

# A History of Water Reuse in Colorado

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WaterReuse Symposium  
September 15, 2013

## Reuse Drivers

- ▶ Growth & Development
- ▶ Water Rights
  - ▶ Trans-Basin Water
- ▶ Disposal of Treated Effluent
  - ▶ Land Application
- ▶ Water Conservation/Rates



## Colorado Regulatory History

- ▶ Before 1977 Unregulated
- ▶ 1977 Guidelines-Primarily Voluntary
- ▶ 1982 Land Application (and Other Reuse) Addressed in Discharge Permits
- ▶ 2000 Regulation 84
- ▶ 2004 More Uses
- ▶ 2013 Resident Controlled

## De Facto Reuse Early Agricultural Irrigation Reuse

Front Range Growth & Development

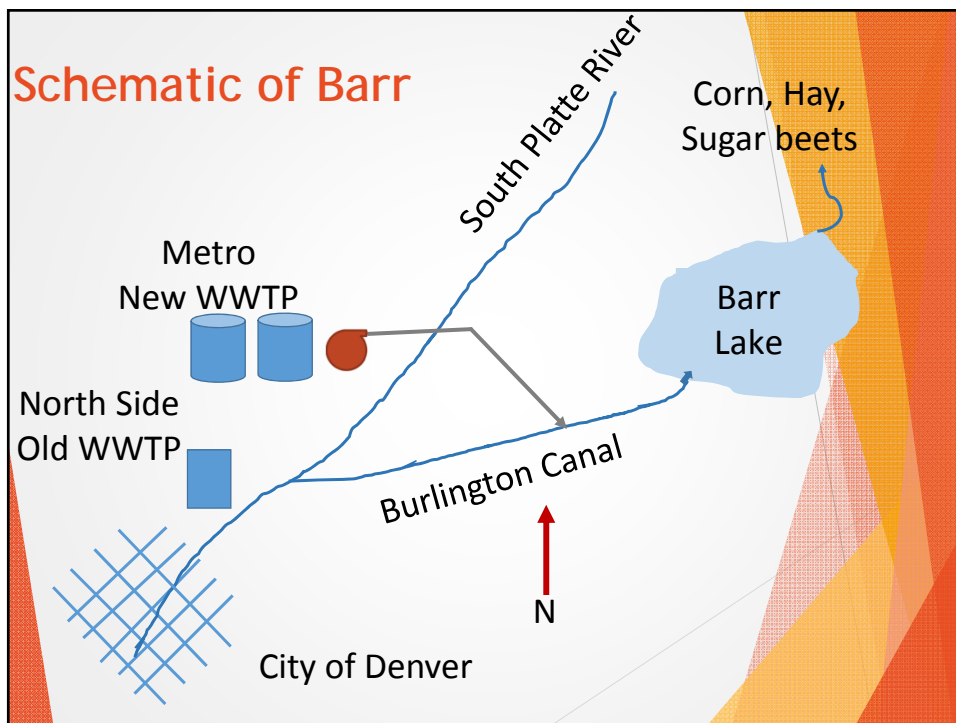
- ▶ Barr Lake
- ▶ Colorado Springs
- ▶ Northglenn



## Barr Lake

- Early 1800's - Buffalo wallow, oasis for cattle drives
- 1885 - Oasis Reservoir built, 19-mile canal from South Platte River, to supply irrigation water
- 1908 - Renamed Barr Lake, double in size
- 50+ Years - Influx of raw & partially treated WW
- 1960's - Labeled as Nation's Largest Lagoon
- 1966 - New WWTF built
- 1976 - Barr Lake became a State Park
- 1990's - Source for drinking water

