



Douglas County  
**Water Resource Authority**

# **Water Conservation Planning and Implementation Assessment**

**Final Report**

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## **Project Overview and Objectives**

This project was conducted to develop a more thorough understanding and document the ongoing commitment of water providers in Douglas County to meaningful water conservation in Douglas County (and in selected areas of Arapahoe County) serviced by members of the Douglas County Water Resources Authority (DCWRA). The project participants included all entities that are members of the DCWRA that provide retail water sales to customers. Table 1 presents a listing of the project participants and the information provided by each.

The objectives of the project are as follows:

- Identify and describe ongoing water conservation activities;
- Discuss the effectiveness of implemented water conservation measures and programs, as possible;
- Review the total water use of the participating entities to identify trends in water use over the past five to ten years; and
- Identify opportunities for future water conservation activities.

## **Current Activities**

The water provider entities that are members of the DCWRA all maintain some degree of water conservation activities. The activities supported by the various municipalities and special districts are variable depending on a number of factors, including, but not necessarily limited to:

- Age of the organization and customer base (e.g., Castle Rock is the county's oldest town, whereas Franktown Water Metro District is newly formed and has only just begun operations);
- Type of customers (e.g., Castle Pines and Castle Pines North (CPN) primarily serve residential customers; whereas Inverness and Arapahoe County Water and Wastewater Authority (ACWWA) serve primarily commercial properties);
- Wealth of customers (e.g., Castle Pines North contains a fairly wealthy customer base with an average household income of about \$150,000 per year, whereas Cottonwood contains residences with only about one half to one third of that average annual income); and
- Water availability (Centennial Water & Sanitation District (Centennial WSD)) has access to the South Platte River via tributary wells and direct diversions whereas Castle Pines and Castle Pines North are located a substantial distance from perennial flowing streams and therefore are more reliant on non-tributary groundwater as their water supply source).

Therefore, each water provider has developed water conservation activities that address the needs of each specific locality, based on these another other factors. Nonetheless, as will be presented herein, all the water providers in the DCWRA membership have ongoing water conservation activities that help to address water supply management through demand reduction and the use of alternative water supply (e.g., reuse of non-tributary groundwater).

**Table 1**  
**Summary of Water Provider Participation**

| Entity   | Provided Information on Water Conservation Programs | Information Provided on Water Use and Population Served |
|--|---|---|
| Arapahoe County Water and Wastewater Authority       | Yes   | 2004-2006   |
| Castle Pines MD                                      | Yes   | None  |
| Castle Pines North MD                                | Yes   | 1998-2006   |
| Town of Castle Rock                                  | Yes   | 2000-2006   |
| Castleton Water & Sanitation District                | No  | None  |
| Centennial Water & Sanitation District               | Yes   | 1995-2006   |
| Cottonwood Water & Sanitation District               | Yes   | 1997-2006   |
| East Cherry Creek Valley Water & Sanitation District | Yes   | 1995-2006   |
| Inverness Water & Sanitation District                | Yes   | None (no residential customers)                         |
| Meridian MD  | No  | None  |
| North Douglas County Water & Sanitation District     | No  | None  |
| Parker Water & Sanitation District                   | Yes   | 2003-2006   |
| Pinery Water & Sanitation District                   | Yes   | 1995-2006   |
| Roxborough Park MD                                   | Yes (combined with Drought Plan)                    | 1995-2006   |
| Stonegate Village MD                                 | Yes   | 1996-2006   |

Note that Franktown Business Area Metro District, and the City of Lone Tree do not provide retail water directly to their water customers.

Independent of these inherent differences, substantial water conservation is happening within the service areas of the DCWRA water providers due to both ongoing programs and influence from messaging and activities being conducted by neighboring entities (e.g., City of Aurora, Denver Water). Although it is difficult to quantify the exact amount of water being “saved” as a result of the ongoing water conservation measures and programs being practiced in Douglas County and southern Arapahoe County, it is clear that all the DCWRA member organizations are spending resources to educate and support their customers needs and desires to conserve water.

