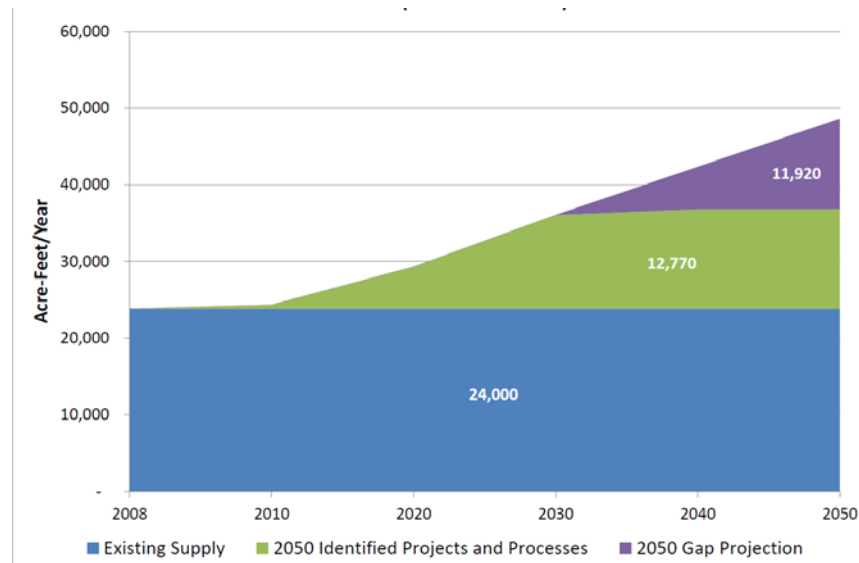


Figure 2: Southwest Basin Municipal and Industrial Gap Summary (medium scenario)<sup>11</sup>

<sup>9</sup> SWSI 2010 Key Findings and Recommendations, Available: <http://cwcb.state.co.us/water-management/water-supply-planning/Documents/SWSI2010/SWSI2010FactSheet.pdf>

<sup>10</sup> Ibid

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## The Drought of 2002

When assessing water conservation activities in Southwest Colorado, the drought of 2002 is an important event that triggered many water providers and individuals to begin assessing and reevaluating their water use practices.

The impacts of the 2002 drought began to be felt as early as April of that year, when statewide snowpack was at 53% of the annual state average. Additionally, April was an especially warm month, particularly in the mountains, which resulted in rapid evaporative snowmelt with very little runoff. As summer began with still very little precipitation and high evaporation rates, extreme drought began to occur. This drought season was characterized by wildfires, very little plant growth, low stream flows, intense heat, and dying crops. In analyzing precipitation by year, 2002 was the worst year on record since 1923 at Mesa Verde National Park.<sup>12</sup> To deal with this drought, the City of Durango put voluntary water restrictions in place for all water users. Water supply for city residents was never considered to be in jeopardy, but residents from rural areas were forced to come into the city to fill up water tanks, as wells were drying up across the region.<sup>13</sup>

As fall began, precipitation patterns began to increase, alleviating the impacts felt in the summer. If this drought had continued for another year or more, the impacts would have been much more devastating. Because the drought only lasted one season, it is not deemed exceptional in terms of long term weather patterns.<sup>14</sup> However, this drought was an example of the water scarcity that is a reality in semi-arid Southwest Colorado and an important indicator toward future planning. As mentioned previously, it is predicted that droughts of five years or more will occur 40% of the time in the future.<sup>15</sup> And as shown in Figure 3 below, Southwest Colorado has been in a severe and extreme drought 15% to 19.9% of the time from 1895 to 1995. Though our region recovered within a year from the 2002 drought, if a drought of similar severity occurred in the future, but lasted longer, our region would likely experience severe impacts.

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<sup>11</sup> 2050 Municipal and Industrial Gap Analysis, Available:

[http://www.coloadaptationprofile.org/index.php?option=com\\_docman&task=doc\\_details&gid=241&Itemid=75](http://www.coloadaptationprofile.org/index.php?option=com_docman&task=doc_details&gid=241&Itemid=75)

<sup>12</sup> 2002 Drought History in Colorado— A Brief Summary, Available: <http://ccc.atmos.colostate.edu/presentations/2002DroughtHistory.pdf>

<sup>13</sup> Personal Communication, Jack Rogers, City of Durango, Director of Public Works, 8/17/11

<sup>14</sup> 2002 Drought History in Colorado— A Brief Summary, Available: <http://ccc.atmos.colostate.edu/presentations/2002DroughtHistory.pdf>

<sup>15</sup> Colorado River Basin Water Supply and Demand Study, Available: <http://www.usbr.gov/lc/region/programs/crbstudy/report1.html>

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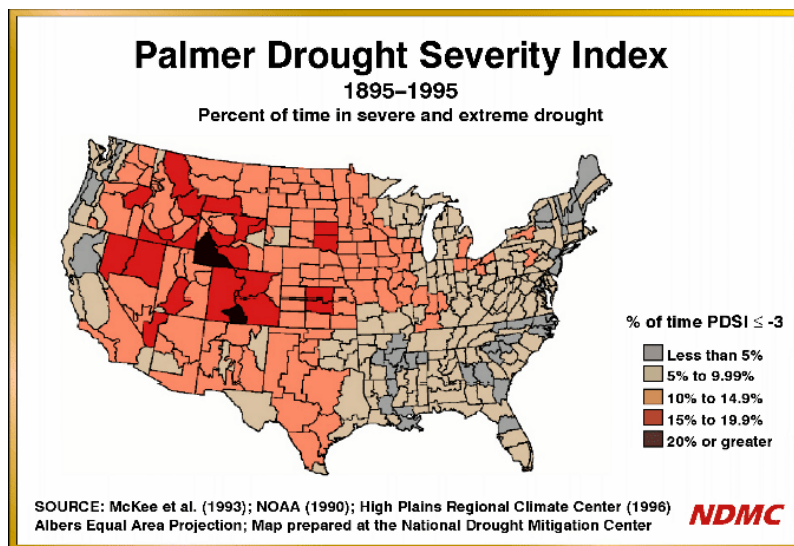


Figure 3: Percent of Time in Severe and Extreme Drought by State<sup>16</sup>

## The Energy/Water Nexus

In addition to direct impacts on the water supply, our consumptive practices also affect our energy resources. In Colorado, 1.2 gallons of water are consumed per kilowatt-hour (kWh) of energy used and 13% of the nation's energy use is by the water sector.<sup>17</sup> Energy is used to pump water, heat water, and treat wastewater. The image below describes the processes and flows of our water use. Energy is required for each segment of this process, with higher ratios of energy loads for pumping versus treating water.

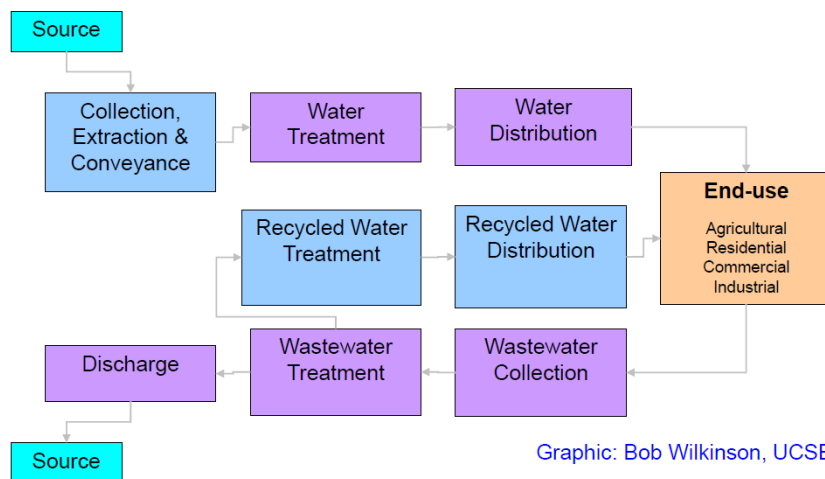


Figure 4: Flow of Consumptive Water from Source to End-use<sup>18</sup>

<sup>16</sup> Presentation by Dr. Tsegaye Tadesse, National Drought Mitigation Center, *Drought Indices: Overview and application*, Available: <http://www.case.ibimet.cnr.it/MTPprogramme/data/doc/4ClimateAnalysisTools/DroughtIndices.pdf>

<sup>17</sup> Presentation by Conor Merrigan, Governor's Energy Office, *Energy Water Nexus 201*, July 13<sup>th</sup>, 2011

<sup>18</sup> Ibid



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Because of this interconnection, conserving water can result in energy savings. Commercial buildings, in particular, consume 20% of the world's water. By utilizing water efficiency practices these buildings can reduce their energy use by 10-11% and their operating costs by 11-12%.<sup>19</sup>

