

The State of Water Conservation in Colorado

a review of public water systems

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Executive Summary

Water and planning professionals do not have adequate information on the myriad water conservation efforts occurring across the State of Colorado. In January 2019, Colorado WaterWise initiated the State of Water Conservation in Colorado pilot research project to help fill knowledge gaps in our state about the water conservation goals and efforts of public water providers.

This project brings together public water system data available from the State and newly collected survey data from 94 water providers. Through these data we explore how frequently conservation programs are implemented; which programs are believed to be the most successful; the most pressing needs of the water conservation community; and how conservation program effectiveness is being measured. The findings and recommendations are intended to benefit water providers, the State, local governments, and water conservation organizations.

Colorado WaterWise is a non-profit whose mission is to address our state's water challenges by improving water efficiency through diverse community connections, innovative solutions, and valuable member resources.

Facts about Colorado Water and Conservation

Federal Classification of Public Water Systems

There are 2,051 public water systems in Colorado that provide potable water and are regulated by the Safe Drinking Water Act (Colorado Department of Public Health & Environment, 2021).

- 906 systems are community water systems. These systems serve the same population year-round.
- 174 systems are non-transient, non-community water systems that serve at least 25 of the same people at least six months per year. Examples include schools and resorts.
- 971 systems are transient, non-community water systems that serve at least 25 people or 15 connections, but people do not remain for long periods of time. Examples include stores and campgrounds.

State of Colorado Goals and Regulations

Statewide Conservation Goals (State of Colorado, 2015; State of Colorado, 2019b)

- By 2025, 75 percent of Coloradans will live in communities that have incorporated water-saving actions into land-use planning.
- By 2050, achieve 400,000 acre-feet (ac-ft) of municipal and industrial conservation.
- Municipal and industrial users do not currently experience a gap between water supplies and demands, except during times of drought. By 2050, the gap between available supplies and projected demands is expected to grow to between 250,000 to 750,000 ac-ft/year.

Note: the terms “system” and “provider” are used interchangeably in this report.

Covered Entities

There are approximately 85 covered entities in the State of Colorado, though the exact number changes year to year. “Covered entity” is the term used by the State to refer to water providers that sell more than 2,000 ac-ft/year of water. Covered entities are only about 4 percent of water providers in the State but serve about 80 percent of the State’s population.

Annual Water Use Data Reporting (HB10-1051, CRS §37-60-126)

- This statewide regulation, introduced in 2010, requires public water providers to report their data annually.
- Since 2013, 87 percent of covered entities have submitted their annual water use data at least once.

- 52 percent of covered entities submit their data every year (based on the period 2013-2019).

Water Efficiency and Conservation Plans (HB04-1365, CRS §37-60-126)

- The Water Conservation Act of 2004 requires covered entities to develop water efficiency plans using State guidelines, prompting the proliferation of standardized plans. Non-covered entities have no requirement.
- As of October 2020, 67 percent of water efficiency plans have been filed within the past seven years as required. These plans were submitted by many of the largest and most progressive providers in Colorado.
- 25 percent of analyzed providers have a water efficiency plan filed with the State that has not been updated on the mandated seven-year update cycle.
- Water systems that are not covered entities are not required to file a water conservation plan with the state, though even small public water systems would benefit from a site-scale conservation plan addressing equipment and fixture selection, maintenance, and conservation practices.

34 percent of all providers analyzed in this study do not have a water conservation plan.

Project Data Collection and Findings

Project Data

Data were compiled for 155 public water systems serving 5.5 million people. State data sources generally represented covered entities and survey data generally represented smaller water systems (Figure 1). The final dataset was combined from numerous sources and includes:

- Complete information for 94 public water systems serving 2.3 million people

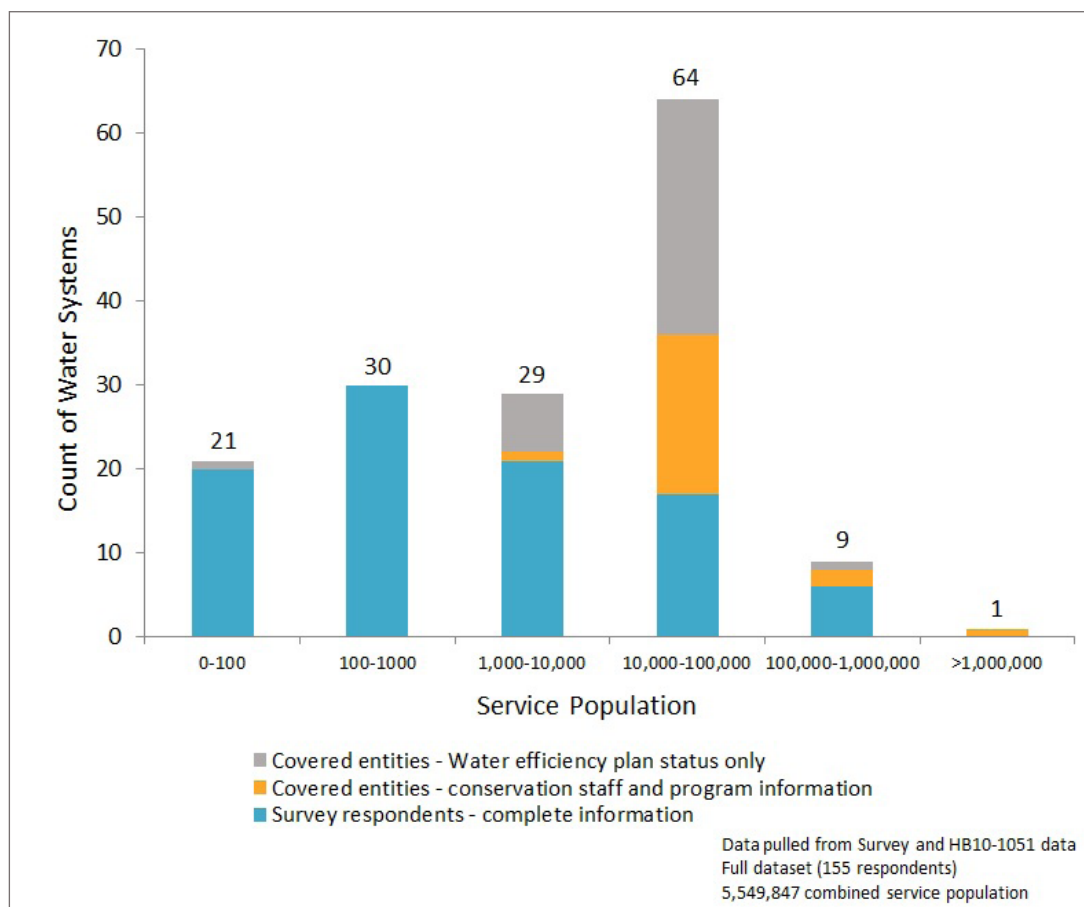


Figure 1. Breakdown of Public Water Systems Represented in Final Dataset



Conservation Program Capacity of analyzed water providers...

23% do not have dedicated conservation staff.

52% have one to three dedicated conservation staff.

58% have no dedicated conservation program budget beyond staff time to implement conservation programs.

- Limited information about conservation staff, budget, and programs for 22 public water systems serving 2.2 million people
- Basic information about water efficiency plan status for 39 public water systems serving 1.0 million people.

Water Representation in Community Land Use Plans and Development Reviews

- 45 percent of survey respondents were unsure if the comprehensive plans that cover their service areas include water conservation.
- Where respondents were aware of conservation programs or policies in comprehensive plans, the top five most common policies and programs included in comprehensive plans are (1) water conservation goal and objectives, (2) xeriscape requirements, (3) conservation-oriented rates and fees, (4) indoor fixture efficiency standards or green plumbing codes, and (5) water efficiency standards for new development.
- 27 percent of survey respondents report that conservation staff participate in developer pre-application and development review meetings.

Water Conservation Goals

- We estimate that 54 percent of analyzed providers have established quantitative conservation goals.
- Survey results show that the most common types of quantitative conservation goals are total water use reduction, per capita water use reduction, and water loss reduction.
- 62 percent of survey respondents have established qualitative (non-numeric) conservation goals.
- Survey results show that the most common types of qualitative conservation goals are focused on education, conservation awareness, and integrated water resources planning.

Water Conservation Programs

- 38 percent of survey respondents had not implemented any water conservation programs.

The Top 5 Conservation Programs

- 1 System water loss audits
- 2 Efficiency-oriented billing rate structures
- 3 Education programs for adults
- 4 Rebates for indoor fixtures
- 5 Direct installation programs

- When water providers lack dedicated conservation staff, the two most implemented programs are system water loss audits and efficiency-oriented rate structures - two program types that directly influence water sales and revenues.

- Billing rate structures, system efficiency upgrades, and system leak detection and repairs are cited as having produced the highest water savings.

Implementation Barriers

The top three barriers to delivering water conservation programs come down to a lack of resources - staffing, financial, and technological.

Co-Benefits

- 74 percent of survey respondents do not measure any co-benefits, e.g. energy savings, associated with their programs, indicating that the benefit of water conservation programs is being undervalued.

Reclaimed Water

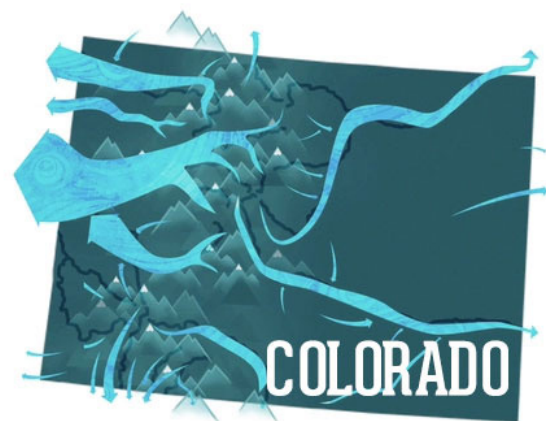
- Reclaimed water is defined under Regulation 84 as domestic wastewater that has received secondary treatment for approved uses only (Colorado Department of Public Health and Environment, 2019).
- 14 percent of survey respondents have a centralized reclaimed water system. They indicate it is used predominantly for irrigation and cooling.

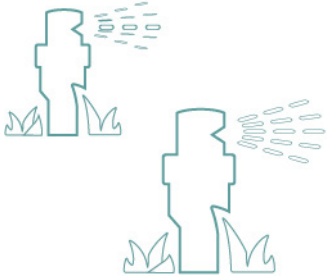
Our recommendations are directed at four audiences: Colorado WaterWise, public water systems, local governments, and the State of Colorado. The following summarizes high-priority suggestions; additional recommendations are contained within the report.

Recommendations

- **Colorado WaterWise** can take several actions to support public water systems in delivering effective conservation programs, such as promoting “gold standard” water conservation resources and developing water savings methodologies.
- **Providers** can better advocate for conservation within their organizations to secure the staffing, budget, and technological resources that many providers desperately need. Writing or updating an existing efficiency plan is highly recommended for medium and large providers, and small public water systems would benefit from a site-scale plan addressing equipment and fixture selection, maintenance, and conservation practices.
- **Local government planners** can coordinate with the water providers serving their communities to develop, track, and report on progress towards shared goals.
- **The State of Colorado** can expand reporting requirements to cover all community water systems, improve the quality of the data submitted, and make the data accessible. The State can also provide grant funding and/or technical assistance to advance consistent methodologies for water savings estimates.

Colorado WaterWise will evaluate whether it is feasible and useful to repeat this study in future years to demonstrate forward progress in delivering conservation programs across the State of Colorado.





Acknowledgments

Authors

This report is the culmination of a project initiated by Colorado WaterWise in January 2019. The authors are:

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Project Advisory Committee

Thank you to the project advisory committee members who volunteered their time in service to this report:

- Courtney Black, INTERA, Colorado WaterWise Board of Directors
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- Thomas Riggle, Centennial Water, Colorado WaterWise Board of Directors
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Additional Contributors

Several other people provided inputs that informed this report. The authors are grateful for their contributions.

- Amal Al-Saffar, CU-Denver, MPA Capstone project
- Adam Waters, City of Aurora

Project Participants

Public water providers who participated in the project survey are listed below by service population.

Water Systems with Population <100

- Crowley Ranch Reserve
- Fox Hill Homeowners Association
- Gold Lake Event Center
- Hermit Basin Lodge
- Latigo Ranch
- Mogote Meadow
- Mountain View Water Service Inc.
- Mustang Water Authority
- Overlook Mutual Water Company
- Platte River Power Authority
- Ponderosa Country Store
- Rainbow Trout Ranch
- San Juan Ranch Homeowner's Association
- Snow Wolf Lodge
- Sonlight Christian Camp
- Wupperman Campground

Water Systems with Population 100-1,000

- Bear Trap Ranch
- Beverly Hills Mutual Water Company
- Camp Alexander Boy Scouts
- Colorado Department of Parks and Recreation
Eleven Mile Colorado State Park
- Deer Creek Metropolitan District
- Dotsero Mobile Home Park
- Durango West Metropolitan District No. 1
- Fort Garland Water & Sanitation District
- Glem Trucking
- Granada Water Association
- Greetville/Carbondale Water Association
- Homestead Water Company
- La Veta Water
- Meridian Point Church
- Mountain Mutual Water Company
- Mountain Vista Village
- Newell Warnock Water Association
- Rio Grande Water Company
- Riverbend Water & Sewer Company
- Seedorf/Gaytan Public Water Systems
- Silver State Baptist Youth Camp
- South Swink Water Company
- Thunderbird Water & Sanitation
- Town of Crestone
- Town of Eckley
- Town of Fleming
- Town of Manzanola
- Town of Ophir
- Town of Williamsburg
- U.S. Department of Transportation Tech Center
- Ute Pass Water Association
- Xcel Energy Comanche Plant
- Xcel Energy Hayden Station

Water Systems with Population 1,001-10,000

- Animas Water Company
- Cherry Creek Valley Water and Sanitation District
- Cherry Creek Village Water District
- City of Cortez
- City of Craig
- City of Idaho Springs
- City of Manitou Springs
- City of Rocky Ford
- Conifer High School
- East Dillon Water District
- Indian Hills Water District
- Lake Durango Water Authority
- May Valley Water Association
- Round Mountain Water and Sanitation District
- Steamboat Ski and Resort Corporation
- Stratmoor Hills Water and Sanitation Districts
- Town of Center
- Town of Eagle
- Town of Frederick
- Town of Frisco
- Town of Nederland

Water Systems with Population 10,001-100,000

- Bancroft Clover Water and Sanitation
- Cañon City Water Department
- Centennial Water and Sanitation District
- City and County of Broomfield
- City of Federal Heights
- City of Fountain
- City of Golden
- City of Longmont
- City of Louisville
- City of Sterling
- Colorado State University
- Denver Southeast Water & Sanitation District
- East Cherry Creek Valley Water and Sanitation
- Green Mountain Water and Sanitation District
- Loveland Water and Power/City of Loveland
- Superior Metropolitan District No. 1
- Town of Estes Park

Water Systems with Population >100,000

- Aurora Water
- Board of Water Works of Pueblo
- City of Thornton
- City of Westminster
- Colorado Springs Utilities
- Fort Collins Utilities

Other Water Systems

- Northern Water (wholesale water provider)



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About Colorado WaterWise

We are a community of water stewards, innovators, activists, and educators in Colorado. Together we pool resources and save more water than we could through solo efforts.

The water sector faces greater challenges than ever before, especially in our state. Together we are meeting those challenges and protecting Colorado's most precious resource: water.

Colorado WaterWise is a 501(c)(3) non-profit organization.

colorado
waterwise



Mission

Colorado WaterWise addresses the State's water challenges by improving water efficiency through diverse community connections, innovative solutions, and valuable member resources.

Vision

Recognized as a collaborative leader in water efficiency, we are creating a more sustainable water future for Colorado.

Values

Colorado WaterWise has a diverse membership throughout Colorado: water utilities, industry partners and individuals. We rely on membership dues to hold our annual conservation summit, offer webinars and lunch and learns, improve our conservation education materials through the Live Like You Love It® program, and fund special projects like the one you are reading about. Please consider becoming a member and supporting the important work we do. Learn more about membership and join at <https://coloradowaterwise.org/Join>.



CONSERVE

must become a way of life



CARE

about water quality, we all live downstream from someone



COMMIT

to learning more and getting involved

Introduction

The State of Colorado released its first State Water Plan in 2015, laying out eight measurable objectives, including a call for 400,000 ac-ft of water savings in the municipal and industrial sector by 2050 (Figure 2 below).

However, no centralized effort exists currently that comprehensively tracks and reports on the current state and results of water conservation programs in Colorado. As a result, water and planning professionals in Colorado do not know as much as we should about the state of water conservation programs, including where we are now and where we have the potential to go.