The list of ongoing water conservation activities currently being practiced in Douglas County (and in selected portions of Arapahoe County) by the DCWRA members can be categorized as follows:

- Collaboration with other water users
- Education and outreach
- Water waste management
- Water billing methods
- Water reuse
- Institutional water use
- Customer technical and financial assistance
- Enforcement

A review of the specific activities being performed by the DCWRA members within each of these categories is provided below.

### **Collaboration with other water users**

The DCWRA provides a forum that all its members participate in, for purposes of sharing ideas, swapping stories, and exchanging information and anecdotes regarding water resources and water conservation. The member organizations also share and pool resources to improve water conservation efforts collectively.

For example, DCWRA with support from a selected group of member organizations produced the Xeriscaping™ DVD which was produced and mailed to over 100,000 residences in Douglas and Arapahoe Counties. The DVD was viewed by as many as 50% of the recipient households and has been provided to numerous other media outlets and distribution channels. As an educational piece, the Xeriscape DVD has been viewed by tens of thousands of people – due to the vision and strength of the DCWRA and its membership.

Centennial WSD has indicated that in an effort to inform the public about conserving water, it has been valuable to have teamed up with DCWRA. Ideas and resources are shared and existing programs are expanded.

## **Education and Outreach**

### *Educational Activities and Public Outreach*

Water and water conservation education is the backbone of all water provider customer based programs, for it is imperative that water customers have a basic understanding of the very systems that support their way of life in such a essential manner. Not surprisingly, much of the water conservation measures and programs that a water provider can conduct to promote meaningful water conservation are based on managing and adjusting water customer behaviors – behaviors that are based on customers understanding how their actions influence the overall water system being managed by the water provider.

All the DCWRA member organizations practice and fund activities focused on educating their customers. Nearly all the organizations utilize bill stuffers, newsletters, flyers, fact sheets and promotional materials to educate customers on appropriate water use behaviors and opportunities. Printed materials and web based content are readily available from nearly every water provider in the County including numerous sources with overlapping jurisdictions.

For example, Centennial WSD has put together water saving information kits to provide to homeowners. These kits include tools and tips to conserve water as a family. The kits are made available to customers at the District office, and during customer visits and water conservation events.

In another example, for the fifth consecutive year, a program teaching water conservation practices to Castle Rock homeowners will exempt graduates of a three hour workshop from the mandatory watering schedule the Town has enforced since 1985. More than four hundred participants are currently monitored as part of this program. Workshop attendees learn about Castle Rock's water supply, the Town's water system, efficient irrigation methods and fundamentals of water conservation including landscaping practices. Residents completing the workshop earn a "Water Wiser" designation, allowing them to water on any day. Their water usage will be monitored by the Town to determine the effect of best water-conservation practices.

Public outreach programs for education and information emphasizing water conservation being conducted by member organizations include:

- Highlands Ranch Community Association Home and Garden Expo
- Metro Districts of Highlands Ranch Arbor Day Celebration
- Water Watch Workshops for residential water users
- Water Management Programs for commercial water users
- Party at the Parks
- Girl Scout "Water Wonder Badge"
- Kids Nature Camp

- World Water Monitoring Day
- Individual Letters and one-on-one communication
- Conservation information for all employees maintaining public lands and open space
- Table tents and signs are placed at restaurants for a small reminder that we need to conserve water
- Xeriscape garden awards

### ***K-12 Education and Activities***

Some of the educational and public outreach activities listed above clearly impact and support the connection of water conservation message with children in primary and secondary schools; however, some of the DCWRA member organizations also have classroom based programs that they support to expand their reach. To this point, Castle Rock and Parker have formal programs that bring water experts to the classroom to engage and interact with primary school aged children. Great Western Institute has recently begun teaching Douglas County 5<sup>th</sup> graders about water conservation in the classroom.

### **Water Waste Management**

#### ***Leak Detection and Repair***

Leak detection and repair is the very first and most basic water conservation activity that any water provider must perform – since minimizing leaks that drain the resources of the water provider is a basic requirement for sound “standard of care” management. To this end, leak detection and repair focus on locating and identifying water that is either unaccounted for or is not billed to customers.

