PLAN, CONSERVE, DEVELOP, AND PROTECT UTAH'S WATER RESOURCES

Utah's Regional M&I Water Conservation Goals

November 2019

Prepared for:

UTAH DNR WATER RESOURCES

Prepared by:

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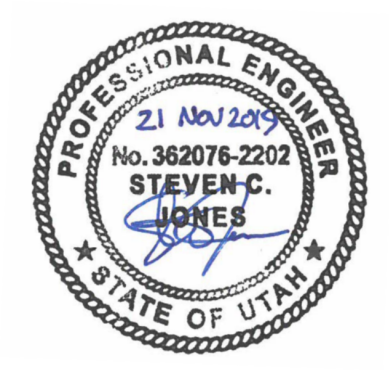
UTAH'S REGIONAL M&I WATER CONSERVATION GOALS

Prepared for:
Utah Division of Water Resources

Prepared by:
Hansen, Allen & Luce, Inc.
Bowen Collins & Associates, Inc.



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PREFACE

The 2030 water conservation goals in this report will require significant effort, increased attention, participation and funding from the legislature, state agencies, municipal water retailers, local elected officials, wholesale public water suppliers and citizens of Utah.

Depending on the approaches taken and water user behavior, costs for achieving the targets associated with the recommendations in this report are estimated in the range of $1.4 billion of capital cost. An important aspect of covering these costs will be who pays for the costs, what the relationship is between the cost and use of water, and how the capital costs of conservation net against not yet identified conservation savings and the price of increasing water scarcity.

The goals require the state and its municipalities to increase water pricing, establish and enforce water use ordinances, encourage broader adoption of existing water technology, as well as secure additional funding to reach the target water use levels.

These efforts fall on all those who have the authority to implement the measures recommended in this report, including but not limited to state and local elected officials in their key roles and businesses. These efforts include, but are not limited to:

1. Reducing new lot sizes, as determined by both market forces and state or local elected officials setting land use policy;
2. Adopting water efficient practices and landscaping changes, including reductions in grass, as determined by both market forces and state or local elected officials through landscaping and water restricting ordinances;
3. Installing secondary water meters and smart controllers on outdoor irrigation systems, as determined by water consumers through market forces and state or local elected officials; and
4. Increasing water pricing, as determined by municipal water retailers and state policies.

Recognizing these measures will require time to enact and implement, the state of Utah recommends a five-year flexibility period to achieve these 2030 goals.

Given the state's wholesale public water suppliers do not have the authority to regulate land use, mandate conservation practices or set end user water rates, they are tasked with providing support, recommendations, educational resources and leadership to the state as well as the municipalities and constituents in their respective service areas.

ABBREVIATIONS AND UNITS

ac	acre
ac-ft	acre-foot (325,851 gal)
AGRC	Utah Automated Geographic Reference Center
BC&A	Bowen Collins & Associates, Inc.
DNR	Utah Department of Natural Resources
DWRe	Utah Division of Water Resources
ET	evapotranspiration
ft	foot
ft^2	square foot
gal	gallon
gpcd	gallons per capita per day (based on permanent population)
gpm	gallons per minute
GSLAC	Great Salt Lake Advisory Council
GWSAT	Governor's Water Strategy Advisory Team
HAL	Hansen, Allen & Luce, Inc.
OLAG	Utah Office of the Legislative Auditor General
M&I	municipal and industrial [water use]
USGS	U.S. Geological Survey
yr	year

EXECUTIVE SUMMARY

Utah's Regional M&I Water Conservation Goals

PURPOSE

This project recommends regional goals and practices for municipal and industrial (M&I) water conservation. M&I includes residential, commercial, institutional (e.g., schools and parks), and industrial water use, and excludes agriculture, mining, aquaculture, and power generation. The project does not recommend a comprehensive water strategy.

PROGRESS TOWARD STATEWIDE GOAL

Utah's statewide water conservation goal has been "25% by 2025," that is, to reduce per-capita M&I water use by 25% when starting at the value estimated for 2000. Thanks to the efforts of many Utahns and their water providers, 2015 M&I per capita water use declined by at least 18% since then. Annual reporting from many individual water suppliers confirms significant progress in water conservation. According to the state's most recent data, the 2015 statewide M&I water use estimate is about 240 gallons per capita per day (gpcd). Water suppliers and users alike are commended for their efforts to reduce water use.

NEED FOR REGIONAL GOALS

While this progress is excellent, the continued growth and demand for water is not stopping. Both water conservation and development of new supplies will be necessary to meet Utah's long-term water needs. The next step—and one recommended by a legislative audit (no. 2015-01) and the *Recommended State Water Strategy*—is a suite of regional M&I water conservation goals that consider the various climates, populations, and water use practices in different parts of the state. These goals will guide the state's water industry in planning future infrastructure, policies, and programs consistent with Utah's semiarid climate and growing demand for water.

HIGHLIGHTS

- Regional M&I water conservation goals are recommended for 2030, and projections are given for 2040 and 2065.
- Utah's Municipal and industrial (M&I) per capita water use declined by at least 18% from 2000 to 2015.
- Considered together, the 2030 regional goals constitute a 16% reduction in per capita use from the new 2015 baseline.
- Several water conservation practices are recommended to help achieve the goals.
- Implementation will be an immense effort requiring funding and engagement from all Utahns.

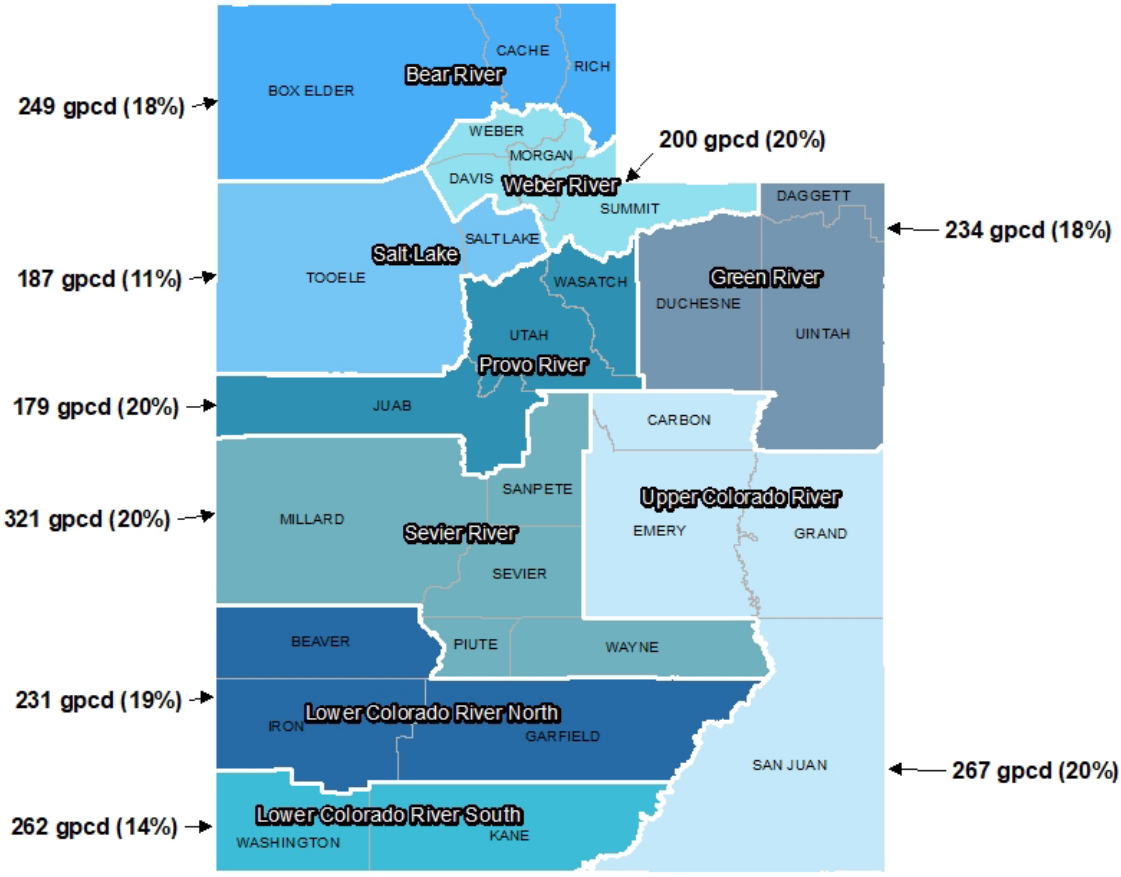
APPROACH

Recognizing its potential impact on Utahns, the project began with a large public involvement effort. An online survey collected information about water use awareness, attitudes, and opportunities from a broad audience, while a series of public open houses and interviews with key stakeholders provided more in-depth insight into the important issues. Early draft reports were circulated to several parties for review. The public process strongly affirmed the need for regional goals and guided the project team to data, perspective, and questions that improved the quality of the work.

Multiple factors were considered when determining regions, including data availability, number of regions, water use practices, similarity of climates, and the ability of the public to recognize the regions. Next, water conservation potential was developed for each region. Many variables were examined; the most influential were secondary metering, climate change, amount of turf on new properties, conversion of turf on existing properties, and conversion to high-efficiency fixtures and appliances. Scenarios were developed to characterize three levels of water conservation within each region. Water conservation practices were then evaluated on gross unit costs, potential for reducing water use, and public acceptance. Finally, combining all of these interdependent elements, the project team developed a timeline of regional water conservation goals and projections from the 2015 baseline year through 2065.

GOALS

Nine water conservation regions are proposed, along with a timeline of M&I water conservation goals and projections for each one. The 2030 values are recommended as the next goals for the State to pursue, while the 2040 and 2065 values are projected water use levels to inform future planning. Actual goals for 2040 will not be established until after evaluating progress toward the 2030 goal, and so on for future goals.



Proposed M&I Water Conservation Regions and 2030 Goals

Proposed Regional M&I 2030 Water Conservation Goals and Future Goal Projections

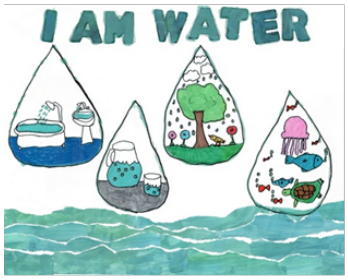
Region	2015 Baseline (gpcd)	2030 Goal		2040 Projection		2065 Projection	
		Goal (gpcd)	Reduction from 2015	Projection (gpcd)	Reduction from 2015	Projection (gpcd)	Reduction from 2015
Bear River	304	249	18%	232	24%	219	28%
Green River	284	234	18%	225	21%	225	21%
Lower Colorado River North	284	231	19%	216	24%	205	28%
Lower Colorado River South	305	262	14%	247	19%	237	22%
Provo River	222	179	20%	162	27%	152	32%
Salt Lake	210	187	11%	178	15%	169	19%
Sevier River	400	321	20%	301	25%	302	24%
Upper Colorado River	333	267	20%	251	25%	248	25%
Weber River	250	200	20%	184	26%	175	30%
Statewide	240	202	16%	188	22%	179	26%

Note M&I = municipal and industrial; gpcd = gallons per capita per day based on permanent population. Reported per-capita use includes all residential, commercial, institutional, and industrial uses averaged over the permanent population in each region.

In 2015, Utah's M&I water use was about 240 gpcd. When considering all regional results together, the resulting water use for the entire state is 202 gpcd by 2030 (16% reduction from 2015), 188 gpcd by 2040 (22% reduction from 2015), and 179 gpcd by 2065 (26% reduction from 2015). Meeting the initial 2030 goal will save nearly 165,000 acre-feet of water annually across the state.

PRACTICES

The following practices are recommended to help achieve the proposed regional M&I water conservation goals. Of necessity, these practices are limited to broad categories that may have different applications in different areas of the state. Local water suppliers, communities, and businesses are encouraged to adapt and refine these recommendations, as well as implement others, in their own water conservation efforts and in pursuit of the regional goals.



GENERAL

- **Water conservation education.** Continued emphasis and funding of education and outreach must be fundamental components of any water conservation plan.
- **Conservation pricing.** Financial impacts will help motivate water conservation. Important features are lowering base rates, increasing tiers for usage, reviewing funding sources, and using customer feedback technology.

INDOOR

- **Fixture conversion.** This will happen naturally with new construction and as old fixtures are replaced, but may be accelerated through incentives and policies.
- **Other measures.** Fixing indoor leaks and inspiring a change in indoor water use habits will reduce consumption.

OUTDOOR

- **Improved irrigation efficiency.** Secondary metering, smart irrigation controls, and drip irrigation systems will improve irrigation efficiency for any landscape.
- **Water-wise landscaping.** New construction can be water-wise from the beginning, while existing landscapes can be converted.
- **Lot size and density guidelines.** Smaller lot sizes and less irrigated area will reduce the amount of water needed outdoors in new developments.

Recommended M&I Water Conservation Practices

(Drawing at top by B. Banner from Salt Lake County)

COSTS

Achieving the goals identified in this report will require a major investment. As with past and current water conservation efforts, the costs are assumed to be borne by all Utahns; however, effective conservation strategies will closely connect water costs to water use.

IMPLEMENTATION

The pursuit of the regional M&I water conservation goals will be an endeavor of immense magnitude but is nonetheless worthwhile for the future of our state. By engaging all parts of our community —not just water suppliers—over extended time periods, this is a challenge we can meet. We can and must do better. Since changing water use behavior, policies, and technologies will become more difficult and expensive with time, prompt action on water conservation will bring the most benefit. A few starting actions are recommended here.

State and Local Policy Leaders

Policy plays a vital role in motivating and enabling water conservation. State, county, and local policy leaders should establish policies which require accountability for efficient water use. Policy leaders' support must consider universal metering, water loss control, education, and other water conservation activities, as well as the necessary funds for success. Policy leaders must also decide whether they are willing to support the necessary land use changes that will be required to reach the water conservation goals. This will include working with and being responsive to market forces to reduce both overall lot sizes for residential development and the amount of turf grass allowed. Water suppliers should be consulted in land-use decisions to ensure alignment with water conservation efforts. Policy leaders can set or influence the pricing of water to promote conservation and reflect the cost of water scarcity. State and local governments should consider the water use impacts of proposed businesses and their plans for water-efficient fixtures, landscaping, and operations before approving construction or incentives.

State Agencies

The Division of Water Resources and other state agencies should continue to support water suppliers' and end users' efforts by analyzing M&I water use data, administering funding programs, reviewing water conservation plans, and promoting education and outreach. It is recommended that the Division evaluate achievement of the 2030 goals and refine the 2040 and 2065 projections accordingly as new data, practices, and technologies develop.

Water Suppliers

Water suppliers have a public responsibility to provide sufficient, safe water to their customers and to carefully manage this invaluable resource. In fulfilling this responsibility, water suppliers are responsible for developing and implementing their own Water Conservation Plans that define local goals, practices, pricing, and accountability. This report recommends several practices which water suppliers may consider, supported by the other parties described here.

Water Users

The water conservation mindset begins with individual water users. By recognizing water as a limited resource and changing their water use practices accordingly, water users will directly impact the overall water situation and the achievement of the regional goals. All Utahns are encouraged to do their part in conserving water for Utah's future.

Chapter 1: Introduction

PURPOSE

The purpose of this project is to recommend regional boundaries, goals and practices for municipal and industrial (M&I) water conservation in Utah. The new regional goals build on the previous statewide goal. While statewide water conservation remains important, this project considers water conservation challenges and opportunities relevant to particular regions of the state.

This study does not recommend a comprehensive strategy for the funding, development, use, or management of Utah's water resources. This study will inform state water planning.

BACKGROUND

Mission of the Division of Water Resources

The mission of the Utah Division of Water Resources (DWRe or Division) is to "plan, conserve, develop and protect Utah's water resources." Per Utah Code (Title 73, Chapter 10), the Division is the water resources authority for the state. Under the Department of Natural Resources, the Division implements several programs to fulfill its mission including M&I water use data reporting, funding assistance, the State Water Plan, and water conservation planning.

Defining M&I Water Use

Using "gallons per capita per day" (gpcd) is helpful in estimating future water demand as well as tracking water conservation achievements but has limitations as a metric to compare water use efficiencies. Utah has one of the most comprehensive water use accounting practices in the nation. Unlike other cities and states, Utah counts all potable (treated), secondary (untreated), and reuse (treated wastewater) water by all users.

M&I water use includes residential, commercial, institutional (e.g., schools and parks), and industrial water use. It also includes secondary water used in municipal and industrial settings. M&I makes up about 15% of all withdrawals from Utah's natural waters (Dieter et al. 2018). M&I water use does not include agriculture, mining, aquaculture, and power generation. It also does not include water losses (i.e. leaks or unmetered uses prior to the water reaching the customer). This does not mean that these water uses are not important, only that they are not the topic of this report. It is expected that efforts will be made outside of this report to evaluate these other water uses, assess their potential for conservation, and examine how they might play a part (along with M&I water conservation) in meeting the state's future water needs.

Per-capita use is computed according to the permanent population (excluding tourist and commuter populations). Numbers used throughout this report represent total M&I water use within a region divided by the region's permanent population.

Other states and cities have reported water use differently over the years, which can make comparisons of M&I water use misleading. Just to give a few examples, Phoenix has not included multifamily housing when reporting residential water use. Phoenix, Tucson, and Santa Fe have not counted residential secondary water. Fort Collins has excluded water used by a university and by local breweries. Sacramento has counted only the consumed (depleted) portion, taking the difference between source water and wastewater. Even within Utah, some water suppliers adjust for commuter and tourist effects, as in Salt Lake City, where the "extra" people use water but are not counted in the permanent population. These different approaches have their purposes and are not inherently right or wrong. For these reasons, among others, one should not compare per-capita water uses without fully understanding the methods behind them.

Past Water Conservation Efforts

Water conservation planning has taken many forms since the Division's creation in 1967. The 1990 State Water Plan established a foundation for the state's policy on water management. The Division began discussing water conservation goals in 1994 and published its first M&I goal in 2001, which was to reduce the statewide per-capita water use in public community water systems by at least 25% by 2050 (DWRe 2001). With substantial early progress, the goal was later modified to aim for at least a 25% reduction by 2025 (DWRe 2014). The Division's 2014 plan outlined numerous strategies to achieve the goal which have since been implemented.

Progress from 2000 to 2015

According to the Division's most recent data (DWRe 2019a, 2019b), Utah's average M&I water use in 2015 was about 240 gallons per capita per day (gpcd). This represents a decrease of at least 18% from the value estimated for 2000. The Division's methods of evaluating water use have improved over the years, especially after implementing recommendations from recent legislative audits and a third-party validation, beginning with the 2015 dataset (OLAG 2015, 2017; BC&A and HAL 2018). Because of these improvements the Division has decided that going forward, 2015 will be the baseline against which M&I water conservation is measured.

Utahns have demonstrated great willingness to accept the statewide goal and conserve water. Beyond the statewide numbers, results from many water suppliers, reported in individual water conservation plans and other documents, confirm that per-capita M&I water use has trended downward. Notable efforts by water suppliers include implementing tiered rates, metering secondary water, repairing leaks, offering incentives for water-efficient appliances and landscapes, and educating the public through water conservation gardens and classes. Individual water users have improved sprinkler controls, converted turf to water-wise landscapes, and reduced irrigation frequency, while improved appliance and plumbing technology has made indoor water use more efficient. The Division sincerely appreciates the

efforts of water suppliers, engineers, legislators, advocacy groups, researchers, government officials, and other Utahns who care about water and the state as a whole.

The Current Situation

Today, Utah is among the fastest-growing states in the country. In 2016 it occupied the top position at 2.0% growth over one year, and now falls just behind Idaho and Nevada at 1.9% (U.S. Census Bureau 2016, 2017, 2018). Utah also happens to be among the driest states in the country in terms of its annual precipitation. Its water resources are finite and, as in many parts of the world, their future is uncertain. As Utah's population continues to grow, so will its demand for water. As such, water development and water conservation should be considered in parallel.

A 2015 legislative audit recommended, among other actions, a regional approach to water conservation goals (OLAG 2015). In 2017, after a multi-year effort, the Governor's Water Strategy Advisory Team (GWSAT) released its *Recommended State Water Strategy*. The first strategy concerns water conservation and recommends numerous actions.

In October 2018, as this project was underway, Gov. Gary Herbert declared a state of emergency due to drought (O'Donoughue 2018). Persistently dry conditions and low reservoir levels have affected Utahns across all industries from agriculture to urban water supply. "The drought is at a level unseen for many years and will not be solved with a small series of storms. In some areas, the drought is at, or near historic levels," Herbert said. Mike Styler, former executive director of the Utah Department of Natural Resources, suggested that the situation prompts a new focus on water conservation. "We can't control precipitation, but we can find opportunities to decrease our water use all year long," he said.

Even with significant progress in water conservation and planning, Utah still has much to learn and much to do. As reaffirmed by the recent drought, water conservation must still be part of the state's overall water strategy, in wet years as well as dry years. While water conservation will not solve all the problems of water supply and demand, it will help bridge the gap and establish sustainable practices consistent with our semiarid climate and fast-growing population.

The Need for Regional Goals

One of the limitations of a statewide water conservation goal is that it blurs the importance of local differences. Utah is a large state with diverse terrain, climates, populations, development patterns, and attitudes that affect what water is available and how it is used. In fact, by 2010, two river basins had already achieved the State's previous goal of a 25% reduction in per capita water use and two others were very close, indicating that some regions have more potential to conserve water than others (OLAG 2015). The *Recommended State Water Strategy* (GWSAT 2017) acknowledged these complications.

The next step (and one recommended by legislative audits and the *Recommended State Water Strategy*) is to take a finer view of water conservation that considers each region's characteristics, challenges, and opportunities as they relate to water.

This project recommends M&I water conservation boundaries, goals, and practices relevant to nine regions of Utah. It is not meant to diminish past efforts or discourage additional efforts by local water suppliers and city governments, whose role in water conservation is more immediate. It will, however, offer a more balanced view of M&I water conservation with regional specificity and inform future actions to fulfill the Division's ongoing mission and plan for Utah's future.

OTHER USES OF WATER

While focusing on M&I water use, the project team acknowledges other major uses of Utah's water, particularly agricultural and environmental (Figure 1-1).

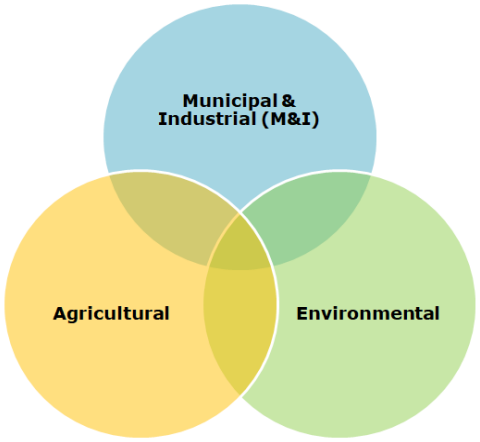


Figure 1-1: Major Uses of Water in Utah
(Graphic not proportional to actual use by category)

Agriculture supports a significant portion of the state's economy outside the Wasatch Front and those residents' livelihoods. It constitutes about 70% of Utah's water diversions (Dieter et al. 2018). Those in the agriculture industry face trade-offs involving irrigation efficiency, local food production, and land development, just to name a few. Continued support for agriculture is a key component of the *Recommended State Water Strategy* (GWSAT 2017).

The need for water in natural systems is likewise important. The Great Salt Lake, for example, controls dust, increases snowfall, supports wildlife, and provides substantial economic value through recreation, mineral extraction, and brine shrimp harvesting (Bioeconomics 2012). Declining lake levels are adversely affecting these functions. As Utah's demand for M&I water continues grow, water for environmental needs must be evaluated. Dealing with water for natural systems is a key policy question in the *Recommended State Water Strategy* (GWSAT 2017).

While conservation is obviously an important part of the state's overall water strategy, determining the balance between these several water uses is beyond the scope of this project.

AUTHORIZATION

This project was recommended by the Legislative Auditor General (report no. 2015-01, "A Performance Audit of Projections of Utah's Water Needs," Chapter 3) and procured through the State of Utah Division of Purchasing (Solicitation #AS18135, conducted by the Division of Water Resources). The consultant team of Hansen, Allen & Luce and Bowen Collins & Associates was selected and began work under contract with the State of Utah in July 2018.

TEAM

The project team consisted of the following individuals. External stakeholders listed in Appendix E also contributed.

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Chapter 2: Public Involvement

PURPOSE

Water conservation is an issue that touches everyone. From policymakers to water suppliers to individual customers, everyone has some stake. For the regional water conservation goals to succeed, the public must be able to inform the process. To this end, the project team devised a series of outreach activities to support the project.

METHODS

The American Society of Civil Engineers' Policy Statement 139, "Public Involvement in the Decision Making Process," states:

> In a period of enhanced awareness about the long-term effects that technical aspects of all types of engineered projects have on the lives of individuals, there is public concern for the environment, there is recognition that capital is limited and must satisfy competing demands, that technology is changing at a rapid rate, and that natural resources have finite limits. Effective public decision-making requires that a wide variety of viewpoints be assessed.

The statement also encourages public involvement through public and social media information, public meetings, presentations, discussions of alternatives, and explanations of the impact of potential decisions.

Considering the need to assess various viewpoints on water conservation, the project team planned and executed three stages of outreach activities: an online survey, open houses, and stakeholder interviews. Each successive stage moved from broad and brief to deep and focused as depicted in Figure 2-1. These activities allowed the project team to receive comments on the challenges, opportunities, and other considerations for regional water conservation goals.

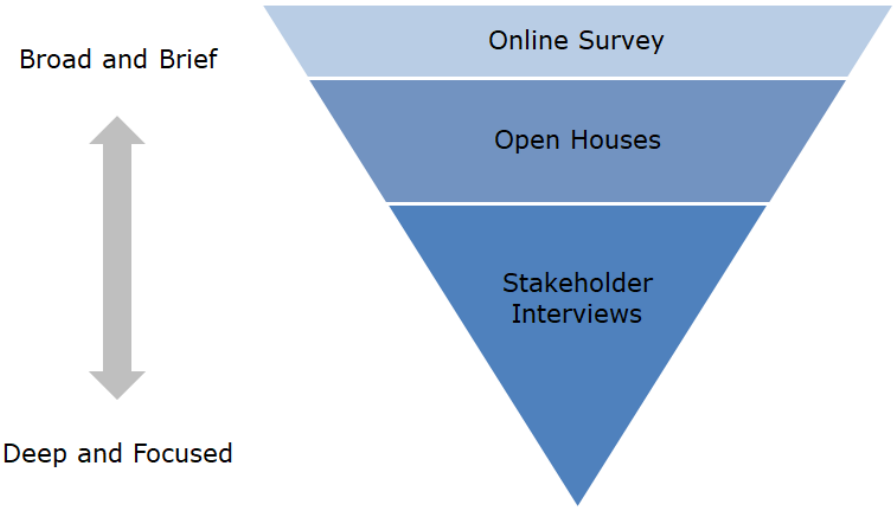


Figure 2-1: Public Involvement Activities

Online Survey

In order to provide an opportunity for the broader public to provide input on the regional water conservation goals, the project team developed an online survey. The survey sought information on respondents' regions, age ranges, lot sizes, water use awareness, water use practices, and attitudes and ideas concerning water conservation. The complete survey questions are presented in Appendix A. The survey ran during September and October 2018 and collected 1,655 responses. Figure 2-2 shows the beginning of the survey.

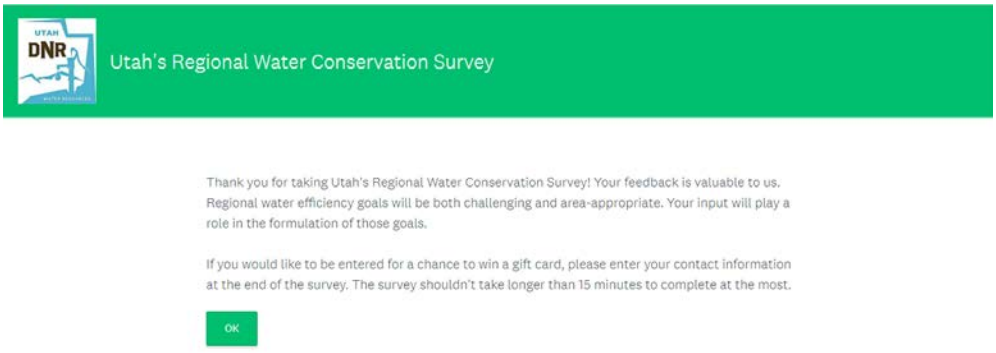


Figure 2-2: Portion of Online Survey

Open Houses

Eight open houses were held during September and October 2018 in Vernal, Provo, St. George, Richfield, Moab, Clearfield, Murray, and Logan. In these informal public meetings, members of the project team guided visitors through a series of posters explaining the history, purpose, and approach of developing the regional water conservation goals. Copies of materials used for the open houses are contained in Appendix C. These events, held in public spaces like libraries and

schools, provided an opportunity for visitors to weigh in on the issues and ask questions while project team members listened and took notes. Figure 2-3 shows one such open house. Over 100 people attended the open houses. About 30 water professionals also participated in a similar session held during the annual conference of the Intermountain Section of the American Water Works Association in Midway, Utah. While the number of people attending open houses was not nearly as great as those completing the online survey, the depth and quality of interaction was excellent. Most participants stayed for 30 to 60 minutes to discuss water issues and provided valuable comments. Their comments are presented in Appendix D.

Figure 2-3: Open House in Murray

Stakeholder Interviews

The project team interviewed dozens of key stakeholders in the water profession to obtain more in-depth insight about their experiences, concerns, and recommendations relating to water conservation. These included managers of water conservancy districts; officials from state agencies; state legislators; leaders of advocacy groups; and a selection of survey respondents representing water systems, city councils, and other associations throughout Utah. A list of interviewees is found in Appendix E. These interviews occurred in person or by phone in October and November 2018. Their comments are presented in Appendix D. The same stakeholders also had an opportunity to review multiple drafts of this report prior to public comment.

RESULTS

Online Survey

Insights from the online survey are summarized here. Full results are included in Appendix A.

- Residential irrigation—About 55% of respondents said they use drinking water, 29% pressurized irrigation/secondary water, and less than 2% use ditch water to irrigate their home landscapes. Some use a combination of the above.
- When asked how important water conservation in Utah is on a scale of 1 to 7 (7 being very important), respondents answered 6.4 on average. However, the average rank of their community's willingness to conserve water was only 4.1, indicating a perceived gap between recognition and action.
- "Sustainability" was the top reason people indicated why water conservation is important. Other prominent answers included "Helping supply future generations with water" and "Because waste is not OK." Saving money and delaying future water projects were deemed less important. Text responses to this question frequently mentioned Utah's desert climate or limited water resources.
- About 83% of respondents believed most water savings are possible outdoors.
- On average, respondents were willing to transition 56% of their landscapes to water-wise plants or features.
- About 12% of respondents indicated that a local policy restricts the kind of landscapes they can have. Text responses to this question indicated that these policies usually involve homeowners' associations requiring turf and limiting other options.
- Participants believed that education and information are the barriers for water conservation in Utah, rather than incentives or leadership.
- Of the surveyed group, 9% were business owners, 11% were water professionals, and 5% were policy leaders.
- Business owners indicated that the main reason for them to conserve water was to save money. The same business owners reported that 54% of them maintain their own landscapes, while 23% use a third party. The rest do not have a landscape to manage.
- Policy leaders, on average, ranked the importance of water conservation to their constituents at 4.9 out of 7, which contrasts with the previous result of 6.4 out of 7 when respondents gauged themselves.

To summarize, most participants are over 30 and live in single-family homes on lots less than one-third of an acre. They mainly irrigate using drinking water or secondary water. They are largely unaware of the amount of water they are using, but still believe that water conservation is very important. Participants believe that sustainability is the most important reason to conserve, rather than saving money. Respondents said they are willing to change half of their landscapes (on average) to water-wise plants, and almost all believe that outdoor water use is the best water conservation opportunity. Business owners are motivated by cost savings of water conservation. Participants believe that a lack of education and information is the greatest barrier to water conservation in Utah.

The findings from the survey were used to inform the goals, practices, and recommendations described later.

Open Houses and Stakeholder Interviews

Several common themes emerged during open houses and interviews with key stakeholders (Figure 2-4). The most frequent comments concerned landscaping practices, water use culture, feedback on draft goals, data management, water supply limitations, and water rates. Complete comments are provided in Appendix D.

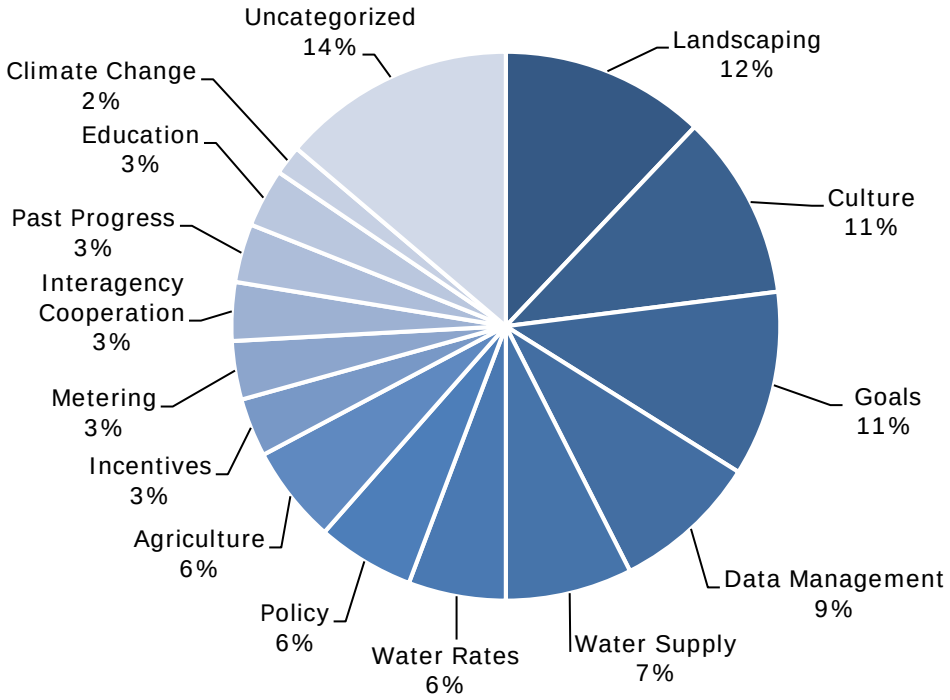


Figure 2-4: Comment Frequency

After synthesizing the various comments and considering their impact on this project, the project team identified the following key concerns. They are addressed briefly here and more fully elsewhere in the report where possible.

1. How do we get credit for water conservation from 2000 to 2015?
Most Utahns have embraced the state's past water conservation goal, contributing to a reduction of at least 18% in per-capita M&I water use since 2000. The results of individual water suppliers confirm that M&I water use has indeed trended downward since that time. Still, there is much to accomplish with new and continued efforts. Water suppliers should continue to monitor their progress and report their results through their water conservation plans (required for many water systems) and other means.

2. How do we move from cool-season turf grasses to more locally appropriate landscapes?
Utahns are accustomed to cool-season turf landscapes for reasons of convenience, familiarity, expense, and ease of maintenance. This type of landscape, however, is not the only option. While other locally appropriate landscapes may initially cost more and require maintenance

activities different than those the public is most familiar with, cities and water suppliers can promote them through development policies, incentives, metered pricing, and education. It will require a cultural shift but will come with time.

3. How do we fund water?
There are real costs associated with developing, conveying, treating, and using water, and much of Utah's existing water infrastructure is aging, requiring significant investments to replace it. There are also real costs associated with developing water supplies and infrastructure to provide "public good" benefits to Utahns, such as flood control, recreation, fire protection, environmental enhancements, and adding value to land through water supply entitlements. Water suppliers have water funding sources that include user charges, impact fees, and property taxes. While this report does not analyze or recommend the philosophy and means of funding these various water services, governments and water agencies can look for opportunities where a greater portion of water delivery system costs can be repaid through user charges, while not disturbing critical funding sources for other water services. With new water resources becoming more difficult and expensive to develop, increased price signals can motivate water conservation in Utah.

4. Why set goals by region?
The recent legislative audits (mentioned in Chapter 1) recommended that the Division develop regionally relevant water conservation goals to replace the single statewide goal. This will improve the state's ability to plan and will offer better guidance at a local level. Too many or too few regions, however, would complicate the process. Several other considerations for defining the regions are presented in Chapter 3.

5. The goals are too aggressive or not aggressive enough.
The method of developing the goals, described throughout this report and particularly in Chapters 4 and 5, involved many stakeholders and considerable research. The process was scientific wherever possible, even while acknowledging uncertainty. As demographics, technology, conditions, and behaviors change, the goals will be reevaluated. Recognizing that uncertainty increases with time, the results have been presented for three time periods—2030, 2040, and 2065. The 2030 result will be the goal for each region and will be the primary focus for action over the next decade. The 2040 and 2065 projections will provide guidance for planning and future expectations. As 2030 approaches, it is expected that the 2040 and 2065 projections will be revisited and modified as dictated by future conditions.

6. How is cost being considered?
Gross unit costs for various water conservation practices are considered in Chapter 5. The project team recognizes that water conservation of the magnitude proposed here is not free and that the costs must be acknowledged in order to secure funding for implementation. The project team also recognizes that as water becomes scarcer, the costs of water will increase, which poses implications for the fiscal attractiveness and viability of various water conservation strategies. Thus, while the costs provided in this report are useful starting points for comparing and prioritizing various conservation practices, a full analysis of the net costs and benefits of

individual water conservation practices and how these practices should be implemented in each region is beyond the scope of this report. It is expected that water providers in each region will consider both the information contained in this report along with the unique circumstances of their systems to identify the most cost-effective approaches to conservation.

7. How is water supply being considered?

Some regions of the state have abundant water supplies and may perceive little or no reason to conserve M&I water when compared to others. Still, water resources are finite and have many other uses for agriculture and the environment. Further, an attitude of “doing your part to conserve” benefits local communities and the state in many ways.

Chapter 3: Regional Water Conservation Boundaries

PURPOSE

The previous statewide M&I water conservation goal was a necessary step. The next step is a finer, regional approach that considers the unique characteristics of certain parts of the state and their potential and ability to conserve water. This chapter describes the selection of water conservation regions for this purpose.

METHODS

The approach to defining the water conservation regions was multifaceted and iterative. As the analysis, potential, goals, and public outreach progressed, potential regions were reviewed according to the following qualitative and quantitative criteria:

- **Ease of communication.** Since the regional goals concern the public, the regions must be easy to communicate and the public must be able to easily recognize the regions. This suggested counties as a starting point, rather than hydrologic basins or some other less familiar designation.
- **Number.** Too many regions would complicate the project, increase the effort required, and, if the regions approached the size of counties or cities, overlap with the plans and goals of local water suppliers. Too few regions would obscure important local differences and offer only minimal improvement over a statewide goal.
- **Similar characteristics.** Counties were characterized in terms of water use, water needs, population, climate, demographics, topography, and numerous other variables described in Chapter 5. Counties with similar characteristics were considered as potential regions.
- **Geographic contiguity.** Neighboring counties were considered as potential regions.
- **Data adequacy.** In counties with few or very small public community water systems, water use and related data may not be sufficient to justify a county-specific goal. This necessitated grouping some counties to improve the adequacy of data.
- **Similar goals.** As the water conservation goals developed throughout the project, counties with similar goals were considered as potential regions.
- **Open house locations.** The project team desired to hold an open house (described in Chapter 2) in each proposed region. The planning and scheduling of these events informed the regional definitions.

All of these criteria were reviewed multiple times as the project progressed, considering the various results and how to balance the criteria, until the ultimate regions below were selected.

RESULTS

The nine groups of counties shown in Figure 3-1 constitute the M&I water conservation regions. Water conservation potential, goals, and practices presented in the following chapters are considered for each region individually.

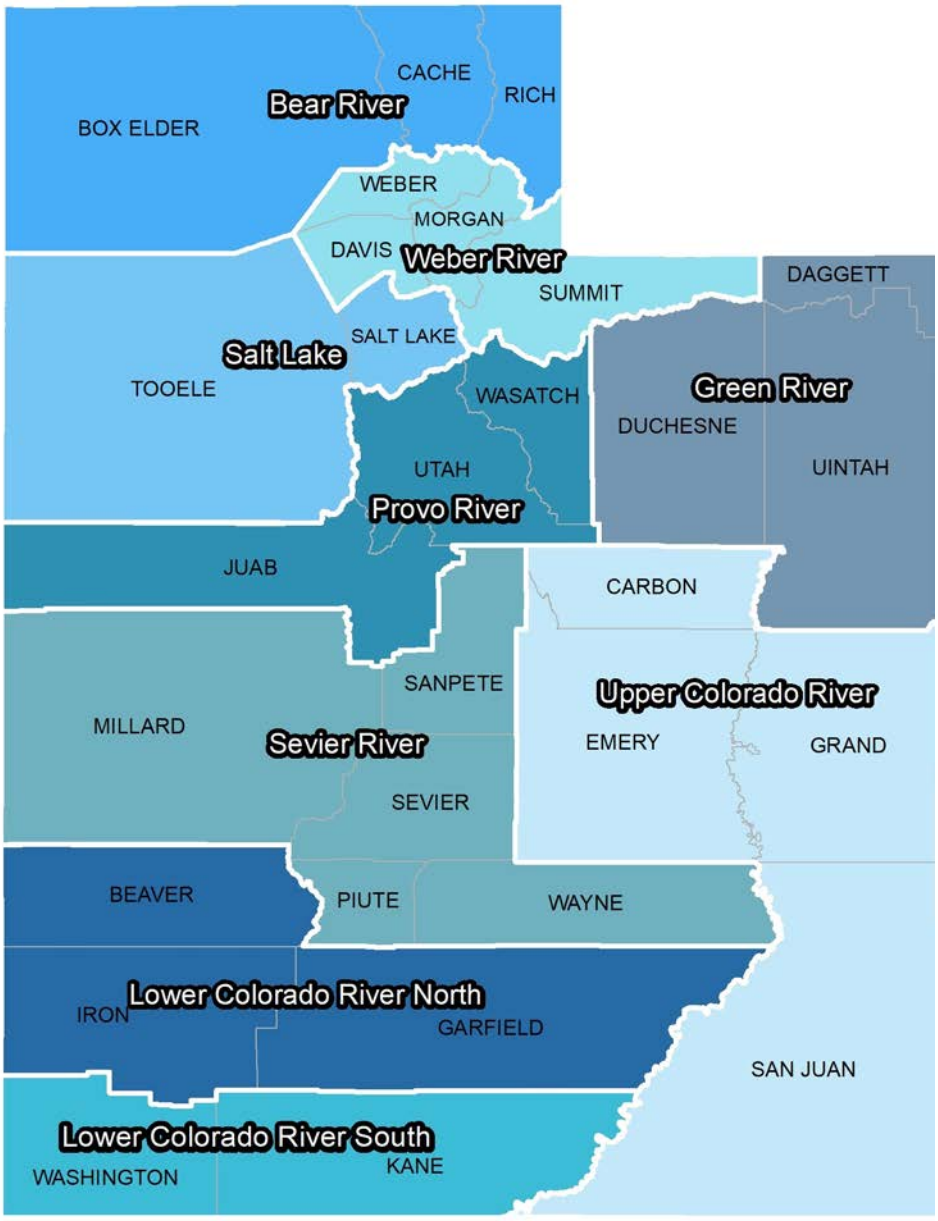


Figure 3-1: M&I Water Conservation Regions

Chapter 4: Regional Water Conservation Potential

PURPOSE

Before regional water conservation goals can be defined, water conservation potential must first be evaluated to estimate the amount of water that could realistically be conserved throughout Utah. The purpose of this chapter is to identify projected M&I water use by region for various irrigation and indoor water use scenarios. Water conservation potential should not be confused with goals. *Potential* seeks to understand what water use *could be* given an assumed set of variables that affect water use patterns. *Goals* seek to decide what water use *should be* by examining potential and additional considerations relative to community values, economics, feasibility, etc.

METHODS

Current M&I Water Use

To determine water conservation potential and project future M&I water use, a thorough analysis of the current statewide use has been completed. Figure 4-1 summarizes the statewide M&I water use by type (DWRe 2019a, 2019b).

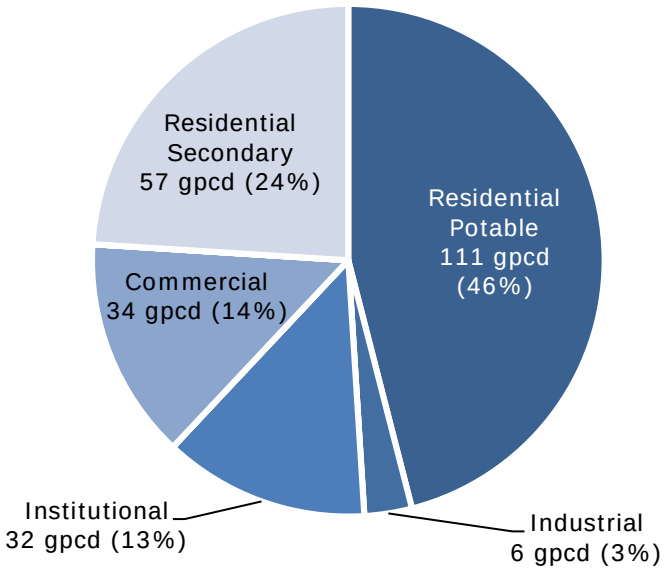


Figure 4-1: Statewide M&I Water Use by Type

As shown in the figure, M&I water use data assembled by DWRe includes a breakdown between several different types. This information is also available for individual counties throughout the state. Considering the amount of each type of use will be important when evaluating potential throughout the State.

Future M&I Water Use and Conservation Potential

When projecting future water use and conservation potential, it is important to understand that water users' choices regarding water use will be influenced by a complicated combination of factors. As represented in Figure 4-2, there are two broad types of factors that can instigate changes in how water is used:

- **Market and Social Trends** – Independent of any deliberate policy actions, there are market and social trends that affect how water is used in the state. An example of this is the observed shift in recent years toward smaller lot sizes (both as a result of increasing land prices and consumers desire for lower maintenance properties). As lot sizes decrease, outdoor water use will also naturally decrease (on a per lot basis), even without further intervention from policy leaders. Individual components within these market and social trends can result in either decreasing water use or increasing water use depending on the nature of the trend.
- **Policy Interventions** – Policy makers can also initiate strategic changes in policy to instigate changes in water use. Several examples of policy changes are shown in Figure 4-2, but these are not meant to be a comprehensive representation of potential policy interventions.

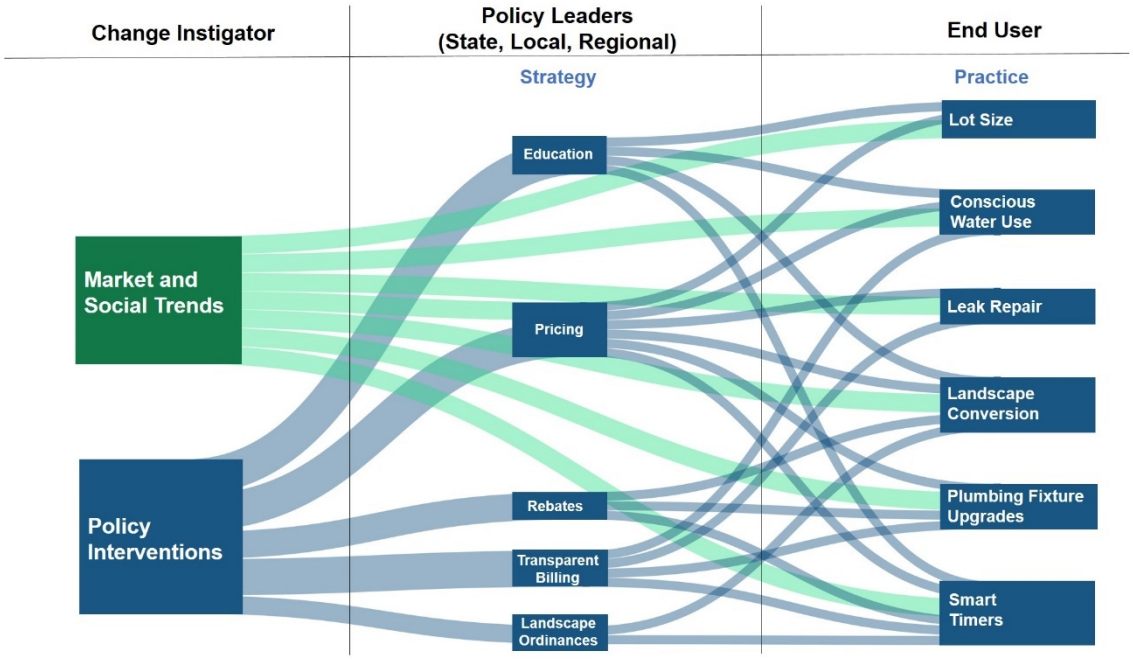


Figure 4-2: Change in Future M&I Water Use

Because of the interrelated nature of these several factors, it is difficult to isolate the conservation potential of any one single policy. Instead, conservation potential calculations must focus on the resulting conservation practices and how their implementation will affect water use. It then becomes the task of policy leaders to identify the best combination of policies to implement practices that achieve the desired change in water use.

With this understanding, the remaining sections of this chapter examine individual conservation practices in different categories of water use and how policy interventions might be used to change the water use in that category. For each category of water use, multiple policy options will be established. Included in each group of options will be a baseline scenario. Because of market and social trends, as well as past and ongoing conservation efforts, the State has seen a significant reduction in per capita water use. As long as current conservation efforts continue, further reductions are expected. The baseline option represents expected behavior if current conservation policies continue unchanged from the recent past[1]. Beyond the baseline option, the other options included in each group represent additional policies that could be implemented to achieve additional conservation.

Policy Options for Conservation Scenarios

As part of the extensive process followed for this project, identification of policy options for analysis was achieved through a two-step process:

- **Example Conservation Scenarios for Public Outreach and Discussion Purposes –** Prior to gathering input from the community as part of the public outreach process, it was unknown what policies or practices the public and decision makers would like to see included as part of future conservation goals. This put the team in a bit of a "chicken or the egg" scenario. It was not possible to move forward on detailed conservation potential calculations without knowing which specific policies or practices to include, but it would be difficult to gather input on which policies and practices to include without understanding their potential to affect conservation.

  To overcome this challenge, the project team prepared a series of three example conservation scenarios. These scenarios looked at what conservation could be achieved in each region given a sample set of assumed water use characteristics without worrying about the specifics of what policies and practices would be used to achieve those water use characteristics. For example, one scenario included an assumption that outdoor turf would be reduced to no more than 50% of landscaped areas without trying to identify how that reduction would occur.

  While these example scenarios provided context and perspective to facilitate discussion during the public outreach and stakeholder coordination process, they have subsequently been replaced with specific policy-based scenarios (see next bullet) and will not be discussed further here. However, additional information regarding these scenarios can be found in Appendix B of this report.

[1] The baseline option should not be confused with a "Do Nothing" option. Doing nothing will not sustain the conservation momentum achieved to this point. The baseline option will still require significant time and investment in education, regulation, and financial incentives. It just does not represent a major change from what is already occurring.

- **Policy Based Conservation Scenarios for Goal Decision Making –** With input gathered as part the public outreach phase of the project, the project team was able to assemble a list of specific policies and practices for further consideration as part of the goal setting process. This allowed the conservation potential calculations to be refined from considering only assumed water use patterns to considering specific policies and practices. The remainder of this chapter explains the policies and practices considered as part of this evaluation of conservation potential and how they are predicted to affect water use in each region.

There are many different areas where conservation policies can affect water use. For discussion purposes, the conservation policies selected for analysis have been grouped by indoor water use policies, outdoor water use policies, and density policies. The following sections of this chapter discuss each of these policy groups and what policy options have been considered in each group. After identifying the specific policy options to be considered, this chapter calculates the conservation potential associated with the implementation of the various policies. The purpose of providing this information is to provide necessary insight into the impacts of each policy so that recommended policies and corresponding conservation goals can be selected in Chapter 5.

It should be noted that residential water use will be the primary focus of discussion for all policy options. This is both because it constitutes the majority of M&I water use (70%) and because the data available to estimate conservation potential is most complete for residential use. Following discussion of residential use will be a description of how conservation potential can correspondingly be applied to all municipal and industrial user types.

RESIDENTIAL—INDOORS

Conservation policy options associated with indoor water use can be organized into the following categories:

- Faucet and Shower Head Conversion
- Toilet Conversion
- Washing Machines
- Leak Report

Faucet and Shower Head Conversion

In 2016, the Water Research Foundation (WRF) published a study which analyzed residential end uses of water (DeOreo et al. 2016). This study found that the most significant reduction in indoor water use in recent years has been accomplished through conversion to higher-efficiency fixtures and appliances. Over the past few years, higher-efficiency fixtures and appliances have become progressively standardized. Indoor residential water use is expected to continue to be reduced over time as older fixtures and appliances wear out and are replaced.

One area where significant progress has already been made in fixture replacement is faucets and shower heads. It is estimate that 80% of existing fixtures nationwide currently meet high efficiency standards (less than 2.5 gpm per fixture, DeOreo et al. 2016). With this in mind, two policy options have been identified relative to faucet and shower head fixture replacement.

- **Baseline –** Under the baseline scenario, it is assumed that adoption of high efficiency fixtures in existing development will occur at roughly the natural replacement rate (i.e. the replacement rate of the fixture based on its expected life span). For new development, federal regulations (Energy Policy Act of 1992) require the use of high-efficiency fixtures in this category. Thus, the adoption rate of high efficiently fixtures in new development is expected to be 100%.
- **Policy Option F1, Aggressive Faucet and Shower Head Conversion Efforts –** Because of the relatively widespread adoption of high efficiency faucets and shower heads, there is limited potential for making major changes in this category. However, policy makers could pursue aggressive incentive programs or water rate increases that could accelerate conversion. This option assumes policies are adopted to accelerate fixture replacement to twice as fast as the rate of natural replacement.

Fixture conversion rates associated with each policy option are summarized in Table 4-1.

Table 4-1: Fixture Conversion Rates (Faucets and Shower Heads)

Baseline – Proportion of Households with High-Efficiency Faucets and Shower Heads

	Current	2030	2040	2065
Existing Development	80%[1]	89%	94%	98%
New Construction	-	100%	100%	100%

Policy Option F1 – Proportion of Households with High-Efficiency Faucets and Shower Heads

	Current	2030	2040	2065
Existing Development	80%[1]	94%	97%	99%
New Construction	-	100%	100%	100%

[1] DeOreo et al. 2016

Toilet Conversion

Another area of potential fixture replacement is toilets. Toilet replacement is complicated by the fact that there are two common levels of water use that are considered high efficiency. Federal regulations require all new toilets use no more than 1.6 gallons per flush. However, there are also toilets on the market that use less than 1.28 gallons per flush (these are sometimes

referred to as ultra-high efficiency). Use of 1.6 gallons per flush toilets is widespread in Utah. Use of the higher efficiency 1.28 gallons per flush is still relatively rare. With this in mind, three policy options have been identified relative to toilet replacement.

- **Baseline –** Under the baseline scenario, it is assumed that adoption of high efficiency fixtures in existing development will occur at roughly the natural replacement rate (i.e. the replacement rate of the fixture based on its expected life span). For new development, federal regulations now require the use of high-efficiency fixtures in this category. Thus, the adoption rate of high efficiently fixtures in new development is expected to be 100%. For both new and existing replacement, it has been assumed that use of the 1.28 gallon per flush toilets will continue to grow at the same rate as observed historically.
- **Policy Option T1, Aggressive Toilet Conversion Efforts –** Policy makers could pursue aggressive incentive programs or water rate increases that could accelerate conversion. This option assumes policies are adopted to accelerate fixture replacement to twice as fast as the rate of natural replacement and that the market share of 1.28 gallon per flush toilet also grows twice as fast.
- **Policy Option T2, New Toilet Standard (<1.28 gallon/flush) –** In the future, circumstances could change to require 1.28 gallons per flush instead of the current standard of 1.6 gallons per flush. This policy option assumes that 1.28 gallons per flush becomes the new standard either through federal policy, state policy, or other factors.

Fixture conversion rates associated with each policy option are summarized in Table 4-2.

Table 4-2: Fixture Conversion Rates (Toilets)

Baseline – Proportion of Households with High-Efficiency Toilets					
		Current	**2030**	**2040**	**2065**
1.6 gallon/flush	Existing Development	61%[1]	76%	86%	93%
	New Construction	-	94%	92%	87%
1.28 gallon/flush	Existing Development	2%[1]	3%	4%	5%
	New Construction	-	6%	8%	13%
Policy Option T1 – Proportion of Households with High-Efficiency Toilets					
		Current	**2030**	**2040**	**2065**
1.6 gallon/flush	Existing Development	61%[1]	86%	91%	94%
	New Construction	-	94%	92%	87%
1.28 gallon/flush	Existing Development	2%[1]	4%	4%	5%
	New Construction	-	6%	8%	13%
Policy Option T2 – Proportion of Households with High-Efficiency Toilets					
		Current	**2030**	**2040**	**2065**
1.6 gallon/flush	Existing Development	61%[1]	52%	47%	23%
	New Construction	-	0%	0%	0%
1.28 gallon/flush	Existing Development	2%[1]	37%	48%	76%
	New Construction	-	100%	100%	100%

[1] Utah DWRe estimate

Washing Machine Conversion

Another area of potential fixture replacement is washing machines. While replacement of washing machines is not currently a very cost-effective way of saving water[2], movement toward high-efficiency washing machines[3] has been observed over the last decade due to many advantages (water savings, power savings, improved cleaning performance, etc.). Federal energy efficiency requirements have also made it more difficult to get good performance from top-loading machines that use more water. As a result, many manufacturers and consumers are moving toward lower-water-use, front-loading machines. With this in mind, two policy options have been identified relative to washing machine replacement.

[2] Cost of replacing washing machines is relatively high when compared to the amount of water saved. See Chapter 5.
[3] Defined as machines using less than 25 gallons per load compared to 40 gallons or more historic

- **Baseline –** Under the baseline scenario, it is assumed that adoption of high efficiency washing machines in existing development will occur at roughly the natural replacement rate (i.e. the replacement rate of the fixture based on its expected life span). For new development, it is assumed that use of high-efficiency washing machines will be a little higher than existing. This is because many people moving into new homes will be buying new washing machines as well. Because of the advantages listed above, it is expected that the market share for higher efficiency machines will be relatively high.
- **Policy Option W1, Aggressive Washing Machine Conversion Efforts –** Policy makers could pursue aggressive incentive programs or water rate increases that could accelerate conversion. This option assumes policies are adopted to accelerate washing machine replacement to twice as fast as the rate of natural replacement. While this policy option has been included for discussion purposes, it does not appear to be a very logical option to implement because of the relatively low cost effectiveness of washing machine replacement as a way of saving water.

Washing machine conversion rates associated with each policy option are summarized in Table 4-3.

Table 4-3: Fixture Conversion Rates (Washing Machines)

Baseline – Proportion of Households with High-Efficiency Washing Machines

	Current	2030	2040	2065
Existing Development	46%[1]	75%	85%	98%
New Construction	-	80%	90%	98%

Policy Option W1 – Proportion of Households with High-Efficiency Washing Machines

	Current	2030	2040	2065
Existing Development	46%[1]	88%	93%	99%
New Construction	-	90%	95%	99%

[1] DeOreo et al. 2016

Leak Repair

The final areas of indoor water use considered as part of this analysis is indoor leaks and other water waste. On the surface, most water users will indicate that they strongly support the elimination of leaks and indoor water waste. However, how diligently water users move toward making progress in these areas will likely depend on issues such as the cost of water and community perception toward water scarcity. With this in mind, two policy options have been identified relative to leak repair.

- **Baseline –** Under the baseline scenario, it is assumed that progress in leak repair and elimination of other indoor water waste will be limited. While separating out these types of water savings is difficult based on the available data, recent decreases in observed indoor water use appear to be primarily the result of fixture conversion as previous discussed. Thus, the baseline scenario for this area of water use assumes only moderate savings based on expected education and rate increase typical of historic trends.
- **Policy Option I1, Aggressive Leak Repair Efforts –** Policy makers could pursue aggressive water rate increases and education programs that could accelerate leak repair. This option assumes policies are adopted to accelerate leak repair to 2.5 times as fast as the baseline rate. Because leak repair and water waste can vary significantly from home to home, it is expected that these types of savings may be difficult to obtain and rate increases and other programs will need to be very aggressive to achieve this level of water savings.
- **Policy Option I2, Theoretical Maximum Leak Repair Efforts –** In all of the previous indoor water use areas, at least one policy option has been included that reaches full (or very nearly full) projected water savings by 2065. To provide a similar scenario in the area of leak repair, this policy option has been included. While a useful policy for comparison purposes, it should be emphasized that increasing leak repair to this level would be extremely difficult. It would likely require detailed and expensive leak location programs and crisis level water pricing to achieve.

Realization of water savings associated with each leak repair policy option are summarized in Table 4-4.

Table 4-4: Water Savings Associated with Leak Repair

Baseline – Percent Reduction in Wasted Water Associated with Leaks			
Current	**2030**	**2040**	**2065**
-	6%	10%	20%
Policy Option I1 – Percent Reduction in Wasted Water Associated with Leaks			
Current	**2030**	**2040**	**2065**
-	15%	25%	50%
Policy Option I2 – Percent Reduction in Wasted Water Associated with Leaks			
Current	**2030**	**2040**	**2065**
-	30%	50%	100%

RESIDENTIAL—OUTDOORS

Outdoor residential water use is the largest single category of municipal water use, averaging 108 gpcd or approximately 45% of statewide municipal use (DWRe 2019a, 2019b). Based on the size of this category alone, it should not be a surprise that that there is substantial potential for further water conservation outdoors by the state's residents. It is expected that outdoor water conservation will be affected by at least three different factors: 1) increases in water application efficiency through changes in water users' behavior and equipment, 2) changes in landscaping, and 3) changes in the sizes of our properties (i.e. development density). The following sections discuss each of these factors.

Increases in Efficiency

Irrigation efficiency is the ratio of water needed by vegetation to the amount of water actually applied through irrigation. For the purposes of this study, irrigation efficiency is defined as the evapotranspiration rate for a given area (as defined by Lewis and Allen [2017]) divided by metered outdoor water use[4]. Inefficient irrigation practices result in a significant waste of water due to leaks, overwatering, watering outside of planting beds, and irrigating in the rain. Currently, irrigation efficiency for metered connections in individual counties ranges between 50% and 70% with the average overall efficiency for the state estimated to be just over 63% based on collected water use data (DWRe 2019a). While this represents notable improvement from past irrigation practices (estimated to be around 50% efficient statewide), there is obviously still room for improvement.

For the purposes of this analysis, increases in irrigation efficiency are expected to change through two primary mechanisms. First, one of the most effective ways shown to increase efficiency is through the metering of secondary connections (BC&A and HAL 2018). Second, irrigation efficiency can be considerably improved simply by adjusting irrigation systems to correlate with seasonal evapotranspiration (ET) rates (DWRe 2014).