## Benefits of Water Conservation – Case Studies

As outlined in the previous sections, addressing our current water supply relative to predicted future demand is necessary in order to ensure our region's ability to thrive and prosper into the future. Water conservation activities provide other benefits, as well. The following case study examples outline the near-term economic benefits that water conservation activities can provide:

- Albuquerque, NM has reduced per capita demand by 20% since the mid-1990s, with an ultimate 30% reduction goal. This has enabled them to avoid spending over \$1 billion to expand their wastewater treatment plant and indefinitely postponed development of new water supply sources.<sup>20</sup>
- Massachusetts Water Resources Authority has reduced system-wide water requirements by 25%, resulting in a half billion dollars in capital expenditure savings. The savings have allowed the cancellation of a plan to dam the Connecticut River.<sup>21</sup>
- Pagosa Area and Water Sanitation District (PAWSD) is projected to save approximately \$6 million over a 10-year planning horizon by implementing water conservation activities instead of increasing supply options and infrastructure.<sup>22</sup>

## The Colorado Water Conservation Board

Water conservation is also encouraged, and required for some providers, by the State of Colorado. Based on Colorado's Water Conservation Act of 2004, water providers that sell more than 2,000 acre-feet or more of water annually must create a water conservation plan and submit it to the Colorado Water Conservation Board (CWCB) for approval.<sup>23</sup> In order to receive water project funding from the CWCB or from the Colorado Water Resources and Power Development Authority (CWRPDA), a water provider must have an approved water conservation plan in place. The Water Conservation Act of 2004 outlines 13 minimum required elements that must be included in each plan. These elements are:

- Water-efficient fixtures and appliances, including toilets, urinals, showerheads, and faucets.
- Low water use landscapes, drought resistant vegetation, removal of water "hogging" plants, and efficient irrigation.
- Water-efficient industrial and commercial water-using processes.
- Water reuse systems.
- Distribution system leak identification and repair.

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<sup>19</sup> Presentation by Conor Merrigan, Governor's Energy Office, *Energy Water Nexus 201*, July 13<sup>th</sup>, 2011

<sup>20</sup> Presentation by Denise Rue-Pastin, The Water Information Program, *Water Conservation*, July 8<sup>th</sup> 2011

<sup>21</sup> Ibid

<sup>22</sup> PAWSD Final Water Conservation Plan, Available: <http://www.pawsd.org/2008-Water-Conservation-Plan.html>

<sup>23</sup> Colorado Water Conservation Act of 2004, Section 3. 37-60-126, Available: <http://cwcwbeblink.state.co.us/weblink/docview.aspx?id=111879&searchhandle=25493&dbid=0>

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- Dissemination of information regarding water use efficiency measures, including by public education, customer water use audits, and water-saving demonstrations.
- Water rate structures and billing systems designed to encourage water use efficiency in a fiscally responsible manner.
- Regulatory measures designed to encourage water conservation.
- Incentives to implement water conservation techniques, including rebates to customers to encourage the installation of water conservation measures.
- Statement of the covered entity's best judgment of the role of water conservation plans in the covered entity's water supply planning.
- Steps the covered entity used to develop, and will use to implement, monitor, review, and revise, its water conservation plan.
- Time period, not to exceed seven years, after which the covered entity will review and update its adopted plan.
- Either as a percentage or in acre-foot increments, an estimate of the amount of water that has been saved through a previously implemented conservation plan and an estimate of the amount of water that will be saved through conservation when the plan is implemented.
- A public review and comment process must take place. If the covered entity does not have rules, codes, or ordinances to make a draft plan available for a public planning process, then the covered entity shall publish a draft plan, give public notice of the plan, make such plan publicly available, and solicit comments from the public for a period of not less than 60 days after the date on which the draft plan is made publicly available.<sup>24</sup>

The CWCB offers both financial and technical assistance to water providers to aid in water conservation plan development. Financial assistance is based on the Water Efficiency Grant Program. This program has more than \$3 million currently available and offers grants for Water Conservation Planning, Water Conservation Implementation, Drought Mitigation Planning, and Water Resource Conservation Public Education and Outreach. Entities requesting funding through these grant programs must be able to contribute a match of 25% of the total project cost, though the CWCB will consider applications with a reduced level of matching funds if the applicant can demonstrate financial hardship.<sup>25</sup> To assist with technical development of water conservation plans, the CWCB has developed a Water Conservation Plan Guidance Document.<sup>26</sup> This document provides a Model Water Conservation Plan template and worksheets, descriptions of potential conservation measures and programs, and a list of water conservation planning resources. Additionally, all water conservation plans submitted to the CWCB will be reviewed based on the guidelines provided in this document.

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<sup>24</sup> Minimum Required Water Conservation Plan Elements, Available: <http://cwcb.state.co.us/water-management/conservation/Documents/MinReqWaterConservePlanElements.pdf>

<sup>25</sup> The application and evaluation process is outlined here: <http://cwcb.state.co.us/LoansGrants/water-efficiency-grants/Documents/GrantGuidelines4WCPlanningProjects.pdf>

<sup>26</sup> Water Conservation Plan Development Guide, Available: <http://cwcb.state.co.us/technical-resources/water-conservation-plan-development-guide/Pages/main.aspx>

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## Water Providers in Southwest Colorado

In Southwest Colorado, there are 18 water providers that service the various municipalities. Of these 18, there are three water providers that have water conservation plans in place that have been approved by the CWCB – Pagosa Area Water and Sanitation District (PAWSD), the City of Cortez, and the City of Durango.<sup>27</sup> The City of Durango submitted a new plan to the CWCB in August 2011 to replace the plan that was developed and approved in 1998. As of August 26<sup>th</sup>, 2011 the CWCB has not yet reviewed and approved the City's plan, though approval is expected.

Of the 15 water providers that have not developed water conservation plans, none are required to do so by the Colorado Water Conservation Act of 2004. However, these water providers could still elect to develop water conservation plans to reap the benefits of conservation activities. They would not be required to submit the plan to the CWCB and would not be required to incorporate the 13 previously mentioned elements.

This information is outlined in the table below.

**Table 1: Water Providers in Southwest Colorado and Existing Water Conservation Plans**

Water Provider	Plan required by CWCB?	Plan	Approved by CWCB?	Last updated	URL
Pagosa Area Water & Sanitation District	Yes	Final Water Conservation Plan	Yes	2008	<a href="http://www.pawsd.org/2008-Water-Conservation-Plan.html">http://www.pawsd.org/2008-Water-Conservation-Plan.html</a>
La Plata Archuleta Water District <sup>28</sup>	In the future	Master Plan currently, plans to develop a Conservation Plan			<a href="http://www.laplawd.org/sites/www.laplawd.org/files/Master%20Plan.pdf">http://www.laplawd.org/sites/www.laplawd.org/files/Master%20Plan.pdf</a>
La Plata West Water Authority <sup>29</sup>	No				
Lake Durango Water Authority	No				
Animas Water Company	No	No known plan			
City of Durango	Yes	Water Efficiency Management Plan	Submitted for review and approval August 2011	July 2011	<a href="ftp://ftp.ci.durango.co.us/Engineering/Water_%20Efficiency_%20Management_Plan/Final%20WE%20Managment%20Plan%2007-11-11.pdf">ftp://ftp.ci.durango.co.us/Engineering/Water_%20Efficiency_%20Management_Plan/Final%20WE%20Managment%20Plan%2007-11-11.pdf</a>

<sup>27</sup> City of Durango Water Conservation Plan – 1998, Available:

<http://cwcbweblink.state.co.us/WebLink/0/doc/108248/Page1.aspx?searchid=603971ca-e419-4978-848c-e0c4de0cac90>

<sup>28</sup> La Plata Archuleta Water District is not yet in operation, but construction could commence as early as 2012. It is estimated that this District will have a demand of 1,060 acre-feet per year by 2030, 2,750 acre-feet per year by 2060.

<sup>29</sup> La Plata West Water Authority is not yet operational, but is working towards the goal of building a rural domestic water supply system for Western La Plata County. So far 660 tap commitments have been collected from property owners in the potential service area.