Water providers in Douglas County enjoy a fairly low amount of unaccounted for and/or non-billed water given the amount of new infrastructure and ongoing practices. Estimated leakage rates are in the 8 to 11 percent range. Most, if not all of the water providers constantly monitor the difference between the water it produces (either from its wells or treatment plants) and the amount of water actually delivered as a means to track and identify unaccounted for water and related losses. Each provider maintains very strict construction standards for all new water line construction which is rigidly inspected and enforced to maintain the highest integrity of the water distribution system that is possible. Leaks that are detected are promptly repaired.

Castle Pines North is looking into conducting sonic leak detection in 2007 as part of its leak detection and repair program to more aggressively address water waste management. Centennial WSD uses a leak detection program to identify underground leaks. In addition to reducing water loss, benefits of the leak detection program include creating favorable public opinion; improving savings in water treatment and energy cost; maximizing capacity of existing water system, distribution and storage facilities; and reducing overall cost. In addition to the distribution system leak detection and

repair program, Centennial WSD, Cottonwood, Inverness and ACWWA employ continuous monitoring of their delivery system using auditing techniques. Through these audits, District and Authority staff examine water production and customer meter records to identify all system uses and to determine the percentage of unaccounted water loss.

### ***Meter Testing and Replacement***

Critical to any water conservation and/or management activity is the collection of reliable information regarding water use. Metering is the front line of water use data collection. Effective meter testing and replacement must occur to support accurate billings, reliable water audits, and as indicated above, identification of unaccounted for water loss.

Most water providers in the DCWRA membership do not have specific large scale meter testing and replacement programs chiefly due to the relatively new age of the service area's infrastructure.

### ***Water Efficient Fixtures***

Most DCWRA membership water providers require that new installations comply with the Advanced Plumbing Regulation, which is a modification of the existing plumbing regulation. It specifically requires the installation of ultra low volume (ULV) fixtures in all new single- and multiple-family homes, businesses, schools, and other public buildings. In addition, the Advanced Plumbing Regulation applies to remodeling and other upgrades to existing homes and buildings.

## **Water Billing Methods**

### ***Inclining Block Rate and Water Budgets***

Pricing water is one of the most difficult tasks that area water providers must undertake. Water pricing must be equitable for its customers, but it must also reflect changing costs for energy, infrastructure maintenance, and development of new reliable and sustainable water supplies. Water pricing can also be developed to help promote water conservation.

All DCWRA water providers develop and maintain water pricing that supports water use efficiency by its customers, to the extent practical – meaning that the price of water increases as more water is used in what is called an inclining block rate structure. This rate structure allows for a 2 to 4 times increase in the cost of water per thousand gallons when water users use more than an allotted amount - typically some fixed quantity of water.

A more individualized water billing program has been developed and implemented by Centennial WSD, Cottonwood, and Inverness who utilize a water budget approach to the water rate structure. A budgeted amount of water is allocated to each account

holder, based on estimates of indoor and outdoor needs calculated based in part on individual lot size and expected outdoor irrigation requirements. The budget system provides a base rate of water to the individual customer based on a calculated water use and higher rates are assessed to customers exceeding their budgeted amounts. This system encourages water conservation by rewarding customers who stay within their individual budget. Water budgets are data intensive, but they do provide for more equitable treatment of water pricing than most other methods since individual yard size is incorporated into the budget development process.

### **Water Reuse**

The DCWRA membership shares the fact that they are reliant to some extent upon non-renewable groundwater supplies, with few exceptions. Although collectively these water providers are actively exploring means to establish expanded renewable water supply portfolios, they are also heavily dependant on the use of water reuse programs to fully utilize their non-tributary groundwater resources, since the law allows for non-tributary groundwater (as well as transmountain diversion surface water and other water decreed for consumptive use) to be used to extinction.

To this point, nearly all of the DCWRA membership utilizes wastewater reuse programs to meet their current water demand. For example, the Parker Water and Sanitation District currently practices a highly innovative wastewater reuse program that allows it to reuse all of its wastewater, gallon for gallon, through its augmentation programs, and through its wastewater irrigation policies. The former is accomplished by treating all of the Districts' wastewater with advanced wastewater treatment (AWT) techniques to meet drinking water standards, discharging this treated wastewater into Cherry Creek and then, after mixing and natural treatment in the Cherry Creek alluvium, each gallon of wastewater discharged is withdrawn through the District's alluvial wells for treatment and distribution into the potable water system. The AWT process is a water treatment system that treats the water to meet drinking water standards before the water is discharged into the creek, rather than after it is withdrawn, which is normally the case.

