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UTAH GROWING WATER SMART

The Water-Land Use Integration Guidebook for Southwestern Utah

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Utah Growing Water Smart

For more information, see:
Utah Growing Water Smart and **Integration of Water and Land Planning**

Growing Water Smart Program

Growing Water Smart is a joint program between the Babbitt Center for Land and Water Policy, a Center of the Lincoln Institute of Land Policy, and the Sonoran Institute.

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A digital version of this guidebook with hyperlinks is available at:
extension.usu.edu/cwel/utah-growing-water-smart/resources

PREFACE

Utah Growing Water Smart

The Utah Growing Water Smart workshop brings together key community staff and water and land use planning decision makers to help build a more resilient and sustainable water future. The workshop uses a range of public engagement, planning, communication, and policy implementation tools to help community teams realize their water efficiency, smart growth, watershed health, and water resiliency goals.

About the Growing Water Smart in Southwest Utah Funding Organizations

Utah State University Extension Water Initiative Grant Program

Utah State University Extension provides research-based programs and resources with the goal of improving the lives of individuals, families and communities throughout Utah. USU Extension operates through a cooperative agreement between the United States Department of Agriculture, Utah State University, and county governments. Founded in 1914 as part of the Smith-Lever Act, USU Extension plays a primary role in helping Utah State University fulfill its land-grant mission. Though more than 100 years old, USU Extension is as vital as ever, and perhaps even more so, due to the increased diversity and complexity of the issues people encounter today. The integration of teaching, research, and public service enables USU Extension to respond to critical and emerging issues with research-based, unbiased information.

Extension
UtahStateUniversity

Utah State University's Center for Water Efficient Landscaping

The Center for Water Efficient Landscaping (CWEL) at Utah State University is a research and outreach center designed to improve and optimize the efficient use of water for landscape irrigation. Our team conducts research in the areas of irrigation technology and management, plant water use and drought, water wise and native plants, sustainable turfgrass management, and urban water conservation. The Center also delivers Utah's Qualified Water Efficient Landscaper (QWEL) certificate training program, hosts a monthly "Water Well with CWEL" webinar, and is the home of the Water Check and WaterMAPS™ programs. As part of Utah's land grant university, the Center's overall mission is to promote water conservation through environmentally, socially, and economically sound landscape management practices.

Center for Water-Efficient Landscaping
UtahStateUniversity

Washington County Water Conservancy District

Washington County Water Conservancy District, a not-for-profit public agency, was established in 1962 to manage Washington County's water needs. It is charged with conserving, developing, managing, and stabilizing water supplies within the county in an ongoing effort to provide a safe, sustainable water supply for current and future generations. The district was formed at the request of local property owners, who signed a petition authorizing the district to develop and manage the county's water supplies, including taxing their properties to accomplish these goals. During its over 60-year history, the district has significantly expanded its infrastructure, services, and capabilities in an ongoing effort to serve the county's growing population.

Utah Division of Water Resources

The Utah Division of Water Resources is one of the seven divisions housed within the state's Department of Natural Resources. Tasked with planning, conserving, developing and protecting Utah's water resources, the Division earnestly strives to be Utah's water steward. We are committed to meeting future water needs through a combination of multi-faceted solutions that include conservation, efficiency, optimization, agriculture conversion, and water development. Such an approach will help Utah prepare, plan, and sustain its water future.

Additional Partners in Implementing Growing Water Smart in Utah

Babbitt Center for Land and Water Policy

The Babbitt Center for Land and Water Policy, a center of the Lincoln Institute of Land Policy, seeks to advance the integration of land and water management to meet the current and future water needs of communities, economies, and the environment. The Babbitt Center develops tools and best practices to guide decisions through research, training, and partnerships for management of land and water resources. We recognize that water is the lifeblood of the American West and land use decisions are made every day that shape our water future. Coordination of these land and water use decisions is critical for ensuring resilient and sustainable communities.

Western Resource Advocates

Western Resource Advocates (WRA) fights climate change and its impacts in order to sustain the environment, economy, and people of the West. Our team of policy experts, scientists, economists, and attorneys has a 30-year history of working where decisions are made, sweating the details, creating evidence-based solutions, and holding decision-makers accountable. This on-the-ground work advances clean energy, protects air, land, water, and wildlife—and sustains the lives and livelihoods of the West. WRA brings a unique set of skills, knowledge, relationships, and leadership to solving conservation issues in the West.