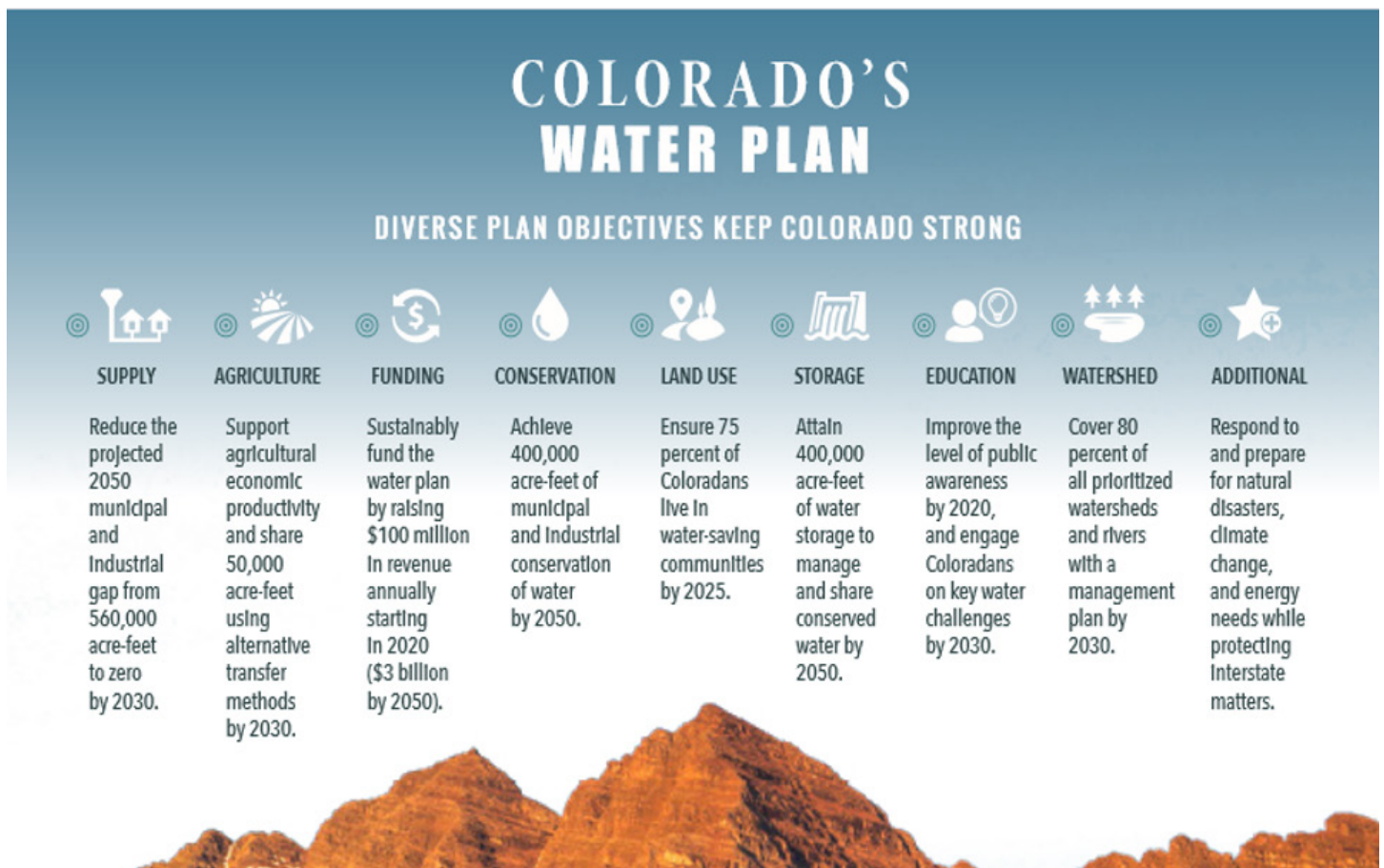


Figure 2. Objectives from Colorado's 2015 State Water Plan (State of Colorado, 2015)

Colorado WaterWise initiated a pilot project in January 2019 to help answer a few basic questions about the state of water conservation in Colorado's public water systems, including:

- How much staff time and financial resources are water providers devoting to conservation programs?
- How prominently and effectively is water conservation featured in long-range land use plans?
- Have water providers set conservation goals, and if so, are they being achieved?
- Which conservation programs are being offered, and which ones have been found to be effective (or ineffective)?
- What types of water savings and other co-benefits are being realized through the delivery of conservation programs?

As a non-profit organization serving Colorado's water conservation community, Colorado WaterWise intends to use the findings to better serve our current members and to help fill resource gaps to improve the value of our offerings to conservation professionals. In particular, we are evaluating how we can better support the small-to-medium-sized public water systems that lack the conservation resources of the larger water providers in the Front Range and Denver Metro regions and that are needed to play their part in the collective goals of the State.

Project Benefits to the State of Colorado

If the State of Colorado had access to comprehensive and up-to-date information on the state of public water system conservation programs in Colorado, the State would be able to:

- Continue improving the quality and integration of conservation data into statewide and regional water planning efforts that assess gaps between water supplies and demands (State of Colorado, 2019b; State of Colorado, 2015).
- Establish a baseline and track progress towards the goals established in our State Water Plan, with the ultimate objective of ensuring we reduce the projected gap between supplies and demands in all water use sectors.

Currently, municipal and industrial users only experience a gap between water supplies and demands during times of drought. By 2050, however, the gap between available supplies and projected demands is expected to grow as large as 250,000 to 750,000 acre feet per year (State of Colorado, 2019b).

Project Benefits to Local Communities and Water Providers

Better information on water conservation programs and water savings benefits water providers and local governments in the following ways:

- Establish a baseline and track progress toward conservation goals.
- Prioritize conservation programs for implementation and inform investment in conservation staff and program budgets.
- Demonstrate that conservation programs are delivering the expected amount of water savings.
- Ensure that program offerings are delivering a positive return on investment, saving more than they are costing.
- Quantify the contributions of conservation towards water supply and system resiliency during times of water shortage, infrastructure maintenance, outages, and more.



In Fall 2020, Northern Water and the Bureau of Reclamation needed to repair and upgrade the Soldier Canyon Dam outlet at Horsetooth Reservoir, one of two water sources used by the City of Fort Collins. The backup pump system was only capable of meeting average water demands, not including irrigation and other seasonal outdoor uses. Fort Collins Utilities and other water providers asked residents to turn off irrigation systems by October 1 to help manage demands. These restrictions were immensely successful - water use dropped by 35 percent within 24 hours of the restrictions and resulted in more than 100 million gallons of water savings compared to historical water use (City of Fort Collins, 2020).

About Public Water Systems in Colorado

The delivery of potable (drinking) water is a highly distributed service compared to other utility services such as electricity and natural gas, with 2,051 public water systems in Colorado alone (Colorado Department of Public Health & Environment, 2021). The federal Safe Drinking Water Act classifies public water systems into three categories (Table 1 below).

Table 1. Classification of Colorado Public Water Systems

Public Water System Type	Definition	Number in Colorado
Community	Serves the same population year-round	906
Non-Transient Non-Community	Serves the same population of at least 25 persons, at least six months per year, but not year-round	174
Transient Non-Community	Serves at least 25 people or 15 connections, but the population represents flow-through traffic, such as stores, RV parks, hotels or churches that are open at least 60 days a year	971

Eighty-four (84) percent of public water systems in Colorado serve fewer than 1,000 people (Figure 3 below). These 1,728 water systems serve a combined population of about 350,000 people. The largest water utility in the state is Denver Water, serving 1.36 million people (Colorado Department of Public Health & Environment, 2021). Fifty-nine public water systems distribute water from Denver Water in the Denver Metro region (Appendix C: Denver Water Distributors). Denver Water also sells treated and raw water to other entities outside of its service area.

Colorado regulations employ the term “covered entities,” defined in CRS 37-60-126(1)(b) as a “municipality, agency, utility, including any privately owned utility, or other publicly owned entity with a legal obligation to supply, distribute, or otherwise provide water at retail to domestic, commercial, industrial, or public facility customers, and that has a total demand for such customers of two thousand (2,000) acre-feet or more” (FindLaw, 2019). Covered entities represent the largest public water systems in the State. Though the number fluctuates each year depending on actual sales, there are currently about 85 covered entities that serve 80 percent of the State’s population (Colorado Department of Public Health & Environment, 2021). A list of these water systems is contained in Appendix B: List of Covered Entities.

Statewide Conservation Regulations

The mission of the Colorado Water Conservation Board (CWCB) is to conserve, develop, protect, and manage Colorado’s water for present and future generations. As part of this mission, CWCB oversees water conservation planning and programs, as well as annual water use data reporting for covered entities.

Water Conservation Plans (HB04-1365, CRS §37-60-126)

The Water Conservation Act of 2004 requires covered entities to develop and adopt a water conservation plan that enumerates water-saving measures and programs, goals, and steps to implement, monitor, and review the conservation plan (Colorado General Assembly, 2004; Colo. Rev. Stat., 2021a). The plans must be updated and filed with the State every seven years. In 2019, the CWCB amended the planning guidance to require that land use strategies be included in the plans.

The State provides grant funding to develop the water efficiency and conservation plans and to implement water-saving measures identified in the plans. Water utilities must comply with the Act to be eligible for loans from the

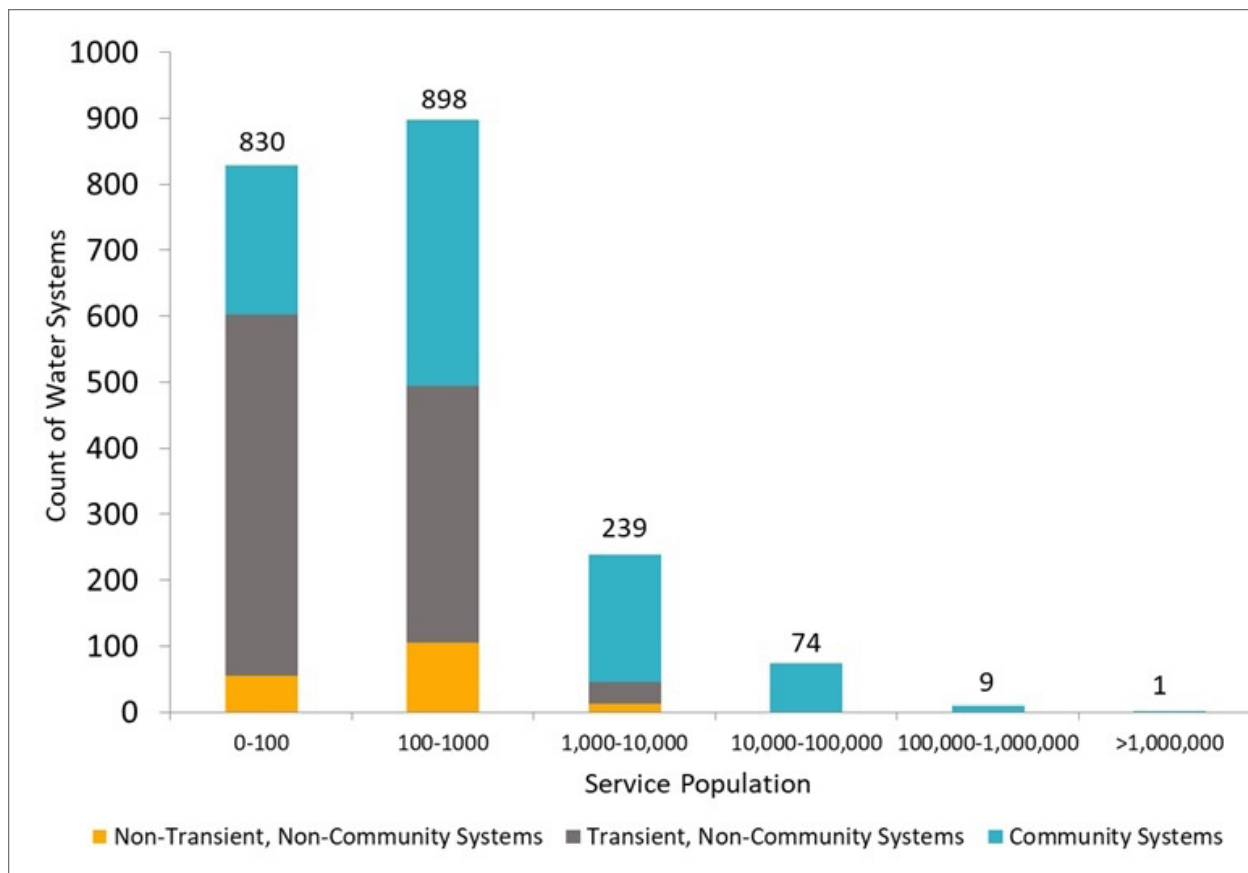


Figure 3. Count of Public Water Systems by Service Population (Colorado Department of Public Health and Environment, 2021)

CWCB and the Colorado Water Resources and Power Development Authority. However, there is no enforcement action taken against covered entities that do not comply with the regulations.

As of October 2020, all covered entities except one provider had a water efficiency plan filed with the State (Colorado Water Conservation Board, 2021b). Sixty-seven percent had been filed within the past seven years as required. These numbers include single provider plans, regional plans, and distributors of Denver Water. As of October 2021, the percentage of covered entities that had plans filed with the State increased to seventy-seven percent (K. Reidy, personal communication).

More and more of the new water efficiency plans being filed with the State are being developed for smaller water systems or were developed as regional plans. As of October 2020, approximately 40 water providers that are not classified as covered entities had also filed water efficiency plans with the State, gaining access to implementation grant funding. As of October 2021, this number increased to 80 non-covered entities with water efficiency plans filed with the State (K. Reidy, personal communication). These numbers include single provider plans, regional plans, and distributors of Denver Water.

Annual Water Use Data Reporting (HB10-1051, CRS §37-60-126)

The Annual Water Use Data Reporting Act requires covered entities to submit annual water use and conservation data to the State (Colorado Water Conservation Board, 2011). However, there is no enforcement action taken against covered entities that do not comply with the mandates. While there is no penalty for not reporting data, there are the same funding incentives as described above for water efficiency plans. As of October 2020,

(Colorado Water Conservation Board, 2021a):

- Since 2013, 87 percent of covered entities have submitted their data at least once, or as distributors of Denver Water are covered by their data submission.
- 52 percent of covered entities submitted their data every year as required, based on the period 2013-2019.

High-efficiency Water Fixtures (SB14-103, HB19-1231, CRS §6-7.5-102)

Colorado has enacted two laws governing the sale of water-efficient appliances and fixtures. The first law, passed in 2014, prohibited the sale of any faucet, showerhead, flushing urinal, tank-type toilet, or tank-type water closet that was not labeled as an EPA WaterSense fixture (Colorado General Assembly, 2014). A 2019 law expanded the standards to include energy efficiency (as denoted by Energy STAR certification) and expanded the list of consumer and commercial appliances and products subject to the standards (Colorado General Assembly, 2019; Colo. Rev. Stat., 2021b).

Perhaps most important from the perspective of water-saving potential in Colorado, the High-efficiency Water Fixtures law requires pressure-regulated sprinkler bodies (the first statewide efficiency measure for outdoor irrigation systems), as well as residential kitchen faucets, public lavatory faucets, and flushometer-valve toilets, as well.

Statewide Integrated Water and Land Use Regulations

Colorado's Department of Local Affairs (DOLA) oversees long-range land use planning in communities.

Water Conservation in Land Use Planning (SB15-008, CRS §37-60-126)

This law empowered CWCB to work with DOLA's Division of Local Government to develop training, provide training, and make recommendations for better integration of water demand management and conservation planning with land use planning (Colorado Department of Local Affairs, 2021a; Colo. Rev. Stat., 2021a).

Water Elements in Master Plans (HB20-1095, CRS §30-28-106)

Water elements are not required in community long-range master plans (also known as comprehensive plans). However, if a community chooses to include a water element in their master plan, this law requires the community to then take the following actions (Colorado Department of Local Affairs, 2021a; Colo. Rev. Stat., 2021c):

- Consult with the public water systems that supply their water to ensure coordination on water supply and facility planning.
- Identify water supplies and facilities sufficient to meet the needs of the public and private infrastructure reasonably anticipated or identified in the planning process.
- Include water conservation policies, ideally tied to the Colorado Water Plan.

This law allows for policies to be implemented that require water conservation to be a condition of development approvals, including subdivisions, planned unit developments, special use permits, and zoning changes. HB 20-1095 also directed DOLA to provide educational resources and technical assistance to local governments interested in including water policies in their comprehensive plans.

Statewide Alternative Water Supply Regulations

The Colorado Department of Public Health and Environment (CDPHE) regulates the water quality standards and allowable uses of different types of alternative water supplies. Expanding the use of alternative water supplies, for example by allowing reclaimed water to be used to irrigate edible food crops, is a solution that continues to evolve to ease demands on potable water supplies.

Reclaimed Water (Regulation 84, CRS §25-8-205)

Regulation 84 governs the use of reclaimed water treated by centralized reclaimed water treatment systems and localized reclaimed water treatment systems (Colorado Department of Public Health and Environment, 2019; Colo. Rev. Stat., 2021d). There are three categories of reclaimed water (see Table 2 below). Each category must meet defined water quality standards related to E. coli, total suspended solids, and turbidity. Each category of reclaimed water has its own list of allowable uses. Reclaimed domestic wastewater may be used as follows (Colo. Rev. Stat., 2021d):

Table 2. Colorado Public Water Systems Categories

Category 1 Standard	Category 2 Standard	Category 3 Standard
<ul style="list-style-type: none">• Evaporative industrial processes• Non-evaporative industrial processes• Non-discharging construction and road maintenance• Landscape irrigation at sites with restricted access• Zoo operations• Nonfood crops• Silviculture	<ul style="list-style-type: none">• All category 1 uses• Wash water applications• Landscape irrigation at sites without restricted access• Commercial laundries• Automated vehicle washing• Manual, nonpublic vehicle washing• Nonresidential fire protection• Irrigation of food crops for commercial use	<ul style="list-style-type: none">• All category 1 and 2 uses• Landscape irrigation at sites that are controlled by residents• Residential fire protection• Irrigation of food crops for noncommercial use

Graywater (Regulation 86, CRS §25-8-205)

Regulation 86 governs the use of graywater (Colo. Rev. Stat., 2021d; Colorado Department of Public Health, 2015). Sources of graywater are limited to discharges from bathroom and laundry room sinks, bathtubs, showers, and laundry machines. Graywater does not include wastewater from toilets, urinals, kitchen sinks, dishwashers, or nonlaundry utility sinks. To implement a graywater program, a city and/or county must adopt Regulation 86 or a local amendment into code that specifies allowable uses, minimum design criteria, and control measures.

There are four defined graywater use categories (Colorado Department of Public Health, 2015):

- Category A: Single family, subsurface irrigation
- Category B: Non-single family, subsurface irrigation. 2,000 gal/day or less
- Category C: Single family, indoor toilet and urinal flushing, subsurface irrigation
- Category D: Non-single family, indoor toilet and urinal flushing, subsurface irrigation

Graywater systems include on-site treatment (e.g., solids management and disinfection), backup potable water supplies, and signage requirements. As of October 2020, three communities have adopted Regulation 86 or a local graywater ordinance: Denver, Castle Rock, and Pitkin County (Bell, 2020). CDPHE is working to improve the adoption of graywater ordinances by streamlining their regulations (C. Wiseman, personal communication).

Rainwater Harvesting (CRS §37-96.5-103)

Since 2016, Colorado water law has allowed small-capacity rooftop precipitation collection, otherwise known as rainwater harvesting (Colo. Rev. Stat., 2021e). Rainwater harvesting is currently limited to no more than two rain barrels with a combined storage capacity of 110 gallons or less. Rain barrels are allowed on single-family homes and multi-family buildings with no more than four units. The collected rainwater may be used for hand watering lawns and gardens on the residential property on which the rainwater was collected.

Project Approach

To better understand the state of water conservation programs in Colorado that are delivered through public water systems, the pilot project was organized into four phases:

- **Phase 1:** develop a comprehensive water provider database that merges utility characteristics with water use and conservation information.
- **Phase 2:** administer a survey to all public water systems in Colorado to gather new “primary” data about water conservation programs. The survey is particularly important for gathering information for small- and medium-sized providers and non-community water systems that are not governed by the State’s regulations for covered entities.
- **Phase 3:** supplement the survey data with “secondary” water use data that are publicly available under HB10-1051 (Colorado Water Conservation Board, 2021a). These data are specifically available for covered entities, the largest water providers in the State.
- **Phase 4:** Synthesize the combined data and illuminate interesting and helpful results to inform Colorado WaterWise on the most pressing needs of the water conservation community and to identify which conservation programs have been most effective.