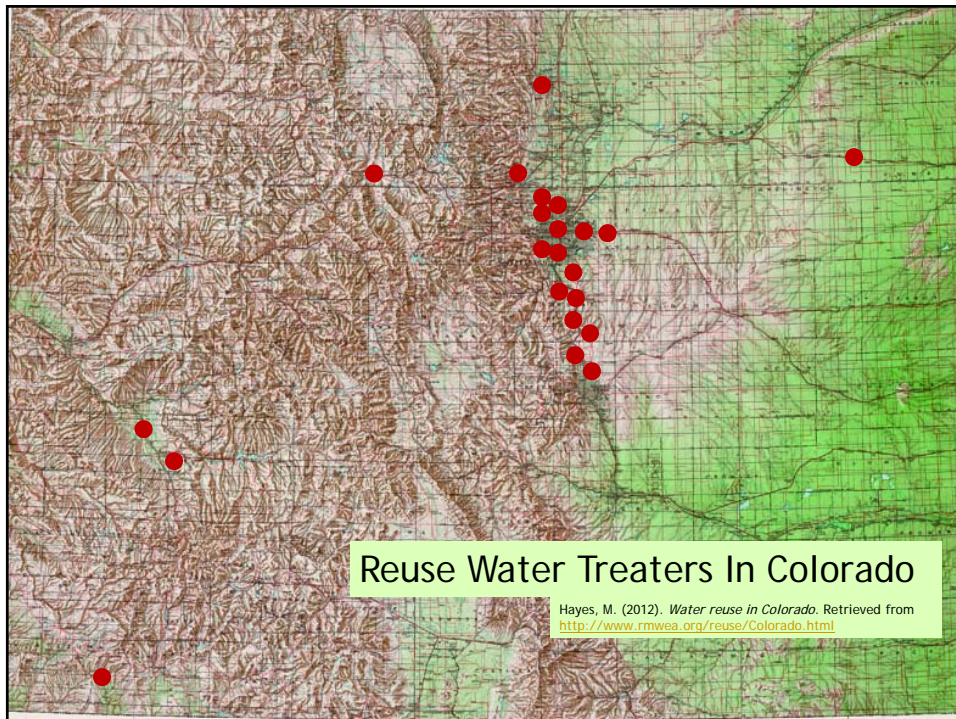
Lundt, S. (2009). Raising the "Barr" for a high plains reservoir in Colorado. *Colorado Lake and Reservoir Management Association*, Retrieved from <http://www.clrma.org/files/newsletters/ClarionJanuary2009.pdf>



## Colorado Municipalities Practicing Reuse

1975  
7 In Colorado  
138 In California

2013  
21 Entities  
4 On West Slope



## Early Turf Irrigation

- ▶ 1957 - U.S. Air Force Academy
- ▶ 1960 - City of Colorado Springs
- ▶ Early 1960's - City of Aurora
- ▶ 1971 - Fort Carson Army Base

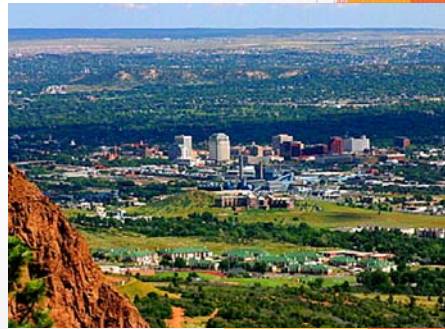
## Air Force Academy

- ▶ 1957 - Treatment Plant Completion
- ▶ 347 Acres
- ▶ Cadet Athletic Fields, Parade Grounds, Golf Course, and Stadium



## Colorado Springs-Las Vegas WWTF

- ▶ Early Century Use of Raw Water for Irrigation
- ▶ First Portions Built 1955 - Construction of I-25
- ▶ Industrial Reuse 1973 Cooling Tower Makeup
- ▶ 1975 City Parks, Golf Course, Colorado College, Cemetery



## Aurora - Sand Creek

- ▶ Water Reuse Facility - Pioneer 1964
- ▶ Sand Creek WWTP - Pressure Filtration
- ▶ Golf Course & City Park Irrigation
- ▶ Fourth Entity in State to Use Effluent for Irrigation
- ▶ Sand Creek WWTP at 5.5 MGD Currently



## Fort Carson Colorado Springs

- ▶ 1971 Golf Course Irrigation
- ▶ Tertiary Treatment Using Pressure Filters
- ▶ Tank Wash Recycle



## Unique Colorado Reuse

- ▶ Northglenn "First Use"
- ▶ Snowmaking
- ▶ Potable Reuse Planning



## Northglenn

- ▶ Pioneered the concept of the "First Use Agreement"
- ▶ Water first used by Northglenn for municipal use then treated and reused by downstream irrigators



Mayor of Northglenn and president of FRICO signing the 1976 agreement which allowed Northglenn to borrow water from FRICO.

