



The New Gold Rush: Using Reclaimed Water as an Innovative Tool for Community Resiliency

An Economist's Perspective

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The Issue at Hand

- “The challenges associated with protecting U.S. water security are among the most pressing issues of our present and future generations.” - National Water Working Group Report & Recommendations, August 2014
- Draft Colorado Water Plan 2004
 - Locally, water providers are looking at reuse water for community garden irrigation and other such types of food crop settings.



Economics of Recycled Water Use

- Traditional Cost-Benefit Analysis vs. Value of Water
 - Externalized Costs and Benefits
 - Intangible (Non-Quantifiable) Benefits
 - Fragmented Benefits
- Over 300 Recycled Water Systems with Long-Term Successful Operation in Florida and California
 - Less awareness of these systems in Colorado
- Competing Demands for Recycled Water in Water-Short Areas
 - Adoption of Recycled Water in Some Sectors



Some Water Use Comparisons- 2004

- Golf in CO has sales value of \$8,650 per acre
- Irrigated Corn in CO has sales value of \$525 per acre
- Skiing has sales value of \$130,000 per acre per year
- Lawn use creates \$6,000 in appraised value per year



■ Fort Collins brewers bottle up excess water use

- The three largest Fort Collins breweries collectively consume more than 1 billion gallons of water annually
- Anheuser-Busch in Fort Collins uses 948 million gallons water per year
 - Anheuser-Busch has reduced its water use at its Fort Collins location by 40 percent in the past decade, according to plant manager Kevin Fahrenkrog.
- New Belgium Brewing Co. brewed 945,367 barrels and used more than 116 million gallons of water last year, according to its water-use ratio.
 - New Belgium saves about 1 million gallons of water per year by reusing water on the bottling line. Odell saved 1.25 million gallons in each year after it implemented a similar process in 2012.
- Odell Brewing Co. brewed 100,000 barrels of beer and used just shy of 12 million gallons of water in 2014, according to Sustainability Coordinator Corey Odell.



Use by Scale

- Anheuser-Busch: 3.06 gallons of water used per gallon of beer produced.
 - The Fort Collins plant makes about 10 million barrels (31 gallons per barrel) of beer each year. Anheuser-Busch in Fort Collins uses more than 948 million gallons of water per year.
- New Belgium Brewing Co.: 3.96.
 - New Belgium brewed 945,367 barrels and used more than 116 million gallons of water last year.
- Odell Brewing Co.: 3.8.
 - Odell brewed 100,000 barrels of beer and used just shy of 12 million gallons of water in 2014.



What Precedent is There?

Water Usage for Golf Enterprises

- 684,000 gallons of water used per acre in US
- But CO courses use just 437,000 gallons/acre
 - Colorado decreased from 15.8 to 15.6 billion gallons, with more reclaimed water use in 2004
- 35,600 acres in golf courses, 19,800 irrigated turfgrass (2004 study)
 - 1/3 is unmaintained that serves wildlife and is less water intensive



Opportunities to Pilot?

- Relatively New School Gardens and Farms
- In 2014 they produced....
 - The Denver Green School Community Farm produced about 11,500 lbs
 - Denver Green School - 12,000 lbs. (per Meg Caley, with approx. 600 lbs. being used by the DGS Kitchen)
 - McGlone - 586.4 lbs.
 - Bradley - 2109.32 lbs and Schmitt- 3084.9 lbs.
 - Note that Bradley and Schmitt experienced a killing frost on Sept. 12 so the totals are from just 3 weeks of harvests and McGlone wasn't planted until July 2014 due to re-construction of the site.



Denver Urban Gardens

- A conservative estimate is 264,450 lbs of produce harvested in 2014
 - They arrive at this number by estimating the square footage of gardens (according to the garden matrix, gardens on DPS land are a total of 215,000 sq ft).
 - Using the weighing project data, we estimate that each sq ft yields about 1.23 pounds of produce.
 - $215,000 \text{ sq ft} * 1.23 \text{ lb} = 264,450 \text{ lbs}$.
- To go a step further, that produce is worth about \$452,209.
 - The average price of organic produce in Colorado was \$1.71/lb. So $264,450 \text{ lbs} * \$1.71 = \$452,209$.



Urban Commercial Farms

- Evidence they can gross up to \$30,000 per acre in cropping systems
 - In contrast, a conventional fruit and veggie farm may gross \$4,000 per acre
 - Labor is primary cost
- Water represents a higher cost in metro areas
 - There are no water rights with land and city water is used
 - Recycled water may address this cost pressure

Recycled Water at Denver Water

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DENVER WATER



RECYCLED

The Right Water

WATER SYSTEM

The Right Use

Why Recycle / Reclaim / Reuse Water?