Water Provider Database

The water provider database was compiled from a variety of sources:

- CDPHE Public Water System database (Colorado Department of Public Health & Environment, 2021). The Public Water System identifier (PWS ID) from this database is used as the unique identifier for the final compiled database.
- CWCB covered entity database and list of Denver Water distributors (K. Reidy, personal communication; [Appendix B: List of Covered Entities](#), [Appendix C: Denver Water Distributors](#))
- CWCB Water Efficiency Data Portal (Colorado Water Conservation Board, 2021a)
- CWCB Water Conservation Plan Search (Colorado Water Conservation Board, 2021b)

In addition to compiling and linking publicly available information from the above sources, Colorado WaterWise worked with a graduate student as part of a capstone project to conduct additional web research. The final water provider database is a Microsoft Excel file stored on Colorado WaterWise’s Dropbox site. The database will be provided to active Colorado WaterWise members upon request.

Survey Administration

Design

A new survey was developed by the authors and the project advisory committee members, with beta testing and feedback provided by the Board of Directors of Colorado WaterWise. The survey in some ways represented a simplification of reporting guidelines under HB10-1051, while also putting an increased focus on the integration of water and land use planning as well as the co-benefits of water conservation, such as reduced greenhouse gas emissions. Survey questions covered the following topics:

- Conservation staffing and program budget resources
- Water conservation in comprehensive plans and water efficiency plans
- Conservation goals (quantitative and qualitative)
- Types of conservation programs being delivered (and discontinued)
- Reclaimed water use, as many water providers consider reclaimed water use to be a conservation program (though other providers consider it a distinct water source)

- Program benefits (water saving and other co-benefits)
- Implementation barriers

Appendix A: Survey Instrument contains the full survey instrument. The survey was also used to crowdsource input on how Colorado WaterWise can better support water systems of all sizes and across all geographic locations.

Distribution

The survey was distributed via Survey Monkey to all public water systems in Colorado with email contact information in the CDPHE Public Water System database (Colorado Department of Public Health & Environment, 2021). The survey was open in July-August 2020. Participants who submitted survey responses by the end of July were incentivized by being included in a raffle for five free registrations to Colorado WaterWise’s 2021 annual symposium.

Response

Ninety-four (94) public water systems responded to the survey. This number represents about 5% of public water systems in Colorado. Survey respondents provide water service to almost 2.3 million people, about 40 percent of the State’s population (**Figure 4** below).

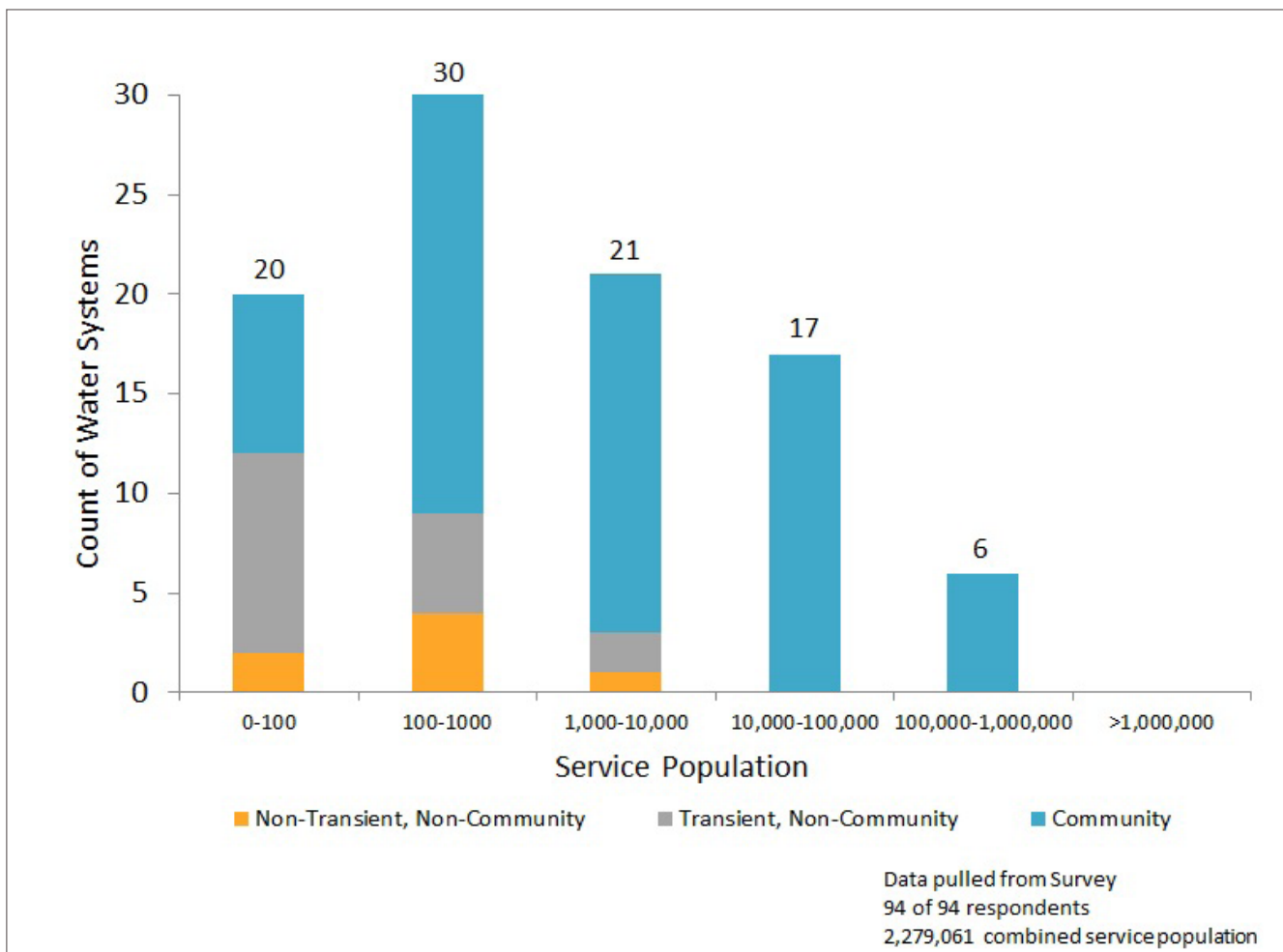


Figure 4. Breakdown of Public Water Systems that Responded to the Survey

An analysis of survey respondents showed that most were community water providers that serve a rural population and are not covered entities. “Rural” systems are considered those that serve less than 50,000 people and “urban” systems are considered those that serve 50,000 people or more. Figure 5 below describe the full survey dataset. For the remainder of the report, analyses in which the survey was the sole data source represent a maximum sample size of 94 public water systems.

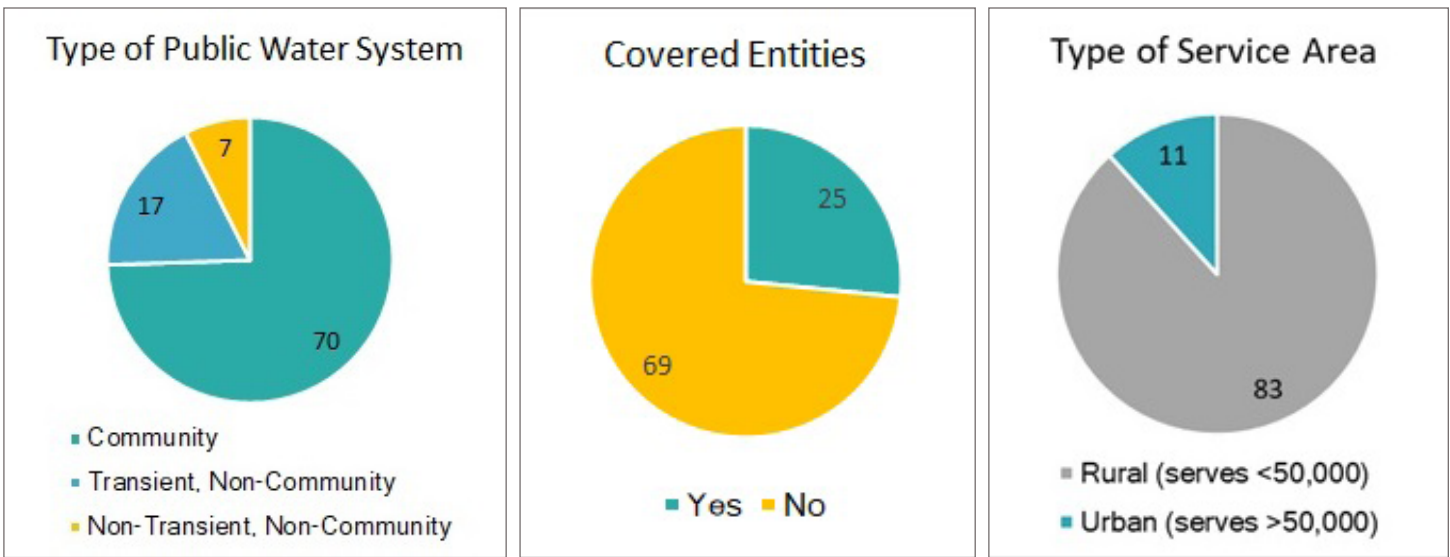


Figure 5. Pie Charts Describing the Survey Dataset

HB10-1051 Data Supplement

To supplement the survey dataset with information for the largest providers in the State, and to boost geographic representativeness of the dataset, additional information was gathered from the State of Colorado’s HB10-1051 dataset (Colorado Water Conservation Board, 2021a).

Conservation staffing and program information were extracted for 22 covered entities that submitted a HB10-1051 report in 2019 or 2020. Analyses related to staffing and budget have a maximum sample size of 116 water providers (94 survey respondents plus 22 additional covered entities from HB10-1051). These systems serve almost 4.5 million people combined, representing about 80% of the State’s population.

Water Efficiency Plans

The availability of a water efficiency plan, and how recently it had been filed with the State, was analyzed for all survey respondents and covered entities, for a total sample size of 155 public water systems (94 survey respondents plus 61 additional covered entities, analyzed using the State’s document retrieval website (Colorado Water Conservation Board, 2021b)). These 155 public water systems serve almost 5.5 million people, about 95 percent of the State’s population.

Final Dataset

The final dataset pieces together information from a variety of sources. The breakdown of public water systems represented in the final combined dataset is shown in Figure 6 on the next page. To summarize, the final dataset includes:

1. Complete information for 94 public water systems serving 2.3 million people

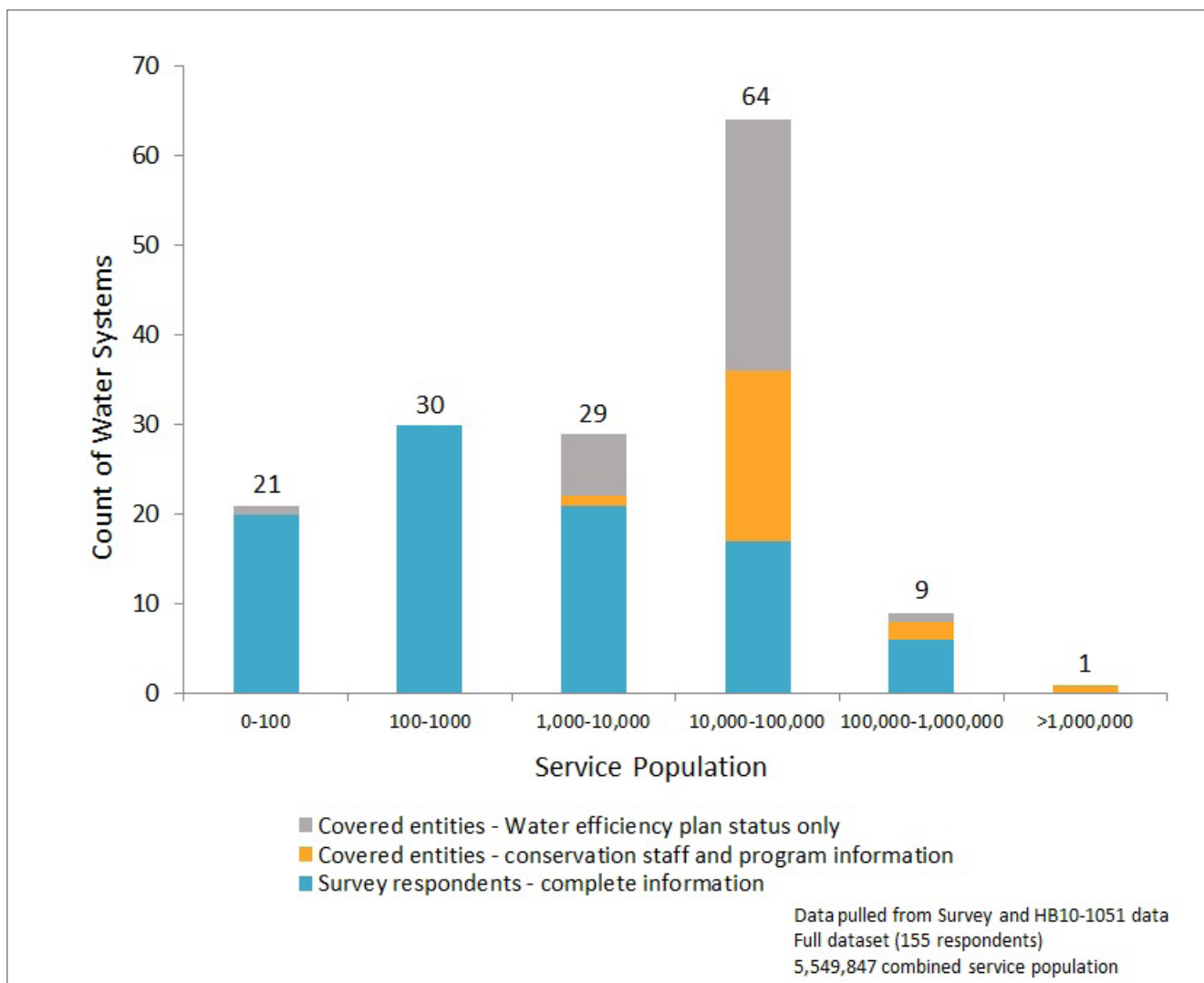


Figure 6. Breakdown of Public Water Systems Responded in Final Dataset

2. Limited information about conservation staff, budget, and programs for 22 public water systems serving 2.2 million people
3. Basic information about water efficiency plan status for 39 public water systems serving 1.0 million people

Dataset Limitations

There are two known limitations to the final combined dataset:

- The survey design, administration, responses, and analysis were not designed to be statistically representative of all water systems in Colorado. The survey responses are therefore what is termed a “sample of convenience.”
- The dataset does not pull data or information from water efficiency plans. Though water efficiency plans contain very useful data, the effort to mine them for information was beyond the scope of this pilot project. The State of Colorado has started to extract and compile this information, but the compiled data were not available at the time of this report (K. Reidy, personal communication).

These data limitations will be evaluated and addressed in future project iterations.

Project Results

The following sections provide a summary of the compiled dataset as well as notable results.

Program Capacity

STAFFING

Question

How many staff do you have dedicated in whole or in part to water conservation programs?

Results

Approximately one-quarter (28 percent) of survey respondents indicated they have no staff dedicated to conservation programming (Table 3 below). From the HB10-1051 dataset, almost all covered entities (representing the largest water providers in the State) have at least one dedicated conservation staff resource. More than half of all respondents (52 percent) indicated one to three staff resources.

Table 3. Number of Staff Dedicated to Conservation Programs

# Staff	Survey Responses	Survey Percentage	HB10-1051 Responses	HB10-1051 Percentages	Total Responses	Total Percentages
0	26	28%	1	4%	27	23%
1	24	26%	7	30%	31	26%
2 to 3	26	28%	5	22%	31	26%
4 to 6	14	15%	4	17%	18	15%
7 or more	4	4%	6	26%	10	9%
Total	94	100%	23	100%	117	100%

BUDGET

Question

What is your annual conservation program budget as a percentage of your utility's total budget, not including staff cost?

Results

The majority of survey respondents (68 percent) have no budget dedicated to conservation programs (Table 4 below). From the HB10-1051 dataset, most covered entities (representing the largest water providers in the State) have dedicated conservation program budgets.

Table 4. Percentage of Budget Dedicated to Conservation Programs

Conservation Budget	Survey Responses	Survey Percentage	HB10-1051 Responses	HB10-1051 Percentages	Total Responses	Total Percentages
No dedicated budget	64	68%	4	17%	68	58%
<0.1% to 1%	25	27%	19	83%	49	42%
1.1% to 5%	5	5%				
Total	94	100%	23	100%	117	100%

Planning

WATER EFFICIENCY PLANS

Questions

- Do you have a water efficiency or water conservation plan?
- What year was your current water efficiency plan finalized?
- Have you filed your water efficiency plan with the CWCB?

Results

All survey participants responded to this question. Additional research was conducted using the State of Colorado's document retrieval system (Colorado Water Conservation Board, 2021b) and by searching provider websites to verify the information.

More than one-third (34 percent) of analyzed systems do not have a water conservation plan (Table 5 below). Even small public water systems would benefit from a site-scale conservation plan addressing equipment and fixture selection, maintenance, and conservation practices.

More than one-quarter (25 percent) of analyzed providers have a water efficiency plan filed with the State that has not been updated on the mandated seven-year update cycle (Table 5 below). Updating water efficiency plans on a regular basis is needed to keep pace with the state of conservation practices.

About one-third (29 percent) of analyzed providers have a water efficiency plan filed with the State that has been updated within the mandated seven-year update cycle (Table 5 below). These water systems represent many of the largest and most progressive water systems in Colorado.

Table 5. Water Efficiency and Conservation Plans (as of October 2020)

Plan Status	Survey Responses	Survey Percentage	Additional Responses for Covered Entities	Additional Percentages for Covered Entities	Total Responses	Total Percentages
No conservation plans	51	54%	2	3%	53	34%
Conservation in some plan, but not filed with the State	19	20%	n/a	n/a	19	12%
Plan dated 1996-2000	4	4%	0	0%	4	3%
Plan dated 2000-2009	0	0%	7	11%	7	5%
Plan dated 2010-2015	8	9%	19	31%	27	17%
Plan dated 2016-2020	12	13%	33	54%	45	29%
Count	94	100%	61	100%	155	100%

PLANS AND ZONING CODES

Questions

- Are water conservation/efficiency policies or programs defined in the comprehensive plan(s) of the cities or counties in your service area?
- What water conservation policies and techniques are listed in your city's comprehensive plan and/or zoning code?
- Do conservation staff participate in developer pre-application meetings or development review with city/county planning staff?