(2007). Water Conservation Plan. City of Northglenn, Retrieved from <https://www.northglenn.org/WEB-PDF/2007PlanDraft042607.pdf>

## Water Reuse Case Study: Steamboat Springs

- ▶ 1974 Study conducted to test feasibility of storing treated sewage effluent as snow as an alternative to reservoir storage
- ▶ Conclusions:
  - ▶ No noticeable odor or color difference
  - ▶ Marked decreases in pollutants including BOD5, ammonia, phosphorus, total dissolved solids, and suspended solids

Storage and renovation of sewage effluent in artificially created snowpack. In (1975). *Upper Yampa Water Conservancy District, Steamboat Springs, Colorado* (Vol. 732-063.000). Denver, Colorado: Wright-McLaughlin Engineers.



## Denver's Direct Potable Reuse Demonstration Project



## Denver's Direct Potable Reuse Demonstration Project

### Objectives:

- ▶ Establish product water safety
- ▶ Demonstrate dependability of the process
- ▶ Generate public awareness and regulatory agency acceptance
- ▶ Provide data for large scale implementation

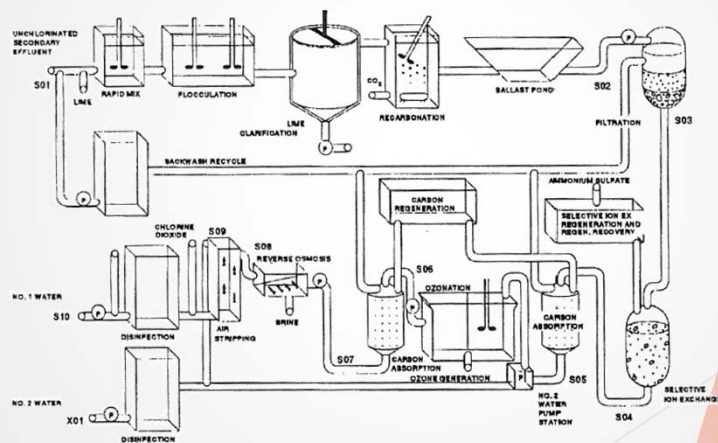


Lauer, W. C. (1993). Executive summary. In *Denver's direct potable water reuse demonstration project*. Denver, Colorado:

## Pilot Plant Studies - University of Colorado



## Denver Water Reuse Demonstration Plant



Lauer, W. C. (1993). Executive summary. In *Denver's direct potable water reuse demonstration project*. Denver, Colorado:

# Denver's Direct Potable Reuse Demonstration Project

Conclusions:

- ▶ Satisfied all current and proposed U.S. EPA drinking water standards
- ▶ No adverse health or reproductive effects were detected in animals
- ▶ Physical, chemical, and microbiological testing revealed purity not normally found in domestic water supplies



Lauer, W. C. (1993). Executive summary. In *Denver's direct potable water reuse demonstration project*. Denver, Colorado:

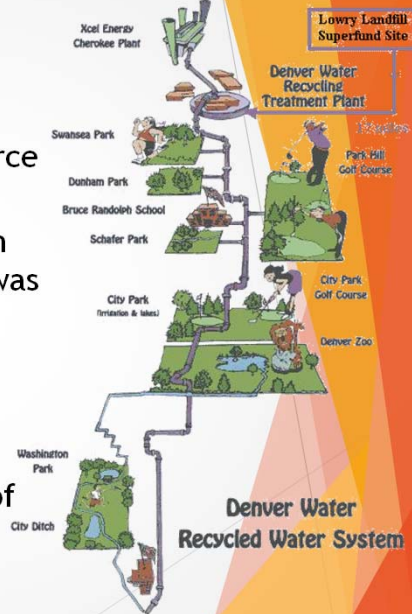
# Denver Water

1994-1997:

- Conducted an Integrated Resource Planning study
- Found that recycling trans-basin effluent and conserving water was preferable in the short term

Today:

- Operates the largest water recycling facility in the state
- Treats up to 30 million gallons of effluent water a day



Carder, C. (2013). Water, water not everywhere. *Progressive Engineer*. Retrieved from <http://www.progressiveengineer.com/features/denverwater.htm>

## Colorado Reuse Projects



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