Secondary Metering

Unmetered secondary irrigation connections have been shown to use about 50% more water than metered connections (BC&A and HAL 2018). This additional water use is excess water applied above and beyond the evapotranspiration needs of landscapes. Thus, adding secondary meters is an area that has shown great potential to reduce waste and increase irrigation efficiency. Unfortunately, progress in this area has been limited as a result of initial construction costs and customers' resistance to losing access to unlimited "free" water. With this in mind, two policy options have been identified relative to secondary metering.

[4] Irrigation efficiency should not be confused with the coefficient of uniformity in an irrigation system. The coefficient of uniformity (sometimes called "distribution uniformity") is a measure of how equal (or unequal) the application rates are for various delivery devices. It is often expressed as a ratio in decimal form ranging from 0 to 1 but is sometimes expressed as a percentage which can lead to it being confused with irrigation efficiency. Distribution uniformity is an important part of irrigation system performance, but is only one factor in overall irrigation efficiency.

- **Baseline –** In the 2019 legislative session, there was significant discussion of requiring all secondary connections to be metered by the year 2030. Although this requirement was not ultimately adopted, an alternative bill (Senate Bill 52) did adopt a requirement that all new secondary connections be metered and that each irrigation system prepare a plan for eventually metering existing connections as well. Based on these requirements, this baseline scenario assumes that metering of existing connections will match the historic trend for metering but that the rate of metering in new development will be 100%.
- **Policy Option M1, Required Secondary Metering –** Policy makers could choose to return to the original concept of requiring all secondary connections to be metered. If this were done, it would still take some time to meter all existing connections, but implementation would likely be much faster than under the current requirement. This option assumes a fixed deadline for metering is established and that adequate assistance is provided to finance the required improvements.

Secondary metering rates associated with each policy option are summarized in Table 4-5.

Table 4-5: Secondary Metering Rates

Baseline – Proportion of Secondary Connections that are Metered

	Current	2030	2040	2065
Existing Development	2%	4%	7%	18%
New Construction	-	100%	100%	100%

Policy Option M1 – Proportion of Secondary Connections that are Metered

	Current	2030	2040	2065
Existing Development	2%	70%	100%	100%
New Construction	-	100%	100%	100%

Irrigation Efficiency

At an average irrigation efficiency rate of just over 63%, it is clear that even metered connections can do much better in effectively applying water to their landscape. Some studies include results that show it is possible to reach 100% irrigation efficiency in demonstration gardens and other controlled settings (Sun et al. 2012). However, due to limitations of time, training, and interest, there is likely a practical limitation on how close the average residential water user can get to 100% efficient. For the purposes of this analysis, it has been estimated that the maximum average efficiency that can be obtained using sprinkler systems is 70% and

that the maximum average efficiency that can be obtained using drip irrigation systems is 80%. These numbers should be viewed with the understanding that additional efficiency will always be the goal, but significant additional savings based on average efficiency across a region is unlikely. With this in mind, two policy options have been identified relative to irrigation efficiency.

- **Baseline –** As noted previously, average irrigation efficiency has improved from around 50% in 2000 to 63% in 2015. This improvement has been achieved through current conservation efforts (education and outreach, tiered rates, etc.). It is assumed that a similar rate of improvement in efficiency can be obtained in the future as long as current conservation efforts continue.
- **Policy Option E1, Aggressive Irrigation Efficiency Improvements –** Policy makers could pursue aggressive water rate increases and education programs that could accelerate efficiency improvements. This would likely need to include improved incentives for water controller improvements, more aggressive tiered rates and significant increases in education and outreach funding. This option assumes policies are adopted to accelerate efficiency improvements to twice as fast as the baseline rate.

Because of the difference in efficiency between sprinkler systems and drip irrigation systems, the maximum efficiency (or “best expected” efficiency”) that can be achieved by any given county or region will vary depending on its mix of turf (assumed to be predominantly sprinkled) and water wise plantings (assumed to be predominantly drip irrigation). For example, the best expected efficiency for the state as a whole based on its current landscape mix is 72%. However, this is expected to increase as changes to landscaping patterns increases the amount of water delivered through drip irrigation systems. Thus, instead of reporting irrigation efficiency for each policy option based on absolute irrigation efficiency, Table 4-6 reports the ratio of irrigation efficiency to the maximum expected based on the landscape mix. These ratios have been grouped into a few broad geographical categories for comparison purposes.

Table 4-6: Irrigation Efficiency

Baseline – Ratio of Efficiency to Best Expected

	Current[1]	2030	2040	2065
Wasatch Front/Population Centers	0.88	0.93	0.96	0.98
Wasatch Back/Rural Areas	0.82	0.90	0.94	0.98
Southern Utah	0.92	0.96	0.97	0.99

Policy Option E1 – Ratio of Efficiency to Best Expected

	Current[1]	2030	2040	2065
Wasatch Front/Population Centers	0.88	0.98	1.0	1.0
Wasatch Back/Rural Areas	0.82	0.97	1.0	1.0
Southern Utah	0.92	0.99	1.0	1.0

[1] DWRe records

Change in Landscaping

In addition to changing how much water is applied to landscapes, the landscape appearance can also change. Historically, most Utah residential landscapes have consisted of cool-season turf grasses[5] irrigated with sprinkler systems. While this type of turf has some benefits (provides excellent play areas, requires maintenance activities that homeowners are familiar with, etc.), it generally requires more water than other landscaping options. This has been documented in a number of different studies. A couple of local examples include:

- *Jordan Valley Water Conservancy District Stud*y (Jackson et al. 2003)—The Jordan Valley Water Conservancy District Demonstration Gardens located in West Jordan feature a variety of residential demonstration gardens. Each garden has a water meter to monitor water use. Table 4-7 shows the water applied to each landscape area after establishment.

[5] It will be noted that turf grasses are extremely variable in terms of water requirement. Warm-season species and even some varieties of cool-season species can have much lower irrigation water requirements than traditional Utah lawns. For simplicity, this report will use the term “cool-season turf grass” to refer to the higher-water-use types of turfs traditionally used for landscaping, but the reader should be aware that not turf grasses fall under into this category.

Table 4-7: JVWCD Demonstration Garden, Total Water Applied to Each Landscape Area 2001–2002

Landscape Type	Landscape Description	Total Seasonal Water Applied (Inches)
Homeowner Average	2000–2002	50
Demonstration Garden	Theoretical Evapotranspiration for Turf at Garden Location	21.9
Traditional Landscape	Primarily Bluegrass	21.2
Harvest	Combination of turf, planting beds and hardscape with a focus on garden areas.	16.55
Perennial Garden	Combination of turf, planting beds and hardscape with a focus on flowering perennials.	15.85

The results of this study conclude that the amount of water used in the perennial and harvest gardens is significantly lower than the amount of water used in a traditional landscape primarily composed of traditional cool-season turf.

- *Water- Efficient Urban Landscapes: Integrating Different Water Use Categorizations and Plant Types. (Sun et al. 2012)*—This study analyzed the water use of various landscape types at the Utah State University Botanical Center located in Kaysville, Utah. The study found that the water use in landscapes composed of predominantly native and climate adapted landscape plants irrigated by drip irrigation systems was approximately 40% of the required irrigation for cool season turf grasses irrigated with sprinkling systems. Even within the turf grass category, there are options for lower-water-use turf than have been traditionally used in the state.

Based on these findings, it is clear that the types of plants we grow, the density at which they are planted, and the type of system used to irrigate them can all have a major effect on the amount of water needed outdoors. A switch from traditional cool-season turf grasses and sprinkling systems to perennials, lower water use grasses, shrubs, and trees with drip irrigation systems can save significant water. Choosing native and climate adapted landscape plants can save even more. Based on these general conclusions, water conservation potential scenarios for residential landscaping practices were developed as described below.

- **Baseline –** Through education efforts and market forces, some movement has been observed over the last 15 years away from cool season turf grasses. This baseline scenario assumes that this gradual trend away from cool-season turf grasses will continue at approximately the same rate as historic.
- **Policy Option L1, Aggressive Landscape Conversion Efforts –** During public open houses, many residents expressed a desire to move toward more efficient landscapes but had not done so yet because of various barriers including cost, local landscaping regulations, less familiar maintenance requirements, limited availability of water wise

plants, etc. Policy makers could focus on implementing policies to reduce or remove these barriers. This would likely include increased conservation education budgeting, providing incentives for cool-season turf reduction, aggressive tiered rates for outdoor water use, and working with communities to implement conservation friendly landscaping ordinances. This option assumes policies are adopted to accelerate movement away from landscaping with cool-season turf grasses to twice as fast as the baseline rate.

- **Policy Option L2, Aggressive Restrictions in Landscape Ordinances for New Construction –** Despite policy makers best efforts, the comparatively high cost of landscape conversion (see Chapter 5) will limit how quickly conversion will happen in existing landscapes. It will be much more cost effective to focus on reducing cool-season turf for new construction. This option assumes that all policies associated with Option L1 and in place and that landscape conversion rates for existing properties are the same as Option L1. Additionally, it assumes that landscaping ordinances or other policies are implemented that include a firm restriction on the utilization of cool-season turf for new properties. Maximum cool-season turf rates would vary based on location – 20% for counties in southern Utah, 35% for the Wasatch Front and other population centers, and 50% for the Wasatch Back and rural areas.

Cool-season turf utilization rates associated with each policy option are summarized in Table 4-8. These values are reflected as a percentage of total irrigated area (not to be confused with percentage of total lot size). It is assumed the remainder of the irrigated area will be landscaped with water-wise plantings. This could include any combination of perennials, lower-water-use grasses, shrubs, trees, or additional hardscape such that total water use is 40% of the water required in the higher-water-use cool-season turf grass areas.

Table 4-8: Cool-Season Turf Grass Utilization

Baseline – Percent of Irrigated Area Landscaped with Cool-Season Turf Grasses					
		Current[1]	**2030**	**2040**	**2065**
Existing Development	Wasatch Front/Population Centers	69.1%	67.6%	67.0%	65.7%
	Wasatch Back/Rural Areas	65.3%	64.0%	63.4%	62.2%
	Southern Utah	34.8%	34.4%	34.3%	33.9%
New Development	Wasatch Front/Population Centers	-	64.7%	62.8%	58.8%
	Wasatch Back/Rural Areas	-	61.4%	59.6%	55.9%
	Southern Utah	-	33.7%	33.2%	32.1%
Policy Option L1 – Percent of Irrigated Area Landscaped with Cool-Season Turf Grasses					
		Current[1]	**2030**	**2040**	**2065**
Existing Development	Wasatch Front/Population Centers	69.1%	65.8%	62.5%	57.5%
	Wasatch Back/Rural Areas	65.3%	62.3%	59.4%	54.7%
	Southern Utah	34.8%	34.0%	33.1%	31.8%
New Development	Wasatch Front/Population Centers	-	59.1%	49.3%	34.3%
	Wasatch Back/Rural Areas	-	56.4%	47.6%	33.5%
	Southern Utah	-	32.2%	29.7%	25.8%
Policy Option L2 – Percent of Irrigated Area Landscaped with Cool-Season Turf Grasses					
		Current[1]	**2030**	**2040**	**2065**
Existing Development	Wasatch Front/Population Centers	69.1%	65.8%	62.5%	57.5%
	Wasatch Back/Rural Areas	65.3%	62.3%	59.4%	54.7%
	Southern Utah	34.8%	34.0%	33.1%	31.8%
New Development	Wasatch Front/Population Centers	-	35.0%	35.0%	35.0%
	Wasatch Back/Rural Areas	-	50.0%	50.0%	50.0%
	Southern Utah	-	20.0%	20.0%	20.0%

[1] DWRe analysis

Changes in Development Density

Over the past few decades, Utah's historically rural landscape has rapidly transformed and developed in some areas. As Utah continues to grow, development density continues to change

and can significantly affect outdoor water use. Not all water suppliers can explicitly control density decisions that would allow density to be used as a conservation tool (e.g., water districts and private water companies do not generally have direct input in land use decisions). However, some water suppliers do regulate land use (e.g., cities that provide their own water) and changes in density are a reality that must be reflected in the water conservation potential calculations and corresponding goals.

Changes in development density can be broken down into two categories: 1) decreasing household size and 2) decreasing lot size.

1. **Decreasing household size—**Population data from the Kem C. Gardner Policy Institute at the University of Utah projects that Utah's household size has been decreasing steadily over the last couple of decades and will continue to decrease with time (Kem C. Gardner Policy Institute 2017). The statewide average household size is currently 2.94 persons per household, a decrease from the 2010 average of 3.09 persons per household. It is estimated that by the year 2065, average household size will decrease to 2.57 persons. For the purposes of this study, it has been assumed that future household sizes will be as projected by the Kem C. Gardner Policy Institute.

   Household size is important because it affects the amount of residential landscape associated with each person. If residential lots continued to develop at the average lot size of the past but household size decreased, then the amount of irrigated acreage per person would increase over time. However, lot size is not expected to stay the same as discussed in the next section.

2. **Decreasing lot size—**Along with household sizes, lot sizes throughout Utah have also been decreasing over the last several decades. There are likely many factors contributing to smaller lots sizes, but three of the most influential appear to be land availability, smaller lot preferences, and an increasing number of multi-family units:

   - **Land availability—**As counties continue to urbanize and expand, the amount of developable land continues to decrease. As a result, there is not enough land available to accommodate for future growth using historic average residential lot sizes. Counties like Salt Lake and Davis are necessarily seeing reductions in lot size simply based on availability of developable land.
   - **Smaller lot preferences—**Recent development trends have confirmed that Utah's residents have generally been moving away from larger lot sizes toward smaller lots sizes that are more affordable and take less time to maintain. There is no reason to believe this trend will change in the foreseeable future.
   - **Increasing Number of Multi-family Units –** In addition to single family lot sizes decreasing, there are an increasing number of Utah residents opting for multi-family housing units, especially in urban areas where affordability is becoming a challenge for younger households.

Based on these factors, decreases in lot size are expected in all areas of the state, but especially in urbanized areas along the Wasatch Front. Table 4-9 shows percent reduction in lot size used in the conservation potential calculations. It should be emphasized that "average lot size" in this case refers to the total residential area developed divided by the total number of residential units in each county, including multi-family units. It should not be interpreted as the average lot size for single family homes only.

Table 4-9: Reduction in Average Lot Size by County

County	2015 Average Lot Size (ft^2)	2015 Average Landscaped Area Per Lot (ft^2)	2030 Reduction in Lot Size	2040 Reduction in Lot Size	2065 Reduction in Lot Size
Beaver	16,234	8,117	7%	10%	14%
Box Elder	15,264	8,759	8%	11%	15%
Cache	12,805	7,770	12%	17%	24%
Carbon	12,149	6,075	4%	6%	9%
Daggett	11,419	5,710	0%	0%	0%
Davis	10,652	6,156	9%	13%	18%
Duchesne	13,882	6,941	5%	7%	9%
Emery	17,725	9,330	7%	10%	16%
Garfield	21,763	10,881	1%	1%	1%
Grand	12,713	6,356	9%	12%	16%
Iron	11,577	5,789	10%	13%	18%
Juab	17,986	9,109	12%	16%	20%
Kane	19,014	9,507	3%	3%	4%
Millard	25,875	12,938	6%	9%	13%
Morgan	21,033	10,704	14%	18%	21%
Piute	24,523	12,262	2%	2%	3%
Rich	20,150	10,075	3%	5%	7%
Salt Lake	8,463	4,239	7%	10%	14%
San Juan	14,607	7,304	16%	22%	29%
Sanpete	19,913	9,957	9%	12%	17%
Sevier	18,020	9,010	8%	11%	15%
Summit	16,063	8,031	6%	8%	11%
Tooele	12,138	6,069	14%	18%	22%
Uintah	16,889	8,445	8%	12%	17%
Utah	13,154	6,577	17%	23%	31%
Wasatch	19,113	10,294	13%	16%	19%
Washington	11,852	5,926	17%	22%	28%
Wayne	28,648	14,324	2%	3%	5%
Weber	11,880	6,828	10%	13%	18%
Statewide Average	11,300	5,899	10%	14%	19%

Lot size reductions are based on the following assumptions:

- Salt Lake and Davis Counties do not have enough developable land to sustain growth at their current lot sizes. As a result, density changes in these two counties are simply based on the required reduction to limit development to available land. This results in lot size reductions of 14% in Salt Lake County and 18% in Davis County. These values are based on 80,000 developable acres left in Salt Lake County and 30,000 developable acres left in Davis County. Utah and Weber Counties would also approach full development of available property at current lot sizes by the end of the planning window (2065) but don't quite reach it.
- For other counties with population centers (Cache, Utah, Washington, and Weber), it has been assumed that all future development will average no more than 7,280 square feet, the projected average lot size in Salt Lake County at buildout. In other words, all new development in these counties will look like average densities in developed areas along the Wasatch Front.
- For all other counties, it has been assumed that the decrease in lot size will be exactly enough to offset the projected decrease in household size. In other words, lot sizes will decrease such that the amount of landscaped space per person stays the same.

Resulting Residential Outdoor Water Conservation Potential

Based on the several factors above, residential outdoor water conservation potential can be calculated. Internal to this calculation are several components worth discussion in some detail:

Evapotranspiration Rate

Evapotranspiration (ET) rates are used to measure the amount of water needed in a landscape. Evapotranspiration occurs when water is moved from soil to the atmosphere by evaporation and from plants to the atmosphere by transpiration. Put simply, ET is essentially the minimum amount of water needed to grow plants. ET is generally measured in units of inches of water per year. To identify the amount of water saved associated with increasing efficiency and as a result of changing residential landscapes, a baseline for ET rates across the state needed to be established.

ET rates for each county have been calculated based on data developed by Lewis and Allen (Lewis et al. 2017). This study looked at vegetation water use variability throughout the state as a result of seasonal weather conditions and air temperature variations. From this raster data, zonal statistics were computed over the water systems' service areas in each county (DWRe 2015) and weighted by area to obtain the representative value for the county. In other words, the variable used for each county represents the area-weighted average of the water systems in that county.

Potential Climate Change Impact on Evapotranspiration

One issue of concern for many water suppliers is climate change and its potential impact on the irrigation needs of landscapes. Water resources planning, including conservation, must acknowledge a changing climate both past and future.

Dendrohydrology analysis (reconstructing past hydrologic conditions by examining tree rings) indicates that streamflow in the Weber River was most stable in the 20th century, while the centuries before showed much greater variability of extended wet and dry periods (Bekker et al. 2014). A similar analysis of the Bear River indicates that the latter half of the 20th century was the second-wettest period of the past 1200 years (DeRose et al. 2015). Both findings imply that future water conditions could be more uncertain than the recent past.

In Utah, the projected effects by 2050 relative to present conditions include a temperature increase of 2.3 °F, an 8-day lengthening of the irrigation season, reductions in mountain snowpack (shift from snow-dominated to rain-dominated hydrology), and peak runoff occurring one month earlier (Kunkel et al. 2004; Barnett et al. 2005; Gillies et al. 2012; Kunkel 2013; EPA 2015; Forsyth and Schultz 2017; Khatri et al. 2018; USGCRP 2018). There is of course considerable uncertainty, but these values constitute representative projections for a variety of likely climate scenarios. See Figure 4-2.

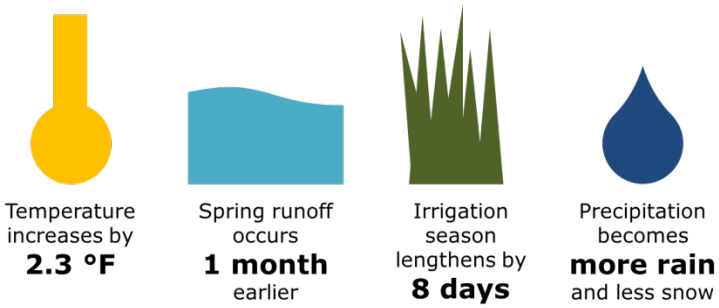


Figure 4-2: Climate Change Impacts in Utah by 2050

All of these effects have implications for water conservation. First, the increasing temperatures and longer irrigation seasons will demand more water for the same uses (especially outdoor) relative to today. Second, less snowpack and earlier runoff will limit available water supplies. While not directly affecting water demand, a limited supply will motivate further water conservation.

Because of the significant uncertainty associated with climate change projections, the impact of these changes on ET are equally uncertain. Ranges of expected increases in ET from one recent study vary from 2% to 17% (Forsyth and Schultz 2017). For the purposes of this analysis, a 10% increase in ET rates as a result of climate change has been included in the water conservation potential calculations. It is assumed that this increase will occur linearly between 2015 and 2065.

Total Water Application

Based on the several issues discussed above, the expected average annual use of irrigation water on landscaped areas can be calculated. This calculation takes into account evapotranspiration, efficiency, lot size, changes in landscaping, and climate change.

OTHER WATER USE TYPES

Estimating water conservation potential for other types of water use is difficult because of the broad range of potential uses within each category. However, many of the principles described above will also apply to other types of use. Using this approach, water conservation potential was calculated for other types of water use as follows.

a) Commercial

Statewide, commercial water use accounted for 14% of total M&I water use in 2015 (Figure 4-1). As a result, water conservation by commercial users must be an important part of overall goals. Unfortunately, evaluating water conservation potential for commercial use is complicated by the significant variation that can be observed between different types of commercial users. Whereas most residential users have relatively similar water use needs and patterns, commercial users can be very different. For example, the water use patterns of a restaurant are very different from the water needs of an office complex.

Research on water conservation for commercial use is less available than for residential uses. Where good research does exist on certain types of commercial uses, current water use data collected throughout the state does not include enough detail to break down and analyze how this can be applied regionally. As part of future goal setting efforts, it is recommended that additional research and data collection be dedicated to this issue. Until then, it is necessary to make some simplified assumptions regarding water conservation in the commercial sector. For the purposes of this study, it has been assumed that commercial water conservation potential will be half the potential calculated for residential water use. For example, if residential water use is reduced by 10%, commercial water use is projected to be reduced by 5%. While all customer types have opportunities available to reduce water use, the commercial sector is generally more likely to already have taken some of the actions necessary to do so for various reasons. Municipal development standards throughout the state are typically more restrictive for commercial development and require water efficient fixtures and water-wise landscaping. The commercial sector also generally has more available resources to invest in water efficiency.

To check the validity of this assumption, the project team examined historical water savings in Salt Lake City, the largest retail water provider in the state and a water provider with a significant commercial customer base. A comparison of recent water use per connection (three-year average from 2016 to 2018) to historical water use per connection (2001) revealed that the conservation rate for commercial customers over the past 15 years was 54% of the conservation rate for residential customers. This is consistent with the assumption used for

calculating commercial conservation potential in this report. While only one data point, this represents a large sample size of the many different types of commercial properties being served throughout the state.

b) Institutional

One of the most important places to save water and a recommended area of focus is institutional water use. Even though institutional water use only accounted for 13% of total M&I water use in 2015, much of this water use occurs outdoors on parks, school ball fields, etc. where there is great potential for increases in efficiency. Institutional water use is also symbolic as most government properties are included in this category and looked at as an example of how state and local governments are conserving water. Therefore, water conservation by institutional users must be a priority and an important part of overall goals moving forward.

With this in mind, institutional water conservation potential has been calculated as follows:

- Indoor conservation—Indoor water use at institutions will be similar to commercial water use and has been calculated under the same assumptions as commercial. This equates to half the potential calculated for residential indoor water use.
- Outdoor conservation—This is the area of greatest potential savings for institutional use. Outdoor conservation potential for institutional considers the same general areas of savings as identified for residential use with a few adjustments:

    - Changes in Landscaping—Water savings associated with changes in landscaping assume that institutional landscaping will be modified to reduce cool-season turf grass areas to match the reductions for residential landscapes. The exception to this will be active play areas such as ball fields. It is expected that these areas will remain turf grass (although implementation of more water efficient species of grasses will still be encouraged). Outside of active play areas, movement to water-wise plantings or naturalized areas will match residential savings.
    - Increases in Efficiency—While detailed data regarding institutional efficiency is not available, it is believed that there is potential for significant improvements in this area. Correspondingly, it has been assumed that increases in institutional efficiency are expected to exceed those achieved by residents. Water savings associated with efficiency have been calculated based on approximately 50% greater increases in efficiency than those expected for residential customers as summarized in Table 4-2.

    - Changes in Density—For institutional use no decrease in lot size per person has been assumed. This approach has been used under the assumption that, as

residential lot sizes reduce and densify, the availability of public open spaces will become increasingly important to the well-being and life quality of the residents surrounding them. Thus, increases in efficiency and changes in landscape type are included in the institutional outdoor water use estimate as described above, but there is no reduction in institutional outdoor area per person.

c) Industrial

It has been estimated that industrial water use will remain constant on a per capita basis in each region and each scenario. This does not mean that water conservation is not expected from industrial customers. It is expected that resources will continue to be invested in looking for ways industrial water use can be decreased. However, this approach assumes that any reduction in water use achieved through water conservation will be made available to reinvest in industry coming into the state. This will help make water available to allow for future industrial growth to drive and sustain the economy.

Mixture of Use Types

It should be noted that all conservation potential calculations assume that the proportional mixture of commercial, institutional, and industrial development in each region will remain approximately the same moving forward. While this is a reasonable assumption for planning purposes, it is recognized that the relocation of a major industry to a region or some significant shift in the economy could change the balance of development. Since the numbers in this report are calculated on a per capita basis, this type of shift would correspondingly affect water use numbers without actual change in water use behavior. While major shifts of this nature are not expected in the short term, the mixture of use types and their effect on water conservation goals should be reexamined as part of future goal setting efforts.

RESULTS

Conservation potential for M&I water use is summarized in Tables 4-10 and 4-11. Conservation potential will obviously vary depending on which policy options are implemented from the list above. With the number of policy options identified above, there are literally hundreds of different combinations that could be implemented. Since it is not practical to report results for all of these combinations, only the two extremes are shown here. Table 4-10 summarizes water use by region for the baseline scenario in each area of water use. Table 4-11 summarizes water use by region if the most aggressive policy was implemented in each area of water use.

Table 4-10: Total Potential M&I Water Use (gpcd) by Region – Baseline Scenario[1]

Region	2015	2030	2040	2065
Bear River	304	274	261	250
Green River	284	259	250	240
Lower Colorado North	284	256	246	235
Lower Colorado South	305	278	267	258
Provo River	222	194	183	173
Salt Lake	210	197	193	187
Sevier River	400	366	349	332
Upper Colorado	333	301	288	274
Weber River	250	230	221	210
Statewide Average	240	220	211	202

[1] Baseline scenario assumes current conservation trends continue

Table 4-11: Total Potential M&I Water Use (gpcd) by Region – With All Aggressive Policy Options

Region	2015	2030	2040	2065
Bear River	304	236	221	212
Green River	284	226	215	213
Lower Colorado North	284	217	203	194
Lower Colorado South	305	246	232	222
Provo River	222	167	153	148
Salt Lake	210	177	169	161
Sevier River	400	307	284	281
Upper Colorado	333	254	236	228
Weber River	250	189	174	167
Statewide Average	240	190	178	171

These results suggest that there is significant potential to conserve water throughout the state. Though the results vary on a regional basis, the state's residents and institutional properties in particular have substantial opportunity to reduce water use both indoors and outdoors. The other municipal and industrial user types have significant potential to conserve as well and should not be overlooked as potential contributors to water conservation.

WATER CONSERVATION POTENTIAL AND ITS RELATIONSHIP TO GOAL SETTING

As discussed previously, the calculations contained here are included to provide perspective on what water use could be for a given set of policies. While it is hoped that this information will be useful in understanding regional water conservation potential, it is recognized that this is not the final step in goal setting.

With that in mind, the water conservation potential model developed here provides an important tool to begin the goal setting process. In essence, setting goals can be described as selecting which set of assumptions/policies is appropriate for each region and then calculating the corresponding water use using the potential model. The following chapter describes the process used to develop assumptions for future water use patterns and correspondingly establish regional goals.

Chapter 5: Regional Water Conservation Goals

PURPOSE

This chapter describes the approach for developing regional M&I water conservation goals and documents the results.

GOAL DEFINITION

Historically, Utah's water conservation goal has been defined as a percentage reduction from a past baseline (e.g., "25% reduction from 2000 baseline by 2025"). This definition has been easy to understand and communicate but lacks specificity as to usage, local conditions, and the effects of water conservation practices. For example, if water use decreases in one year compared to the previous year, it may be attributed to conservation, or it may be a wet year in which outdoor water demand was lower. In developing the new goals, alternative definitions were considered.

- Denver Water (2017) is specifying its goal as "the number of customers that are using water efficiently." With this approach, Denver Water is evolving "from just focusing on water savings and toward helping our customers to meet their water needs in the most efficient ways." Like a volume target, however, it is difficult to define and track for different types of users.
- The Massachusetts Water Resources Authority (2018) specifies its goal as "below the safe yield" of its water sources. With abundant water supplies admittedly unlike Utah or Denver, Massachusetts still promotes water conservation but does not focus on per-capita usage.

Ultimately, based on the outcome of the public involvement and discussions with the Division, the project team decided on a combination of the usage target and the percentage relative to the new 2015 baseline, though still averaged within each region. Such a definition is consistent with the Division's previous and forthcoming planning efforts, allows comparison with the 2015 baseline, satisfies federal reporting requirements, and offers both numbers to inform water conservation actions by water suppliers and individual users.

METHODS

The project team's approach to developing the regional water conservation goals synthesizes many of the components already presented: current water use (Chapter 1), public involvement (Chapter 2), regional definitions (Chapter 3), and water conservation potential (Chapter 4). In this chapter, the project team uses these results to develop regional goals. The steps to developing the goals are as follows:

- Identify water conservation practices (in Utah and beyond) and their associated costs.
- Based on costs and input gathered during the public involvement process, identify and prioritize water conservation practices for implementation.
- From the water conservation policy options developed in Chapter 4, select the water use policies that incorporate the identified practices for implementation.
- Using the water conservation potential model and selected policy options, calculate the regional goals.
- Develop a regression model of 2015 water use to explore important regional variations and inform the goals (Appendix G).

Each of these steps are described below. Figure 5-1 summarizes the process.

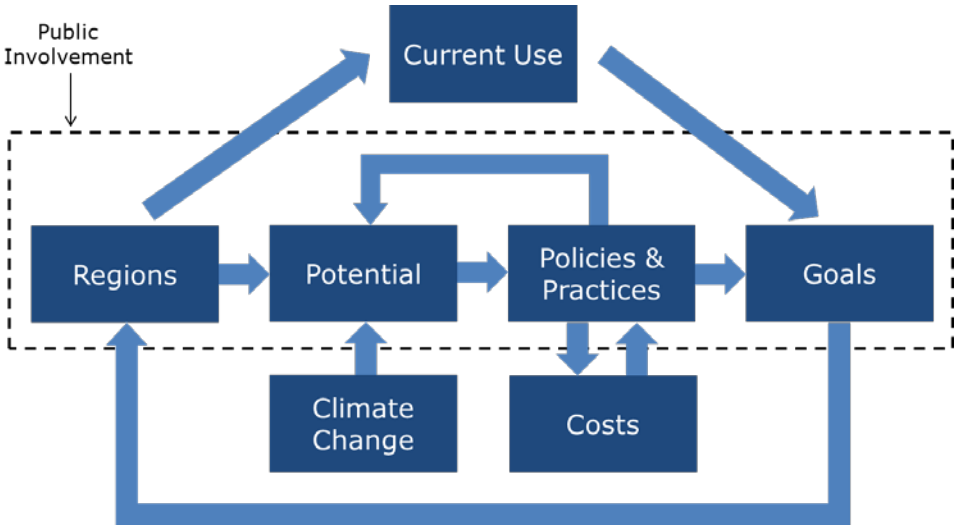


Figure 5-1: Goal Development Process

Water Conservation Practices

Possible Practices

There are hundreds of different practices that could be implemented to conserve water in Utah. This includes conservation both indoors and outdoors as well as among all different water user types. A sample of possible practices follows, obtained from a review of water conservation successes in Utah and other water-scarce places such as the southwestern U.S., Australia, and Israel (DWRe 2001, 2014; Sovocol 2005; EPA 2010; WBWCD 2013; SNWA 2014; Maddaus Water Management 2015, 2018; Siegel 2015; Edwards et al. 2016; Turner et al. 2016; LVVWD 2018). Many of these practices also came up during the public involvement process.

General

- Educate through demonstration gardens
- Provide landscaping classes
- Distribute educational booklets
- Distribute information mailers

- Create website resources
- Promote mass media messaging
- Target high residential and commercial water users
- Implement business water efficiency management plans
- Increase stakeholder coordination
- Create data management programs
- Provide rebates (indoor and outdoor)
- AWWA M36 water audits to identify and eliminate sources of water loss
- Enhance leak detection and repair
- Water pricing policies
- Ordinances and policies

Indoor

- Provide do-it-yourself water saving kits
- Incentivize shower head replacement
- Incentivize toilet replacement
- Incentivize faucet replacement
- Incentivize washing machine replacement

Outdoor

- Increase landscape watering at night
- Incentivize and educate on landscape conversion
- Implement landscape watering regulations
- Implement lawn installation regulations
- Establish irrigation water budgets
- Raise lawn mower cutting height to better shade grass and deepen roots
- Encourage rainwater harvesting
- Improve wastewater reuse
- Implement water waste fees
- Incentivize smart controllers
- Increase secondary water metering
- Implement irrigation schedules

Practices Grouped for Discussion

All of the aforementioned practices have merit in some applications. This analysis groups the selected practices into the following major categories. These categories have been developed because they are specific enough to provide detail regarding potential water savings but broad enough to be analyzed using the limited data available for all regions of the state.

General

- Water conservation education—Conservation gardens, landscaping classes, information mailers, websites, etc.
- Conservation pricing—Reducing or eliminating use of property tax to pay for water system costs, increasing block rates, collecting greater percentage of costs through volume rates, etc.

Indoor

- Fixture conversion or new installation (Toilets, Faucets, and Shower Heads)—These fixtures are generally lower cost/more cost effective and have correspondingly been grouped together.
- Appliance conversion or new installation (Washing Machines)—The indoor appliance with the greatest water use that can be converted to higher-efficiency.
- Leak repair—Refers to indoor leaks only. Does not include water distribution system leaks (outside the scope of this study)
- Changing Indoor Water Use Habits—Shorter showers, etc.

Outdoor

- Smart irrigation controllers—Controllers that increase efficiency by adjusting irrigation schedules based on weather and landscaping needs.
- Secondary meters—Adding meters for all M&I secondary water customers.
- Existing landscape conversion—Changing existing residential turf landscapes to water-wise plants and drip irrigation.
- Initial landscape construction—Using water-wise plantings and drip irrigation on new construction.
- Turf rebates—While this is actually just a subcategory of "existing landscape conversion," it has been separated to provide additional cost information.

It is recognized that these practices are not mutually exclusive (e.g., education will likely be necessary to implement the other practices). It is also recognized that, within these major categories, further discussions and decisions will be needed to effectively implement the overall strategies. For example, if fixture conversion of washing machines is selected as a practice for implementation, policy makers will need to decide whether this is accomplished through water conservation education (providing information on the benefits of high-efficiency washing machines and where to get them), incentives (either in the form of positive incentives such as providing cash rebates on the purchase of high-efficiency machines, or negative incentives such as pricing water such that machine conversion is more likely), and/or regulation (passing ordinances requiring the purchase of high-efficiency machines). Determining the most effective approach to implement each practice will vary by entity and is beyond the scope of this report.

Implementation Costs

One factor in determining the priority of implementation for a water conservation practice is cost. The project team recognizes that water conservation of the magnitude proposed here is not free and that the costs must be acknowledged in order to secure funding for implementation. While the complete costs and benefits of achieving the goals cannot be presented here (and will be somewhat different for each water provider), gross unit costs can inform a future statewide implementation plan as well as local water conservation actions.

Table 5-1 summarizes estimated gross unit costs for various water conservation practices. To facilitate comparison, annualized unit costs are presented in dollars per acre-foot per year based on the estimated implementation costs and estimated water savings.

Table 5-1: Water Conservation Practice Costs

Practice	Cost ($)	Yield (ac-ft)	Unit Cost ($/ac-ft)	Annualized Cost[1] ($/ac-ft)
General				
Water Conservation Education				Varies
Conservation Pricing				Varies
Indoor				
Fixture Conversion—Toilets, Shower Heads, and Faucets				$485[2,3]
Appliance Conversion—Washing Machines				$1,830[2]
Leak Repair				Varies
Changing Indoor Water Use Habits				Varies
Outdoor				
Secondary Meters	$1,300	0.285	$4,567	$525[4]
Smart Irrigation Controllers				$198[2]
Landscape Conversion[5]—Wasatch Back	$26,136	0.259	$101,009	$6,571
Landscape Conversion—Wasatch Front	$26,136	0.345	$75,757	$4,928
Landscape Conversion—Southern Utah	$26,136	0.431	$60,605	$3,942
Initial Landscape[5]—Wasatch Back	$10,454	0.259	$40,403	$2,628
Initial Landscape—Wasatch Front	$10,454	0.345	$30,303	$1,971
Initial Landscape—Southern Utah	$10,454	0.431	$24,242	$1,577

[1] Annualized over 30 years at 5%.
[2] Sample of costs from Edwards et al. 2016 and Maddaus 2015.
[3] Based on average per acre-foot costs for all fixture types in this category.
[4] Because of the short lifespan of meters, annualized over 20 years. Includes $45/year/meter for meter reading and maintenance.
[5] Landscaping costs and water savings shown for ¼ acre residential lot. Costs assume $3/$ft^2$ for turf and sprinklers and $5/$ft^2$ for water-wise plantings with drip irrigation. In the case of new construction, costs only include the differential between water-wise plantings with drip irrigation and turf with sprinklers. Landscaping costs can vary significantly depending on how the landscape is designed and whether a homeowner does the work themselves or hires it out to a contractor. Estimates here reflect a relatively basic landscape completed by a contractor. For simple landscapes completed by homeowners, expected costs would be 65% of the current estimate. For more ornate landscapes done by a contractor, expected costs could be 150% or more of the current estimate.

A few items should be noted regarding these cost calculations:

- Cost "varies"—There are four categories for which a gross cost number cannot be accurately reported. This includes water conservation education, conservation pricing, leak repair, and changing indoor habits. While cost estimates have been prepared by other entities for some of these activities, the reported values vary greatly depending on the specific application and are largely based on water savings assumptions that are difficult to verify.
- Location of landscape conversion—While the gross costs of landscape conversion will be approximately the same regardless of location, the water saved through this action can be significantly different depending on evapotranspiration needs. To represent the range of water savings available, calculations have been provided for three representative areas: Wasatch Back representing low ET requirements (e.g., Summit

County, Wasatch County), Wasatch Front representing average ET requirements (e.g., Salt Lake County, Utah County) and southern Utah representing high ET requirements (e.g., Washington County, Kane County).

- Turf Rebates—Turf rebates have not been included in Table 5-1. This is because the calculation of costs associated with turf rebates generally refer only to the costs incurred by the water supplier in offering the rebate. They do not include the remaining costs of converting turf that the customer must pay. For example, if turf conversion to more water-wise landscape costs $5/ft^2 and a water supplier offers a rebate of $1.50/ft^2, the customer must still cover the remaining $3.50 /ft^2. Thus, the full cost of a turf rebate program is identical to the landscape conversion costs already included in the table.

  With that said, it may be useful for water suppliers to have a calculation of cost for their portion of turf rebates only to use in comparison with other alternatives they are considering. Following the same approach used for other water conservation practices, the estimated costs of turf rebates (to the water supplier only) are shown in Table 5-2.

Table 5-2: Turf Rebate Costs to Water Supplier

Turf Rebate	Cost[1] ($)	Yield (ac-ft)	Unit Cost ($/ac-ft)	Annualized Cost ($/ac-ft)
Per dollar per ft^2, Wasatch Back	$43,560	1.725	$25,252	$1,643
Per dollar per ft^2, Wasatch Front	$43,560	2.300	$18,939	$1,232
Per dollar per ft^2, Southern Utah	$43,560	2.875	$15,151	$986

[1] Turf rebate costs are unit costs per dollar offered per square foot. For example, if an entity offered $3/ft^2, the cost would be triple the value reported in the table. The total cost and water yield reported are based on 1 ac of turf conversion. Costs shown do not include program administration costs.

The costs reported in the table are per dollar per square foot. It is understood that water suppliers who choose to pursue turf rebates as a conservation strategy will opt for varying levels of rebate. If an entity offered $0.50/ft^2, rebate costs would be half the value shown. If entities offered $3.00/ft^2, rebate costs would be triple the value shown. With this said, it should be emphasized that the number of customers interested in pursuing turf rebates will directly relate to the size of the rebate. Thus, while a lower rebate may be less expensive, it will also have a much smaller impact on water savings than a larger rebate.

Finally, the costs reported in the table do not include program administration costs. These have been excluded because they will vary by entity and the amount of rebate being offered. However, they can be significant and should not be ignored when water suppliers are deciding if they want to implement a turf rebate program as part of their water conservation plans.

Considerations Outside Direct Costs

One approach to deciding what water conservation practices should be selected for implementation into the regional goals would be to consider the practices from strictly a cost perspective. In this case, only those practices with costs lower than the next available source of water for a community would be implemented. While gross direct cost does provide important insight into the selection and prioritization of viable practices, there are several reasons cost should not be used as the exclusive selection criterion:

- **Water is a limited resource—**When conservation costs are compared against water source costs, the water sources will usually be those that are the most cost-effective and viable water sources currently known. This means that, after these sources are developed, costs for subsequent sources will be higher, and in many cases, significantly higher. In some areas, there may not be any other significant new sources. Consequently, conservation must occur in order to meet Utah's growing population in the long term, regardless of any future water developed. With limited viable water sources available, it is prudent for the residents of the state to implement some practices now in order to stretch the available remaining water supply to meet future demands (and to recognize the costs of future water depletion today).

- **Long-term vs. short-term cost—**A quick review of the water conservation practices cost table will reveal that an investment now can result in significant long-term savings. This is especially true of landscaping new properties.

  As an example, consider full water-wise landscaping for a property on the Wasatch front. The estimated cost of this practice is almost $2,000/ac-ft/yr. While this may be above the cost of development of some sources currently identified to serve the Wasatch Front, at some point less expensive sources will be used up and the next block of sources (if any can be located) will cost more than $2,000/ac-ft/yr. At that point, water suppliers will be looking for existing customers to convert to water-wise landscapes at a cost of $5,000/ac-ft/yr. In short, any turf that is avoided now may mean less turf that needs to be converted later at a greater overall cost to the community.

- **Indirect costs—**Costs of both conservation and source development are most immediately limited to gross direct costs that can be readily calculated. During public outreach meetings throughout the state, many comments were received expressing the need to consider impacts that have either indirect costs or costs that are difficult to quantify. Some examples of non-cost issues mentioned during public outreach meetings include: reduced instream flows for wildlife habitat, reduced lake levels at the Great Salt Lake (ECONorthwest 2019), increased treatment costs, negative impacts to urban forestry health, urban heat island effects, and reduced useable recreational space at homes. While it is beyond the scope of this study to provide a detailed analysis of these issues, it is recognized that their consideration may result in selection of practices that may not appear viable from a comparison of direct costs only.

- **Cost uncertainty—**While the costs contained in Tables 5-1 represent the most up-to-date gross cost estimates for conservation practices, actual costs will not be known until the practices are fully implemented.

- **Risk—**Financial and water availability risks will vary depending on what strategies each water provider selects to meet future demands. Minimizing risk should be a consideration in the evaluation of potential conservation practices.

- **Consideration of Direct Cost Offsets and Benefits—**In addition to the direct and indirect costs noted above, there is a range of financial offsets and non-financial benefits that exists for different approaches to more efficiently use currently developed water. Policymakers should consider not only the costs but also the benefits and offsets of each approach and the associated tradeoffs.

  For example, assume that installing smart meters encourages more efficient use of water by (a) giving consumers better real-time feedback to inform timely water use decisions, and (b) interacting directly with smart timers, automatic leak shutoff mechanisms, and other watering devices to directly impact water use. A comprehensive financial cost and benefit comparison can examine not only the capital cost of installing the meter, but also the direct on-ledger offsets related to that water meter installation, including savings in meter reader labor and transportation costs, and other benefits such as the impact on market price, and foregone or delayed capital costs, as well as non-financial benefits such as environmental improvements.

Practices Selected for Implementation into Goals

Based on the analysis above, survey data, and input received at regional open houses and in stakeholder interviews, the major categories of practices have been implemented into the regional goals as described in the following sections. Included in each section is also a summary of how the recommended practices translate into policy options to be included in the conservation potential model as part of the final goals.

General Practices

Water conservation practices identified under this heading have been included in regional goals as follows:

- **Water conservation education—**Continued aggressive emphasis throughout the state
- **Conservation pricing—**Continued aggressive emphasis throughout the state

Conservation Policy Implications: Both of these practices are expected to be ongoing, fundamental components of overall water conservation efforts. They will form the backbone of efforts to encourage and support the other practices described in the following sections. Correspondingly, no specific policy implications are identified here. Instead, the identification of selected policy options in subsequent sections will inform the required level of conservation education and pricing.

Indoor Practices

Water conservation practices identified under this heading have been included in regional goals as follows:

- **Fixture conversion (Faucets, shower heads, and toilets)—**Assume continued progress toward full implementation throughout the state. This practice is more cost effective than any of the water development options identified and should be encouraged in all regions. With this said, federal regulations now require the use of high-efficiency fixtures in these categories. As a result, natural replacement is already resulting relatively efficient replacement rates. Adding significant additional investment in this area could accelerate the process but would take resources away from other important areas of conservation. Correspondingly, it is recommended that programs in this area be sustained at current levels.

  Conservation Policy Implications: The Baseline policy option will be used in all counties for these categories of water use.

- **Appliance conversion (washing machines)—**Assume continued progress toward full implementation throughout the state. While this practice is currently more expensive than most water development options, movement toward high-efficiency washing machines has been observed over the last decade due to many advantages (water savings, power savings, improved cleaning performance, etc.). Federal energy efficiency requirements have also made it more difficult to get good performance from top-loading machines that use more water. As a result, many manufacturers and consumers are moving toward lower-water-use, front-loading machines.

  Conservation Policy Implications: The Baseline policy option will be used in all counties for this category of water use.

- **Other indoor measures (leak repair and indoor water use habits)—** While the cost effectiveness of these practices is difficult to quantify, most water users will support the elimination of leaks and indoor water waste. However, how diligently water users move toward making progress in these areas will likely depend on issues such as the cost of water and community perception toward water scarcity. Since these issues will vary by region, assumed progress varies by county depending on supply availability.

  Conservation Policy Implications: Policy Option I1 – Aggressive Leak Repair Efforts will be used in Grand, Kane, and Washington counties for this category of water use. The Baseline policy option will be used in all other counties.

Outdoor Practices

Water conservation practices identified under this heading have been included in regional goals as follows:

- **Secondary meters—**This practice of metering (and charging for) end-use irrigation water is more cost effective than any of the water development options identified and should be encouraged in all regions. While Senate Bill 52 provides a good start, it is recommended that required metering be extended to all secondary water users.

  Conservation Policy Implications: Policy Option M1 – Required Secondary Metering will be used in all counties for this category of water use.

- **Increases in Irrigation Efficiency (Smart controllers, etc.)—**Increasing irrigation efficiency is one of the most cost-effective methods of saving water available. Thus, it is recommended that all counties emphasize increasing efficiency through smart controller rebates, water audits, conservation education, and aggressive pricing tiers.

  Conservation Policy Implications: Policy Option E1 – Aggressive Irrigation Efficiency Improvements will be used in all counties for this category of water use.

- **Water-wise landscaping (construction of new properties and conversion of existing properties)—**Water-wise landscaping has the greatest potential for water conservation but is also the most dependent upon cost and regional attitudes toward landscaping. Two issues should be noted in estimating rates of water-wise landscaping adoption for goal setting purposes:

  - As shown in Table 5-1, the cost of water-wise landscaping in new construction is significantly less than the conversion of existing landscape. As a result, all areas of the state are encouraged to pursue water-wise landscaping for all new construction.
  - Water-wise landscaping is a practice where cost may not be the driving factor in adoption. More and more water customers have been willing to incur the higher costs of construction for water-wise landscaping in order to reduce maintenance,

improve the aesthetics of their property, and/or out of a desire to save water, regardless of cost. Many water suppliers are also seeing the benefit of encouraging water-wise landscaping through regulations or incentives in order to stretch limited resources. For these reasons, it is prudent to keep landscaping changes as a fundamental component of future water conservation goals, even in areas where it may not be justified by current water prices.

Based on this discussion, assumed progress in this area will vary depending on location and type of construction (new construction vs. existing landscape conversion).

Conservation Policy Implications: Policy Option L1 – Aggressive Landscape Conversion Efforts will be used in Wasatch Front counties, counties with population centers, and counties in Southern Utah for this category of water use. The Baseline policy option will be used in all other counties (Wasatch Back and rural counties).

A summary of policy options selected for inclusion in the regional goals are summarized by county in Table 5-3.

Table 5-3: Conservation Policies by Category of Water Use and County

County	Faucet and Shower Head Conversion	Toilet Conversion	Washing Machine Conversion	Leak Repair	Secondary Metering	Irrigation Efficiency	Landscaping
Beaver	Baseline	Baseline	Baseline	Baseline	M1	E1	Baseline
Box Elder	Baseline	Baseline	Baseline	Baseline	M1	E1	L1
Cache	Baseline	Baseline	Baseline	Baseline	M1	E1	L1
Carbon	Baseline	Baseline	Baseline	Baseline	M1	E1	Baseline
Daggett	Baseline	Baseline	Baseline	Baseline	M1	E1	Baseline
Davis	Baseline	Baseline	Baseline	Baseline	M1	E1	L1
Duchesne	Baseline	Baseline	Baseline	Baseline	M1	E1	Baseline
Emery	Baseline	Baseline	Baseline	Baseline	M1	E1	Baseline
Garfield	Baseline	Baseline	Baseline	Baseline	M1	E1	Baseline
Grand	Baseline	Baseline	Baseline	I1	M1	E1	L1
Iron	Baseline	Baseline	Baseline	Baseline	M1	E1	L1
Juab	Baseline	Baseline	Baseline	Baseline	M1	E1	Baseline
Kane	Baseline	Baseline	Baseline	I1	M1	E1	L1
Millard	Baseline	Baseline	Baseline	Baseline	M1	E1	Baseline
Morgan	Baseline	Baseline	Baseline	Baseline	M1	E1	Baseline
Piute	Baseline	Baseline	Baseline	Baseline	M1	E1	Baseline
Rich	Baseline	Baseline	Baseline	Baseline	M1	E1	Baseline
Salt Lake	Baseline	Baseline	Baseline	Baseline	M1	E1	L1
San Juan	Baseline	Baseline	Baseline	Baseline	M1	E1	Baseline
Sanpete	Baseline	Baseline	Baseline	Baseline	M1	E1	Baseline
Sevier	Baseline	Baseline	Baseline	Baseline	M1	E1	Baseline
Summit	Baseline	Baseline	Baseline	Baseline	M1	E1	Baseline
Tooele	Baseline	Baseline	Baseline	Baseline	M1	E1	Baseline
Uintah	Baseline	Baseline	Baseline	Baseline	M1	E1	Baseline
Utah	Baseline	Baseline	Baseline	Baseline	M1	E1	L1
Wasatch	Baseline	Baseline	Baseline	Baseline	M1	E1	Baseline
Washington	Baseline	Baseline	Baseline	I1	M1	E1	L1
Wayne	Baseline	Baseline	Baseline	Baseline	M1	E1	Baseline
Weber	Baseline	Baseline	Baseline	Baseline	M1	E1	L1

RESULTS

Based on the selected policies, regional goals and future goal projections as calculated in the water conservation potential model are summarized in Table 5-4. Further details are presented in Chapter 7.

Table 5-4: Regional M&I 2030 Water Conservation Goals and Projections

Region	2015 Baseline (gpcd)	2030 Goal (gpcd)	2040 Projection (gpcd)	2065 Projection (gpcd)	Reduction from Baseline		
					2030	2040	2065
Bear River	304	249	232	219	18%	24%	28%
Green River	284	234	225	225	18%	21%	21%
Lower Colorado River North	284	231	216	205	19%	24%	28%
Lower Colorado River South	305	262	247	237	14%	19%	22%
Provo River	222	179	162	152	20%	27%	32%
Salt Lake	210	187	178	169	11%	15%	19%
Sevier River	400	321	301	302	20%	25%	24%
Upper Colorado River	333	267	251	248	20%	25%	25%
Weber River	250	200	184	175	20%	26%	30%
Statewide	240	202	188	179	16%	22%	26%

Note: gpcd = gallons per capita per day based on permanent population

In reviewing the numbers produced by this process as summarized in Table 5-4, a few questions have arisen regarding the results that may be useful to address here:

- **Why do some areas have higher goals than others?** As described above, the goal setting process considered applicable water conservation practices and available water conservation potential. In the case of areas with above-average goals (by percentage), the higher goals are usually the result of above-average conservation potential. For example, consider the Weber River Region, a region with one of the higher overall goals (by percentage). This region has the highest overall percentage of unmetered secondary use. Thus, implementing secondary meters (one of the first conservation practices recommended for implementation) results in more conservation in this region than any other.

- **Why do some areas have lower goals than others?** Similar to the explanation above, lower goals can generally be explained by below-average water conservation potential. For example, consider the Lower Colorado River South Region, a region with one of the

lower overall goals (by percentage). This region actually has practices that are either equal to or more aggressive than all other regions. However, because this region has already made significant progress in some areas of water conservation (most specifically reduction in cool-season turf coverage), the implemented practices still result in a lower amount of overall water conservation.

- **Why is the difference in projections between 2040 and 2065 relatively small in most regions?** In all regions, the decrease from 2040 to 2065 is much smaller than the decrease from 2015 to 2040, even though the length of the period is the same. This can be explained by two factors. First, it is expected that water conservation will gradually slow over time as the easiest and most cost-effective practices are implemented first and only more difficult/expensive practices are reserved for later. However, this is only part of the explanation. A second factor that limits decreases in projected use during the later period is climate change. During this period, ongoing water conservation activities will be offset to some extent by increased need for water as the climate warms. This does not mean that conservation efforts can be reduced after 2040. Such activities will need to continue just to keep up with the increased need for water associated with climate change. It should also be reiterated that the 2040 and 2065 per capita use estimates serve as projections and not goals. Actual 2040 and 2065 per capita use goals will be revisited and revised as conditions change, including adjustments to reflect advances in current technology and emergence of new technologies.

Chapter 6: Regional Water Conservation Practices

PURPOSE

This chapter identifies the water conservation practices that should be considered to achieve the regional M&I water conservation goals identified in this report. Local water suppliers, communities, and businesses are encouraged to adapt and refine these practices, as well as implement others, in their own water conservation efforts and in pursuit of the regional goal.

METHODS AND ANALYSIS

It is not the purpose of this report to develop a detailed water conservation plan for all the different regions in the state. Local water suppliers will have the best information regarding their own systems and will understand the unique opportunities and challenges associated with implementing water conservation practices in their service area.

With that in mind, this section will outline the areas where water conservation will be necessary and identify major water conservation categories that should be included in future efforts. It is expected that water suppliers in each region will then work together to identify the best approach to implementing the overall water conservation plan and reaching their goals.

The effectiveness of water conservation practices was analyzed as part of the goal setting process documented in Chapter 5. This section will summarize the major findings of that process and discuss implementation of water conservation practices. As in Chapter 5, practices will be grouped into simplified categories for discussion.

RECOMMENDED PRACTICES

Recommended implementation of water conservation practices over the next several decades are as follows.

General Practices

The following practices are expected to be ongoing, important parts of overall water conservation efforts in all regions of the state. While it is difficult to quantify the exact savings associated with these efforts, it is expected that they will form the backbone of efforts to encourage and support the other practices described in following sections. This includes:

- **Water conservation education—**Education is the foundation of any effective water conservation program. No action will occur until customers and water users understand what is needed and how to make it happen. Continued emphasis and funding of education and outreach must be fundamental components of any water conservation plan, and these efforts must evolve and innovate to be more effective than in the past.

An important companion to water conservation education will be improved metering. Water users' interest in conservation and ability to modify their behavior will largely depend on them first understanding how their water is being used. This is discussed in greater detail for secondary water use but has applications to culinary use as well. Customer feedback tools in bills and web applications, such as social norming comparisons and leak notifications, are also valuable, especially when enabled by advanced metering infrastructure (AMI) and supported by tiered rates. Research has shown averages of 7% to 12% water savings for new installations of AMI systems coupled with customer feedback (Sønderlund et al. 2016; Davies et al. 2014); another study noted the benefits of earlier leak detection and notification (Schultz et al. 2018).

- **Conservation pricing—**While most Utahns have a desire to save water, experience suggests that efforts to do so will be limited unless financial incentives exist to help motivate action. This is especially true where significant investment is required to implement water savings. With this in mind, it is recommended that water suppliers examine and update their existing water rate structures to identify ways of encouraging continued conservation. Four specific recommendations regarding water rates include:

    - **Minimize base rates—**According to data provided by JVWCD (Forsyth and Schultz 2017), a small base rate (with correspondingly higher volume rates) correlates with improved water conservation. The data on JVWCD's retail service area and a few member agencies show that base rates constituting less than 30% of the total revenue corresponded to greater reductions in per-capita water consumption from 2000 to 2015 than did base rates making up a larger share of the revenue. The smaller the base rate, the more customers pay for their actual consumption. This finding could inform future rate changes aimed at water conservation, where a relatively low base rate is one of the most important components.
    - **Improve increasing tier volume rates—**State regulations require that all water suppliers use an increasing block rate for volume charges in their system. However, no additional detail is provided regarding how the increasing block rates should be structured. To be effective, block break points should be selected at meaningful levels that provide clear price signals to customers. The difference in cost between blocks should also be large enough to provide a significant incentive to conserve. The tiers should be based on the cost of service in order to be defensible and effective. Many other western states have already adopted aggressive tiered rates to help in their water conservation efforts. For example, Boulder, Colorado, has a tiered structure that in the highest tier charges five times the base rate (Equinox Center 2009). Cities like Las Vegas and San Diego have also implemented this measure (SNWA 2014). While rates must be cost based and treat all customer classes equitably, it appears that there is still some opportunity for each region to identify ways in which tiered volume rates could be improved to encourage conservation.

- **Review water funding sources—** Water suppliers have water funding sources that include user charges, impact fees, and property taxes. The scope of this report does not include analyzing or recommending the balance of these funding sources. However, as part of its 2015 audit, the Office of the Legislative Auditor General recommended policymakers consider the way water is funded in Utah and look for opportunities where a greater portion of water delivery system costs can be repaid through user charges, while not disturbing critical funding sources for other water services.
- **Use technology to provide nearly real-time water use information to water users—**Changes in water pricing will be of limited effect unless water users understand how their personal water use practices are connected to how they are charged for water. Providing detailed water use data using advanced metering infrastructure, together with more graphical and useful water bill information, can transform water users into educated and motivated water consumers.

Indoor Practices

The following indoor water conservation practices are recommended.

- **Fixture conversion—**Conversion of toilets, faucets, and shower heads to high - efficiency options has been shown to be one of the most cost-effective conservation practices available. In addition to reducing water volume with each use, new fixtures also reduce leakage. Thus, it is expected that this practice will be included as a part of conservation plans in all regions. Conversion of washing machines is less cost effective, but still expected to contribute to conservation plans. For new construction, use of high-efficiency fixtures has already largely been implemented as a result of federal regulations that prohibit the sale of anything other than high-efficiency toilets, shower heads, and faucets. Market trends are also driving new consumers toward high-efficiency washing machines. For existing development, regions could decide to wait for natural replacement of the fixtures as they age (at essentially no cost to water suppliers) or offer cash incentives to accelerate the process.

- **Other indoor measures (leak repair and changing indoor water use habits)—**To achieve long-term water conservation, all regions will need to make at least some progress in reducing indoor leaks and changing indoor water use habits. The most effective methods of accomplishing this will vary but will rely heavily on water conservation education and conservation pricing to encourage improvement in these areas.

Outdoor Practices

Recommended outdoor conservation practices are as follows:

- **Improved irrigation efficiency—**While significant improvement has been made in irrigation efficiency over the last few decades, additional potential still exists. To make additional progress in efficiency, areas of focus should include:

    - **Secondary meters—**One of the most effective ways demonstrated to improve irrigation efficiency is to meter secondary water use. Since the amount of secondary use varies by region, the impact of this action will also vary. However, in regions with significant secondary water, full secondary metering is expected to reduce total water use by up to 15%. It is recommended that universal metering be implemented as a regulatory requirement at the state level. While the net cost of metering will vary from system to system, it is expected that many systems will actually save money in the long-term through installing meters. However, even in systems expected to see long-term net savings, metering will require a major initial capital investment from the water suppliers. Correspondingly, it is recommended that the requirement to install secondary metering be coupled with assistance in financing the required improvements.
    - **Smart irrigation controllers—**Smart irrigation controllers are a low-cost tool to improve irrigation efficiency. There are already a number of water suppliers offering rebates for smart irrigation controllers. This practice should be continued and expanded.
    - **Drip irrigation systems—**There will always be a practical limit on how much efficiency can be improved in sprinkling systems. While sprinkling systems can be fine-tuned to minimize overspray and optimize coverage, issues such as wind will always result in some inefficiencies. Drip irrigation systems (including bubblers and micro-sprinklers) allow for more targeted delivery of water and greater efficiency. The challenge with drip irrigation is that it has not historically been used for turf areas and is correspondingly more likely to be used where there are changes in landscaping (as will be discussed below)[6]. However, where possible, use of drip irrigation systems must be encouraged in order to reach desired efficiency goals.

- **Water-wise landscaping—**As noted previously, this is an important area for discussion because it is the water conservation practice with the greatest potential for conservation but also the greatest cost. Based on the several considerations discussed previously, the following actions are recommended to reach the established water conservation goals in support of long-term water supply plans.

[6] Drip irrigation has historically been used primarily for irrigation of perennials, shrubs, and trees, but systems can be designed to irrigate turf.

- **Landscaping for new construction—**The most cost-effective time to install water-wise landscaping is during new construction. It is recommended that water suppliers work with entities regulating development to implement the following guidelines.
    - In high ET areas (Southern Utah), installation of cool-season turf during new construction should be limited to no more than 20% of the landscaped area in residential areas.
    - In medium ET areas (Wasatch Front), installation of cool-season turf during new construction should be limited to no more than 50% of the landscaped area in residential areas. It should be noted, however, that this is an absolute maximum that will only result in reaching projected long-term water conservation if it is also accompanied by existing residential areas converting landscaping such that cool-season turf is limited to 50%. To compensate for existing properties where conversion is more difficult to obtain, regions may consider limiting cool-season turf during new construction to 35%.
    - In low ET areas (Wasatch Back), installation of cool-season turf during new construction should be limited to no more than 60% of the landscaped area in residential areas.
    - In all areas, installation of cool-season turf should be minimal in commercial, industrial, and institutional areas except for designated activity areas such as ball fields.

- **Conversion of existing landscaping—**Changes in the landscaping of future construction only will not save enough water to reach water conservation goals in most regions. It will also be necessary to encourage and incentivize conversion of landscapes on existing properties. While this is expected to be more difficult given the expense of conversion, the following actions are recommended as part of regional plans to achieve existing landscape conversion.
    - **Water conservation education—**In recent years, more and more water customers have shown a willingness to incur the higher costs of construction for water-wise landscaping in order to reduce maintenance, improve the aesthetics of their property, and/or save water, regardless of cost. Continued education through demonstration gardens, landscaping classes, resources available through the Utah State University Extension and Center for Water-Efficient Landscaping, etc., will be important to support existing property owners who already desire to improve their current landscapes. An important aspect of this effort will be working with home improvement businesses and nurseries to ensure water-wise options are available to support existing property owners' efforts.
    - **Financial incentives—**Recommended financial incentives to convert existing landscaping will likely come in one of two forms. First, conservation pricing structures that encourages the wise use of outdoor water can help make the decision to convert landscape more attractive.

