



CMG GardenNotes #261

## Colorado's Water Situation

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Outline: Western water rights – *Doctrine of Prior Appropriations*, page 1  
Water quality terminology, page 2  
Sources of landscape irrigation water, page 2  
Wells, page 3  
Rainwater and gray water, page 3  
Colorado's water use, page 4  
Community water infrastructure, page 5  
Population growth and water conservation, page 5

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### Western Water Rights – *Doctrine of Prior Appropriations*

In Colorado and other western states, water rights are based on the *Doctrine of Prior Appropriation* or “first-in- time, first-in-right”. Rights are established when water is put to beneficial use.

A water right is a property right to use a specified quantity of the state's water for a specified purpose. As a property right, water rights can be sold, leased, or rented (like other personal properties such as a home, apartment, or car). With the *prior appropriation doctrine* used in western states, a property owner does not own the water that rains, snows, or flows across or is adjacent to his/her property.

By contrast, eastern states follow some form of “riparian” water right (i.e., water rights belong to landowners bordering the water source). Without an understanding of the *doctrine of prior appropriation*, newcomers and residents may fail to realize that the purchase of land does not necessarily include the rights to irrigation water.

Under the *prior appropriation doctrine*, water rights are established by putting the water into *beneficial use*. The person or organization putting the water to beneficial use requests the *water courts* to legally recognize the right with a *decree*.

In the establishment of water rights, the water judge decrees the location at which the water will be withdrawn, the amount to be withdrawn, the use of the water, and assigns a *priority date*. Claims with earlier priority dates have *senior rights*; claims with more recent priority dates have *junior rights*.

During times of reduced rainfall or drought, *senior rights* (water rights established in early years) take precedence over *junior rights* (water rights established in recent years). Water use will be cut off for junior rights, protecting senior rights.

When a water use is changed, the water courts reissue the decree amending the owner, location, amount, or use. The priority date will be based on the previous priority date. Since Colorado's water supply fluctuates continually and the typical available water in a river basin is already owned with established water rights, issues of senior and junior rights become very complex in drought scenarios.

**Colorado's water future** – *“As Colorado's water consumption reaches the limits of its allotment under interstate compacts and treaties, intensive water management will become even more critical. Water management decisions will involve examinations of all options. Conversation will become indispensable.... Inevitably, as each generation must learn, the land and the waters will instruct us in the ways of community.”* (Citizen's Guide to Colorado Water Law)

### **Administration**

In Colorado, the Office of the State Engineer, Colorado Division of Water Resources, administers water rights. It monitors the amount of water being taken from surface and underground sources, and oversees distribution based on the priority of water rights.

Interstate water rights are set in federal agreements based on stream flows for the Platt, Colorado, and Arkansas River basins.

## **Water Quality Terminology**

Regulated by the EPA, **drinking water** or **potable water** is water of sufficiently high quality for safe human consumption. The drinking water in many Colorado communities is of higher quality than most bottled water. Over large parts of the world, humans have inadequate access to potable water, and use sources contaminated with unsafe levels of dissolved chemicals, suspended soils, disease vectors, and pathogens.

**Nonpotable water** refers to water not processed to drinking-water standards. **Raw water** refers to untreated water taken directly from rivers and lakes.

**Wastewater** is any water that has been adversely affected in quality by human activities. This includes domestic, municipal, or industrial liquid waste products disposed of by flushing them with water through a pipe system. **Sewage** technically refers to wastewater contaminated with feces and urine. However, in popular usage, sewage refers to wastewater. **Gray water** refers to water from the bath/shower and washing machine. **Black water** refers to water with feces and urine (from the toilet).

**Reclaimed water** or **recycled water** is former wastewater (sewage) that has been treated to removed solids and certain impurities. In most situations, it is returned to the river system, being the non-consumptive use portion of water rights. That is, the reclaimed water returned to stream flow becomes someone's water right downstream. In Colorado, some parks, golf courses, and industrial properties are irrigated with reclaimed water. Reclaimed water may be high in salt, limiting its use for landscape irrigation.