ACWWA and Cottonwood are in the process of constructing a reverse osmosis treatment system to capture and reuse their water supplies from Cherry Creek.

The Parker Water and Sanitation District encourages wastewater reuse for irrigation by charging a lower rate than potable water rates for commercial or public users who want to irrigate their landscape, and it maintains a policy with the Town of Parker of irrigating the Town's parks with treated (reclaimed) wastewater.

Inverness maintains a "closed loop" water supply system, where its water supplies are captured and reused through appropriate production, treatment and recycling facilities. Stonegate utilizes treated wastewater to make-up nearly 90% of its outdoor irrigation

water. Other utilities and districts utilize wastewater effluent to irrigate golf courses and parks, augment tributary water supply wells, or some combination thereof. The DCWRA water providers are extremely savvy regarding the opportunities and benefits of water reuse and take substantial advantage of their reuse programs to benefit their customers.

### **Institutional Water Use**

The institutional use of water by each of the DCWRA member organizations, and their customers is important to discuss, given that not only are these uses substantial across the county, but customer feedback often centers on observed water use by parks, schools and other institutions. Institutional water use especially for outdoor purposes is one of the most visible of all water uses given the location and relative visibility of the areas landscaped medians and roadways, parks and other irrigated areas. Unfortunately, a substantial amount of these high visibility areas are owned and managed by entities other than the water providers such that water conservation promoted by the DCWRA membership does not necessarily impact all managed green spaces; however some water providers have taken steps to promote wise water use in highly visible outdoor areas creating deliberate links with selected homeowner associations (HOAs), parks, and schools.

For example, Highlands Ranch Community Association, working with Centennial WSD and the Metro District has been installing large areas of native and low water use landscaping at its new facilities in areas not utilized for play field. Douglas County Parks has been working with various organizations to install artificial turf into high use athletic fields as a means to reduce water use and increase field utility. Castle Rock has conducted audits of its Town parks to identify over watered areas and develop alternative watering and planting schemes that will be implemented to reduce overall water use. The combination of audits and landscape management has been used effectively in numerous locations within Douglas County to help conserve water.

As noted above, substantial treated wastewater reuse is being used at regional parks and recreation facilities, and golf courses, to lower raw and treated water demand, and allow for the more efficient use of non-renewable supplies.

Finally, Douglas County Parks have replaced irrigated grass with artificial turf in nearly a dozen of its athletic fields, reducing irrigation requirements and improving the “playability” of the field. Although the artificial turf is expensive, particularly due to the drainage and grading requirements of the turf, the increased use of the fields year-round is well received by the recreating public.

### **Customer Technical and Financial Assistance**

Customer technical and financial support goes directly to helping the water end user better understand and manage their individual water use. In Douglas County,

substantial water use relates to residential water use, such that the discussion in this section will focus upon residential customer technical and financial assistance.

### ***Technical Assistance for Residential Low Water Use Landscapes***

The DCWRA water providers have committed substantial resources to promote low water use and water efficient landscaping to their water customers. Not only does low water use landscaping make sense in Douglas County, it helps to reduce summertime peak and total demand, which is some of the hardest water supply demand to fill. To serve the community, DCWRA received a grant from the State of Colorado, as well as cash donations from Centennial WSD, South Metro Water Supply Authority and Douglas County to print and circulate over 90,000 Xeriscape DVDs to all the households in Douglas County and about 10,000 in southern Arapahoe County. This DVD has also been forwarded to water providers and water educators across the State, as well as to interested organizations on both the east and west coast.

Nearly all of the DCWRA water providers maintain Xeriscape demonstration gardens, chiefly at their administration and/or operations buildings, but also at regional recreation facilities and parks. Many of these demonstration gardens utilize drip irrigation, or Netafim™, to deliver water to the plant root zones as opposed to spray irrigation methods. Efficient irrigation using subsurface drip and appropriately timed and controlled spray systems is supported and promoted by many area water providers through brochures and educational seminars.