COLORADO ANNUAL PRECIPITATION

Diversion



**80% of the
Water**

**80 % of the
Population**

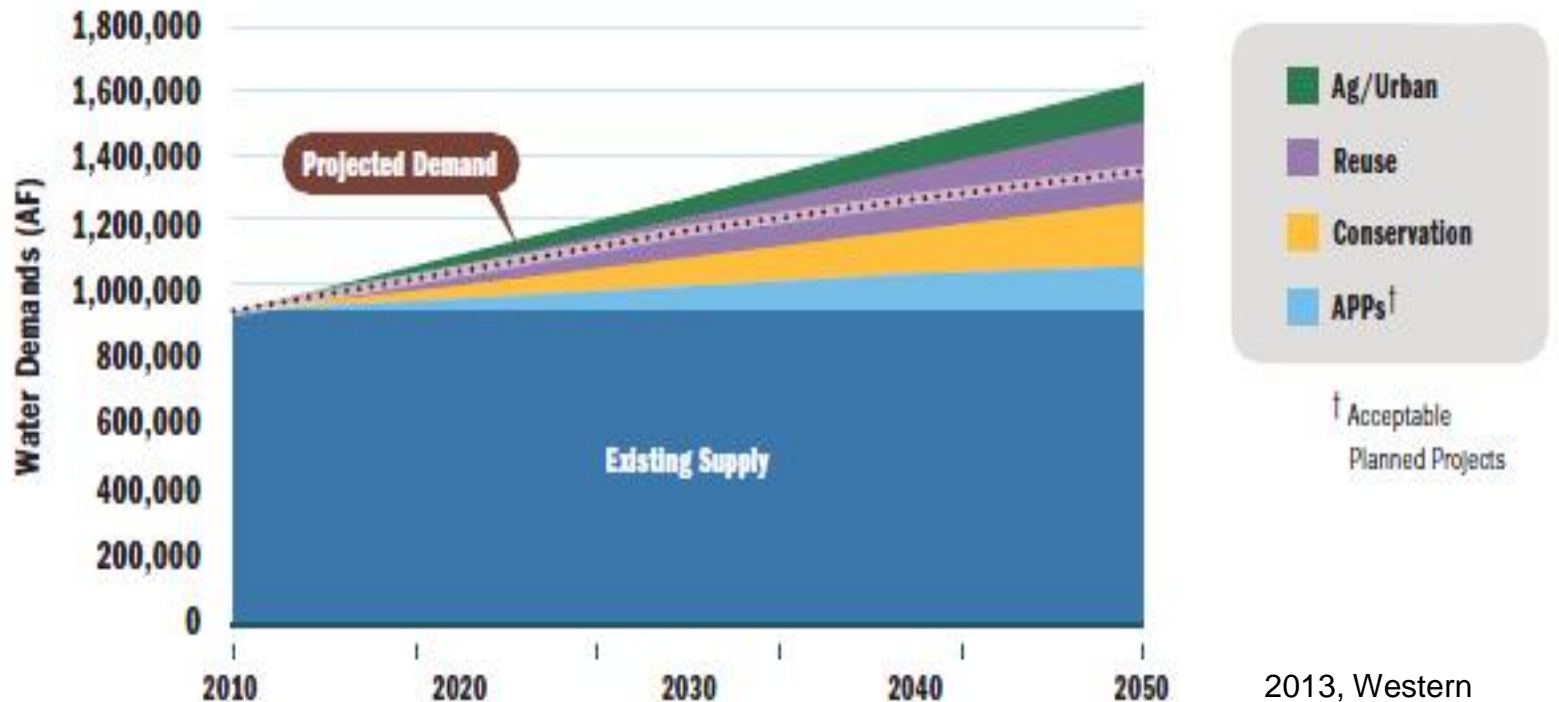
Average
Annual Precipitation
1961-1990
inches per year



Continental Divide



Why Recycled Water?



2013, Western
Resource Advocates

* Our South Platte Basin report covers the years 2008-2050, whereas our Arkansas Basin report is based on 2010-2050 data. Accordingly, this figure assumes implementation of our South Platte Basin portfolio from 2008-2050, and of our Arkansas Basin portfolio from 2010-2050.

DENVER WATER  RECYCLED WATER SYSTEM



Current Uses of Recycled Water

- **Landscape irrigation**
- **Cooling tower feed water**
- **Commercial laundries**
- **Commercial car washes**
- **Construction**
- **Dust suppression**
- **Fire suppression**



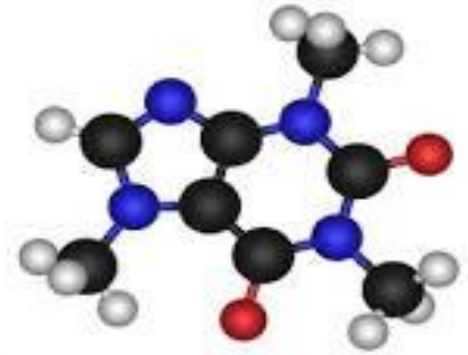
New Use Approval

- **Water Quality Control Commission provides approval through a hearing process**
 - **Demonstrate a need for use**
 - **Demonstrate that it is safe for public**
 - **Studies**
 - **Successful use in other states**
 - **Compare to similar use with other water**
 - **Compare to similar water with other use**
 - **Management practices**



Concerns

- **Pathogens**
- **Pharmaceuticals**
- **Disinfectant byproducts**





Is it Safe?

- **The current surface water supply is effluent (wastewater) dominated for large parts of the year**
- **Being used for edible crops in WA, AZ, CA**
- **Studies exist that examine and address each concern**
- **CO Category 3 water meets 1982 drinking water standards**



Edible Crop Irrigation Utilization

- **Looking to use recycled water for edible crops for:**
 - **Urban community farms and gardens in the Denver metro area**
 - **Metro area school gardens**
 - **Eliminate compatible but competing interests**
 - **Agriculture throughout CO**
 - **Innovative development trends**

Disruptive Technology & Wastewater Recycling

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Wastewater Recycling



References

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- People Drink Sewage Water For The First Time. (2015, February 2). Retrieved March 9, 2015, from https://www.youtube.com/watch?v=p-f_F3tE9rA



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