## **Sources of Landscape Irrigation Water**

In many communities, most landscape irrigation is done with potable, drinking water purchased from the city or community water provider (who owns the water right or purchases the water wholesale). The source of water may be stream flow (from snowmelt with storage in the reservoir system) or wells. During the summer irrigation season, this puts a high demand on the water treatment facilities. To deal with this, many communities aggressively market landscape water conservation.

In the west, many larger landscape sites (golf courses, parks, and industrial sites) are irrigated with nonpotable water or raw water. In some western communities, homes have a waterline for drinking water and a second, nonpotable waterline for irrigation. This creates significant savings in water treatment costs.

### **Wells**

For rural homes, a common water source is groundwater (wells). The Colorado Division of Water Resources also regulates the drilling and use of groundwater. In the past, the lack of strict regulations caused a significant drop in the water table in some communities, creating problems for well users. Today the use of wells is regulated, limiting the amount of water that can be withdrawn. In recent years, new domestic well permits have been very restrictive, prohibiting outdoor irrigation. Folks moving to their rural ranchette are often shocked when they learn that they may not irrigate the landscape with their well water.

On the high plains of eastern Douglas and El Paso Counties, the community water source is non-renewable groundwater (wells). This water supply is not refilled with annual rain and snowmelt. Conservation is extremely critical.

### **Rain Water and Gray Water**

Landscape design can be creative in reducing the surface runoff of rain and snowmelt (reducing pollution of surface water). However, in Colorado state law prohibits the intentional interception and diversion of rain and snowmelt (that is, the collection of the water in a retention system for later use), including rain barrels. This is an issue of water rights, as the water already belongs to someone downstream. Collection of rain and snowmelt could interfere with another's water right.

A new exception which went into effect August 1, 2016 allows rain barrels to be installed at single-family households and multi-family households with four (4) or fewer units. A maximum of two (2) rain barrels can be used at each household and the combined storage of the 2 rain barrels cannot exceed 110 gallons. Rain barrels can only be used to capture rainwater from rooftop downspouts and the captured rainwater must be used on the same property from which the rainwater was captured, for only outdoor purposes, including to water outdoor lawns, plants and/or gardens. Rain barrel water cannot be used for drinking or other indoor water uses.

Colorado House Bill 13-1044, which was passed and signed during the 2013 legislative session, provides municipalities, counties, and groundwater management districts the authority to authorize graywater use and enforce

ordinances. Under HB-13- 1044, graywater can be used to flush toilets and irrigate landscapes at residential, multi-residential and commercial locations. As of the 2017 revision of this publication, only the City and County of Denver has permitted graywater uses for irrigation, and only for sub-surface or drip irrigation of non-food crops.

For additional information on using gray water and harvesting rainwater in Colorado, refer to CSU Extension fact sheet #6.702, *Graywater Reuse and Rainwater Harvesting*, and the *Rainwater Harvesting in Colorado* fact sheet number 6.707, available on the CSU web site at <http://extension.colostate.edu>

## Colorado's Water Use

Eighty percent of Colorado's water supply falls on the Western Slope. With the high population along the Front Range and major agriculture in northeastern Colorado, 80% of the water use (that is 80% of the water rights) is along the Front Range and High Plains. Table 1 gives the breakdown of water use in a typical year.

**Table 1. Where does Colorado's water go?**

Agriculture	86%
Domestic/municipal	7%
Recreation and fisheries	3%
Industrial and commercial	2%
Augmentation	1%
Recharge	1%

Source: Colorado State Engineer's Office, 2004

**Production agriculture** is the primary user of Colorado's water supply, using 85 to 90% for food production. To grow the typical American meal it takes 500 to 2,000 gallons of water. On an annual basis, it takes 1.6 million gallons of water to grow the food for the typical American diet of 2,000 calories per day. (Source: Michigan State University Institute of Water Research)

Although the individual farmer can be rather inefficient in use, the runoff water returning to the system is used repeatedly by other farmers down the line, resulting in a 90% system-wide efficiency.