MESSAGE FROM
UTAH GOVERNOR SPENCER J. COX

"Welcome, Growing Water Smart Workshop participants! Thank you for dedicating your time and energy to address such an important topic for our state. As you all know, Utah is facing immense challenges with our water resources. The extreme drought is causing us to think hard about where and how we can best use and conserve water. We also know that water conservation requires all Utahns to do their part, including all of you - who represent our growing towns, cities, and counties. Your participation in this workshop is essential to making our state more resilient by identifying ways to integrate water and land use planning–two vital and connected efforts in one of the fastest growing states in the country. These next few days will be a lot of work, but I have no doubt that the action plans you develop will put your communities on the path to a more sustainable water future."

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Aaron Fortin

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INTRODUCTION

Utah faces a formidable challenge. We have the distinction of being among the most arid states in the nation and one of the fastest growing. At the convergence of these two realities lies the challenge of providing a secure water supply for our growing population – projected to reach approximately 6 million by 2065[1] – while maintaining environmental health, economic vibrancy, and agricultural productivity.

The fragility of a secure water supply is increasingly evident. In recent years Utah and other western states have experienced the most persistent and driest conditions in recorded history. In the summer of 2022, the **U.S. Drought Monitor** showed most of Utah in either the "Exceptional Drought" (most severe) category or "Extreme Drought" (second most severe) category for extended periods of time, with drought conditions persisting through the fall. The eastern and southwestern parts of Utah faced the Colorado River Basin crisis, where declining reservoir levels threatened power production, mandatory water shortages affected users in the Lower Basin states, and basin-wide water allocation and river operations were renegotiated. In the western and northern parts of Utah which lie in the Great Basin, Great Salt Lake reached historic low elevations. Its decline led to alarming fears over ecosystem, economic, and public health risks.

Other water-related insecurities are also becoming more evident. The winter of 2022/2023 broke snowpack records across Utah, leading to extensive flooding and emergency declarations in various urban areas as the snowpack melted and rivers, creeks and stormwater systems were overwhelmed. Oftentimes urban flood-related damage is the consequence of not adequately protecting riparian and coastal zones or providing for flood retention in land use planning. We are witnessing communities throughout our nation become increasingly vulnerable to extreme weather events, particularly in areas where rapid growth has occurred. While Utah's record snowpack was a welcome relief from drought despite flood risks, analysis indicates that one or several good water years cannot fully alleviate the combined effects of extended drought conditions, the impacts of climate change, and the state's underlying arid region geography and hydrology.

As we face a changing climate coupled with population and economic growth, we must build resiliency into our water and land use planning by taking immediate steps to adjust habits that contribute to growing water scarcity and an increase in water-related land use risks. We must also implement measures to support responsible and sustainable growth.

There is broad consensus that optimizing water use and reducing demand for municipal, commercial, institutional, industrial (M&I), and agricultural water is critical to ensure that Utah's limited water supply can equitably meet

the needs of people, agriculture, the economy, and the environment over the long term. However, the pathway to achieving substantial water conservation includes many challenges as well as opportunities.

One significant opportunity for reducing water consumption lies with integrating water use into land use planning. Too often, land use planning is undertaken independently of water use planning efforts, even though the two can and should inform one another. Traditionally, responsibilities for water resource management and land use planning have been siloed in different levels of government, departments, and management entities. The way that new development occurs, however, can have a major impact on municipal water demand, as well as the health of the communities and watersheds in which it happens. Land use planning that incorporates water use considerations can lead to a more sustainable urban design in terms of the built environment, urban ecology, and lifestyle patterns of cities and towns.

Another significant opportunity lies in integrating land use considerations into water planning. This opportunity recognizes that the earth's water cycle is a closed loop that circulates water between oceans, the atmosphere, and land via precipitation, drainage, and evaporation. Just as the natural environment treats water as a cycle, it is important that communities view their water supply, including wastewater and stormwater, as interconnected and part of their larger watershed. Integrated Water Resource Management (IWRM) is a stewardship strategy that coordinates the development and management of water, land, and related resources, while maximizing economic and social benefits, and minimizing impacts on the environment. A key step in this process is to change institutional structures to strengthen the coordination and collaboration between water supply and wastewater managers, land use planners, economic development managers, and other community and regional officials.