Results

Comprehensive plans are long-range plans that set the vision and goals for a community, typically

include a future land use map, and provide a foundation for zoning and development codes. These plans are developed by community planners working for land use authorities.

Survey respondents (representing water provider staff) were typically unsure if the comprehensive plans in their service area included water conservation policies and programs (45 percent). Seventeen (17) percent of respondents reported that water conservation policies or programs are defined in the comprehensive plan covering their service area.

Where respondents were aware of water conservation policies or programs defined in the comprehensive plan, the top five most common policies and programs included are (1) water conservation goal and objectives, (2) xeriscape requirements, (3) conservation-oriented rates and fees, (4) indoor fixture efficiency standards or green plumbing codes, and (5) water efficiency standards for new development (Figure 7 below).

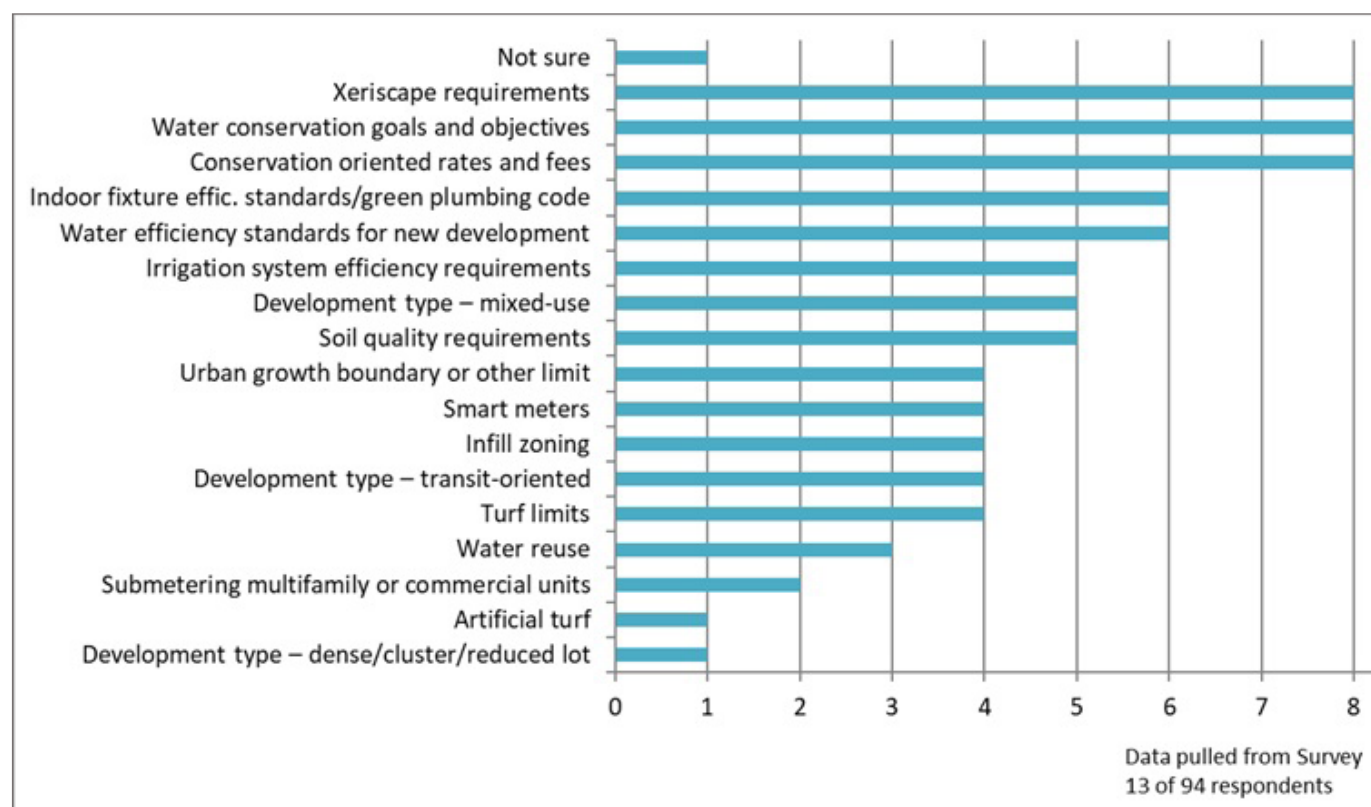


Figure 7. Conservation Policies and Programs in Comprehensive Plans and Zoning Codes

Thirteen (13) of 70 survey respondents (19 percent) that work for community water systems reported that conservation staff participate in developer pre-application or development review meetings. Six additional respondents from non-community systems said the same.

Conservation Goals

Questions

- What are your current quantitative conservation goals?
- What are your qualitative conservation goals?

Results

Twenty-five (25) survey respondents (30 percent) reported that they have established quantitative conservation goals. This percentage is known to be an underestimate as all providers with conservation plans filed with the State are required to establish a quantitative conservation goal. Using this assumption, 54 percent of water systems are estimated to have established quantitative conservation goals.

Of the survey respondents that have established these goals, the most common types by far are water use reduction goals (total gallons reduction or percentage reduction), followed by improved system efficiency (expressed as reduction in gallons per capita per day or reduced water losses). It is interesting to note that one respondent reported their quantitative goal is based on their project service area build-out, rather than a reduction compared to historical values. Other responses include the use of a drought resilience plan and a watershed enhancement plan (Figure 8 below).

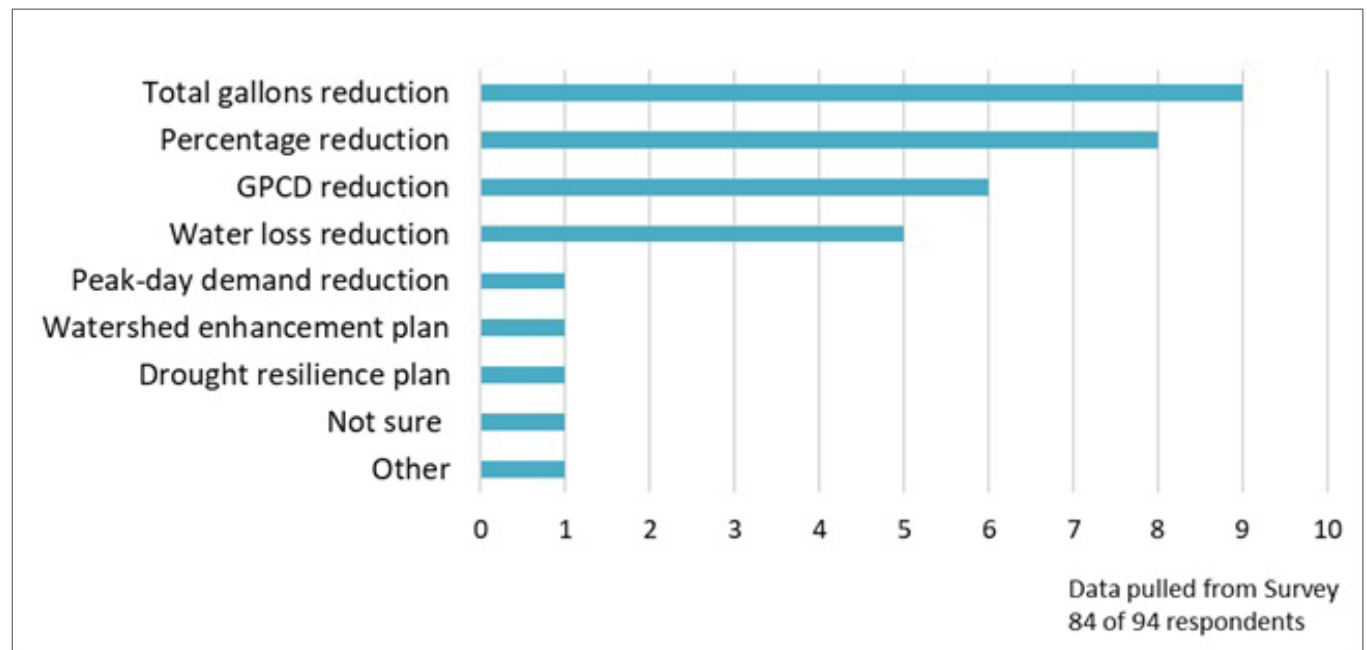


Figure 8. Quantitative Conservation Goals

note: some providers reported more than one type of goal

One respondent clarified why they do not have quantitative goals, writing, “We are a [non-transient, non-community] water supply used mostly for industrial process use. We deploy water conservation protocol during emergency situations only, as very little of our water is used for residential type use and none is used for landscape irrigation.” This statement reminds us of the huge variety of water provider types in Colorado.

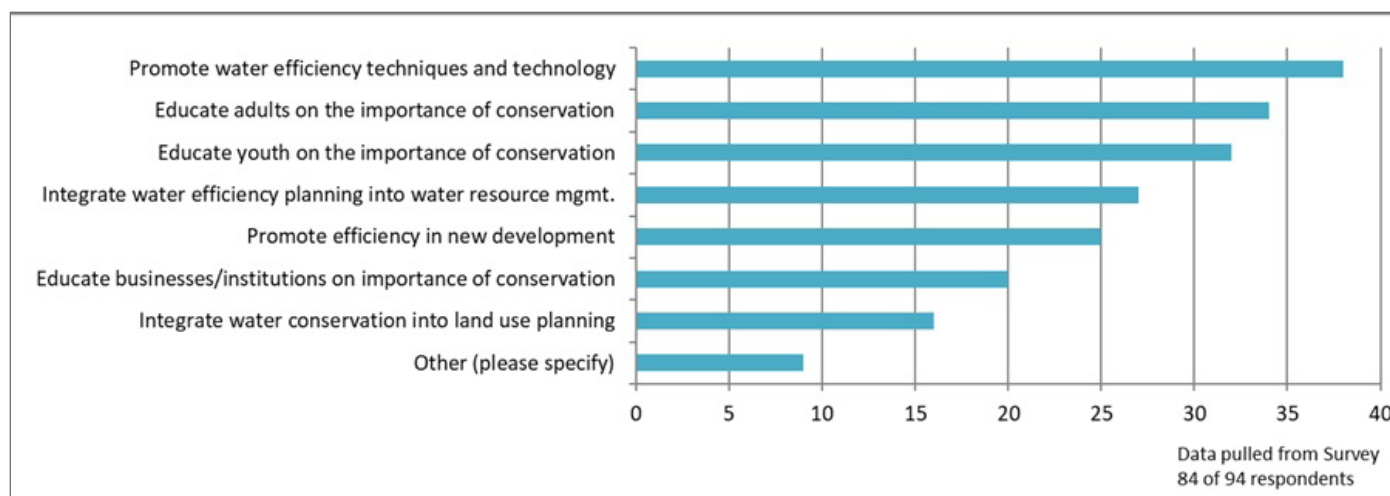


Figure 9. Qualitative Conservation Goals

A majority of survey respondents (61 percent) have established qualitative conservation goals that focus on education, awareness, and integrated water resources planning (Figure 9 above). Other responses include leveraging Advanced Metering Infrastructure (AMI) capabilities; expanding commercial, industrial and

One respondent submitted this qualitative goal: “Address inefficient use in the commercial sector using industry-specific benchmarking, performance-based incentives and comprehensive water use evaluations.”

Conservation Programs

Question

What types of conservation programs has your utility implemented?

Results

More than one-third of survey respondents (38 percent) reported that they have not implemented any conservation programs. This result implies that some providers without conservation plans are still implementing conservation programs. Respondents who have implemented programs reported an average of five program types per provider.

Survey responses were combined with recent HB10-1051 data; the combined data are shown in Figure 10 on the next page. The five most common program types are system water loss audits, efficiency-oriented billing rate structures, education programs for adults, rebates for indoor fixtures, and direct installation programs. The five least common program types are graywater reuse system ordinances, soil amendment ordinances, indoor fixture exchanges, system efficiency upgrades, and xeriscape ordinances. This finding does not imply that these programs are not effective conservation measures.

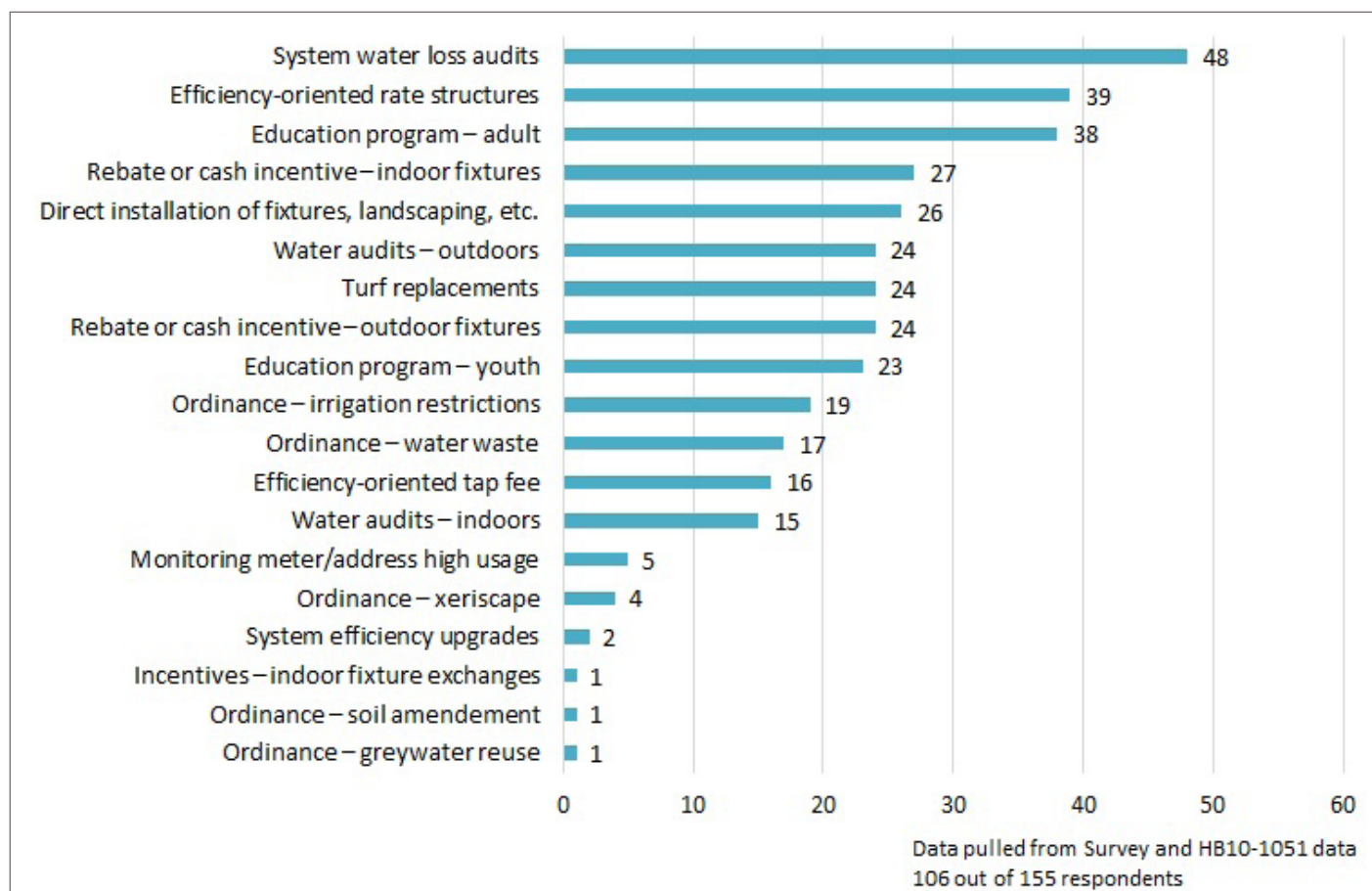


Figure 10. Types of Implemented Conservation Programs

Question

What conservation policy or program successes from the last five years would you like to share with other utilities?

Results

Twenty survey respondents (37 percent) shared success stories that were grouped into seven categories: water loss, advanced metering infrastructure (AMI), water reuse, audits, incentives, citations, and education. Incentives and water loss accounted for the most cited areas of success (Table 6 below).

Table 6. Conservation Policy and Program Success Stories	
Audits (1 response or 5 percent)	Water Reuse (1 response or 5 percent)
<ul style="list-style-type: none"> “Our audit program with Resource Central has been our main program to get conservation plans implemented.” 	<ul style="list-style-type: none"> “[Our utility] has a robust water reuse program that addresses as much as 20 percent of the overall water demand in the city.”

Table 6 continued

Water Loss (6 responses or 30 percent)	Incentives (7 responses or 35 percent)
<ul style="list-style-type: none"> • “The key is replacing water mains.” • “Aggressive leak detection and repair, which has resulted in some major savings in utility usage.” • “Replacement of old ABS [acrylonitrile butadiene styrene] pipe with PVC [poly vinyl chloride] has cut our water losses by 10 percent.” • “...our greatest success at reducing our treated water demands has come from focusing on improvements in our internal operations. We optimized the amount of treated water needed to backwash filters at the water treatment plant while still meeting water quality standards. We changed over to use partially treated wastewater at our water reclamation facility at the headworks and in the RAS [return activated sludge] pumps. We also have decreased our non-revenue water by billing the wastewater utility, storm water utility and parks and recreation department for water that previously had gone unbilled. These internal improvements have actually saved more water than our water efficiency measures offered to our general customer base.” • “A former [colleague] of mine, [redacted], installed a “membrane filtration” (X-flow Pentair Aquaflex HP 55) water plant with the help of the people of Filter Tech Systems. Relative to the filter system before, I backwash the system less (more water conserved) while it also being much more user friendly (time conserved). One thing I also like is the great amount of help we received such that these people could afford it. Donations from generous people, alongside a grant from our government helped bring online a system with the cost of something like \$72,000. This was a wonderful step not only for our small water system and those who oversee it, such as myself, but also for the better use of the water that we are given here.” 	<ul style="list-style-type: none"> • “Lowered tap fee incentive” • “Landscape programs!” • “Our H2Overhaul program and water-wise landscape rebate is successfully changing traditional residential yard norms and is encouraging conversion to water-wise landscapes. It is a slow process, but the program is designed to reduce barriers and make it easier for our customers to transform their yards and significantly decrease water use.” • “The sports fields at Conifer High School were converted to artificial turf eliminating the need to irrigate.” • “Our Parkways Improvement Plan” • “The value of landscape contractor training and large-scale turf to native grass conversion projects.” • “While we’ve had many successes, our weather-based smart irrigation controller program has become our most popular incentive. The program has evolved through data analysis to create a more efficient process while increasing customer ‘buy in’.”