Second, regions may consider direct rebates for the removal of turf and sprinklers to be replaced with water-wise plants and/or drip irrigation. One challenge with this second approach is that the cost of landscape conversion is still relatively expensive compared to typical turf rebates[7]. Thus, experience suggests that offering turf rebates at historic levels will have limited success in motivating customers to change their landscapes. While offering turf rebates may be a prudent first step, turf rebates should be viewed as just one potential tool that can be considered and combined with other measures by water suppliers to achieve their goals.

- **Consider Water Budgeting—**The recommendations above have focused largely on the final landscaping results needed to achieve the proposed conservation goals. However, it should be understood that reaching these landscaping goals could be accomplished through several different approaches. While implementing landscaping restrictions is the most obvious solution, another worthy of consideration is irrigation water budgeting. This market-driven approach would establish a target volume of water to be used for irrigation by property owners. This volume would be established based on consideration of regional goals and the property owner's lot size. Excessive use could then be controlled through pricing. This would allow property owners to decide how to best use their available landscaping water but still stay within regional water use guidelines.

- **Lot size and density—**While regulating density is outside the control of many water suppliers, future lot size will substantially impact the amount of water needed to serve the future population of Utah and must be considered when developing plans for water conservation. It is recommended that water suppliers work with entities regulating development to implement guidelines that encourage and respond to market demand for smaller lot sizes.

WATER CONSERVATION COSTS

As discussed in Chapter 5, there are a host of financial and non-financial costs and benefits associated with water conservation practices. Evaluating each of the these to calculate the net cost of conservation is beyond the scope of this study. However, independent of long-term benefits, it is clear that achieving the goals identified in this report will require a major initial investment from the citizens of the state. It is estimated that initial direct costs associated with statewide conservation activities may range from hundreds of millions to billions of dollars statewide depending on the approaches taken. For the set of conservation policies selected for inclusion in the current goals, estimated capital costs are approximately $1.4 billion through the

[7] While this report uses "turf rebates" to be consistent with a term that will be familiar for most readers, it should be noted that this type of rebate program could be used for any landscape modification resulting in reduced water use. This could include the replacement of historic turf species with lower-water-use types or the installation of drip irrigation systems under existing turf.

year 2030. This number is based on estimated capital costs only and does not reflect any potential cost savings or on-ledger offsets associated with conservation. It is reported in 2019 dollars and does not include any inflation or financing costs. While this cost is significant, making this investment will be an essential component of the state's plan to meet future water needs.

Chapter 7: Conclusions and Recommendations

SUMMARY OF FINDINGS

This project developed M&I water conservation goals for nine regions of Utah (Figure 7-1). These goals, which build on the previous statewide goal, will complement water development, help the Division fulfill its mission of planning and conserving Utah's water resources, guide local water suppliers in their own water conservation efforts, and promote effective policies to support water conservation.

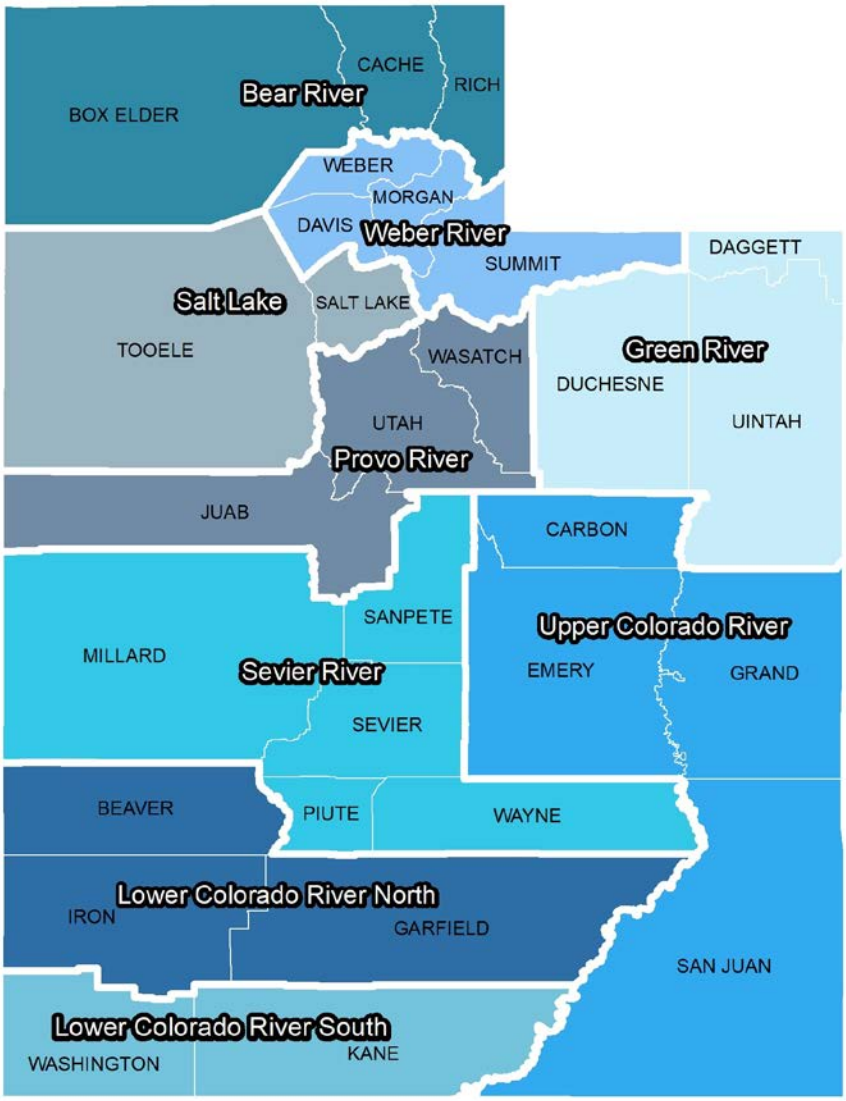


Figure 7-1: Regional M&I Water Conservation Boundaries

The approach relied heavily on public involvement from an online survey, informational open houses, and in-depth interviews with key stakeholders in Utah's water industry. The public process strongly affirmed the need for regional goals and guided the project team to data, insights, and questions that improved the quality of the work.

Rigorous analysis of M&I water conservation potential indicates that there is significant potential to conserve water throughout the state. Though the results vary by region, the state's residents have substantial opportunity to reduce water use both indoors and outdoors. The other M&I user types—commercial, institutional, and industrial—have significant potential to conserve as well and should not be overlooked.

While water conservation potential is high, it will not solve all of the problems of water supply and demand. A balance of water development and water conservation, pursued in parallel, will be necessary to meet the water needs of a rapidly growing state.

RECOMMENDED GOALS

Table 7-1 presents M&I water conservation goals and projections for each of the regions shown in Figure 7-1.

Table 7-1: Regional M&I 2030 Water Conservation Goals and Future Goal Projections

Region	2015 Baseline (gpcd)	2030 Goal		2040 Projection		2065 Projection	
		Goal (gpcd)	Reduction from 2015	Projection (gpcd)	Reduction from 2015	Projection (gpcd)	Reduction from 2015
Bear River	304	249	18%	232	24%	219	28%
Green River	284	234	18%	225	21%	225	21%
Lower Colorado River North	284	231	19%	216	24%	205	28%
Lower Colorado River South	305	262	14%	247	19%	237	22%
Provo River	222	179	20%	162	27%	152	32%
Salt Lake	210	187	11%	178	15%	169	19%
Sevier River	400	321	20%	301	25%	302	24%
Upper Colorado River	333	267	20%	251	25%	248	25%
Weber River	250	200	20%	184	26%	175	30%
Statewide	240	202	16%	188	22%	179	26%

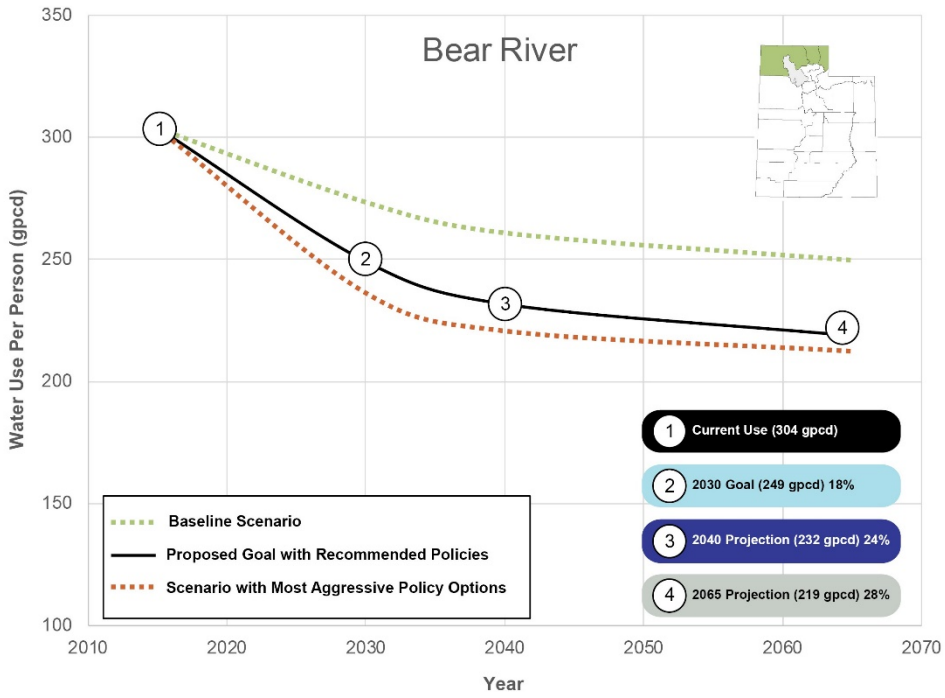
Note M&I = municipal and industrial; gpcd = gallons per capita per day based on permanent population. Reported per capita use includes all residential, commercial, institutional, and industrial uses averaged over the permanent population in each region.

Regional goals and their relationship to the water conservation scenarios (described in Chapter 4) and historic use are shown in Figures 7-2 through 7-10. Figure 7-11 shows the outcome for the state as a whole as a result of the regional goals and projections. The water conservation goals assume action above baseline improvements, with baseline representing more efficient water use that will likely occur without any new or more aggressive policy interventions. (Baseline activities include natural replacement of household fixtures, new homes constructed using existing water technology, market trends toward smaller lot sizes, and status quo price trajectories.) The lower limit of the water conservation potential is the scenario with the most aggressive policy options. While the goals set a point to work towards, it is recognized that additional conservation may make sense in some areas. Water providers are encouraged to assess their individual situations and pursue additional conservation beyond the stated goals where prudent.

Recognizing that uncertainty increases with time, the goals and future goal projections have been presented for three time periods: 2030 (goal), 2040 (projection), and 2065 (projection). The 2030 goal will be the primary focus for action over the next decade with the 2040 and 2065 projections providing guidance for planning and future expectations. While 2065 is the planning horizon for this study, it is clear that M&I water conservation will need to continue thereafter. For planning purposes, it is recommended that the annual conservation rate in each region used for future planning beyond 2065 be half of the annual conservation rates projected for the 2040–2065 period. For example, if the project conservation rate from 2040 to 2065 is 1% per year, the projected conservation rate for planning purposes beyond 2065 would be 0.5% per year.

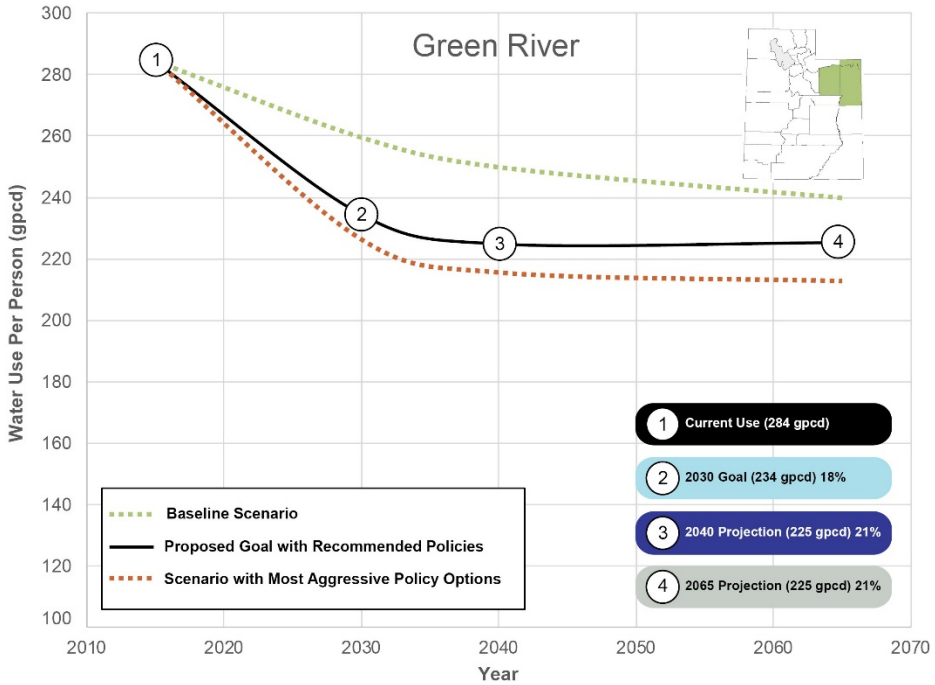
As 2030 approaches, the 2040 and 2065 projections will be revisited and modified as demographics, technology, conditions, and behaviors change. Once adopted, however, the goals should not be reset before the year for which they were intended in order to accurately assess progress during that time period.

In 2015 (the new baseline year), Utah's M&I water use was about 240 gpcd (DWRe 2019a, 2019b). If considering all regional goals together, the outcome for the entire state is 202 gpcd by 2030 (16% reduction from 2015). Projections for all regions, considered together, are 188 gpcd by 2040 (22% reduction from 2015), and 179 gpcd by 2065 (26% reduction from 2015). Meeting the 2030 goals will save nearly 165,000 ac-ft annually across the state.



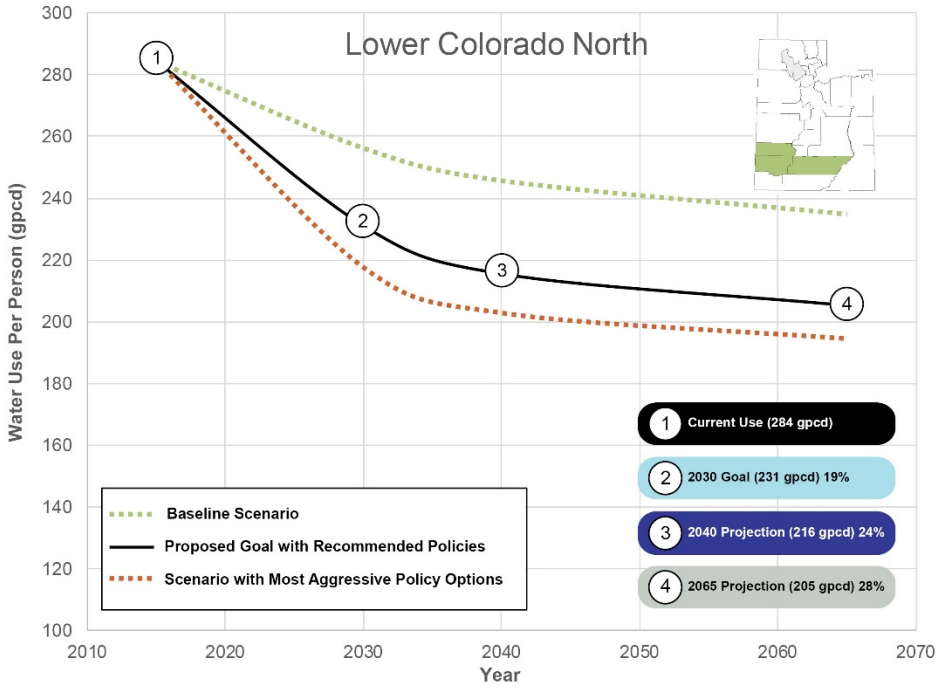
Note: The baseline and aggressive policy scenarios do not consider the cost or feasibility of achieving the assumed use patterns. They have been included solely to provide perspective relative to past and current water use and to help each region understand what must occur to achieve the final goals.

Figure 7-2: M&I Water Conservation Goals—Bear River Region



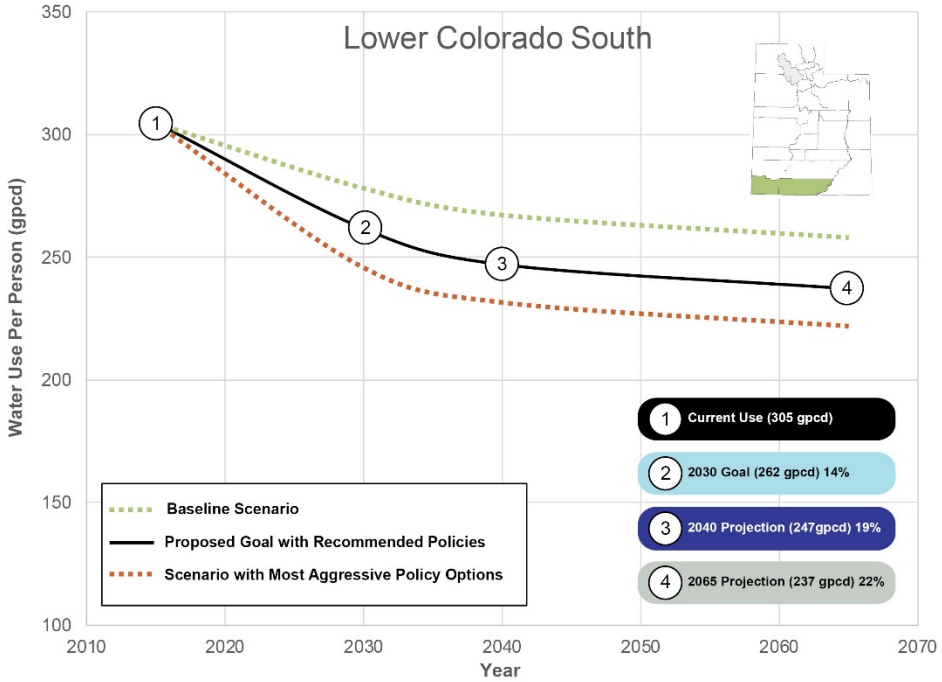
Note: The baseline and aggressive policy scenarios do not consider the cost or feasibility of achieving the assumed use patterns. They have been included solely to provide perspective relative to past and current water use and to help each region understand what must occur to achieve the final goals.

Figure 7-3: M&I Water Conservation Goals—Green River Region



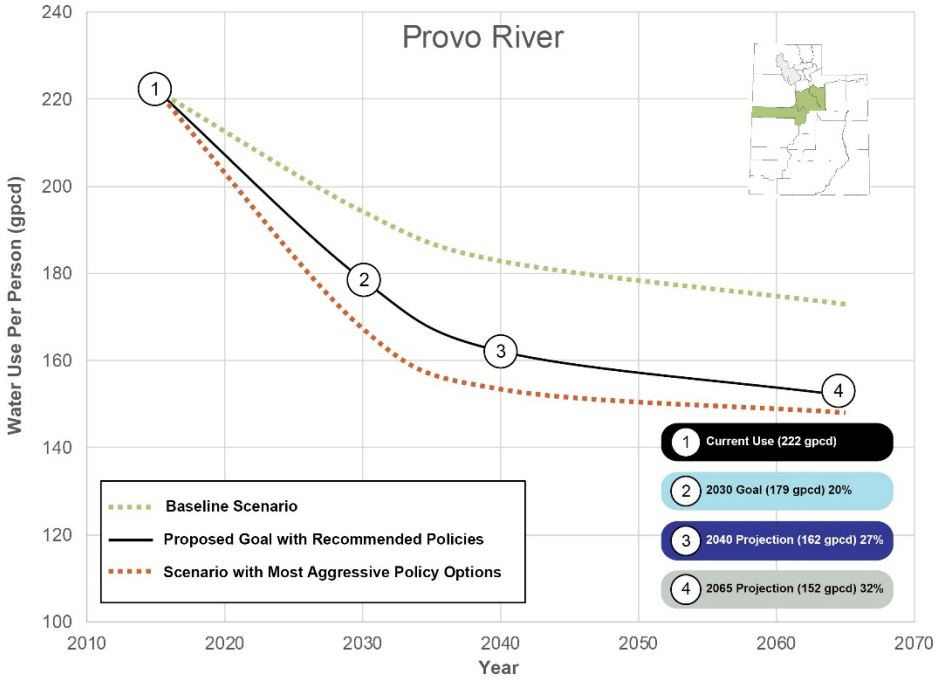
Note: The baseline and aggressive policy scenarios do not consider the cost or feasibility of achieving the assumed use patterns. They have been included solely to provide perspective relative to past and current water use and to help each region understand what must occur to achieve the final goals.

Figure 7-4: M&I Water Conservation Goals—Lower Colorado River North Region



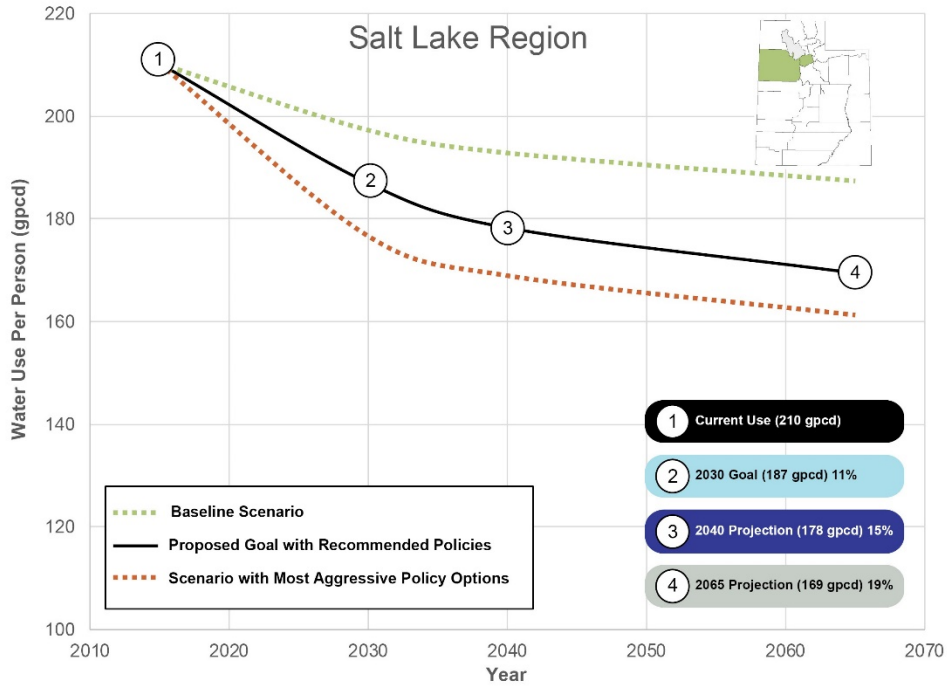
Note: The baseline and aggressive policy scenarios do not consider the cost or feasibility of achieving the assumed use patterns. They have been included solely to provide perspective relative to past and current water use and to help each region understand what must occur to achieve the final goals.

Figure 7-5: M&I Water Conservation Goals—Lower Colorado River South Region



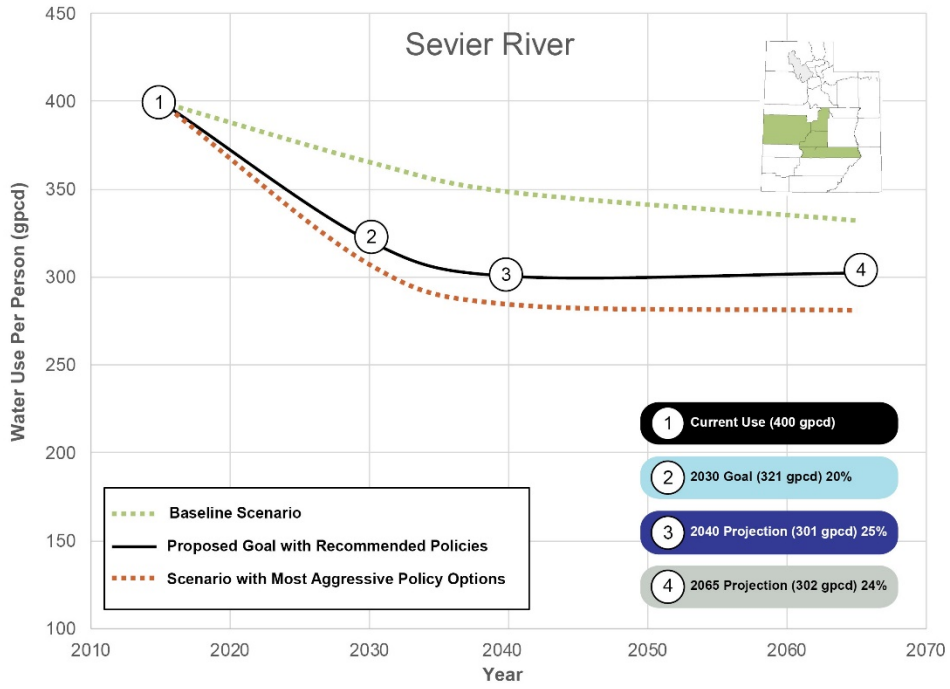
Note: The baseline and aggressive policy scenarios do not consider the cost or feasibility of achieving the assumed use patterns. They have been included solely to provide perspective relative to past and current water use and to help each region understand what must occur to achieve the final goals.

Figure 7-6: M&I Water Conservation Goals—Provo River Region



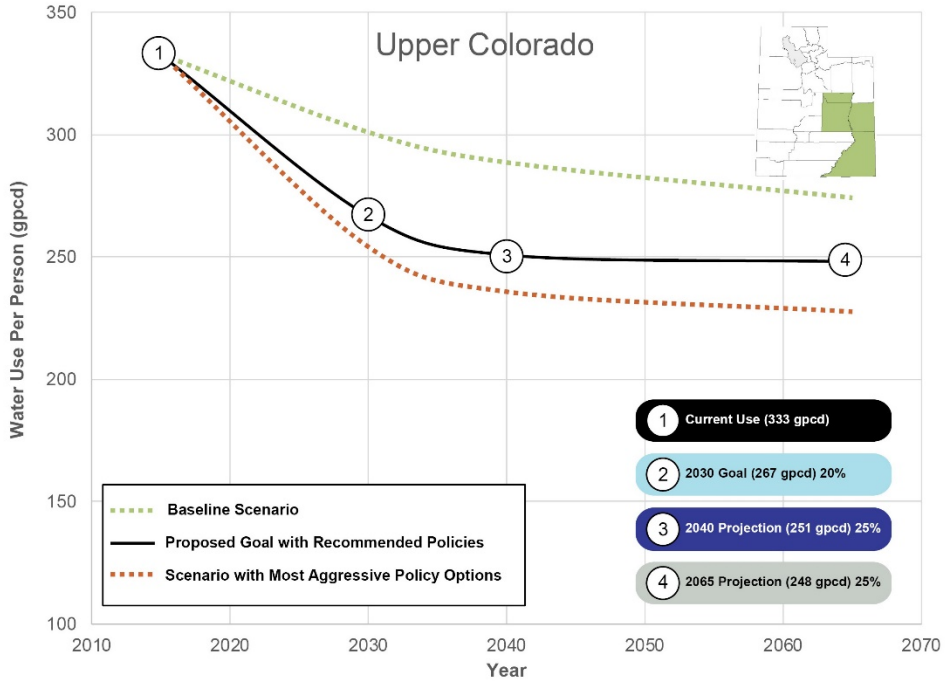
Note: The baseline and aggressive policy scenarios do not consider the cost or feasibility of achieving the assumed use patterns. They have been included solely to provide perspective relative to past and current water use and to help each region understand what must occur to achieve the final goals.

Figure 7-7: M&I Water Conservation Goals—Salt Lake Region



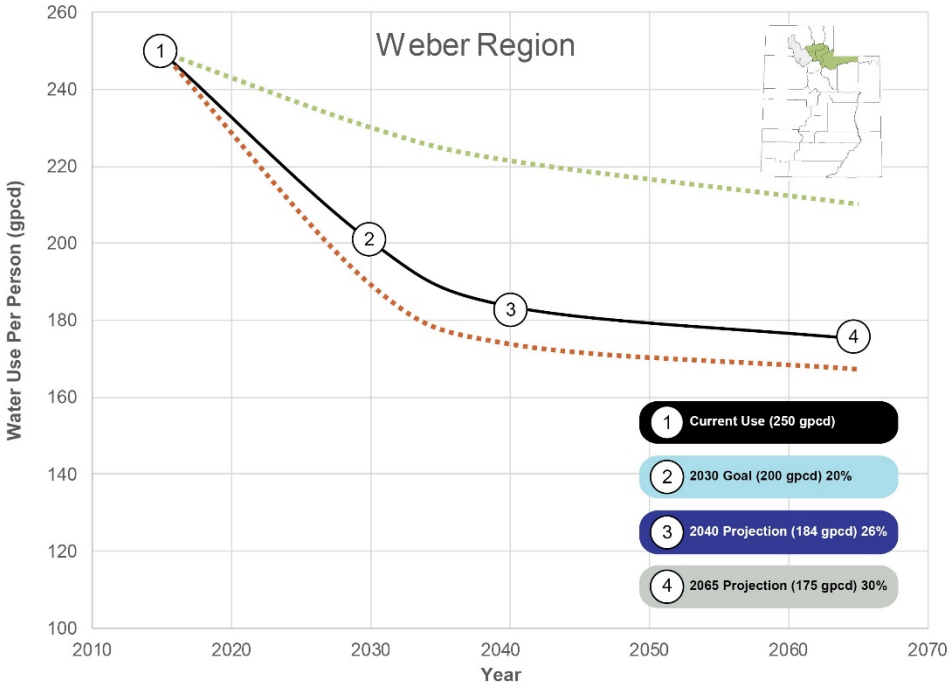
Note: The baseline and aggressive policy scenarios do not consider the cost or feasibility of achieving the assumed use patterns. They have been included solely to provide perspective relative to past and current water use and to help each region understand what must occur to achieve the final goals.

Figure 7-8: M&I Water Conservation Goals—Sevier River Region



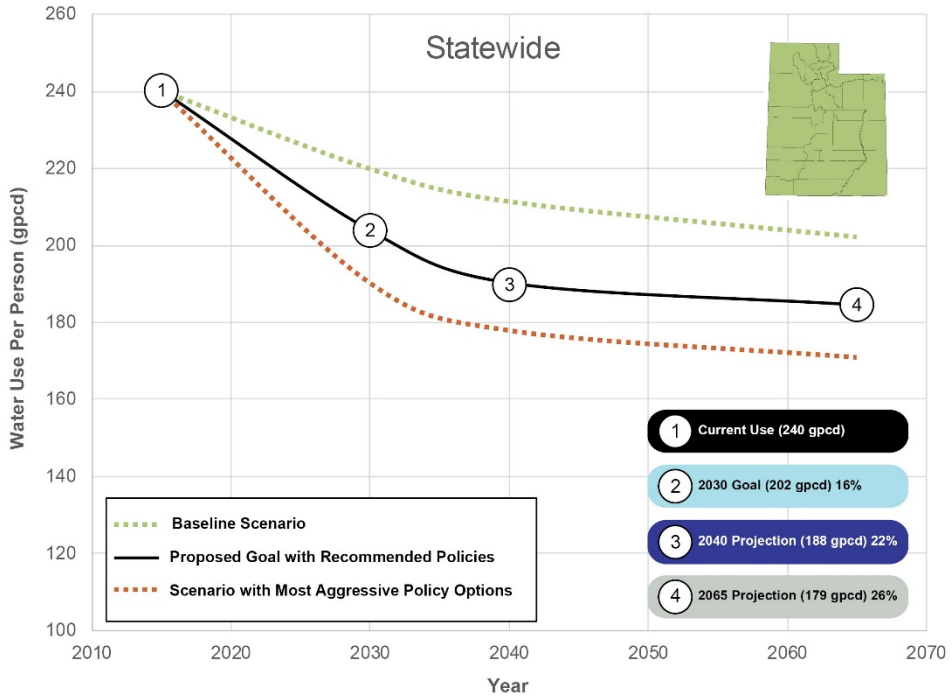
Note: The baseline and aggressive policy scenarios do not consider the cost or feasibility of achieving the assumed use patterns. They have been included solely to provide perspective relative to past and current water use and to help each region understand what must occur to achieve the final goals.

Figure 7-9: M&I Water Conservation Goals—Upper Colorado River Region



Note: The baseline and aggressive policy scenarios do not consider the cost or feasibility of achieving the assumed use patterns. They have been included solely to provide perspective relative to past and current water use and to help each region understand what must occur to achieve the final goals.

Figure 7-10: M&I Water Conservation Goals—Weber River Region



Note: The baseline and aggressive policy scenarios do not consider the cost or feasibility of achieving the assumed use patterns. They have been included solely to provide perspective relative to past and current water use and to help each region understand what must occur to achieve the final goals.

Figure 7-11: Impact of Regional Goals on Statewide M&I Water Use

RECOMMENDED PRACTICES

The following practices, selected from analysis of many possible ones, are recommended to help achieve the proposed regional M&I water conservation goals (Figure 7-12). Of necessity, these practices are limited to broad categories that may have different application in different areas of the state. Local water suppliers, communities, and businesses are encouraged to adapt and refine these recommendations, as well as implement others, in their own water conservation efforts and in pursuit of the regional goals.

GENERAL

- **Water conservation education.** Continued emphasis and funding of education and outreach must be fundamental components of any water conservation plan.
- **Conservation pricing.** Financial impacts will help motivate water conservation. Important features are lowering base rates, increasing tiers for usage, reviewing funding sources, and using customer feedback technology.

INDOOR

- **Fixture conversion.** This will happen naturally with new construction and as old fixtures are replaced, but may be accelerated through incentives and policies.
- **Other measures.** Fixing indoor leaks and inspiring a change in indoor water use habits will reduce consumption.

OUTDOOR

- **Improved irrigation efficiency.** Secondary metering, smart irrigation controls, and drip irrigation systems will improve irrigation efficiency for any landscape.
- **Water-wise landscaping.** New construction can be water-wise from the beginning, while existing landscapes can be converted.
- **Lot size and density guidelines.** Smaller lot sizes and less irrigated area will reduce the amount of water needed outdoors in new developments.

Figure 7-12: Recommended M&I Water Conservation Practices

(Drawing at top by B. Banner from Salt Lake County)

COMPARING COSTS AND BENEFITS

A range of financial and non-financial costs, offsets, and benefits exists for different approaches to more efficient use of currently developed water. In selecting conservation practices for implementation, policymakers should consider the full costs and benefits of each approach and the associated tradeoffs.

For example, assume that installing smart meters encourages more efficient use of water by (a) giving consumers better real-time feedback to inform timely water use decisions, and (b) interacting directly with smart timers, automatic leak shutoff mechanisms, and other watering devices to directly impact water use. A comprehensive financial cost and benefit comparison can examine not only the capital cost of installing the meter, but also the full benefits associated with that water meter installation, including savings in meter reader labor and transportation costs, the impact on the market price, and foregone or delayed capital costs, as well as non-financial benefits such as environmental improvements.

Because costs and benefits will vary depending on the unique circumstances of each water provider, this report does not attempt to quantify the all the costs and benefits associated with future conservation efforts here. Each provider will need to more fully explore the marginal financial costs of various approaches. Important features of this evaluation should be:

- Examining who pays for the costs and the relationships between cost of water and the use of that water
- Understanding marginal financial benefits from these same approaches, including financial savings to water users and taxpayers
- Exploring the non-financial costs and benefits of these different approaches.

RECOMMENDATIONS FOR IMPLEMENTATION

The pursuit of the regional M&I water conservation goals will be an endeavor of immense magnitude. All levels of society—not just water suppliers—must engage over extended time periods. Since changing water use behavior, policies, and technologies will become more difficult and expensive with time, prompt action on water conservation will bring the most benefit. A few starting actions are recommended here.

State and Local Policy Leaders

Policy plays a vital role in motivating and enabling water conservation. State, county, and local policy leaders should establish policies which require accountability for efficient water use. Policy leaders' support must consider universal metering, water loss control, education, and other water conservation activities, as well as the necessary funds for success. Policy leaders must also decide whether they are willing to support the necessary land use changes that will be required to reach the water conservation goals. This will include working with and being responsive to market forces to reduce both overall lot sizes for residential development and the amount of turf grass allowed. Water suppliers should be consulted in land-use decisions to

ensure alignment with water conservation efforts. Policy leaders can set or influence the pricing of water to promote conservation and reflect the cost of water scarcity. State and local governments should consider the water use impacts of proposed businesses and their plans for water-efficient fixtures, landscaping, and operations before approval.

State Agencies

The Division of Water Resources and other state agencies should continue to support water suppliers' and end users' efforts by analyzing M&I water use data, administering funding programs, reviewing water conservation plans, and promoting education and outreach. To date, much of the focus of data collection and research has been on residential water use. State agencies can take the lead in making sure there is adequate focus on the other categories of water use: commercial, institutional, and industrial. It is recommended that the Division evaluate achievement of the 2030 goals and refine the 2040 and 2065 projections accordingly as new data, practices, and technologies develop.

Water Suppliers

Water suppliers have a public responsibility to provide sufficient, safe water to their customers and to carefully manage this invaluable resource. In fulfilling this responsibility, water suppliers are responsible for developing and implementing their own Water Conservation Plans that define local goals, practices, pricing, and accountability. This report recommends several practices which water suppliers may consider, supported by the other parties described here.

Water Users

The water conservation mindset begins with individual water users. By recognizing water as a limited resource and changing their water use practices accordingly, water users will directly impact the overall water situation and the achievement of the regional goals. Utahns are encouraged to do their part in conserving water for Utah's future.

CONCLUSION

Population in Utah is expected to nearly double over the next 50 years. Meeting the water needs of this growing population will require conscientious planning and investment. Even as the state and its water suppliers explore options to more efficiently deliver existing sources and develop new sources, it is increasingly clear that conservation must be a foundational component of the state's plan to meet future water needs.

To assist citizens in reducing their water use, this report has developed customized M&I water conservation goals for nine regions of Utah. It is expected that policy leaders, state agencies, water suppliers, and all water users will work together to identify water conservation solutions to meet these goals. As we each do our part, our united efforts will help us prepare for the future.

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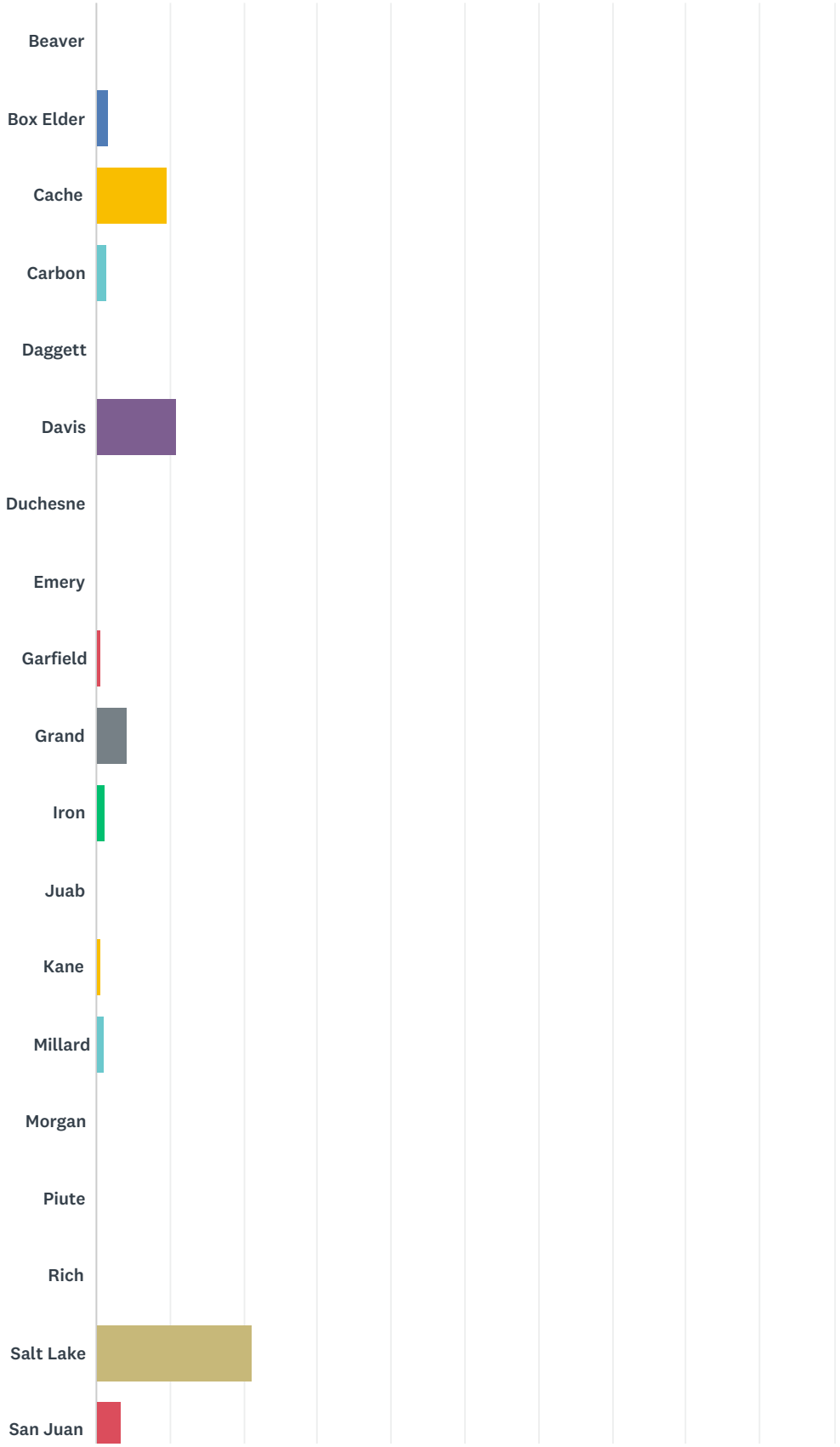
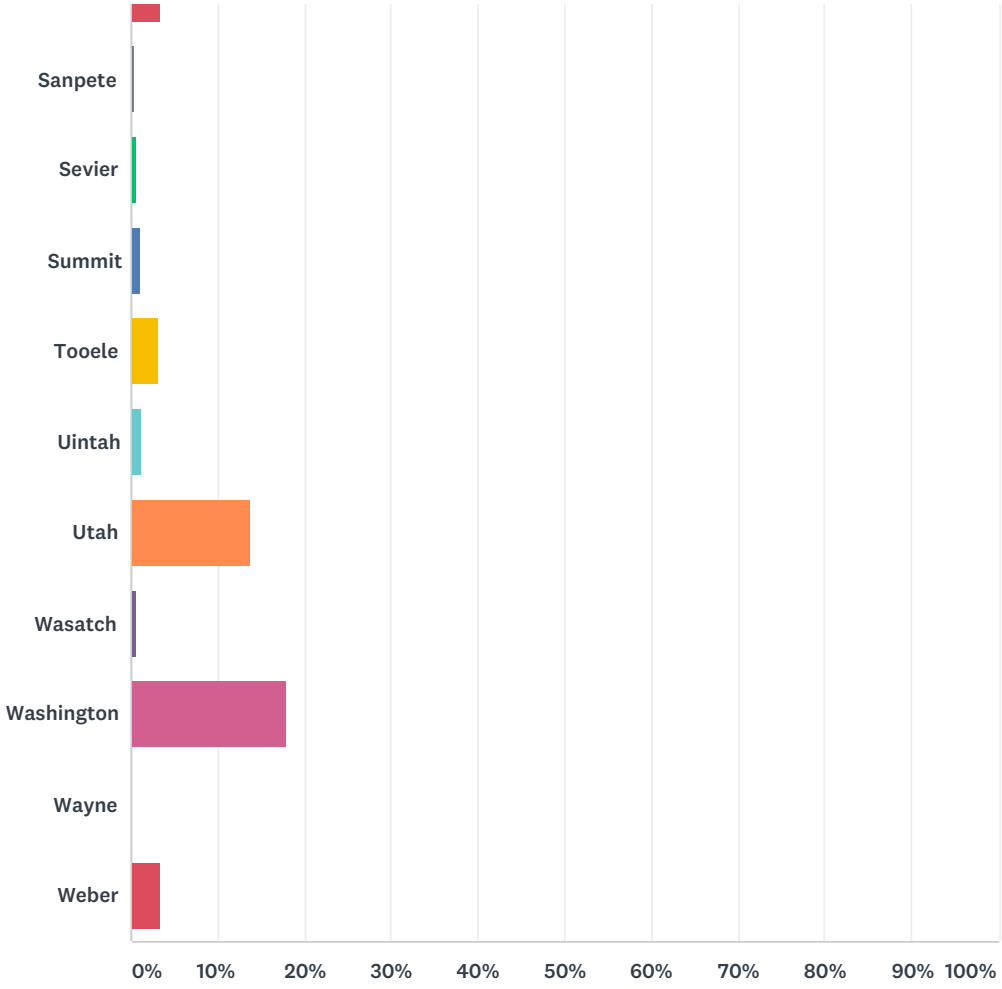
Appendix A: Online Survey and Results

Q1 In which county do you live?

Answered: 1,655 Skipped: 0





ANSWER CHOICES	RESPONSES	
Beaver	0.24%	4
Box Elder	1.75%	29
Cache	9.61%	159
Carbon	1.39%	23
Daggett	0.12%	2
Davis	10.94%	181
Duchesne	0.30%	5
Emery	0.24%	4
Garfield	0.54%	9
Grand	4.11%	68
Iron	1.33%	22
Juab	0.12%	2
Kane	0.73%	12
Millard	0.97%	16

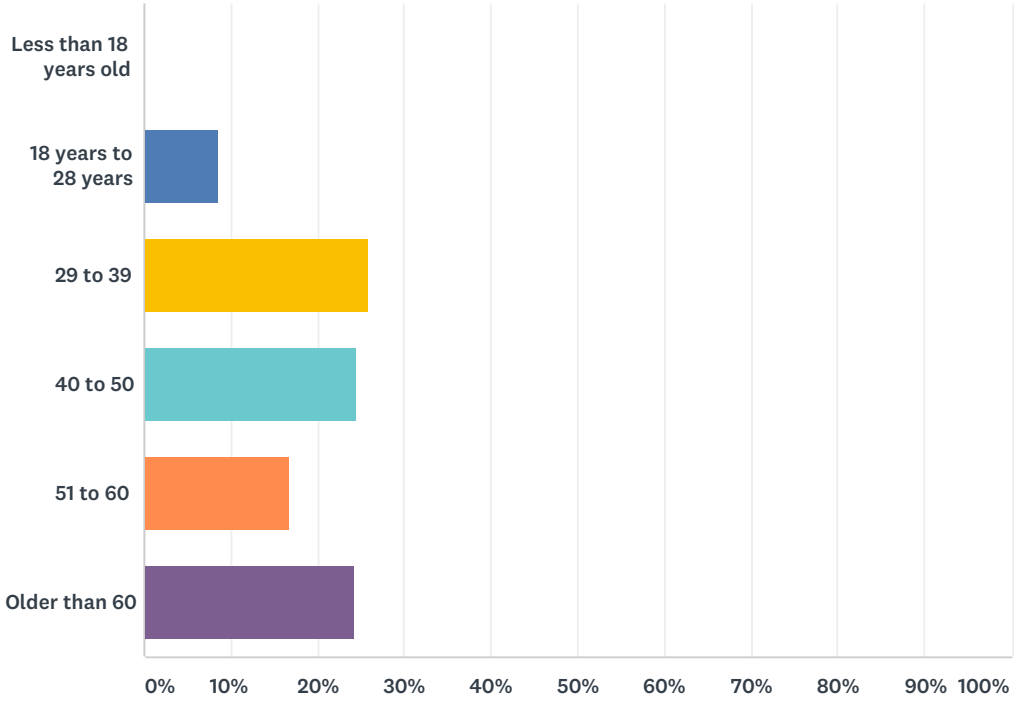
Morgan	0.24%	4
Piute	0.12%	2
Rich	0.30%	5
Salt Lake	21.09%	349
San Juan	3.26%	54
Sanpete	0.48%	8
Sevier	0.73%	12
Summit	1.03%	17
Tooele	3.14%	52
Uintah	1.33%	22
Utah	13.90%	230
Wasatch	0.54%	9
Washington	18.01%	298
Wayne	0.00%	0
Weber	3.44%	57
TOTAL		1,655

Q2 In which city do you live?

Answered: 1,647 Skipped: 8

Q3 How old are you?

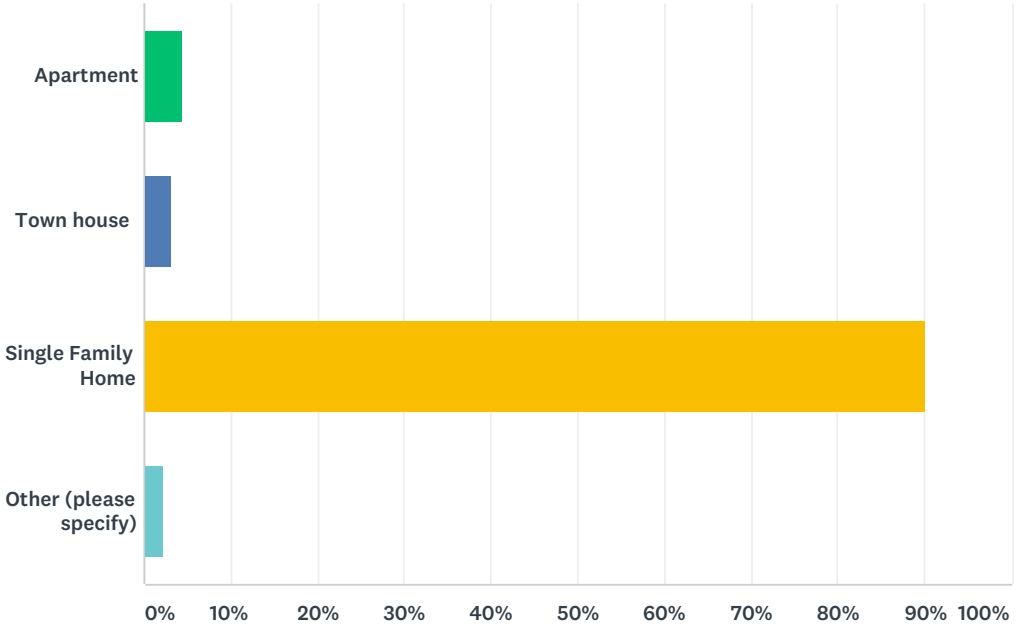
Answered: 1,655 Skipped: 0



ANSWER CHOICES	RESPONSES	
Less than 18 years old	0.12%	2
18 years to 28 years	8.64%	143
29 to 39	25.86%	428
40 to 50	24.41%	404
51 to 60	16.74%	277
Older than 60	24.23%	401
TOTAL		1,655

Q4 Which best describes your residence?

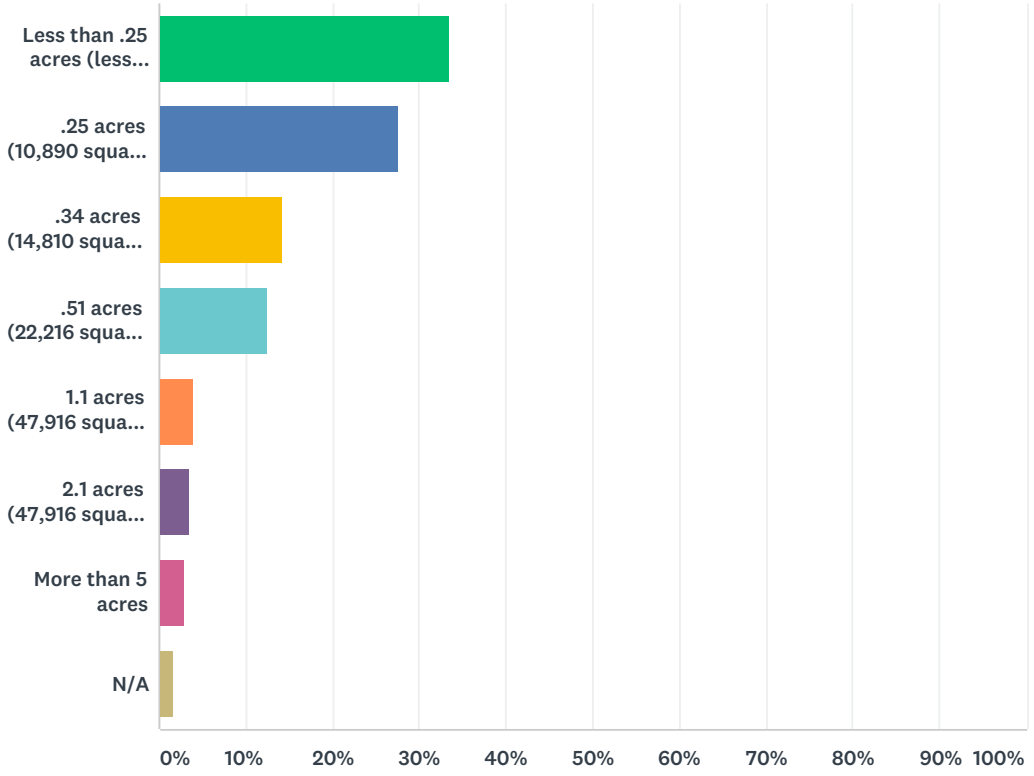
Answered: 1,655 Skipped: 0



ANSWER CHOICES	RESPONSES	
Apartment	4.35%	72
Town house	3.08%	51
Single Family Home	90.21%	1,493
Other (please specify)	2.36%	39
TOTAL		1,655

Q5 What is the approximate size of your property?

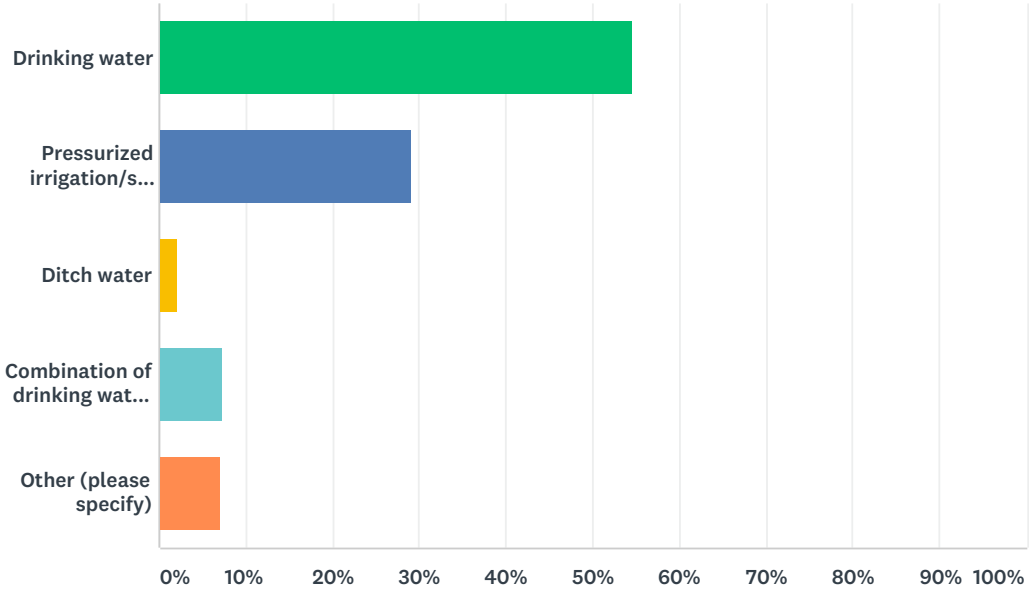
Answered: 1,644 Skipped: 11



ANSWER CHOICES	RESPONSES	
Less than .25 acres (less than 10,890 Square Feet)	33.39%	549
.25 acres (10,890 square feet) to .33 acres (14,374 square feet)	27.62%	454
.34 acres (14,810 square feet) to .50 acres (21,780 square feet)	14.29%	235
.51 acres (22,216 square feet) to 1 acres (43,560 square feet)	12.65%	208
1.1 acres (47,916 square feet) to 2 acres (87,120 square feet)	4.01%	66
2.1 acres (47,916 square feet) to 5 acres (217,800 square feet)	3.53%	58
More than 5 acres	2.92%	48
N/A	1.58%	26
TOTAL		1,644

Q6 What source of water do you use to irrigate your landscape?

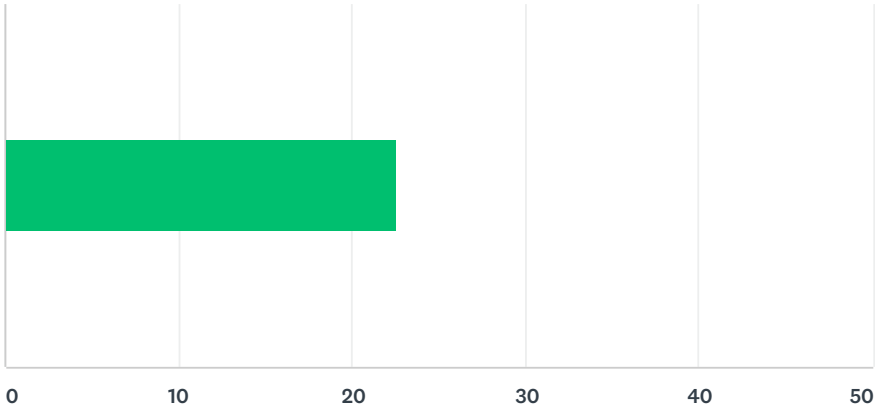
Answered: 1,646 Skipped: 9



ANSWER CHOICES	RESPONSES	
Drinking water	54.56%	898
Pressurized irrigation/secondary water	28.98%	477
Ditch water	2.00%	33
Combination of drinking water and secondary water	7.29%	120
Other (please specify)	7.17%	118
TOTAL		1,646

Q7 On average, how many gallons of water do you think your household uses daily, including indoor and outdoor use?

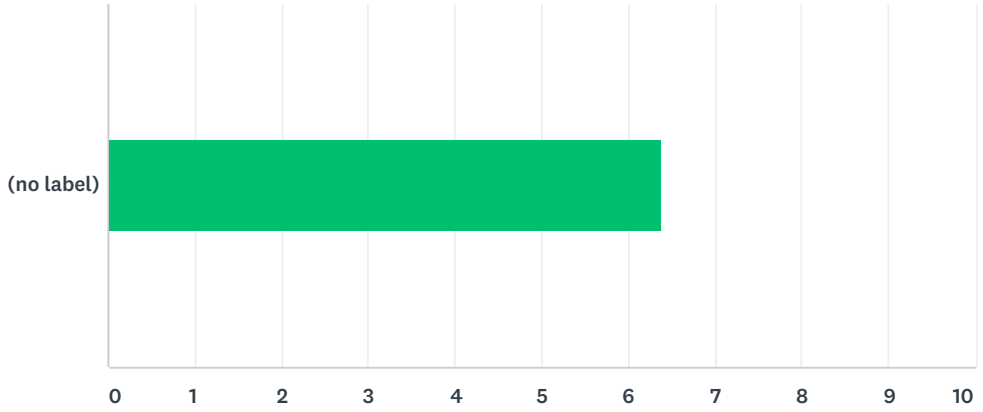
Answered: 1,338 Skipped: 317



ANSWER CHOICES	AVERAGE NUMBER	TOTAL NUMBER	RESPONSES
	23	30,203	1,338
Total Respondents: 1,338			

Q8 On a scale of 1 to 7, where 1 is not important and 7 is very important, how important is water conservation in the State of Utah?

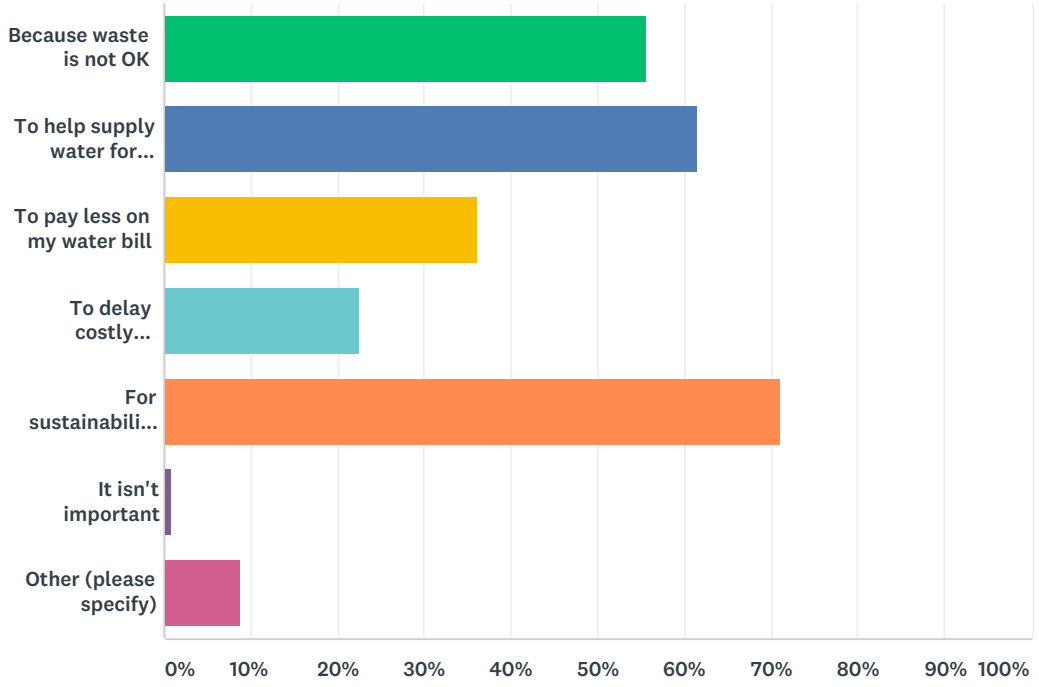
Answered: 1,407 Skipped: 248



	1 (NOT IMPORTANT)	2	3	4	5	6	7 (VERY IMPORTANT)	TOTAL	WEIGHTED AVERAGE
(no label)	0.92% 13	1.14% 16	1.49% 21	3.77% 53	8.46% 119	15.92% 224	68.30% 961	1,407	6.39

Q9 Why is it important to use water efficiently?