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Water Provider	Plan required by CWCB?	Plan	Approved by CWCB?	Last updated	URL
Town of Ignacio	No	Water Saver Rate and Water Code		2009	
Town of Bayfield	No	None			
Southern Ute Indian Tribe	No	None			
Montezuma Water Company	No	None			
Dolores Water Conservancy District	No	None			
Mancos Rural Water Company	No	None			
City of Cortez	Yes	Water Conservation Plan	Yes	Dec 2010	<a href="http://cwcbweblink.state.co.us/WebLink/ElectronicFile.aspx?docid=146785&amp;searchid=353aa3d4-6b25-4734-9cac-638ade075160&amp;dbid=0">http://cwcbweblink.state.co.us/WebLink/ElectronicFile.aspx?docid=146785&amp;searchid=353aa3d4-6b25-4734-9cac-638ade075160&amp;dbid=0</a>
Town of Dove Creek	No	No known plan			
Rico	No	None			
Town of Dolores	No	None			
Ute Mountain Ute Tribe	No	No known plan			
Town of Silverton Public Works	No	None			

## Water Providers with a Conservation Plan

### City of Durango

#### *Water System Profile*

The City serves approximately 20,200 water users as of 2010. About 17,000 of those users are located within City limits. The City's water is obtained preferentially from the Florida River, with additional water supply needs provided by the Animas River. The City also obtains water from storage in the Terminal Reservoir. The majority of water use in the City is commercial at 43%, followed by residential at 34%. Of note is that 20% of water use is unaccounted for due to losses in the distribution system.<sup>30</sup>

#### *Why a plan was developed*

The City of Durango first began addressing water conservation in the mid-1990s as a way to save money in their water operations in order to deliver more affordable water to their customers.<sup>31</sup> In 1998, the

<sup>30</sup> Final Water Efficiency Management Plan, Available: [ftp://ftp.ci.durango.co.us/Engineering/Water %20Efficiency %20Management Plan/Final%20WE%20Managment%20Plan%2007-11-11.pdf](ftp://ftp.ci.durango.co.us/Engineering/Water%20Efficiency%20Management%20Plan/Final%20WE%20Managment%20Plan%2007-11-11.pdf)

<sup>31</sup> Personal Communication, Jack Rogers, City of Durango, Director of Public Works, 8/17/11

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City developed a formal Water Conservation Plan that was approved by the CWCB.<sup>32</sup> This plan has been in effect since that time and was updated in 2003 with the “Long Range Water Efficiency Management Plan”. As a result of these two plans, in addition to other factors, per capita water use has dropped 13% since 2000 and 10% since 2004.<sup>33</sup> However, average water consumption for a Durango citizen is 209 gallons per day, which is higher than the state average.<sup>34</sup> Though much progress has been made, the CWCB requested that the City update their plan and resubmit it for approval. It is required for the City to have a plan approved by the CWCB in order to be eligible for funding and loans from both the CWCB and the CWRPDA. The City has plans to apply for a loan from the CWRPDA for the Animas-La Plata project,<sup>35</sup> so renewing their plan was necessary for this reason. The City has already made a \$1 million investment towards this project, and has saved enough to put down another \$1.2 million, but an additional \$4 million will need to be borrowed to pay for this new water supply. The citizens of Durango will be asked to approve this loan in November 2011.<sup>36</sup>

Water conservation is often looked at from two perspectives in Durango. The City is generally characterized by a community with a strong environmental ethic that encourages conservation efforts. However, Durango citizens also value the aesthetic beauty of the city and the quality of life that comes with living in a fairly lush environment for the Southwest. There is the concern that water conservation would diminish this value and quality, and impose unnecessary restrictions on people’s day-to-day activities. Additionally, many citizens do not see the local benefits of water conservation. It is perceived that any efforts that are made in Durango will only benefit downstream users, as Durango’s water supply is predicted to be fairly sustainable into the future. For example, the lowest flow the Animas River at Durango has experienced was 120 cubic feet per second during the drought of 2002. However, water use by the City of Durango at that time was only at 10 cubic feet per second. For this reason, the City does not expect near-future supply issues, though there is always the concern over reliability and how to plan for potential water shortage circumstances.<sup>37</sup> To address this, the City’s Final Water Efficiency Management plan was completed in July 2011 and submitted to the CWCB in August. Official approval has not yet been received, but is expected.<sup>38</sup>

## *How the plan was developed*

To develop their updated plan, the City applied for a Water Conservation Planning grant from the CWCB. Approximately \$2,000 was spent on a consultant to develop the grant application. Jack Rogers, the City’s Public Works Director, described the application process as fairly simple and straightforward. The City

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<sup>32</sup> City of Durango Water Conservation Plan, Available: <http://cwcwebblink.state.co.us/WebLink/DocView.aspx?id=108248&page=1&dbid=0>

<sup>33</sup> Ibid

<sup>34</sup> Dahl, J. “Durango to see new water plan”, The Durango Herald, June 20<sup>th</sup>, 2011

<sup>35</sup> The Animas-La Plata project is being built to fulfill the water rights settlement of the two Indian tribes that live in Colorado – the Ute Mountain Ute Tribe and the Southern Ute Indian Tribe. These tribes have water rights that date back to 1868. Fulfillment of the settlement obligations, one of which is completing the Animas-La Plata Project, will provide non-Indian water users in Southwest Colorado certainty to the continued, historical use of water. The project will provide nearly 33% of the storage in Lake Nighthorse for use by non-Indian entities in the Four Corners region. There are seven entities that will benefit directly from the construction of the Project and the storage of water in Lake Nighthorse. These are: 1) Southern Ute Indian Tribe, 2) Ute Mountain Ute Tribe, 3) Animas-La Plata Water Conservancy District, 4) State of Colorado, 5) Navajo Nation, 6) San Juan Water Commission and 7) La Plata Conservancy District:

<http://www.usbr.gov/uc/progact/animas/fag.html>

<sup>36</sup> Personal Communication, Jack Rogers, City of Durango, Director of Public Works, 8/17/11

<sup>37</sup> Ibid

<sup>38</sup> Ibid

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was awarded \$17,000, which was used to hire a consultant (Great Western Institute) to develop the Water Efficiency Management Plan. The City could have developed a plan in-house without the assistance of a consultant, but the expertise and broader perspective of an outside consultant is seen to have strengthened the caliber of the final product.<sup>39</sup> In developing the plan, the City evaluated potential measures and programs based on a cost benefit analysis, the weight of evidence and the continuation of ongoing effective programs. These measures and programs were developed to address foundational water savings, ongoing water uses, ordinances, and education and outreach.<sup>40</sup>

## *Achieved and Expected Results*

As the plan was submitted to the CWCB the same month as this report, implementation has not yet begun. However, the plan outlines key goals to be achieved:

- Reduce summertime peak daily treated water demand.
- Limit unaccounted for water.
- Reduce water and energy use in City's operations.
- Maintain a fair and equitable block rate water structure.<sup>41</sup>
- Reduce outdoor water use.<sup>42</sup>

Due to resource limitations, there is no full-time City employee dedicated to water conservation. The responsibility for implementing proposed measures will be divided between various departments, and outside consultants may need to be hired for some of the measures, such as conducting audits. This implementation will cost approximately \$75,000 per year from now until 2020 (the Public Works capital improvement budget has already allocated \$5.25 million over that time period). A proposed 2012 budget of \$75,000 has been submitted to the Durango City Council for review, and will be approved/disapproved by December 15<sup>th</sup>, 2011. By implementing all of the proposed water efficiency efforts in the plan, the City expects a 6% reduction from 2020 average demands. This reduction is estimated to counterbalance the projected increase in demand, as shown in Figure 5.<sup>43</sup> In addition to this reduction in demand, by implementing the plan the City expects to be able to postpone certain capital investment projects, keep water rates low by delivering water more efficiently, reduce energy consumption from pumping and treating water, and reduce unaccounted for water.<sup>44</sup> One potential side effect of water conservation activities is a reduction in water sales due to reduced demand. However, reducing water losses helps offset cash revenue decreases from reduced demand.<sup>45</sup>

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<sup>39</sup> Ibid

<sup>40</sup> Final Water Efficiency Management Plan, Available:

[ftp://ftp.ci.durango.co.us/Engineering/Water %20Efficiency %20Management Plan/Final%20WE%20Managment%20Plan%2007-11-11.pdf](ftp://ftp.ci.durango.co.us/Engineering/Water%20Efficiency%20Management%20Plan/Final%20WE%20Managment%20Plan%2007-11-11.pdf)

<sup>41</sup> Ibid

<sup>42</sup> Personal Communication, Jack Rogers, City of Durango, Director of Public Works, 8/17/11

<sup>43</sup> Final Water Efficiency Management Plan, Available:

[ftp://ftp.ci.durango.co.us/Engineering/Water %20Efficiency %20Management Plan/Final%20WE%20Managment%20Plan%2007-11-11.pdf](ftp://ftp.ci.durango.co.us/Engineering/Water%20Efficiency%20Management%20Plan/Final%20WE%20Managment%20Plan%2007-11-11.pdf)

<sup>44</sup> Personal Communication, Jack Rogers, City of Durango, Director of Public Works, 8/17/11

<sup>45</sup> Final Water Efficiency Management Plan, Available:

[ftp://ftp.ci.durango.co.us/Engineering/Water %20Efficiency %20Management Plan/Final%20WE%20Managment%20Plan%2007-11-11.pdf](ftp://ftp.ci.durango.co.us/Engineering/Water%20Efficiency%20Management%20Plan/Final%20WE%20Managment%20Plan%2007-11-11.pdf)