Table 6 continued

Advanced Metering Infrastructure Program (2 responses or 10 percent)	Education (2 responses or 10 percent)
<ul style="list-style-type: none"> • “All of the ways we’ve utilized AMI data: sprinkler audits, LWBs, leak alerts, MyWater portal, etc.” • “We have installed Badger LTE [long-term evolution] cellular remotely readable meters in all 119 homes in our water system. These meters allow users to monitor their consumption and get alerted if the system detects a leak. The water company can also look at any current leaks. We reach out to homeowners for very large leaks.” 	<ul style="list-style-type: none"> • “Last year we started offering table tents with our new logo and a message for patrons to ask for water if they wanted it and we were pleased with the participation.” • “Weekly monitoring and holding our staff accountable to usage.”
Citations (1 response or 5 percent)	
<ul style="list-style-type: none"> • “Citations have helped here.” 	

Question

What conservation programs have you discontinued and why?

Results

Most survey respondents (79 percent) have not discontinued any conservation programs. For the 11 respondents that had discontinued programs, indoor fixture rebates - including clothes washer, toilet, and dishwasher rebates - were the most frequently discontinued program (Figure 11 below). Four respondents indicated that the statewide WaterSense regulation and efficiency improvements in new equipment made the indoor rebate programs unnecessary.

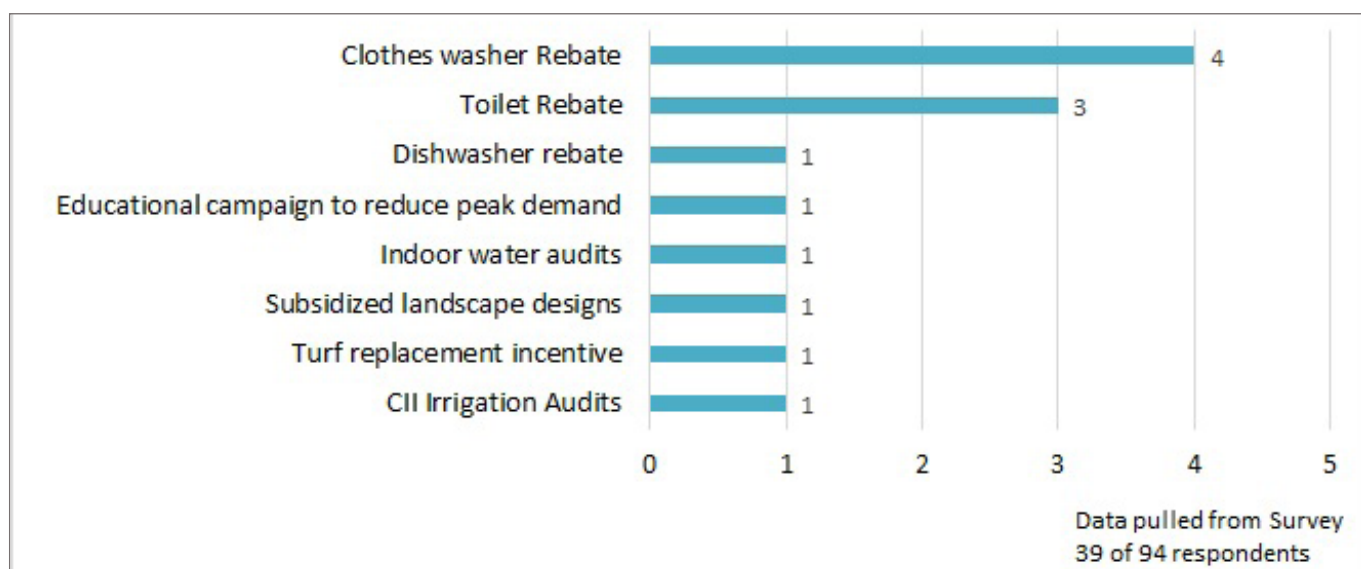


Figure 11. Discontinued Conservation Programs

“[We discontinued our] ‘Shave the Peak’ campaign directed at reducing summer peak demands to delay a water treatment plant capacity project. It successfully helped delay the plant expansion project. The plant expansion project is complete and we currently have plenty of peak capacity. We will probably employ a similar campaign as we get closer to reaching the new increased plant capacity.”

Question

What conservation policy or program challenges from the last five years would you like to share with other utilities?

Results

Fifteen respondents (16 percent) shared their challenges that were grouped into seven categories: internal and political support, tracking savings, customer challenges, program challenges, public opinion, water loss, and metering. Internal and political support was the area identified as the most commonly challenging (Table 7 below).

Table 7. Conservation Program Challenges

Internal and Political Support (4 responses or 26 percent)	Tracking Savings (1 response or 7 percent)
<ul style="list-style-type: none"> • “Struggle with internal support.” • “An uphill battle on changing development requirements and building codes. Heavy focus on making development easier/more affordable and these changes can be seen as expense-adders and barriers. Struggle to get on the same page with our Planning department - different opinions about what should be required/allowed through code.” • “Code changes that impact landscapes within new developments is challenging. The political landscape is changing, and acceptance of restricting turf is becoming easier. It is critical that our Conservation and Planning groups continue to work together to realize a common goal while finding solutions that work for the citizens, development community and utility.” • “The effort to improve landscape water efficiency in new developments has taken longer than expected. We started with an incentive for Home Builders that is on hold until City Council approves potential city code changes.” 	<ul style="list-style-type: none"> • “Because we contracted out doing our last Water Conservation Plan and we had internal staff turnover with the employees that worked with the consultant, we had not done a good job of recording all the information needed to track the costs, participation levels and water savings of the conservation programs which was needed for the updated Water Efficiency Plan. It took considerable research to try to piece together that information. Going forward we plan to do a better job of tracking this information and looking at the costs and benefits of each of the programs to help determine where to increase or decrease funding.”

Table 7 continued

PROGRAM SUCCESSES	Customer Challenges (3 responses or 20 percent)	Public Opinion (2 responses or 13 percent)
	<ul style="list-style-type: none"> • “Changing people’s behaviors.” • “Difficult getting residents to quit watering their grass so much.” • “Getting the district customers to save water.” 	<ul style="list-style-type: none"> • “Varying opinions (positive and negative) regarding adjustments to the current rate structure.” • “Working with staff and residents that don’t believe in climate change.”
	Program Challenges (3 responses or 20 percent)	Metering (1 response or 7 percent)
	<ul style="list-style-type: none"> • “Honor system did not work with customers. Penalties did not work either because we don’t have time to police the area for unapproved water use.” • “More structure is required to ensure the integrity of the lowered tap fee incentive is maintained over the years.” • “The difficulty in making significant impacts with commercial indoor water use.” 	<ul style="list-style-type: none"> • “If they aren’t metered individually, get them metered, each meter is a cash register and you can do a better job of educating wasteful practices.”
	Water Loss (1 response or 7 percent)	
	<ul style="list-style-type: none"> • “Finding leaks in plastic distribution pipes in mountain areas that are buried are next to impossible.” 	

Reclaimed Water Supplies

Questions

- Do you have a centralized/utility-managed reclaimed water system?
- For what uses does your reclaimed water system (i.e., recycled water or purple pipe) provide water?

Results

Reclaimed water is defined under Regulation 84 as domestic wastewater that has received secondary treatment to meet the standards for approved uses (Colorado Department of Public Health and Environment, 2019). Most survey respondents (64 or 81 percent) who answered the question do not have a centralized reclaimed water system (Figure 12 at right).

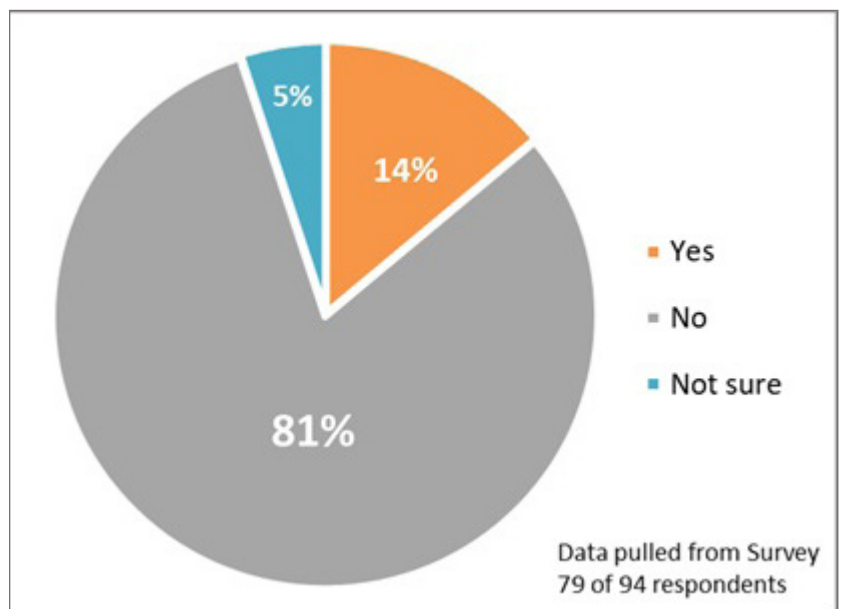


Figure 12. Providers with Centralized Reclaimed Water Systems

Of the 11 respondents that do have a reclaimed water system, the most common use for reclaimed water is irrigation (Figure 13 below). Four providers also use their reclaimed water in cooling systems, such as in a cooling tower.

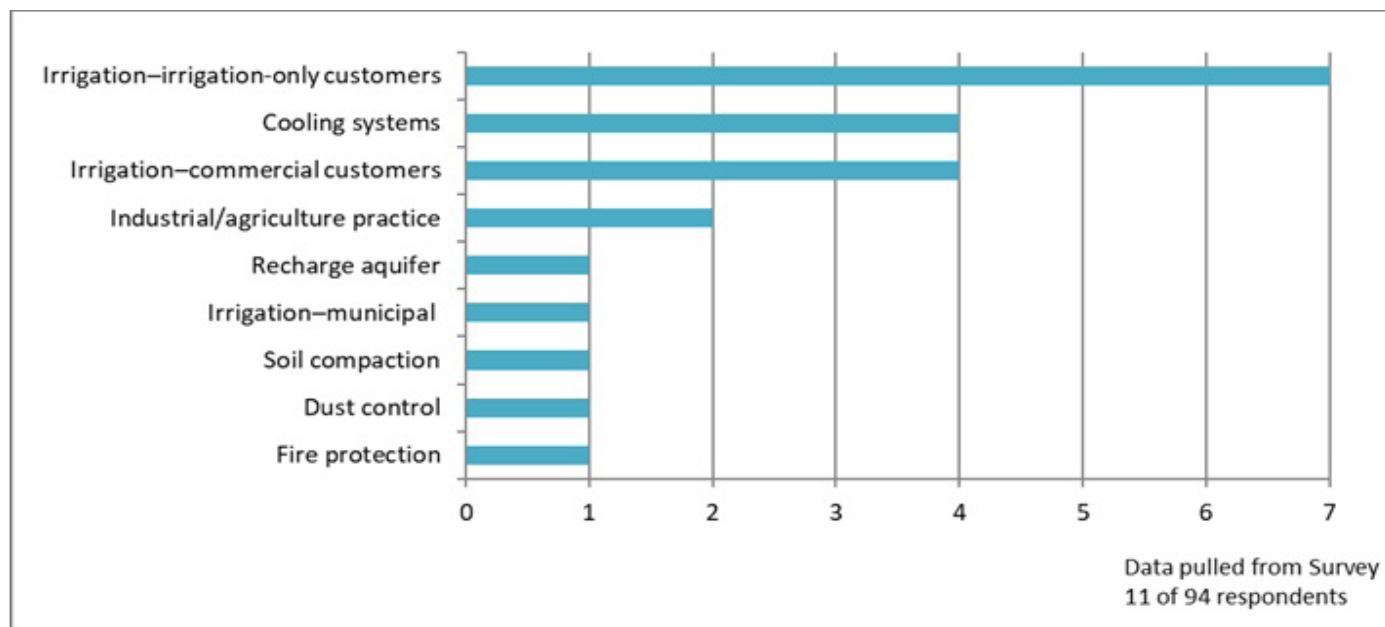


Figure 13. Beneficial Uses of Reclaimed Water

Program Impacts

Question

Which of your current conservation programs has produced the highest water savings? Please explain why.

Results

The responses were highly varied, with three water providers indicating they were unsure or did not track water savings, and 19 unique program types cited as the highest-saving program (Figure 14 on next page). The three most cited program types were water rate fee structures; system efficiency upgrades; and system leak detection and repair.

It is notable that some of the responses (such as citations for outdoor water waste and AMI meter leak detection) did not show up in the previous question as implemented conservation programs (see Types of Programs). This finding indicates that additional program types should be added to the survey question and answer choices.

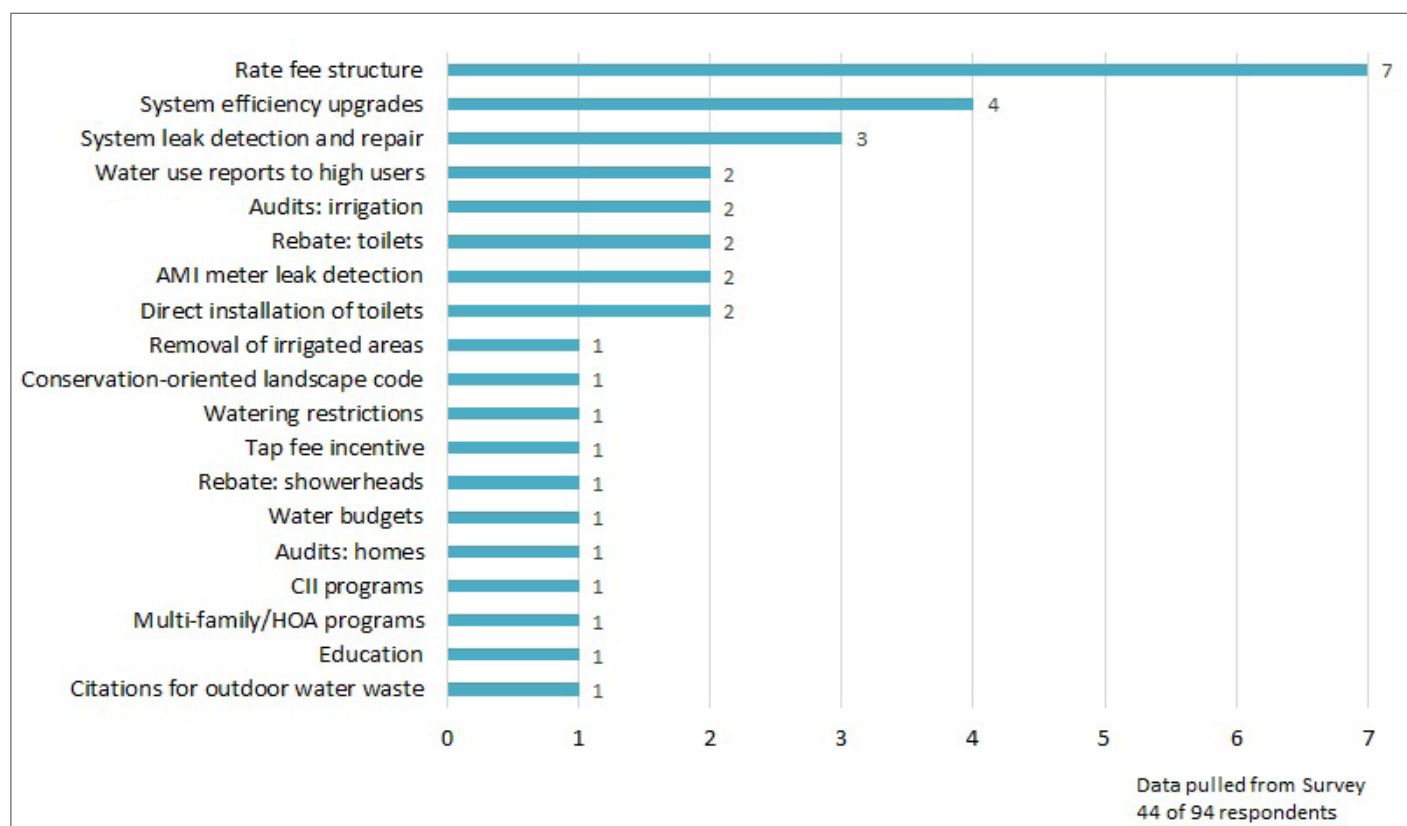


Figure 14. Conservation Programs with the Highest Water Savings

Questions

- What is challenging about measuring water savings attributed to your conservation policy/programs?
- How do your most recently measured annual savings compare to your projected/planned savings?
- To the best of your knowledge, what do you attribute the difference between your savings projections and your measured savings?

Results

Fourteen survey respondents reported no challenges, or they were unsure; some reported that the question was not applicable but did not indicate why.

Responses from thirty-six respondents were grouped into 13 categories, with many respondents indicating more than one category (Figure 15 on next page). The most cited challenges were “no analysis expertise” and “controlling for external variables.” Many of the responses relate to measurement methodology, indicating an opportunity to standardize and train provider staff on water savings calculations.

Most respondents (66 percent) either do not measure savings, do not plan or project savings, or were unsure how planned and projected savings compared (Figure 16 on next page). Twenty percent of respondents indicated that planned and projected savings were comparable; 12 percent of respondents indicated actual savings were higher than planned savings; and six percent of respondents indicated actual savings were less than planned savings.