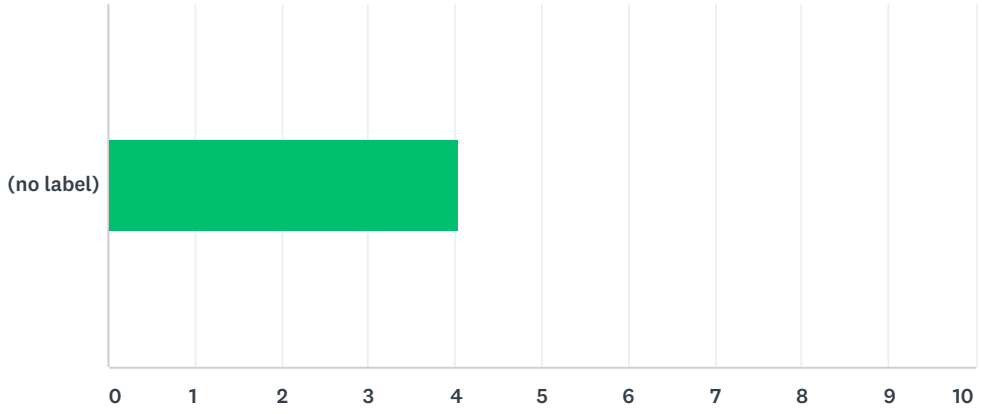
Answered: 1,402 Skipped: 253



ANSWER CHOICES	RESPONSES	
Because waste is not OK	55.56%	779
To help supply water for future generations	61.48%	862
To pay less on my water bill	36.23%	508
To delay costly development projects	22.61%	317
For sustainability and balance within the ecosystem	71.11%	997
It isn't important	0.93%	13
Other (please specify)	8.84%	124
Total Respondents: 1,402		

Q10 On a scale of 1 to 7, where 1 is very unwilling and 7 is very willing, how would you rate your community's willingness to conserve water?

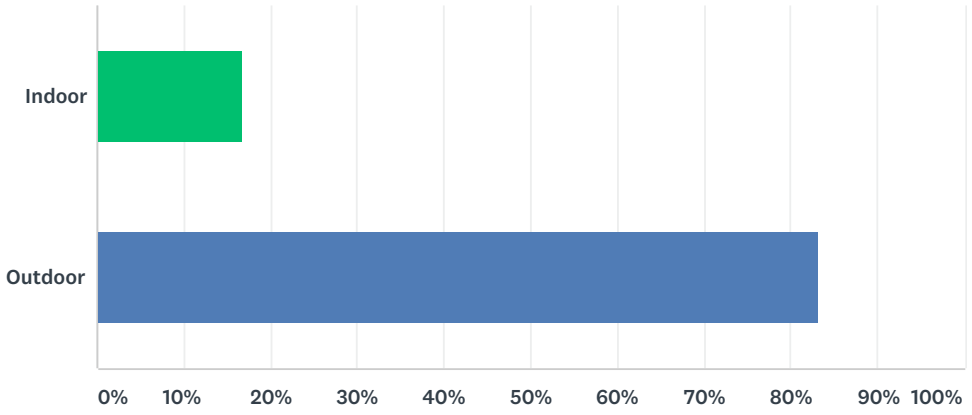
Answered: 1,399 Skipped: 256



	1 (VERY UNWILLING)	2	3	4	5	6	7 (VERY WILLING)	TOTAL	WEIGHTED AVERAGE
(no label)	4.72% 66	14.58% 204	19.87% 278	28.09% 393	19.30% 270	7.58% 106	5.86% 82	1,399	4.03

Q11 Where do you think you can save the most water?

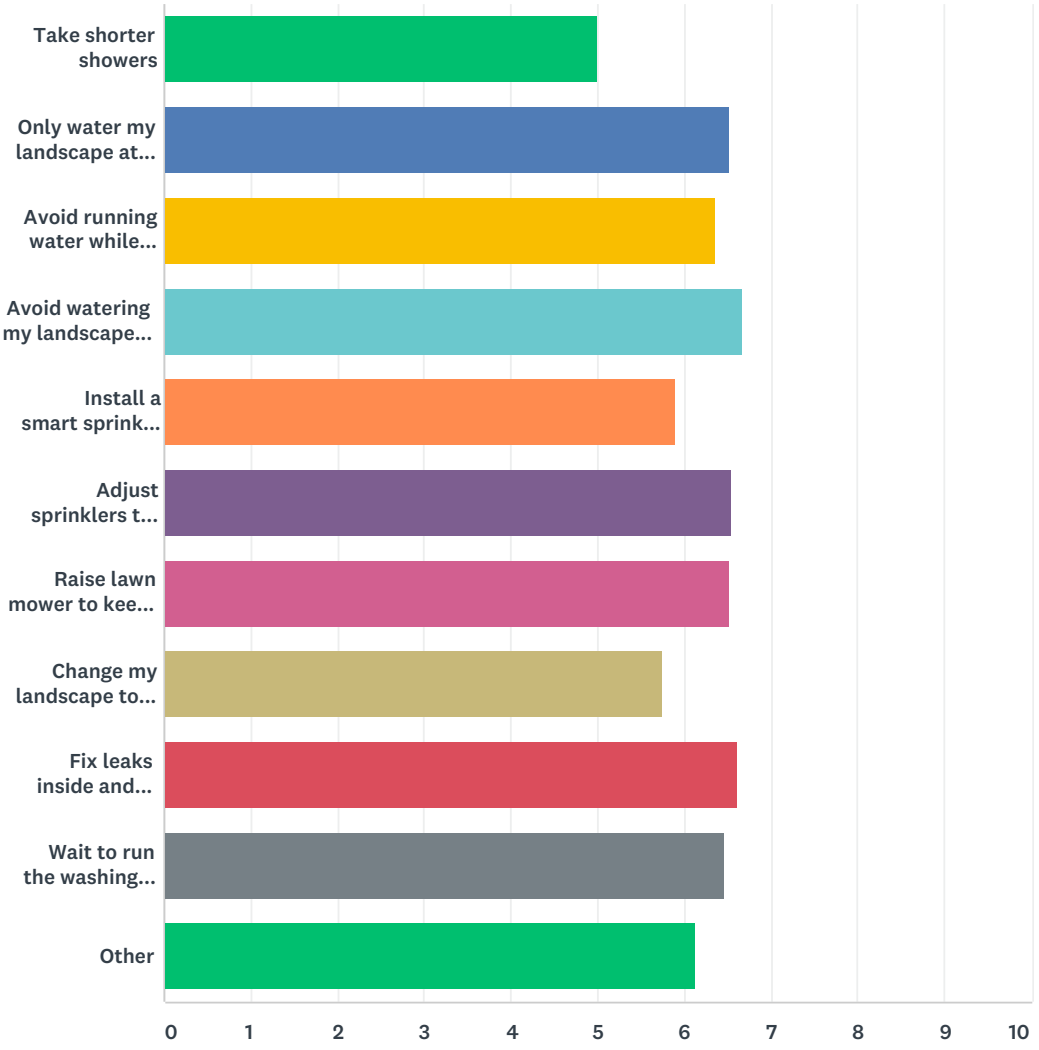
Answered: 1,407 Skipped: 248



ANSWER CHOICES	RESPONSES	
Indoor	16.70%	235
Outdoor	83.30%	1,172
TOTAL		1,407

Q12 On a scale of 1 to 7, where 1 is very unwilling and 7 is very willing, how willing are you to do the following to become more efficient?

Answered: 1,407 Skipped: 248

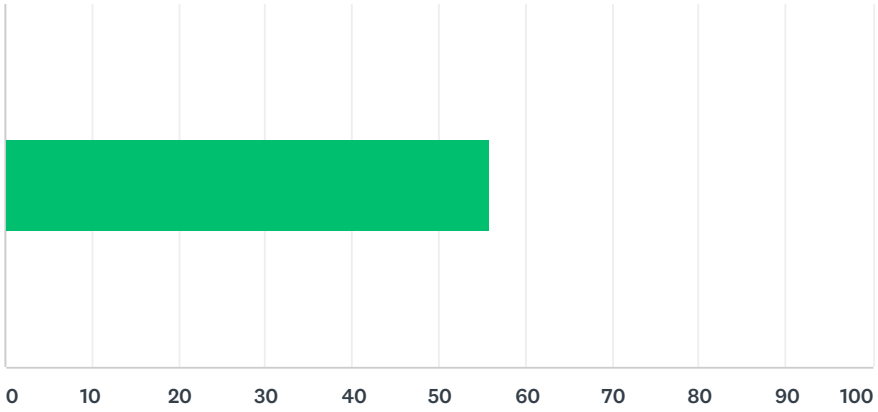


	1: VERY UNWILLING	2	3	4	5	6	7: VERY WILLING	TOTAL	WEIGHTED AVERAGE
Take shorter showers	4.39% 61	6.26% 87	9.57% 133	16.33% 227	19.42% 270	16.76% 233	27.27% 379	1,390	4.99
Only water my landscape at nighttime	1.36% 19	0.86% 12	1.22% 17	3.30% 46	5.02% 70	10.19% 142	78.05% 1,088	1,394	6.53
Avoid running water while brushing my teeth	1.93% 27	1.29% 18	2.00% 28	5.36% 75	5.08% 71	10.44% 146	73.91% 1,034	1,399	6.37
Avoid watering my landscape during the rain	1.65% 23	0.43% 6	0.72% 10	2.01% 28	2.44% 34	7.10% 99	85.66% 1,195	1,395	6.67
Install a smart sprinkler timer and use the highest efficiency setting	2.72% 38	2.79% 39	4.94% 69	7.31% 102	12.32% 172	12.97% 181	56.95% 795	1,396	5.90

Adjust sprinklers to avoid sidewalks	1.29% 18	0.22% 3	1.00% 14	3.01% 42	5.09% 71	12.62% 176	76.77% 1,071	1,395	6.55
Raise lawn mower to keep grass a little taller to shade the roots	1.37% 19	0.36% 5	1.15% 16	3.38% 47	4.67% 65	12.44% 173	76.64% 1,066	1,391	6.53
Change my landscape to add more water-wise plants and features	2.86% 40	3.00% 42	5.72% 80	9.01% 126	15.09% 211	12.59% 176	51.72% 723	1,398	5.75
Fix leaks inside and outside of my home	0.86% 12	0.07% 1	0.72% 10	1.72% 24	5.87% 82	13.18% 184	77.58% 1,083	1,396	6.62
Wait to run the washing machine and dishwasher until there is a full load	1.36% 19	0.57% 8	1.00% 14	3.22% 45	7.16% 100	14.33% 200	72.35% 1,010	1,396	6.47
Other	3.50% 14	0.75% 3	1.25% 5	12.25% 49	5.75% 23	9.50% 38	67.00% 268	400	6.13

Q13 How much of your landscape are you willing to transition to water-wise plants and features?

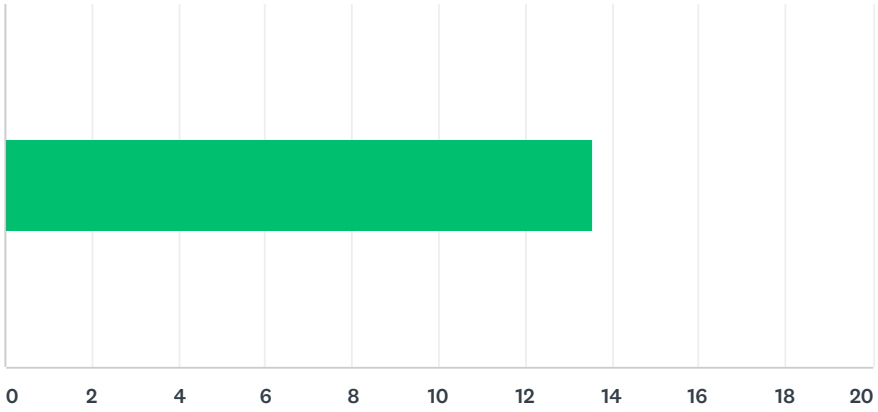
Answered: 1,407 Skipped: 248



ANSWER CHOICES	AVERAGE NUMBER	TOTAL NUMBER	RESPONSES
	56	78,739	1,407
Total Respondents: 1,407			

Q14 On average, how many less gallons of water daily, including indoor and outdoor use, do you think your household could use daily?

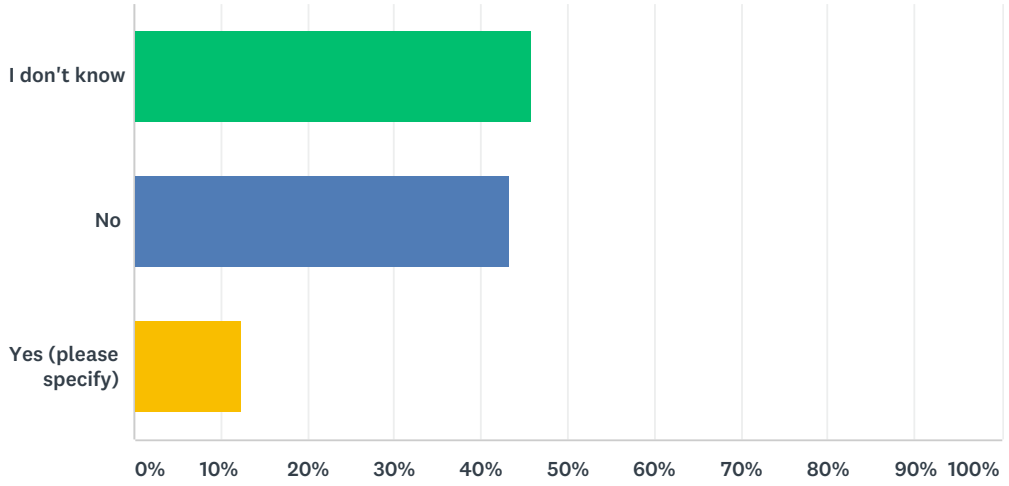
Answered: 1,325 Skipped: 330



ANSWER CHOICES	AVERAGE NUMBER	TOTAL NUMBER	RESPONSES
	14	17,982	1,325
Total Respondents: 1,325			

Q15 Are there policies in your community that restrict landscaping choices (for example, requiring turf in the park strip)?

Answered: 1,400 Skipped: 255



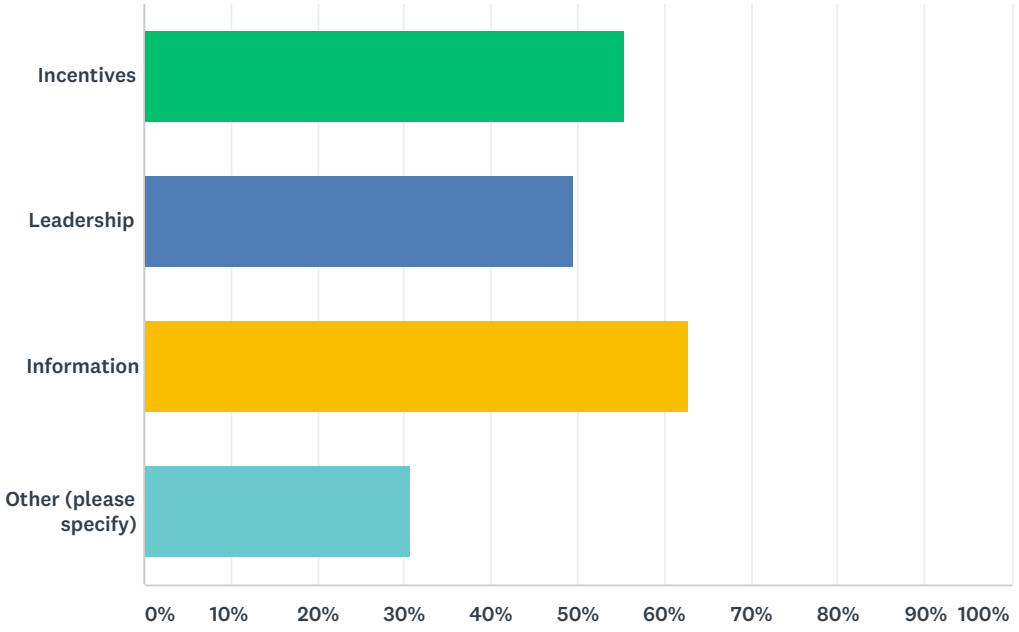
ANSWER CHOICES	RESPONSES	
I don't know	45.71%	640
No	43.29%	606
Yes (please specify)	12.43%	174
Total Respondents: 1,400		

Q16 What is the organization and/or name and title of the person who takes the lead on water conservation programs in your community?

Answered: 1,118 Skipped: 537

Q17 What are the barriers to water conservation in your community (select all that apply)?

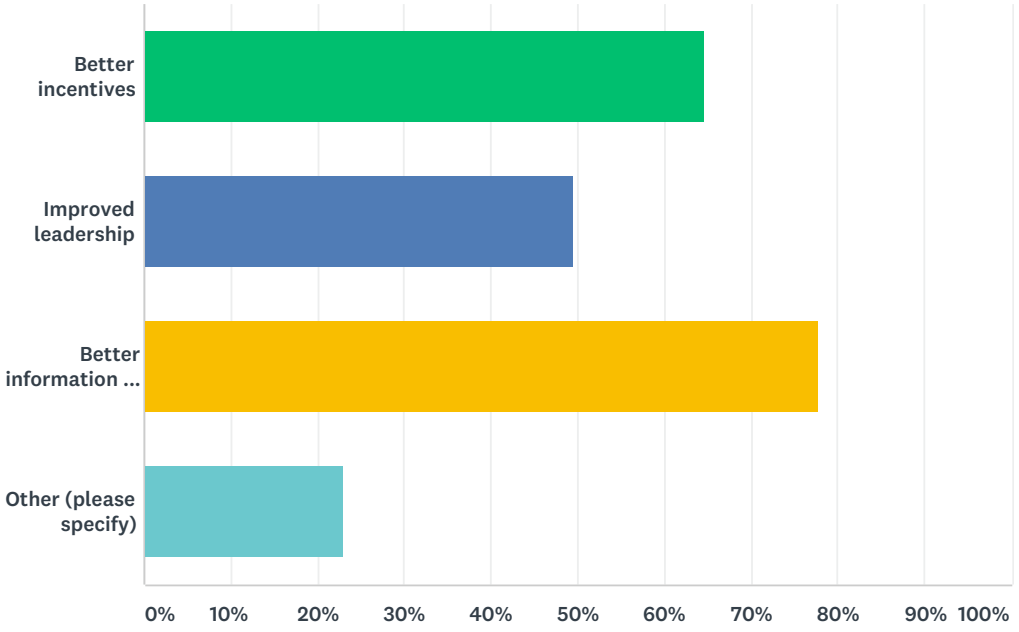
Answered: 1,407 Skipped: 248



ANSWER CHOICES	RESPONSES	
Incentives	55.51%	781
Leadership	49.61%	698
Information	62.76%	883
Other (please specify)	30.85%	434
Total Respondents: 1,407		

Q18 What do you think are Utah's best opportunities for water conservation (select all that apply)?

Answered: 1,407 Skipped: 248



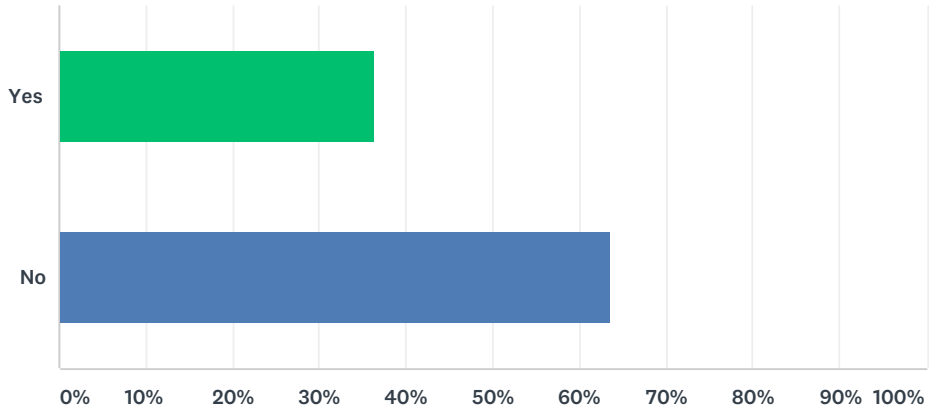
ANSWER CHOICES	RESPONSES	
Better incentives	64.75%	911
Improved leadership	49.54%	697
Better information and education	77.75%	1,094
Other (please specify)	22.96%	323
Total Respondents: 1,407		

Q19 Please tell us about the regional factors or context that should be considered when setting conservation goals in your area?

Answered: 982 Skipped: 673

Q20 Are you willing to be contacted for an interview?

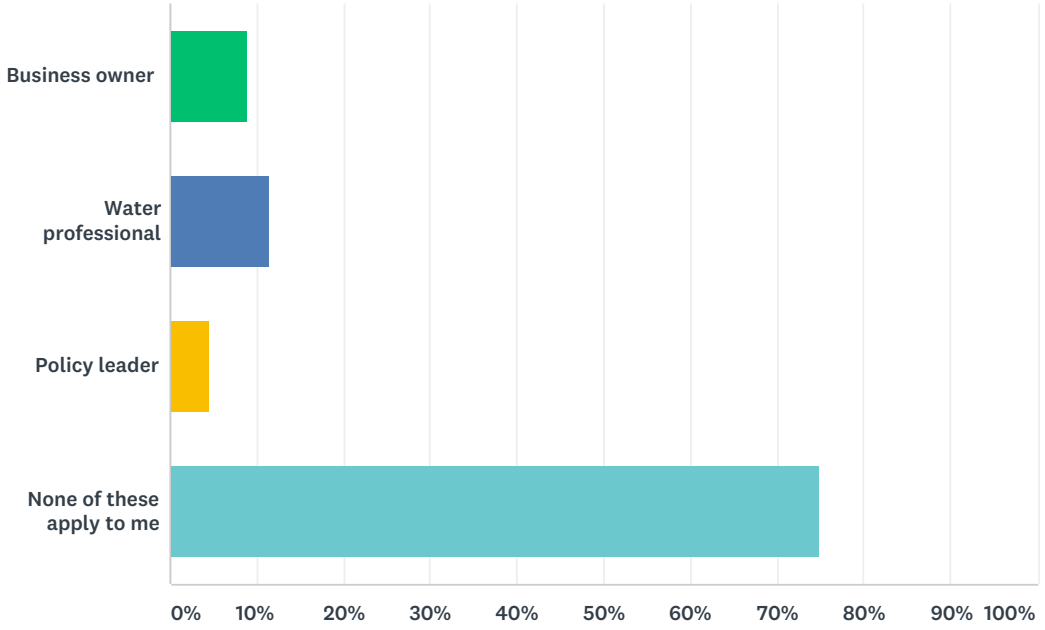
Answered: 1,359 Skipped: 296



ANSWER CHOICES	RESPONSES	
Yes	36.50%	496
No	63.50%	863
TOTAL		1,359

Q21 Which of the following apply to you?

Answered: 1,407 Skipped: 248



ANSWER CHOICES	RESPONSES	
Business owner	9.03%	127
Water professional	11.44%	161
Policy leader	4.69%	66
None of these apply to me	74.84%	1,053
TOTAL		1,407

Q22 What are some of the water efficiency challenges at your business?

Answered: 92 Skipped: 1,563

Q23 What are some of the water efficiency opportunities at your business?

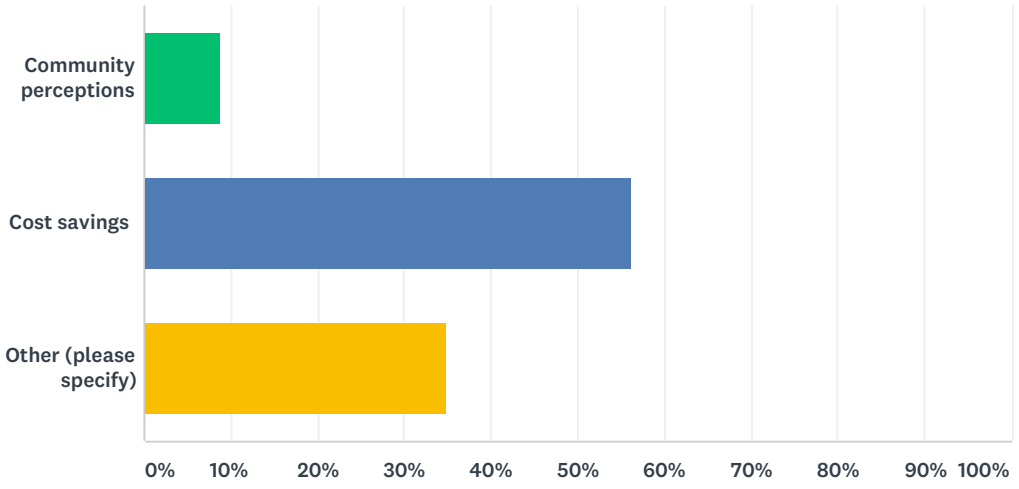
Answered: 83 Skipped: 1,572

Q24 What water efficiency measures are being implemented at your business?

Answered: 82 Skipped: 1,573

Q25 As a business person, what motivates you the most to conserve?

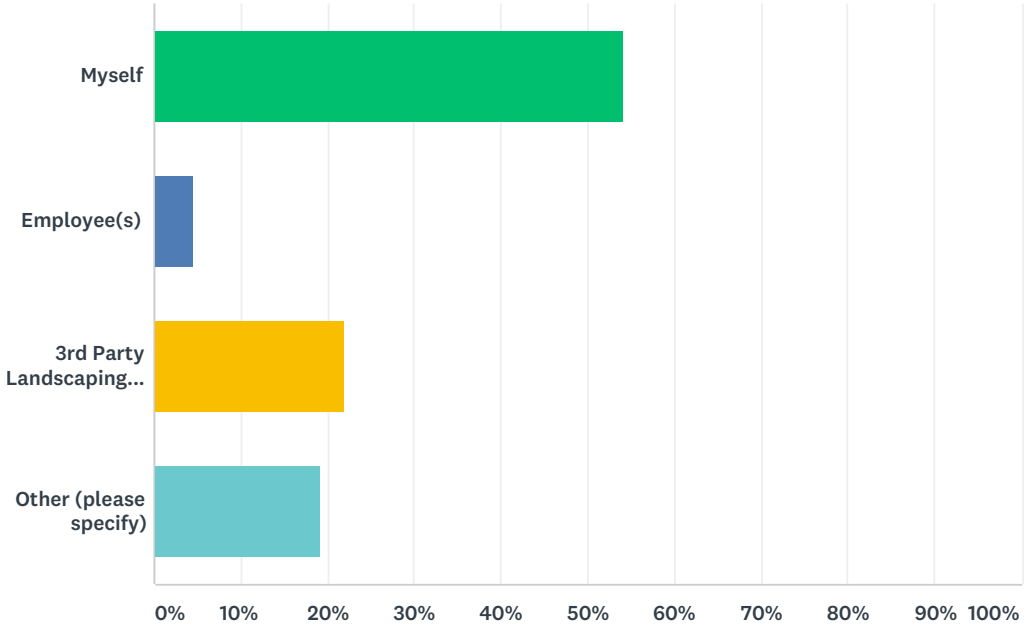
Answered: 103 Skipped: 1,552



ANSWER CHOICES	RESPONSES	
Community perceptions	8.74%	9
Cost savings	56.31%	58
Other (please specify)	34.95%	36
TOTAL		103

Q26 Who manages the landscape at your business?

Answered: 109 Skipped: 1,546



ANSWER CHOICES	RESPONSES	
Myself	54.13%	59
Employee(s)	4.59%	5
3rd Party Landscaping Company	22.02%	24
Other (please specify)	19.27%	21
TOTAL		109

Q27 As a policy leader, what are your greatest challenges related to encouraging water efficiency through statutes, rules and/or legislation in your constituency?

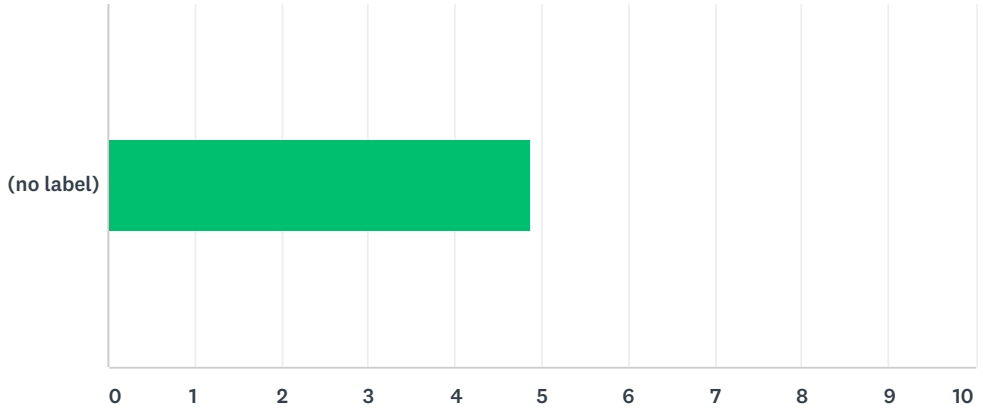
Answered: 50 Skipped: 1,605

Q28 Which policies would help the State of Utah or your region become more water efficient (please specify whether the policy is a statewide or local policy)?

Answered: 43 Skipped: 1,612

Q29 On a scale of 1 to 7, where 1 is not important and 7 is very important, how important is water efficiency to your constituents?

Answered: 54 Skipped: 1,601



	1 (NOT IMPORTANT)	2	3	4	5	6	7 (VERY IMPORTANT)	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	3.70% 2	9.26% 5	25.93% 14	24.07% 13	31.48% 17	5.56% 3	54	4.87

Q30 What, as a water professional, do you see as the greatest barriers to improved water efficiency?

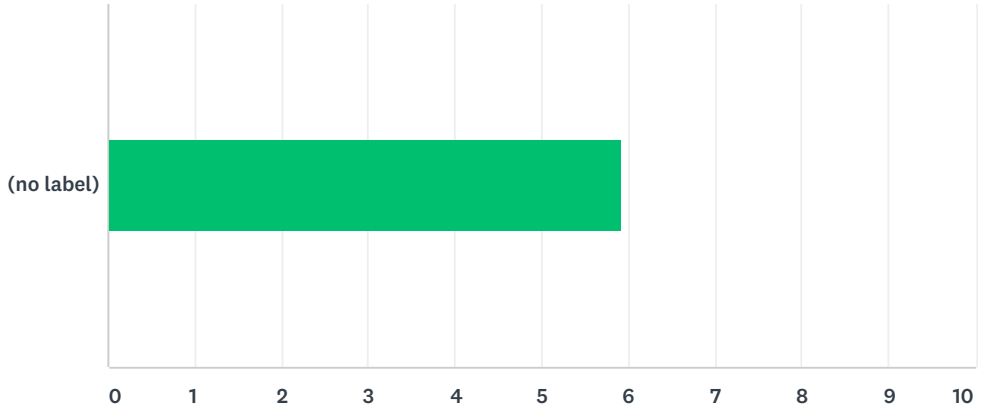
Answered: 143 Skipped: 1,512

Q31 What, as a water professional, do you see as the greatest opportunities to improve efficiency in your area?

Answered: 140 Skipped: 1,515

Q32 On a scale of 1 to 7, where 1 is not important and 7 is very important, how important is water conservation to your employer?

Answered: 151 Skipped: 1,504



	1 (NOT IMPORTANT)	2	3	4	5	6	7 (VERY IMPORTANT)	TOTAL	WEIGHTED AVERAGE
(no label)	2.65% 4	1.99% 3	2.65% 4	9.27% 14	13.25% 20	17.22% 26	52.98% 80	151	5.92

Q33 Is there any other feedback you feel is important to share?

Answered: 674 Skipped: 981

Q34 If you would like to be in the running to win a gift card for taking this survey, please enter your contact information below. Winners will be randomly selected.

Answered: 668 Skipped: 987

ANSWER CHOICES	RESPONSES	
Name	100.00%	668
Company	0.00%	0
Address	98.20%	656
Address 2	5.69%	38
City/Town	98.65%	659
State/Province	98.65%	659
ZIP/Postal Code	98.65%	659
Country	0.00%	0
Email Address	97.01%	648
Phone Number	91.17%	609

Appendix B: Example Conservation Scenarios for Public Outreach and Discussion Purposes

Example Conservation Scenarios for Public Outreach and Discussion Purposes

INTRODUCTION

As discussed in Chapter 4, prior to gathering input from the community as part of the public outreach process, it was unknown what policies or practices the public and decision makers would like to see included as part of future conservation goals. This put the team in a bit of a "chicken or the egg" scenario. It was not possible to move forward on detailed conservation potential calculations without knowing which specific policies or practices to include, but it would be difficult to gather input on which policies and practices to include without understanding their potential to affect conservation.

To overcome this challenge, the project team prepared a series of three example conservation scenarios. These scenarios looked at what conservation could be achieved in each region given a sample set of assumed water use characteristics without worrying about the specifics of what policies and practices would be used to achieve those water use characteristics. The purpose of these example scenarios was to provide context and perspective to facilitate discussion during the public outreach and stakeholder coordination process. The purpose of this appendix is to explain the sample conservation scenarios developed and used during the public outreach process.

METHODS

To quantify water conservation potential by region and provide perspective for future discussions regarding goals, three example future M&I water use scenarios have been developed. **It should be strongly emphasized that these scenarios are not goals.** They have been prepared to provide context and perspective to assist in the goal setting process. These scenarios can be generally described as follows:

- **Scenario 1—**Scenario 1 is based on potential savings associated primarily with reducing M&I water use through higher-efficiency methods. While this scenario includes some minor changes to the way water is used, it does not include any significant changes in lifestyle or development patterns.
- **Scenario 2—**Scenario 2 is based on reducing M&I water use through partial conversion to higher-efficiency household fixtures and landscaping methods.
- **Scenario 3—**Scenario 3 is based on reducing M&I water use through full conversion to higher-efficiency household fixtures and low water use landscaping methods. This scenario represents the maximum theoretical reduction in water use if there were 100% adoption of all the water conservation activities identified herein.

The following sections evaluate each of the M&I water use scenarios on a regional basis across all municipal and industrial user types. As a baseline for comparison, descriptions of the scenarios include a comparison to past water use practices. Values reported for “Past Practices” in the following sections are reflective of estimated water use practices prior to 2000.

RESIDENTIAL—INDOORS

In 2016, the Water Research Foundation (WRF) published a study which analyzed residential end uses of water (DeOreo et al. 2016). This study found that the most significant reduction in indoor water use in recent years has been accomplished through conversion to higher-efficiency fixtures and appliances. Over the past few years, higher-efficiency fixtures and appliances have become progressively standardized. Indoor residential water use is expected to continue to be reduced over time as older fixtures and appliances wear out and are replaced.

Based on these findings, the WRF study concluded that indoor residential use could be reduced to approximately 40 gpcd if all fixtures were converted and best practices were exercised relative to leak repair and personal water use habits (e.g., shorter showers). Using the WRF study as a guideline, a range of water conservation potential scenarios for indoor residential water were developed as summarized in Table B-1 and as described below. For this and all factors to be discussed in this section, the assumed use in the scenario definitions would apply to both existing and future development.

Table B-1: Statewide Residential Indoor Water Conservation Potential

Scenario	Indoor Residential Water Use (gpcd)
Past Practices	70
1	60
2	50
3	40

Indoor Residential Water Use Scenarios

- Past Practices—70 gpcd
    - Average per capita residential indoor water use prior to 2000 (i.e. before the state established water conservation goals, DWRe 2010).
- Scenario 1—60 gpcd
    - This is approximately equal the current statewide average per capita residential indoor water use.
    - It represents about 80% conversion of shower heads and faucets to higher-efficiency fixtures and about 40% conversion of toilets and washing machines to higher-efficiency fixtures.
- Scenario 2—50 gpcd
    - This represents significant additional conversion of fixtures but limited additional water conservation associated with fixing leaks or changing personal habits.

    - It represents about 95% conversion of shower heads and faucets to higher-efficiency fixtures and about 80% conversion of toilets and washing machines to higher-efficiency fixtures.
- Scenario 3—40 gpcd
    - This represents 100% conversion to high-efficiency fixtures and appliances, a 60% reduction in residential indoor water leaks, and increased awareness and focus on water conservation.

It will be re-emphasized that these scenarios are not attempting to predict or dictate what future use will be. They are simply a sample of potential water use assumptions that can then be used to provide perspective during the goal setting process.

RESIDENTIAL—OUTDOORS

Outdoor residential water use is the largest single category of municipal water use, averaging 108 gpcd or approximately 45% of statewide municipal use (DWRe 2018a, 2018b). Based on the size of this category alone, it should not be a surprise that that there is substantial potential for further water conservation outdoors by the state's residents. It is expected that outdoor water conservation will be affected by at least three different factors: 1) increases in water application efficiency through changes in water users' behavior and equipment, 2) changes in landscaping, and 3) changes in the sizes of our properties (i.e. development density). The following sections discuss each of these factors.

a) Increases in Efficiency

Irrigation efficiency is the ratio of water needed by vegetation to the amount of water actually applied through irrigation. For the purposes of this study, irrigation efficiency is defined as the evapotranspiration rate for a given area (as defined by Lewis and Allen [2017]) divided by metered outdoor water use. Inefficient irrigation practices result in a significant waste of water due to leaks, overwatering, watering outside of planting beds, and irrigating in the rain. Currently, average irrigation efficiency in the state for metered connections is estimated to be from approximately 60% to 65% efficient based on collected water use data (DWRe 2018a). While this represents notable improvement from past irrigation practices (estimated to be around 50% efficient), there is obviously still room for improvement.

Irrigation efficiency can be considerably improved without a large effort on the water users' part simply by adjusting irrigation systems to correlate with seasonal evapotranspiration (ET) rates (DWRe 2014). Irrigation efficiency also tends to improve when meters are added to secondary water connections and customers are required to pay based on the quantity of water they use. Based on perceived opportunity for improvement in this area, water conservation potential scenarios for outdoor residential efficiency were developed as summarized in Table B-2 and as described below.

Table B-2: Irrigation Efficiency Scenarios

Scenario	Irrigation Efficiency[1]
Past Practices	50%
1	70%
2	80%
3	>80%

1. Ratio of water needed by vegetation to the amount of water actually applied through irrigation

Irrigation Efficiency Scenarios

- Past Practices—50%
    - Historically, water use data has suggested that the average irrigation application rate along the Wasatch Front was 50% efficient, double the amount what was actually needed (Jackson et al. 2003).
- Scenario 1—70%
    - This scenario considers an increase in the average irrigation efficiency to 70% efficient, meaning almost one and a half times the needed water is applied.
- Scenario 2—80%
    - This scenario considers an increase in the average irrigation efficiency to 80% efficient, meaning about one and a quarter times the needed water is applied.
- Scenario 3—>80%
    - Studies have concluded that it is possible to reach 100% irrigation efficiency in demonstration gardens and other controlled settings (Sun et al. 2012). However, due to limitations of time, training, and interest, there is likely a practical limitation on how close the average water user can get to 100% efficient. For this scenario, water use has been calculated based on 80% efficiency (same as Scenario 2) with the understanding that additional efficiency will always be the goal, but significant additional savings is unlikely.

b) Change in Landscaping

In addition to changing how much water is applied to landscapes, the landscape appearance can also change. Historically, most Utah residential landscapes have consisted of cool-season turf grasses irrigated with sprinkler systems. While turf has some benefits (provides excellent play areas, requires maintenance activities that homeowners are familiar with, etc.), it generally requires more water than other landscaping options. This has been documented in a number of different studies. A couple of local examples include:

- *Jordan Valley Water Conservancy District Stud*y (Jackson et al. 2003)—The Jordan Valley Water Conservancy District Demonstration Gardens located in West Jordan feature a variety of residential demonstration gardens. Each garden has a water meter to

monitor water use. Table B-3 shows the water applied to each landscape area after establishment.

Table B-3: JVWCD Demonstration Garden, Total Water Applied to Each Landscape Area 2001–2002

Landscape Type	Landscape Description	Total Seasonal Water Applied (Inches)
Homeowner Average	2000–2002	50
-	Theoretical Evapotranspiration for Turf at Garden Location	21.9
Traditional Landscape	Primarily Bluegrass	21.2
Harvest	Combination of turf, planting beds and hardscape with a focus on garden areas.	16.55
Perennial Garden	Combination of turf, planting beds and hardscape with a focus on flowering perennials.	15.85

The results of this study conclude that the amount of water used in the perennial and harvest gardens is significantly lower than the amount of water used in a traditional landscape primarily composed of traditional cool-season turf. ET rates for various water efficient plantings were used to estimate outdoor water conservation potential.

- *Water- Efficient Urban Landscapes: Integrating Different Water Use Categorizations and Plant Types. (Sun et al. 2012)*—This study analyzed the water use of various landscape types at the Utah State University Botanical Center located in Kaysville, Utah. The study found that the water use in landscapes composed of predominantly native and climate adapted landscape plants irrigated by drip irrigation systems was approximately 40% of the required irrigation for cool season turf grasses irrigated with sprinkling systems. Even within the turf grass category, there are options for lower-water-use turf than have been traditionally used in the state.

Based on these findings, it is clear that the types of plants we grow, the density at which they are planted, and the type of system used to irrigate them can all have a major effect on the amount of water needed outdoors. A switch from traditional cool-season turf grasses and sprinkling systems to perennials, shrubs, and trees with drip irrigation systems can save significant water. Choosing native and climate adapted landscape plants can save even more. Based on these general conclusions, water conservation potential scenarios for residential landscaping practices were developed as shown in Figure B-1 and as described below.

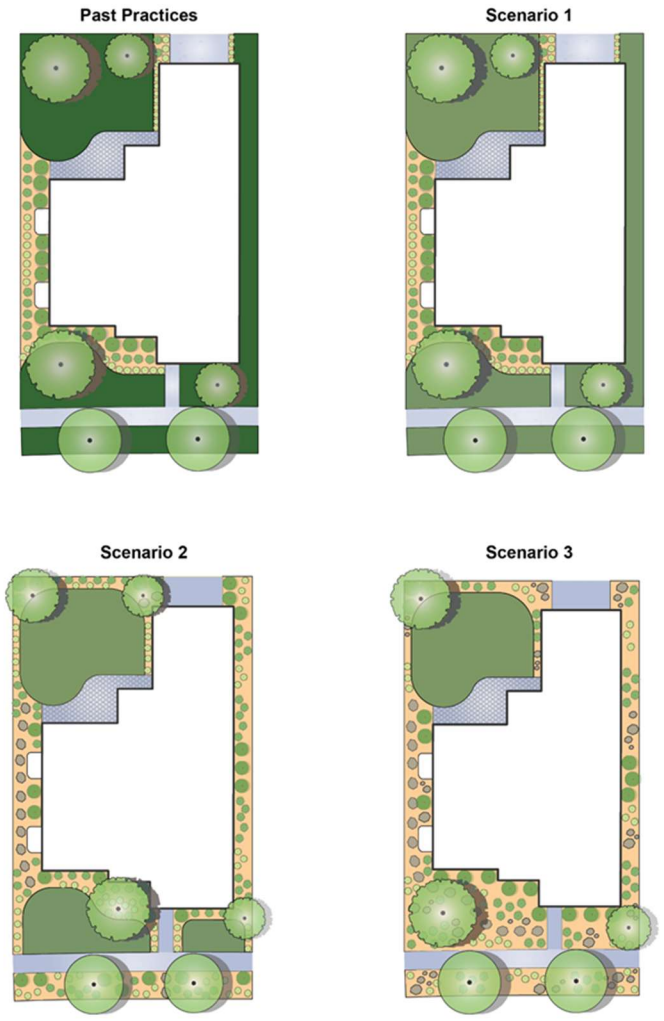


Figure B-1: Potential Scenarios for Residential Landscaping Practices

Landscaping Type Scenarios

- Past Practices—Traditional Landscaping
    - Representative of a traditional residential landscape.
    - Composed of 80% cool -season turf and 20% planting beds/hardscaped areas.
- Scenario 1—Minimal Landscape Adjustments
    - Since Scenario 1 is designed to represent primarily increase in efficiency (by reducing overwatering), no major changes are included in this scenario for landscaping type.
    - Representative of a traditional residential landscape.
    - Composed of 80% cool-season turf and 20% planting beds/hardscaped areas.
- Scenario 2—Moderate Landscape Adjustments
    - Representative of a partial traditional/partial climate adapted landscape.
    - Composed of 50% cool -season turf and 50% planting beds and hardscaped areas.

    - Assumes that planting beds will include predominantly low water use plants and will be irrigated with drip irrigation systems.
- Scenario 3—Aggressive Landscape Adjustments
    - Representative of a climate adapted landscape.
    - Composed of 20% cool season turf and 80% planting beds and hardscaped areas.
    - Low-water-use plant selection and drip irrigation.

c) Changes in Development Density

Over the past few decades, Utah's historically rural landscape has rapidly transformed and developed in some areas. As Utah's continues to grow, development density continues to change and can significantly affect outdoor water use. Not all water suppliers can control density decisions that would allow density to be used as a conservation tool (e.g., water districts and private water companies do not generally have direct input in land use decisions). However, some water suppliers do regulate land use (e.g., cities that provide their own water) and changes in density are a reality that must be reflected in the water conservation potential calculations and corresponding goals.

Changes in development density can be broken down into two categories: 1) decreasing household size and 2) decreasing lot size.

1. **Decreasing household size—**Population data from the Kem C. Gardner Policy Institute at the University of Utah projects that Utah's household size has been decreasing steadily over the last couple of decades and will continue to decrease with time (Kem C. Gardner Policy Institute 2017). The statewide average household size is currently 2.94 persons per household, a decrease from the 2010 average of 3.09 persons per household. It is estimated that by the year 2065, average household size will decrease to 2.57 persons. For the purposes of this study, it has been assumed that future household sizes will be as projected by the Kem C. Gardner Policy Institute.

   Household size is important because it affects the amount of residential landscape associated with each person. If residential lots continued to develop at the average lot size of the past but household size decreased, then the amount of irrigated acreage per person would increase over time. However, lot size is not expected to stay the same as discussed in the next section.

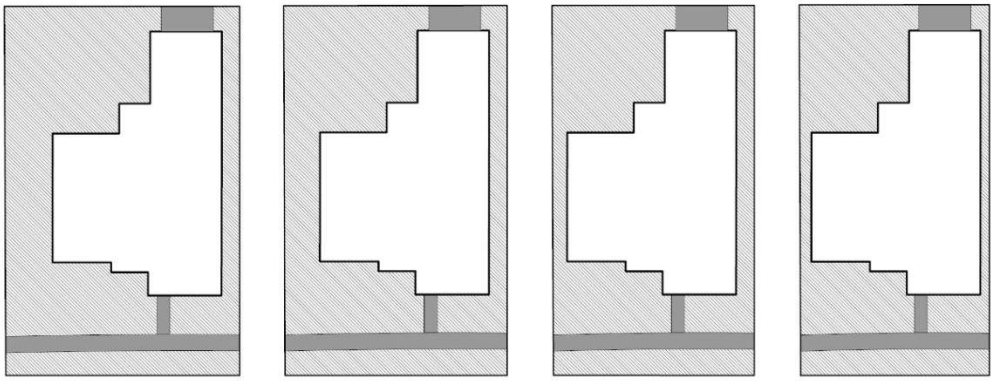
2. **Decreasing lot size—**Along with household sizes, lot sizes throughout Utah have also been decreasing over the last several decades. There are likely many factors contributing to smaller lots sizes, but two of the most influential appear to be land availability and smaller lot preferences:

    - **Land availability—**As counties continue to urbanize and expand, the amount of developable land continues to decrease. As a result, there is not enough land

available to accommodate for future growth using historic average residential lot sizes. Counties like Salt Lake and Davis are necessarily seeing reductions in lot size simply based on availability of developable land.

- **Smaller lot preferences—**Recent development trends have confirmed that Utah's residents have generally been moving away from larger lot sizes toward smaller lots sizes that are more affordable and take less time to maintain. There is no reason to believe this trend will change in the foreseeable future.

Based on these factors, decreases in lot size are expected in all areas of the state, but especially in urbanized areas along the Wasatch Front. Table B-4 shows percent reduction in lot size included in each of the M&I water use scenarios. The impact of reduced lot size (based on the statewide average) is shown graphically in Figure B-2.



[1] Based on state average. Actual reduction varies by county, see Table 4-4.

Figure B-2: Potential Scenarios for Decreases in Residential Lot Sizes

Table B-4: Reduction in Average Lot Size by County

County	Average Single Family Lot Size (ft^2)	Average Landscaped Area Per Lot (ft^2)	Scenario 1	Scenario 2	Scenario 3
Beaver	16,234	8,117	7%	14%	24%
Box Elder	15,264	8,759	8%	15%	25%
Cache	12,805	7,770	6%	12%	24%
Carbon	12,149	6,075	4%	9%	17%
Daggett	11,419	5,710	0%	0%	10%
Davis	10,652	6,156	18%	18%	18%
Duchesne	13,882	6,941	5%	9%	21%
Emery	17,725	9,330	8%	16%	25%

Garfield	21,763	10,881	1%	1%	24%
Grand	12,713	6,356	8%	16%	20%
Iron	11,577	5,789	9%	18%	21%
Juab	17,986	9,109	10%	20%	43%
Kane	19,014	9,507	2%	4%	25%
Millard	25,875	12,938	6%	13%	31%
Morgan	21,033	10,704	11%	21%	45%
Piute	24,523	12,262	2%	3%	20%
Rich	20,150	10,075	4%	7%	28%
Salt Lake	8,463	4,239	14%	14%	14%
San Juan	14,607	7,304	14%	29%	33%
Sanpete	19,913	9,957	8%	17%	34%
Sevier	18,020	9,010	7%	15%	28%
Summit	16,063	8,031	5%	11%	28%
Tooele	12,138	6,069	11%	22%	25%
Uintah	16,889	8,445	9%	17%	28%
Utah	13,154	6,577	8%	16%	31%
Wasatch	19,113	10,294	10%	19%	45%
Washington	11,852	5,926	5%	11%	28%
Wayne	28,648	14,324	3%	5%	31%
Weber	11,880	6,828	7%	15%	18%
Statewide Average	11,300	5,899	5%	14%	19%

- Scenario 1—5% reduction in lot size statewide
    - This scenario assumes that decreases in lot size will be relatively modest. The values included here are based on half of the change calculated in Scenario 2 (see next section).
    - There are two exceptions to the statement above. Salt Lake and Davis Counties do not have enough developable land to sustain growth at the size of lots that would result from the calculation described for this scenario. As a result, density changes in these two counties for all three scenarios (including this one) are simply based on the required reduction to limit development to available land. This results in lot size reduction of 19% in Salt Lake County and 13% in Davis County. These values are based on 80,000 developable acres left in Salt Lake County and 30,000 developable acres left in Davis County. Utah and Weber Counties would also approach full development of available property by the end of the planning window but don't quite reach it.

- Scenario 2—14% reduction in lot size statewide
    - This scenario assumes that the decrease in lot size is enough to exactly offset the projected decrease in household size. In other words, lot sizes will decrease such that the amount of landscaped space per person stays the same.

- Scenario 3—19% reduction in lot size statewide
    - In this scenario, all future development in each county would average no more than 7,280 square feet, the projected average lot size in Salt Lake County at buildout.
    - Under this scenario, all new development in the state would look like average densities in developed areas along the Wasatch Front. While it is unlikely that most rural counties will densify at this rate, this scenario is intended to cover the full range of potential densification.

Resulting Residential Outdoor Water Conservation Potential

Based on the several factors above, residential outdoor water conservation potential can be calculated. Internal to this calculation are several components worth discussion in some detail:

Evapotranspiration Rate

Evapotranspiration (ET) rates are used to measure the amount of water needed in a landscape. Evapotranspiration occurs when water is moved from soil to the atmosphere by evaporation and from plants to the atmosphere by transpiration. Put simply, ET is essentially the minimum amount of water needed to grow plants. ET is generally measured in units of inches of water per year. To identify the amount of water saved associated with increasing efficiency and as a result of changing residential landscapes, a baseline for ET rates across the state needed to be established.

ET rates for each county have been calculated based on data developed by Lewis and Allen (Lewis et al. 2017). This study looked at vegetation water use variability throughout the state as a result of seasonal weather conditions and air temperature variations. From this raster data, zonal statistics were computed over the water systems' service areas in each county (DWRe 2015) and weighted by area to obtain the representative value for the county. In other words, the variable used for each county represents the area-weighted average of the water systems in that county.

Potential Climate Change Impact on Evapotranspiration

One issue of concern for many water suppliers is climate change and its potential impact on the irrigation needs of landscapes. Water resources planning, including conservation, must acknowledge a changing climate both past and future.

Dendrohydrolgy analysis (reconstructing past hydrologic conditions by examining tree rings) indicates that streamflow in the Weber River was most stable in the 20th century, while the centuries before showed much greater variability of extended wet and dry periods (Bekker et al. 2014). A similar analysis of the Bear River indicates that the latter half of the 20th century was the second-wettest period of the past 1200 years (DeRose et al. 2015). Both findings imply that future water conditions could be more uncertain than the recent past.

The climate continues to change. In Utah, the projected effects by 2050 relative to present conditions include a temperature increase of 2.3 °F, an 8-day lengthening of the irrigation season, reductions in mountain snowpack (shift from snow-dominated to rain-dominated hydrology), and peak runoff occurring one month earlier (Kunkel et al. 2004; Barnett et al. 2005; Gilles et al. 2012; Kunkel 2013; EPA 2015; JVWCD 2017; Khatri et al. 2018; USGCRP 2018). There is of course considerable uncertainty, but these values constitute representative projections for a variety of likely climate scenarios. See Figure B-3.

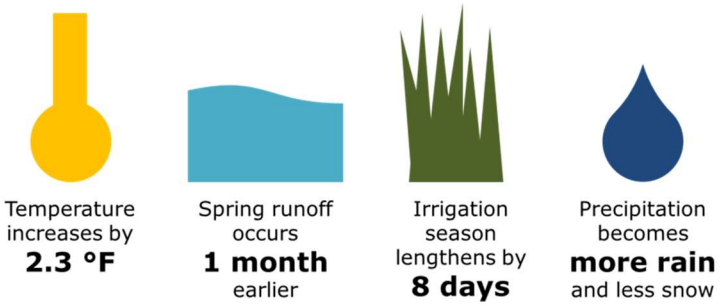


Figure B-3: Climate Change Impacts in Utah by 2050

All of these effects have implications for water conservation. First, the increasing temperatures and longer irrigation seasons will demand more water for the same uses (especially outdoor) relative to today. Second, less snowpack and earlier runoff will limit available water supplies. While not directly affecting water demand, a limited supply will motivate further water conservation.

Because of the significant uncertainty associated with climate change projections, the impact of these changes on ET are equally uncertain. Ranges of expected increases in ET from one recent study vary from 2% to 17% (JVWCD 2017). For the purposes of this analysis, an increase in ET rates as a result of climate change has been included in each water conservation scenario as summarized in Table B-5. It will be noted that, in most cases, water conservation potential increases from Scenario 1 to Scenario 3. In this case, however, water conservation potential will decrease as the impact of climate change increases. (Additional impacts from climate change would result in more pressure to conserve and is correspondingly more likely to be associated with the higher scenarios.)

Table B-5: Potential Increase in Irrigation Needs Associated with Climate Change

Scenario	Increase in Irrigation Needs
Past Practices	0%
1	5%
2	10%
3	15%

OTHER WATER USE TYPES

Estimating water conservation potential for other types of water use was done following the same procedure defined in Chapter 4 of the main report.

RESULTS

M&I water use under these scenarios is summarized in Tables B-6 and B-7. Table B-6 summarizes water use by component and Table B-7 summarizes water use by region. See Appendix G for a summary of water use by county.

Table B-6: Potential M&I Water Use (gpcd) by Type

User Type	2015	Scenario 1	Scenario 2	Scenario 3
Res. Indoor	60	61	51	41
Res. Outdoor	108	95	70	48
Commercial	34	35	31	27
Institutional	33	32	28	26
Industrial	6	5	5	5
Total	**240**	**228**	**186**	**148**

Table B-7: Potential M&I Water Use (gpcd) by Region

Region	2015	Scenario 1	Scenario 2	Scenario 3
Bear River	304	275	230	180
Green River	284	261	216	169
Lower Colorado North	284	250	202	159
Lower Colorado South	305	335	267	214
Provo River	222	210	169	129
Salt Lake	210	204	168	139
Sevier River	400	339	276	208
Upper Colorado	333	292	231	186
Weber River	250	213	176	141
Statewide Average	240	228	186	148

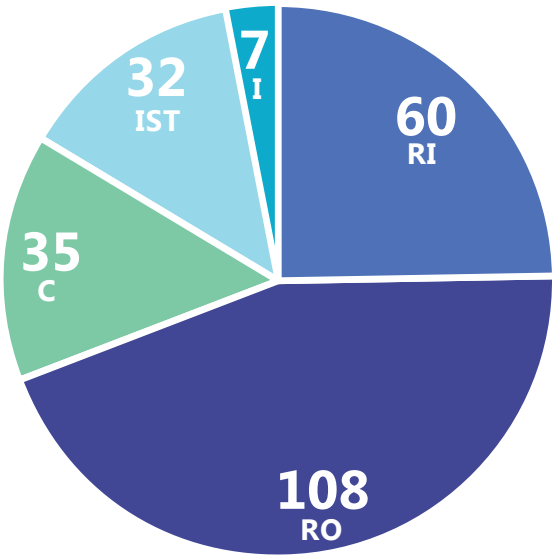
These results suggest that there is significant potential to conserve water throughout the state. Though the results vary on a regional basis, the state's residents and institutional properties in particular have substantial opportunity to reduce water use both indoors and outdoors. The other municipal and industrial user types have significant potential to conserve as well and should not be overlooked as potential contributors to water conservation.

In reviewing Table B-7, it should be noted that, simply because a region has a 2015 use below the benchmark for a given scenario, it does not mean that the region has necessarily met all the assumptions associated with that scenario. Consider Lower Colorado South for example. Its 2015 use is below Scenario 1. This does not necessarily mean that it has already met its goals relative to indoor fixture conversion and efficiency. In this case, its progress toward water conservation can primarily be explained by landscaping practices where average residential turf grass use is already less than 50% (the target for Scenario 2). Thus, savings through turf grass reduction offsets remaining water conservation that can be achieved in other areas. Even where 2015 water use falls below one or more of the scenarios, it is still expected that water conservation associated with items such as indoor fixture conversion and improved efficiency will be considered in these areas as goals are established.

Appendix C: Open House Materials

WHERE ARE WE AT TODAY?

STATEWIDE WATER USE 2015



I **Industrial Water Use** - Manufacturing, plants, oil and gas producers, mining companies, dairies and stock watering.

IST **Institutional Water Use** - Various public agencies and institutions (i.e. schools, municipal buildings, churches)

C **Commercial Water Use** - Office spaces, retail businesses, restaurants and hotels.

RI **Residential Indoor Water Use** - Residential drinking water, cooking, washing clothes, miscellaneous cleaning, personal grooming and sanitation.

RO **Residential Outdoor Water Use** - Irrigation of lawns, gardens and landscapes, and other residential activities.

Total - 242 gallons per capita per day(gpcd)

Source: Utah Division of Water Resources

HOW DID WE GET HERE?

2001

25% By 2025

- In 2001, Governor Leavitt published a statewide conservation goal to reduce per capita use by 25 percent. Governor Herbert later added to the goal to achieve the reduction of 25 percent by 2025.

2005

Water Use Monitoring

- 2005, 2010, and 2015 Utah Division of Water Resources published Municipal and Industrial Water Use Data reports.

2010

Legislative Water Audit

- In 2015, the Utah Division of Water Resources had a legislative audit that looked at the divisions Municipal & Industrial (M&I) Water Use Report. The audit recommended regional water conservation goals.

2015

Regional Goals

2018

- Utah is unique in that we have a variety of climates and microclimates, and other factors throughout the state that impact regional efficiency potential.
- Purpose of regional goal setting process is to combine scientific/ engineering analysis with regional input to develop goals appropriate for different areas of the state.

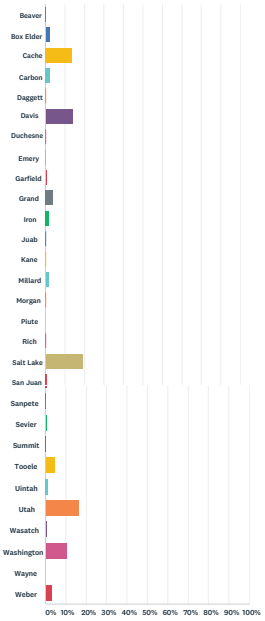
Major Recommendations Of The Legislative Water Audit

- Establish regional water conservation goals.
- Recommend that the Legislature consider adopting policies that will require the phasing in of universal (secondary [non-drinking] water) metering.
- Adopt pricing policies that encourage efficient water use.
- The Division should work with the legislature to encourage large water systems to conduct periodic AWWA M36 system water audits
- Use the 2015 M&I Report used as the baseline for future analysis and conservation goals.

SURVEY RESULTS

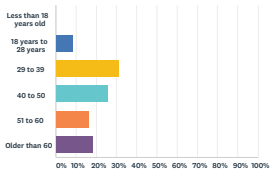
SURVEY RESULTS AS OF SEPT. 20, 2018:

Q1 In which county do you live?

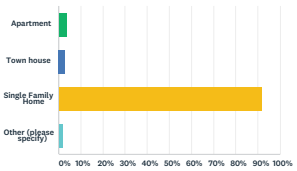


Q2 In which city do you live?

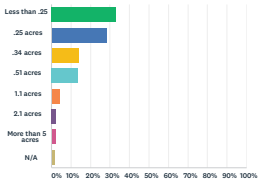
Q3 How old are you?



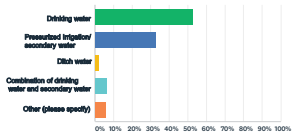
Q4 Which best describes your residence?



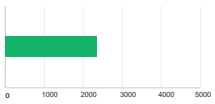
Q5 What is the approximate size of your property?



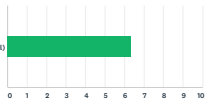
Q6 What source of water do you use to irrigate your landscape?



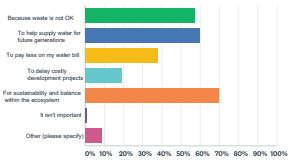
Q7 On average, how many gallons of water do you think your household uses daily, including indoor and outdoor use?



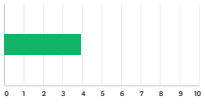
Q8 On a scale of 1 to 7, where 1 is not important and 7 is very important, how important is water conservation in the State of Utah?



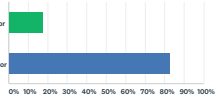
Q9 Why is it important to use water efficiently?



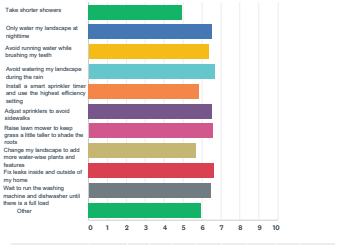
Q10 On a scale of 1 to 7, where 1 is very unwilling and 7 is very willing, how would you rate your community's willingness to conserve water?



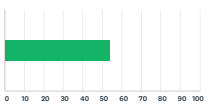
Q11 Where do you think you can save the most water?



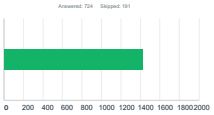
Q12 On a scale of 1 to 7, where 1 is very unwilling and 7 is very willing, how willing are you to do the following to become more efficient?



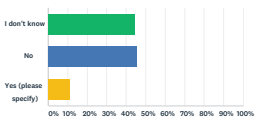
Q13 How much of your landscape are you willing to transition to water-wise plants and features?



Q14 On average, how many less gallons of water daily, including indoor and outdoor use, do you think your household could use daily?