Centennial WSD also encourages the use of water saving products in the landscape. In addition, Highlands Ranch Community Association, in conjunction with Centennial WSD has developed a set of low water use landscaping standards. These standards have identified types of irrigation systems to be installed, soil testing requirements, and soil preparation requirements.

Castle Rock has perhaps the most aggressive low water use landscape requirements in the State. They require landscaper training and certification to ensure that proper soil amendment and irrigation system installation occurs during commercial, institutional and residential construction, including the proper use of Xeris and other low water use plant materials.

### ***Residential Outdoor Irrigation Management and Audits***

Outdoor summertime water use constitutes about 50% of the total water use in the County. Many residential water customers rely upon irrigation systems to water their lawn and shrubs on a pre-set schedule, based on a programmable logic controller. Unfortunately, a substantial number of these customers set the timers and forget them, such that they often water at inappropriate times such as every day and night, during a rainstorm, or during the day after 10 am and before 6 pm.

Programmed outdoor watering also may stress potable water delivery systems. For example, Castle Rock since 1985 has imposed circle, square, diamond watering restrictions to limit the morning water demand caused by programmable irrigation systems starting up at the same time (i.e., 3 am), which overburdened their groundwater wells and pumps. Watering restrictions, which are included in some water provider conservation programs, are often focused on managing peak summertime demands rather than long-term annual demand. Therefore, water conservation practices for the DCWRA membership have included watering restrictions, where appropriate.

Nearly all Douglas County water providers utilize some form of outdoor watering restrictions to both save water and limit peak demand impacts on water delivery. In most DCWRA water provider service areas, watering restrictions include involuntary limits on the number of days when watering may occur. In addition, most water providers limit outdoor watering to the hours before 10 am and after 6 pm.

Many residential irrigation systems operate poorly or inadequately due to system leaks, damaged sprinkler heads, inappropriate clock settings, and/or inappropriate system pressure. Centennial WSD and CPN have utilized the Center for ReSource Conservation (a Boulder-based non-profit) to conduct residential outdoor water audits to determine individual system efficiencies and identify how homeowners can improve their outdoor watering efficiency including how to properly set and manage individual homeowner sprinkler system controllers.

As previously discussed, Castle Rock homeowners have the opportunity to be trained in water conservation principles for indoor and outdoor water use through a three hour workshop, which exempts them from the mandatory watering schedule the Town has enforced since 1985. This program teaches efficient irrigation and the fundamentals of water conservation including landscaping practices to individual homeowners, which can then be directly tracked by the Town by following individual water billings and usage.

### *Technical Assistance for Residential Indoor Water Use*

Indoor water waste can also occur within old and new homes alike. Running toilets, inefficient appliances, and other unwise water use habits can be identified and fixed through a simple home walk-through and post walk-through discussion. These audits can be provided to improve customer relations and direct educational efforts. For those entities that conduct these types of audits, they indicate that one-on-one residential customer settings provide the best long term water savings of any of their programs. The effectiveness of house specific water audits can also be easily tracked through billing data that is readily available.

Other examples of residential indoor water use technical assistance include Centennial WSD's water saving information kits that they provide to homeowners. These kits

include tools and tips to conserve water as a family. The kits are made available to customers at the District office and during customer visits and water conservation events. Alternatively, Parker Water & Sanitation District distributes kits with flow-restricting washers for faucets and water displacement bags for toilets to encourage less water use. Leak detection kits are also included. Finally, CPN is looking to hire an outside consultant to provide indoor residential auditing services to its customers for free.

### ***Residential Rebates***

One of the best methods to create measurable water conservation is to offer customer rebates for indoor appliances. Outdoor irrigation system rebates and sod replacement can also be effective in saving water; however, outdoor irrigation effectiveness can be influenced by variations in annual precipitation, existing irrigation system inefficiencies and other circumstances beyond the control of the water provider. Nonetheless, outdoor irrigation rebates can be of great benefit to the overall customer water use efficiency, albeit somewhat difficult to measure when compared to indoor rebates.