Within Utah, notable key stakeholder processes, authorities, and studies have advocated for the integration of land use and water planning, including, but not limited to the following.

- **Recommended State Water Strategy (2017)**
- **Water Resources Plan (2021)**
- **Utah's Coordinated Action Plan for Water (2022)**
- Utah's Division of Water Resources **Conservation Programs** and **Integration of Water and Land Planning**
- Utah's Division of Water Quality **Watershed Programs**
- Great Salt Lake **HCR10 Steering Group Recommendations** to help maintain adequate flows to Great Salt Lake (2020)
- **Reports and studies** commissioned by the Great Salt Lake Advisory Committee

This guidebook provides background information, community case studies, and numerous additional resources to help Utah communities align their water resource management and land use planning priorities. By doing so, Utah's communities—regardless of their size or geographic location—can shift their focus from supply-side to demand-side water management, promote cooperation to enhance watershed health, and seek opportunities to implement integrated water and land use planning in a custom fit, locally planned manner.

The toolboxes outlined in this workbook highlight some of the most effective strategies communities can employ to manage local water demand. By implementing these tools and strategies, Utah communities can help meet the state's need for reliable, clean and affordable water to sustain thriving communities and businesses, robust agriculture, ample recreation, and a healthy and resilient natural environment as our population grows and we face an uncertain climate future. Measuring and tracking progress toward integrating water and land use will help to ensure your community's success in contributing towards these goals.

Focusing on Demand-Side Water Management

Instead of making costly investments to increase water supply, communities are increasingly reducing demand for water by using existing supplies more efficiently. Growing populations can increase the costs of operating local utilities, accelerate the need for enhanced and expanded water infrastructure, worsen impacts on environmental water needs, and—if the water supply is constrained—increase the cost of acquiring new sources.

In the past, water resource managers and water providers turned to supply side management to meet growing demand by investing in water acquisition, treatment, and storage and distribution projects. However, these options come with a significant price tag and can be time and resource intensive. Recent and projected warming throughout the region also makes the availability and reliability of new supplies less predictable. An alternative to these costly investments is more efficient use of existing supplies. Increasingly, communities are turning to demand side management—an approach that seeks to reduce the demand for water. A demand side approach generally includes:

- **Water Conservation:** Encouraging water users to reduce how much water they use.
- **Water Efficiency:** Encouraging or requiring the use of technology, building, or site designs that use less water.
- **Water Reuse:** Treating or converting gray and black water to replace or augment water supply.

One particularly impactful demand side management strategy is the integration of water conservation, efficiency, and reuse into land use planning. Communities throughout the West have found that by increasing development density, utilizing on-site technological efficiencies (e.g., fixtures, appliances, and irrigation systems), and enacting aggressive conservation programs and policies, they have been able to continue to grow without acquiring new water supplies. Water-smart land use planning can also reduce the negative financial impacts of increased water demand through efficiency and conservation measures implemented prior to, during, and after building construction.

The demand side management approach to water resources is also good for the triple bottom line of financial, social, and environmental outcomes. It increases the cost-benefit ratio of capital investments by using the same amount of water and infrastructure to serve more people per dollar spent, benefits the environment by balancing ecosystem and human needs, and ensures a more sustainable future for our communities through a more resilient and long-lasting water supply.

Promoting Watershed Cooperation

Communities live together within their watershed—a land area that channels rainfall and snowmelt to creeks, streams, rivers, and underlying groundwater aquifers. The amount and quality of water in rivers, streams, and groundwater aquifers depend on activities in the land areas upstream from those sources. Water and land are connected through the geography and hydrology of watersheds, as are the people who use the water and land and share in the benefits and risks that their collective actions have on watershed health. For instance, the Virgin River watershed of southwestern Utah is experiencing rapid growth and development which has placed great pressure on its limited water supplies. The future ability of the watershed to meet the region's water needs will depend on cooperative efforts across communities and water use sectors.