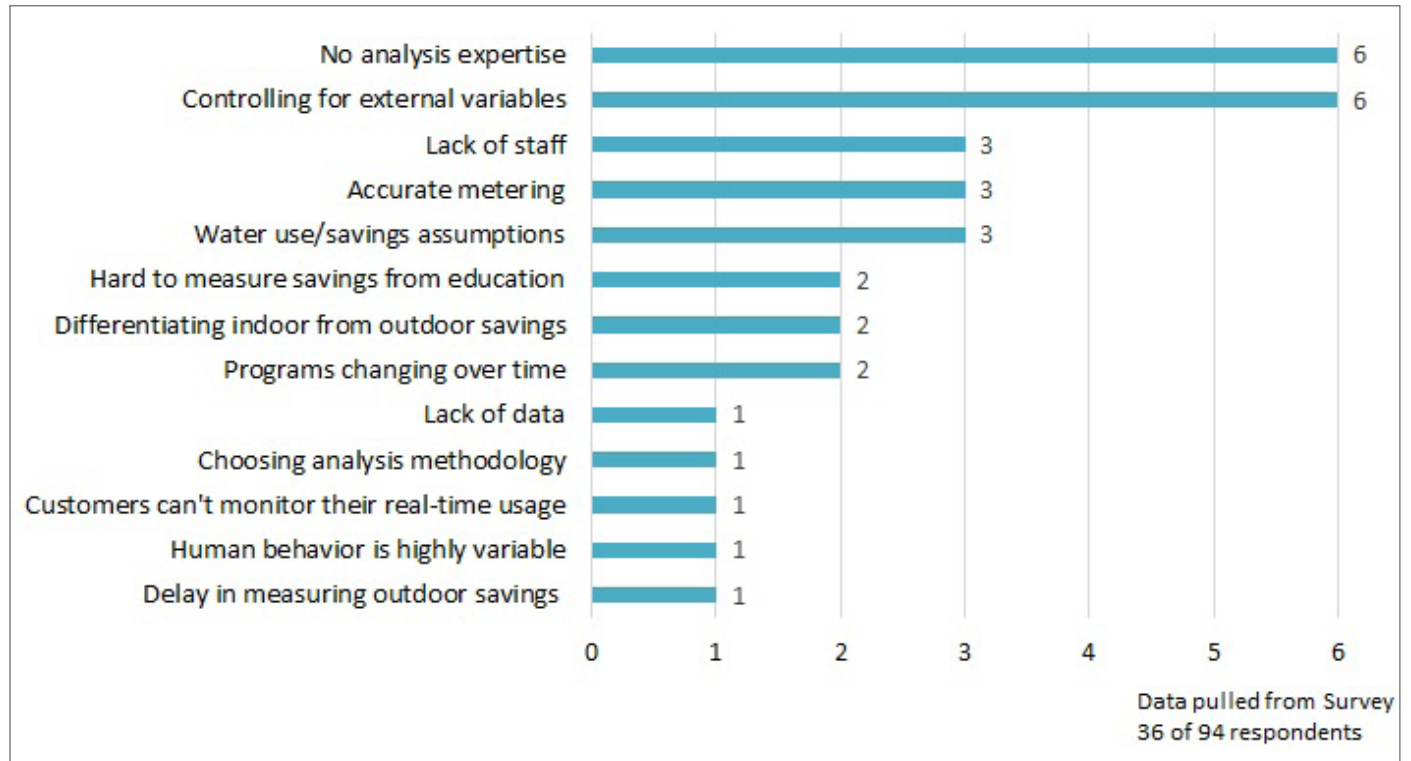


Figure 15. Challenges in Measuring Water Savings

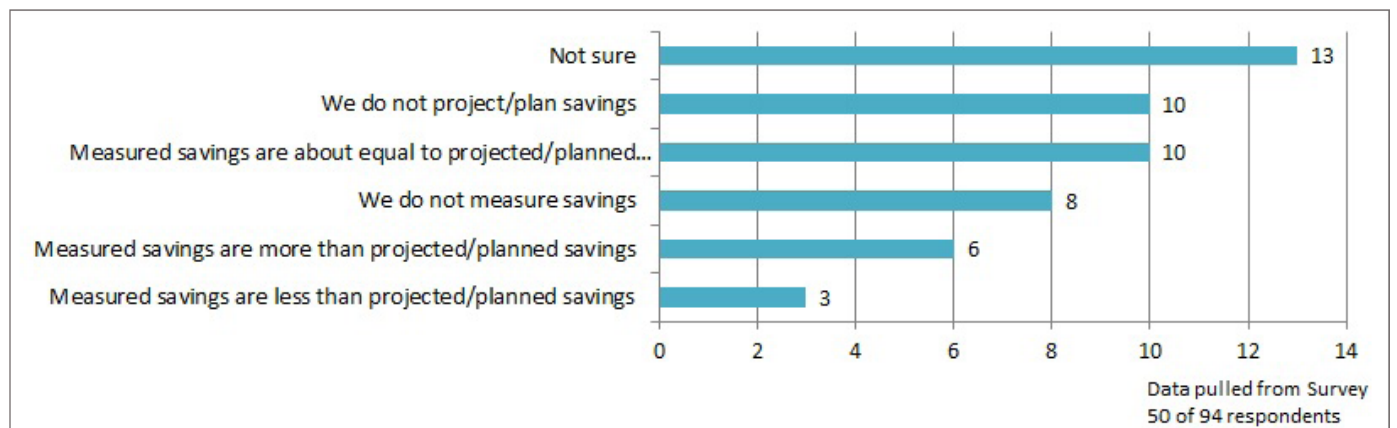


Figure 16. Planned vs. Actual Water Savings

Questions

- Do you measure the co-benefits of conservation policy/programs, e.g., energy savings?
- What co-benefits do you measure?

Results

Most survey respondents (56 of 76 respondents, or 74 percent) do not measure any co-benefits associated with conservation programs or policies. Of the 11 respondents who do measure co-benefits, 10 measure energy savings (Figure 17 on next page). Interestingly, three of the respondents are combined water and power service providers (data not shown).

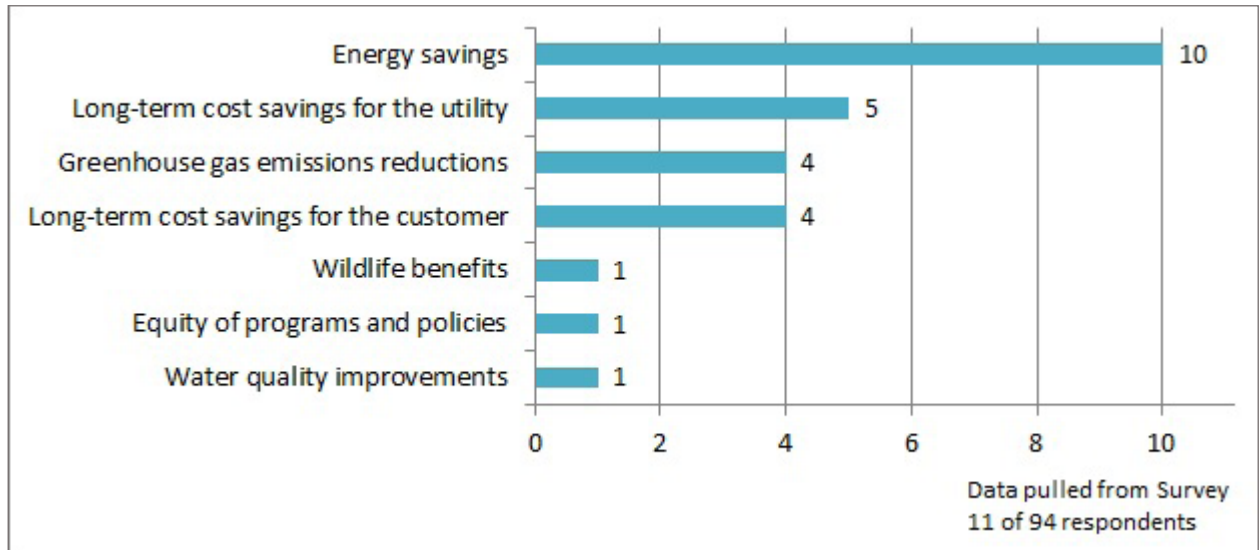


Figure 17. Co-benefits Measured for Conservation Programs

One respondent shared a valuable perspective that demonstrates the diversity of providers and their priorities in Colorado: “Since we are a private business, [the barrier is] usually getting capital to do [conservation programs]. However, this is a priority for our organization nationwide and we are working on ways to reuse wastewater.”

Question

- What barriers to implementation of water conservation policies/programs have you faced?

Results

Forty-seven respondents made multiple selections in answering this question (Figure 18 below). One respondent reported that they do not face any barriers. The most common barriers type are available resources (including staff capacity, financial, and technological).

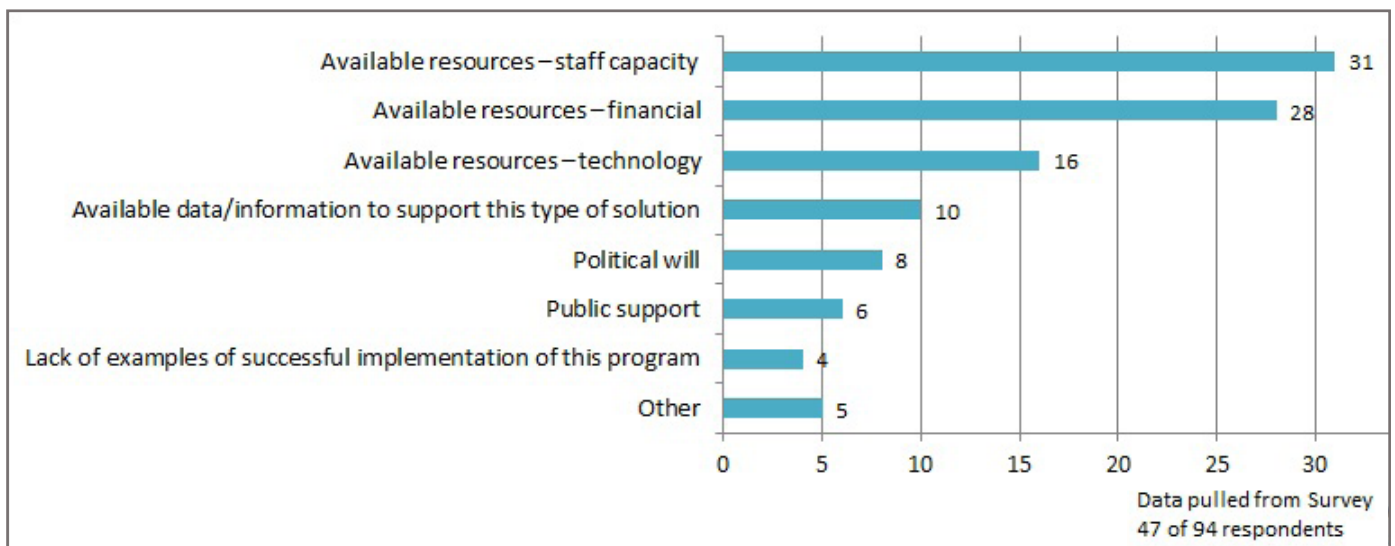


Figure 18. Barriers to Program Implementation

Analysis of Findings

The following sections include an analysis of project results across topics to illuminate meaningful findings.

Program Capacity

As described previously, a large portion of respondents had neither dedicated conservation staff nor budgets. Yet, some of these respondents had still implemented conservation programs and policies. The top two conservation programs implemented in this case are water loss audits and conservation-oriented rate structures. These are conservation measures implemented by utility operations and finance departments that are fundamental to the business of being a water provider, minimizing water loss and maximizing sales revenues for the water treated. Lack of a dedicated conservation budget is most impactful for conservation programs that are delivered to customers. Staffing and budget resource constraints are the most cited implementation barriers.

Lack of dedicated budget was not necessarily a limiting factor for allocating staff, as two-thirds of respondents without a dedicated budget still allocated at least one staff person in whole or part to conservation programs. Smaller providers may not have the capacity to “dedicate” staff to conservation programs but may be providing conservation policies and programs through consultants and vendors. Therefore, a lack of dedicated budget may be a stronger constraint on providing conservation programs. Interestingly, half of respondents (16 of 32) who reported having dedicated conservation staff also reported having implemented no conservation programs. These results appear conflicting.

Utilities are unlikely to develop water efficiency plans and implement conservation programs without dedicated conservation staff resources who typically lead up these efforts. Without dedicated budgets, conservation programs and policies may be short-term, running only until a specific goal is reached. This was the case for one respondent who explained their “Shave the Peak” campaign was a temporary project to reduce summer peak demands that was run only until they were able to expand their water treatment plant. With the expansion completed, they discontinued the campaign.

Planning

CWCB grant funding and planning guidelines for the development and implementation of water efficiency plans has been very successful. However, many small- and medium-sized providers still lack water efficiency plans and programs. Unsurprisingly, the fewer conservation staff a provider has, the less likely the provider is to have a water efficiency plan ([Figure 19](#) on next page).

In 2015, the Colorado Water Plan established an integrated water and land use planning goal for the first time statewide, land use planning strategies became required components for water efficiency plans, and much progress has been made since then. However, integrating land use strategies into water efficiency plans, and water into long-range land use plans and zoning codes, are still emerging practices. The survey did not delve into why water was not better represented in land use planning, but some of the responses about conservation challenges address this issue. Four respondents reported a lack of internal and political support, with three specifically calling out a lack of support from their planning and development groups.

Many survey respondents lack a good understanding of the long-range land use planning being done in their communities, even though land use types and development directly affect water providers in terms of future system demands and infrastructure needs. In communities that continue to develop and experience growth,

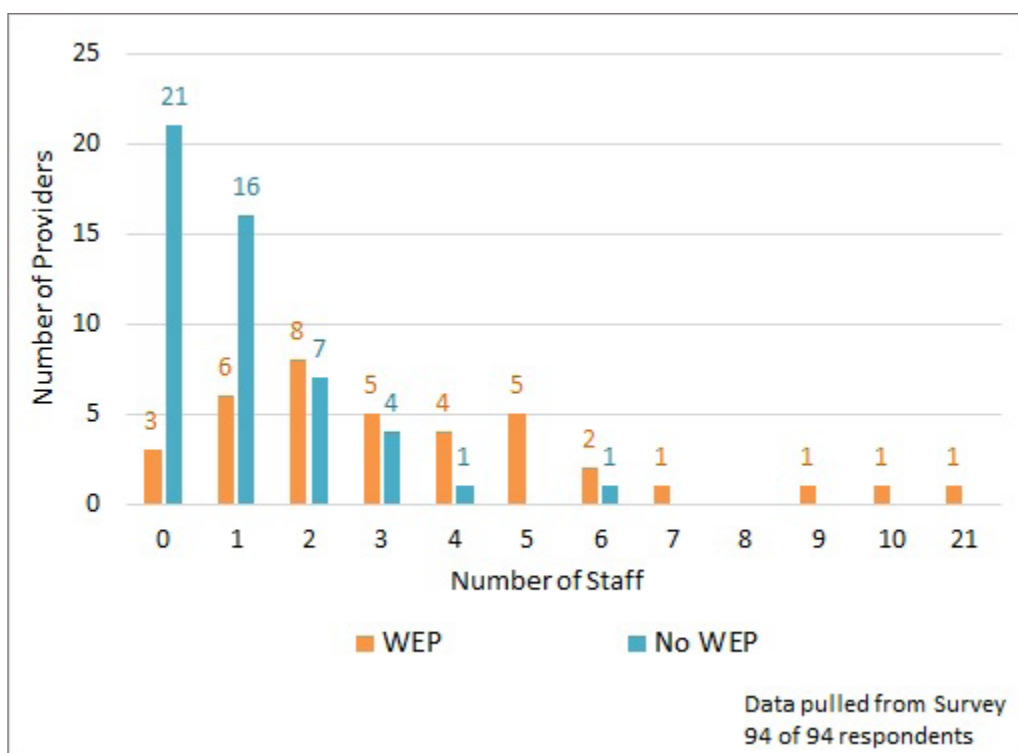


Figure 19. Relationship between Staff Size and Water Efficiency Plan

conservation in new development may be one of their best opportunities to save water. Water providers and community planners must work together to implement tools such as water waste ordinances, water-efficient development and building standards, and conservation-oriented system development charges to a greater degree. The Growing Water Smart program is one program designed to bridge the divide between these two professional practices (Sonoran Institute, 2021).

Conservation Goals

The variety of goal types being used by providers makes it hard to compare utilities and even harder to aggregate across utilities to assess regional and statewide progress. While utilities may have unique goals based on their own water rights portfolios and system characteristics, it would be beneficial to adopt common metrics to foster comparison and aggregation across the State.

For communities that are experiencing significant new development, it may not be realistic to set conservation goals to reduce water demands (though population growth and water demand trends are increasingly independent). Rather, growing communities may express conservation goals in terms of lowering projected water demands at community build-out, or overcoming growth in water demands so that new developments do not put additional strain on water supplies.

Conservation Programs

The type and number of conservation programs are (unsurprisingly) greatly affected by the number of dedicated conservation staff and having a dedicated conservation budget. As described previously, providers with no dedicated conservation staff have fewer programs and are more likely to focus on water loss management and rate structures, while providers with dedicated conservation staff have more programs and are more likely to include customer-facing programs (e.g. incentives). Figure 20 on the next page shows the number of utilities that

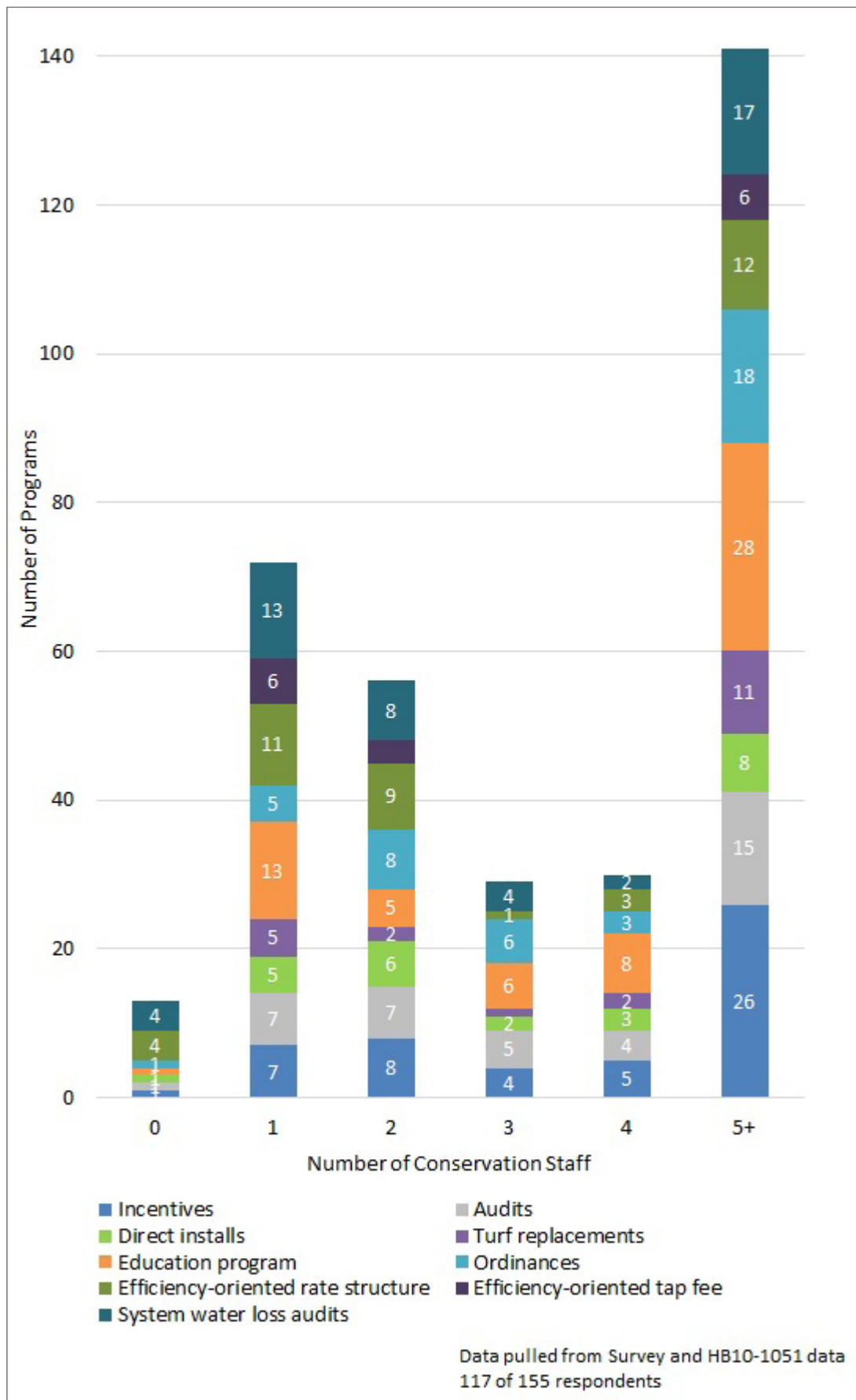


Figure 20. Conservation Programs by Number of Staff

offer different types of conservation programs as a function of conservation staff size.