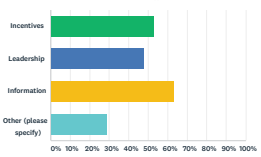


Q15 Are there policies in your community that restrict landscaping choices (for example, requiring turf in the park strip)?

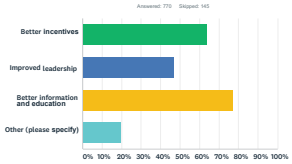


Q16 What is the organization and/or name and title of the person who takes the lead on water conservation programs in your community?

Q17 What are the barriers to water conservation in your community (select all that apply)?

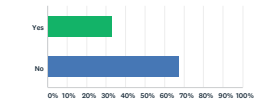


Q18 What do you think are Utah's best opportunities for water conservation (select all that apply)?

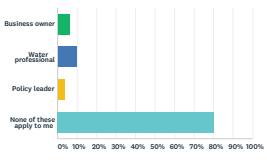


Q19 Please tell us about the regional factors or context that should be considered when setting conservation goals in your area?

Q20 Are you willing to be contacted for an interview?



Q21 Which of the following apply to you?



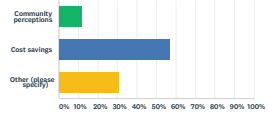
BUSINESS OWNERS :

Q22 What are some of the water efficiency challenges at your business?

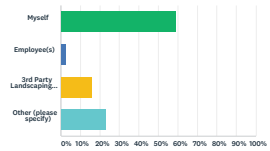
Q23 What are some of the water efficiency opportunities at your business?

Q24 What water efficiency measures are being implemented at your business?

Q25 As a business person, what motivates you the most to conserve?



Q26 Who manages the landscape at your business?

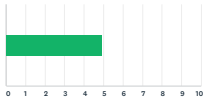


POLICY LEADERS :

Q27 As a policy leader, what are your greatest challenges related to encouraging water efficiency through statutes, rules and/or legislation in your constituency?

Q28 Which policies would help the State of Utah or your region become more water efficient (please specify whether the policy is a statewide or local policy)?

Q29 On a scale of 1 to 7, where 1 is not important and 7 is very important, how important is water efficiency to your constituents?

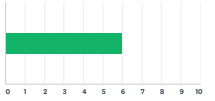


WATER PROFESSIONALS :

Q30 What, as a water professional, do you see as the greatest barriers to improved water efficiency?

Q31 What, as a water professional, do you see as the greatest opportunities to improve efficiency in your area?

Q32 On a scale of 1 to 7, where 1 is not important and 7 is very important, how important is water conservation to your employer?



Q33 Is there any other feedback you feel is important to share?

Q34 If you would like to be in the running to win a gift card for taking this survey, please enter your contact information below. Winners will be randomly selected.

Complete the Regional Water Conservation Survey:

The survey will be available through October 19, 2018

At One Of The Laptop Stations

Fill Out A Paper Survey

SurveyMonkey.com/r/LocalGoals

Our commitment to you, the public, is to actively listen to your ideas, feedback and concerns, and to communicate how public input informed these goals.

HOW MUCH WATER COULD WE SAVE ?

INDOOR WATER USE PROJECTIONS FOR DIFFERENT DEVELOPMENT PATTERNS

Inefficient Past Practices

70 gpcd

- Water use averages prior to 2000.
- Limited use of high efficiency fixtures and appliances.

Improved Efficiency

60 gpcd

- 40% conversion to high efficiency fixtures and appliances.

Additional Efforts

50 gpcd

- 80% conversion to high efficiency fixtures and appliances.

Maximum Conservation

40 gpcd

- 100% conversion to high efficiency fixtures and appliances.
- Elimination of leaks.
- Improved awareness and focus on water conservation.

Source: Water Research Foundation

OUTDOOR WATER USE PROJECTIONS FOR DIFFERENT DEVELOPMENT PATTERNS

Inefficient Past Practices

- Traditional Landscaping – 80% turf 20% planting beds and hardscaped areas.
- Historic irrigation efficiency = 50% (Double the amount needed)

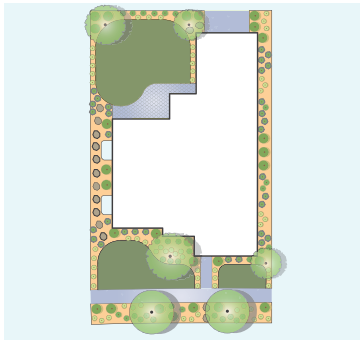
0% Reduction

Improved Efficiency

- Traditional Landscaping – 80% turf 20% planting beds and hardscaped areas.
- Increased irrigation efficiency to 70%

29% Reduction

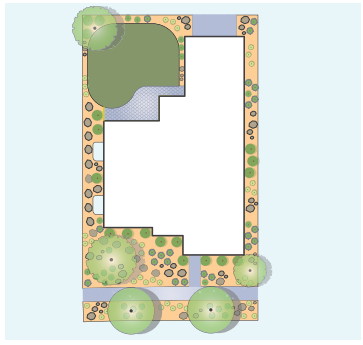
Additional Efforts



- 50% turf 50% planting beds and hardscaped areas.
- Increased irrigation efficiency to 80%.

50% Reduction

Maximum Conservation



- 20% turf 80% planting beds and hardscaped areas.
- Increased irrigation efficiency to >80%.

63% Reduction

GOAL SETTING METHOD

Historic Water Use

- Evaluate 2015 Utah M&I water use data (most recent)
- Evaluate progress and regional trends

Statistical Analysis

- Identify important regional factors and their effect on water use
- Adjust goals according to regional differences

Region Definitions

- Define regions with similar water use and/or characteristics
- Make regions easily identifiable (counties)

Water Conservation Goals

Public Involvement

- Gauge attitudes and gather feedback through current online survey, stakeholder interviews, and open houses

Conservation Potential

- Develop multiple scenarios considering growth trends, indoor use, landscapes, and climates in each region

Successful Approaches Elsewhere

- Consider positive Utah examples
- Look to other Western states
- Incorporate lessons learned

ADDITIONAL RESOURCES

H2OATH
UTAH'S WATER-WISE PLEDGE
water.utah.gov/H2Oath

Water.Utah.Gov/H2Oath

Water.Utah.gov/FameOrShame

Know When To Water

ConserveWater.Utah.Gov/guide.html

Utah Water Savers

UtahWaterSavers.com

Localscapes®

Localscapes.com

WaterSense
Meets EPA Criteria

EPA.gov or WaterSense.com

SLOW THE FLOW

SlowTheFlow.org

WATER CONSERVATION Certification
Two Day Certification Exam Included

WaterConservationCertification.com

Use Utah Water Wisely
UTAH WATER CONSERVATION FORUM

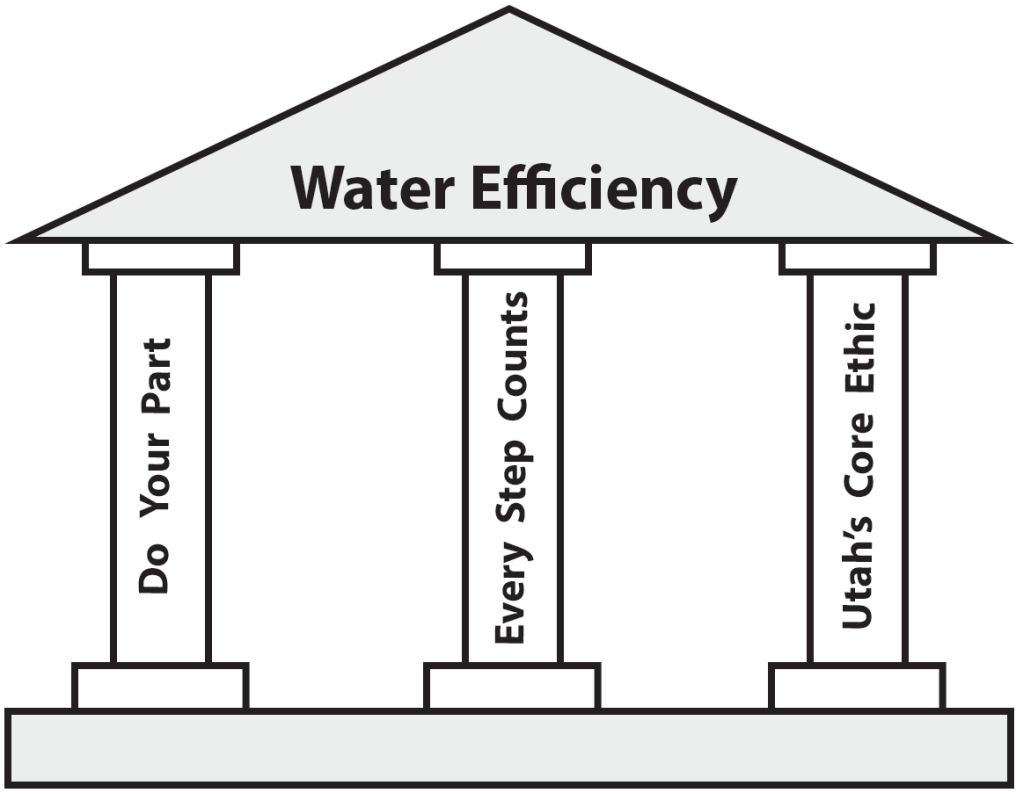
UtahWaterConservationForum.org

UTAH DNR

Water.Utah.gov/

UTAH DNR WATER RESOURCES
HANSEN ALLEN & LUCE
BOWEN COLLINS & ASSOCIATES

THREE PILLARS OF CONSERVATION



DO YOUR PART

There is not an entity or individual that is entirely responsible for, or is the exception to, water efficiency. We all need to do what we can to use water wisely.

EVERY STEP COUNTS

Whether that step is taking a shorter shower, updating infrastructures and appliances, fixing a leak, adjusting sprinkler timers, installing secondary water meters, using a tiered rate, running or following an education campaign, or installing water-wise landscaping. Each step helps us to create changes that will assist in reaching our goals in being water-wise.

EFFICIENCY IS UTAH'S ETHIC

We do not conserve water because we have a wet or dry year, we conserve because, as Utahns, we are not wasteful.

Appendix D: Stakeholder and Open House Comments

PUBLIC COMMENTS

The following comments were collected during open houses and stakeholder interviews from September to November 2018. They are organized here by topic.

Water Rates

1. Several highlighted local political barriers. “We should install secondary meters because it’s the responsible thing to do,” one said. “But it’s an unpopular move. My city council isn’t willing to do it because they wouldn’t get reelected.”
2. Resident said that Logan City doesn’t have tiered rates.
3. Need a tiered structure.
4. Many participants acknowledged that even though most water suppliers now have tiered rates, “the tiers are too flat to encourage conservation” but that most local governments aren’t willing to increase them for political reasons.
5. In one rural community that is very “pro-land use and pro-property rights,” according to a city council member, “rates are probably only way to change behavior.”
6. “Our pricing isn’t done right,” said a state planning official. “Water users don’t see the full cost when they decide to use or not user water.”
7. Abolish equal pay on water bills.
8. What is the cost—cheap water vs. expensive water.
9. Look at next most expensive block of water.
10. Metering, said one state official, must be combined with “effective rates and smart billing processes” to succeed as a conservation practice.

Incentives

1. “To inspire people to conserve water, there needs to be financial incentives.” Buy-back programs, buy homeowner’s ripped out turf, give $1,000 per household to flip your strip.
2. Incentivize changing landscaping; rebate for controllers is good; rebate on landscaping materials, like landscape rock and water-wise plants
3. A state water official spoke of a “tipping point” where financial incentives are enough to prompt individuals to act. Currently, she said, almost everyone recognizes that changing landscapes will save water, but frugal Utahns can’t afford to do it “on their own dimes” just for the social good. Incentives will help tip the scales, she said.
4. Want to know what incentives are available that will encourage a change in behavior.
5. One individual suggested incentives that allowed homeowners to sell their removed turf to conservancy districts to help fund a more water conservative landscape.
6. Promote specific actions to decrease water use; earn rewards by demonstrating less water use; publish the target rate within a water supplier boundary on the water bill; show the actual use on the water bill compared to the target use;

Universal Metering

1. “There seem to be no consequences to unmetered use.”

2. “There’s a world of waste caused by an apparent abundance of water, low costs, unmetered ditches, leaks, and no automation. Some people still flood irrigate their lawns and let the water run down the street. There’s a lot we could do.”
3. Many stakeholders emphasized the need for better data provided to water users, including metering all water.
4. A state planning official said, “If secondary water users want to conserve but aren’t metered, they can’t tell how they are doing. There’s no measurement and no financial benefit.”
5. Another state planning official said, “From the consumer’s perspective, it’s unlimited water use.” He recognized that retrofitting existing systems is difficult, but “we should get in the habit of installing secondary water meters in new developments.”
6. Water two times each day; using secondary water that is not metered.

Landscaping
1. Minimize lawn, keep our trees.
2. Work with local nurseries to retail water-wise plants (e.g., podless sunburst locust tree); identify nurseries that will special order appropriate plants.
3. Need trees for cooling.
4. Study measuring outdoor irrigation at night; does it save water?
5. Need to get rid of ordinances that require specific types of landscapes.
6. No availability of water-wise plants in the basin.
7. A city engineer said, “People don’t seem to notice that we’re in a desert,” especially when they live along the Wasatch Front. Further water conservation must be “a grassroots effort” where individuals recognize its importance, rather than merely responding to government. “The culture must change,” he said. “Grass is not the only option for landscapes,” he said, suggesting education on alternative localscapes.
8. A water conservation manager observed, “As long as people have turf, people will overwater.”
9. Stormwater professionals: “We don’t see a big deal with changing landscaping and stormwater runoff.”
10. By removing our front yards, do we lose community feel because people don’t spend time in their yards.
11. County requires more water use landscape.
12. “Maintaining instream flows and wildlife is more important than our lawns.”
13. “Utahns are very independent and like to do things themselves,” said a state water regulator. “They know how to install grass and sprinklers, but a water-wise landscape is harder and requires particular skills and money.”
14. Residents might be wary of localscapes, said several water professionals, “because they imagine the most extreme case” of bare rocks and dry plants. There’s the erroneous perception of a binary choice, many said, between lush turf and bare dirt. Poorly constructed localscapes only reinforce this perception.
15. Turf conversion, said one experienced water conservation manager, is only effective if the home does not change hands frequently. “The next owner might want grass and put it back in,” she said.

16. Several were concerned about the undesirable effects of landscape conversion. “In converting to water-wise landscapes, we can’t destroy our urban forests,” said a senior water conservation manager.
17. Several commented on a potential to increase heat islands and dust if landscapes were not properly managed.
18. Still, some people will want to plant grass for aesthetic reasons. “If you want grass, use a different kind that’s better for our climate,” said a senior water conservation manager.
19. Aesthetic standards of community need to support conservation.
20. A suggestion to help limit the residential outdoor use would be to have more community developments, like Daybreak or townhomes, where they residents share a park-like backyard. This scenario reduces the amount of unused space typically seen in a traditional landscaped backyard of a single family. Also, vertical growth, as in more multi-family structures, will be the quickest and easiest solution to handling the growing population and the limited water resources.
21. Need more emphasis on water-wise trees.

Supply Limitations
1. A rural city council member noted, “Water here is a regional problem. Conservation will help, but the bigger question is growth.”
2. Water supply must be considered.
3. A city water supervisor said, “There’s only so much water. We should learn to manage it better.”
4. Many stakeholders agreed that “the cheap water has already been developed” and that future water supplies will take more time and money, prompting further conservation as a way to get by in the meantime.
5. “We’re seeing water sources dry up that were once consistent and reliable,” said a state water regulator, referring to many springs and wells that supply drinking water. Water conservation will be driven not just by growth, she said, but also by a diminishing water supply.
6. Even with conservation, there is still a need to plan for water development. “We can’t conserve our way out of a demand problem,” said one senior water manager. “We have a responsibility to provide water, and those projects take time, often decades. They might be delayed, but we still need to plan so we’re ready when we need them.”
7. Other water managers acknowledged that “even with water development, the future supply is finite and uncertain.”
8. “We have a history of good conservation, but we’re always concerned about supply,” said a rural city council member. “We just don’t have access to water from other sources. When there’s no water, there’s no water.”
9. Gov. Herbert has repeatedly acknowledged that water is what constrains Utah’s growth, a sentiment reaffirmed by his staff and others during the outreach process.
10. Many interviewees supported the development of “water markets” or “water banks” to arrange exchanges of water, such as fallowing late-season crops and diverting the water to municipal uses.

11. “We’re all in the midst of some kind of project,” said a water conservancy district manager. His district has already spent $10–$12 million on its water conservation program since 2000, and expects another $10 million in next three years.
12. Take better care of the water we have. Be accountable for the water supply we do have.
13. Sending water; stop pirating water by California for California use.

Policy
1. “Hoping the State forces us to meter, so we have someone to blame. Local leaders know we have to do it, but are reluctant.”
2. Water conservation is political.
3. Decrease subsidizing of water.
4. Impose penalties for non-compliance.
5. Why don’t we have more reuse? Several conversations mentioned this question. Water Rights would need to evolve to include water reuse programs.
6. Require feasibility study for new development showing there is water available to support the development.
7. There should be state policies about how to implement a tiered rate system.
8. “Lots of older infrastructure, even in commercial areas, that needs replacement.”
9. Have we considered water efficiency in public facilities like schools? Low flow toilets would make a much bigger difference there than in individuals’ homes.
10. A homeowner understands that water-efficient appliances in the home don’t make the necessary impacts that we as a state need to conserve more water, although every bit does help. However, implementing low-flow toilets and other water efficient appliances in institutional facilities would greatly impact the water use and would be a much more effective use of time promoting water conservation.

Culture
1. Addition of LDS temple has brought in many retirees that like smaller yards.
2. Money available through oil/gas has resulted in more investment in piping canals and other water saving issues.
3. “General public doesn’t understand water is a finite resource.”
4. Even while encouraging less water use, several stakeholders acknowledged the need to maintain or improve environmental flows and quality of life. “We need places to recreate and to beautify the community,” one said.
5. “We all need reminders” on water conservation, said a water manager. “Like not irrigating during the day and taking shorter showers.”
6. “We need to be ahead of the curve.”
7. Cost of conservation and willingness to implement changes to reach the proposed goal.
8. “In our area, I feel like people are already good stewards of water,” said one water manager. “We’re pretty conservative.”
9. A state water official said, “We Utahns have not fundamentally changed our views on water conservation. We agree, collectively, that we should conserve water, but we lack individual implementation.”

10. Most participants agreed that waiting for a crisis before changing water use habits is unacceptable. “We can’t hit a wall and change drastically,” one water conservancy district manager said. “We need to anticipate the problems and plan our course of action.”
11. Water conservation requires a multiyear outlook. “We’ve had this attitude of ‘we’ll deal with next year next year,’” said a rural city council member. “We’re changing that mentality to smooth out usage over several years. We’d like everyone to be more conscious about water all the time, not just during droughts.”
12. “We need an ‘all of the above’ approach,” said a state planning official, “with water conservation first and foremost.”
13. A water conservancy district manager explained how water conservation takes time. “We can’t reach our maximum conservation potential right away, or even in our lifetime,” he said, “but what we can do is achieve a double-digit reduction in per-capita usage in the next few years.” Another manager in a similar position highlighted the difficulty of getting even new developments to go that far.
14. “In New Mexico, nothing changed until we started charging.”
15. To help lower outdoor water use, new homes should be built like the Daybreak community, townhomes with community, park-like backyards. That way, people can share their land and thus lower water use.
16. New development should be mandated to use water-wise landscaping and low flow fixtures. Plumbing codes address the low flow fixtures. There should be laws that require better water use choices and require HOAs and apartment complexes to be water wise.
17. Create “sound bites” to influence desired behaviors.
18. No more golf courses. Too much water spent on these amenities that benefit only a few people.
19. Take maximum advantage of the current drought conditions; strongly encourage behavior changes while water conditions are on people’s minds; begin early in the spring to remind people what the water supply is like.

Climate Change
1. “We are already in a water crisis,” said an experienced water conservation manager. “And climate change will only enhance our droughts and lengthen our irrigation seasons.”
2. Climate change is a real threat. Recent trends, as well as climate models, suggest higher temperatures, longer growing seasons, and less snowfall in the future.
3. “Future water will be harder to get, and we need a margin in drought years,” said a rural city council member. “The whole place is slowly drying up.”

Data Management
1. Improved water metering and data reporting are helping, said a state water regulator, referring to recent legislation and other efforts to better quantify water use.
2. GPCD metric has limits (permanent vs. daytime, tourist, or second home population; high-density development; water loss)
3. JVWCD board uses different measure for water reduction evaluation.
4. Normalization to account for wet years and dry years?
5. 2015 was a wet year; may skew acceptable water use.

6. AWWA— target operators—help small systems track their data.
7. Site that shows daily ET?
8. Meter readings from Sand Hollow—Entrada development
9. Find out what the use is.
10. Assume new growth will be like Entrada.
11. Compare historic data to current.
12. “In our future planning, we can’t just look at per-capita water use”—must consider density, etc., be wise about how we use the number.
13. Research should come through universities.
14. 2015 water year was wet year; shouldn’t use as baseline.
15. Hire consultant to compare water use to other like-states.

Cooperation Among Agencies

1. One water conservancy district manager said, “As a water conservancy district, we don’t need city approval to change water rates, install meters, or implement water conservation programs. However, we don’t want to irritate residents or oppose local governments. We have to cooperate with the cities and align our programs with theirs.” Another such manager said that “we don’t have the ‘policy whip’ that cities do, and we certainly need their support to complement our own efforts.”
2. Likewise, many water professionals expressed an interest to support, rather than oppose, the Division’s water conservation efforts.
3. A state planning official encouraged “working with municipal planning departments to ensure that water efficiency is built-in from the get-go” and that “local landscape ordinances don’t discourage conservation.”
4. “As a city, we need to send the right signal,” said a rural city council member.
5. A state planning official recommended “getting a better handle on institutional water use”—such as watering city parks—“and setting a positive example” for the community by not watering during rainstorms or during the hottest part of the day. ‘A summit of institutional water users might be convened to develop best practices,” he suggested. Another state planning official agreed that Institutional water use has “a very, very big potential for efficiency.”
6. Need to coordinate with: County Commissioners, Mayor, USU extension (Good resource), Farm Bureau.

Recognition of Past Achievements

1. “How do we get credit for past efforts?” several water officials asked. “We’ve invested millions of dollars to conserve water and worry that these new goals will reset our numbers and erase all of our progress.”
2. Concern about the conservation already achieved would be forgotten and the citizens wouldn’t get credit for what they have already done.
3. “Can we get any credit for what we’ve already accomplished?”
4. Previous reductions need to be accounted for.
5. Need a LOT of acknowledgment for progress since 2000. “Everybody is nervous about resetting the clock.” Consistent message from all WCDs.

6. Because [you] have worked so hard, it is time to take it to the next level; communities need to get credit for what has already been accomplished.

Agriculture

1. Several residents felt that any changes to behavior or use for municipal and industrial water are inconsequential since agricultural uses 80% of water.
2. It is not only vital, nor an option—we have to incorporate agriculture.
3. Zoning for agriculture?
4. Identify prime agricultural land; preserve for agricultural uses.
5. Need to put agriculture in the equation.
6. Ag water needs to be included in the discussion.
7. Verify percentage of water going to agricultural use. Is it still 80/20?
8. Lots of ag improvements recently.
9. Agriculture is the first one to have water restrictions. Restrictions should be for both residential and agriculture. Crops should be watered before grass.
10. The homeowner suggests that the agriculture community be educated on the different forms of irrigating their fields and livestock; and to be taught in a way that shows them the profits and benefits of switching over to more water conservative methods. The suggestion was not directed toward drip irrigation, as the homeowner understood that using drip irrigation uses more water over a longer period of time, and believes that other methods could be better implemented.

Thoughts on Goals

1. Overall state goal seems reasonable to me.
2. Setting goals is a waste of time. People will conserve when they have to.
3. Overall county numbers are too high.
4. Regional goals will be difficult to administer.
5. What happens when we don't meet the goals?
6. New growth is already achieving the minimum conservation goal.
7. Maximum conservation number is unrealistic.
8. Regional goal seems too aggressive, with our rural areas we want to have more open space and lawns than dense urban.
9. Needs to take into account available supply.
10. We've already done our share.
11. Goal is not aggressive enough. We need to accept that we live in the desert.
12. What is the basis of your goals?
13. Timeline must not be arbitrary.
14. Reasons to group by region? May confuse public.
15. Very different goals in the different communities even within the same county. (i.e. running out of water in Aurora vs. no problems in Richfield).
16. Another asked, "What does this regional goal mean for my water system? How does it help me?"
17. Cost of water needs to be factored into goal.
18. Factor in cost into goal setting.

19. Need to separate out Washington and Kane Counties?

Education

1. People want to do their part, but they don't know what to do.
2. Need education of retirement community.
3. Education of youth is important moving forward.
4. Ask Rural Water to post to their Water Conservation website and advertise with the Rural Water Water Conservation Certification class.
5. More commercials like the grass whisper: resonated with his community; established authority; likeable character; associated with a local, successful team, current.
6. Many visitors noted that people would use less water on their lawns if they knew what amount was sufficient, but it varies with lot size, type of plants, and weather. The information is available but not widely known.

Uncategorized comments

1. Macon shale formation results in selenium reduction and investment in sprinklers.
2. Need to consider both water use and electricity.
3. Messaging stinks.
4. Are we considering salt loads?
5. State watering schedule is bogus for St. George.
6. Vertical growth is the answer to water conservation.
7. There was some talk about gray water and wondered why we don't promote this.
8. Distribution system problems should not be used to push watering to less optimal times.
9. Demand hardening—if water use becomes very efficient, there will be no more wiggle room. (Conservation seen as immediate extra supply.)
10. Focus on in-filling.
11. Conservation ethic is expensive.
12. People are concerned with population growth and projected growth throughout the state.
13. Causes stress on system; if winds are strong at night what is the difference between ET rate.
14. They were concerned about tourism, development, and indoor hotel use.
15. A lot of drought in this year. Good window for promoting.
16. Don't use potable water for irrigation.
17. Oil prices dropping, resulting in slowing of economy in the Green River District; use the slower economy to encourage water conservation.
18. Must adequately and responsibly water that we have; that means secondary to work on water reuse.
19. Recommend specific actions (start M&I irrigation water later in the season—after May 1 or May 15—instead of April 15.

Appendix E: List of Interviewees and Reviewers

List of Interviewees and Reviewers

The following individuals provided input to this project during in-person and phone interviews and/or through comments on draft reports:

Richard Bay, Jordan Valley Water Conservancy District
Paul Burnett, Trout Unlimited
Kristin Cox, Governor's Office of Management and Budget
Evan Curtis, Governor's Office of Management and Budget
Lynn de Freitas, Friends of Great Salt Lake
Mike Duncan, Moab City Council
Phil Dean, Governor's Office of Management and Budget
Stephanue Duer, Salt Lake City Department of Public Utilities
Michael Fazio, City of Bluffdale
Christine Finlinson, Central Utah Water Conservancy District
Tage Flint, Weber Basin Water Conservancy District
Bart Forsyth, Jordan Valley Water Conservancy District
Chris Hansen, Central Utah Water Conservancy District
Jared Hansen, Central Utah Water Conservancy District
Darren Hess, Weber Basin Water Conservancy District
Derek Johnson, Weber Basin Water Conservancy District
Julie Jones, Washington County Water Conservancy District
Voneene Jorgensen, Bear River Water Conservancy District
Rick Maloy, Central Utah Water Conservancy District
Alan Matheson, Utah Department of Environmental Quality
Devin McKrola, Central Utah Water Conservancy District
Annalee Munsey, Metropolitan Water District of Salt Lake and Sandy
Matt Olsen, Jordan Valley Water Conservancy District
Marie Owens, Utah Division of Drinking Water
Alan Packard, Jordan Valley Water Conservancy District
Jon Parry, Weber Basin Water Conservancy District
Scott Paxman, Weber Basin Water Conservancy District
Warren Peterson, Farmland Reserve
Karry Rathje, Washington County Water Conservancy District
Jeremy Redd, Blanding City Council
Zachary Renstrom, Washington County Water Conservancy District
Todd Schultz, Jordan Valley Water Conservancy District
Gene Shawcroft, Central Utah Water Conservancy District
Marcelle Shoop, National Audubon Society
Brad Stewart, Salt Lake City Department of Public Utilities
Nate Talley, Governor's Office of Management and Budget
Brie Thompson, Washington County Water Conservancy District
Ron Thompson, Washington County Water Conservancy District
Gerard Yates, Central Utah Water Conservancy District

Appendix F: Meeting Notes

Utah Division of Water Resources
Regional Water Conservation Goals
Kickoff Meeting Notes
July 12, 2018

1. Introductions

Attending:

Rachel Shilton, DWRe, River Basin Planning Manager
Todd Adams, DWRe, Deputy Director
Candice Hasenyager, DWRe, Assistant Director of Planning
Josh Palmer, DWRe, Water Efficiency and Engagement Manager
Aaron Simon, DWRe, GIS Analyst
Russ Barrus, DWRe, State Water Plan
Steve Jones, HAL, Project Manager
Rob Sowby, HAL, Project Engineer
Keith Larsen, BC&A, Project Engineer

Excused (to attend in future):

Faye Rutishauser, DWRe, Water Conservation Manager
Adam Clark, DWRe, GIS Analyst
Mike Collins, BC&A

2. Project Overview

a. Scope review
b. Goals
    i. Establish regional boundaries
    ii. Recommend regional water conservation goals
c. Schedule

3. Approach to Project

a. "Blender"—Multivariable linear regression (or similar model) to identify important influencers of M&I water use, assist with region definitions, and inform goals and practices
    i. Offers transparency—"We considered it"
    ii. Scenario modeling
    iii. Statistical rigor and defensibility
    iv. Rob to provide list of suggested explanatory variables (precipitation, % indoor use, population, etc.)
    v. Ask in outreach—what variables to consider
    vi. Survey stakeholders—develop trust in the approach
b. Range of conservation options
    i. Avoid specific numbers; give ranges—low, mid, high
    ii. Don't "demonize" water—OK to use it
    iii. Purpose is to inform and make progress
c. DWRe will trust consultant approach and recommendations; don't want to influence too much
    i. Public outreach important—firsthand feedback
d. Timing is good for public discussion
    i. Legislative audits

ii. Water use program improvements
iii. Drought
iv. 2015 water data release (data portal)

e. What's most important?
i. "Define regions, set goals"
ii. Objective criteria by which to make recommendations; third party adds objectivity and credibility
iii. Regions must make sense to public (e.g., counties, not river basins)
1. Know what efficiency potential is
2. Act accordingly
iv. Empower water suppliers to make decisions
v. Cost
vi. "Goal must stretch us"—past goals maybe not aggressive enough

f. "How do you use these numbers?"
i. Collaborating with communities to set goals and implement practices
ii. Inform local water conservation plans
iii. "Grading" water conservation plans
iv. Potential funding incentive for plans or goals
v. State Water Plan
vi. Water Demand Model (planning scenarios)
vii. Consistent messaging—"This is your goal"

g. Deliberately limited planning window
i. Known practices and technologies
ii. Revise goal as new information arises

Outreach

- Step 1—Initial effort these (LEAP)—DWRe to prioritize and help make contact
  - Legislative
    - Water Development Commission
    - Executive Water Task Force
    - Friends of Great Salt Lake
    - Auditors
    - NREA interim
    - Water Strategy Team
    - Tim Hawks
    - Warren Peterson
  - Executive
    - Evan Curtis
    - Phil Dean
    - Alan Matheson
    - Gov. Herbert, Lt. Gov. Cox
  - Administrative
    - Prep60 (WBWCD, JVWCD [Matt Olsen, Cynthia Bee], CUWCD, WCWCD)
    - City water conservation specialists, including rural
    - Water districts
    - Marie Owens
    - Kent Jones
    - Tage Flint
    - Clyde Watkins

        - Gawain Snow
        - Vonnene Jorgensen
    - Public
        - Nature Conservancy
        - Audubon Society
        - Utah Rivers Council
        - Trout Unlimited
        - Conserve Southwest
        - Academic
            - Kelly Kopp
            - Adrea Wheaton
            - Courtney Flint
        - Candice _____ (Cedar City)
        - Business
            - Landscaping
            - Manufacturing
            - Chambers of Commerce
- Step 2—Meetings with water suppliers
    - Share draft results before public meetings
- Step 3—Meetings with public
    - One meeting in each proposed region
    - Receive comments
    - Use DWRe staff
    - DWRe creates strategic communications plan (demographic analysis, social media, video, in-person meetings)

4. **Establish Geodatabase Specs**
    - Geodatabase format as deliverable
    - UTM Zone 12
    - Attribute fields
    - Metadata to describe fields, units, data sources, etc.
    - Work with Adam Clark directly

5. Next Meeting

Thu. Aug. 2, 2018
3:00–4:30 PM
DWRe Room 314

Assignments

- Steve: Distribute meeting notes
- Rob: Suggest variables for survey
- DWRe: Prioritize outreach list
- Josh: Prepare survey

Utah Division of Water Resources

Regional Water Conservation Goals

Progress Meeting Notes

Aug. 2, 2018

Attendees

Steve Jones, Rob Sowby, Keith Larson, Rachel Shilton, Candice Hasenyager, Todd Adams, Arthur Guo, Ashley Nay, Russ Barrus

Assignment follow-up

Josh: Survey progress. Todd is following up with Josh to have a draft next week.

File sharing and data requests

Just received green space data. Everything else requested has been received.

Public outreach plan

- Meeting Fri. Aug. 10, 1:00–3:00 PM to discuss survey content
    - Josh to draft questions
- By Aug. 16: Send survey to large list
    - Get input on the thinking about water conservation
        - Like Envision Utah
        - What should be considered when developing goals
            - E.g., transient population in SLC and second homes in St. George
        - Community willingness to adopt certain practices
    - Include question about interest in having a more in-depth interview
    - DWRe has email addresses for most on the list
    - Josh consider posting on website (minus interview question)
- By Aug. 30: Receive responses
- Review responses and identify key people to meet with in person during early September based on interest indicated on survey and variety of background
- Share draft before public meetings in October or possibly earlier through website
- Public meetings
    - Purpose is to get input
    - Early October
    - Need to identify venues and times to notify
        - DWRe to draft list of locations
            - SLC/JVWCD
            - WBWCD/Layton
            - CUWCD/Provo/Orem
            - Logan/Cache Co.
            - Richfield
            - Price
            - Tooele/Delta

                - Monticello
                - St. George
                - Uinta Basin/Roosevelt
            - DWRe to set up meetings
            - DWRe to make press release
        - Start in SLC to generate buzz
            - Invite media
        - Consulting team to lead/facilitate meetings
- Draft report by October—make available to public
    - Public summary, 1 page
    - Full version to satisfy certain groups
        - GSL Advisory Council
        - Utah Rivers Council
        - Nature Conservancy
        - Etc.
    - Maybe present during interim legislative meeting

Statistical model progress

Good approach; need to consider green space, secondary systems, and finer resolution (water system vs. county level)

Assignments

- Josh and team: Draft questions for survey and prepare for Aug. 10 meeting; work with Keith
- Rachel: Compile email addresses
- Todd: Draft list of public meeting locations (see above)
- Barbara: Set up meetings and post on website
- Rob: Continue statistical analysis
- Keith, Steve, Rob: Develop schedule, critical path

Next meeting

Survey Preparation Meeting

Fri. Aug. 10, 1:00–3:00 PM

DWRe room 314

Utah Division of Water Resources
Regional Water Conservation Goals
Progress Meeting Notes
Sept. 13, 2018

Attendees

- DWRe: Rachel Shilton, Aaron Austin, Josh Palmer, Brooke Olsen, Jamie Tsandes, Arthur Guo, Marcie Larsen, Candice Hasenyager, Adam Clark, Russ Barrus, Todd Adams
- Consultant: Steve Jones, Rob Sowby, Keith Larson, Mike Collins

1. Survey results (Josh)
    - 722 responses as of this morning; average 70 per day
    - Expect to double in 4 weeks
    - Cache, Davis, Grand overrepresented
    - Utah, Salt Lake, Weber underrepresented
    - Josh to push for local responses in certain counties so each is represented
    - Closing date Oct. 19, after open houses; may need to extract data sooner for analysis, but can still continue to gather feedback
    - Largely positive response, perhaps due to drought
    - Results
        - Q7 average guess 25,000 gal/day
        - Q8 average importance 6.3 out of 7
        - Q9 top reasons: sustainability, future generations, waste not OK; bottom reasons: cost savings, delay projects
            - Other: many mentioned desert, drought, and preserving GSL
        - Q10 community willingness 4.0 out of 7
            - Disconnect from 6.3 importance in Q8
            - Show gratitude for those already conserving
        - Q12 willingness toward specific practices: most around 5 out of 7
            - Which ones cost money? Trend lower?
        - Q13 willing to transition 52% of landscape to water-wise
            - Likely correlate with those willing to take survey
        - Q15 need to determine specific cities/counties for policy hotspots
        - Q17/18 better *information* is best opportunity, more than incentives and leadership
            - Must come from city government—users may not identify their water supplier or be willing to listen to state
        - 409 text responses to analyze
        - Q25 cost savings motivate businesspeople to conserve
        - Q26 most business landscapes are self-managed
        - Q29 average 4.9 out of 7 importance of water conservation to constituents—disconnect from 6.3 importance in Q8
    - Rob has access and will start examining patterns
2. Conservation potential (Keith)
    - In 2015, 242 gpcd statewide
    - 3 scenarios on potential:
        - 192 gpcd (-21%) conservative
        - 165 gpcd (-32%) moderate
        - 137 gpcd (-44%) aggressive

        - All assume 0% contribution from industry; consider 3% or 5% goal for industry to make message consistent
        - All assume commercial and institutional potential is half of residential potential
        - Industrial is only 3% of all M&I use in 2015
    - Potential separate from goal
    - Indoor
        - 60 gpcd conservative
        - 50 gpcd moderate
        - 40 gpcd aggressive
    - Outdoor varies by application rate
        - Conservative: about 30 inches
        - Moderate: about 24 inches
        - Aggressive: about 18 inches
        - Accomplish by transitioning to water-efficient landscapes and reducing waste
    - Assume increased density in certain counties (smaller new lots and high density redevelopment of old lots)
        - Conservative: same density, more irrigated area
        - Moderate: greater density, same irrigated area
        - Aggressive: greater still density, less irrigated area, assume average 2065 lot size in SLC
3. Approach to goal setting (Steve)
    - Scale of goals based on conservation potential, survey results, and correlated factors
    - Example of Denver: setting goal based on percentage of users who are using water efficiently
    - Must consider costs
        - To user: e.g., per square foot of turf converted
        - To state/legislature: level of support needed
    - How to define goal—gpcd number, percentage reduction, or other? How to communicate
        - Gpcd number preferred
    - Scenario approach is preferred
4. Plan for public outreach (Rachel/Keith)
    a. Schedule
        - Dates are set
    b. Venues
        - Venues TBD
    c. Attendance assignments
        - 2 consultants
        - Josh or Marcie
        - 2 other DWRe
    d. Materials and communication tools
        - Poster showing conservation scenarios and pictures, including in-between scenarios to show stepwise process
        - Careful on comparisons, especially secondary; potable OK
        - Don’t show 2000 values—start from 2015 (“today”)
        - Note audits, reports, etc., improved data
        - Consider one-question survey on preferred scenario (after viewing posters)

        - DWRe will provide tablets and papers
    - Regional maps (2–3 counties each)
        - DWRe to provide maps
    - Poster assignments by BC&A
5. Plan for report development (Rob/Steve)
    - Rob to provide outline early next week
6. Next meeting
    - Before first open house
    - Review materials and plans
    - **Thu. Sept. 20, 2018, 1:30–3:30 PM, DWRe**

Utah Division of Water Resources
Regional Water Conservation Goals
Progress Meeting Notes
Sept. 20, 2018

1. Discussion of draft goals
    a. Major decisions
        i. Approach—OK. Data and assumptions may change.
        ii. Regions—8 board districts; public meeting in each. Also show county goals.
        iii. Percent vs. GPCD—Use both. Each has its own purpose and communication value.
        iv. Timeline—Need multiple goals. Can adjust goals according to timeline. Exact timeline to be determined by practices, cost, implementation. For planning:
            1. 2030—proportion of next scenario
            2. 2040—as planned
            3. 2065—don't go below floor
2. Open house preparation
    a. Materials (Keith/Jamie)
    b. Attendance (Keith)
    c. Logistics (posters, equipment, travel, setup, access…)
3. Draft report outline (Rob)
    a. Review and respond by Mon. Sept. 24
4. Update on survey results (Josh/Rob)
5. Next meeting
    a. Wed., Oct. 24, 2018, 1:30 PM

HANSEN ALLEN & LUCE inc
ENGINEERS

Utah Division of Water Resources
Regional Water Conservation Goals
Progress Meeting Notes
Oct. 30, 2018

Attending: Rachel Shilton, Todd Adams, Candice Hasenyager, Marcie Larson, Joel Williams, Russ Barrus, Steve Jones, Rob Sowby, Keith Larson

1. Outcome of public involvement
    a. Survey (complete—1,655 responses)
    b. Open houses (complete)
        i. Experience improved with each one
        ii. Attendance improved with each one
        iii. Good quality of interaction, personal attention
        iv. Diverse attendance
    c. Stakeholder interviews (in progress)
        i. Show progress since 2000, but acknowledge limited data and different methods in the past. New baseline is 2015 for reasons of data quality and improved methods. Use this opportunity to explain why 2000 baseline is no longer valid.
        ii. Use State Water Plan meeting to connect with others to be interviewed
        iii. Regions:
            1. Split Lower Colorado into North and South (separate Washington Co. from Iron)
            2. Rich County its own region? Second homes make different GPCD and practices should focus on second homes—no, keep in region.
            3. Split into 29 counties? No, more reliable data when grouped into regions.
            4. 9 regions total.
    d. Lessons learned
        i. Advertise earlier
        ii. Advertise with multiple methods—social media, newspaper, website, radio, TV news
        iii. Consider presentation first, then follow-up interaction
        iv. Venue: water district or community space? Advantages to both.
            1. District: show unity, recognize important “boots on the ground” role in water conservation
            2. Community: Neutral location, not “tool of the district,” more public
            3. Best: meet with districts first to get their support, then go to public meetings
    e. Notes to be discussed Friday
2. Revised approach to goal setting
    a. Conservation practices and costs
        i. Persuade, bride, force
    b. Conservation potential
        i. Still missing how to connect potential to practices; some judgment required.
    c. Climate change
        i. 18% increase in ET? Rob Gilles
            1. Differs by county, especially precipitation
        ii. Water demand will increase as a result of climate change

iii. Climate change will motivate water conservation
   d. Regression model
      i. Improved accuracy and significance
   e. Others
      i. 2065 goal to be communicated as “long-term goal”
      ii. Remove floor from scales
      iii. Show fuzziness
3. Schedule for completion
   a. Report
      i. Draft report to water districts, or summary figure?
         1. Key figure(s) plus sufficient explanation
      ii. 4 reviews: DWRe, water districts, legislature, public
      iii. Clarify expectations; what will we do with the comments
      iv. HAL/BC&A to prepare timeline for completion
   b. Presentations
   c. Contract to be extended to March
4. Next meeting
   a. State Water Plan advisory committee—Thu. Nov. 1
   b. Compile notes—Fri. Nov. 2

Regional Water Conservation Goals

Progress Meeting Notes

Dec. 21, 2018, 9:00 AM, DWRe

Attending: Rachel Shilton, Todd Adams, Faye Rutishauser, Josh Palmer, Joel Williams, Marcie Larson, Candice Hasenyager, Rob Sowby, Steve Jones, Keith Larson

Stakeholder Involvement

A report draft (v0) was shared with the following stakeholders during the week of Dec. 3 with comments requested by Dec. 10:

- JVWCD (comments received)
- WBWCD (comments received)
- CUWCD (comments received)
- WCWCD (declined comment on this draft)
- MWDSLS (responded no comment)
- BRWCD
- SLCDPU
- Bluffdale
- DDW
- Trout Unlimited
- Audubon Society
- Friends of GSL (comments pending)

Consultants met with DWRe last week to discuss comments and plan revisions. Keith met with JVWCD and adjusted density assumptions with better data (see below). A new draft of the report (v1) was shared with DWRe prior to today's meeting.

Stakeholders' involvement has significantly improved the quality of the work. Diversity of relationships with water districts, environmental groups, and local officials improves credibility of study. We hope they will promote these goals to their constituents and public media.

Rachel and Josh's report on meeting with WBWCD

- WBWCD wanted to show progress since 2000, but not to their benefit considering recent data issues and audits. Might lose legitimacy referring to questionable historic data.
- Give credit for efforts (e.g., leadership in secondary metering), but avoid use of 2000 baseline
- Draw the line: DWRe is not going back to 2000. Others may choose something else. Josh to reach out to CUWCD for similar conversation on these 3 points.
- For report, separate regions on summary figure—one per page—to avoid inadvertent comparisons. Scales are not the same.

- For presentations, adjust scales and show all on one figure. Also consider other alternatives for showing all goals in one place.
- Sufficiently introduce graphics.
- Scenario 3: Footnote to emphasize goals only go to 2065; conservation will change/continue.
- Clarify potential, not 2015 use, as starting point for goals.
- Add detail to language about goals being revisited at 2030, 2045, and 2060.
- Scientific document; avoid hyperbole.
- Water use in other locations—not comparable.

Keith's report on meeting with JVWCD

- JVWCD felt this project should be 2-year process. Lots of data, analysis, stakeholders, comments, reviews.
- JVWCD felt the landscape transition is uncertain. Expensive, time-consuming, public preference. Will need to work with communities and change culture as well as density. Maybe more density/development issue than landscaping. Can't enforce land development ordinances, only recommend and influence.

One purpose of report is to recommend policy/actions to state leadership and justify doing the right thing.

Incidentally, development data show trends toward smaller lots, less water use, less irrigated area. Market forces are already working; policy can accelerate progress.

Process from here

Revise report (v2), share with stakeholders (including those who have not yet received v1) early next week. V2 will be more complete than v1. DWRe will review simultaneously with other stakeholders.

Emphasize this is last opportunity for review and need to maintain schedule.

Few changes are expected in the goals.

Emphasize "regional" nature of goals: not just for water district, but communities.

Prepare comment matrix and share with stakeholders.

Todd to share with Gov's office

Distribute v2 by Dec. 24

Receive comments by Jan. 7; evaluate

Next meeting Jan. 10, morning

Appendix G: Regression Model

Regression Model

To help determine what variables correlate with water use and to consider the unique features of each of Utah's counties, the project team developed an empirical regression model of county-level M&I water use.

Following the approaches of similar work by the Committee on USGS Water Resources Research (2002) and others (Huang et al. 2017; Eslamian et al. 2016; Li 2013; Wong et al. 2010), the project team selected an ordinary least squares (OLS) multiple regression model, which is a common choice in the physical sciences and relatively easy to explain, use, and share. Details of the modeling theory are described elsewhere. Each county's 2015 per-capita M&I water use in gallons per capita per day (DWRe 2019a, 2019b) was the dependent variable (left-hand side) and all others were potential explanatory variables (right-hand side).

The following explanatory variables were considered, as suggested by public involvement, engineering experience, and review of the above-cited literature:

- Geographic
    - County (AGRC 2014)
    - Area (AGRC 2014)
    - Water right duty (DWRi 2018)
    - Ratio of developed area as green space (DWRe 2019a)
    - Average elevation (USGS 2018)
- Demographic
    - 2015 population (DWRe 2019a, 2019b)
    - Population density (computed)
    - Population change, 2010–2015 (Kem C. Garner Policy Institute 2016)
    - Average age (U.S. Census Bureau 2015a)
    - Ratio of second homes (vacation, recreational, or occasional) to total homes (U.S. Census Bureau 2015c)
    - Median household income (U.S. Census Bureau 2015b)
    - Persons per household (U.S. Census Bureau 2015b)
- Climatic
    - Climate zone (Gillies and Ramsey 2009)
    - Average annual precipitation, 1981–2010, raster (PRISM 2018a)
    - Average annual evapotranspiration, 1980–2017, raster (DWRe 2018; Lewis and Allen 2017)
    - Average minimum vapor pressure deficit, 1981–2010, raster (PRISM 2018a)
    - Average maximum annual air temperature, 1981–2010, raster (PRISM 2018a)
    - 2015 total precipitation, raster (PRISM 2018b)
    - 2015 total evapotranspiration, raster (DWRe 2018; Lewis and Allen 2017)
    - 2015 growing season (May–Sept.) average temperature, raster (PRISM 2018b)
    - 2015 growing season (May–Sept.) total precipitation, raster (PRISM 2018b)

    - 2015 growing season (May–Sept.) total evapotranspiration, raster (PRISM 2018b)
- Hydraulic and system-specific
    - Ratio of public water systems with tiered water rates (individual responses)
    - Ratio of public water systems with documented water conservation programs or policies (individual responses)
    - Ratio of public water systems with clearly defined water conservation goal (individual responses)
    - Ratio of public water systems also covered by secondary water service (individual responses)
    - Ratio of total water use as industrial water use (DWRe 2019a, 2019b)

For raster data, zonal statistics were computed over the water systems' service areas (DWRe 2015) and weighted by area to obtain the representative value for the county. In other words, the variable used for each county represents the area-weighted average (rather than population-weighted average, due to spatial coarseness of population data associated with the water supplier service areas) of the water systems in that county.

To improve the overall fit of the regression, several transformations were necessary, particularly on variables that showed a wide range of values or nonlinear relationships when plotted against water use. In these cases, the natural logarithm of the variable was substituted for the original variable. This is a common practice to linearize the data (Sowby and Burian 2018; Carlson and Wallburger 2007).

Three criteria were set for the specification. First, the adjusted R^2 value must exceed 0.75 (the model must explain more than 75% of the observed variation in water use). Second, the *p*-value for each variable must be less than 0.05 (the model may only accept less than a 5% chance that the correlation is random). Finally, the root mean square error (RMSE) must be less than 121 gpcd, or 50% of the observed 2015 water use of 242 gpcd (DWRe 2019a, 2019b).

The specification of such a model is an artful balance of plausibility and significance. While many variables may correlate significantly with water use, the cause-and-effect relationship must be plausible. This eliminates variables whose influence on water use is far-fetched even if they improve the fit. The inclusion of each variable in the final model was evaluated qualitatively for plausible influence.

Ultimately, a regression model with the following significant variables (and an intercept) was produced:

- Climatic
    - EL: Average elevation (feet)
    - ET: 2015 growing season evapotranspiration (inches)
    - VPD: Average minimum vapor pressure deficit, 1981–2010 (millibars)
- Demographic
    - POP: Population (persons)

    - PD: Population density (persons per square mile)
    - RSH: Ratio of second homes (vacation, recreational, or occasional) to total homes (unitless)
    - INC: Median household income, dollars
- Hydraulic
    - RIND: Ratio of industrial water use to total water use (unitless)

The mathematical expression for this model is:

$$\text{County's 2015 Water Use (gpcd)} = 11{,}416 - 722.9\ln(\text{EL}) + 74.46(\text{ET}) - 1{,}932\ln(\text{VPD}) - 59.25\ln(\text{POP}) + 0.1345(\text{PD}) + 675.4(\text{RSH}) - 0.00378(\text{INC}) - 1{,}155(\text{RIND})$$

The model yields an adjusted R^2 of 0.85 and RMSE of 82 gpcd, with all variables' *p*-values less than 0.03. These satisfy the aforementioned criteria. Figure G-1 compares the observed and predicted values.

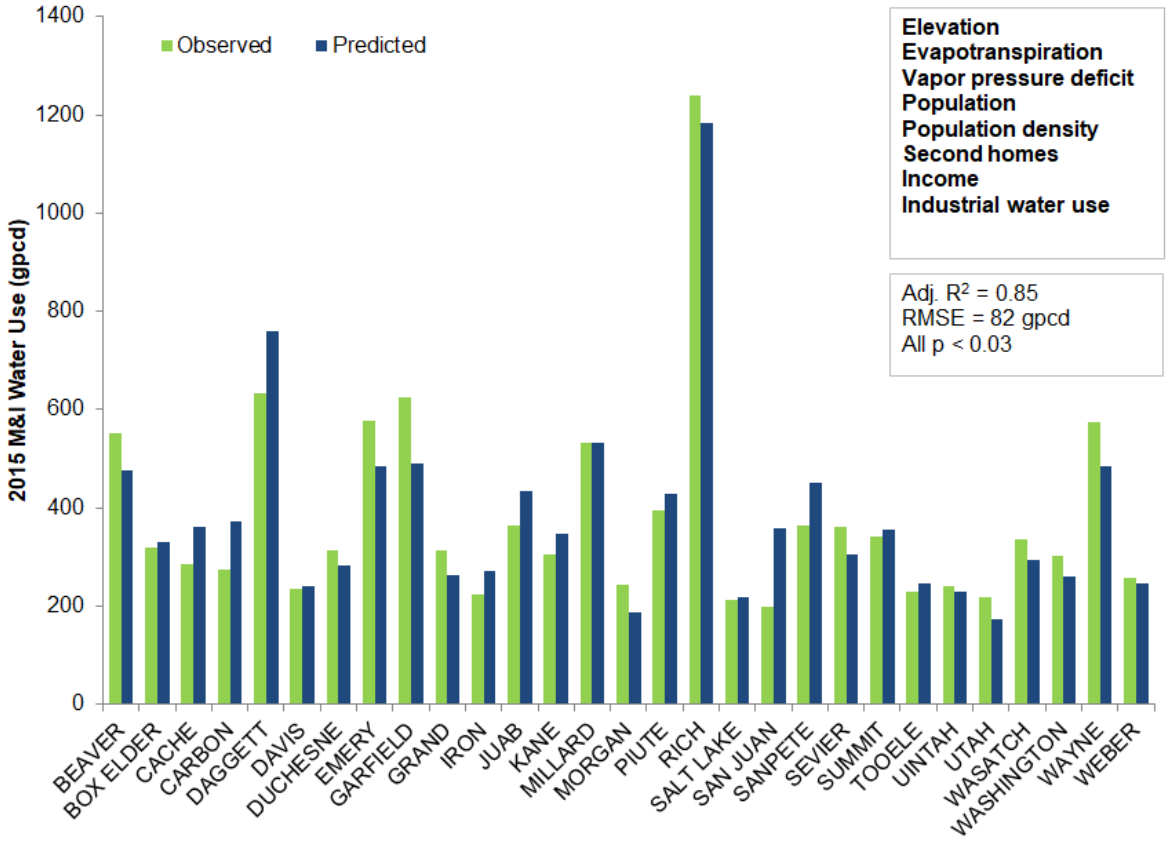


Figure G-1: Regression Model Comparison

Appendix H: Supplemental Data

Data may be made available upon request to the Utah Division of Water Resources.

Appendix I: County-Level M&I Water Conservation Data

County-Level M&I Water Conservation Data

Regions/ Counties	Baseline (gpcd)	2030	2040	2065	Reduction from Baseline		
	2015	Goal (gpcd)	Projection (gpcd)	Projection (gpcd)	2030	2040	2065
Bear River							
Box Elder	318	266	249	236	17%	22%	26%
Cache	284	233	217	204	18%	24%	28%
Rich	1,275	984	918	909	23%	28%	29%
Green River							
Daggett	423	343	314	307	19%	26%	27%
Duchesne	327	267	254	254	18%	22%	22%
Uintah	256	212	205	206	17%	20%	19%
Lower Colorado River North							
Beaver	553	390	360	356	30%	35%	36%
Garfield	582	463	432	429	20%	26%	26%
Iron	223	193	182	173	13%	19%	23%
Lower Colorado River South							
Kane	358	304	289	282	15%	19%	21%
Washington	302	260	246	236	14%	19%	22%
Provo River							
Juab	373	292	280	284	22%	25%	24%
Utah	214	172	155	145	20%	27%	32%
Wasatch	344	265	249	249	23%	28%	28%
Salt Lake							
Salt Lake	210	186	178	169	11%	15%	19%
Tooele	224	195	184	176	13%	18%	21%
Sevier River							
Millard	522	422	398	397	19%	24%	24%
Piute	391	341	322	325	13%	18%	17%
Sanpete	366	272	250	252	26%	32%	31%
Sevier	363	322	312	317	11%	14%	13%
Wayne	537	412	381	388	23%	29%	28%
Upper Colorado River							
Carbon	267	239	230	230	11%	14%	14%
Emery	569	376	337	333	34%	41%	41%
Grand	309	282	272	267	9%	12%	13%
San Juan	199	180	175	177	11%	14%	13%
Weber River							
Davis	235	188	170	161	20%	28%	32%
Morgan	238	187	179	186	22%	25%	22%
Summit	341	300	290	286	12%	15%	16%
Weber	256	202	184	175	21%	28%	32%
Statewide	240	202	188	179	16%	22%	26%

Note M&I = municipal and industrial; gpcd = gallons per capita per day based on permanent population. Reported per-capita use includes all residential, commercial, institutional, and industrial uses averaged over the permanent population in each region.

Appendix J: Public Comments

This appendix contains comments from the official public comment period (Aug. 26–Sept. 25, 2019) and the associated responses.

No.	Comment	Organization	Commenter	Response
1	Why are we allowing special interest groups such as those seeking funding for Bear River Development and the Lake Powell Pipeline to influence conservation goals? These agencies seek to create barriers to making more significant gains in water conservation in Utah. 60% of the participants in Appendix E are from the four water districts that employ the lobbyists seeking funding for these two water projects.	Utah Rivers Council	Zachary Frankel	Water conservation is an issue that affects numerous stakeholders. Those invited to contribute to this project include water suppliers, environmental groups, policy leaders, and others. The perspective of water suppliers is particularly important since they are largely responsible for implementing water conservation programs.
2	Why are the 2019 Goals less than Utah's existing water conservation goals (1% down to 0.52%)? If Utah achieved significant water conservation, then neither the Bear River Development or the Lake Powell Pipeline would be necessary.	Utah Rivers Council	Zachary Frankel	The current statewide goal is a reduction of 16% by 2030. This is a little over 1% per year, an increase over the historic goal. While the increase in percentage is modest, this represents a significant increase in effort as much of the conservation achieved to date has been easier to accomplish than what will be required in the future.
3	The Division's goals and projections have Utah, 70 years from now, as having a higher GPCD than comparable states in the southwest now. Denver currently uses 142 GPCD and 2019 Goals have Utah 15% higher than that in 2065.	Utah Rivers Council	Zachary Frankel	Utah calculates its GPCD differently than other states and has different water requirements. Therefore a straight comparison of the two values is invalid. However, DWRe is in the process of doing more in-depth analysis to see what can be learned from water use numbers in other states.
4	If dozens of water suppliers have already surpassed the 2065 water conservation GPCD targets from the 2019 Goals Report, how are these 2065 projections aggressive enough?	Utah Rivers Council	Zachary Frankel	The goals are regional, not local. Performance and potential are highly variable. While some individual water suppliers may have already reached the 2065 goal, others in the same region need to improve. Progress will be evaluated regionally. Even if individual suppliers have reached the regional GPCD goal, they will still be expected to continue conservation efforts to help the region reach its overall goal.
5	The Utah Rivers Council, and over 50 businesses and countless community members believe Utah should aim to save 2% of water each year.	Utah Rivers Council	Zachary Frankel	This report does not discourage individual businesses and communities from conserving more than the proposed goals. Localized conservation efforts may help educate and promote additional savings beyond those proposed in the report.
6	"Per-capita use is computed according to the permanent population (excluding tourist and commuter populations). Numbers used throughout this report represent total M&I water use within a region divided by the region's permanent population. Other states and cities report water use differently." Why aren't the GPCD reported the same way other communities are to provide transparency? Please provide peer-reviewed data or document that you have analyzed, showing that the water use calculations for all of these 18,000 cities is wrong and Utah is the only state in which the data has been correctly analyzed.	Utah Rivers Council	Zachary Frankel	There are many ways to measure water use and each has particular strengths and weaknesses. There is no "correct" method across cities and states and no standard method used by all other communities as implied in the comment. Chapter 1 now includes a few examples to better illustrate this issue. The GPCD metric used here, while different than in some other states, is consistent with Utah's past efforts and therefore allows comparison over time. It has several limitations that are acknowledged in the report (Chapter 5), but those limitations should not prevent us from advancing meaningful water conservation.
7	Water conservation saves consumers water and money. The report does not reflect this. The report should not report the total replacement cost, rather the difference between a standard (older) vs a more efficient version based on the concept of natural replacement or a device reaching the end of its useful life. Need to include "avoided costs", which occur because the more efficient models save energy, time, and fertilizers, etc.	Utah Rivers Council	Zachary Frankel	As discussed in Chapter 5, the report recognizes that costs and benefits should be a factor when evaluating conservation. The report also specifically mentions that there are both direct and indirect cost savings associated with conservation (see page 44 and 68 of draft report). However, cost savings will vary significantly between different water providers depending on dozens of different factors, and there is little consensus among stakeholders on the value to assign to indirect cost savings. Correspondingly, attempting to analyze/generalize total costs and cost savings is something that simply could not be done within the scope of this report. Instead, this report provides basic direct cost and water savings data for specific conservation practices that can then be used by water providers to prioritize and evaluate the practices for application in their specific circumstances.
8	Report should use Cooley's Report to estimate cost of water conservation. The 2019 Goals Report needs to be revised to include these large maintenance savings.	Utah Rivers Council	Zachary Frankel	See response to Comment 7.
9	Climate change may encourage higher water rates, which would lead to cuts in water usage. Due to climate change, people may want to maintain fewer grass landscapes. Projecting how climate change will impact water usage in Utah is a complex issue that requires detailed and explicit modeling. Division's view of climate change is too simplistic.	Utah Rivers Council	Zachary Frankel	There is no doubt that Utah must adapt to a changing climate that will force changes in water use. Projecting climate change impacts, particularly the exact effects on water users' behavior and preferences, is indeed a complex issue. While the Division, other state agencies, and research groups continue to study climate change, it is necessarily simplified here.
10	Lack of documentation is a recurring concern. The 2019 Goals Report assumes without basis that commercial conservation potential is only half of residential conservation potential.	Utah Rivers Council	Zachary Frankel	As noted on page 34 of the draft report, calculation of commercial conservation potential in detail is not possible as a result of the lack of data regarding commercial water uses and the huge variation in water use patterns between different commercial water users. While the study team would have liked to provide a more in depth analysis of this potential, the lack of available data leaves us with only the option of using a simplified assumption. However, some additional documentation regarding the overall validity of the assumptions has been added to the text.
11	The regression model in Appendix G drops theoretically important variables that fail to achieve statistical significance. This is inappropriate for such a small sample size and control variables need to be included.	Utah Rivers Council	Zachary Frankel	This is one of many regression models that could have been produced. The variables selected here are statistically significant and predict the observed water use. Discarded variables are not necessarily invalid; they just do not predict the observed water use as well as the selected ones do. The regression model was used merely to inform the goals. The sample size is indeed small, but nonetheless produced a statistically significant and informative model.