Slightly less than half of the DCWRA water providers offer their customers rebates, which are offered on a first-come, first-serve basis (for example East Cherry Creek Valley offered indoor appliance rebates this year, but ran out of money by July). Castle Rock offers three rebates: up to \$300 on smart irrigation system controllers, \$200 on high efficiency clothes washers and \$25 on three-day irrigation system controllers. CPN offers rebates for high efficiency clothes washers, low flow toilets, low flow showerheads, and irrigation system rain sensors and clocks, and is looking into offering rebates for ET controllers and sod replacement programs. Roxborough Park is looking into indoor appliance rebates. Parker offers low flow (2.0 gpm) showerheads to its customers free of charge.

For some time Cottonwood has offered residential customer rebates for low flow shower heads, low flow toilets and high efficiency washing machines. These same rebates will be made available to residential customers as they begin to move into new construction within the Inverness service area.

### **Enforcement**

The last, and typically most expensive, means of developing meaningful water conservation involves enforcement actions. Enforcement actions are typically expensive because they require staff time to review water use records, make site visits, record violations, etc. Enforcement can also take the form of restrictive and/or preventative covenants and rules that govern water customer actions. Both of these types of enforcement practices are used to varying degrees by the DCWRA member water users.

For example, the Town of Castle Rock requires inspections of soil amendments and irrigation systems by the Town before a developer can receive a certificate of occupancy.

Town staff visit new home sites, commercial construction sites and homeowner association landscaping to conduct the inspections and provide acceptance or denial actions. Centennial WSD, in order to educate the public on good watering behavior, employs water monitors. The monitors patrol neighborhoods to ensure that customers are following the mandatory outdoor water conservation measures, which restrict watering between the hours of 10 am and 6 pm.

In the Pinery, if a homeowner leak is not fixed within the prescribed 72 hour period from time of notification the District has the right either to repair it or to have it repaired, in which case the customer shall be assessed 110% of the actual cost accrued by the District. Also, the Pinery works with developers to get covenants into its subdivisions that limit the amount of irrigated turf. Some of the subdivisions in the Pinery do not allow more than 6,000 square feet of irrigated turf per home.

## **Recent Innovations**

Although substantial work has and continues to be accomplished by the DCWRA membership, a number of noteworthy innovative projects in various states of completeness are being sponsored by individual DCWRA members. These specific projects were selected based on the potential for specific, measurable water savings to result from the effort. In addition, the results of these innovative projects are expected to be readily shared with the DCWRA membership and beyond.

### **Inverness Xeriscape Pilot Project**

Inverness provides the majority of its retail water to commercial customers. Many of these customers maintain large areas of landscape dominated by bluegrass. Based on their understanding of turf replacement costs and current water pricing, most of Inverness's commercial customers are not prone to install low water use landscapes and plantings.

Inverness is therefore in the process of conducting a pilot project to better quantify the costs and benefits related to various types of turf replacement options. This information, which will be developed over the next 3 to 5 years, will be useful to all other DCWRA member entities, and other water providers and users in the Front Range.

### **Great Circle Water**

Centennial WSD is partnering with a California firm, Great Circle Water (GCW), to assist them with the evaluation of a new technology that may prove valuable in the remote treatment of sewage originating from residential and light commercial sources for purposes of creating non-contact irrigation water. The technology uses a unique non-biological process that meets the most stringent disinfection requirements for recycled water in the United States, and has the added bonus of being able to start-up and shut down relatively quickly during periods of non-use (which makes it an ideal

option to help meet irrigation watering demands). Centennial WSD has been funding this project in part through a grant received from the CWCB.

The status of the project is that GCW and Centennial WSD are working to demonstrate the effectiveness of the technology to obtain a variance and design approval for this new technology in the State of Colorado. If the technology can be shown to be safe and effective, it will likely be used in a pilot study to demonstrate use for a specific geography that has sizable irrigation needs and has access to the required wastewater flows. If proven effective, this technology, which fits on the bed of a tractor trailer, may have applications anywhere that use water sources that can be legally used to extinction such as non-tributary groundwater, transmountain diversions, or consumptive use transferred from agriculture to municipal use.