Figure 21 on the next page shows the number of utilities that offer different types of conservation programs as a function of conservation program budget. Surprisingly, the size of a dedicated conservation budget does not appear to have an obvious relationship with the number or diversity of programs. In fact, the providers that reported the highest percentage of budget dedicated to conservation reported the least number of programs.

Program Impacts

The most common conservation programs are not always the programs cited as the most effective in terms of water savings. Conservation-oriented rate structures and water loss programs are both common and effective. However, other common programs—adult education, outdoor water audits and turf replacements—were rarely cited as providing the highest water savings. While water

While fossil fuels can be replaced by renewable electricity, there is no option to create more water when we need it; conservation of our current supplies is the best way to ensure reliable supplies for generations to come.

savings from education programs are difficult to measure and substantiate, educational programs provide other benefits such as positive customer relationship management. Audits do not result in direct water savings unless the auditor is making repairs, direct installs, or changing watering schedules during the audit. Turf replacement programs are relatively new but increasing; it is possible that the programs have not yet had high participation compared to other programs. Additionally, although the water savings may be high, the cost for replacing turf with water-wise landscaping is also high. Reducing outdoor water use is a priority that many providers are investing in, so these results should be revisited in the future. Many providers also cited difficulties measuring actual water savings, so it is probable that providers may have difficulty identifying their most effective programs.

Co-benefits such as energy conservation and greenhouse gas reductions are increasingly being quantified when evaluating the economics of water conservation programs. We anticipate that more co-benefits will be measured and reported in the future and that sharing information about co-benefits could be motivational to residents and businesses interested in achieving water savings and/or taking climate and sustainability action.

There is a lack of consistency in savings measurement methodology between providers of all sizes, which makes accurate statewide reporting and analysis difficult, if not impossible.

Energy conservation program design is decades ahead of water conservation in linking to financial and climate co-benefits, attributable to two factors: (1) energy historically has been more expensive than water, and (2) energy through the combustion of fossil fuels has a demonstrable link to climate

change and global warming. There is some evidence that the increase in water rates is occurring more steeply than for energy rates - meaning that the economics of water conservation are likely to change in the future. While fossil fuels can be replaced by renewable electricity, there is no option to create more water when we need it; conservation of our current supplies is the best way to ensure reliable supplies for generations to come. Water is often an overlooked component of greenhouse gas inventories and climate action plans, because the most impactful link to greenhouse gas emissions is the energy used to treat and distribute the water. However, saving water means saving energy, improving watershed health, and other co-benefits.

Measuring Savings

Many of the reported challenges for measuring savings related to difficulties with methodology. One respondent answered that their challenge is “differentiating indoor from outdoor use,” although most large providers have methodologies for differentiating at a service-area scale indoor from outdoor use while accounting for seasonal

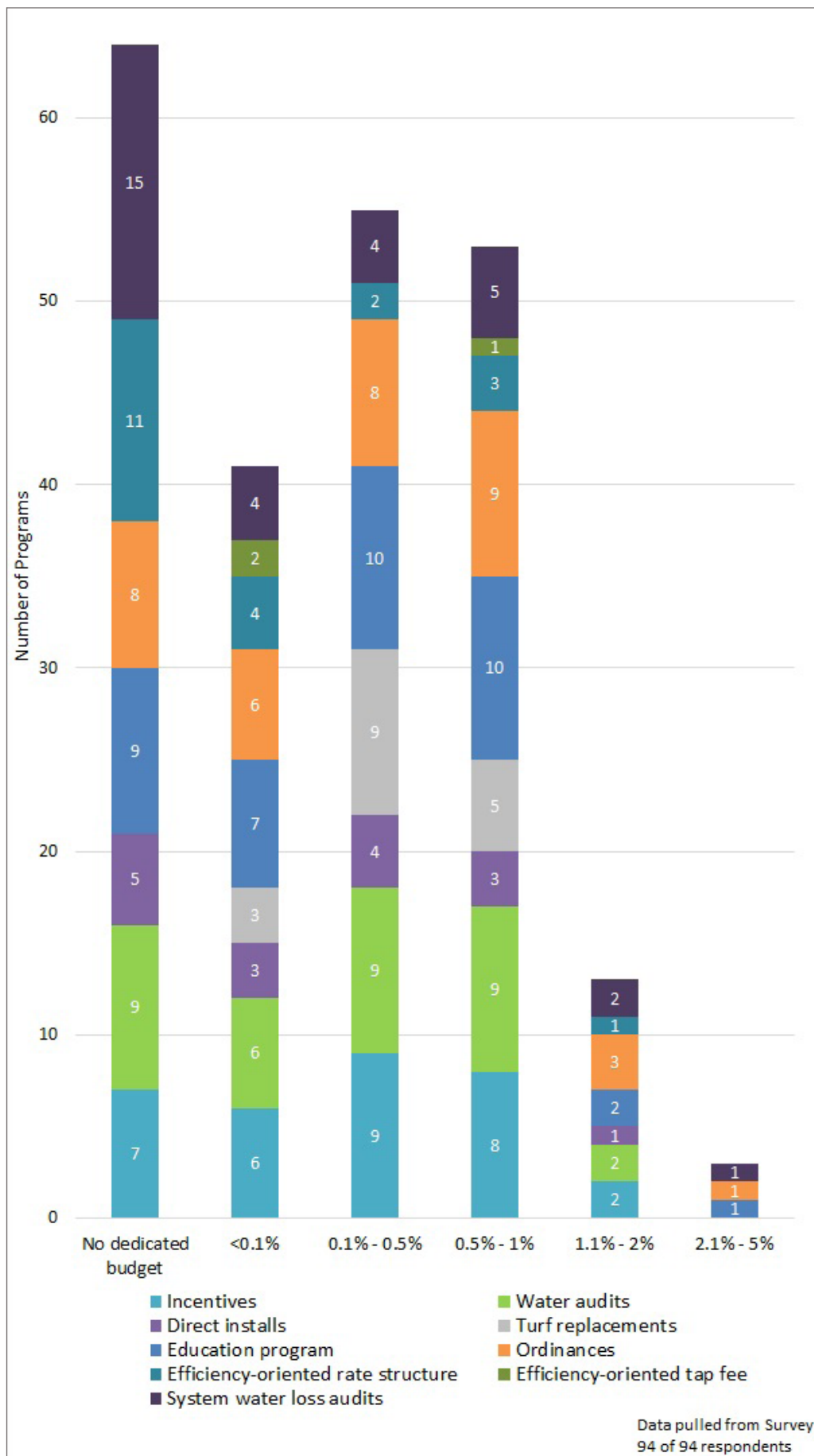


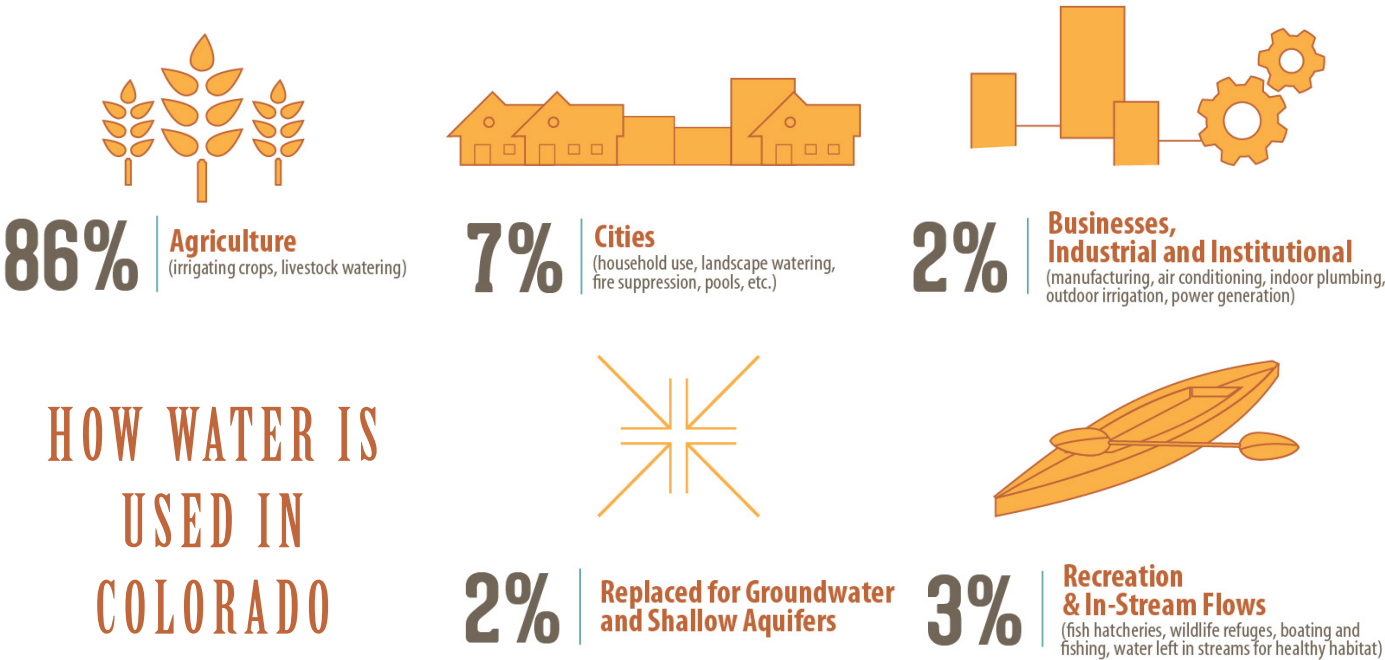
Figure 21. Conservation Programs by Budget Size

variation. There may be a lack of staff expertise and resources at medium and small providers. There is a lack of consistency in savings measurement methodology between providers of all sizes, which makes accurate statewide reporting and analysis difficult, if not impossible.

As the State of Colorado embarks upon an update to the State Water Plan, it is important to revisit the quantification of water savings, and how well actual savings compare to planned savings, as these findings will affect our collective ability to track progress towards, and eventually meet, the State Water Plan goals and ensure adequate supplies to meet future demands. As providers develop or update their water efficiency plans, that is an opportunity to standardize a measurement and verification methodology.

Barriers

Respondents identified staff and financial resources as the top barriers to implementing conservation programming. This finding was true across all water systems. Large or small, providers could offer more programs with more staff and budget. There is a huge opportunity for the delivery of programs on a regional scale to achieve better returns on investment.



Conclusions

This project used data collected from a new survey and the HB10-1051 database to assess the state of public water system conservation in Colorado using five main questions. Our findings informed the following conclusions.

How many staff and financial resources are utilities devoting to water conservation programs?

This study found that the largest utilities in Colorado dedicate significant staff and financial resources to the delivery of conservation programs, but the overwhelming majority of public water systems lack dedicated staff and conservation budget, which translates into a lack of customer-facing programs. Almost one-third of survey respondents had not implemented any water conservation programs.

How prominently and effectively is water conservation featured in long-range land use planning efforts?

The integration of water and land use planning is in a nascent stage, but DOLA and the CWCB offer technical support for this growing arena of best management practices. Community planners may be better able to answer these questions than the utility conservation staff who responded to our survey.

Have utilities set conservation goals, and if so, are they being achieved?

30 percent of survey respondents and an estimated 54 percent of water systems have established quantitative (numeric) conservation goals, while almost two-thirds have established qualitative goals. There is a high correlation between having a plan and having quantitative conservation goals, as the State's water efficiency planning guidelines require that water efficiency plans approved by the State have established conservation goals. The project data did not support an assessment of whether conservation goals are being achieved.

Which conservation programs are being offered, and which ones have been found to be ineffective?

The five most implemented water conservation programs are system water loss audits, efficiency-oriented billing rate structures, education programs for adults, rebates for indoor fixtures, and direct installation programs.

The five least implemented water conservation programs are authorization of on-site reuse systems, soil amendment ordinances, indoor fixture exchanges, system efficiency upgrades, and xeriscape ordinances. This finding does not imply these programs are ineffective.

Where water providers have discontinued conservation programs, the most discontinued programs are indoor fixture rebates that are made obsolete by statewide WaterSense regulations.

What types of water savings and other co-benefits are being realized through the delivery of conservation programs?

Most survey respondents cited difficulty in measuring water savings—something large utilities are doing regularly. The two most cited challenges were lack of analysis expertise and ability to control for external variables.

Energy savings were the most measured co-benefit of conservation programs, but still are quantified by a minority of providers. Water managers need the ability to quantify and communicate a wider range of co-benefits to emphasize the importance of conservation programs.

Recommendations

Colorado WaterWise

As a non-profit organization representing Colorado's water conservation community, Colorado WaterWise intends to use these findings to better serve our members and to improve the value of our offerings to conservation professionals. In particular, Colorado WaterWise is evaluating how we can better support small-to-medium sized public water systems that are located outside of the Front Range and Denver Metro areas and that lack the resources of larger utilities.

The study revealed several new actions that Colorado WaterWise should take to help utilities deliver effective conservation programs:

1. Demonstrate the return on investment (i.e. cost-benefit) of different conservation programs. Start with detailed case studies of high-savings programs and policies to help small providers build their conservation programs.
2. Develop, share and train providers on standardized methodologies for measuring water savings.
3. Develop relationships with and consider financially supporting professional organizations that monitor water legislation and help interpret the impacts of pending legislation.
4. Support water professionals by writing messaging on the importance of conservation for a utility management audience. This could be done through the Live Like You Love It campaign.
5. Enhance education of community leaders, including utility directors, city council members, county commissioners, and other decisionmakers.
6. Provide a clearinghouse of conservation programs offered by different service providers.
7. Recruit members and board members from small water systems and regional entities across the State to improve the representativeness of our organization.
8. Provide support to the State in improving conservation data quality and making data more accessible.

Colorado WaterWise will address a number of these objectives through a project kicking off in 2022 to update the 2010 Guidebook of Best Practices for Municipal Water Conservation in Colorado (Colorado WaterWise and Aquacraft, Inc., 2010). The updated guidebook will include best conservation practices, case studies for large and small water systems, and information about quantifying water savings and other co-benefits.

We will also evaluate whether it is feasible and useful to repeat this study in future years to demonstrate forward progress in delivering conservation programs across the State. Recommendations for future surveys include:

- Send the survey only to community water systems or rework the survey questions to be suitable to a wide range of water systems.
- Clarify the unit of measure for number of conservation staff (e.g., full-time equivalents versus number of contract, seasonal, part-time, and full-time staff).
- Rework or remove the conservation budget question. Respondents were not clear on the unit of measure. This question in future surveys should include an example and should be modified to be more specific, for example to specify budget spent on conservation programs rather than staff time and benefits. A further refinement could break down conservation program budgets by direct (e.g., rebate programs) and indirect (e.g., education) water savings programs.
- Remove the questions about water efficiency plans. The survey responses were unreliable. The data can be obtained directly and reliably from CWCB's document retrieval system (Colorado Water Conservation Board, 2021b).
- Revisit the list of conservation program types to be more comprehensive.
- Revisit and refine as needed the comprehensive planning and zoning code questions to better reflect this

- emerging strategy for demand management.
- Include improving water and stormwater quality as co-benefits of water conservation.
- Broaden alternative water supply questions beyond centralized reclaimed water supplies to include raw water, rainwater harvesting, and graywater.
- Consider a different incentive for taking the survey. Of five survey respondents selected to receive a free registration to the Colorado WaterWise Annual Symposium, none claimed the incentive.

Water Providers

This study reinforces that providers need assistance, including experienced staff and funding, to build and run effective programs. Some ideas to help utilities deliver programs when they lack budget or staff include delivering conservation programs on a regional basis under the umbrella of a regional water authority (such as Colorado River Water Conservation District, Northwest Colorado Council of Governments, South Metro Water Supply Authority) or wholesaler (such as Northern Water); utilizing third-party, non-profit vendors that can then be subsidized through grant programs; forming partnerships to cost-share staff and programming (Diringer & Shimabuku, 2021); and focusing on programming or policy-making that requires little staff time after implementation.

Because multiple respondents mentioned political and public support, it would be beneficial for providers to share talking points to better make the case for conservation projects. In addition to more facts, conservation professionals need training in persuasive communication techniques and fostering behavior change. We recommend that water providers:

1. Develop and publish a water efficiency plan that includes quantitative and qualitative conservation goals. Take into consideration water savings, co-benefits, and community benefits. Small providers may not have the need to publish a full water efficiency plan, but they would benefit from setting conservation goals and a site-scale plan addressing equipment and fixture upgrades, maintenance, and conservation practices.
2. Measure program impacts with a consistent methodology.
3. Build communication between water conservation staff and land use planners into work plans so staff can work alongside each other to achieve common goals.
4. Share conservation data, success stories, and learning moments so that water providers can do better together.
5. Band together to form regional collaboratives to extend the reach of conservation program and achieve economies of scale.
6. Share ideas with Colorado WaterWise, the American Water Works Association, and other professional organizations when you see opportunities for incentives and technical assistance.
7. Work with the State to connect local and statewide conservation planning efforts.