No.	Comment	Organization	Commenter	Response
12	Great Salt Lake: It would be instructive to refer to the findings of recent reports (The Assessment of Potential Costs of Declining Water Levels in Great Salt Lake, yet-to-be-released Great Salt Lake Integrated Model (GSLIM) – Phase II, Consequences of Drying Lakes Around the World) that help put the importance of conservation in perspective while ensuring water for natural systems.	National Audobon Society	Marcelle Shoop	Reference added.
13	Include a suggestion that the Governor's Office of Economic Development (as well as local economic development agencies) incorporate criteria into the review of businesses seeking incentives that take into consideration water use/ demand and the applicant's plans for incorporating water efficient practices into its business model.	National Audobon Society	Marcelle Shoop	See Executive Summary: "State and local governments should consider the water use impacts of proposed businesses and their plans for water-efficient fixtures, landscaping, and operations before *approving construction or incentives.*"
14	Lack of discussion concerning opportunities for addressing leaks in public distribution or industrial distribution systems and infrastructure. Such water conservation opportunities merit further discussion, analysis, recommendations and/or inclusion in practices to implement.	National Audobon Society	Marcelle Shoop	DWRe recognizes the potential for supply side conservation through leak detection and repair. However, this is not the topic of this study and has therefore been left out of this analysis. Language has been added to the report to clarify this point. It is expected that efforts will be made outside of this report to evaluate these other water uses, assess their potential for conservation, and examine how they might play a part (along with M&I water conservation) in meeting the state's future water needs.
15	"Unlike other cities and states, Utah counts all potable (treated), secondary untreated and reuse (treated wastewater) water by all users." (p. 2). Can the RWCG provide more information or references to explain this statement? Such information is important to understanding how Utah is positioned relative to other cities or states and whether there are missed opportunities.	National Audobon Society	Marcelle Shoop	See response to Comment 6.
16	There is significant interest in increasing the conservation goals. The RWCG recommends reassessing the 2040 and 2065 goals after some progress is made toward achieving the 2030 goals. While it is important to continue to reassess goals in light of technological and other changes, if long-term investments are being made to achieve the goals it seems the investments should be structured where possible to meet the long-term goals. Suggesting efforts to exceed the proposed goals should be part of recommendations. Please consider adding a recommendation for municipalities and other water providers to assess costs and additional means to achieve higher conservation goals in the areas they serve.	National Audobon Society	Marcelle Shoop	Recommendation has been added.
17	the Draft Goals would benefit from a review process by one or more water efficiency experts with experience in western water conservation in multiple states.	WRA	Amelia Nuding, Laura Belanger	Agreed. Many members of the project team and stakeholder groups do have such experience and we may seek additional perspectives in future studies.
18	It is incumbent upon the State to demonstrate its commitment to water conservation by providing transparent water use data, calculations, and assumptions, and by adopting stronger conservation goals, and by providing a solid strategy for achieving these water use reductions.	WRA	Amelia Nuding, Laura Belanger	Thank you for taking time to provide this feedback. This comment does not have specific application to this report but has been forwarded to DWRe for their consideration.
19	The Draft Goals need improved messaging. The tone of the report should be motivating and inspirational, not discouraging as it comes across currently. The report is too focuse on how burdensome, costly, time-consuming and extensive conservation will need to be.	WRA	Amelia Nuding, Laura Belanger	We have modified some language, particularly in the executive summary, to be more motivational. The language was not intended to be discouraging in anyway. The costs and difficulties of water conservation must be noted in order to secure funding and support for these goals. Even though water conservation at the magnitude contemplated in this report will not be easy or inexpensive, it is absolutely still worthwhile.
20	The benefits of conservation need to be emphasized more: conservation is substantially less expensive and faster to develop than the development of new supplies, it is foundational to adapting to an increasingly arid climate, and it is a continuation of what Utah has already been doing for decades.	WRA	Amelia Nuding, Laura Belanger	Statement that "conservation is substantially less expensive and faster to develop than the development of new supplies" is not universally true (see response to Comment 7). Fundamental shifts in attitude and habits are required for conservation to be successful, and will take time to develop.
21	Several examples, by no means comprehensive, of language that could be revised to be encouraging rather than discourage are: o Page iv: "The 2030 water conservation goals in this report will require significant effort, increased attention, participation and funding from the legislature, state agencies, municipal water retailers, local elected officials, wholesale public water suppliers and citizens of Utah." o Page iv: The efforts are framed as very challenging, costly and could require significant behavior change when in fact much of the conservation that has already been achieved in communities has been embraced, and can be less expensive than other supply alternatives. o Page ES-5: "Achieving the goals identified in this report will require a major investment. As with past and current water conservation efforts, the costs are assumed to be borne by all Utahns…" o Page ES-5: "The pursuit of the regional M&I water conservation goals will be an endeavor of immense magnitude. All levels of society—not just water suppliers—must engage over extended time periods."	WRA	Amelia Nuding, Laura Belanger	Thank you. See response to Comment 19.

No.	Comment	Organization	Commenter	Response
22	It is important to fully and accurately convey the actions that advance or impede conservation, notably the cost and pricing structures. It should be clear that the collection of property taxes to support water utility operations dilutes the impact of a conservation-oriented water rate structure, because much of the true cost of water is buried in fixed fees, and not made understandable in monthly bills. o On pg ES-5 it says “Policy leaders can set or influence the pricing of water to promote conservation and reflect the cost of water scarcity.” This should clarify messaging around the conservation impact of rates vs. property taxes.	WRA	Amelia Nuding, Laura Belanger	Discussion of water funding sources is already included on page 54 of the draft report. Property taxes are specifically mentioned as one funding sources that should be examined and the legislative audit recommendation is already referenced.
23	A statement from the state’s 2015 Legislative Audit could be included, such as: o “Policymakers should also consider the way water is priced in Utah. Utah’s existing price structure does not adequately encourage conservation. For example, the use of property tax to subsidize the cost of water may lead to an increase in use. In addition, rather than using relatively flat pricing structures, water systems should adopt conservation pricing, or increasing block rates, to incentivize efficient water use. As shown in Figure 2, cities with block rate structures charge consumers an increasingly higher price as consumption increases. The Legislature should consider changes to pricing policies that will encourage efficient water use” (p. iii).	Western Resource Advocates	Amelia Nuding, Laura Belanger	See response to Comment 22.
24	The regional grouping should be re-worked to disaggregate urban and rural communities. The grouping of Salt Lake County and Tooele County doesn’t make intuitive sense because of their very different characteristics such as population, density, and climate – and therefore water use. It makes more sense to combine Salt Lake, Utah, and Wasatch counties into one region, and then combine Tooele and Juab Counties into another region. Alternatively, if trends in Salt Lake County are markedly different than other counties due to Salt Lake City, it could be pulled out on its own. The State of Colorado did exactly this when designing regional water discussions (https://www.colorado.gov/pacific/cowaterplan/basins). The state divided regions by watershed basins, but also carved out the Denver metro are because of its very distinctive character as compared with other regions in the states.	Western Resource Advocates	Amelia Nuding, Laura Belanger	The project team explored several different options for regional groupings. It is true that arguments can be made for breaking out additional smaller regions. In fact, the most accurate approach might be to have an individualized goal for every one of the State's more than 500 water providers. Unfortunately, this is clearly not practical. Adequate data does not exist to establish goals for each individual provider and messaging for and administration of so many goals would prove ineffective. Ultimately, keeping counties together and in the regions proposed was selected to balance capturing regional differences without becoming overly complicated. E.g. For the specific example given, breaking Salt Lake County out from Tooele County would only change the Salt Lake City goal by 1 GPCD. Grouping Salt Lake, Utah, and Wasatch Counties together would be inappropriate given the significant difference in secondary water sue between these counties.
25	The goals for 2030 would benefit from more transparent analysis and more ambitious targets, and the 2040 and 2065 goals are weak. The smallest percent GPCD reduction is for Salt Lake County, and this is not well explained. If it is due to the fact they this region already has the lowest per capita usage, and numerous conservation programs have already been implemented, then it is reasonable that the percent reduction would be lower. However, due to the fact that that Salt Lake County and Tooele counties are combined, the water use trends are not apparent. We recommend that highly and densely populated regions be grouped together because of their similar water use patterns. This would provide better information about water use trends – and better inform future goals - if more similar county types are grouped together. The 2030 goal for Colorado River South is noticeably the second smallest percent reduction, and it is not well justified either. Due to the fact that so much new growth is anticipated, we should expect per capita water use to drop much faster if the requisite conservation policies are in place for new construction. This region, like many others, realized water savings faster than they anticipated in the last 15 years, and this is not a reason to think that more cannot be done, in fact the opposite seems a more logical conclusion as the water use rates are still high (even accounting for visitors).	WRA	Amelia Nuding, Laura Belanger	The difference between the regions is explained in detail in Chapters 4 and 5. See response to Comment 24 regarding regions.
26	It would be helpful for the reader to have the best data available regarding typical levels of water use. Specifically, in the study Residential End Uses of Water (DeOreo et al 2016), the researchers found that in 2016 (pg xxxiii): □ Indoor per capita water use was 58.6 GPCD on average across 737 study homes, and □ High efficiency homes’ indoor per capita water use was 36.7 GPCD. The regional goals of course include more than residential indoor use, but it would be informative to compare the future goals for indoor water use with these average numbers, and for the public to consider for themselves if a goal of 321 GPCD or 249 GPCD is reasonable.	WRA	Amelia Nuding, Laura Belanger	DeOreo report is already referenced and indoor values are documented in the appendices of the report.

No.	Comment	Organization	Commenter	Response
27	The Draft Goals would greatly benefit from input of additional water conservation experts. The engineering firms of Hansen Allen & Luce, Inc. and Bowen Collins & Associates should be applauded for what was obviously a great deal of work developing the August 2019 Draft Utah's Regional M&I Water Conservation Goals study. However, we urge the State to bring an additional consultant with conservation planning-specific expertise to work with Utah DWRe and its consultant to improve the study. Given the importance of the study to establish goals for Utah through 2065, we urge the state to bring on one of the numerous Western conservation planning experts, and WRA would be happy to provide recommendations at your request. We also encourage communities and water providers to involve these experts in their own planning and implementation efforts.	WRA	Amelia Nuding, Laura Belanger	Thank you. Many such experts did contribute, even if not officially contracted to do so. Future efforts to refine the 2040 and 2065 goals may seek additional experts.
28	Scenario analyses and goal development are flawed and should be revised. The scenario analysis in Chapter 4 is at the crux of the study, but relies on a non-standard and in some cases erroneous methodology. The analysis should be more transparent, at a minimum, and potentially be redone. While we appreciate all the work and analysis that went into the scenarios, based on decades of experience working at the local, regional and state level, we find significant flaws in the analysis. The fact that the resulting per capita use goals for 2065 are significantly higher than what many western communities use currently should raise flags.	WRA	Amelia Nuding, Laura Belanger	This comment can only be addressed relative to the specific issues highlighted below.
29	Here we provide several examples which are intended to be illustrative, rather than comprehensive list of issues. o For scenario and goal development we strongly suggest the study switch to more standard and well-proven methodologies. Rather than working backwards by assuming certain conservation activities will be implemented and using questionable data and assumptions regarding savings and implementation, the study could develop better conservation goals utilizing more common methods and data to set conservation goals. A first step would be developing the additional data suggested above regarding indoor and outdoor use, existing and projected populations (including seasonal), and metered and unmetered secondary connections. Then per capita use rates for highly efficient homes can be applied to calculate indoor use goals. Outdoor goals can be set by incorporating defensible assumptions regarding existing and future housing stock (including multi-unit dwellings), lot sizes and landscaping. Water application rates for different types of landscaping can then be assumed and applied to square footage. Indoor and outdoor baseline analyses should incorporate savings that will occur with little to no active conservation and scenarios can then be developed to set goals for different levels of active conservation.	WRA	Amelia Nuding, Laura Belanger	The project team does not understand this comment. The comment requests a "switch to more standard and well-proven methodologies" but then proceeds to describe almost exactly what was done in the analysis. Because the analysis already follows the approach proposed, no "switch" will be made as part of the final report.
30	Additional data that weren't provided are necessary to understand how the secondary metering scenarios impact the goals. While scenarios include assumptions about the percentage of secondary connections that are metered, there's no data provided to understand how that translated to decreased water use. Current and projected water use needs to be broken out to include secondary water with a further breakdown of what is and is not metered. Savings assumption related to metering needs to be documented.	WRA	Amelia Nuding, Laura Belanger	Savings associated with metered secondary water are already documented on page 24 of the draft report. Detailed secondary water use information is contained in Appendix H.
31	High efficiency fixture water savings assumptions and volumes appear to be based on inaccurate data and, if that is the case, greatly underestimate potential savings. On page 19, the study refers to fixtures using 2.5 gallons per minute (gpm) as high efficiency. 2.5 gpm is not high efficiency. EPA WaterSense labeled sink faucets and accessories use a maximum of 1.5 gpm (standard fixtures use 2.2 – 2.5 gpm) and WaterSense showerheads use a maximum of 2.0 gpm (standard showerheads use 2.5 gpm). If the study assumed high efficiency fixtures use water at the rate of 2.5 gpm as the text implies, that is a significant error that would lead to greatly overstated demands.	WRA	Amelia Nuding, Laura Belanger	You are correct. High efficiency documentation in the report is an error resulting from a miscommunication that occurred during the drafting of the report and has been corrected to match the definition in the 2016 Deoreo report ("< 2.5 gpm"). However, the conservation potential model was not based on a fixed reference to 2.5 gpm per fixture, but a potential savings of 50% by moving to high efficiency fixtures. While the numbers you have suggested indicate slightly less potential for savings than included in the model, we have kept the full volume of reduction in the goals.
32	Relatedly on page 19, the study erroneously uses data from a 2016 Water Research Foundation study (DeOreo et al. 2016) as the source for the baseline scenario assumption that 80% of existing homes have water efficient fixtures installed. A review of DeOreo et al 2016 reveals that 80% of the homes surveyed had showerheads installed that use less than 2.5 gpd. The 1999 study found that 75% of homes had similarly "efficient" showerheads installed. By inappropriately applying the 2016 80% fixture rate across faucets and showerheads, potential savings from water efficient (and highly water efficient) fixtures have been severely and erroneously limited in the scenario analysis and conservation goals.	WRA	Amelia Nuding, Laura Belanger	In the absence of additional data, the DeOreo report groups showers, faucets, and bathtubs. The conservation potential calculations do the same. Given the conservatively high estimation of potential savings associated with these fixtures (see response to Comment 31), this seems a reasonable approach. Also, the conservation potential model ultimately results in a potential reduction in indoor use to less than 40 GPCD, matching the DeOreo report. This is further confirmation that the simplifying assumption here is not leading to any "severe and erroneous" underestimation of conservation potential. As more data becomes available in the future, the analysis can be further refined, but the results are not expected to change significantly.

No.	Comment	Organization	Commenter	Response
33	Regarding residential outdoor use, it appears that scenario analyses assumes all new residents live in single family homes and that lot size decrease slightly (19% statewide from 2015 to 2065) which is contrary what is occurring on the ground. Lot sizes are decreasing and more people are living in multi-family units, which have much lower outdoor water use per capita. The study overlooks multi-family units completely and mostly likely greatly underestimates shifts to smaller lot sizes – all of which is occurring regardless of conservation actions. A 2/22/18 Utahbusiness.com article Build Out: Population Growth Will Reshape Utah's Housing Landscape quotes James Wood, Ivory Boyer senior fellow at the Kem C. Gardner Policy Institute at the University of Utah as saying "Housing prices in Utah's metro areas will continue to increase faster than the nation, and it will push more people toward higher density, affordable housing". "Right now, looking at numbers for the first nine months of [2017] on residential construction, single family is up 15 percent, but condos are up 60 percent and apartments are up 36 percent. We're seeing a real boom in condos. That's a reflection of affordability. People want to get into ownership, but they can't afford single family, particularly if they're a young household. That gives us a trend of pushing home ownership out farther geographically, which then creates sprawl."	WRA	Amelia Nuding, Laura Belanger	This is an inaccurate interpretation of the report. Multi-family is included in the analysis and is a large part of why the average lot size decreases. Additional language has been added to the report to clarify.
34	Irrigation efficiency assumptions should be redone considering more current technology and efficiency data. The study states that average existing irrigation efficiency is just over 63% (page 25). The study then assumes that the maximum efficiency is 70% for sprinkling systems (we assume this refers to "sprinkler" systems) and 80% for drip systems. These assumptions thus incorporate significant overwatering of landscaping, when the goal should be to eliminate or minimize that. Given that outdoor use can be a significant portion of total annual water use, there is great overlooked potential for savings here that should be addressed. Further, in Table 4-6 on pg. 26 portrays scenarios for the "Ratio of Efficiency to Best Expected" which is non-standard and a little confusing, but it seems to apply to the 70% and 80% assumed efficiencies, resulting in even lower water efficiency. Irrigation technology has become much more efficient in recent years, with water efficient sprinkler heads saving significant water with more precise application and drip systems that are extremely efficient when properly designed and installed. Also of interest is the 2016 Water Research Foundation resident end use study (DeOreo et al. 2016, p. 160) which suggests that a substantial majority of households actually under-irrigate, and there is no mention about to what extent this mirrors the situation in Utah.	WRA	Amelia Nuding, Laura Belanger	It is true that the assumed efficiencies included in the report still include some overwatering and waste. We too wish that all overwatering could be eliminated. However, expecting that 100% of residents in the state will perfectly maintain and operate their irrigation systems is clearly unreasonable. Thus, the challenge highlighted here is to determine how much of an allowance for overwatering should be included for goals and planning purposes. The project team met with a large number of irrigation and conservation experts as part of the public outreach process. While consensus does not exist among all the experts, the values used here reflect the majority of feedback received regarding reasonable expectations for efficiency within the current goal setting window. As for "Ratio of Efficiency to Best Expected", this is necessary to reflect the different mix of landscaping in each region as described in the report. Language has been modified slightly in an attempt to clarify.
35	Cost and financial analyses are incomplete and misleading regarding the costs of conservation. Cost considerations are important in evaluating demand management and water supply alternatives, the analyses and discussion provided in the study are misleading as they overlook critical components of a true cost analysis. Some specific recommendations include:	WRA	Amelia Nuding, Laura Belanger	See response to Comment 7.
36	The study should include a discussion and comparison of the costs of conservation to the costs of providing water to meet demands that would occur without conservation. The cost per acre-foot of water saved through conservation is likely to cost significantly less than the cost of supplying water to meet water demands that would occur without conservation. Without conservation, communities will need to pay for additional water supplies, conveyance, storage, treatment, staff, and operation and maintenance, among other things. As currently presented in the study, it appears that a decision to pursue conservation will result in additional spending by communities and utilities that otherwise would not be incurred. One case study on this topic can be found here: https://www.financingsustainablewater.org/resource-search/fact-sheet-conservation-keeps-rates-low-westminster-co.	WRA	Amelia Nuding, Laura Belanger	See response to Comment 7.
37	In Table 5-1 (pg 41), the costs of conservation for indoor fixtures seems too high. All new homes will need to have fixtures and appliances purchased, and existing home will eventually replace old or broken fixtures, so only incremental additional costs to purchase highly efficient items or to prompt retrofits more rapidly should be included as the cost of conservation. The table does seem to appropriately include only additional costs for water efficient landscaping.	WRA	Amelia Nuding, Laura Belanger	Costs for indoor fixtures are taken from other peer reviewed, academic studies as referenced in the report. The comment correctly notes that the costs quoted in Table 5-1 are gross unit costs and may not represent "additional" cost for fixtures that will naturally be replaced. However, this has been clearly indicated in the report, as well as the expectation that each provider consider the applicability of these numbers to their own situation as they design their conservation program. Specific to this report, the total cost of conservation quoted in Chapter 6 only includes costs associated with accelerated fixture replacement activities. Conservation associated with natural replacement has already been assigned zero cost as suggested in the comment.
38	Also in Table 5-1, the costs to the utility vs. the costs to the customer should be differentiated. Costs to the utility may or may not be directly passed on the customers, but would presumably be distributed among all customers, which can be lower cost on a per-customer basis. Direct customer costs tend to be borne upfront and in one lump sum for just some customers. The point here is that the financial impacts to an individual or family are very different.	WRA	Amelia Nuding, Laura Belanger	We agree with the comment that it would be nice to include costs from the customers perspective. However, these costs will vary significantly between water providers depending on their situation and how they decide to distribute costs. Thus, expressing these costs in any meaningful way that would be applicable to the state as a whole is not possible.

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39	In the “Considerations Outside of Direct Costs” section (pg 43) we believe risk is another very important consideration that should be included. In other words, it is important for the state and local communities to consider the financial and water availability risks of various strategies going forward, and including risks into these analyses. Conservation comes with significantly reduced risk compared with many supply-focused strategies.	WRA	Amelia Nuding, Laura Belanger	Recommendation to consider risk has been added to the report.
40	We recommend including current and projected population data. It is extremely difficult to evaluate conservation opportunities, savings, and costs without current and projected population data.	WRA	Amelia Nuding, Laura Belanger	This information is included in Appendix H. Projections are taken from the Kem C. Gardner Policy Institute projections.
41	Current and project population data needs to be included in the scenario analyses as well in the table on page ES-3. And, because seasonal visitors impact GPCD numbers, it would be helpful to include seasonal population estimates where relevant to better identify where and the extent to which those may be driving up GPCD numbers.	WRA	Amelia Nuding, Laura Belanger	This information is included in Appendix H.
42	In areas where significant new growth is anticipated, significant water conservation can occur passively. For example, the trend to smaller lots and multi-family housing and the installation from the start of more water efficient fixtures and appliances that currently dominate the market. More active conservation, such as landscaping ordinances and incentives, can ensure landscaping is water efficient from the start, alleviating the need for costly retrofits. For this reason it is important that population data be provided and incorporated into analyses.	WRA	Amelia Nuding, Laura Belanger	Yes. All these factors, including consideration of population data, have already been taken into account in the analysis.
43	We are concerned that in table 5-3 of the Plan; Grand County seems to be required to implement levels I1 and L1 with only a few other counties. It seems that we cannot be the only counties that need to have an aggressive leak repair plan nor better landscaping policy.	GWSSA	Dana Van Horn	Because of the potential for growth in the county and limited water resources, Grand County does include more aggressive goals than many other counties in the states. However, the report does not mandate any specific actions. It recommends levels of implementation that will help achieve the developed goals, but ultimately, each water provider will need to decide what is the most effective way of achieving the proposed regional goals.
44	GWSSA is concerned that in the future this document could be used to deny SRF funding for capital improvements if our entire region is not achieving the goal amount.	GWSSA	Dana Van Horn	This document provides recommendations on future goals and how to achieve them. It does not include specific recommendations on how the goals will be administered and does not suggest that they be used to deny future funding for water systems. However, your comment has been noted and will be forwarded to those who are considering administration and enforcement of the goals.
45	1.a. Title is misleading. The title of the document (“Public Review Draft-Aug. 23, 2019 (v10) - Utah’s Regional M&I Water Conservation Goals”) and the name by which it is being referred to (“Draft Regional Conservation Goals”) lead the reader to expect a more comprehensive approach to setting state-wide water conservation goals. The document does not cover the full range of water use sectors (agricultural use constitutes the largest share statewide) nor the full range of M&I water uses (more below), nor does it adequately prioritize overall statewide water conservation measures. We agree with the regional approach taken in this document in recognition of ecological and climatic variability across the state, but we know that the proportions of water use in various sectors also varies (with M&I use being just one sector). It would be helpful to better set the stage for the focus of this document by explaining when and how water conservation goals will be set for other sectors of water use that are not included here.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; Dr. Joanna Endter-Wada; Dr. Kelly Kopp; Dr. Paul Johnson; Dr. Youping Sun; Ms. Susan Buffler, Ms. Chris Garrard, and Mr. Paul Harris	The title is appropriate. The goals are regional and limited to municipal and industrial (M&I) water use. The "draft" refers to the report, not the goals. We recognize agriculture is the largest water user, but it is not dealt with here. Please see the forthcoming State Water Plan for information on other efforts.
46	1.b. Commercial and industrial use is omitted from M&I. The commercial and industrial sectors have largely been set aside in the document, yet they are important components of M&I water use in a rapidly growing and urbanizing state. The water implications of how Utah grows the commercial andindustrial sectors of its economy will dramatically affect M&I use and, correspondingly, the estimated per-capita water use (given the way it is calculated; see pg. 2). These sectors must be included for any plan articulating state M&I water conservation goals to be equitable, but only receive minimal attention and are dismissed with undocumented assumptions on pg. 34 (commercial) and pg. 35 (industrial). The inequity of singling out the Green Industry to bear the burden of M&I water conservation is covered in more detail below.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	See response to Comment 10.
47	1.c. Focus is on end users; goals also need to be articulated for municipal systems. The plan focuses on promoting and incentivizing individual water users to conserve water in their homes and on their properties, and for government institutional users to do the same. However, conservation gains to be made in operating municipal and industrial systems is absent. M&I water conservation savings should be sought at both the system and consumer levels in the interests of fairness and prioritizing where the greatest savings can be obtained. This is a key omission in the plan. For instances:	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	See response to Comment 14.

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48	1.c.ii. Data infrastructure. The rapid technological development in water management data infrastructure and its further adoption is not covered by the plan. Better municipal engineering through systems such as AMR (Automated Meter Reading), AMI (Advanced Metering Infrastructure), and AMA (Advanced Metering Analytics) are advances regularly highlighted at national and international water management conferences. AMI is only mentioned once (pg. 52) in connection with water conservation education of end users, while concerted efforts to upgrade existing municipal systems with such infrastructure and how this would contribute to meeting conservation goals is entirely missing.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	Some additional text in this regard has been added to Chapter 5.
49	2.a. Time frame. Distinctions in conservation goals tied to 2030 and those tied to 2065 are not entirely clear. The document states that Utah will take stock of conservation progress in 2030, but the plan projects to 2065. The goals for 2030 do not incorporate the breadth of best available science and engineering, nor the technological innovation occurring in the water industry today. Projections past 2030 underestimate the continuation of and/or increase in these trends. Both factors cause long-term water conservation potential to be minimized and goals to be correspondingly inadequate.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	The goals are set for 2030 since the conditions are the least uncertain. (Still, getting there will require policy interventions to enable the existing technologies, such as secondary metering, to be fully adopted.) We acknowledge that new water-efficient technologies may mature by 2040 and 2065, which is why those timeframes are referred to as "projections" rather than "goals." The future goals will be refined over time.
50	2.b. Calculating per-capita water use. Calculation of GPCD forms the foundation of the conservation goals, thus the data it relies upon and how it is calculated is extremely important (which was the focus of the 2015 Legislative Audit and follow-up documents). This document adopts the line of argument that Utah is unique in how it calculates GPCD and that it cannot be compared to neighboring states (pg. 2,“M&I Water Use Disclaimer”). This approach does not enable Utah to benchmark its contemporary water use in comparison to nationally-accepted standards or to reliably monitor its conservation gains over time. It is also an important policy issue in Utah’s negotiations with neighboring states over shared river basins and its ability to justify its apparently higher GPCD. It is incumbent on drafters of this document to provide details clarifying how Utah calculates its GPCD and how that compares to other states. Specific references to locations in the Legislative Audit Process Reports need to be included if relevant. This clarification is important for several reasons. How GPCD is currently calculated must be transparent so that future calculations of GPCD can be assessed for comparability and conservation gains can be determined to be real and not data artifacts. Additionally, such clarification would be extremely helpful for setting national standards if indeed “Utah has one of the most comprehensive water use accounting practices in the nation” (pg. 2). This is an area where Utah could exercise national leadership in water data management.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	See response to Comment 6. Utah is not necessarily "unique" in its GPCD calculations, merely different than many states which others would to compare to. We recognize this as a limitation but nonetheless aim to start conserving.
51	3.a. How costs were calculated. Estimates of costs associated with different practices are not well documented. One of the key references contains cost estimates that were, even at the time, based on outdated, speculative, and controversial figures. Actual costs, as documented in more reliable water industry sources, are needed to justify these estimates.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	It is not possible to respond to this comment in full as no specific examples or data are provided. While cost estimates by their very nature can vary significantly depending on the application, the costs included in the report generally comes from multiple sources and have been reviewed by several stakeholders familiar with broad application of these practices.
52	3.b. Capital costs and who pays them. The key practices recommended for implementation in this document focus on general water conservation education, water pricing, indoor fixture conversion and other measures, and outdoor improvement in irrigation efficiency in the residential and institutional sectors. It is assumed that some reductions will be gained through trends in lot sizes naturally occurring in the residential real estate market. Given this set of recommendations, most of the costs will be born privately (by individual property owners making upgrades, by water consumers paying higher prices) or captured by society at large through changing residential trends. Therefore, what constitutes the “capital costs” included in the $1.4 billion estimate remains unclear.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	This comment appears to infer that capital costs should only be considered if they are incurred by a water provider or other governmental entity. If that is the case, we disagree. Costs incurred by private property owners are just as valid as other costs and need to be considered. Further detail regarding how the $1.4 billion is calculated is contained in the response to Comment 78.
53	3.c. Costs versus benefits. The document mentions a variety of benefits to be gained through conservation, but most of these are labeled “non-financial benefits” (dollar amounts have not been assigned to them). The financial costs versus the financial benefits entailed in pursuing conservation are a key consideration for evaluating the worth of conservation in relation to other strategies to secure Utah’s water future. This issue deserves more careful analysis and is highly relevant to decisions involving trade-offs that lie ahead for Utah water policy.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	See response to Comment 7.

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54	4.a. Stakeholder exclusion and conservation burden for the Green Industry. Unfortunately, there is an omission of input from stakeholders in the Green Industry (anyone working with landscaping as a career or business) in the document. Of the 39 stakeholders interviewed and serving as document reviewers, representation was 67% water purveyors, 23% government agencies, 8% environmental groups, 3% agricultural water users, and 0% from the Green Industry. Given that the report predominantly places the burden of conservation on the Green Industry, the final version should incorporate input from groups such as the Utah Nursery and Landscape Association, the Utah Chapter of the American Society of Landscape Architecture, the Utah State University Center for Water-Efficient Landscaping, the Utah Community Forest Council, the Intermountain Chapter of the Sports Turf Managers Association, the Utah Golf Course Superintendents Association, the Utah Cemetery and Parks Association, and individuals within this broad field of endeavor.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	Thank you. We agree that Green Industry input would improve the report. Unfortunately, those of the Green Industry we invited to participate were unavailable or unresponsive during the study. Thank you for recommending groups we may consult with on future efforts.
55	4.b. No conservation contributions from other industries that use M&I water. We wonder, again (see point 1.b.), why “industry” is given a pass on M&I conservation; indeed, the report asks for no contribution to conservation from “industry” as “this approach assumes that any reduction in water use achieved through water conservation will be made available to reinvest in industry coming into the state. This will help make water available to allow for future industrial growth to drive and sustain the economy.” (pg. 35). Meanwhile, the Green Industry is not even recognized as a part of the economy that employs thousands of workers and contributes millions of dollars. Why are most industries granted all the water they want (e.g., some of the large technology and industrial firms being enticed to locate in Utah), while other industries in the M&I sector, such as the Green Industry, are asked to bear the brunt of meeting conservation goals? Further, the assumption that “commercial water conservation potential will be half the potential calculated for residential water use” (pg. 34) has no supporting documentation whatsoever. The statement that “the water use patterns of a restaurant are very different from the water needs of an office complex” (pg. 34) is not justification to give them a “pass” on water conservation. Most importantly, the report does not seem to recognize that commercial and industrial facilities also have landscapes. In this sense, the portion of their overall water use attributable to irrigating landscapes can be analyzed in a manner directly comparable to landscape water use at residential and institutional properties, and should be subject to similar water conservation goals and practices.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	Comments here and else regarding "singling out the Green Industry to bear the burden of M&I water conservation" seem misplaced for several reasons: 1. As documented in Appendix H, the rate of conservation for culinary water is only slightly higher for outdoor use (14% statewide) than it is for indoor use (12%). Conservation rates for secondary water are much higher but this is almost entirely a function of reducing overwatering through metering and is therefore not an extra "burden" on the Green Industry. 2. The project team recognizes the value of the Green Industry to the economy. However, we do not see these goals as a burden but rather a boon to the Green Industry. The vast majority of the $1.4 billion identified as capital cost in this plan will go to the Green Industry. See response to Comment 10 regarding commercial conservation.
56	4.c.i. Water-wise turfgrass species and varieties. Throughout the document, turfgrasses are characterized as high-water use plant materials and turfgrass removal is presented as an effective approach to achieving water conservation. There are several issues with both characterizations, although the authors might be forgiven for this omission, since these are very common misconceptions within the water industry, and neither horticultural nor Green Industry experts were consulted while drafting the document. As a plant materials group, turfgrasses are extremely variable in terms of water requirement. Within the species commonly known as ‘Kentucky bluegrass’, for example, there are hundreds of available varieties with drastically variable water requirements. In fact, some varieties of Kentucky bluegrass have been trialed in research projects at Utah State University that have required little to no irrigation over the growing season. Other turfgrass species also have very low water requirements, but these nuances are completely overlooked in the document.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	The report does already acknowledge that lower water use options are available for turf. However, to better clarify this fact, language throughout the landscaping section has been updated.
57	4.c.ii. Appropriate irrigation scheduling. In general, 30-50% of the water used for landscape irrigation can be conserved through proper irrigation management, without any change to landscape plant materials or to the irrigation system. First efforts toward landscape water conservation must be directed to this area.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	We agree that this is true for many properties. The conservation goals reflect this by placing increases in efficiency as a top priority in all areas of the state.
58	4.d. Landscaping ordinances. The report recommends asking cities to adopt ordinances that will control landscaping to reduce turf. Rather than codify landscape plant requirements, we recommend alternative approaches be considered, such as allocating a regionally-appropriate and lot size-appropriate water budget to property owners sufficient to irrigate a water conserving landscape. Property owners would be free to use that budgeted water as they see fit. Excessive and/or wasteful use compared to a budgeted amount could then be regulated by pricing, fines, or other means. Importantly, property owners should have the freedom to landscape as they choose within regional water use guidelines, rather than as dictated by government agencies. Fortunately, current technologies, such as USU’s WaterMAPS™ Program, permit a direct determination of landscaped area and estimated water requirements on an individual parcel basis, and billing tiers for water pricing can be based on that data to send economic signals and incentivize voluntary conservation.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	Good suggestion. This has been added to the report.

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59	4.e. Turfgrass replacement. The document encourages turfgrass rebates and replacement of turfgrass with alternative landscaping. However, the document does not address the negative, unintended consequences that may result from such policies. For example, in California's recent turfgrass rebate programs, the negative environmental impacts of artificial turf, the loss of trees that were embedded in turfgrass, and urban heat island effects have not been considered. At enormous expense, turfgrass removal programs in California have focused on the reduction of turfgrass areas, which account for only 3-5% of all water used in the state. However, research at the University of California has shown that utilizing different turfgrass species can save up to 20% of applied water, while maintaining the functionality of grass areas, as well as the aesthetic for those who prefer it. The funds used for such rebate programs would be better used for research, education, or other technologies with a proven water conservation potential and return on investment. One area, in particular, that deserves greater attention is research identifying the most appropriate varieties of turfgrasses for use in Utah, their suitability in different regions of the state, and their acceptability to meet the variable needs of different landscape locations.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	This is an example of the indirect costs specifically noted on page 44. Based on this comment, "urban heat island effects" has been added as an example of indirect cost consideration. Also, the intent of the document was not to discourage use of low water use turf or encourage the removal of trees. Language has been altered to further clarify this per response to Comment 56.
60	4.f. Irrigation Efficiency. Further explanation and justification of the ratio of irrigation efficiency (pgs. 25-26) is needed. The ratio is based on assumptions that sprinkler systems operate at 70% efficiency and that the maximum efficiency attainable with a drip irrigation system is 80%, which are inaccurate. The document states that "These numbers should be viewed with the understanding that additional efficiency will always be the goal, but significant additional savings based on average efficiency across a region is unlikely" (pg. 25). Locking in to this set of assumptions for the purpose of setting 50-year M&I water conservation goals is untenable, as it underestimates the technological innovations already underway in the irrigation industry (for both agricultural and urban applications) and the potential to improve irrigation practices on the ground through careful management (see 4.c. above).	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	See response to Comment 34.
61	5. Water Conservation Education. The document places a great deal of emphasis on the importance of water conservation education, yet does not elaborate on the sources of such educational materials and opportunities. For example, Utah State University Extension does more state-wide garden/landscape education than any other entity in the state and collaborates with most of the water conservancy districts and the state's Division of Water Resources on multiple research and education projects. Indeed, USU Extension is funded by the federal government and the State of Utah to provide such educational training and yet neither it, nor the USU Center for Water-Efficient Landscaping, is mentioned in the document.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	Failure to mention these resources was simply a function of space and time limitations. This was not intended as a slight to the excellent work happening at USU. While it is not possible to document all possible resources, we have added a short reference to these resources in the recommendations.
62	6.a."Raise lawn mower to keep grass a little taller to shade the roots." In reality, raising lawn mower height increases turf resilience to drought by permitting a deeper root system. There is research-based information on this topic available, but this concept is misrepresented in the document.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	We have included this in Chapter 6.
63	6.b. "The challenge with drip irrigation is that it cannot be used for turfgrass areas and correspondingly requires changes in landscaping…" Drip irrigation can be used to irrigate turfgrasses and is particularly effective in high evaporative demand climates, such as Utah's.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	Although not common, it is true that drip systems can be used for turf. Report language has been adjusted to reflect this.
64	6.c. "Studies have concluded that it is possible to reach 100% irrigation efficiency in demonstration gardens and other controlled settings (Sun et al. 2012)." It is not possible to achieve 100% irrigation efficiency in a landscape environment and this research has been mischaracterized. Additional conclusions drawn from this research are misinterpretations. The document states that the main conclusion of this research was that the xeric turfgrass species used 40% less water than that required for cool-season turfgrass irrigation. In fact, the differences in water use between the xeric (buffalograss), mixed (tall fescue), and mesic (Kentucky bluegrass) grass species utilized varied from as little as 8% to as much as 38%, depending upon the compared species and year considered, and was strongly influenced by the weather conditions during each year of the study. Given that the water use of the grasses in the study is consistent with previous research, the most important conclusion of this research is, in fact, that plant canopy cover rather than plant material water use classification is the controlling factor in woody plant and perennial water use.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	We agree that the use of the word "concluded" was a poor choice and indeed is a mischaracterization of the report. The report language has been altered to remove this inadvertent inference. However, the primary point of the paragraph is to come to the same conclusion as expressed in this comment - "It is not possible to achieve 100% irrigation efficiency in a landscape environment". We are glad you agree. Relative to the second part of this comment, it appears the commenter has misread the report. The report states that "water use in landscapes composed of predominantly native and climate adapted landscape plants irrigated by drip irrigation systems was approximately 40% of the required irrigation for cool season turf grasses irrigated with sprinkling systems." This makes no claim relative to specific species water use and does not claim this as "the main conclusion". It indicates only that the study includes landscape strategies that include a combination of lower water use plants, drip irrigation, and reduced plant canopy cover that result in 40% of the required irrigation.

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65	6.d. “While all customer types have opportunities available to reduce water use, the commercial sector is generally more likely to already have taken some of the actions necessary to do so for various reasons.” This statement is based on conjecture. Published research (Endter-Wada et al. 2008 – “Situational Waste in Landscape Watering…”) and other observational data suggest that combinations of absentee landlords, differences in property and business ownership, professional landscape maintenance, separation of who pays water bills and who applies water to landscapes, commercial entities’ ability to pass on higher water costs to clients/customers, and emphasis on premium landscaping to attract business can make water conservation a low priority in the commercial sector.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	See response to Comment 10.
66	6.e. “Changes in Density – For institutional use no decrease in lot size per person has been assumed. This approach has been used under the assumption that, as residential lot sizes reduce and densify, the availability of public open spaces will become increasingly import to the well-being and life quality of the residents surrounding them. Thus, increases in efficiency and changes in landscape type are included in the institutional outdoor water use estimate as described above, but there is no reduction in institutional outdoor area per person.” If communities are built out, recreational properties are retained at current levels, and population growth continues, there must be a reduction in institutional outdoor area per person.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	Only Salt Lake and Davis Counties qualify as "built out" within the extended planning window of the study and neither of these reach build out within the planning window of the actual goal (2030). Additionally, even after all property is fully developed a community can choose to add back public open spaces as part of redevelopment activities.
67	We believe that conservation goals should be developed in the context of current and future water supply. It is unclear in the draft Regional Goals document how regional water supply planning scenarios influence the proposed regional goals outlined in the plan.	SLCDPU	Laura Briefer	We recognize that available supply must be a consideration in establishing conservation goals. However, it is beyond the scope of this study to evaluate and establish supply development policy for the state. Supply policy has historically been developed in the next step to the process, the State Water Plan. It is expected that the details of supply policy will again be revisited and further developed as part of the State Water Plan. If during this process it is determined that the conservation goals are not consistent with the overall plan, it is expected that the conservation goals may be revisited and revised. With this said, it is important to note that supply was considered in general terms as part of the goal setting process. As discussed in Chapter 5, the selection of policy actions for inclusion in the goal are based on general water supply availability in the regions/counties. Where water supply is more scarce, more aggressive policy options have been included in the goals.
68	If not already included in the regional goals, current and future water supply data for each region would provide context for the goals and more fully demonstrate both the need for the goals, as well as provide a meaningful metric by which to measure our successes. SLCDPU has incorpoorated this approach into our recently updated Water Supply and Demand Plan, which has a 40-year planning horizon. The context of current water supply data and future water supply projections inform specific water conservation goals and strategies as SLCDPU updates its 2014 Water Conservation Master Plan.	SLCDPU	Laura Briefer	See response to Comment 67.
69	Besides linking conservation goals more directly to supply data and projections, it is unclear if improvements in technology or turf grass science innovations were considered in identifying capacities to conserve out-of-doors. With these thoughts in mind, we offer the following general comments and suggestions to the August 2019 draft report:	SLCDPU	Laura Briefer	See response to Comment 56.
70	Provide current water supply data for each region; this should be achievable as the DWRe collects supply data from most water providers.	SLCDPU	Laura Briefer	This will be included in the State Water Plan. See response to Comment 67.
71	Consider the role of irrigation maintenance in improving water use efficiency in landscapes; USU has excellent data on which to draw.	SLCDPU	Laura Briefer	Irrigation management is indeed a very important part of meeting future goals and is incorporated into the increased efficiency requirements. Additional references to USU resources have been added.
72	Expand on commercial, institutional, and industrial water conservation opportunities.	SLCDPU	Laura Briefer	See response to Comment 10.
73	It is unclear how the various Policy Options for each region were selected.	SLCDPU	Laura Briefer	Basis of policy option selection is documented for each category in Chapter 5.
74	Disclose the true costs of conservation. The original cost estimate prepared by the consultant was $3.26 billion. The current draft of the report, dated August 23, 2019, reads that expenses are in the “estimated range of $1.4 billion of capital costs…reported in 2019 dollars and does not include any inflation or financing costs.” The full costs, including inflation and financing, should be disclosed to the public, as they are with water infrastructure developments. Legislators, state agencies, municipal water providers, local elected officials, wholesale public water suppliers and citizens who are expected to fund and implement the conservation recommendations in this report should understand the significant financial commitment they are expected to bear.	WCWCD	Ronald Thompson	Costs for conservation included in the $1.4 billion are broken down in detail in Appendix H. A summary of costs through 2030 is as follows: Water Conservation Education - $74 million Indoor Conservation Upgrades - $43 million Secondary Metering - $189 million New Landscaping (differential only) - $313 million Existing Landscaping Conversion - $810 million Inflation and financing are not included because defining how and when each of the activities are paid for is beyond the scope of this document.

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75	Seek policy leader input. The conservation goals are aggressive and will necessitate significant and timely implementation from policy leaders. State and local elected officials who will bear the burden of funding and implementing the recommendations in this report should have been included in the drafting and review process. In addition, public opinion should have been considered regarding specific changes to community demographics, i.e. reduction of lot sizes and mandated restrictions to grass, as these factors directly impact lifestyle and quality of life.	WCWCD	Ronald Thompson	Policy leaders are indeed critical to the success of these goals. Elected officials and other policy leaders had the opportunity to review various drafts and/or to hear from the project team during open houses, presentations at the Capitol, and other public and private meetings prior to the public comment period. We appreciate their input and support for this project. As for demographic changes, the online survey (Appendix A), open house feedback, and interviews with stakeholders showed general support for landscape changes and turf reductions.
76	Consider impacts on existing infrastructure. Existing regional/municipal infrastructure has been designed based on anticipated housing density. If density is drastically increased, existing infrastructure (roads, water lines, sewer systems, etc.) may be undersized and the costs associated with remedying deficiencies in infrastructure caused by increased density were not considered in the analysis.	WCWCD	Ronald Thompson	This report does not advocate that overall densities be increased. It only reflects current trends toward smaller lot sizes. For communities with concerns regarding infrastructure capacity as lot sizes decrease, the same demand can be maintained on the infrastructure by offsetting decreased lot sizes with increases in natural open space, essentially maintaining overall densities and demands. It is in the purview of policy leaders to make overall land use and density decisions.
77	Recognize that sustainable conservation isn't achieved by simply raising water rates. There are multiple references in the report that suggest water conservation can be achieved by simply raising rates. Our wholesale water rate reflects the cost to secure, treat and deliver water. We can't arbitrarily increase rates to drive consumer action. Water is an essential life commodity and should be affordably priced to meet basic needs. Having said that, we do support and encourage tiered water rates for use that extends beyond basic needs.	WCWCD	Ronald Thompson	We have not been able to find any references in the document that indicate that simply raising rates saves water. The message of the report has consistently been that rates can help motivate decisions to save water, but that they will also need to be accompanied by actions to actually reduce water use.
78	Protect Utah's water funding model, including the use of property tax. Tax is an essential and common revenue source for regional water providers throughout the western United States. In Utah, property taxes collected by the state's water conservancy districts support project expenses (planning, permitting, design, etc.) that are incurred before a project comes online, allowing for multiple generations of water users to equitably contribute to costs. In addition, taxes are used to fund public services that benefit all property owners (fire prevention, flood control, watershed management, groundwater protection, conservation programs, etc.). Recommending "reducing or eliminating use of property tax to pay for water" threatens the water conservancy district's most stable revenue source.	WCWCD	Ronald Thompson	This report does not include any specific recommendations regarding property tax. The section quoted is merely identifying one conservation pricing suggestion that has been identified by several stakeholders. See page 54 of the draft report for the actual recommendation regarding water funding sources.
79	It is an insufficient and perhaps inappropriate step to define "Utah's Recommended Regional Water Conservation Goals". The target that must be agreed upon is "regional water demand objectives" (see the Detailed Comments for a definition of these terms in order to understand the difference), and the plans to implement them. Without a clear context and scope statement and a program management structure to manage Utah's water, goals or objectives, it will be extremely difficult to address Utah's water challenge.	Conserve Southwest Utah	Tom Butine	These semantic nuances might be lost on the general public. We aim to establish easily understood "water conservation goals" for each region and then, with the support of policy leaders, empower water suppliers and individual users to achieve them. This is just one facet of Utah's ongoing plan for water resources management.
80	Some has been said about irrigation management within the document, but management seems to be overshadowed by new landscape construction or re-landscaping efforts. It is understandable to want to build something or re-build a landscape to make it better, however, simple maintenance practices should not be neglected. Proper management will do wonders. While building water wise landscapes helps towards a desired cultural shift in landscaping, best management practices will keep existing landscapes alive while saving water. Respected best management practices are available through USU's Extension CWEL program, its partner QWEL program, the Conservation Garden Park's work, the Irrigation Association's Best Management Practices, etc. Improved management can be significant in conserving water. More could be done to require such practices.	Farm Reserve	?	See response to Comment 71.
81	Cost to Implement - The $1.4 billion number shown on ES-1 and on page 56 needs to be more fully spelled out. From a large property owner's perspective this seems very optimistic.	Farm Reserve	?	See responses to Comment 7 and Comment 74.
82	*Second Paragraph from the Bottom* - "Water conservation won't solve all the problems." Why? This statement could use more explanation.	Farm Reserve	?	We may not be able to conserve our way out of the water demand expected with population growth. Conservation is one tool in the water management toolbox.
83	"(Change) will require a cultural shift but will come with time." What is this assumption based on? It needs to be spelled out.	Farm Reserve	?	Many of the public comments throughout the project dealt with our water use culture (e.g., green lawns, attitudes, and pricing). See Figure 2-4. The cultural shift will come as stress on water resources increases and users then have to respond.
84	The second paragraph states, "some movement has been observed." I recommend changing this to "meaningful movement has been observed" and provide interpretive context	Farm Reserve	?	Data suggests that movement away from turf in the state has been relatively minor overall. While some areas of the state have seen "meaningful" movement, the determiner "some" seems a more accurate description of the data overall.

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85	*Climate Change* – While the document addresses potential effects of global climate change, the removal of lawns and landscaping will cause local climate change, such as dramatic increase in urban heat island effect. An example is found in the removal of high school lawn football fields and their replacement with synthetic turf. The intent of this effort has been to decrease maintenance and water use. While those goals in many ways have been achieved, lawn removal has dramatically increased field temperatures. In this example, temperatures have jumped 20 to 50 degrees, sometimes leading to the practice of water artificial turf merely to cool it. The overall effects of broadscale removal of landscape material and the replacement with hard or synthetic surfacing and the resulting need to manage temperature increases t through other energy-consuming systems should be addressed; *e.g.,* we saved water here but now our electric bill is through the roof, with resulting water consumption in energy production.	Farm Reserve	?	We recognize this complexity but cannot model local heating effects in a study which covers the entire state.
86	*Second Paragraph* – Provide clarification for the last sentence in the second paragraph. This is difficult to understand.	Farm Reserve	?	Done.
87	*Regional Goals* – For the regional goals, why were the goals selected that were selected? Why not the most aggressive goal? Why not the least aggressive goal? Could that logic be more fully described?	Farm Reserve	?	Basis of policy option selection is documented for each category in Chapter 5.
88	Furthermore, smaller residential landscapes are not necessarily bad, but to implement them without seriously considering broader ramifications suggests to the reader that less-landscape is better. Landscape areas have value beyond that of irrigation. Smaller landscape areas and more built-out square footage will create increased urban heat islands. Planners will argue that increased population density requires less overall energy. Regardless, the increased temperatures will still come. Is it possible that homeowners expand the use of pools to offset the increased temperatures? This won't aid in conserving water. One inexpensive way to mitigate the urban heat island is to add vegetation to the urban environment. However, reliance on the encouraged small residential landscapes to provide environmental relief is akin to Utah planning ordinances that rely on trees planted within diamond shaped parking lot planters to provide shade. In concept the parking lot planters are a great idea, but any individual patronizing an establishment within such a jurisdictionally mandated setting, who is still able to see living trees, will note that the trees are not doing well. With a more careful observation they will also see that the parking lot trees lag far behind their counterparts planted in more generous landscape areas along the perimeter. Simply put, landscape materials do better in larger open spaces than they do in smaller spaces surrounded by hot pavement. Larger institutional landscape areas have meaning within the planning document, but only at a very remedial level. Per page 35, "the availability of public open spaces will become increasingly important to the well-being and life quality of the residents surrounding them."	Water professional	David Wright	See response to Comment 59.
89	As currently presented, this value of public open space seems merely a footnote within the 74-page document. Continuing at this same page 35 location, the document says there should not be a decrease in institutional land, but it does not share anything about an increase. If there is a decrease in residential landscape, it might well make sense that there is an increase in institutional landscapes. To not include consideration of additional institutional landscape could be devastating to a community. How closely do we want the Utah urban environments to resemble the off-deplored concrete landscape of Los Angeles? To address the potential concerns of additional institutional landscapes it might be beneficial to understand that they range from hardscaped to natural conditions. To the latter variety, a burgeoning body of research emphatically points to the importance of such places. Not only are there major personal health benefits associated with nature interactions, but there also are larger environmental benefits. In addition, when protecting natural spaces nearby we grow less dependent on the numerous resources required to escape an otherwise dull, urban environment and put pressure on natural resources far way.	Water professional	David Wright	As described in the report, the document assumes that institutional land will remain the same on a per person basis. This means the total amount of land will increase proportionally with population.
90	Furthermore, consolidated institutional landscapes encourage ecological diversity as larger swaths of natural spaces allow for mammal vitality instead of rodent proliferation. To the focus of the document and conserving water, not every piece of un-paved or unconstructed land must be irrigated. In fact, there is value in un-irrigated landscapes. Per page 10, "how do we move toward more locally appropriate landscapes?" Can't we also say that natural unirrigated landscapes are more appropriate? The document should encourage communities to allow for unirrigated institutional areas. Perhaps there is more value in looking at landscapes holistically on a per capita basis rather than a lot size basis. In respect to the previously presented idea of institutional landscapes, local government emphasis on per capita landscape size could help communities concentrate swaths of more ecologically sound landscape bands rather than ecologically sterile mini-swatches for homeowners.	Water professional	David Wright	You are correct that unirrigated institutional areas may be a valuable part of local communities. The project team did not include specific recommendations in this regard because it was not feasible to cover all possible water and planning related topics in this document. This is a great example of an area with local policy makers are best equipped to evaluate their unique situations and how to best meet the overall goals.

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91	Homeowner Responsibilities Heavy emphasis has been placed on the homeowner to achieve broad water conservation goals. This is problematic because it is difficult for a homeowner to absorb such a large expense. For example, Table 5-1 is a little difficult to understand, but if read correctly, it suggests that a Wasatch Front homeowner would need to spend $26,000 on a landscape remodel. Is that correct? That is a hefty cost. Using other statistics from the document, the average Salt Lake landscape is 4,239 SF. If this is 80% lawn and needs to transition to 20% lawn, using the document numbers we have the following: 4,239 SF x .8 = 3,391.2 SF, 4,239 SF x .2 = 847.8 SF, 3,391.2 SF - 847.8 SF = 2,543.4 SF * $5 = $12,717 This is still a large number for homeowners to absorb. How many residences are we talking about?	Water professional	David Wright	Your math is accurate and highlights one of the big challenges that will face the state as we all work towards reducing our water use. While conversion of existing landscaping is only one strategy, Most conservation practices will require a significant investment. It should be noted, however, that this report does not suggest how the costs of conservation should be allocated between home owners, water providers, etc. This is a policy decision that will need to be explored as regions develop their more detailed plans for reaching the goals.
92	Page 26: " After perusing DWRe 2019a - as referenced within the Utah Water Goals " it is still unclear how 63% efficiency was arrived at. The 13% efficiency increase from 2000 and 2015 needs more clarity. If different measuring tools were used in the 2019 document, were they also used in coming up with the 50% efficiency number?	Water professional	David Wright	The 63% calculation was based on the volume of applied water divided by the calculated ET need of landscaping for each county throughout the state. The 50% is a rough estimate based on the same general methodology but with less detailed information available.
93	Many of the requirement including requiring cities to limit the size of building lots will hurt the housing market by reducing the foot print of home for clients that are retired and can't use steps. We can't build up for people that can't use stairs, this is a problem for our housing market!!! We also currently conserve more water than any other county in Utah and now we are being forced to conserve even more??? That is like asking the skinniest guy in the room to lose as much weight as the heaviest guy in the room on a percentage basis! This sounds great in theory but it it does NOT work in reality!!! You can only conserve so much before you need to build the infrastructure to provide for the needs of the current communities population and its future growth.	Business owner	Seth Foster	The report does not mandate any reduction in lot sizes. The report does evaluate some policy options in this regard, but none are ultimately included in establishing the final goals. However, current trends in Utah already show a reduction in lot sizes without any regulation. The report highlights this and concludes that a reduction in lot size will be a factor in future water use.
94	Far too little attention is paid to best conservation method available and at essentially no cost: steeply increasing water rates with increased usage. It works in Tucson, why not here? Let people make their own choices about how they want to adjust rather than making top down decisions and imposing the resulting costs on us all, i.e, the Lake Powell pipeline.	Policy leader	W Howard Sierer	The project team recognizes the potential conservation savings through conservation oriented pricing. This is recognized as a fundamental component that "will form the backbone of efforts to encourage and support the other practices described" in the report. However, it is not accurate to say that this approach has no cost. It simply shifts the cost onto end users as they must find ways to save water.
95	Living Rivers is a 501c3 non-profit organiization based in Moab, UT. Colorado Riverkeeper is a licensed and voting member of a 501c3 non-profit organization based in New York called the Waterkeeper Alliance. Canyonlands Watershed Council is a 501c3 non-profit organization based in Moab, UT. We thank you for this opportunity to provide a few comments for your review and consideration. INTRODUCTION: We have read through the materials and have suggestions for the water conservation goals in the state of Utah. In general, this is a top-down strategy that asks the bottom communities to cooperate, and even do some of the heavy lifting, whether the rate payers and the tax payers of these communities agree with the strategies, or not. We suggest that this approach be greatly modified to allow Utah communities to decide for themselves how conservation strategies will be implemented.	Policy leader, Canyonlands Watershed Council, Living Rivers & Colorado Riverkeeper	John Weisheit	As noted on page 69 of the draft, the practices include in the document are recommended to help achieve the proposed regional goals but may have different application in different areas of the state. "Local water suppliers, communities, and businesses are encouraged to adapt and refine these recommendations, as well as implement others, in their own water conservation efforts and in pursuit of the regional goals." The report recognizes that each region will need to develop its own approach to meeting its goals based on its unique circumstances. This will include consideration of which recommended actions apply, how to best implement them, and what additional actions not listed might be effective in the region. It is beyond the scope of the report to include detail about every possible conservation action for each region.
96	1. DEMAND HARDENING The Preface of "Utah's Regional M&I Water Conservation Goals" states the success of this program depends on the behavior of the water users. It is very obvious the behavior of the leadership in the state of Utah is not about conserving water to create long-term sustainability for the arid communities of Utah. Rather, the state has an agenda to maximize as much water consumption as possible, for as many people as possible, and consequently to generate as much revenue as possible. This agenda is wrong because maximum consumption of a finite resource creates more risk and uncertainty, not less. The elimination of any and all risks is the prudent agenda for the state leadership to promote for the public's well-being. It is already self-evident that present demand for water in the entire Colorado River Basin has already exceeded the natural water supply. If you conserve water at an existing community, only to transfer the water savings to a new development project in that community, how does the state justify it is actually reducing demand? A better strategy is: Balance the water budget first, followed by the creation of a water savings reserve, which is then used to provide a comfortable supply buffer, that in turn ensures community prosperity during periods of sustained aridity. Please be truthful to the public about the perils of demand hardening strategies that fail to eliminate risk and uncertainty by 2030. Additionally, a 2030 deadline to achieve these goals is fine, but a 100-year goal is much more appropriate because it enforces a more strident scenario planning process. Especially to address the looming problems of increasing sediment storage in reservoirs, and potential spillway or dam failure when extreme flooding events arrive.	Policy leader, Canyonlands Watershed Council, Living Rivers & Colorado Riverkeeper	John Weisheit	These comments have been passed on to DWRe for consideration as part of the State Water Plan.

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97	This single focus on how to achieve the regional conservation goals through pricing excludes the multiple tools available to water providers and stifles the creativity in 248 of our unique communities. ULCT is requesting the recommendations to achieve the regional conservation goals be broader and less focused on pricing as the central tool to achieve conservation. Unintended Consequences: The draft states, "regional goals that consider the various climates, populations, and water use practices in different parts of the state" (ES-1). The goals recognize the need for regions because of the varying water environments across the State, but the report appears to make state-wide recommendations on how to achieve required conservation. For example, the conversion to toilets that utilize 1.28 gallons and indoor fixture conversion and increase in water rates are state-wide strategies. The state-wide recommendations fail to recognize the reason for having regional conservation goals and will have unintended consequences.	ULCT, Policy leader	Wayne Bradshaw	See response to Comment 95.
98	Utah's 248 cities and towns range drastically in the complexity of their water and sewer systems, age of their operations, staffing, and funding levels. Asking each community to implement the same indoor water use methods may result in unintended consequences. In California conservation through indoor fixture conversion had several unintended consequences. The Los Angeles Times reported in 2015 that Sacramento sewer system saw less flow of waste because of conservation. As a result, grease and debris built up in the pipes causing costly repairs. The article provided other highlights of the negative impacts of conservation[1]. To avoid unforeseen or unintended consequences, ULCT recommends creating region-specific recommendations to account for the difference between the regions. If region-specific recommendations are not feasible, ULCT recommends creating an extensive list of potential conservation tools and allow water providers and municipalities in the various regions to adopt what works best for the area. Top-Down Conservation: The final concern is the lack of local elected officials and municipal staff asked to participate in the review and creation of the regional conservation goals. According to the list of interviewees and reviewers in Appendix E, only 6 of the total 39 asked to participate were either local elected officials or city staff. This is equal to the number of staffers interviewed in the Governor's Office of Management and Budget (GOMB).	ULCT, Policy leader	Wayne Bradshaw	See response to Comment 95.
99	However, the obligation to implement the recommended changes (General, Indoor, and Outdoor) largely rests with local elected officials and municipal staff. ULCT recommends increasing the number of local elected officials and staff in the review process before the goals and recommendations are finalized. Utah's 248 cities and towns are dynamic and unique communities, and as such water conservation and the tools utilized to conserve water are also unique to those communities. ULCT appreciates the Division of Water Resource's efforts to create conservation goals that recognize the dynamic differences across the State. However, ULCT requests you make adjustments in price increase recommendations, work to avoid unintended consequences, and integrate more involvement of local elected officials, staff, and their recommendations before finalizing the regional conservation goals. Please feel free to contact ULCT staff or its membership for additional information.	ULCT, Policy leader	Wayne Bradshaw	Eight open houses were held in throughout Utah to promote public involvement. An online survey was created to receive feedback from those that were not able to attend the open houses. Key stakeholders were asked to provide input during the drafting process and were asked to be involved throughout the goal development process. A 30 day public comment period was opened up for the report.
100	Will the Draft Regional Conservation Goals program be implemented through a statewide mandate? If these goals are to be achieved, there must be high-level support from both State agencies and a statewide mandate from the Legislature. Otherwise, the cities and water entities will be left to carry and enforce the program individually, lacking sufficient legal backing, consistency, and monetary resources. A mandate from the Legislature sends a very clear message that water conservation is a requirement for everyone. Will State funding be allocated directly to these systems by the Legislature as part of this program? As a drinking water provider with limited budget and resources, we feel strongly that significant funding is essential to install metering and other equipment, provide man-power, and develop tools and programs to facilitate waterwise habits with water users. An unfunded mandate will result in minimal water savings, and only create a huge burden on cities and water systems forcing them to raise rates significantly. Funding is crucial for water entities to implement these conservation practices while continuing to deliver safe drinking water and maintain their systems. State funding from the Legislature indicates that water conservation is a priority as well as a requirement. We also expect that future conservation goals for 2040 and 2065 will be re-evaluated as better data becomes available from the installation of meters. These new meters will provide the physical data needed to assess if the anticipated usage and savings are in line with the assumptions used to project these goals.	Water professional	Layton City Engineering Dept (ATTN: Stacy Majewski)	State agencies and legislators largely support these goals and recognize the importance of policy in driving and funding the needed changes (e.g., secondary metering). While there will not likely be a blanket "mandate" to achieve the goals, certain policy and regulatory actions will be needed to follow through. We agree that funding must accompany the goals.