# Water Assessment for Southwest Colorado

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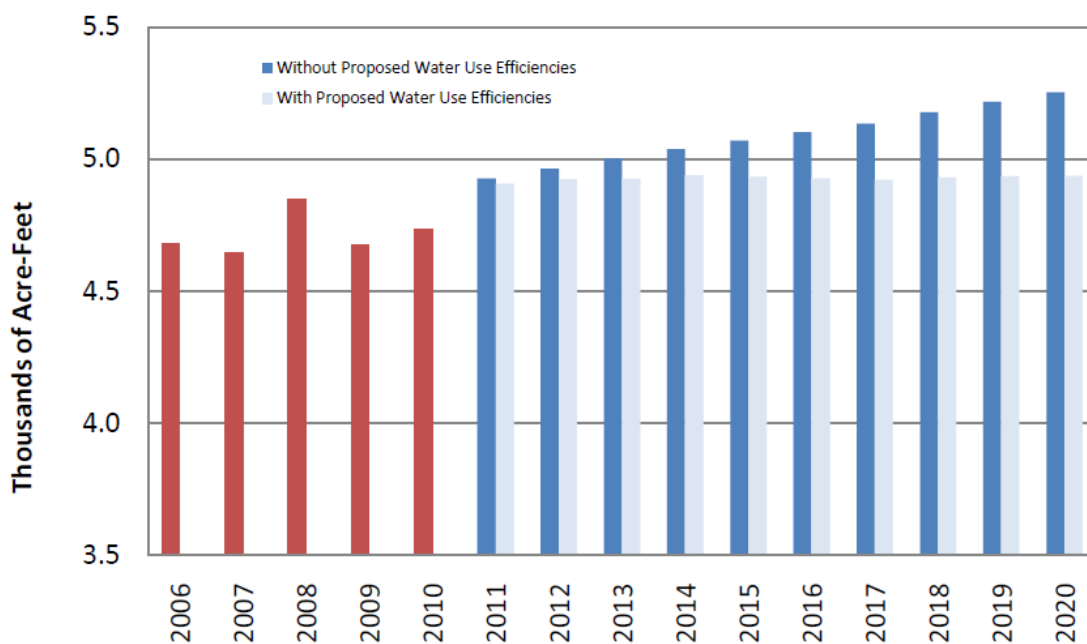


Figure 5: City of Durango Future Water Demand and Estimated Reductions<sup>46</sup>

## Pagosa Area Water and Sanitation District (PAWSD)

### Water System Profile

The PAWSD employs 27 full-time staff to administer and operate their water and sewer lines, with one staff member dedicated to water conservation activities. As of 2008, PAWSD provides approximately 2,000 acre-feet of treated water per year. In addition to this treated water, PAWSD may at times be required to supply an additional few hundred acre-feet of raw water for landscape irrigation. Currently, PAWSD serves approximately 7,000 equivalent units (EUs).<sup>47</sup> This service is 77% residential, 22% commercial, and 1% for irrigation.<sup>48</sup>

### Why a Plan was Developed

In assessing available water resources in relation to projected future demand, the PAWSD staff and board of directors realized that they were faced with a critical water situation in which demand would exceed supply by 2015. PAWSD had been looking to develop additional water resources since the 1980s,

<sup>46</sup> Final Water Efficiency Management Plan, Available:

[http://ftp.ci.durango.co.us/Engineering/Water\\_%20Efficiency\\_%20Management\\_Plan/Final%20WE%20Managment%20Plan%2007-11-11.pdf](http://ftp.ci.durango.co.us/Engineering/Water_%20Efficiency_%20Management_Plan/Final%20WE%20Managment%20Plan%2007-11-11.pdf)

<sup>47</sup> The Colorado State Demographer estimates that Archuleta County has 12,600 full-time residents; however, PAWSD serves approximately 75% - 85% of the County full-time population. PAWSD also provides water to a significant transient population associated with tourism and property owners who reside in the community only on a part-time basis. The transient population is not reflected in the published census data for the area. For this reason, PAWSD uses EUs to estimate existing and future water demands rather than population. When an estimate of population served is necessary, an approximate conversion rate of 1.5 persons per EU is used

<sup>48</sup> Presentation by Denise Rue-Pastin, The Water Information Program, *Water Conservation*, July 8<sup>th</sup> 2011

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however there are significant capital costs associated with building such infrastructure. For this reason, and to address their critical situation, PAWSD undertook the development of a water conservation plan in 2008.<sup>49</sup>

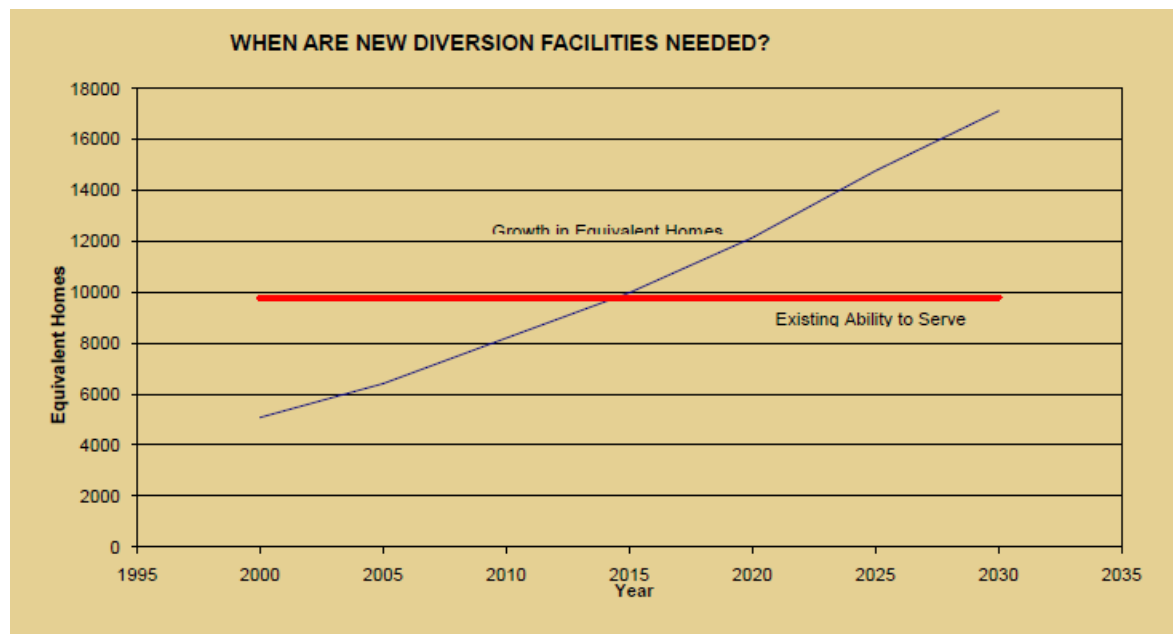


Figure 6: PAWSD Current Supply in Relation to Projected Future Demand<sup>50</sup>

Additionally, prior to 2008 the PAWSD drought mitigation and water conservation plans were housed in the same document. After the 2002 drought, these plans were revisited and it was realized that though these issues are interrelated, it is important for them to be addressed individually. These documents were officially separated in 2006 and the water conservation plan was revamped and submitted to the CWCB in 2008.<sup>51</sup> Most of PAWSD's water conservation measures and programs were established after the 2002 drought.<sup>52</sup>

## How the Plan was Developed

To develop their water conservation plan, PAWSD applied for and received a grant from the CWCB. It took dedicated staff time to develop this grant application, in addition to the use of an outside consultant. From stated staff experience, it is possible that this application process could be better streamlined to increase the ease with which smaller water providers can access water conservation funding opportunities.<sup>53</sup> In actually developing the plan, PAWSD used the CWCB funds to hire a consultant from the Great Western Institute, the same consultant used by the City of Durango in their planning process.<sup>54</sup>

<sup>49</sup> Personal Communication, Denise Rue-Pastin, The Water Information Program, August 12<sup>th</sup>, 2011

<sup>50</sup> Presentation by Denise Rue-Pastin, The Water Information Program, *Water Conservation*, July 8<sup>th</sup> 2011

<sup>51</sup> Personal communication, Mat deGraaf, PAWSD Water Conservation Coordinator, August 19<sup>th</sup>, 2012

<sup>52</sup> PAWSD Final Water Conservation Plan, Available: <http://www.pawsd.org/2008-Water-Conservation-Plan.html>

<sup>53</sup> Personal Communication, Denise Rue-Pastin, The Water Information Program, August 12<sup>th</sup>, 2011

<sup>54</sup> Personal communication, Mat deGraaf, PAWSD Water Conservation Coordinator, August 19<sup>th</sup>, 2012



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## *Achieved and Expected Results*

Prior to the development of their water conservation plan, PAWSD's main conservation efforts focused on customer education and awareness in combination with their indoor appliance rebate programs.<sup>55</sup>