**Landscape irrigation** – Depending on the year, approximately 7 to 10% of Colorado's water supply is used for landscape irrigation, including home lawns and yards, public and commercial landscapes, parks, and golf courses. During the summer irrigation season, 50 to 75% of a community's water use may be for landscape irrigation. Because it is highly visible, landscape irrigation is often targeted for conservation.

Based on community water use, the average landscape receives twice the amount of irrigation water that plants actually need. This is due to poor irrigation system design, maintenance, and management. In research of actual yard-by-yard comparisons, most gardeners are rather efficient; however, others may be applying 5 to 10 times the amount of water actually needed!

With the rapid growth in Colorado's population, some farmers have sold, leased, or rented water rights to communities. This creates a significant shift in water use during periods of drought and creates long-term dynamics between agriculture and urbanization.

**Other demands** on water flows come with power generation, recreational use, and wildlife habitats. As an important side issue, during periods of drought (decreased stream flow), hydroelectric power generation will also decrease.

A standard unit for measuring large quantities of water is the *acre-foot*. An acre-foot is the amount of water needed to cover an acre of land to a depth of one foot, or 325,851 gallons. The standard unit of measuring water flow is cubic feet per second, or cfs. One cfs equals 7.48 gallons per second or 448.83 gallons per minute.

### **Community Water Infrastructure**

A community typically invests \$30,000 to \$60,000 per new household for the water and sewer treatment infrastructure. Due to landscape irrigation, Colorado communities typically experience 10 to 15 days per year when water use greatly exceeds average use. Because peak demand actually occurs only a few days a year, developing the water processing and delivery infrastructure to adequately meet water needs during these few peak days is very expensive. One Colorado community, for example, is facing a \$35 million expansion to its water-processing infrastructure to meet peak demand for just five days a year!

The high cost of meeting peak water demand is why communities often adopt irrigation schedules based on address (like odd/even days or other set irrigation day programs). Schedules are designed to spread the water demand more evenly over the week. Just imagine the water infrastructure that would be required if most residents decided to water the lawn on a Saturday morning during a hot week!

Odd/even or set watering day water restrictions do not effectively reduce total water usage. An underlying fear with gardeners is that they cannot hold off irrigation until their next turn, so the lawn is watered just because it is their turn. Irrigation restrictions that allow for no irrigation on some days of the week more effectively conserve water.

### **Population Growth and Water Conservation**

Colorado's rapid population growth creates growing pains for Colorado's water supply. Due to planning by forefathers, some communities have good water resources, including senior rights. Other communities seriously lack sufficient water rights to support growth. Residents who do not understand western water rights may have strong values and opinions about where water should and should not be used during shortages. Under western water rights, market price to purchase water rights will determine who has water. What are you willing to pay?

Water conservation, both indoors and outdoors, is essential for communities to meet the water demands for growth. Some communities with limited water resources have put restrictions on new building permits. This could be viewed as a form of discrimination aimed at keeping newcomers out of the "white" community.

Other communities, with limited water resources, have allowed for growth by purchasing “surplus” water from water rights holders (such as other communities or farmers). Some of the extreme water restrictions during the drought of 2002 are examples of what happens in years when “surplus” water is not available for purchase.

With growth, water conservation is also critical even for those communities with senior water rights. For example, Denver Water and Colorado Springs Utilities, two of the state’s larger water providers, are running out of water resources to support continued growth at current usage rates. Conservation is essential.

Water for growth must come from water conservation. This will be through voluntary conservation and aggressive pricing structures to push conservation. Since Colorado’s climate typically has a multi-year drought about every 20 years, water conservation is important to all residents.

## **CMG GardenNotes on Irrigation Management**

- #260 Irrigation Management: References and Review Questions
- #261 Colorado’s Water Situation
- #262 Water Movement Through the Landscape
- #263 Understanding Irrigation Management Factors
- #264 Irrigation Equipment
- #265 Methods to Schedule Home Lawn Irrigation
- #266 Converting Inches to Minutes
- #267 Watering Efficiently
- #268 Home Lawn Irrigation Check-Up

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