## **Metrics**

Total water delivery and per capita annual water use data were collected from the water providers as a means to track past water use, and evaluate, where possible, the effectiveness of water conservation programs currently in place. Water use information was available for many of the water providers for the past 7 to 12 years, whereas water use and population served, which are needed to calculate per capita water use, were available only from a selected group of water providers. The results of the analyses are provided below.

### **Total Water Delivery**

Total water delivery, as shown in Figure 1, indicates that overall water use has increased over the past 12 years (from 1995 to 2006) as would be expected given the growth that has occurred in the DCWRA membership service area. Population in Douglas County (which is used as a surrogate for population in the DCWRA membership service area) has more than doubled over this same period of time.

Notable is the downward trend in total water delivery from 2001 to 2004. This trend was observed throughout the Denver metro area, presumably as a result of the broadcast messaging related to the 2002-2003 drought. Water use began to increase again in 2005 and 2006 at a rate that is slightly faster than the rate of population growth in the county; however it is likely that the population growth in the DCWRA membership service area is occurring at a faster rate than the population growth rate for Douglas County.

Based on total water delivery, there is no discernable effect of water conservation measures and practices, but there is a clear impact of regional messaging that occurred in response to the drought. To this point, another metric was evaluated to identify local effects of water conservation programs.

## **Per Capita Water Use**

Per capita average daily water use, in gallons per capita per day (GPCD), is the metric used to look at the average annual water use per person for seven member service areas, as shown in Figure 2. The seven members, Centennial WSD, CPN, Pinery, Parker, Castle Rock, Cottonwood and ECCVWA were able to provide both total water delivered and population data for various periods from 1997 to 2006.

Please note that direct comparison of GPCD between water providers is not an appropriate means to compare entity water conservation programs. Each water provider has a different mixture of customers and customer needs, and therefore GPCD is not going to be the same from all entities. For example, Castle Rock has older residential communities as well as substantial commercial and industrial customers. They also serve the Douglas County Jail, which has no permanent residents but does have a large total water demand. CPN, on the other hand is chiefly residential without any industry and limited, albeit growing, commercial customers. Therefore, the most important comparison between water providers GPCD will be the overall trends of per capita water use, more so than the absolute GPCD.

That said, these data indicate some interesting and noteworthy trends in GPCD. To begin with, all seven water providers observed substantial declines in per capita water use from 2000 to 2004. Some of this reduction in water use likely is related to the regional messaging associated with the 2002-2003 drought. This observation is supported by the increase in per capita water use observed in 2005 and 2006 for all seven water providers. However it is noteworthy that the rebound has not risen to per capita water use levels observe prior to the drought in 2002. GPCD observed in 2005 and 2006 are substantially lower than those GPCD observed in 2002, which is likely based on the more aggressive water conservation measures and programs instituted by these entities over the past few years.

Specific observations are as follows. CPN has the greatest decrease in GPCD of any of the seven entities, reducing annual per capita water use from over 275 gallons per day to about 175 gallons per day. This reduction likely relates to the aggressive nature of CPN's water conservation program, which is one of the most aggressive in the state. Castle Rock has also been able to trim its GPCD from near 220 to less than 165 gallons per day, based in part on the Town's aggressive water conservation programs. These two entities (i.e., CPN and Castle Rock) have two of the four water conservation plans that have received state approval since new laws went into effect in 2004. ACWWA also has an approved plan.

Centennial WSD also has seen reductions from near 200 gallons per day in 2001 to less than 150 gallons per day in 2006, due in part to its water budget rates program and extensive water conservation education efforts.

## Future Actions

Although the DCWRA entities are conducting a substantial amount of water conservation programs and activities, more effort in promoting and realizing meaningful water conservation is warranted with respect to a number of specific areas, given the non-renewable nature of a substantial quantity of the area's water supply, the continuing growth, and the desire of the water community to be a leader in the region and the state with regard to water conservation.

Therefore, the following areas of additional activity have been identified as potential future expansions and refinement to the outgoing water conservation activities.