This rebate program and education has thus far resulted in:

- 7,268,000 gallons of water saved through toilet replacement, with an avoided cost saving of \$83,000.
- 694,000 gallons of water saved through clothes washers replaced, with an avoided cost saving of \$43,000.
- 65,500 gallons of water saved through the Restaurant Pre-Rinse Spray Valve Program
- 2,280,000 gallons of water saved through fifth grade participation in the "Water Wise" program.<sup>56</sup>

In developing their water conservation plan, PAWSD's main priority was to emphasize and increase recognition of the impact future droughts could have on their water supply, as they are dependent solely on surface water with very little storage capacity. The drought of 2002 only lasted one summer and still had significant effects, so future, longer droughts could drastically impact the ability of PAWSD to provide water to their customers. To address this priority, PAWSD encourages customers to understand their water consumption in order to decrease excess waste. By achieving this, PAWSD will be able to understand how much water is necessary to supply to meet basic water needs ("demand hardening"). Additionally, the creation of a water conservation plan enables PAWSD to determine where their efficiencies and inefficiencies lie in order to expand best practices and reduce inefficient ones.<sup>57</sup> Since the plan was developed, priorities have shifted to focus on addressing water loss in the distribution system. The plan was developed with basic goals and provides guidance for implementation, but was designed to be adaptable to changing circumstances and values.<sup>58</sup>

Since the plan's inception, PAWSD has realized significant results through implementation. These results include:

- Hiring a water conservation coordinator.
- Increased awareness of water loss issues internally and externally, with steps taken to address these issues.
- Installation of AMR systems to read meters electronically and daily. This helps streamline operations and reduce staff time associated with tracking meter use. Additionally, more available meter readings have encouraged the public to become more active in understanding their bills and water use patterns.
- Reduced unaccounted for water loss from 36% to 16%.

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<sup>55</sup> PAWSD Final Water Conservation Plan, Available: <http://www.pawsd.org/2008-Water-Conservation-Plan.html>

<sup>56</sup> Presentation by Denise Rue-Pastin, The Water Information Program, *Water Conservation*, July 8<sup>th</sup> 2011

<sup>57</sup> Personal communication, Mat deGraaf, PAWSD Water Conservation Coordinator, August 19<sup>th</sup>, 2012

<sup>58</sup> Ibid

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- Replacement of 1/3 of meter registers to read in 10 gallon increments. Previously (and for the 2/3 of meters that have not been replaced yet) registers were read in 1,000 gallon increments. This meant that it would take three consecutive hours of >1,000 gallon readings for a leak to be flagged by the AMR system and singled out for examination by PAWSD staff. By reducing the register to 10 gallons, PAWSD is able to be much more proactive with their leak detection and have already detected and fixed hundreds of small leaks that would have previously gone unnoticed. This is a proactive service that PAWSD offers to their customers to help them save on their water bills. This service also benefits PAWSD, as the less water that is wasted, the less they have to treat, which expands the lifetime of their treatment plants.<sup>59</sup>
- Average EU water use has dropped 26% since 2001.
- Reduction in the costs of new water development efforts and improvement in the overall reliability of the water delivery system.<sup>60</sup>

The overall implementation cost for the PAWSD Water Conservation Plan is estimated to be \$3 million over a 10-year planning horizon. However, in contrast, it would have cost approximately \$9 million to instead increase supply options, as opposed to the reductions in demand proposed in the plan.<sup>61</sup> Figure 7 demonstrates the reductions in demand that can be achieved by conservation activities.

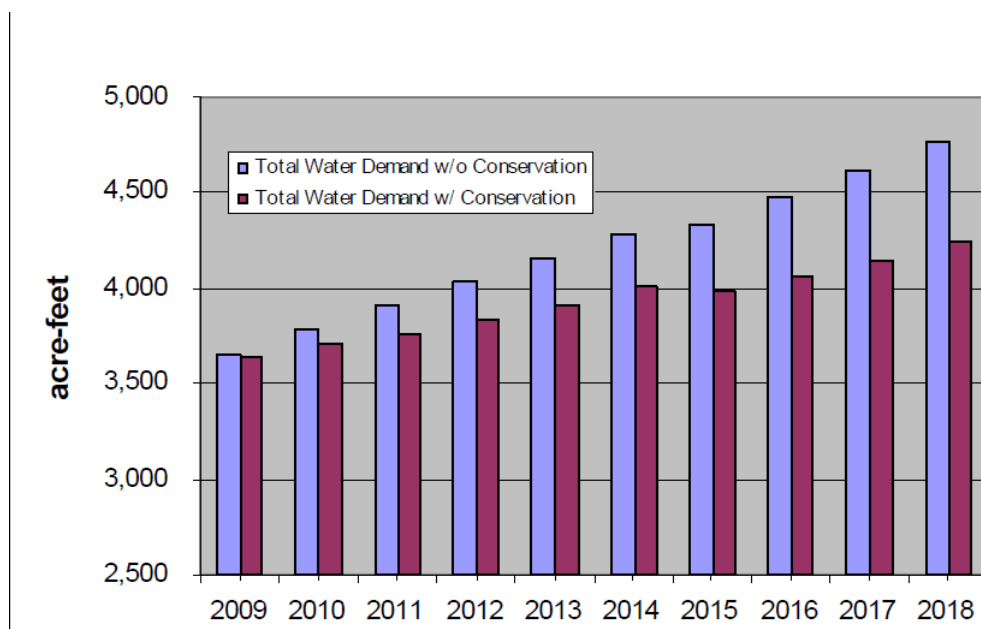


Figure 7: PAWSD Predicted Total Annual Water Demand With and Without Proposed Water Conservation Program<sup>62</sup>

<sup>59</sup> Personal communication, Mat deGraaf, PAWSD Water Conservation Coordinator, August 19<sup>th</sup>, 2012

<sup>60</sup> PAWSD Final Water Conservation Plan, Available: <http://www.pawsd.org/2008-Water-Conservation-Plan.html>

<sup>61</sup> Ibid

<sup>62</sup> PAWSD Final Water Conservation Plan, Available: <http://www.pawsd.org/2008-Water-Conservation-Plan.html>

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## City of Cortez

### Water System Profile

The City of Cortez Department of Public Works supplies water to approximately 10,000 users, both inside and outside of the City limits. Populations outside of the City limits include Montezuma Water District No. 1 and the Ute Mountain Ute Tribe. The distribution from the City represents the exclusive source of drinking water for these entities. The water supply for this distribution comes from the McPhee Reservoir and the Dolores River. The McPhee Reservoir is the second largest in Colorado and has a maximum storage capacity of 229,000 acre-feet.<sup>63</sup> As shown in Figure 8, the majority of the City's water is distributed to the residential sector.

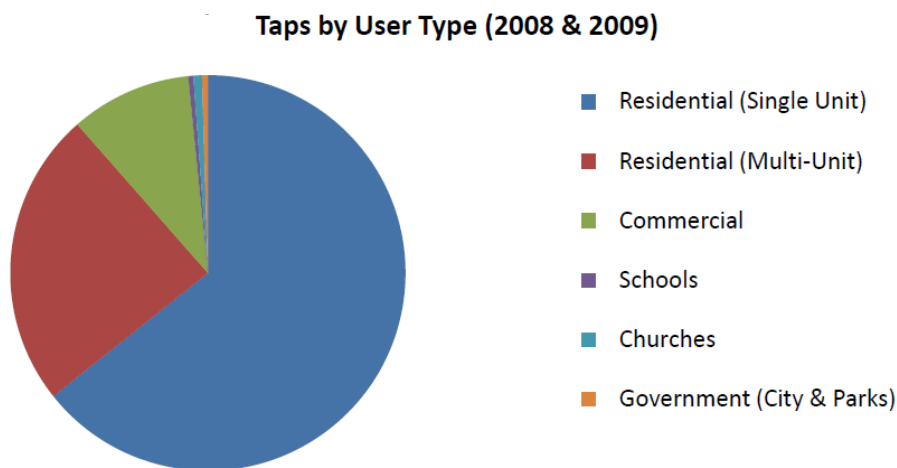


Figure 8: City of Cortez Water Distribution by Sector<sup>64</sup>

### Why a Plan was Developed

In assessing their water system, the City of Cortez realized that their system was characterized by six main limitations. These limitations are:

- High per capita water demand
- Projected annual growth rate of 1%

From 1990 to 2002, per capita water demand has been reduced from an average of 325 gallons per day to 230 gallons per day, with demand leveling out since 2002. This reduction is a significant achievement, but a per capita use of 230 gallons per day is still much higher than the state average. The short-term goal for the City is for water use to remain at approximately 230 gallons per day, with a long-term goal of reducing per capita demand to 200 or less gallons per day.<sup>65</sup>