New and better models are needed to encourage small water providers to develop water efficiency plans and programs. Some ideas to encourage planning include developing regional water plans and using a cohort model, where utilities move through a program together in discrete pieces to not overwhelm utility staff. For example:

- Module 1: baseline analysis of historical demands
- Module 2: setting achievable water conservation goals
- Module 3: finding your next conservation program
- Module 4: putting next year's plan into action
- Module 5: measuring the impact of the program

Regional water planning agencies such as the Northwest Colorado Council of Governments could serve as conveners of regional planning initiatives. Regional collaboratives have also been formed in Summit County and the Roaring Fork Watershed for planning and program delivery.

Local Governments

City and county governments have land use authority, including land use, zoning, and development decisions that affect water demands. Community planners therefore have an important role to play in the success of conservation programs. We recommend that local governments and community planners:

1. Coordinate with the utilities serving your community to develop, track, and report on progress towards shared goals.
2. Review long-range plans (e.g., master plans, water efficiency plans) for the utilities serving your community.
3. Integrate the utilities serving your community into relevant planning and development processes.
4. Work with the utilities serving your community to ensure water conservation is well represented and easily enacted through long-range plans and development codes.
5. Include information on your website about the utilities serving your community, including service area maps and conservation program information.

State of Colorado

Our state government, primarily through the CWCB but also through DOLA and CDPHE, has made important strides to improve statewide regulations, community planning, and grant funding to support conservation plans and programs. However, the State Water Plan makes clear there is more work to be done to ensure reliable water supplies into the future. We recommend that the State of Colorado:

1. Expand the HB10-1051 reporting requirements to cover all community water systems and improve the quality of the data submitted. This database is our best and most consistent source of conservation data.
2. Make annual water use and water conservation plan data more accessible through compiled, electronic, web-based delivery systems.
3. Work with Colorado WaterWise to analyze and interpret data to assess Colorado's conservation programs, similar to what this project has tried to initiate. Determining if conservation programs are achieving planned savings remains a knowledge gap.
4. Continue to emphasize the role and importance of conservation in closing the gap between water supplies and demands in our State Water Plan. Set a conservation goal in the Water Plan that can be calculated and tracked over time.
5. Continue to expand statewide regulations for water efficient fixtures and appliances. For example, toilet models that exceed WaterSense specifications are now available. Irrigation controllers and nozzles are not yet included in the statewide WaterSense regulations.
6. Focus on improved water conservation planning and programs for small- and medium-sized utilities. Expand technical assistance programs to support these utilities to write efficiency plans or site-scale conservation goals. The fundamental management and analysis of water use data by water providers needs additional attention.
7. Amend the water efficiency planning guidelines to include a measurement and verification process for water savings. Lead the development of a standard water savings measurement methodology for all Colorado water providers.

Glossary

Term	Definition
1051 Data	1051 Data is the municipal water usage data reported to the CWCB by water providers pursuant to House Bill 2010-1051 (State of Colorado, 2019b).
Acre-Foot	A volumetric unit used to represent water quantity, corresponding to one foot depth over one acre of area (about the size of a football field).
Community Water System	A public water system that supplies water to the same population year-round (US Environmental Protection Agency, 2021).
Convenience Sample	A convenience sample, also called a non-probability or opportunity sample, is a sample drawn without any underlying probability-based selection method. A convenience sample is not a complete enumeration of all the possible data, nor a scientific sample.
Covered Entity	Defined by the State of Colorado as retail water providers that sell 2,000 acre-feet or more on an annual basis (Colorado Water Conservation Board, 2021c).
Municipal and Industrial Water Use	Portion of distributed water attributable to uses typical of municipal systems, including residential, commercial, light industrial, non-agricultural-related irrigation, firefighting, and non-revenue water; also includes self-supplied use (not connected to a public water supply) by households and industrial operations.
Municipal Water Provider	Water utility that operates as part of a city, town, or county that has incorporated and adopted a home rule charter under Title 31 of the Colorado Revised Statutes.
Non-Transient Non-Community Water System	A public water system that regularly supplies water to at least 25 of the same people at least six months per year. Some examples are schools, factories, office buildings, and hospitals which have their own water systems (US Environmental Protection Agency, 2021).
Potable Water	Water that is treated in accordance with drinking water standards. Has the same meaning as “Finished Water” as defined in section 11.3(32) of the Colorado Primary Drinking Water Regulations, 5 CCR 1002-11 (Colorado Department of Public Health and Environment, 2019).
Public Water System	A public water system provides water for human consumption through pipes or other constructed conveyances to at least 15 service connections or serves an average of at least 25 people for at least 60 days a year. A public water system may be publicly or privately owned (US Environmental Protection Agency, 2021).
Reclaimed Water	Domestic wastewater that has received secondary treatment by a domestic wastewater treatment works (centralized system or a localized system) and such additional treatment as to enable the wastewater to meet the standards for approved uses.
Special District Water Provider	Water utility that operates as part of any quasi-municipal corporation and political subdivision organized or acting pursuant to the provisions of Title 32 of the Colorado Revised Statutes.
Transient Non-Community Water System	A public water system that provides water in a place such as a gas station or campground where people do not remain for long periods of time (US Environmental Protection Agency, 2021).
WaterSense	A product label defined by the US Environmental Protection Agency to denote low water-using fixtures and appliances (US Environmental Protection Agency, 2021).

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Appendix A: Survey Instrument

CWW Colorado Conservation Study

Time to complete: 30+ minutes

More than 2,000 utilities provide potable water service in Colorado. The Colorado Water Plan calls for us to save 400,000 acre-feet of water by the year 2050. We need to work together to achieve that savings, and we need to know where we're starting. How are these 2,000 utilities already conserving water? What is working and what isn't working?

Colorado WaterWise is a non-profit that has been serving water providers for more than 20 years. We address the State's water challenges by improving water efficiency through connecting diverse communities, creating innovative solutions, and providing valuable resources to our members.

We will use these survey results and information collected from the Colorado Water Conservation Board to draft a "State of Colorado Conservation Study" report. This report will provide a clear picture of water conservation efforts across the State. It will be available to the public on the Colorado WaterWise website.

This survey requests data on your conservation programs, budget, measured water savings, etc., which may require that you save it and return to it later as you gather information. *Please note that the terms "conservation" and "efficiency" are used interchangeably in this survey.

By taking the time to assist Colorado WaterWise with this study, you will see two benefits: A summary report with our findings and access to improved offerings from Colorado WaterWise available to members and non-members. For multiple choice questions, please highlight or underline your selection.

Section A: General Information

The following questions ask for general information about your utility.

Q1. What is the name of your utility?

Q2. What is your public water system identifier (PWS-ID)? If you are not familiar with your PWS-ID, use the ID that you include on 1051 reporting or CDPHE drinking water reports.

Q3. How many staff do you have dedicated in whole or in part to water conservation programs?

Q4. What is your annual conservation program budget as a percentage of your utility's total budget, not including staff cost? Select a percentage range.

- We do not have a dedicated budget
- <0.1%
- 0.1% - 0.5%
- 0.5% - 1%
- 1.1% - 2%
- 2.1% - 5%
- >5%

Q5. Is your utility considered a covered entity? A "covered entity" is defined by Colorado's Water Conservation

Act of 2004 as a retail water provider who sells 2,000 acre feet or more of water annually.

- Yes
- No
- It depends on the year
- Not sure

Section B: Water Conservation Program

Q6. (If you answered yes or depends to Q5) Have you submitted a 1051 report every year?

- Yes
- No
- Not sure
- Please answer why or why not:

Q7. Do you have a Water Efficiency or Water Conservation Plan?

- Yes
- No
- No, but water efficiency is included in a different plan.
- Not sure

Q8. (If you answered yes to Q7) What year was your current Water Efficiency Plan finalized?

Q9. (If you answered yes to Q7) Have you filed a Water Efficiency Plan with the Colorado Water Conservation Board?

- Yes
- No
- Not sure

Q10. What is your Quantitative conservation goal(s)? For example, "Reduce potable water use by 10% from 2010 level or achieve a water savings minimum of 15 million gallons per year." If you do not have a quantitative conservation goal, write "None."

Q11. What are your qualitative conservation goals? Select all that apply.

- Integrate water efficiency planning into overall water resource management
- Promote water efficiency techniques and technology
- Promote efficiency in new development
- Integrate water conservation into land use planning
- Educate youth on the importance of conservation
- Educate adults on the importance of conservation
- Educate businesses and institutions on the importance of conservation
- Other, please explain: _____
- We do not have qualitative conservation goals

Q12. What types of conservation programs has your utility implemented? Select all that apply.

- Rebates or cash incentives - indoor fixtures/appliances
- Rebates or cash incentives - outdoor fixtures/parts
- Water audits - indoors
- Water audits - outdoors
- Direct installation
- Turf replacements - residential

- Turf replacements - commercial
- Turf replacements - parks or city-owned property
- Education program - youth
- Education program - adult
- Ordinance - xeriscape
- Ordinance - water waste
- Ordinance - greywater reuse
- Ordinance - irrigation restrictions
- Efficiency-oriented rate structures
- Efficiency-oriented tap fee
- System water loss audits
- Others: _____
- None of the above

Q13. What conservation programs have you discontinued and why?

Q14. What barriers to implementation do you face for water conservation policies/programs? Select all that apply.

- Available resources - staff capacity
- Available resources - financial
- Available resources - technology
- Available data/information to support this type of solution
- Lack of examples of successful implementation of this program
- Public support
- Political will
- Other: _____

Q15. Which of your current conservation programs has produced the highest water savings? Please explain why.

Q16. What is challenging about measuring the water savings attributed to your conservation policy/programs?

Q17. How do your most recently measured annual savings compare to your projected/planned savings? Select one.

- Measured savings are less than projected/planned savings
- Measured savings are about equal to projected/planned savings
- Measured savings are more than projected/planned savings
- We do not measure savings
- We do not project/plan savings
- Not sure

Q18. To the best of your knowledge, what do you attribute the difference between your savings projections and your measured savings?

Q19. Do you have a centralized/utility-managed reclaimed water system?

- Yes
- No
- Not sure

Q20. (If you answered yes to Q19) For what uses does your reclaimed water system (aka recycled water or purple pipe) provide water? Select all that apply.

- Irrigation - commercial customers
- Irrigation - irrigation-only customers
- Irrigation - residential customers
- Fire protection
- Cooling systems
- Concrete work
- Dust control
- Soil compaction
- Street cleaning
- Zoo
- Other, please describe: _____

Section C: Water and Land Use

Q21. Are water conservation/efficiency policies or programs defined in the Comprehensive Plan(s) of the cities or counties in your service area?

- Yes
- No
- Not sure

Q22. (If you answered yes to Q21) What water conservation policies and techniques are listed in your city's Comprehensive Plan and/or Zoning Code? Select all that apply:

- Water conservation goals and objectives
- Urban growth boundary
- Development type - dense/cluster/reduced lot size
- Development type - mixed-use
- Development type - transit-oriented
- Water efficiency standards for new development
- Infill zoning
- Indoor fixture efficiency standards or green plumbing code
- Irrigation system efficiency requirements
- Water reuse
- Water harvesting
- Smart meters
- Submetering multifamily or commercial units
- Xeriscape requirements
- Soil quality requirements
- Turf limits
- Artificial turf
- Conservation oriented rates and fees
- Others: _____
- Not sure

Q23. Do conservation staff participate in developer pre-application meetings or development review with city/county planning staff?

- Yes
- No
- Not sure

Section D: Co-benefits of Conservation

Q24. Do you measure the co-benefits of conservation policy/programs, e.g. energy savings?

- Yes
- No
- Not sure

Q25. (If you answered yes to Q24) What co-benefits do you measure? Choose all that apply.

- Long-term cost savings for the utility
- Long-term cost savings for the customer
- Energy savings
- Water quality improvements
- Greenhouse gas emissions reductions
- Equity of programs and policies
- Wildlife benefits
- Recreational benefits
- Other: _____

Section E: Narratives

Please take a few minutes to thoughtfully answer the following questions.

Q26. How does climate change impact affect your conservation plan, goals, and/or programs?

Q27. What additional educational resources or technical assistance could Colorado WaterWise provide you?

Q28. What conservation policy or program successes from the last five years would you like to share with other utilities?

Q29. What conservation policy or program challenges from the last five years would you like to share with other utilities?

Appendix B: List of Covered Entities

The list of covered entities varies year to year based on actual retail sales. However, the following water providers have qualified as covered entities in at least one year since 2016:

Alamosa, City of	Green Mountain Water and Sanitation District
Arapahoe County Water and Wastewater Authority	Hill Crest Water District
Arvada, City of	Ken-Caryl Ranch Water District
Aspen, City of	Lafayette, City of
Aurora, City of	Lakehurst Water and Sanitation District
Bancroft-Clover Water and Sanitation District	Lamar, City of
Bear Creek Water and Sanitation District	Left Hand Water District
Boulder, City of	Little Thompson Water District
Breckenridge, Town of	Littleton, City of
Brighton, City of	Longmont, City of
Broomfield, City and County of	Louisville, City of
Canon City, City of	Loveland Water and Power
Castle Rock, Town of	Montrose, City of
Castlewood Water & Sanitation District	Morgan County Quality Water District
Centennial Water and Sanitation District	Mount Werner Water and Sanitation District
Central Weld County Water District	North Table Mountain Water and Sanitation District
Cherokee Metropolitan District	North Washington Street Water and Sanitation District
Cherry Creek Valley Water and Sanitation District	North Weld County Water District
Clifton Water District	Northglenn, City of
Colorado Springs Utilities	Pagosa Area Water and Sanitation District
Commerce City	Parker Water and Sanitation District
Consolidated Mutual Water Company	Pinery Water and Wastewater District
Cortez, City of	Platte Canyon Water and Sanitation District
Craig, City of	Pueblo West Metropolitan District
Denver Water	Pueblo, Board of Water Works of
Durango, City of	Saint Charles Mesa Water District
Eagle River Water and Sanitation District	Security Water and Sanitation District
East Cherry Creek Valley Water and Sanitation District	South Adams County Water and Sanitation District
East Larimer County Water District	Southeast Englewood Water District
Englewood, City of	Southgate Water and Sanitation District
Erie, Town of	Southwest Metro Water and Sanitation District
Estes Park, Town of	Sterling, City of
Evans, City of	Superior, Town of
Firestone, Town of	Thornton, City of
Fort Collins, City of	Tri-County Water Conservancy District
Fort Collins-Loveland Water District	Trinidad, City of
Fort Lupton, City of	Upper Eagle Regional Water Authority
Fort Morgan, City of	Ute Water Conservancy District
Fountain, City of	Westminster, City of
Glenwood Springs, City of	Wheat Ridge Water District
Golden, City of	Widefield Water and Sanitation District
Grand Junction, City of	Willows Water District
Greeley, City of	Windsor, Town of

Appendix C: Denver Water Distributors

Outside the City and County of Denver, Denver Water provides water service through contractual relationships with distributors (Denver Water, 2021):

- **Total Service:** Under Total Service contracts, Denver Water owns the water system and is responsible for its operation, maintenance, and replacement. Denver Water reads each customer's meter and bills each customer at the "Total Service" rate. In Total Service Areas, water service is provided to the customers in the same manner as that provided to customers inside Denver.
- **Read and Bill:** Under Read and Bill contracts, the distributor owns and is responsible for construction, operation, maintenance, and replacement of its water system into which Denver Water delivers water. Denver Water reads the meter of each customer and bills each customer at the "Read and Bill" rate.
- **Master Meter:** A Master Meter distributor owns and is responsible for construction, operation, maintenance, and replacement of its water system. Denver Water delivers water to the distributor through one or more master meters and bills the distributor at the "Wholesale (Master Meter)" rate. The Distributor reads the meters and bills individual customers according to rate schedules established by the Distributor.

Table 8. Denver Water Distributors

Covered Entities	Non-covered Entities
Master Meter Accounts	
Bancroft-Clover Water and Sanitation District	Alameda Water and Sanitation District
Cherry Creek Valley Water and Sanitation District	Bonvue Water and Sanitation District
Consolidated Mutual Water Company	Bow Mar Water and Sanitation District
Green Mountain Water and Sanitation District	Cherry Creek Village Water District
Ken Caryl Ranch Water and Sanitation District	City of Edgewater
Lakehurst Water and Sanitation District	City of Glendale
North Washington Street Water and Sanitation District	City of Lakewood
Wheat Ridge Water District	Crestview Water and Sanitation District
Willows Water District	High View Water District
	Meadowbrook Water District
	North Pecos Water and Sanitation District
	South Adams County Water and Sanitation District
	Valley Water District
	Willowbrook Water and Sanitation District
Read & Bill	
Bear Creek Water and Sanitation District	Colorado Department of Natural Resources
Platte Canyon Water and Sanitation District	County Homes Metropolitan District
Southgate Water District	Lockheed Martin Space System Company
Southwest Metropolitan Water and Sanitation District	North Lincoln Water and Sanitation District
Willows Water District	Phillips Petroleum Company
	South Sheridan Water and Sanitation District

Table 8 continued

Covered Entities	Non-covered Entities
Total Service	
City of Littleton	Alameda Water and Sanitation District
Castlewood Water and Sanitation District	Bennett Bear Creek Farms Water and Sanitation District
Colorado Academy	Berkeley Water and Sanitation District
Southeast Englewood Water District	Cherry Hills Heights
	Cherry Hills North Water and Sanitation District
	City of Cherry Hills Village Water District
	City of Greenwood Village
	City of Sheridan
	Columbine Water and Sanitation District
	Devonshire Heights Water and Sanitation District
	Fehlmann Subdivision Water Association
	Galleria Metropolitan District
	Grant Water and Sanitation District
	Havana Water and Sanitation District
	HI-LIN Water and Sanitation District
	Hillcrest Water and Sanitation District
	Holly Hills Water and Sanitation District
	Holly Mutual Water Company
	Lochmoor Water and Sanitation District
	Loretto Heights Subdivision Water Association
	Mansfield Heights Water and Sanitation District
	Panorama Park Water Association
	South University Place Water Association
	Southwest Plaza Metropolitan District
	Southwest Suburban Denver Water and Sanitation District