1. Collect additional information relevant to measuring effects of water conservation practices
  - Water users should strive to collect information in a consistent manner with one another related to tracking total and residential per capita water use on an annual basis based on water deliveries and population served.
2. Conduct more water audits and/or account reviews
  - Water users should conduct audits and/or reviews of their largest water customers, especially golf courses, parks and other open irrigated spaces to determine water application rates and, if needed, provide advice for more efficient watering practices to those customers. The audits would also help to maintain some consistency across the county regarding how much water usage these facilities should be allowed to apply to achieve their specific functions.
3. Establish means to share information more readily
  - Water users should maintain an organized information exchange leveraging DCWRA and other organizational resources, including informal dialogues, to share and exchange stories and anecdotes, and knowledge and information regarding experiences and challenges with water conservation planning and implementation.
4. Develop local and/or regional planning and monitoring programs that provide for some consistency between DCWRA membership water providers
  - Water users may benefit from developing water conservation plans that are generally consistent in form to those prepared by Castle Rock, CPN and Arapahoe County Water and Wastewater Authority to better define water conservation goals and measures and programs; delineate monitoring efforts; and engage the public and their governing boards on ongoing and future water conservation efforts. Note that each water providing entity may choose to select different water conservation measures and programs to address its specific

customer and water system needs; however, each plan should include the same basic content as listed above.

- Develop more programs and related plans that link drought response and related water management activities with ongoing and planned water conservation efforts.

5. Expand K-12 Educational Activities

- The area providers, in conjunction with the Douglas County School District and other public and private school programs, should develop and maintain additional tools and activities to engage our school aged children in understanding our water resources and the value of conserving water. These tools and activities should include content provided both in and outside the classroom.

Figure 1

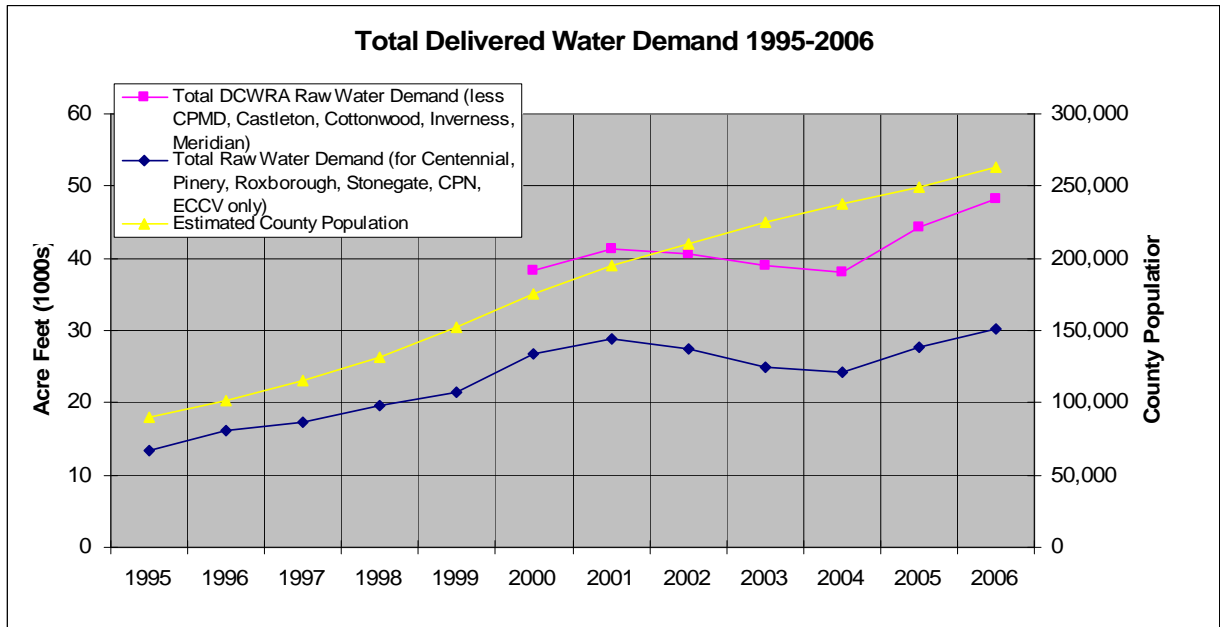


Figure 2