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101	Central Utah Water Conservancy District is committed to water conservation and has a long history of measurable conservation that to date has saved over a million acre feet of water through various projects and programs. We appreciate all the hard work that has gone into the drafting of new regional goals and recognize many of the challenges during this process. The district has provided many hours of feedback and response to the goals. However, we continue to feel strongly that currently they are not achievable. We will continue to support conservation efforts but would recommend a closer look at what can and should be implemented with our current political and financial climate. We also feel the drafting process would have benefited from representation from municipalities and others, with whom many of the recommended strategies rely upon. We know conservation is important and, in many cases, a viable future water supply, but the current stated goals are not achievable in the time frame suggested. Any progress will take collective action and large investments to a scale that has never been seen. While we are committed to increasing our efforts, we are only one part of the process. We do not have the ability to increase end user water rates or enact land use laws and ordinances that will be required to meet the goals.	CUWCD	Central Utah Water Conservancy District	We commend CUWCD for leading by example in water conservation. The goals do indeed exceed what has been done in the past, and we agree that progress will take collective action and large investments. State agencies and policy leaders are ready to support them with appropriate policies and funding. We understand that water districts currently lack the land use authority and the rate-setting authority that municipalities have in their toolbox. Several municipal leaders were invited to participate in this project, but their response was unfortunately small.
102	I am pleased to see 18% improvement with out the regulation. My comment is unique because I ran two separate municipal water utility billing offices for nearly 10 years. I worked at the Washington City offices as the Utility Billing Supervisor and then in the City in the City of St George as the Treasurer. In both instances I worked directly with utility billing applications that took massive amounts of meter register data for all areas of our service area. I am her to tell you that no statistical analysis of these datasets are being conducted in a routine and automated basis. Simple real time data analysis should be conducted and published on every utility customer's bill Statewide. What this would do is easily show customers that where their consumption is at compared to other users in the region. I created a bill in Washington City that emulated this process monthly and it was a massive hit. Within the first 2 months I had hundreds of people contact me because they got a leak notice on their bill. I still get Christmas cards to this day from customers who saved hundreds of dollars each year. My feed back on the goals is that they maybe too small. When O calculated standard deviation on the datasets my calculations was that Cities could reduce consumption by 35-39%. What is needed is regulation mandating City's Statewide to publish these comparison data directly on the bills in a unified and coordinated manner. The formulation of these metrics would be tested similar to calibration and certification of gasoline pumps on an annual basis to ensure integrity. Real time publication of goal progress could be published in real time for each goal region. It is critical that these goals are supported by holding each City accountable for publishing utility bills with this information for all customers. This is how awareness will ultimate be matched with adoption and end user changes to consumption. Please don't do this like every other initiative in the State. Water is far too important. Feel free to reach out to me concerning help or more feedback. I am passionate about this topic. Thanks for what you are trying to accomplish here.	Business owner	Aaron Olsen	Thank you. Smart meter technology and the associated customer feedback tools are quickly enabling this kind of analysis more than ever before. This is certainly an area for Utah water systems to improve. The Division is also improving its own program for collecting and evaluating water use data, which will address some of these concerns.
103	1. Water Conservation Through Increased Densities- The draft conservation plan states that policy makers will need to support land use changes that would result in higher densities (smaller lot size). The report shows that in 2015, the average lot size in Washington County is 11,852 SF. In order to achieve the level of conservation suggested by the report, the average lot size would decrease by 17% in 2030, 22% in 2040, and 28% by the year 2065. This would require that lot sizes in all future development average no more than 7,280 SF. While smaller lot sizes may reduce water use, there are some negative aspects to smaller lot sizes. Our utility and transportation master plans are based on current land use and zoning plans and suggest that based on our current plans, the City of St. George has a build-out population of about 225,000 people. A 25% reduction in average lot size would result in a similar increase in the number of lots and population at buildout conditions. While smaller lot sizes would result in a reduction in outdoor watering for each lot, there would be an increase in the amount of water used indoors as the number of homes and population would increase. The roads and utility infrastructure that is currently planned for the build-out condition would no longer be adequate as the new build-out population would be increased. The draft conservation plan suggests that while residential lot sizes decrease, the amount of parks and recreation facilities per person remains the same. It seems to me that if the average lot sizes decrease, AND, the amount of turf allowed on each lot decreased, the City will need to increase the number or size of parks and recreational areas that are available for its residents. A family with a smaller lot and very limited or no turf landscaping will be more likely to use a landscaped park area than families with larger lots and turf landscaped areas. This will result in an increased water use on City facilities (parks) as the number or size of parks would increase.	Water professional	Scott Taylor	See responses to Comment 76, Comment 93, and Comment 89.

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104	2. Water Conservation Through Changes in Landscaping- The draft water conservation report suggests that Southern Utah adopt a policy for Aggressive Landscape Conversion Efforts. This effort would limit the percentage of Irrigated Area Landscaped with Cool Season Turf to 32.2% in 2030 and 25.8% in 2065. It is interesting to note that the same suggestion for the Wasatch Front would limit their percentage of Irrigated Area Landscaped with Cool Season Turf from 59.1% in 2030 to 34.4% in 2065. The report clearly suggests that the majority of the water that is to be conserved is the water that is currently being used outdoors. Wouldn't it make more sense if all regions within the state shared the same goal for limited turf landscaped areas? If Southern Utah restricted the amount of turf landscaping to 25% by 2065, shouldn't the rest of the state require the same?	Water professional	Scott Taylor	The report has been drafted to highlight regional differences in the state of Utah. Water supply and climate variables make up a large portion of these differences. Southern Utah has vastly different water availability and climate then the Wasatch Front, therefore the landscape ordinances should reflect these differences.
105	3. Water Conservation Through Water Rates- The report suggests that water suppliers adjust their water rates to promote or encourage water conservation in two ways: minimize the base rate and increase volume rates. A widely used practice for establishing water rates is that the base rate should cover "fixed costs" of the water system (i.e. bond P&I, salaries, etc..), while the volume rate cover the "variable costs" of the water system (ie. operations, maintenance, chemicals, replacement, etc.). The City has generally followed this practice in establishing our current water rates, which are very defensible. The report uses the term "aggressive tiered rate" throughout the document to describe out water suppliers should adjust their water rates. However, there is no definition of "aggressive tiered rate". State regulations currently require that all water suppliers use an increasing block rate for volume charges. The water conservation document states that "the tiers should be based on the cost of service in order to be defensible and effective." It appears that this draft conservation plan encourages water suppliers to adjust their water rates in order to penalize the larger water users by arbitrarily establishing an aggressive tiered water rate, but state that the rate needs to "be based on the cost of service and be defensible". It seems that in order to truly encourage water conservation through water rates, the rate would need to be artificially inflated to the point where they would no longer be based on the cost of service, nor be defensible. While the City's current water rates need to be adjusted, and we may want to consider alternative approaches to our current rate structure, I am hesitant to do anything too drastic that does not reflect the true cost of service or is not defensible.	Water professional	Scott Taylor	The recommendations provided do not suggest arbitrarily raising water rates, but do suggest looking at adjustments within cost of service based rates that can help promote water conservation.
106	I am very concerned that the regional conservation goals under consideration for Washington county are over reaching. We have done an outstanding job as a community conserving water on our own. The recent new construction efforts and water use numbers can prove it. We have made an extreme effort to conserve and use water sparingly. Additionally, These goals will force our community build mass amounts of attached product to meet the 7,280 avg. lot square footage goal. How on earth can the state force our local municipalities to do this?? Is the state going to create a task force to make sure the many municipalities start forcing land owners and developers to rezone to higher densities? Also, are these the communities we want to live in? Is it the states job to basically force cities into zoning goals they aren't in agreement with? Also, We have already placed conservation goals on ourselves. How is it the states job to decide to turn our community into a desert scape community? This is effectively what you are doing by adopting this. Isn't that the job of our community leaders? Will the state also create a task force to audit the municipalities so they can make sure our landscaping gets to 20%?? Why is the state dictating this?? It seems to me that the state needs to support our local municipalities on what they/we need here. We have very smart individuals that are here locally and are active in our community working through projects and issues that are best for us. Again, Why is the state trying to adopt something that will force our community leaders into policy's created by the state? Most state leaders and I'm guessing this 3rd party don't even live and work here. I understand that the state needs to step in on issues that at times are bigger than any community. But, in speaking to our water district, they were not involved with this plan. They absolutely need to be!! Please work with our local municipalities and try to come up with solutions that are best for us. Thank you.	Business owner	Brett Burgess	See responses to Comments 76, 93, and 95. Washington County Water District was one of many stakeholders included in the planning process and was allowed to make comments at many stages during the drafting of the plan.

No.	Comment	Organization	Commenter	Response
107	Dear Division of Water Resources, Thank you for the opportunity to comment on your Regional Water Conservation Goals (RWCG). The Moab Area Watershed Partnership (MAWP) agrees with the concept of regional goals as proposed. The geography and climate is diverse throughout this State and regional goals for conservation are appropriate. The State is demographically and economically diverse and goals with a metric of percent conserved are appropriate. However, Statewide and regional goals for per capita day consumption are not appropriate for regions as economically and demographically diverse as your Upper Colorado proposed region. Grand County's economy is significantly different from Emery, Carbon and San Juan's because of our tourism industry. Accordingly, our current and historic water use per capita day is also significantly different because we provide water almost year round to support two or three times our resident population. The regional approach is appropriate but the RWCG regions are too large in the Upper Colorado region to set reasonable water consumption per capita day goals. We would suggest using percent conservation, consider using Equivalent Residential Connection (ERC) as a metric or reduce the size of the regions to the 29 counties in this State. We believe the regions may also be too large in other areas of the State also.	Moab Area Watershed Partnership	Arne Hultquist	The project team understands that the current regions cannot possibly capture all the unique circumstances of water providers within each region. However, it should be remembered that creating these regional goals are just the first step in conservation planning. Within each region in is expected that individual providers will work to identify how the region can work together to accomplish the overall goals.
108	The MAWP is also concerned with the application of means to attain the conservation goals which was not discussed in this document. There are numerous well-meant and appropriate means suggested to conserve water in the document. Any of them can probably be used to some extent or with some modifications in any of the State's Counties but some are more regionally applicable than others. We are concerned that the State might consider mandating certain means that may not be appropriate regionally. Furthermore, we believe all the listed conservation methods can be implemented with an incentive approach as opposed to a mandated approach. Water suppliers can select which methods are "best" for their specific situation with an incentive approach. The MAWP is concerned with the relationship between water conservation, development, demand hardening and climate change. The MAWP realizes there are realistic boundaries on how much development the regional water supplies can viably support. Your document discusses to climate change and how the future warming trends will require 17% more water for vegetation. We have also received climate change analyses indicating our natural flora will use 18% more water in our region. The RWCG document doesn't address any ideas or proposed policy on how water supplies to every water provider and user in the State will decrease by 17% due to undeveloped areas natural flora water use.	Moab Area Watershed Partnership	Arne Hultquist	See response to Comment 95.
109	The relationship between water conservation, development, demand hardening and drought is also concerns the MAWP. Some regions of the State are more prone to drought and climate change may exacerbate the chances of prolonged or increased frequencies and extent of drought. The document does not address any policy on drought. We are concerned that continually enacting water conservation measures and could lead to situations where we don't have any realistic opportunities to conserve water without drastic challenges to our citizens during drought. We will need some buffer of water resources to deal with drought in the future. There isn't any discussion in this RWCG document on a policy to deal with drought regionally or Statewide. We realize these latter two policy items may be out of the scope of your current document but would like to insure you are aware that there is a limit to how much demand hardening can occur based on water conservation and continued development without consideration of impacts due to climate change and drought. Lack of foresight and sound water policy on these matters could be detrimental to the citizens of this State. It may be possible for our area to reduce its per capita day consumption by another 20 %. Prior to this proposed initiative our M & I providers set their own goals which are similar in extent. It should be noted that since the original proclamation of Water Conservation Goals by John Huntsman, the Moab City has decreased its per capita water use by 18 to 20 Percent. Combining the new goals, Moab City will reach a goal of almost 33% reduction in per capita water use by 2030.	Moab Area Watershed Partnership	Arne Hultquist	See response to Comment 67.
110	I would like the state of Utah to make the effort necessary so that per capita water use is calculated in a similar manner to other cities in the desert southwest such as Las Vegas, Tucson and Phoenix. That way a comparison can be made that is more realistic in terms actual savings being achieved in the present rather than just looking at an internal measure comparing a city's current water use to what it was 10 or 20 years ago.			The limitations of the chosen per-capita metric are acknowledged in the report (newly in Ch. 5). While it would be helpful to compare with other states, it is more important that we compare with ourselves and improve over time. Changing the metric midway would defeat the purpose of measurement.

No.	Comment	Organization	Commenter	Response
111	Utah's Regional M&I Water Conservation Goals plan describes worthy actions to reduce demand. However, the premise of the plan is based on the wrong question. While I understand this plan is not a Lake Powell pipeline report, I would suggest this report will be politically difficult, prohibitively expensive and most likely not be adopted at the local levels. My experiences working at local and regional agencies helped me understand how the public sector can achieve the types of goals in the report. It takes the right data applied down to the end-user level to effect the needed changes. The Colorado River is already over-allocated. California is the most senior water rights holder of Colorado River water, and has agreed to reduce its Colorado River allocation now and in the future. The question for Utah is not reducing demand to an arbitrary level, or if or when to build a pipeline. The question is how do we get to be as efficient as we can with the water we have. For that answer California is metering everything, using aerial imagery to measure landscapes, watersheds and Ag lands. Leakage and efficiency standards will be set. Efficiency-based rate structures will use the same data to enforce efficiency standards at the parcel level that are equitable to end-users and maintain agency revenues (yes, you can have water savings and stable agency revenues at the same time). The lessons learned in California can help Utah to save time, money and water, steer clear of most political unrest, and maintain a healthy economy and lifestyle while adapting to the new water normal we all face. The lesson learned from Australia is"¦don't wait. While I am recently retired, I would be happy to describe what was learned and where we are headed in more detail, and introduce you to some key experts in our state. I spoke about this same scenario in 2000 traveling the state with Lyle Summers. He got it. It did take California nearly 2 decades and a very scary drought to reveal and substantiate a different approach. Utah does not need to lose the time and money and could do this, at least in the southern counties, and put you on a course you and constituents will appreciate. Tom Ash tom.ash27@outlook.com 949.922.9539 Retired California water agency conservation manager, horticulturist, university educator and Utah visitor		Tom Ash	Thank you for insight in this area. Water conservation is one tool in the water resources toolbox - one that has not been used to its full potential. This report addresses that, while water development and other topics are reserved for further work.
112	The goals for 2030 and goal projections for 2040 and 2065 are extremely weak. In spite of the weak goals, the plan's preface states: "The 2030 water conservation goals in this report will require significant effort, increased attention, participation and funding from the legislature, state agencies, municipal water retailers, local elected officials, wholesale public water suppliers and citizens of Utah." It seems as if the DWRe is trying to color readers' perceptions before they even read the report so that once they get to the anemic goals they will perhaps think that we can't do any better, and that it's not worth trying. But we can and must do better! Other desert communities already have done much better. Where is that busy, industrious, beehive spirit Utahns like to promote? The plan also states, ""¦prompt action on water conservation will bring the most benefit." So, two warnings are offered: it will be difficult but we best get on with it.	None of these apply to me	Lisa Rutherford	See response to Comment 19. Water conservation is expensive and difficult given Utah's current attitudes, policies, and funding. We certainly "can and must do better." These goals will start us down the right path. To do so, we must acknowledge the cost and challenges in order to secure adequate funding and policy support to reach the goals. Some feel the goals are too weak, some feel they are too aggressive. Either way, we need to start.
113	The 2030 reduction goal is based on 2015 baseline gallons per capita per day (GPCD) usage. For example, currently, Washington County, which ranks among the worst in water use in the country, uses a little over 300 GPCD. The 2015 baseline usage for the Lower Colorado River South region (Washington and Kane counties) is 305 GPCD. The 2030 statewide reduction goals (reduction from 2015 to 2030) range from a low of 11% for Salt Lake (already an area of low-end water use in Utah: 210 GPCD) to 20% for 4 regions (2 of which used 400 GPCD and 333 GPCD in 2015). The 2030 goal for Washington County's region (Lower Colorado River South) is 262 GPCD "“ a 14% reduction from 2015. The Lower Colorado River South region 2030 goal of 262 GPCD amounts to about .1% per year (14% total from 2015 to 2030). Other desert communities have had conservation achievements far in excess of this and are still thriving communities, not dying on the vine as some LPP proponents assert if the pipeline is not built. The 2065 projected goal for our region (237 GPCD) amounts to a .4% reduction from our 2015 305GPCD usage over 50 years. We can do better, and if we do better, we won't need the Lake Powell Pipeline (LPP) for many decades, if ever. The draft plan wants us to focus on the 2030 goal but the timeframe for the LPP is around 2060 so we need to be thinking beyond 2030 when it comes to our conservation efforts. The plan asserts that even the proposed paltry conservation efforts will cost the state $1.4 billion by 2030 but adds "number is based on estimated capital costs only and does not reflect any potential cost savings or on-ledger offsets associated with conservation." Is it really fair to look at the capital costs only with no regard to real "benefit" costs?	None of these apply to me	Lisa Rutherford	This document is necessarily limited to discussion of conservation goals. While related to decisions regarding supply, decisions regarding the LPP, etc. are beyond the scope of this document. See response to Comment 67 for further discussion. Relative to cost comments, see response to Comment 7.

No.	Comment	Organization	Commenter	Response
114	Page 9 summary states that most are unaware of how much water they use. If that is the case then why would you ask them to conserve something they obviously don't care enough about to concern themselves with. It would make the most sense to me to educate them. If the public's concern is not really conservation then their answers are going to be skewed to sound politically correct. Disturbing that Appendix E does not include any local input with the exception of Salt Lake City and Bluffdale. Most of the recommended measures would need to be accomplished at the local level however all of the discussion has been at the District level or above. Not prudent to the local governments to not be allowed input during the preliminary stages when they are making the local policies on conservation. Some of the assumptions on institutional potentials seem unrealistic. If the proposal is to decrease lot size then there will be a need to increase institutional areas (parks, schools, etc.) due to the fact that the areas will be more densely populated. It is hard to agree with the assumption that the population will remain the same due to fewer people per household allows for more households in the same area without increase in population. Even if that were the case, the population still has a desire to enjoy open areas which include turf areas. If the turf areas are significantly reduced within their own yards I believe the desire for more institutional areas will increase significantly Master planning for utilities as well as transportation have historically been done based upon General Plan and Zoning maps. To create a shift toward smaller lots, as proposed, would negate the past planning that has been done to provide utility and transportation needs to the existing and future residents. Utility service and transportation corridors through existing communities would need to be upsized to accommodate the increased units that the document proposes. To the general public, this would appear to be poor planning on the part of the municipality. Does not make sense that industrial uses would be simply brushed aside for any conservation recommendations. Recommendations to lower base rates are not feasible due to the fact that Base Rates are to cover fixed costs the expenses realized by the supplier and must be recovered in order to provide reliable service. Our current tired structure is defensible and based upon the cost of service. As time goes on and the cost of service increases, the cost of water within our tiered structure will increase as well, thus achieving the recommended goal of an aggressive tiered structure while maintaining the defensible rate based on the cost of service. Incentives to retrofit fixtures is a great idea if there is a funding mechanism provided - perhaps a fee with new development to offset their impact to the existing residents. Appendix A	Water professional	Lester C Dalton	We hope this report will *increase* awareness of water conservation and related issues. Many local cities were specifically invited to participate but several could not, for various reasons. Still, city officials were present at open houses and offered comments at other times. It is true that most of the practices must be implemented locally, and we expect that to happen as local water suppliers and communities continue their conservation efforts. For institutional water savings potential, see response to Comment 10. We are not proposing smaller lots, but acknowledging a trend that is already occurring. The population data came from state agencies and the Kem C. Gardner Policy Institute; we are using existing, established datasets. Turf areas for public use are preserved in our analysis. We recognize that integrated planning of transportation, water, and other services would be beneficial. For industrial water conservation, see response to Comment 10. Water pricing is indeed tricky but the data show that lower base rates promote conservation. Funding will need to come, along with policies, from policy leaders. Appendix A, among other things, highlights just how little people are aware of their water use, which is a real barrier to conservation that we must all overcome.
115	The plan is comprehensive but some areas need additional material. Need to include information about the following aspects: 1. We must link future development plans in urban areas to the projected level of available water resources. We must restrict development in some areas due to lack of projected water especially as our climate in Utah is likely to continue to be drier than normal but long term trends are very uncertain. 2. We may need to establish restrictions on very water intensive industries in some regions. 3.. Need to emphasize the need for improved education of residents. 4. Promote the use of native vegetation and trees in urban areas.	None of these apply to me	Jamie Vavra	Supply planning and development restrictions are beyond the scope of this document. See response to Comment 67. Items 3 and 4 are already addressed in the document.
116	Enhanced secondary water usage and improved exterior landscape watering practices should be employed and supported rather than a determined request to kill all grass landscaping. We further increase the arid nature of our surroundings by covering all our neighborhoods with landscape rock. The heat generated off these practices will eventually create such increased temperatures in the community that we will end up using more water to keep alive that which we want to preserve.	Business owner	Kevin Hansen	See response to Comment 59. Nowhere in the document is "covering all our neighborhoods in landscape rock". However, it is recognized that changes in landscaping could have negative effects. Urban heat island and other issues will need to be analyzed before specific landscape ordinances are put in place.
117	Draft looks good. Now we need conservation action and not building Lake Powell Pipeline that in the end will cost too much and not provide sufficient water. I urge the conservation plan to include injecting treated wastewater into the ground to recharge groundwater levels. I also encourage letting water consumers better track their water usage on their water bill. Indicate water consumption compared to prior year on the bill and note % change up or down. I favor encouraging low water plants and removing turf lawns from landscape in Washington County and other arid areas by charging those with turf lawns more per gallon of water and water use.	None of these apply to me	Karen L Monsen	Thank you. This report does not offer an opinion on the Lake Powell Pipeline or other water development like recharge. Customer feedback technology is mentioned in Chapters 5 and 7. Thank you for supporting turf changes; your pricing suggestion is interesting (and has been used, in similar ways, in Saratoga Springs, where residents receive an "allotment" of water depending on their lot size and irrigated area).
118	The idea of regional goals is a positive move, but I do not understand leaving out agriculture one of the major users of water.	None of these apply to me	Richard C Wilkerson	The project team recognizes other water uses beyond M&I uses must be considered as part of the state's overall water supply plan. However, the topic of this study is M&I water conservation and other uses have therefore been left out of this analysis. It is expected that efforts will be made outside of this report to address these other water uses, assess their potential for conservation, and examine how they might play a part (along with M&I water conservation) in meeting the state's future water needs.

No.	Comment	Organization	Commenter	Response
119	The biggest users of water in the region in which I reside are the University of Utah and other state entities. I suggest the University of Utah and other State agencies curtail their use of sod in their landscaping and allow some areas to grow native such as sage brush, rabbit brush and other native vegetation.	Water professional	Andrew Aagard	During the public outreach process, the project team has received many suggestions regarding specific conservation practices worthy of consideration as part of overall conservation plans. While we value the feedback received, it is not possible to address all of these specific conservation strategies within the document. As applicable, additional general categories have been added to the report. It is also hoped that the commenters will work with their local water providers to advocate for specific conservation practices that will have the greatest benefit in their specific areas.
120	I agree that we need to do everything possible to conserve water resources in our state. I would encourage you to use a performance based metric in determining water use efficiency as opposed to specific prescriptive measures. In residential new construction there are currently at least 2 nationally recognized rating systems for determining the relative efficiency/conservation of water use. I strongly recommend adopting one or more of these already developed programs and determining a minimum score to show compliance. This leaves a contractor or developer multiple options to achieve the required level of savings to show compliance. The EPA Water Sense and the Resnet WERS (water efficiency rating index) are both currently national programs.	Business owner	Kim Ewers	See response to Comment 119.
121	I believe if the reasons why water conservation is necessary were added to this campaign it would resonate more with the citizens. People need to know what the consequences would be if conservation is not taken seriously.		Jami Hadlock	The potential effects of not conserving water vary greatly and cannot be fully addressed within the scope of this project. However, they are expected to be covered in greater detail in the State Water Plan.
122	*The Goal is "per-capita" is not realistic for Industrial/Agirculture/residental lumped together. The "goals' should be broken out. *Goals for residential use are attainable with progressive costing structures because individuals will have the incentive to be more frugal with their water use. I believe a 25-40% reduction in this area is possible. * I see goals for agriculture are not included. However BIG Government being what it is, will eventually want to move into this area too. Goals for Farming would not be realistic because the best way for a farm to achieve a mandated "goal" would be to change to a less water dependent crop. Basically the government would be setting the type of crop to be grown. I don't believe the government should be determining crop types. Farmers have large shares of Weber County water which are based on continuous usage of river sources. Perhaps an incentive for farmers and green belt owners would be to help with metering costs so they could better manage their water usage. Meters for large diameter pipes are very expensive. *I would suggest more incentives to conserve, such as helping with meters (smart water controllers) such as Weber Basin is currently doing which have a dramatic reduction in water usage with very little cost. I took part in this incentive and I am seeing about 10% reduction (about $30/month to me) in water usage over last year - with a one time cost to Weber Basin of $40 in the form of a rebate. More Grant or low interest money is needed if there is to be a higher number of users being able to afford the infrastructure needed to be able to conserve water.	Policy leader	James Richardson	Regarding agricultural water, see response to Comment 118. How conservation is to be funded is beyond the scope of this study, but smart meters are specifically mentioned in the report as a recommended measure.
123	I support these conservation goals and think they could go further. I also hope that you are looking into ways that agriculture, mining, and power generation can use water more efficiently and participate in water conservation.	None of these apply to me		See response to Comment 118.
124	The most important part of conservation is education. In Farmington in 2018, there was a severe water shortage. The Benchland water district sent out postcards, called people, posted on social media, everything but going door-to-door. And still there were so many people who were watering every day. Even when they did issue citations to those who were violating the rules, many of those people simply ran their systems all night long, completely draining the reservoirs. The most effective way to educate is the one-on-one sessions with homeowners, measuring how much water their sprinklers put down and figuring out how long their systems should water. Keep that in mind with these goals. Significant reductions can happen, but only with proper, individual education sessions.	None of these apply to me	Kyle Stowell	See response to Comment 119.
125	Conservation is a worthy goal, but government intervention in the real estate economy of Washington County only creates problems. Impact fees should be proportionate to the impact or in this case lot size. The current fee is based on a 10,000 sq.ft lot with additional for larger lots but no decrease for smaller lots. The current small lot policy does not work. Make small lots fees lower based on the current fee. Do not lower the lot size but keep the fee the same.I	Business owner	James Raines	Relative to small lot issues, see responses to Comments 76 and 93. This report is not involved in any way with impact fees.

No.	Comment	Organization	Commenter	Response
126	Some comments about water conservation and re-use I see that the "Recommended Water Strategy" incorporates support for agriculture. This is important for us down here is Washington County. We love our agricultural areas and hate to see it being eaten up by houses. Ag lands serve as open space and help keep Washington County from looking like Las Vegas. And as time goes on, ag land will become increasingly important as a consumer of reclaimed water. Ron Thompson is right: Conservation goes only so far. It is good to curtail waste, but the more we tighten our belts during good years, the less resiliant the system becomes, and the more likely to run dry when the drought hits. Washington County is well along with conservation, and needs to start thinking about re-use. (I know I'm changing the subject, but it's important). Your 2005 report "water reuse in Utah" has some good ideas relating to this issue. Sooner or later we will want to start trading reclaimed water back upstream for agricultural or environmental purposes. We need to consider the cultural, legal, and institutional roadblocks that get in the way. 1)Salt.""Washington County residents dump tons of salt into the water stream via their sodium-based water softeners. I helped my neighbor load his water softener last week; he uses 1 or 2 80-lb bags of salt every month. This salt degrades the effluent stream, limiting its re-use potential. Eventually the salt burden will require reverse osmosis (RO) treatment to make effluent re-useable, but the expense of RO may make re-use economically infeasible. The county needs to start discouraging whole-house sodium-based water softeners. Many new homes are automatically equipped with sodium water softeners because builders think that's what people want. There are already relatively inexpensive single-appliance RO water softeners on the market. 2)Legal and institutional inertia "" Last year I went over to the Ash Creek Special Service District when they had their open house, and learned a little about its operation. The plant has been operated as a total containment system since about 1981. It currently receives an average inflow of 1 Â½ mgd. There are 7 lagoons, using algae to clarify and oxygenate the water; mechanical aerators are on some of the ponds to be used as needed. Water cascades by gravity through the pond system to pond #7, where it is pumped up to the fields. Ponds are drawn down in the summer, and refilled during the winter. Tailwater is chlorinated before use, and goes to irrigate about 300 acres of alfalfa and triticale, which is sold as hay. Ash Creek is currently not allowed to use recycled water to irrigate crops for human consumption. Although the Ash Creek Plant is well positioned to return water to the Virgin River for downstream users, it may not sell its	None of these apply to me	Ben Everitt	See response to Comments 118 and 119.
127	It will be easier to cut back on landscaping or secondary water use than to cut back on potable water use. The state could give a tax break to those who change their front yards to desert landscape or do it when they first build. They could keep a reasonable patch of grass in the back yard for the kids to play on. The same could apply to institutions which use a pretty high percent of the water. I think we have more money than we have water. I don't like the plans to meter secondary water in small towns. The cost would be prohibitive and we have so much muddy water in the early part of the year that it plugs up every thing. In our case we have one large meter where the water leaves the PI pond so we can compare our use year to year . Our city employees can monitor correct use of our pressurized water without having mandatory metering which would cause a huge economic burden to us and our citizens. Thanks for the opportunity to respond.		Hal D. Murdock	See response to Comment 119.
128	The Utah Division of Water Resources is asking St. George residents to cut their per capita water use from 305 to 262 gallons per day. For comparison, Salt Lake City residents are asked to reduce water use to 187 gallons per day. Where is all that water going in St. George? In our Salt Lake City home, we've averaged 138 gallons per capita per day over the last nine years. And that's with just two people; a larger family would have a lower rate per capita. It's not as if we're counting every gallon, either. We have a large garden, a lawn, and a hundred-year old tree. I know it's dry in St. George, but we've proven it's possible to use half the recommended St. George amount--almost without trying. Could it be that generous numbers for St. George could help justify the Lake Powell Pipeline?	None of these apply to me	Garry Blake	This comparison highlights the acknowledged difficulties in the per-capita metric (see Ch. 1 and 5). In addition to different climate and irrigation characteristics, St. George also has a high tourist/second-home population that inflates their water use (more water use, fewer permanent residents to divide it by). The numbers have nothing to do with the Lake Powell Pipeline.
129	The tribes need to be included in this discussion. As do the conservation biologists.	None of these apply to me	John Weisheit	Tribes are not regulated under state water agencies and are therefore outside the scope of the project. Some conservation biologists were consulted during the project and we will seek to involve them more in future work.
130	Engineering solutions will not solve this issue alone. Landscape Architects and allied desingers have better solutions that the ones being employed currently that involve decentralization and ecological based solutions.	Business owner	Tyler Smithson	Landscape architects and designers will be key in developing new landscape options for Utah residents.

No.	Comment	Organization	Commenter	Response
131	The Utah Division of Water Resources has made a commendable effort in developing the regional goals. I think that people generally do not think about or generally care about their water use. They put their sprinklers on automatic and don't think about it during the entire summer. For two reasons. First there is a disconnect between understanding of the our water sources and the users. Second, it is easy to just turn on the sprinkler controller or turn the tap. This makes sense because people are busy and most don't want to think about the details or infrastructure behind that tap. So this means that three things need to happen. 1) New developments need to limits to green areas. For example, areas that are being developed in areas that were not historically irrigated should not have outdoor irrigation associated with the developments. This is particularly true in Utah Valley and Southwestern Utah. 2) Universal secondary metering and a progressive fee structure for water should be put in place. 3) An incentive structure for installing water conservation features should be put in place to hardscape or localscape existing lots. On the Agricultural side. We need to take a serious look at crop production and consumptive use. We need to incentivize producers to change their irrigation practices and crop choices as well. Doing research at the state level looking at alternative crops and basin level water conservation should lead to regional crops. Incentive structures for regional crop changing away from highly consumptive crops such as alfalfa. The Utah Division of Water Resources should work with the Utah Division of Wildlife to determine instream flow needs and critical lake levels across the state, so that consumptive use reductions can meet specific objectives.	Business owner		Each of these aspects has been included in the report. See response to Comment 118 regarding agricultural use.
132	Help water consumers know exactly how much water they are consuming on their water bills. The City of St. George Utility Bill is confusing to read.	None of these apply to me	Karen L Monsen	See response to Comment 119.
133	"While conservation is obviously an important part of the state's overall water strategy, determining the balance between these several water uses is beyond the scope of this project." The Division openly implies that Utah's rivers, streams and lakes have too much water in them and hint to its political surrogates that its time to reduce the amount of water in our natural environments.	Utah Rivers Council	Zachary Frankel	This comment is speculation regarding issues outside this report and correspondingly has not been addressed.
134	Bear River Development and the Lake Powell Pipeline will cost billions of dollars to taxpayers and lawmakers are making decisions on whether or not to fund these costly projects based on the need for water between 2015 and 2065. With such meager water conservation goals, the Division essentially states that these communities will need the water justifying unnecessary spending on Bear River Development and Lake Powell Pipeline.	Utah Rivers Council	Zachary Frankel	See response to Comment 67.
135	Supply vs demand and price elasticity were not accounted for in the conservation goals based on the increased cost of water due to the Bear River Development and the Lake Powell Pipeline. Concern regarding that the conservation goals did not include economic projections of increased cost of water.	Utah Rivers Council	Zachary Frankel	See response to Comment 67.
136	Table 5-1 and the report as a whole, refuses to talk in specific dollar details when it comes to cheap conservation efforts but will go into detail about any expensive conservation effort. This framing represents an obvious anti-water conservation bias.	Utah Rivers Council	Zachary Frankel	Without specific examples, we are not clear on what "cheap conservation efforts" the commenter is referring. While it is not possible to address every conservation practice in this document, the report attempted to address all conservation practice categories for which water savings and costs are quantifiable.
137	Taxes are not essential to the future of our water delivery. The 2019 Goals Report has ignored property tax phase-out, despite Governor Herbert's repeated statements urging it to be carefully considered. Low water rates derived from property tax subsidies encourage water waste.	Utah Rivers Council	Zachary Frankel	See response to Comment 22.
138	Report does not address delivery efficiency. If delivery efficiency of a canal is 50%, the overall efficiency will be low.	Utah Rivers Council	Zachary Frankel	See response to Comment 14.
139	URC's GRAMA request for information on irrigation efficiency calculations was denied. Numbers on expected or practical irrigation efficiency are left unsubstantiated.	Utah Rivers Council	Zachary Frankel	Numbers from irrigation efficiency are taken from DWRe 2019a
140	Table 4-6 suggests that Southern Utah is 92% as good as it could possibly be. Metering secondary systems would reduce water usage by 30%. How was secondary water inefficiency incorporated into the irrigation efficiency calculations? Provide all methodology for calculations regarding current and potential irrigation efficiency as soon as possible.	Utah Rivers Council	Zachary Frankel	The value reported in Table 4-6 refers to efficiency for metered water use only. Losses associated with unmetered water loss are accounted for separately.
141	The 2019 Goals Report assumes without basis that institutional indoor conservation potential is only half of residential indoor conservation potential.	Utah Rivers Council	Zachary Frankel	See response to Comment 10.
142	Does the Division wish to improve the 2019 Goals Report, or do they want to hide it? Regardless of the Division's intent in hiding the data, the regression appears to be erroneous and suggests people lacking competence in regression analysis wrote the 2019 Goals Report.	Utah Rivers Council	Zachary Frankel	The report is the result of considerable analysis and collaboration by many diverse parties. The data are not being hidden; in fact, the Division has been particularly transparent and inclusive in this project given the immense public interest. The criticism of the regression model is unfounded, though the model did not affect the goals.

No.	Comment	Organization	Commenter	Response
143	Opportunities for water related improvements in those commercial, institutional, and industrial (CII) sectors have not been identified. Recommend further study and investigation of improvement opportunities and water use practices in the CII sectors.	National Audobon Society	Marcelle Shoop	See response to Comment 10.
144	The goals for 2030 are a step in the right direction, but should be stronger. The goals for 2040 and 2065 are weak and undercut the State's commitment to conservation.	Western Resource Advocates (WRA)	Amelia Nuding, Laura Belanger	Some groups view the 2030 goals as too weak, and others as too strong. Regardless, we need to start. Goals for 2040 and 2065 will be revised as new information and new water-saving technologies becomes available.
145	It is important to make only fair comparisons of water use across states	WRA	Amelia Nuding, Laura Belanger	Agreed.
146	Several valuable resources on this topic are available at no charge, which we wish to make you aware of: □ Free webinars on integrating water into comprehensive plans, zoning, planned unit developments, codes and plans: https://www.colorado.gov/pacific/cowaterplan/integrating-water-land-use-planning □ Free Guidebook: Integrating Water Efficiency into Land Use Planning in the Interior west: A Guidebook for Local planners: https://westernresourceadvocates.org/publications/integrating-water-efficiency-into-land-use-planning/ □ Free Guidebook: A Guide to designing Conservation-Oriented Water System Development Charges: https://westernresourceadvocates.org/wp-content/uploads/2019/06/WRA_Guide-to-Conservation-Oriented-SDCs_web.pdf □ Free Community Assistance: WaterNow Alliance's Project Accelerator: https://waternow.org/our-work/our-work-projects/wna-project-accelerator/ □ Sonoran Institute's Growing Water Smart Workshops (not currently offered in Utah, but demand for these workshops could change that): https://sonoraninstitute.org/resource/growing-water-smart-rfp/	Western Resource Advocates	Amelia Nuding, Laura Belanger	Thank you for the resources.
147	The DeOreo 2016 study also found the following and it should be made clear the extent to which this information has been integrated into the analysis of the Draft Goals: "Substantial additional indoor conservation potential exists in the single-family sector. Current average daily indoor per household use of 138 gphd and per capita use of 58.6 GPCD are expected to reduce to 110 gphd and 36.7 GPCD in the coming years through replacement of old toilets and clothes washers. Additional indoor reductions below these levels can be expected as future fixtures and appliances become even more efficient than today's models and are widely installed and customer side leakage is reduced through automated metering and leak alert programs."	WRA	Amelia Nuding, Laura Belanger	Total potential indoor conservation numbers are similar to the 36.7 GPCD identified in the DeOreo report. Additional conservation beyond that amount has not been included in the potential calculations but is expected to be added in future updates of the goals if technology results in lower water use appliances and fixtures.
148	As discussed above, due to a lack of data on current and projected populations, it is not clear if these were population figures were properly broken down in the scenario analyses and goal development.	WRA	Amelia Nuding, Laura Belanger	See Appendix H.
149	Indoor and outdoor usage need to be provided for existing and projected use. While the percentage of existing homes with water efficient fixtures and appliances may vary, per capita indoor use goals for new development as well as longer term goals are expected to be similar across the regions. The current analysis does not allow for this comparison or confirmation.	WRA	Amelia Nuding, Laura Belanger	See Appendix H.
150	In addition to the cost savings that will result from deferred or avoided new supplies, customers who conserve will save money on their water bills and those savings will increase over time as water rates raise.	WRA	Amelia Nuding, Laura Belanger	See response to Comment 7.
151	The study notes that Utah is one of the fastest growing states in the country. Embracing comprehensive conservation programs now will ensure that conservation opportunities related to new development are not missed, leading to more rapidly decreasing per capita water demands and a sustainable water supply for Utah's future.	WRA	Amelia Nuding, Laura Belanger	The project team agrees and has been working to finalize these goals so that work towards them may begin.
152	Communities around the West have shown that high levels of conservation can be implemented while maintaining robust economies and a high quality of life. Many communities have experienced significant population growth while seeing their total water demands decrease thanks to a commitment to water conservation – and Utah can do the same.	WRA	Amelia Nuding, Laura Belanger	The project team agrees and is hoping this report will help influence the same commitment to conservation.
153	We respect the need to have regions established to have a manageable dataset at the legislative level. We also agree individual cities and counties should be encouraged to manage their own goals. Each city and county in Utah is unique and has their own set of challenges and differences. It is important to use those differences to enact policy at a local level that will affect the most change in water consumption.	Grand Water & Sewer Service Agency (GWSSA)	Dana Van Horn	See response to Comment 95.

No.	Comment	Organization	Commenter	Response
154	Our unique situation is focused on tourism. Our water use per capita is higher due to ten percent of our connections being second homes or overnight accommodations. The water use by these connections is borne on the roughly 4,000 folks that live here full-time. There are several other places in Utah where this is a challenge.	GWSSA	Dana Van Horn	We understand this issue and have account for it in the establishment of the goals. This is one of the reasons we have advocated not trying to directly compare straight GPCD values between regions or communities.
155	It will require a joint effort on the part of Grand County and our office to accomplish many of the suggested policy changes like reducing lot size and landscaping requirements.	GWSSA	Dana Van Horn	Cooperation between local and state agencies will be important to make these policy changes.
156	We appreciate the final page of the report that breaks down the goals by county. It gives us a better picture of the actual use and our specific goals.	GWSSA	Dana Van Horn	You are welcome.
157	GWSSA believes in a locally produced drought management plan that includes local input and stakeholders. Drought management was not in the scope of the Plan.	GWSSA	Dana Van Horn	The project team agrees that local drought plans are important. However, as you have noted, drought management was not part of the scope of this report.
158	The water resource is finite. At some point all cities in the state will either reach build-out or they will run out of water.	GWSSA	Dana Van Horn	Agreed.
159	Protecting the public health and maintaining the water source for future generations is paramount.	GWSSA	Dana Van Horn	Agreed.
160	1. Title and Scope of the Document: The official title does not reflect the limited scope of this document, which is focused on landscape water use in the residential and institutional sectors. This limitation is at odds with a few overarching statements included in the document that suggest conservation must be a collective effort. More specifically:	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	The title correctly specifies the scope as regional goals for M&I water use. We understand that the treatment of commercial, industrial, and institutional water use is weak, but a lack of statewide data on these sectors has limited our analysis.
161	1.c.i. Water loss. Addressing water loss is one practice specified for end use conservation. However, conserving water by repairing leaky infrastructure in the operation of M&I water delivery systems in any detail is specifically excluded (pg. 40). In its reports on Utah's water infrastructure, the AWWA (American Water Works Association) has documented and given poor grades to M&I infrastructure due to aging water systems and high-water loss in conveyance. The USBR (United States Bureau of Reclamation) Water Smart Program has prioritized canal lining and other infrastructure repair or replacement projects in recent years precisely because of the large volumes of water that can be saved at the system level in delivery to end uses.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	See response to Comment 14.
162	2. Time Frame and Conservation Goals: The document projects water uses to 2065 (Tables 4-10 and 4-11 on pgs. 36-37). In light of that 50-year time frame, the conservation goals are extremely weak. The plan estimates that Utah will need to spend at least $1.4 billion dollars of capital costs (only estimated through 2030) and 50 years (2015-2065) to achieve a "gallons per capita per day" (GPCD) that is not even as low as the GPCD today in many neighboring states and cities of the western U.S.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	Other states calculate their GPCD differently than Utah, which does not allow for a comparison between the two. The GPCD for 2040 and 2065 are projected water use levels, and are not meant to serve as goals for the state.
163	2.c. Annual water reduction goals. When calculated on the 50-year time frame, projected annual water use reductions from the 2015 baseline range between 0.38% and 0.64% (Table 5-4, pg. 49). These goals are modest in comparison with other western states and cities, which have set annual goals between 1-2%. Whether Utah is meeting the stated conservation goals will be hard to document given the level of precision required to ensure such small percentages are not "noise" in the data. These points emphasize the importance of water data infrastructure (point 1.c.ii. above) and the need to upgrade it as a critical part of incorporating conservation into Utah's long-term water strategy.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	The 2030 values are the only recommended goals, while the 2040 and 206 are projections of future water use. The project team and DWRe agree that improved data infrastructure is important in tracking these goals.
164	3. Costs Estimates Included in the Document. How the $1.4 billion in capital costs associated with achieving conservation targets was determined is not well explained. The document states "a full analysis of the net costs and benefits of individual water conservation practices and how these practices should be implemented in each region is beyond the scope of this report" (top of pg. 12; disclaimer reiterated on pg. 56). However, the document contains many references and details related to calculating costs and presents estimated capital costs of approximately $1.4 billion through the year 2030. In this regard, points that need clarification include:	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	See responses to Comment 7 and Comment 74.
165	4. Focus on Landscape Water Use Reductions. The report places virtually the entire burden of M&I water conservation on residential and institutional users and the Green Industry and, more specifically, on landscape water use and turfgrass water use. While we know that roughly 50-65% of all residential and presumably much of institutional water is applied to landscapes, and acknowledge that there is certainly room for landscape water conservation, we submit that the report does an inadequate job of addressing the full spectrum of water use sectors and M&I conservation options, as previously noted.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	As documented in Appendix H, the rate of conservation for culinary water is only slightly higher for outdoor use (14% statewide) than it is for indoor use (12%). Conservation rates for secondary water are much higher but this is almost entirely a function of reducing overwatering through metering and is therefore not an extra "burden" on outdoor use. It is expected that conservation will be advanced in all areas, not just outdoors.

No.	Comment	Organization	Commenter	Response
166	4.c. Other landscaping options besides reducing turfgrass areas. The report emphasizes M&I water conservation as a function of reduced turfgrass areas in urban landscapes, without adequate review of the available scientific literature on the topic of turfgrass water use. In addition, the wide range of additional landscape water use reduction options available through better water conservation science and engineering are given much lower priority in the document. Many of the options are much less expensive than the options modeled in the report and these options apply to all urban landscapes (residential, institutional, commercial, industrial). Consider:	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	See responses to Comment 119 and specific comments below:
167	4.c.iii. Irrigation system maintenance. Inexpensive practices such as proper sprinkler maintenance, using auditing programs such as USU's Water Check program to identify problems, using cycle-soak irrigation timing, leak repair, weed control, and others can save significant amounts of water when applied to existing landscapes.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	These practices should be introduced to the public through educational sessions and pamphlets. The project team and DWRe understand that practices to reduce overwatering of existing landscapes may be very effective in conserving water.
168	4.c.iv. Better irrigation system design. Research has documented how poorly designed and installed irrigation systems can lock in wasteful watering practices for long periods of time. Irrigation systems should be inspected prior to dirt fill and installation of plant materials. Such inspections would be directly comparable to various structural, mechanical, electrical, plumbing and other under construction phase inspections required for buildings, the purpose of which is to provide important consumer and community protections and a level of consistency between builders.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	These practices should be introduced to the public through educational sessions and pamphlets. The project team understands that practices to reduce overwatering of landscapes may be very effective in conserving water.
169	6. Factual Errors or Recommendations in the Document. Below we list statements that are not consistent with the best available science and, consequently, we recommend they be corrected and properly interpreted in the revised draft document.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	See responses to specific comments.
170	6.f. "Increase landscape watering at night" - It may not be feasible to have all irrigation done at night simply due to delivery constraints. It also may not be the most efficient, depending on location (the presence of wind needs to be considered) and behavior patterns associated with night watering (if people do not observe their sprinklers in operation they will miss seeing problems with system maintenance). Additionally, tradeoffs between water efficiency and pest and disease management must to be considered. There is current, ongoing research being conducted at Utah State University on this topic, for which preliminary results will be available at the end of the current irrigation season.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	Research performed by the project team revealed most literature pointing to lower evapotranspiration at night. Therefore the team has included it in the report as a way to reduce landscape irrigation needs. When additional information becomes available, it can be included in provider specific conservation plans.
171	6.g. The cost estimates of $2,000/ac-ft/yr for new water-wise landscaping and $5,000/ac-ft/yr for landscape conversions and estimates of $3.00/ft2 for turfgrass and sprinklers and $5.00/ft2 for waterwise plants with drip irrigation are noted as being highly variable (a range of 85%) and their use is questionable.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; et. al.	The variability of these costs have been recognized in the report.
172	The proposed year 2030 regional goal for Salt Lake is 187 GPCD. SLCDPU's GPCD has fluctuated between 219 and 208 since the baseline year of 2015 through 2018. When we account for the significant commuter population into SLC, our calculated GPCD ranges between 199 and 189 for the same time period, which is very close to the 2030 regional goal for our area. Integrating this data as well as the analysis provided in our current Water Supply and Demand Study, we anticipate exceeding the 187 GPCD well before 2030.	SLCDPU	Laura Briefer	We recognize the important effect that commuter populations have on Salt Lake City's water use. Still, the regional goals are defined by permanent population and will be evaluated accordingly. SLC should continue its excellent water conservation programs and analysis of population effects so other cities can learn from them.
173	Show regional water conservation goals in contest to these regional supplies.	SLCDPU	Laura Briefer	This will be done as part of the State Water Plan.
174	Future water development needs could be illustrated comparatively with current supply and newly articulated goals.	SLCDPU	Laura Briefer	This will be done as part of the State Water Plan.
175	Review costs of landscape improvements, taking into account, newer, lower, water turf grasses thus reducing program cost and lowering program ROL.	SLCDPU	Laura Briefer	Additional text has been added regarding lower water use turf grasses. However, overall cost impacts are expected to be modest. While some cost may be saved on new landscapes (where a simple substitution of lower water use turf may indeed result in lower initial installation costs than some other water wise options), costs associated with retrofitting landscapes are expected to be similar.
176	Include opportunities for water loss in water delivery infrastructure.	SLCDPU	Laura Briefer	See response to Comment 14.
177	Update Utah's water accounting practices. Utah is often erroneously referred to as "one of the highest water users in the nation" due to its comprehensive water use accounting practices. We encourage the division to consider how other cities/states report their water use and adopt similar methodology.	WCWCD	Ronald Thompson	Thank you. See response to Comment 6.
178	Titling this document with the word "Goals" seems to be premature. At a minimum, there should be more emphasis on the importance of the economic impacts and that they are necessary to make wise choices.	Farm Reserve	?	The project, and in part its title, was defined in a legislative audit and it is well within the Division's purview to set water conservation goals. Economic impacts could not be handled comprehensively here.

No.	Comment	Organization	Commenter	Response
179	Management - While a decrease in water consumption by improved management practices has been acknowledged (Second Paragraph Page ES-1), a great deal more can be saved than what has acknowledged. As an anecdote, but a meaningful one, at a site consuming 25,000,000 gallons a year, a water manager was able to save an average of 10,000,000 gallons using the following practices: •Adjusting heads •Installing MPR nozzles •Adjusting times •Repairing leaks •Using a flow meter When adding a smart controller, he was able to save an additional 1,000,000 per year. When fine tuning the smart controller a year later he was able to save an additional 5,000,000 per year. After fine tuning, the contractor saved a cumulative 16,000,000 a year from the original 25,000,000 gallons, adjusting for weather conditions. This is a 64% savings; 24% of which is attributable to the smart controller. Please do not underestimate the possibilities of good management!	Farm Reserve	?	Thank you for these insights. "Good management" is certainly promising, but is difficult to quantify, especially on a statewide level. Many of the items cited here are already included in the analysis.
180	"Water suppliers and users alike are commended…" To date organizations have spent large sums of money to accomplish water conservation goals. More could be done within this document and beyond to recognize and reward those who have been saving water.	Farm Reserve	?	We do appreciate the good work to date, which has been acknowledged in Chapter 1. This project, however, looks forward with new goals and practices for water conservation.
181	*Last Paragraph* – "Two river basins achieved their goal." Which ones?	Farm Reserve	?	This is a quote from the legislative audit. The two basins are not named there.
182	*Item 1* – As addressed in the previous answer to ES-1, more specific description could be given to those already using conservation measures, with more consideration for practices already implemented for those individuals, companies, and institutions. Provide more flexibility in the goals to allow for relaxation when owners can demonstrate conservation from baseline. This would encourage overall best management practices and improve management culture. This would also cut down on the enormous cost associated with re-landscaping a property.	Farm Reserve	?	The recommended practices are not prescriptive or exhaustive. Water users may pursue savings by any means they choose. These are recommended as the best options. The intent of the report is not to identify who has already saved water and how, but to set goals and guide implementation.
183	"How do we move from cool-season turf grasses to more locally appropriate landscapes?" Who determines what is more locally appropriate? This public question, fueled by the media-driven, public perception that grass is bad, needs to be tempered with other realities. There is a great deal of benefit in cool-season grasses. They provide significant micro-climatic cooling. They are comfortable to be on. They are aesthetically pleasing. Lawn is a problem, but it isn't all bad.	Farm Reserve	?	Locally appropriate refers to landscapes with vegetation and levels of water use that are more consistent with what naturally exists in the area. The regional goals do not recommend completely removing all turf, but work to create a more sustainable balance between turf landscapes and localscapes.
184	*Question 7* - "How is water supply being considered?" Remember that costs associated with water conveyance in some parts of the state are much less expensive than transporting the water to other parts of the state. While goals in the document are different for different parts of the state, this response seems to suggest that everyone should work to achieve the same thing. Please clarify.	Farm Reserve	?	See response to Comment 67.
185	The $3/SF and $5/SF costs are very low. We have experienced much higher prices when competitively bidding lawn conversions.	Farm Reserve	?	After conducting research these were the average values the project team found. Actual prices may be higher or lower, but to simplify the analysis, the average was used.
186	*Last Paragraph* – It would be nice to see what 175,000 acre feet translates to in graph form and how that volume relates to overall water supply as seen in the projected water supply table of the DWRe 2014 document.	Farm Reserve	?	See response to Comment 67.
187	When first seeing the Outdoor Recommended Practices and specifically the topic of lot size and density guidelines, the question arises as to the effects and acceptance of mountain to mountain hard surfacing. Los Angeles has been described as a concrete jungle. Is that what is desired along the Wasatch Front?	Farm Reserve	?	We recognize some difficulties with smaller lots and more hardscapes. Still, the trend in recent development is clearly going toward smaller lots. It should be emphasized, however, that the report does not advocate "mountain to mountain hard surfacing". Prudent development would offset increasing densities with additional natural open space to offset many of the concerns highlighted here. The implications of smaller lot sizes will have to be considered by the residents and policy leaders who vote to enact landscape restrictions.
188	We emailed comments to Rachel.	Water professional	Dana Van Horn	The project team thanks you for your comment on this important project.
189	As a Salt Lake Valley citizen and student studying water conservation, I support the Residential Outdoors Policy Options M1, E1, and L2. I also approve of incentives as a way to encourage the public to conserve water. The rebates currently offered through Utah Water Savers have been wonderful incentives for the public to conserve water. I think continuing support for such things is an important idea.	None of these apply to me	Moriah K Jackson	The project team thanks you for your comment on this important project.

No.	Comment	Organization	Commenter	Response
190	With regards to the Residential-Outdoors section: Policy Option L1, Aggressive Landscape Conversion Efforts: the suggestion to likely increase budget to conversion education is not enough. The focus should be on making educational resources available to the public. We will never shift if we aren't educated. More education than just showing up to classes at the Water Conservation Garden. We need educators who can come to the home and walk homeowners, business owners, etc. through the process of drip irrigation, conversion, conservation. I have the same feeling about Policy Option E1 and appreciate the built in "significant increases to education and outreach funding".	None of these apply to me	Nysse Wilson	The project team agrees that education and outreach are very important. The exact method of how to deliver education and outreach is best determined by the individual water providers.
191	We emailed detailed comments.	USU Center for Water Efficient Landscaping	Dr. Larry Rupp; Dr. Joanna Endter-Wada; Dr. Kelly Kopp; Dr. Paul Johnson; Dr. Youping Sun; Ms. Susan Buffler, Ms. Chris Garrard, and Mr. Paul Harris	The project team thanks you for your comment on this important project.
192	Need to be more aggressive in reducing water consumption to be in line with other desert communities	None of these apply to me		The project team thanks you for your comment on this important project. Some feel the goals re too week, others too aggressive. Either way, we need to start.
193	I think the goals are not high enough. We should strive to use much less water than the goals that are proposed	None of these apply to me		The project team thanks you for your comment on this important project. Some feel the goals re too week, others too aggressive. Either way, we need to start.
194	We would like to see the cost of water that homeowners use raised to help motivate homeowners to lower their usage.		Betty Marianetti	This is one of the recommendations from the report.
195	Lot Size: The general assumption in the document is that through market forces and landscape ordinances, smaller lot sizes will result in smaller landscape areas. Ultimately, it is anticipated that this will result in less water consumption. In general, this seems to be a fair assumption. From the document, planners anticipate that average household and lot sizes will decrease, but there also seems to be room to allow that overall housing square footage could shrink and potentially allow landscape sizes to stay the same. There are, however, much larger community implications than a minor landscape size oversight. While this document does not specifically say it, nor does it probably even mean it, the prevalent discussion of smaller lot size with minimal additional land-use consideration indirectly assigns landscaping a lesser value than hard-surface areas in our developing communities. To be clear, it is understood that market forces are pushing development in the direction of smaller lot sizes and the assumed smaller landscape areas.	Water professional	David Wright	Correct. The trend we see is smaller lots with relatively larger homes and smaller landscapes. We have sought to include this important trend in our consideration of future development and its effect on water use.
196	Page Specific Comments Page 11: " Question 3 - How do you fund water? A broader and more significant question might be, how do you fund change?	Water professional	David Wright	This is an interesting but philosophical question beyond the scope of the project.
197	I don't think that government should have the ability to restrict lot sizes. I don't feel that the government should get involved in water consumption in Southern Utah where we have already made huge strides in conservation, more so than any other area in Utah. Builders are making huge efforts to reduce landscaping and the cities are doing a lot to make it so that reuse water is more available than it used to be. I am in full support of the Lake Powell Pipeline and while it will benefit Southern Utah greatly, the northern parts of the state will benefit from its construction because it will bring in much more revenue and an increased tax base.	None of these apply to me	John Henderson	Government should have a role in regulating use of natural resources, including land and water. In some cases that regulation might extend to lot sizes. Our analysis seeks to include the *observed* trend of decreasing lot size, rather than prescribe it. See response to Comment 93. This is not just the case in southern Utah. The report does not offer an opinion on the Lake Powell Pipeline.
198	2. PEER REVIEW BY THIRD-PARTY There was no independent and disinterested peer-review process for the "State of Utah Water Use Data Collection Program Report." The peer-review was instead written by for-profit consulting firms. This is inappropriate. Please provide a more rigorous and independent peer-review process for all water conservation reports and programs.	Policy leader, Canyonlands Watershed Council, Living Rivers & Colorado Riverkeeper	John Weisheit	This comment is not relevant to the project. Further, the consultants *were* the independent party in both projects, rather that the Division evaluating its own work.

No.	Comment	Organization	Commenter	Response
199	The Utah League of Cities and Towns (ULCT) represents all 248 cities and towns across the State of Utah. The comments below are not comprehensive. The League has encouraged each municipality to comment on the regional goals to express direct impacts and suggest revisions. The three main concerns from ULCT would like to see addressed the single focus on conservation through pricing, recommendations with unintended consequences, and a change from the draft being very top-down in creating the report to locally-driven regional conservation goals. It is the request of ULCT to the Division of Water Resources is to address these concerns in the final regional conservation goals. ULCT staff and its membership are available to provide additional information and details as requested.	ULCT, Policy leader	Wayne Bradshaw	Thank you. See further responses below.
200	Single Focus Conservation: Conservation is an important water management tool for Utah communities. In a recent ULCT survey, 98% of respondents ranked water conservation as a high or equal priority in their water systems. ULCT also found that 79% of respondents have a current conservation plan in place. These efforts are having an impact. Since the State adopted the conservation goal of reducing water use by 25% by 2025, we have seen an average reduction of 1% per year since 2000. Municipalities and water providers achieve internal goals as well as the State's conservation goals by applying a multitude of tools. Some of the most common tools utilized to conserve water include structural improvements, operational improvement, education, economical, ordinances, pricing, marketing, and incentives. The current draft regional conservation goals overlook the many tools available to water providers and municipalities and adopt a single focus of conservation through water rate increases. ULCT compared the February 2019 draft of the regional conservation goals with the current August 2019 draft. Water pricing language increases significantly with "tiered rates"utilization rising by 38%, "pricing" increases by 25%, and words like "rate increases" were added from February to August.	ULCT, Policy leader	Wayne Bradshaw	We thank UCLT and its members for their strong support of water conservation. Rate changes are effective conservation tool when they reflect the true cost of water. In earlier versions of the report this issue was not well developed, and feedback from numerous stakeholders prompted us to reconsider. Rate changes, however, are not the single focus of the report, which considered more than 30 potential practices and recommended 11 practices found to be particularly effective.
201	I think the goals could be more ambitious. My family is willing to work hard on conserving.	None of these apply to me	Christy Lueders	DWRe thanks you for your comment on this important project and for your family's willingness to conserve water. Some feel the goals are too weak or too ambitious. Regardless, we need to start.
202	1. Flip the Strip - Convert useless lawn in park strips with native, drought-tolerant species. 2. Curb cuts- allow stormwater to enter park strips via curb cuts and flow into bio-swale that allows infiltration and reduced peak flow. 3. Promote Graywater reuse - encourage residents to collect and distribute graywater for irrigation and toilet flushing at their residence. 4. Stormwater harvest - encourage properties to collect and infiltrate all stormwater that falls on their residence. 5. Slow the Flow!	None of these apply to me	Tyler Smithson	These are excellent suggestions. Many water suppliers are already offering incentives to flip the strip. Greywater and stormwater solutions, while important, are beyond the scope of this work.
203	I live in Kanab, Utah. I am against the proposed frac sand mine and the Lake Powell Pipeline project. We live in a desert where water is precious. We just had a monsoon season without 1 drop of rain. We should be creating recharge (percolation) ponds to preserve all the water allotted to us. We should not be selling our water and giving Gardner/Southern Red Sands opportunities to use up or foul our aquifers and wells. There are many conflicts of interest among proponents of this project and the public knows it. We are informed and fully prepared to fight both of these projects that give away our most precious resource, water.		Diana Zimmerer	Thank you for your passion about water issues. This comment, however, does not relate to this project.
204	Lower the per person allocation !	None of these apply to me		The project team thanks you for your comment on this important project.
205	I believe the stated goal of 25% water use reduction is far too modest...a goal of 50% is attainable.	None of these apply to me	Timothy L Weiler	The project team thanks you for your comment on this important project. The goals were carefully selected with the input of numerous stakeholders after considerable analysis. Some feel the goals are too weak or too ambitious. Regardless, we need to start.
206	We should easily achieve that goal if more people are made aware.	None of these apply to me	Marsha McCoy	Agreed. Education and outreach will be a key component of achieving these regional goals.
207	Kane county's allocation of water for the frac sand mining efforts of Southern Red Sands is contrary to the Conservation goals of Utah. Kanab city aquifers will be impacted if this mining effort is allowed to draw from Kanab's local aquifer. This misuse of a city's aquifer is similar to the 2018 house bill HB135 attempt to limit a city's ability to protect it's drinking water aquifer. Please use this example of water waste in your consideration of conserving Utah's drinking water resources	Water professional	Douglas Dewitz	Thank you for your passion about water issues. This comment, however, does not relate to this project.
208	I don't think this plan is promoting conservation enough. The goals are not ambitious enough compared to other towns and cities in the southwest	None of these apply to me	Claire heyman	The project team thanks you for your comment on this important project. The goals were carefully selected with the input of numerous stakeholders after considerable analysis. Some feel the goals are too weak or too ambitious. Regardless, we need to start. Also see response to Comment 6.
209	This is a great step in the right direction. We need more public service announcements and educational opportunities to help educate the public about water- wise Landscaping and other water conservation ideas		Bill Doty	Agreed. Education and outreach will be a key component of achieving these regional goals.