<sup>63</sup> City of Cortez Water Conservation Plan, Available:

<http://cwcwebweblink.state.co.us/WebLink/ElectronicFile.aspx?docid=146785&searchid=353aa3d4-6b25-4734-9cac-638ade075160&dbid=0>

<sup>64</sup> Ibid

<sup>65</sup> Ibid

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The City is projected to grow at a rate of 1% per year from its population of 9,078 in 2009.<sup>66</sup>

- Annual raw water availability limited

The City of Cortez has senior direct flow water rights for 3,040 acre-feet per year from the Dolores River and purchases the rights to 2,300 acre-feet per year from the McPhee Reservoir. Currently, annual water demand (993 million gallons in 2008, 961 million in 2009) is about half of the available water supply (1,740 million gallons annually), but growing populations and potential future droughts could affect the availability of this supply.<sup>67</sup>

- Treated drinking water used for supplemental park irrigation and street sweepers

Using treated water for irrigation is an inefficient use of resources, due to the cost of treating water. It is preferable to use raw, untreated or reclaimed wastewater instead.<sup>68</sup>

- Unmonitored use for supplemental park irrigation, pool, street sweepers

The water used for these three sources is metered cumulatively by a master meter. However the use at this meter is not monitored. Additionally, better data would be received if each of these three locations had individualized meters.<sup>69</sup>

- Hydrant flushing program unmetered

The City of Cortez has an annual fire hydrant flushing program that consumes 11 million gallons per year. It is necessary to meter this use in order to better track consumption and ensure efficient water use.<sup>70</sup>

In realizing these limitations apparent in their water distribution system, the City of Cortez decided to develop a water conservation plan. This plan is designed to address four primary goals, with the overall goal of achieving lasting improvements in water use efficiency. These goals are:

- Reduce volume of water withdrawn from water supply sources
- Reduce loss or waste of water
- Maintain or improve the efficiency in the use of water
- Increase the reuse of water<sup>71</sup>

## *How the Plan was Developed*

The City of Cortez Water Conservation Plan was developed using the CWCB Model Water Conservation Plan, and prepared by Briliam Engineering (located locally in Pagosa Springs). This plan was developed as

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<sup>66</sup> City of Cortez Water Conservation Plan, Available:

<http://cwcwbeblink.state.co.us/WebLink/ElectronicFile.aspx?docid=146785&searchid=353aa3d4-6b25-4734-9cac-638ade075160&dbid=0>

<sup>67</sup> Ibid

<sup>68</sup> Ibid

<sup>69</sup> Ibid

<sup>70</sup> Ibid

<sup>71</sup> Ibid

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an update to the 1996 Water Conservation Plan, though the 1996 plan was not submitted to and approved by the CWCB.<sup>72</sup> The 2010 updated plan has been approved by the CWCB.

In developing the plan and selecting which actions were the most appropriate for implementation, the City based their action selection on the following (note: the City lacked the data to conduct a cost-benefit analysis):

- Estimated breakdown of water consumption by use
- Presence within 1996 plan
- Feasibility of implementation
- Non-duplication with ongoing measures<sup>73</sup>

## *Achieved and Expected Results*

As the City's plan was developed in December 2010, implementation is still in initial stages. However, the plan outlines future goals and expected results for the City:

- Develop a separate drought mitigation plan in the next five-years
- Maintain adequate supply for current per capita water demand in the short term, and reduce per capita demand to 200 gallons per day in the long-term
- Implement full metering/monitoring of all water users
- Improve quantification of water loss, maintain current water loss percentage

The City currently has a very effective water leak detection and repair program, which has resulted in less than 5% loss in the distribution system. Having a loss of 10% or less is generally considered to be effective management of water resources.<sup>74</sup>

- Institute automatic metering reading system to identify waste and expedite billing<sup>75</sup>

Figure 9 below describes the projected reductions in demand the City expects to achieve as a result of implementing their Water Conservation Plan.

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<sup>72</sup> City of Cortez Water Conservation Plan, Available:

<http://cwcwweblink.state.co.us/WebLink/ElectronicFile.aspx?docid=146785&searchid=353aa3d4-6b25-4734-9cac-638ade075160&&dbid=0>

<sup>73</sup> Ibid

<sup>74</sup> Ibid

<sup>75</sup> Ibid

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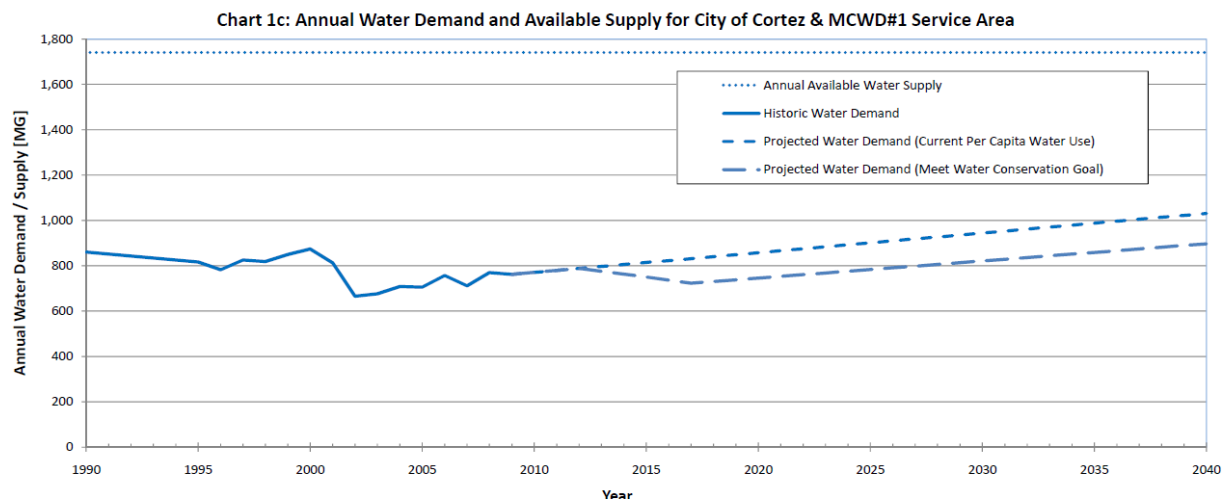


Figure 9: Historical and Projected Annual Water Demand and Available Supply<sup>76</sup>

## Water Providers without a Conservation Plan

### Why they do not have plans

In assessing the various water providers in the region that have not developed water conservation plans, there are a few general trends in why conservation planning has not been approached. These trends include:

- Lack of available staff and resources
- Misperceptions of the cost of water conservation
- Mindset of supply-side vs. demand-side
- Conservation reduces revenue from water sales
- Do not foresee near-future water shortages
- Conserve only when potential storage water might have to be purchased
- Aesthetic value of green towns
- Conservation not a priority

Though comprehensive conservation planning has not been developed by these providers, there are a few conservation tactics that have been employed. Examples of these conservation tactics include:

- Structured water rates. Bayfield Public Works, for example, has seen a 20% reduction in usage since their rate structure was established.<sup>77</sup>
- Enact water restrictions during water shortages. Bayfield Public Works has only had to do this once in the last six years, but it resulted in a 35% reduction in use.<sup>78</sup>

<sup>76</sup> City of Cortez Water Conservation Plan, Available:

<http://cwcwebblink.state.co.us/WebLink/ElectronicFile.aspx?docid=146785&searchid=353aa3d4-6b25-4734-9cac-638ade075160&&dbid=0>

<sup>77</sup> Personal Communication, Ron Saba, Bayfield Director of Public Works, August 17<sup>th</sup>, 2011

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- Education for consumers about conservation
- Leak detection. Animas Water Company uses SCADA software to monitor their water tanks. If a leak occurs the software will notify them by phone. Animas Water Company currently loses 7-10% of their supply in unbillable water.<sup>79</sup>
- Use pressurized distribution systems. The Dolores Water Conservancy District, for example, has a 97% efficiency rate in their water delivery as a result of delivering water under pressure and requiring agricultural users to have pressurized irrigation systems in order to receive this water. The pumping for this water distribution is powered by hydropower. Additionally, the District tracks inflow and outflow of water on a daily basis in order to account for all water that is distributed.<sup>80</sup>
- Water measuring devices on irrigation ditches<sup>81</sup>

## How to make conservation a priority

Providing information on the economic benefits of water conservation seems to be the first step to making conservation activities more of a priority for these providers. Many of the water providers in our region are not associated with a municipality, but are private, non-profit enterprises. Water sales are the only source of income for these providers. Even if they recognize that conservation is the right thing to do, it does not make sense for them economically to promote conservation practices to their consumers. However, water conservation can often save the provider money by reducing water loss. Money can also be saved through the avoided cost of not having to treat water, as well as through reduced pumping costs.