No.	Comment	Organization	Commenter	Response
210	I am disappointed because these goals are weak and anemic. We can do much better.	None of these apply to me		The project team thanks you for your comment on this important project. The goals were carefully selected with the input of numerous stakeholders after considerable analysis. Some feel the goals are too weak or too ambitious. Regardless, we need to start.
211	Goals of the WCWCD and local entities are already conserving from what predictions were to be by this time and so we don't feel we need big government override something that is already working.	Business owner	Building Concepts of So. Utah, Inc.	Some feel the goals are too weak or too ambitious. Regardless, we need to start. Remember that this project is not focused on WCWCD or even southern Utah but covers the whole state with a regional approach.
212	I am supportive of these enhanced goals and hope we can look for opportunities to reduce water use in every sector, including M&I as well as agricultural use. The methods suggested (secondary water metering), in-home use reductions, and water conserving landscapes are especially useful. Water rate changes should also be considered. Incentives to conserve should be highly considered. Of particular concern to me is water for Great Salt Lake, so I hope that some of the current diversions can be discontinued and there are firm plans for making sure that GSL has a stable level that supports the critical environmental conditions, wildlife habitat, and at the same time avoids the consequences of effects on climate and air quality. Thank you.	None of these apply to me	Jan Striefel	Increasing tiered water rates is one of the recommendations in the report. The Great Salt Lake, while immensely important, is not part of this work.
213	Is all treated water metered? If not, why not? Why is agriculture, mining, and power exempted? I know this is usage, will you eventually monitor pollution? Possibly limit the types of fertilizer homeowners and other can use? Do we have figures for the lowest reservoir capacities? Can we reduce usage to that level today? If not, what will we do for the future? Will planting more trees help or hurt? Reducing grass in parks? Requiring xeriscaping?	None of these apply to me	Dennis Hanks	These questions are already addressed in the report or fall outside the scope of the report.
214	This is a good step but putting a lot of onus on individuals, and for the most part rightly so, but I would rather see more onus going onto PUBLIC entities such as cities and counties in their development of parks and field spaces that are NOT blue grass or lawn. There should be play fields but so many of them are mostly lawn that requires irrigation to the tune of between 250,000 up to 1,000,000+ gallons a week. I'd like to see that changed. I'd also like to see commercial developers use zero lawn wherever possible. We could easily see unirrigated meadow grasses and other such approaches in parks and commercial developments. Cities and Commercial entities resort to using grass to fill up large areas because it's cheaper and 'easier' to maintain. In the long run lawn is the WORST. It is useful but should be limited to areas that its specific use is required.	Water professional	Brandon Ruiz	Agreed. The report already addresses many of these issues. We recognize the potential water savings from commercial, industrial, and institutional users, but lack adequate statewide data to offer specific recommendations for practices and policies.
215	The challenge is long term implementation and buy-in by all. Odd that Bear River doesn't have a lower GPCD goal. Cooler temperatures, shorter growing season, should equal less water. Also, I'd assume that Weber, SLC, and Provo basins should be similar, but there is a difference showing long term. State funding should occur on major initiatives that produce the most savings.	Water professional		This is the very reason that a statewide goal is no longer meaningful: each region has particular climate, population, and water use characteristics that need to be considered individually. As such, regions' goal should not be compared to each other.
216	The Colorado River was over-allocated since the 1922 compact was agreed to. The state of Utah has over allocated its Colorado River water rights. A warming climate has already reduced water availability. Due to all these factors I suggest that Utah has to get more serious about water use efficiency. The state cannot plan on new pipelines to get more water because there isn't any. The new premise must be how efficient do we need to be given our water supplies. The question for the state is how do we get to be as efficient as we can with the water we have. The report is real missed opportunity and it is critical for the state to take new leadership in requiring water conservation measures.	Business owner	Jane Whalen	This report is an effort to get serious about water conservation. It does not offer opinions on water development projects. Some feel the goals are too weak or too ambitious. Regardless, we need to start.
217	The documents are not at all accessible to the average citizen. Seems like only token effort based on letting technology do the work instead of actually educating and changing consumer behavior - quite weak compared to say Arizona and their water conservation efforts.	None of these apply to me	Hailey Wall	The recommended practices include changes in education, policy, and technology. This project will start Utah down a more meaningful path in water conservation.
218	The Weber Basin Water Conservancy District (District) appreciates the opportunities provided by the Utah Division of Water Resources and their consultants to provide input and comment regarding the Utah's Regional M&I Water Conservation Goals document. The 2030 goals offered in the final document are aggressive and will require substantial expenditures and a drastic change in municipal ordinances. The District has no additional comments to add beyond those already offered during the drafting process.	WBWCD	Jonathan Parry	We appreciate WBWCD's support of and involvement in this important project, as well as your leadership in water conservation.
219	The goals outlined are laudable, including the goal of smaller average lot sizes in new developments. However, this seems like a blunt instrument for improving water conservation. The type of landscaping chosen and the care with water is used seem to matter far more. I wonder if more emphasis shouldn't be put on pricing so that higher water use results in a progressively higher price paid. That seems to me a better way to create a feedback loop that will change behavior in a lasting way.	None of these apply to me	Stacy Young	Increasing tiered water rates is one recommendation offered in the report. Tiered water rates must be related to the cost of operation of the water system. To be clear, smaller lots are not necessarily a goal, but an already occurring trend.
220	They are too lenient. We live in a desert and should have already been using far less water than we currently do.	Business owner	t bain	Some feel the goals are too weak or too ambitious. Regardless, we need to start.

No.	Comment	Organization	Commenter	Response
221	I am sending comments on the Utah Conservation Goals report based on 30 years in conservation in California. I also got to know Utah and agencies in 2000 when I traveled with Lyle Summers, Utah's water economist at the time, up and down the state describing water rates, water budgets and new smart technologies that helped my agency and others achieve water use efficiency. We were able to gain significant and long-term water efficiency and meet agency revenue needs at the same time. An unknown benefit at the time was how end water users understood and accepted water budgets and rates that were transparent and fair across different customer groups. My experiences and those of a small group of agencies, led to why and how California changed its water conservation thinking. Today, after 19 years of drought in the southwest, we have a "new normal" in water. Our State is adapting, by getting serious about water use efficiency. There is no choice but to adapt in the Colorado River basin with less and less water availability expected well into the future.		Tom Ash	The project team thanks you for your comment on this important project.
222	In 2014, after a 12-year drought, Australian officials warned California to plan and save more water sooner than later. During the latest drought, California found it was not prepared as prepared as we hoped, and mandatory conservation was enacted by the Governor. California hit the conservation-savings goal of 25% per capita use demand reduction. However, we also found we could be much more efficient with water than previously assumed. We now see signs of a new drought emerging over the Pacific Ocean. The drought trend continues"¦ But, what to do? In short, California recognized why they needed to get serious about water use efficiency. But how? First, the State and local agency perceptions needed to advance beyond the simplistic method of reducing demand by a prescribed percentage of per capita water use. Why? Past water demand (use) is not a measure of water need. And, as we found during the recent drought, asking users to simply conserve is unfair to efficient users, lacks science-based equity, leaves a lot of excessive water use unaffected, and does not account for local weather, family and lot size, business, recreational, tourism and agricultural water needs. From listening and reading the Utah plan, setting per capita water use targets will be argued and cause disagreement from many sides. We found this approach was arbitrary and difficult in a public relations perspective as well.		Tom Ash	The project was indeed difficult, seeking to involve many stakeholders and considerable research. Thank you for your insights on this matter.
223	I live in Ivins, UT in Washington County and the 2030 goal of 262 GPCD is far too large of a usage. We need a larger reduction than 14%! We live in a desert and we should be conserving more water by not putting lawns in with new homes and being smart about the types of plants. Other desert cities such as Tucson AZ have a goal of 160 GPCD! St George can do so much better - we need to be more aggressive!	None of these apply to me	Susan Gordhammer	See response to Comment 6.
224	Very comprehensive and forward looking.	None of these apply to me	Zurl Ansel Thornock	The project team thanks you for your comment on this important project.
225	"¢Southern Utah home builders know water conservation is an essential part of our water supply plan. We have proactively incorporated several water-saving practices in our building/landscaping plans and are committed to ongoing efforts to ensure we are being water smart. However, the recommendations in this plan extend beyond traditional water conservation practices and, if implemented, will change the demographics and lifestyle of our community. Washington County grew by 13 percent between 2010-2015, with water use going down by 9 percent during the same period. New construction implementing water-wise landscaping is in part a contributing factor. "¢Washington County exceeded the statewide goal to reduce water use 25% by 2025. We exceeded the goal with 30% reduction in water use a decade ahead of schedule. Statewide average is 18%. We are concerned future reductions in Washington County will be more expensive and difficult to accomplish. "¢Market demand should dictate lot sizes not through adoption of regional conservation goals. "¢Enforcing water use ordinances as recommended in the regional goals would be costly to implement.		Mari Krashowetz	Thank you for the comment. Washington County's progress in water conservation is admirable. Still, as in all regions, more can be done, especially with proper policies and funding from state agencies.
226	Utah's Regional Conservation Plan Draft was released on September 7 for comment. Over a year ago the Utah Division of Water Resources (DWRe) began the process of developing regional water conservation goals for our state. The process included a survey, eight open houses and interviews with "key" stakeholders to gather information from the public, landscape professionals and leaders. Earlier this year the first draft plan was created but not officially released. Deciding what our water conservation goals will be as we plan for the next several decades is incredibly important. That cannot be emphasized enough! If our goals are too low we will continue to waste water, a precious resource, resulting in the need to get more at great distance and at great cost via the proposed multi-billion dollar Lake Powell Pipeline (LPP). Need must be based on current supply. We cannot be sure that other water will actually be available.	None of these apply to me	Lisa Rutherford	The project was indeed difficult, seeking to involve many stakeholders and considerable research over more than a year's time. Some feel the goals are too weak or too ambitious. Regardless, we need to start. Thank you for your interest in this project.

No.	Comment	Organization	Commenter	Response
227	Here are the key comment points: "¢The water conservation goals for 2030 and projections for 2040 and 2065 are anemic and would require that we build the proposed Lake Powell Pipeline (LPP) at great cost. "¢Scenarios developed to come up with conservation goals appear skewed resulting in higher goals than necessary. "¢Water conservation methods suggested seem to cost too much and provide too little benefit. "¢The planning process was closed and comprised mainly of water district personnel.	None of these apply to me	Lisa Rutherford	See response to Comment 226 and individual responses to other comments from this commenter.
228	How these recommended goals will be achieved specifically is not included in the plan and the plan is clear that it is not a "comprehensive strategy plan." The plan does state that the "goals require the state and its municipalities to increase water pricing, establish and enforce water use ordinances, encourage broader adoption of existing water technology, as well as secure additional funding to reach the target water use levels." Some key recommendations in the plan include: reducing new lot sizes and other land use changes to encourage reduced water use, reductions in grass, secondary meters and smart controllers for outside, increased water pricing with increasing tiers, education, policies which require accountability for efficient water use, conservation plans by water producers that define local goals, practices, pricing and accountability. The plan offers some residential conservation policy suggestions but adds that their implementation will depend on the cost of water "" higher cost, quicker adoption. Outdoor water, which is a bigger problem than indoor, still faces challenges. If lot sizes decrease and landscaping improves, that will help, along with education about poor water practices. Unmetered "secondary" (untreated) water connections use about 50% more water than metered. Adding secondary meters holds great potential but with lawmakers balking in the 2019 legislature at mandating secondary meters, this will remain a large area of concern and shows leaders' unwillingness to tackle big issues. However, with irrigation efficiency currently at 63%, those using secondary water can still help by improving watering methods. Again, the pursuit of aggressive water rate increases by policy makers and education programs could help accelerate efficiency, but will that happen?	None of these apply to me	Lisa Rutherford	Many of these issues are already addressed in the report. Implementation will indeed cost money and take time, which is why the recommendations for policies and funding are so strong. We need to accelerate our progress.
229	The plan emphasizes that how we landscape has a lot to do with how effective conservation efforts will be. Eliminating or minimizing traditional cool-season turf grasses and changing sprinkling systems to drip irrigation can save significant amounts of water. We can save even more by using native and climate adapted landscape plants. So, there is much under our own control. Even with these suggestions, the plan scenarios for our water future show little change in our region for existing homes (even though people ARE converting) and not much real change for new development, possibly an indication of developers' and leaders' lack of appetite to adopt and enforce limitations on grass. The plan acknowledges that an issue of concern for many water suppliers is climate change which has potential to affect irrigation needs. This makes it even more critical that homeowners and others choose native and climate adapted landscape plants and little or no grass to ensure our consumption continues to decrease. Although the focus of the plan is residential water use, commercial, institutional and industrial water use is considered in the plan with most emphasis on institutional where the plan authors see most opportunity for water savings due to outside grass and watering techniques. Plan authors assert that little water savings is anticipated in the commercial and industrial area which seems a flaw in the plan. Commercial and industrial businesses also landscape. Shouldn't the potential savings in landscaping for then also be considered? Also, as leaders make decisions for new businesses in communities, consideration of the type of business and their water needs must be considered if our water future is so important?	None of these apply to me	Lisa Rutherford	With regard to landscaping, the plan actually shows considerable change in our landscapes if we are to meet the goals through 2030 and beyond. Converting existing landscapes is wise but expensive, so we emphasize new development and the associated policies for lot sizes and turf limits. Relative to what now exists, the plan calls for very different approaches to landscaping as one way to achieve the goals. With regard to commercial, institutional, and industrial water use, the plan does not "assert little water savings" but acknowledges the lack of statewide data on these sectors' water use and their conservation potential. We agree there is much to be saved there and indeed, commercial and industrial savings will need to occur if we are to meet our goals. However, we do struggle to quantify the exact potential in this area. This is an area for future work.

No.	Comment	Organization	Commenter	Response
230	A comprehensive strategy for the funding, development, use, or management of Utah's water resources is not part of this draft conservation goal plan. So how do these proposed goals for 2030, 2040 and 2065 tie into our own water supply without the proposed LPP? We must be sure our goal for water use is not greater than our water supply or we will have created a scenario where we must have the LPP. The plan admits that "In some areas, there may not be any other significant new sources. Consequently, conservation must occur in order to meet Utah's growing population in the long term, regardless of any future water developed. With limited viable water resources, it is prudent for the residents of the state to implement some practices now in order to stretch the available remaining water supply to meet future demands." This is particularly important for our fast-growing Washington County area where we can rely on and benefit from our local resources for many decades to come if our conservation practices are well-conceived, well-implemented, well-managed and well-enforced. Unfortunately, actual regional supplies were not considered by the draft plan writers and perhaps the heavy hand of our local district that wants the LPP is the reason. Without the LPP, the water district says it can provide 100,000 acre feet of water (over 32 billion gallons of water!). That amount would support over 500,000 people using 175-180 GPCD ""‘ well within what other areas are using now. But 175-180 GPCD is not a goal this plan sets. The goals the plan has set will require that we build the LPP! That's where you can see the heavy hand of our local water district in the goals set for our region. Even under the most aggressive conservation policy options suggested in the plan, our region's proposed goals for 2030, 2040 and 2065 respectively would be 246, 232, and 222. However, at least the 2065 222 GPCD would get us close to where we need to be.	None of these apply to me	Lisa Rutherford	The relationship between these goals and any water development projects is left to future planning efforts.
231	Per the plan, "Per-capita use is computed according to the permanent population (excluding tourist and commuter populations)." The state and our district emphasize this because they can use that to justify how second homes and visitors drive up our M&I usage number. But other areas such as Phoenix and Las Vegas also have large numbers of second homes and visitors using their water while using less water than we do. Phoenix uses 111 GPCD and Las Vegas uses 203 GPCD. I am willing to admit that you can't compare two areas in absolute terms because of differences in climate, elevation, etc., but I think it's still fair to compare us to other desert communities generally and we don't compare very well when it comes to water use. The plan asserts "water development and water conservation should be considered in parallel." I do not disagree generally, and our water district has project plans on the books without the LPP for securing water. A parallel path does not mean that the LPP should be on the parallel path at this time. We can do much to secure our water future before building a risky, expensive pipeline from an over-allocated river that may not be able to provide the water. The plan also notes "Utah's existing water infrastructure is aging, requiring significant investments to replace it." This is something that many people don't consider but is critical. Should we be investing huge amounts of money in new unneeded infrastructure over conservation, which can be done incrementally, when we already have aging infrastructure that needs money for repair?	None of these apply to me	Lisa Rutherford	See response to Comment 6 for discussion of other places' water use. Aging infrastructure is indeed critical and will be addressed in other water planning efforts.
232	Suggested water conservation practices include an extensive list and include: "¢Target high residential and commercial water users "¢Implement business water efficiency management plans "¢Increase stakeholder coordination I don't know exactly how many of the suggested conservation practices are currently being done in our county but a cursory review reveals many are. How successful they've been I also don't know. If our current use of 303 GPCD versus the 2015 baseline number (305 GPCD) is any indication, perhaps the measures have not been very effective and we need to look at other options. I'm fairly certain that the three suggestions bulleted above have not been implemented. Our district water manager mentioned several years ago that a small percentage of water users are driving up our consumption. Have those users been identified? Have they been counseled? What about increasing stakeholder involvement and coordination? As noted, the members of the plan team are mostly water district members. When our own water district held their Community Integrated Resource Planning Advisory Committee (CIRPAC) meetings in 2013, most committee members were handpicked citizens who supported the LPP. With many citizens questioning the LPP at this point, stakeholder involvement and coordination needs to be expanded to be more inclusive.	None of these apply to me	Lisa Rutherford	Yes, many communities are already using the practices mentioned in the report. The three you mention are less common but growing. Smart metering, for example, is already enabling identification and real-time outreach to large water users.

No.	Comment	Organization	Commenter	Response
233	As mentioned earlier, a public survey was included in the study as were eight open houses attended by approximately 100 people. The online survey which collected 1,655 responses from a total Utah population of about 3,000,000 ran during September and October 2018. This does not seem like a lot of public input compared to the amount of water district input to the plan as revealed on the stakeholder list. Of the 1,655 who answered the online survey, most were in age groups 29-39, 40-50 and 60+. Respondents were divided fairly equally between those age groups. Most had single-family homes. The majority were on lots of .25 acre or less. The survey results reveal that not all 1,655 answered all questions. It's clear from the survey results that most did not know how much water they use, but the survey question was very poorly worded and many did not even answer. Nearly 70% felt water conservation is very important for sustainability, but about 40% felt their community did not really support water conservation. A little over 50% said they were willing to change their landscape to add more water-wise plants and features. The survey questions seemed to require a certain level of understanding about water use that many citizens would not have at that point. I'm not sure how useful the survey information really was when citizen education seems lacking.	None of these apply to me	Lisa Rutherford	The online survey was meant to reach as many people as possible, not a statistically representative sample. It was an opportunity open to everyone, and we cannot control who responds. The results, combined with the input of many other stakeholders across government, research, and water professionals, informed the project.
234	Fortunately, the plan states ""¦it is recognized that this is not the final step in goal setting." The model provided is a tool in that process. So, fortunately, we are not at this point locked into these anemic goals that do not serve the future of our county or our state well. However, the report states in the Implementation section: "The pursuit of the regional M&I water conservation goals will be an endeavor of immense magnitude. All levels of society""not just water suppliers""must engage over extended time periods. Since changing water use behavior, policies, and technologies will become more difficult and expensive with time, prompt action on water conservation will bring the most benefit. " This seems another attempt to scare citizens about conservation. If conservation is so scary, how have other places been so successful in their efforts? Surely we are made of the right stuff to get this done. For this plan to succeed even with its anemic conservation goals, "State, county, and local leaders should establish policies which require accountability for efficient water use." To date, I have witnessed no real willingness on the part of leaders to deal with accountability.	None of these apply to me	Lisa Rutherford	Many social, political, and financial barriers exist to water conservation in Utah. This plan seeks to acknowledge them and call for action so we can begin a more responsible approach to water resources management. Some say the goals are too easy, others say they are too hard. Either way, we need to start. We do worry, however, that delaying *any* goal will only put off the water savings we could achieve. The goals for 2040 and 2065 will be refined as new data become available and as technologies mature.
235	Also needed is an adequate focus on water use by commercial, institutional and industrial entities. Will our businesses and business-friendly leaders be willing to do this? That's an interesting question because as I was writing these comments, I became aware of the "Save 2% for Utah" campaign, a campaign started by 50 Utah businesses that are asking Governor Herbert to adopt a sensible water conservation goal of 2% per year for 25 years, rather than the current 1% per year goal. The current 1% per year goal now being reduced to.5% per year for the next 50 years by this draft conservation goal plan. So, apparently many businesses are willing to get on board for a better water future. Hope others do too. Basically, all water users are essential to conservation and extending the life of our water resources. I've provided my thoughts on the state's plan. I appreciate the time that's been put in developing this plan but feel it falls short of establishing goals that can really meet the needs of our state and Washington County specifically. Although public surveys and open houses were held, the central process for developing this document was a closed process with the majority of those involved being water agency people. Trout Unlimited, Audubon Society and Friends of Great Salt Lake are the only conservation organizations listed on the 39-member list of those involved in the project. By far the majority of those on the list are statewide water district employees. Our own local conservation organization, Conserve Southwest Utah was not included and not even invited to participate although CSU's 2,000 members and all other Washington County citizens will be expected to live with the results and repay the proposed LPP costs should the pipeline ever be built. Omitting a Washington County conservation group from this discussion was an unfortunate decision. Finally, it would have been nice if after having over a year to develop this complex plan the DWRe would have given the public more than a couple of weeks to review, digest and comment. That seems very unfair to the public. Thank you for the work put into this document but I must encourage you to work harder on the final document to produce goals that actually deal with the water we have in Washington County and how to effectively use those not dream about more.	None of these apply to me	Lisa Rutherford	See response to Comment 10. Also, the 2040 and 2065 projections are not goals and will be refined with new data and new technologies. As for stakeholders, we could not possibly reach all interested parties, which is one reason we opened the online survey last year and the public comments this year. Many feel the goals are too hard, others feel they are too easy. Either way, we do not wish to delay establishing some kind of goals to get started. They will no doubt change over time.

No.	Comment	Organization	Commenter	Response
236	Down in Washington County - you may get more conservation if you look at some of the new subdivisions around Sand Hollow. Gather data on those homes water use. Assume that all new growth will look like that in the future - very little traditional landscaping. Be careful in getting this new water use data - use total water use per home, not per capita use. Because many of these homes are second homes and nobody is living in them permanently. Get total use per home and then just divide that use by the persons per household number you can find through the census. Now you have an assumed per capita use for those new types of homes. That becomes your new residential per capita use. Now you need to figure out the other categories water use. See what the reduced residential water use is on the above mentioned residential water use compared to the current residential per capita use is and just assume that reduction percentage could be achieved in the other categories (commercial, institutional and industrial uses). Or maybe 80% of that reduction. When you add up all the percapita uses, I really believe that is what you should be using as a Conservation goal down there. The other arts of the state are fine. Thanks for your work on this.	None of these apply to me	Eric Klotz	Excellent suggestion. This is a great opportunity for a small-scale study on local water use with new construction.
237	I will address a part of the local Washington County future water supply problem that I feel is not currently addressed. My geologically-based research of the situation concludes that neither local St George City, Washington County, WCWCD, nor the Utah WR water managers have recently or rigorously studied the abundant local groundwater resources of the extensive Navajo Sandstone aquifer as an alternative to, or replacement of, the proposed long distance Lake Powell Pipeline (LPP). About 30% of St. George's culinary water is currently derived from the Navajo Sandstone aquifer, via two small water well fields (south of Gunlock and in Snow Canyon State Park) and a few other isolated water wells. Santa Clara, Washington City, and Hurricane also obtain percentages of their municipal water supply. Natural springs on the slopes of Pine Valley Mountain supplied another 10% of St. George water. Sixty percent was purchased from Quail Creek WTP+Sand Hollow+Virgin River. (https://waterrights.utah.gov/wateruse/WaterUseList.asp) The geologist in me suspects there are many magnitudes more recoverable water in the nearby Navajo Sandstone aquifer, versus the annual quantity proposed from the LPP. This Jurassic-age rock water reservoir, which stretches from just north of St. George City, west past Motaqua, east pass Hurricane, and even extends underneath the Pine Valley Mountains into Iron County, some 800 sq miles in extent, can be more than 2000 ft thick. Assuming a conservative 15% rock porosity, and the above areal extent, there calculates more than150,000,000 ac ft of trapped water held in the Navajo Sandstone. Compare this to the maximum capacities of Sand Hollow reservoir, Lake Powell, or Lake Meade of 50 thousand, 24 million, and 26 million ac ft, respectively. The U.S. and Utah Geological Surveys, and others, have extensively studied the Navajo Sandstone in the Virgin River basin since the 1970s. The water exists. It is of good quality. It is close by. It is not too deep. Most of the land above the aquifer is either BLM or National Forest lands. The costs of drilling new water wells on appropriate lands, and linking them with smaller diameter and much shorter-length gravity-fed pipelines than the proposed LPP, would be much less expensive, and developable much sooner, than the LPP. Surely this local immense water source should be further developed in a sustainable way, not "mining the reservoir", and I feel preferred over the LPP.	None of these apply to me	Terry W Massoth	Thank you. Water supply is not within the scope of this project.

No.	Comment	Organization	Commenter	Response
238	Thank you for the opportunity to comment on the Water Conservation Goals for Utah. Living in SW Utah, Ivins specially, I have understood that in the desert environment, water is our most precious resource. In as such, I would expect the politicians, who represent us in accomplishing these new goals, would also focus on compliance within their own communities. Last Thursday, Sept. 19th 2019, the Ivins City Council passed a rezoning resolution on 104 acres of Utah State owned land from Low Density Residential (practical zoning for the desert) to Resort Mixed Use and the development of a Resort Rental Complex including, pool, and a golf course (the 10th within 10 miles of Ivins. Development is surely to occur as Ivins grows, but water consumption on a development of this size poses a huge environmental impact on our water usage. Visitors paying up to a $1000 a night to stay there are unlikely to care about water conservation, and water resources required to maintain another golf course seems wasteful at best. The State of Utah may be eager to sell this land, but to a developer whose investors will likely not be effected by future shortages or restrictions of our water resources, there seems to have been little forethought to Utah's water conservation goals. If find this whole process of rezoning to higher density tends to fly in the face of what Utah Water Conservation expects from the rest of it's residents. Please take a moment to look into this State land and judge for yourself. Asking citizens of Ivins and Washington County to conserve water while our local city representatives assist the State in selling land within our city limits only to squander this precious desert resource is disheartening. Ivins won an award this this year for water conservancy. You might seriously consider taking it back! Thank you for you time!	None of these apply to me	Randy Johnson	Thank you for your comment. However, it is on a very specific situation not relevant to the project.
239	I think this is admirable, but when I see the city of Farmington adding parks and High School with grass in areas that could be zero-scaped, and I was required to grass the park strip in my yard I have a hard time caring about saving water. I also see these public laws watered very liberally. Why should my grass go brown to meet these goals?	None of these apply to me		The aim of the report is to encourage all parties to be more conservative about their watering. This includes institutional users. We acknowledge significant potential among institutional water users but struggle to quantify it on a statewide scale.
240	Thank you for your work on conservation of our water resources. Thank all those that came up with innovative ideas. I also agree with reducing the amount of lawn grass in public and private sectors in Addition to reducing in home water use. I would very much like to see a more liberal view of home gardens for personal food production.and less liberal view of pasture land. It takes six times more water for humans to eat animal products than it does for them to eat plant products. If homeowners were encouraged to grow their own home gardens it could greatly reduce water usage in all areas and reduce the carbon footprint on the planet. Gardens need morning water to prevent mold and frequent water for new seedlings. Therefore regular lawn watering schedules do not work for a home garden. A daily morning schedule is much better. Please consider assisting those who are seeking to reduce pollution in all areas for our planet by growing and consuming local plant food. Thank you!	Business owner	Susan Whiting	Thank you for your comment. Specific analysis of home gardens was not part of the scope of this project but should be a consideration as water providers develop overall policies.
241	Please don't do anything that hobbles our farmers and ranchers unnecessarily.		Jean Corey	The report is meant to only address Municipal, Industrial, Commercial, and institutional water usage. Agricultural uses are beyond the scope of this report. We recognize that future water supplies for M&I uses may come from agriculture, but any supply policy decisions regarding agricultural water are beyond the scope of this study.
242	Utah can do better than this. Our household uses 167 gallons of culinary per day for the entire household of 4 people, which equals 47.6 gallons per capita per day. Incentives for homeowners to hardscape or waterwise landscape along with progressive secondary watering are important to implement. Commercial areas need to be incentivized to hardscape and plant waterwise landscapes. We need to hold people in desert areas to a higher standard. It doesn't make sense for people in deserts to use more water.	None of these apply to me		We can do better - this is the reason for the project. Unfortunately we cannot directly compare ourselves to other places that measure water differently; see response to Comment 6. Also see response to Comment 10 on commercial water use. Many incentives for water-wise landscapes already exist.
243	I believe there should be higher tiered pricing for residential/commercial use that is included to help achieve goals.	None of these apply to me	Daniel Shallenberger	The report recommends an increase in tiered rates to promote water conservation.

No.	Comment	Organization	Commenter	Response
244	I have lived in Washington County since 2002, and have recreated and played in this area since the mid 1970 when I moved to Utah. S Utah is a desert, and a desert that is constructed of volcanic ash and sand. Neither of these substances are great for building on because we also happen to have fault lines running through this area. If the soil isn't contracting or expanding it is prone to slipping and sliding and falling apart. Yet the planning for this county seems not to take any of that into consideration. Also the planning does not seem to take into count that Pine Mtn has been here for a lot longer than man and it has created some pretty stable drainage canyons and basins of it's own, right in the heart of our cities and homes. Water use in this area would easily be available if the homes didn't have grass all around, and people were encouraged to let the desert be their guide to planting their yards. There are plenty of areas that should not be built on in the future and should not have been built on in the past because they are part of those old drainage and containment areas that Pine Mtn dictates. As a population this area should encourage all the desert, drought resistant trees and plants that thrive here to be part of their homes and lives. Watering a cottonwood can use up to 200 gal per day. The water conservancy seems to want that pipeline so badly that they are overlooking the fact that many of our homes are only lived in occasionally. And that seniors use much less water than families with children.	Business owner	Pat Matthews	Thank you for comment. Improved, water-wise landscaping is one of the topic recommendations from the report.
245	Why not look to find other ways to conserve water that then can be used as irrigation water. How about a way to save water downstream and pump it into an irrigation system? How about just planting (and fining those that don't) desert plants. That pipeline will only benefit people that have an interest in making money off of its construction (many may be related to those that chose to spend the money on that pipeline) and many will get jobs after (many may be related to those that chose to spend the money on that pipeline) because of who they are and how they relate to the old base population in the area. This is graft plain and simple, and it has been occurring in many ways long before I got here and will go on long after I leave. But that doesn't make it right. There are so many things that are not taken into account when the planning of this community is based on money alone. Where are the native animals going to go? How is the beauty of this place being destroyed? What is happening to the quality of life of our citizens? When is money going to be the last thing we think of when we destroy this place for a gain for the few??? It's time to realize that S Utah is unique. We are a destination for many but maybe not a place to live for everyone. There need to be limits on places and people if any of us hope to be happy while living here. Encourage people to come and then go back home. You don't see houses being built in the middle of Nation or State parks for a very good reason. Those places would be lost forever! So why not change out thinking about the place we live in, let it be enjoyed by the many and let them spend their money here, that's what the county seems to want, but let them go back home when their done. There is only so much ground, so much clean air, and so much water for this place. We are being greedy to the point where all we seem to be doing is destroying our earth and the other animals we live with. Grow a heart and use your mind to find ways to save this place from the greedy humans that simply want to make money off of it. plm	Business owner	Pat Matthews	Thank you for comment. Improved, water-wise landscaping is one of the topic recommendations from the report. Philosophies on development and growth are not part of this project.
246	We must be sure our goal for water use is not greater than our water supply. The goals are anemic when compared to communities in other states, to what is possible, and perhaps to what will be necessary. Utah ranks worst in the country, and Washington County is perhaps the worst in the state with water use over 300 gallons per person per day - (not counting agricultural use). That's twice the national average and about twice of what water-wise communities in the Southwest use. The proposed goal of 29% reduction (to 237) over the next 45 years is very poor, about .6% per year. We can, and must, do much better, more like a 40% reduction (to 175). This can easily and cheaply be done while still maintaining a vibrant, growing and attractive community.	None of these apply to me	Mar Fibish	See response to Comment 6.
247	Our goals should be at least equal to most areas in the SW outside of Utah! Having lived in WA State, we do more water conservation there with annual rainfalls of 30-60" / year ! This state is a pathetic example of stewardship of the earth.	None of these apply to me	Sheila Brown	This is one reason for the goals - we need to do better.

No.	Comment	Organization	Commenter	Response
248	Rather than whittling at the problem, let's just acknowledge that the lawn is the problem. A perfectly green lawn is a major status symbol in our culture. Over the last few years, I converted my yard from all lawn to all native and food producing plants. While a few people responded positively, I received a number of anonymous complaints (including a nasty letter from St. George City) about "degrading the value of the neighborhood." It took serious social stubbornness for me to reduce my water use, most people would never push themselves that far out of the norm. If we really care about water conservation, then we need to put lush lawns in the same category as fur coats--something to be embarrassed about. Then water use will drop dramatically.	None of these apply to me	Samuel Roth	We agree that lawns can be major water users that should have limited use in water-scarce places. The report strongly recommends new landscaping practices and policies.
249	WE. DO. NOT. WANT. THE. PIPELINE.		Ashlee	The project team thanks you for your comment on this important project. Decisions regarding the Lake Powell Pipeline are outside the scope of this report.
250	Eliminate residential & some commercial natural turf. Establish a rebate program like Las Vegas to change turf to desert landscaping. Make the new reservoir in Warner Valley bigger.	None of these apply to me	DAVID ROMANO	Many communities are already offering turf rebates, and new landscaping practices and policies are a major recommendation of the report.
251	My wife and I think that this level of conservation is far too low as set forth in this document, especially given than Washington County is starting from one if the highest rates of water usage per capital in the country. We should be far more aggressive in conservation particularly when asked to spend unknown dollars on a pipeline that is questionable at best and will certainly have a negative impact on our quality of life here in SW Utah.	None of these apply to me		Thank you. Some feel the goals are too high, others too low. Regardless, we need to start conserving and this report does just that. Also see response to Comment 6.
252	I lived in Los Alamos New Mexico for 25 years until moving to St. George in 2003. New Mexico has averaged 225 gallons per person per day throughout the period I lived there. I was appalled when I moved to Utah to see the water waste occurring though overwatering lawns. We can easily match 225 gallons IF we try as a community to conserve this valuable resource.	None of these apply to me	John C Browne	See response to Comment 6. We agree that saving water will take a community-wide effort.
253	The conservation goals are not as stringent as they need to be in order to maintain our water supply for the projected growth of our community. If we were more aggressive with our goals there would be no need for a pipeline.	None of these apply to me	Ted Carapezza	Thank you. Some feel the goals are too high, others too low. Regardless, we need to start.
254	I agree with your Water Conservation Goals draft when it says Utah still has much to learn and much to do when it comes to water conservation. I agree that water conservation must still be part of the state's overall water strategy, in wet years as well as dry years.	None of these apply to me	Morgan Cloward	The project team thanks you for your comment on this important project.
255	Tell me more. Thanks for working to ensure we have well planned water systems.	Policy leader	Mark Hurd	The project team thanks you for your comment on this important project.
256	Your goal for water reduction in Washington County is 14%, while Iron County 19%. Just based on population , and expected growth, Washington County should be at 19% projected water reduction and Iron County 14%. Your goal for Iron County is misleading since it is primarily farmland, which consumes much more water for crops. The suggested water reduction goal should be 14% instead of 19%.	None of these apply to me	Leonard Correa	Please refer to the report for details of what is considered for each region.
257	I think you should shut down all the bottled water companies in Utah, especially the ones in rural areas like Box Elder Utah	None of these apply to me		Water use should be a consideration when policy makers are considering different types of development. This has already been noted in the report.
258	I note based on date we use in our business that Washington County exceeded the statewide goal to reduce water use 25% by 2025. We exceeded the goal with 30% reduction in water use a decade ahead of schedule. Statewide average is 18%. We are concerned future reductions in Washington County will be more expensive and difficult to accomplish. We should not adopt standards that impact market demand on dictating lot or housing sizes. This should not be accomplished through adoption of regional conservation goals. It also seems that enforcing water use ordinances as recommended in the regional goals would be extremely costly to implement			Washington County has indeed made excellent progress in water conservation and in many ways is inspiring other parts of the state. We agree that future efforts will be more difficult and expensive, but are still worthwhile. We are not dictating lot sizes but acknowledging a already observable trend that needs to be considered in future growth. The report recommends policies and funding to help achieve the goals.
259	It is important for residents to conserve water, and more could be done. But leaders are wrong to place so much emphasis on conservation by residents when they are acting to grow the state population far beyond the amount of water that is available. Money talks, of course, so officials are gleeful to facilitate developers getting richer. But we are losing water and the best farmland in the state to tasteless bulk suburban development. In the process there will be political disruption as people from elsewhere move in and find the social status quo in Utah not to their liking. Tension awaits us.	None of these apply to me		This is an important viewpoint but is beyond the scope of what can be addressed in the report. If current priorities hold, population will continue to grow.
260	The draft of the goals is really ambiguous. There isn't anything that I could find in how each region will participate in the conservation goals. If you really want public comment open your specific goals for each region, that way we can know how much water will be diverted to the Wasatch Front from the Uintah Basin.	None of these apply to me	Glenn Todd	The goals are particularly clear and region's residents, governments, and water suppliers are encouraged to pursue them however they see fit. At the state level, we expect new policies and funding to enable this. The public open houses held in each region (Chapter 2) provided us good insight on the local issues. Water supply is not part of this report.

No.	Comment	Organization	Commenter	Response
261	I am not in support of the proposed Regional Water Conservation Goals. They will require substantial funding, adoption, and enforcement of ordinances which will have a negative impact on housing and our community. Washington County does a great job at water conservancy. Market demand should dictate the lot size. Washington County is already has a lower % of turf compared to the rest of the state. Washington County has grown by 13% from 2010-2015 but water usage has gone down by 9%.			We are well aware of Washington County's example in water conservation. Still, the county and the rest of the state can do better. With supporting policies and funding, we can reach these goals.
262	I think the goals can be reached.	Business owner	Stuart Boyd	Thank you.
263	In my opinion the proposed Conservation Goals are to extreme. As a home builder/developer in Southern Utah we have been able to accomplish a 9% drop in water usage with a 13% growth rate between 2010 and 2015. We were also able to accomplish a 30% reduction 10 years ahead of the 2025 goal. Washington County leads the State of Utah in Water Conservation and will continue to do so. It has been through innovative building and landscaping techniques that we have been able to be successful with water conservation. We are continually looking for new and better ways to do things to further conserve. To force these goals on us at this point is irresponsible and not in the best interest for our area. If the Regional Conservation Board, is so concerned about water conservation they should be looking for ways to have the rest of the state look to Washington County and try to accomplish what we already have. Thank you!	Business owner	James Sullivan	See response to Comment 261.
264	Washington County has lead the charge in water conservancy for decades now, We have local goals and plans in place. I have many concerns about the regional water conservation goals proposed. Reducing the lot size is unrealistic, We live in a rural area, There are many lots exceeding 10 acres in size. The local authorities along with the free market should decide on lot size. Builders have already implemented many changes in building practices to conserve water, As new technology is implemented the market will naturally evolve, And more changes will be made. Placing unrealistic reductions are not possible on homes that are already using every reasonable water conservation technique available. With an affordable housing crisis happening across the country more cost adding regulation is a step in the wrong direction. Investments in Washington county should be made in an effort to support reasonable water conservation, And Water Development to insure the ability for future growth and needs of our residents today.	Business owner	Austin Anderson	See response to Comment 261.
265	Future lot sizes should not be determined by water goals. Grass area can still be limited based on goals, but mandating smaller lots will have unintended consequences. Please don't be this foolish.			This report does not advocate mandating smaller lot sizes. Lot sizes are already decreasing, with or without mandates. We expect this trend to continue. Policies for limiting turf in new construction are recommended (regardless of lot size).
266	Honestly I believe that Washington County is doing a wonderful job of conserving water without further regulation. We have grown and yet our water use is down according to the studies I have read.	Business owner	Chris Warhurst	See response to Comment 261.
267	Until there are severe restrictions to stop lawns from being installed on all new homes, church bldgs., public bldgs., etc., the plan seems anemic. There needs to be incentives for families to convert lawns to desert landscaping---offer rebates or financial assistance for this conversion.		Dan Wood	Such recommendations are already in the report. We recognize the need to limit new turf and encourage landscape conversion.
268	This is very Effective Draft for conservation goals, it should be implemented as soon as possible..	Water professional	Ahmed Suhail	Thank you.
269	Need higher percentage goals.	None of these apply to me	Ket	We still start with these goals and reevaluate later. We hope to exceed the goals.
270	I am all for conservation of water. We will die without it. My heartache is with the thought of having to put in the pipeline so we can allow more people to move in. I do understand that we need more water but this spring and summer when we received so much water and I saw it just go down the drains. I am assuming that the water that goes down our drains is going to the Virgin River which then eventually flows into Vegas. I do not heart burn about that because at least we are capturing it somewhere. But can we keep any of that water for ourselves? I know we have the Sand Hollow reservoir but the water that flows around Greater St George Area goes where? What are we doing to capture more water for our area to help eliminate having to put in the pipeline?			Local water supply and storage issues are not within the scope of the report.
271	The draft looks very thorough. I would urge much more public conservation awareness through public radio announcements on when to reduce outside watering, like Las Vegas does. But the big users, agriculture and industry, must be monitored and given incentives to conserve and not waste!	None of these apply to me	Sheila Smith	The project team thanks you for your comment on this important project. Public education will play a key part in promoting the conservation goals.
272	I think they need to have more of a conservation percentage. .4 is a start but not enough.	None of these apply to me	Randy Lindsey	The conservation goal exceeds 1% per year on a statewide basis.

No.	Comment	Organization	Commenter	Response
273	All new developments, commercial and residential, should have, at minimum, low water toilets. All new commercial development should be xeriscape. Subsidies for grey water systems should be provided by the city, county or state for all residents.	Water professional	Natalie Day	Some of the recommendations are already in the report. New, high-efficiency plumbing fixtures are one of the most cost-effective actions, and we also recommend limiting turf on new construction. Greywater may be a good idea but, along with other supply and reuse issues, is beyond the scope of this project.
274	I am a long-time Washington County resident. I converted the lawn in my front yard to desert xeriscape native plants, and have a drip irrigation system in the back yard, and I cut my previous monthly water use by half. I reviewed the draft regional conservation goals, especially for where I live in the Lower Colorado River South. I support them as far as they go, but I believe that they are too modest. A 14 percent reduction in water use over 11 years seems like baby steps when bolder conservation measures are clearly feasible and necessary. Many other cities and counties in the Southwest have already achieved lower per capita water use rates than the 2030 Utah goal for Washington County. Our state and local officials are so blindly obsessed with building the exorbitantly expensive Lake Powell Pipeline, despite enormous risks, that they have given short shrift to serious water conservation measures that would be much cheaper, more reliable, and less risky. Construction companies seem to be in charge as they see money signs. Those who do lawn conversions or otherwise save water apparently have little political influence. Until this sad political status quo changes, I am skeptical that meaningful water conservation measures will be implemented. For example, our water district has no incentive program for lawn conversions, no tiered water pricing to discourage waste, and uses some property tax revenues that have no correlation with water usage. The current system is broken, but who has the courage and capacity to change it?	None of these apply to me	Richard Spotts	Thank you. Some feel the goals are too high, others too low. Regardless, we need to start. We are aware of the issues in Washington County and this report does not offer an opinion on the Lake Power Pipeline.
275	Kane County and Kanab city have committed a portion of Kannab's pristine water aquifer to a company Southern Red Sands LLC; to an eastern European,Estonian fracking interest, Enefit. This was done with no prior public input in water management and conservation as exemplified by state conservation efforts. I would strongly encourage the Utah state department of natural and water resources and the state water engineer to subscribe to the state of Utah's conserve our pristine water resources, and not the wishes of certain fossil fuel, water and real estate interests. Our public and city aquifers are under attack by private interests which may hamper the ability of small rural cities to protect their necessary drinking and agricultural water supplies.	Water professional	Douglas Dewitz	Thank you for commenting. This has little to do with the project.
276	Any plan that continues to allow water-hungry lawns all over the state is not going to help residential use decline. People who water lawns during the day or by spraying water all over the pavement need to be held accountable. The solution to most residential use problems is very easy: fines. Expensive fines. Water shutoff after a certain quota is reached would be in the public interest, too. Without punishment, most homeowners are going to keep wasting water just because they want a green lawn. Any plan that continues to ignore all of the losses of inefficient agricultural watering practices isn't going to help Utah at all. Most water losses here are caused by agriculture. Open irrigation canals and traditional sprinkler systems lose more water to evaporation than ever reaches crops. We could all replace our water-hungry lawns with rocks and we'd still die of thirst due to old-fashioned farming practices. This plan won't change anything.	None of these apply to me		We do need to reduce our cultural preference for cool-season turf, and many recommendations in the report aim to do that. Restrictions and fines are an option but may not produce long-term results. Instead, we aim for policy change to encourage use of more waterwise options in new construction and be accountable for irrigation efficiency. We also recognize the potential savings in agriculture but those are not in this project's scope.
277	Why didn't you ask city council and present to them this is a bunch of crap based on only 1600 people that is like the city of toquerville telling the state how to water a law. This is not right			Numerous stakeholders from government, research, policy, and water industry participated in this project with involved considerable research and analysis. The online survey was a chance for others to offer their perspectives. The online survey did not determine the goals.
278	The levels suggested are not low enough. I live in Kane County. We need to do much better. Many people say it does not matter. It does. The lake Powell pipeline And it's billion dollar costs should never be imposed upon local or state wide citizens. We need to conserve water!! It is precious in the desert. Kane County should never sell or water to a Frak Sand mine.	None of these apply to me		Thank you. Some feel the goals are too high, others too low. Regardless, we need to start. We are aware of the issues in southern Utah and this report does not offer an opinion on the Lake Power Pipeline.
279	I live in Washington County and I agree that Washington County and the cities within the county could do much more to conserve water. I see much that could be improved with the implementation of some reasonable restrictions. It is hard to mandate water conservation for existing buildings but going forward all new development and construction should have legally mandated and enforced compliance with water wise policies. Historically, Washington County and associated cities have been interested in growth no matter the negative impact rather than planning for the future in an environment with limited water resources and a changing climate. Hopefully, the State of Utah will mandate some responsible stewardship for southwest Utah.	None of these apply to me	Robert Heffernan	Thank you. We can certainly do more. This report recommends, among other actions, significant changes in water policy and practice for new developments.
280	The use of secondary water for urban irrigation should be re-established and financially supported.	None of these apply to me	Karel	Water supply is not within this project's scope.

No.	Comment	Organization	Commenter	Response
281	The state should stop pushing their growth agenda! Slowing growth will provide for better planing and a higher quality of life. Adjust state taxes so to not encourage such large family formation. After all we are reaching the limit of our resources to meet increased population growth. Climate change and growing shortages are foremost caused by increased population growth. We are not in the nineteenth century any longer. Slow down and we will be fine. Keep growing at a unsustainable pace and it will be very a troublesome future no mater how you try to manage it!	None of these apply to me	Donald Watlet	This plan seeks to project water use and goals given the expected population growth, whether it is wise or not. The growth trend is real and must be considered here.
282	I agree with your goal to reduce water consumption. As a couple, we are actively working to manage our water usage. However, reducing turf in residential areas is not the greatest idea, since business and golf courses use so much more than average families use. Being in St. George, I have a very hard time seeing new golf courses built while the city complains that we need to cut back on our water usage. Let's talk when the city decides to put their money where their mouth is. :(	None of these apply to me		Thank you for your efforts. See response to Comment 10. Parks and golf courses can certainly conserve water.
283	It seems like Washington and Kane county could do more. They have the highest rates of any urban area (Wasatch Front, Cache Valley, Southwestern Utah), but they aren't willing to make a big commitment. It seems like if you are asking the state to help you finance a $2 billion project, you should at least show your dedication to the cause by working on conservation as well.	None of these apply to me		The whole state could do more. These goals will help us better manage our water resources.
284	We are still way out of whack! The work done in ALbuquerque is truly amazing - and yes we are a bit different climate and have more water generally but we have so far to go in terms of conservation. We need to create a competitive atmosphere for saving water that celebrates and models the value of savings and increase our water prices to reflect the true value. I'm amazed at how profligate Utahns are in general with water . We're heading the right direction but our usage numbers are pretty huge compared to say Albuquerque NM where they have done an amazing job reducing their water use http://www.abcwua.org/education/pdfs/WaterUseGraph.pdf	None of these apply to me	Liz Haigh	We certainly can do better, which one reason this project exists. Appropriate pricing of water is a main point of the report. Also see response to Comment 6.
285	Ranchers and farmers are the largest users of water and waste the most water. Why are they not included in the conservation plans?	None of these apply to me	Gerald Wahlberg	See response to Comment 118.
286	Without incentives, such as a lower water bill, a nice landscape, or rebates, I think many individuals have a difficult time changing their behavior. I think advertising of resources such as Conservation Garden Park at JVWCD and Utah Water Savers helps	Water professional	Moriah K Jackson	Thank you. Many communities already offer incentives and rebates for certain water conservation activities.
287	Lawns are not evil.	Business owner	David Wright	No, but traditional lawns use a lot of supplemental water in a place where there isn't much and many are overwatered. While this report does not advocate for elimination of lawns, we can be more selective in where and how we use them.
288	Yes, we really need to improve the infrastructure to supply water to our community and not rely solely on conservation. We live in an area that is extremely aware of the need to conserve water and we do a damn fine job at it. The idea of conservation is very important to us and we work very hard to keep our community working towards that goal but the idea that conservation will improve the supply of water to counter the projected growth is simply put, irresponsible. The leaders in the past that have built the facilities that provide our water we use today had the foresight and courage to make the difficult decisions to move projects forward to ensure that we have the water we use today. They understood the need for increasing the facilities that provide water resources for the current generation and we need that kind of leadership again... Leadership to push forward on projects like the Lake Powell Pipeline or replacing the aged infrastructure that exists in Northern Utah.	None of these apply to me	Seth Foster	Thank you. We do appreciate the foresight of past generations in securing our water supply. As the report states, water conservation and water development are both important.
289	These goals are not very realistic and they seem to be getting forced on us by a select few who don't live in Southern Utah and it's kind of a kick in the back, not really acknowledging what strides we've already taken down here with conservation. We're beefing up our infrastructure to support the use of reuse water, only to be told that all water consumption should be reduced along with lot sizes. Who is to say this developer can only build this size of lots because the neighbors just put in this size of lots (all because we have to keep the average lot size down)?	Policy leader	John Henderson	We are well aware of southern Utah's example in water conservation. Still, the whole state can do better. With supporting policies and funding, we can reach these goals. Lot sizes are already decreasing across the state and we have merely included this trend in our analysis; it is not necessarily a mandate.
290	Utility Bills suck in this State. They should be regulated by the State if UTAH to give adequate information for users to make conscious changes in their consumption.	None of these apply to me	Aaron Olsen	Good comment. Smart metering, now being adopted by more and more Utah communities, is enabling better customer feedback to support water conservation. We know this will save water.
291	If the LPP is based on a viable water source, take the people to the water rather than vice versa. Build a model community near Bigwater.	None of these apply to me		While we appreciate the time the commenter took to communicate this viewpoint, it involves policy issues outside the scope of this report. It is expected that efforts will be made outside of this report to address these other policy ideas and examine how they might play a part (along with M&I water conservation) in meeting the state's future water needs.

No.	Comment	Organization	Commenter	Response
292	As a property owner and taxpayer, water, development, use,sustainable development and taxation of that use is very important to the citizens of Kane county and Kanab city.	None of these apply to me	Douglas Dewitz	The project team thanks you for your comment on this important project.
293	Have local government, WCWCD, SUHBA use their own regulations that are already working to conserve water.	Business owner	Building Concepts of So. Utah, Inc.	See response to Comment 291.
294	None of this is new. If we weren't controlled by ranchers, farmer, miners, and power concerns we would be much further along. Some day we will run out.	Water professional	Dennis Hanks	The project team thanks you for your comment on this important project.
295	The chart on page 140 is good for reference. You can make a bigger reduction in the Commercial Water Use and Institutional Water Use right off the bat. Until there is more done to reduce lawns in general you won't see much change in the residential water use especially when it is the lion's share of water being used. I don't see most people changing their indoor habits for very long. The Outdoor use is the key across the board.	Business owner	Brandon Ruiz	We agree with this comment. Outdoor water use is where the greatest conservation potential lies.
296	The question for the state is how do we get to be as efficient as we can with the water we have. The state cannot depend on Colorado River and Bear River as the answer. They don't have any more water to give to the state. It is past time to being taking action. If the state doesn't act it puts the state and its residents in economic peril.	None of these apply to me	Jane Whalen	That is the very purpose of this and other projects.
297	For heavens sake, hide the technical information in the index and make documents legible to the average citizen...else nothing will ever change. Professionals already recognize the problem and are aware of the possible solutions	Business owner	Hailey Wall	We have tried to keep the plan as clean as possible, but other comments have requested the additional data. Including it in the appendices seemed an appropriate compromise.
298	We absolutely have to do better, not kick the can down the road or depend on a shrinking Colorado river to bail us out. We may need a moratorium on rampant development.	None of these apply to me	t bain	See response to Comment 291.
299	We need to be more aggressive on conserving water - it only makes sense!	None of these apply to me	Susan Gordhammer	The project team thanks you for your comment on this important project.
300	The goals set for conservation in our county must be based on the supply of water we already have and those projects already planned without the proposed Lake Powell Pipeline. To set goals too high will not help create a sustainable future for our area. The LPP has not been built and we should not set goals to require that it be built.	None of these apply to me	Lisa Rutherford	See response to Comment 67.
301	Involve the local municipalities, they know more about their areas than they are given credit for. Policy change proposals should be vetted to the local level at the beginning of discussions.	None of these apply to me	Lester C Dalton	Many local entities participated in the project. We encourage local water suppliers and their communities to pursue the goals in ways that are most effective in their area, using their extensive knowledge of water use practices and their own potential.
302	Policy leaders are not representing the "will of the citizens" was it relates to water resources. They are serving developers and rezone to increase city revenues, without the environmental due diligence require by every citizen, every day. If you are only focused on making revenue today, it is truly a disservice to every resident who is being asked to conserve. And, if the State of Utah feels compelled to sell 104 acres in Ivins to a developer in order to build another Resort Rental golf course complex in a saturated market this n Washington County, please don't ask, or expect, the citizens to willing conserve when the State or local government ignores this issue. Set an example and we will follow!	None of these apply to me	Randy Johnson	This comment does not relate to the project.
303	Again, let's all rethink animal agriculture and seek to be more plant based. Also to just be more conservative consumers in general.	None of these apply to me	Susan Whiting	See response to Comment 291.
304	Green is good. Brown is bad. The more we strive to create a dry climate with restriction, the more we impact the global climate. Wise use of all resources is beneficial.	Business owner	Kevin Hansen	The project team thanks you for your comment on this important project.
305	Please take time to listen. I may be one voice but I would like to think that my voice is important.	None of these apply to me	Pat Matthews	We have read, considered, and tried to address all comments received during this process.
306	Gray water systems should be allowed for irrigation use. I was planning to do that when we moved here and was told it isn't allowed	None of these apply to me	Sheila Brown	See response to Comment 291.
307	The water use scales in the survey are useless on an iPhone.	None of these apply to me	Samuel Roth	Future surveys will try to take this into account.
308	My son runs a 10 acre vegetable garden half of which is watered by the Lake Bottom Chanel the other half by a one inch Provo city residential line using a drip tube system. The drip tube system uses little water and the crops do better as they are not poisoned by the chemicals that leach into the canal off the Orem bench. The water is distributed evenly and where needed..	Water professional	Richard C Wilkerson	Interesting. Drip irrigation is an important part of the plan.
309	Expand the use of recycled waste water for irrigation, especially golf courses.	None of these apply to me	DAVID ROMANO	Water reuse may be a good strategy, however it is beyond the scope of this report. Further, the state regulations on this issue are still developing. See response to Comment 291.
310	I used to live in Entrada where there were so many water features that were beautiful but waste water through evaporation. Now I see that new developments are allowing the same practice with artificial lakes - bad policy. We need better leadership on water usage and planning.	None of these apply to me	John C Browne	Agreed.
311	Slow the growth of this community to something that is sustainable and initiate mandatory water conservation rules that will keep us from having to build a pipeline and raise our water rates 4 fold.	None of these apply to me	Ted Carapezza	This report proposes goals based on the expected population growth. Water development is not part of this project.

No.	Comment	Organization	Commenter	Response
312	Conservation can be quickly encouraged by raising water rates to represent the real costs of water delivery to the region. Water efficiency can be incentiveized with discounts and rebates for high efficiency toilets, faucets, shower heads, irrigation timers and water audits etc.	Business owner	Kim Ewers	Both of these conservation actions have been recommended in the report.
313	Educate municipalities on the fact that a canal/irrigation company is their friend.	Policy leader	Mark Hurd	Education will be an important part of these conservation goals.
314	Avoid weaponizing our water rights and water rates by starting a tiered billing system.	None of these apply to me	Leonard Correa	The project team thanks you for your comment on this important project. Tiered rates are already being adopted and a pilot project is underway for "water banks" and "water markets" to facilitate sharing water rights.
315	I love the water conservation DNR icon, it was well thought out	None of these apply to me		Thank you.
316	Developers are too influential in the State's growth plans. Seek more input from farmers.	None of these apply to me		This comment has limited application here as agricultural water use is outside the scope of this study, but has been passed on to DWRe for future planning efforts.
317	Provide conservation goals by region rather than a summary on an overall basis. We need to see the goals To see specifically what the detail is to make the over all goals	None of these apply to me	Glenn Todd	Goals are provided by region.
318	Please do not make our lives harder by requiring over the top water conservation goals when we lead the state in water conservation and we are doing more than our part to live in this arid climate.	Business owner	James Sullivan	The whole state could do more. These goals will help us better manage our water resources.
319	Incentives are the best way to conserve. Smaller impact fees for smaller lots. Impact fee credits for innovative open spaces	Business owner	James Raines	Other incentives have been presented in the report. Impact fee incentives are beyond the scope of this project.
320	Southwest Utah is largely forgotten about in the State Legislature, Especially in Governor Herbert's Staff. The future growth of Utah is in Southern Utah, We need the Lake Powell pipeline. I feel this regional conservation goal is really about stopping the lake powell pipeline. The reality is we do conserve more than anybody in the State. And when we hit a prolonged drought we will be in trouble with out the lake powell pipeline, What are we going to leave our Kids, Water conservative toilets that can't flush since we have no water? Listen to our local leadership and the WCWCD. Follow the legislation that was passed over a decade ago to build the pipeline.	Business owner	Austin Anderson	We are well aware of southern Utah's example in water conservation. Still, the whole state can do better. With supporting policies and funding, we can reach these goals. This report is independent of any water development consideration, including LPP. (Interestingly, some commenters feel that this report is meant to promote, rather than stop, the LPP.)
321	I am a Realtor and very active in my community. I think it is important to conserve water and feel Washington County is doing a great job.	None of these apply to me	Chris Warhurst	The project team thanks you for your comment on this important project.
322	I believe that greed and disregard for maintaining quality of life cause unbridled growth in Washington County.	Business owner	Gary Allred	The project team thanks you for your comment on this important project.
323	Control what is being built, we conserve, the more building permits are issued. The population grows then even more water is used. So the total water used per county. Has it been reduced?	Business owner	Elton Bryant	See response to Comment 291.
324	Building caps throughout the state, especially St. George. Buildings/ homes are not even being finished because materials are so backed up. Stop building new homes.	Business owner	Ket	See response to Comment 291.
325	I am very glad that Utah is waking up to this issue. Other cities/counties have accomplished much more. Utahns just need to change their mindset from grass, water waste, and cheap water rates to achievable scientific sustainability and corporate responsibility.	None of these apply to me	Sheila Smith	This is the goal of this report, and the forthcoming State Water Plan. Thank you for your comment.
326	The group I lead, Conserve Southwest Utah, has been giving detailed feedback for many years, with very little response from our state and local water policy leaders. Processes are very opaque and interaction is extremely poor. Public engagement is not welcome. Policy leaders appear to prefer propaganda to real discussion.	Water professional	Thomas Butine	Thank you for your efforts. We disagree that public engagement is not welcome. The DWRe has been very transparent in this project and hopes to further improve outreach in the future.
327	Don't let Utah be the first state to run out of water.	None of these apply to me	Natalie Day	The project team thanks you for your comment on this important project.
328	I support and applaud your efforts on behalf of greater water conservation, but I fear they may have little positive effect given the sad political realities in Utah. Despite climate change, extended droughts, an over-allocated Colorado River, and past history with wasteful water boondoggles, Utah's politicians appear stuck in the 1950s and obsess over more dams and pipelines to solve water shortages. Our leaders need to wake up, smell the coffee, and realize that the days of Ozzie and Harriet are long gone. We need much more progressive and innovative leadership. Other places have that, and we need to strive for it here too. Thanks for your consideration.	None of these apply to me	Richard Spotts	Thank you. We can and must do better.
329	Water resources impact the majority of the population. Resource use and benefit cannot be "held close" information to be applied in a democratic society. Water in Utah is held in trust for the people of Utah; not for a minority of water and real estate advantage.	Policy leader	Douglas Dewitz	The project team thanks you for your comment on this important project.
330	If you want to continue to drink water to live, then you need to get much more serious about conserving water in this silly state. It's not rocket science, and the solutions aren't difficult.	Water professional		The project team thanks you for your comment on this important project.
331	Increase hook-up fees, development fees, and usage fees. Mandate water saving landscaping, fixtures, appliances, etc. for all new building and development. Become much better at planning and managing growth.	Water professional	Robert Heffernan	Thanks for your comment. Nearly all of these are discussed in the report.

No.	Comment	Organization	Commenter	Response
332	The use of separate secondary outdoor systems such as are in Tucson Arizona should at least be explored for urban areas.	None of these apply to me	Karel	This strategy has been utilized in certain cities in Utah. It is a valuable strategy but its analysis is beyond the scope of this report.
333	DNR is supposed to be protecting our resources... its very frustrating to be constantly suspicious of organizations who claim to defend the environment.	None of these apply to me	Mar Fibish	The project team thanks you for your comment on this important project.
334	The water scale you used was ridiculous. No household uses 10,000 gallons of water per day. Split up the survey with some skip logic so households have a scale that actually matters, while allowing business or industrial users their gigantic scale. Unless if you average 40,000 gallons per month (I don't know how common that is, but it certainly seems ridiculous to me) to an daily use of 1,250 gallons, the scale is really hard to deal with. If I am (based on documented use in my water bill) using 430 gallons per day and I want to lower my water use by 80 gallons per day, there is no way for me to actually convey that.	None of these apply to me		This feedback has been noted for future surveys.