It is also important to increase awareness of potential future supply issues. To do this, information for water providers should include an analysis of growth projections in relation to water supply to demonstrate the need for planning now, in order to be able to continue supplying water into the future. Many of the providers have already taken this step, which is the motivation for the development of new supply options. For that reason, this analysis should also include a comparison of the costs associated with developing new water supplies and additional storage infrastructure in contrast to the cost of implementing water conservation practices. PAWSD, for example, will save \$6 million over a 10-year planning horizon by opting to conserve water and reduce demand, as opposed to increasing supply.<sup>82</sup> The final section of this document, *Next Steps*, outlines ways to increase awareness of these benefits.

## How to make conservation more feasible

For many of the smaller water providers in this region, water conservation planning is a large undertaking. There are not adequate resources currently available, as it takes dedicated staff time to develop a conservation plan and financial resources to implement it. As mentioned before, there are grants available from the CWCB to both develop and implement water conservation plans, so increasing awareness of this resource is a first step towards increasing the feasibility of conservation planning.

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<sup>78</sup> Personal Communication, Ron Saba, Bayfield Director of Public Works, August 17<sup>th</sup>, 2011

<sup>79</sup> Personal communication, John Ott, Animas Water Company, General Manager, August 25<sup>th</sup>, 2011

<sup>80</sup> Personal communication, Mike Preston, Dolores Water Conservancy District, General Manager, August 23<sup>rd</sup>, 2011

<sup>81</sup> Southern Ute Indian Tribe Water Resources Division, Available: <http://www.southern-ute.nsn.us/natural-resources/water>

<sup>82</sup> Personal communication, Mat deGraaf, PAWSD Water Conservation Coordinator, August 19<sup>th</sup>, 2012

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However, it still takes staff time to apply for these grants and then use the awarded funds. It is possible, though, to do this with limited resources. PAWSD is an excellent example this, as they were able to apply for funds from the CWCB and then develop their water conservation plan with only a ¼ to ½-time staff person dedicated to the process.<sup>83</sup>

One potential solution to the staff/resource issue would be to develop a circuit rider approach to regional water conservation planning.<sup>84,85</sup> Most of the providers in the region cannot afford a full-time staff person dedicated to water conservation. However, various water providers could potentially pool their resources to hire a water conservation coordinator to serve all of them. This would work best if water providers in the region were grouped by location and “branches” were created. Each branch would have a conservation coordinator that served each of the respective providers in that branch on a part-time basis. This initiative would take significant coordination and collaboration on the part of interested water providers, but could be a potential solution to the feasibility issue. Additionally, the circuit rider approach would increase the sharing of best practices for the mutual benefit of all. 4CORE could potentially help facilitate the development of this initiative regionally.

## Addressing the Consumer

### Agriculture and Irrigation

Agricultural consumption currently accounts for 86% of the water use in the State of Colorado.<sup>86</sup> The Southwest Basin of Colorado accounts for 7% of the State’s agriculture, with 259,000 irrigated acres.<sup>87</sup> Looking at Figure 10 below, shortages in meeting agricultural needs are already occurring. By 2050, 500,000 to 700,000 irrigated acres state-wide could dry up due to increasing urban water demands.<sup>88</sup>

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<sup>83</sup> Personal Communication, Denise Rue-Pastin, The Water Information Program, August 12<sup>th</sup>, 2011

<sup>84</sup> In the early frontier days of the U.S., clergy in many denominations would often serve more than one congregation. To do this they would be assigned to a preaching circuit and would travel around to various locations to minister and organize congregations. These clergy came to be referred to as “circuit riders”.

<sup>85</sup> Personal Communication, Denise Rue-Pastin, The Water Information Program, August 12<sup>th</sup>, 2011

<sup>86</sup> Colorado’s Water Needs, Available: <http://cwcb.state.co.us/water-management/water-supply-planning/Pages/ColoradosWaterSupplyNeeds.aspx>

<sup>87</sup> SWSI 2010 Full Final Report, Section 4-24, Available: <http://cwcb.state.co.us/water-management/water-supply-planning/Documents/SWSI2010/SWSI2010Section4.pdf>

<sup>88</sup> Ibid



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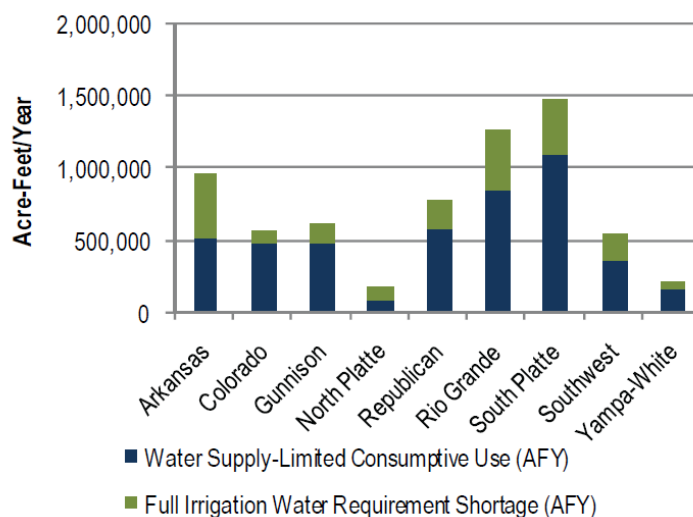


Figure 10: Current agricultural demands and shortages by basin<sup>89</sup>

Multiple factors may affect water shortages in the future, such as population, drought cycles, climate, and evaporation rates. Conservation measures planned and implemented now could bring large returns later. Incentives and return on investment need to be evaluated prior to implementation. Conservation prior to droughts can lessen the impact of future predicted shortages. As the largest user group in Colorado, agriculture stands to show dramatic savings from the implementation of modest conservation measures.

Agricultural water conservation includes potential, voluntary activities such as:<sup>90</sup>

- Growing crops that use less water<sup>91</sup>
- Managing soils to hold water more efficiently (by using mulches and cover crops, minimum tillage practices and increasing soil organic matter)
- Schedule timing, duration and amount of irrigation based on plant needs, soil moisture, and climatic conditions<sup>92</sup>
- Control weeds that compete for water
- Using more efficient irrigation practices. In order of efficiency, with flood as the least efficient:
  - Flood: low cost and flushes salts out of the soil, but high water loss through evaporation and leaching. Also promotes nitrogen loss and recharges the water table.
  - Furrow: relatively inexpensive, but high water loss by leaching, seepage and evaporation. Additionally, can cause water logging and salinization.

<sup>89</sup> SWSI 2010 Full Final Report, Section 4-24, Available: <http://cwcb.state.co.us/water-management/water-supply-planning/Documents/SWSI2010/SWSI2010Section4.pdf>

<sup>90</sup> Manuals and guides for agricultural water conservation activities can be found here: [http://agwaterconservation.colostate.edu/tools\\_manuals\\_guides\\_link.aspx](http://agwaterconservation.colostate.edu/tools_manuals_guides_link.aspx)

<sup>91</sup> See the "Seasonal WATER Needs and Opportunities for Limited Irrigation for Colorado Crops" fact sheet: <http://www.ext.colostate.edu/pubs/crops/04718.html>

<sup>92</sup> Tools for scheduling irrigation: [http://www.msue.msu.edu/objects/content\\_revision/download.cfm/revision\\_id.604557/workspace\\_id.-30/#3%20Scheduling%20Tools.pdf/](http://www.msue.msu.edu/objects/content_revision/download.cfm/revision_id.604557/workspace_id.-30/#3%20Scheduling%20Tools.pdf/)

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- Sprinkler: good for medium to large fields, but water is lost through evaporation and wet leaves can contribute to foliar disease.
- Micro-Irrigation: More than 90% efficient, but expensive to install and maintain. Additionally, water emitters can get clogged if water quality is poor.<sup>93</sup>
- Reuse irrigation water
- Use wastewater for irrigation<sup>94</sup>
- Address supply system leakage issues

These water conservation practices can help reduce water loss from evaporation, leaching, conveyance and runoff. Additionally, water efficiency practices can benefit agricultural users by reducing pumping costs, reducing water logging and maintaining nutrients and pesticides in the root zone.<sup>95</sup>

Based on conversations with representatives from the local agriculture sector, it is important to emphasize that any potential conservation activities should be considered on a case-by-case basis. Each action should be assessed in terms of their economic effects, as well as in terms of potential unintended consequences. For example, one local farmer switched from flood to sprinkler irrigation in order to use water more efficiently. After this switch the land began to be infested with prairie dogs, which affected the feed available for his cattle. He was forced to switch back to flood irrigation in order to control the prairie dog population.<sup>96</sup>

Additionally, the water rights system in Colorado affects the ability of agriculturalists to take advantage of water conservation practices. Colorado water law is based on the doctrine of prior appropriation, in which the earliest water users have priority over later appropriations in times of water shortages. These appropriation rights will continue to exist so long as the water is being put to beneficial use.<sup>97</sup> For this reason, agriculturalists could risk losing their water rights by utilizing conservation practices that reduce their consumption.

Agriculture is an essential sector in Southwest Colorado, and continued agricultural productivity is vital to our community's future success. Providing municipal water supply is the first priority for many water providers, therefore, when shortages occur, it is water allocated for agriculture that is impacted first.<sup>98</sup> For this reason, proactive conservation planning on the part of all entities, from water consumers to providers, is integral to mitigate future shortages in our water supply.

## Residential and Commercial

It is generally easier for residential and commercial users to conserve when compared with agricultural users, as their consumption is not affected by water rights issues. However, not all consumers are aware of or understand the effect of their water consumption. The responsibility for conducting consumer

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<sup>93</sup> Fact sheet on micro-irrigation: <http://www.ext.colostate.edu/pubs/crops/04703.html>

<sup>94</sup> Presentation by Barbara Bellows, NCAT Soils Specialist, "Irrigation", Available: [https://attra.ncat.org/downloads/water\\_quality/irrigation.pdf](https://attra.ncat.org/downloads/water_quality/irrigation.pdf)  
<sup>95</sup> [http://agwaterconservation.colostate.edu/FAQs\\_WATER%20SUPPLY%20SOURCES%20AGRICULTURAL%20USE.aspx#A7](http://agwaterconservation.colostate.edu/FAQs_WATER%20SUPPLY%20SOURCES%20AGRICULTURAL%20USE.aspx#A7)

<sup>96</sup> Personal Communication, John Ott, James Ranch, August 25<sup>th</sup>, 2011

<sup>97</sup> Colorado Water Rights Fact Sheet, Available: <http://www.blm.gov/nstc/WaterLaws/pdf/Colorado.pdf>

<sup>98</sup> Personal Communication, Mike Preston, General Manager, Dolores Water Conservancy District, August 23<sup>rd</sup>, 2011

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education and outreach could be taken on by local water providers, municipalities, and non-profits associated with water conservation.

A potential role for water providers would be to educate consumers on how to access and interpret their meter reads in order to better understand their usage and the costs associated with this usage. Providers could also connect the efforts of individual consumers to the overall supply (for example, conserving reduces the need for capital investments to expand supply and saves energy from treating less water). By doing so, consumers will feel more connected to their consumption and how it affects others and the region as a whole. Water providers, municipalities and non-profits can also increase awareness of and promote best practices for residential and commercial water users. In addition to promoting these practices, it is also important to link the tangible results that consumers will realize by implementing these practices. Examples of best practices include:

## Residential Water Conservation

- Limit shower length to 5-7 minutes
- Install low-flow showerheads and faucet aerators
- Fix leaks – a leaky toilet can waste 200 gallons per day and a faucet that drips one drop of water per second can result in 2,400 gallons wasted a year
- Purchase water efficient appliances – a high efficiency washing machine can reduce water consumption by 50%
- Thaw frozen foods in the fridge overnight to defrost, as opposed to running under warm water
- When loading the dishwasher, scrape, rather than rinse, dishes. And only run full loads
- Use efficient watering practices – up to 75% of a home's total water use is outdoors<sup>99</sup>
- Don't let water run while brushing your teeth or shaving – letting your faucet run for five minutes uses as much energy as leaving a light bulb on for 14 hours<sup>100</sup>

The average household in the U.S. spends about \$500 per year on their water bill. Adopting just a few conservation measures can result in savings of approximately \$170 per year.<sup>101</sup>

## Commercial Water Conservation (in addition to the applicable residential practices):

- Educate employees and engage them in conservation efforts
- Install low-flow toilets or adjust flush valves on existing toilets
- Institute leak detection and repair practices
- Replace old appliances with water saving models
- Use manufacturers recommendations to minimize water used in cooling equipment, and shut off equipment when not needed
- Wash vehicles less often
- Sweep or blow outside areas to clean, as opposed to hosing off.<sup>102</sup>

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<sup>99</sup> <http://www.epa.gov/WaterSense/pubs/res.html>

<sup>100</sup> [http://www.epa.gov/WaterSense/water\\_efficiency/benefits\\_of\\_water\\_efficiency.html](http://www.epa.gov/WaterSense/water_efficiency/benefits_of_water_efficiency.html)

<sup>101</sup> Ibid

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Businesses can reduce their operating costs by incorporating water efficiency into their business practices, which would increase the funds available for them to invest in other ways. As previously mentioned, commercial buildings that utilize water efficiency practices can reduce their energy use by 10-11% and their operating costs by 11-12%.<sup>103</sup> Water conservation also creates a positive image for the business in the community that can be used for marketing purposes.

## Next Steps for the Region

In assessing the current state of affairs of water conservation in our region, it is apparent that though progress has been made, there is still the potential for much more to be achieved. The three major municipalities in Southwest Colorado have all developed comprehensive water conservation plans that are approved (or soon will be) by the CWCB. These providers are leaders in the community in implementing conservation best practices. There are a multitude of other water providers that have done very little to incorporate water conservation practices at the supply level, or to promote conservation at the demand level. For many, water conservation is seen to be a practice that would result in economic losses, as a reduction in demand would reduce water provider income from water sales. For others, the benefits of water conservation are only seen to accrue for downstream users, not for the entities implementing the practices.

To address these concerns, it is recommended that action be taken to demonstrate the benefits of water conservation in order to encourage more widespread planning. To achieve this, two levels of action are proposed.

## First Proposed Action

The first level of action would be the responsibility of the CWCB. It is requested that the CWCB expand their current education and outreach practices to develop materials targeted at water providers that outline the economic benefits of water conservation in order to dispel any misperceptions currently associated with conservation practices. These materials could take the form of a short informational video, a PowerPoint presentation, or a pamphlet.

It often takes a few years to see the benefits of water conservation, so it would be helpful to incorporate case study examples that describe the tangible results of other providers in the state. These examples should outline the costs of implementing conservation practices in comparison to the costs of expanding supply options and infrastructure. Additionally, a comparison of demand in relation to revenue should be developed in order to demonstrate that decreasing demand does not necessarily mean that overall revenue will decrease as a result. These materials should also emphasize the resources available to water providers to assist in the development and implementation of water conservation plans.

The creation of these educational materials should be the responsibility of the CWCB to ensure that consistent information is being received across the state. The circulation and distribution of these

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<sup>102</sup> <http://www.epa.gov/WaterSense/pubs/businesses.html>

<sup>103</sup> Presentation by Conor Merrigan, Governor's Energy Office, *Energy Water Nexus 201*, July 13<sup>th</sup>, 2011

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materials would then be the responsibility of local organizations dedicated to water conservation. In Southwest Colorado, the Water Information Program could be an appropriate entity to take on this effort, with assistance available from 4CORE.<sup>104</sup>

## Second Proposed Action

This action would occur locally in the form of a stakeholder meeting facilitated by 4CORE and/or the Water Information Program. The goal of this meeting would be to bring together all of the water providers in Southwest Colorado to discuss water conservation. It is proposed that PAWSD, the City of Durango and the City of Cortez help lead the meeting by sharing their experiences with water conservation planning and implementation. These three providers could begin the meeting by discussing why they chose to develop a water conservation plan, how they were able to do so, obstacles encountered, and results achieved so far. After the three aforementioned providers share their stories, ideally the meeting would evolve into a roundtable discussion in which the various providers involved can share their own respective perspectives and experiences, as well as ask questions of each other.

Establishing these connections and relationships between the various providers will increase water conservation as a priority and help to spread best practices. For many of the smaller water providers in the region, conservation is not a main concern or even something that is thought about. A goal of this meeting would be to increase awareness of conservation opportunities and to open the door to future dialogues about developing a water conservation plan and implementing water conservation practices.

These are necessary first steps towards planning for the future and for considering the adoption of water conservation practices. Conservation is historically most successful in periods of extreme shortage. Proactive planning and implementation of water conservation practices could prevent extreme shortages and the costly delayed actions necessary to mitigate such potential shortages. Improving supply and delivery systems, reducing leakage, and tracking and metering usage are all smart, simple ideas that also save energy. Efficiency and conservation are logical first steps towards better use of our resources.

This report has looked largely at providers, but education for consumers on the demand side to conserve water as a limited resource will add to the solution. Water conservation has the added benefit for the consumer of saving energy from pumping and heating water. A next step for our region would be to look further at water conservation from the demand side and develop a strategy for encouraging conservation activities among consumers. The development of such a strategy is not within the scope of this report, but is an important avenue to pursue in the future.

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<sup>104</sup> The Water Information Program is a public information program sponsored by the water districts, organizations and agencies in the San Juan and Dolores watersheds of Southwestern Colorado. The purpose of the WIP is to provide information to the public and community on water topics and water related issues: <http://www.waterinfo.org/>