Watersheds integrate natural terrestrial and aquatic ecosystems with human water and land uses. Tensions often exist between preserving the natural environment and developing land for residential, commercial, or industrial uses to house a growing population and promote economic growth. While degradation of land within a watershed comes with societal and environmental costs, careful management yields significant benefits. Holistically managed watersheds can store water supplies, reduce erosion and channel incision, increase infiltration into local floodplains

Photo Credit
Aaron Fortin

and regional aquifers, reduce water treatment costs, and provide habitat, biodiversity, recreation, and aesthetic values. ***Healthy watersheds and resilient natural systems can also help communities cope with increasingly extreme weather events such as droughts, high temperatures, and severe wildfires.***

Fortunately, many measures can be taken to maintain and improve watershed health, both for existing and future development. Factors such as residential lot size, housing density, water conservation measures, vegetation management and habitat protection, and stormwater management all influence the health of a watershed and impact water quality and stream flows. However, to realize the benefits of such measures, communities located within the same watershed must cooperate and work together toward shared goals.

Water and Land Use Integration Opportunities

Utah communities are faced with the challenge of accommodating growing populations, supporting economic development, and maintaining or enhancing quality of life, all while managing increasingly variable and scarce water supplies, infrastructure challenges related to growth, and the impacts of land and habitat degradation.

Regionally shared risks of extreme weather and wildfires also make understanding the interconnectedness of water and land particularly urgent. Across Utah, communities have experienced record heat, devastating fires, dry soils, ongoing drought, and damaging floods in recent years alongside health and economic impacts associated with the COVID-19 pandemic which, in some places, were exacerbated by limited access to safe and reliable water. These conditions have highlighted the need to act now to build community, economic, and environmental resiliency and to address equity concerns associated with access to safe drinking water within communities and across regions and watersheds.

At the community level, each planning and regulatory mechanism guiding how and where a community develops provides an opportunity to consider how to better integrate water and land use in order to reduce future risks and strengthen resiliency. Potential points of intervention to enhance land-water integration are described in Table 1. Determining how and where to intervene will depend on a community's local values and needs, political

motivation and staff capacity, the demand side management initiatives that have been implemented to date, and the community's water-saving goals. The vision and goals defined in general and master plans - and related planning efforts - will guide opportunities in other elements of a local government's water and land use policies and programs.

Table 1. Intervention points, tools, and their purpose for strengthening integration between water and land use.

POINT OF INTERVENTION	TOOL	PURPOSE
Planning and Goal Setting	General Plans	Evaluates local water supplies, current and future demands, and related community and economic values. Establishes goals and objectives for managing the intersection of natural resources and the built environment.
	Water Conservation Plans	
	Stormwater Management Plans	
	Capital Improvement Plans	
	Hazard Mitigation, Response, and Recovery Plans	
Development Policies	Zoning Ordinances, Subdivision Regulations, and Planned Development Policies	Links new development to water supply planning. Determines the requirements applied to new development for water resource management, conservation, and efficiency.
	Water Budgets	
	Demand Offset Programs	
	Building and Design Codes	
	Water Efficient Landscaping Ordinances	
Watershed Resilience and Water Smart Infrastructure	Watershed Planning for Resilience	An integrated water resource management approach helps mitigate the factors that can degrade ground and surface water quality and quantity. Green infrastructure can support these efforts.
	Green Infrastructure and Low Impact Development	
Water Conservation and Efficiency Tools	Conservation Rate Structuring	Empowers and incentivizes landowners and renters to reduce water consumption. Links community-wide programs to water supply planning.
	Post-Occupancy Incentives and Educational Programs	

Measuring and Tracking Progress

Measuring and tracking the results of water and land use integration is vital to determining whether your community's plans and goals are being met. **Growing Water Smart Metrics: Tracking the Integration of Water and Land Use Planning** offers a set of indicators that can be assessed for year-over-year trends to demonstrate

achievement of water savings through land use planning. Ten progress metrics track whether the community's land use plan integrates water efficiency and its water plan integrates land use strategies; conservation-oriented system development charges and pricing structures are being used; indoor and outdoor water efficiency measures are being utilized; and collaboration around development proposals is occurring. Fourteen impact metrics measure increasing or decreasing trends in water demand and use and trends in development patterns and land use.

Guidebook Overview

This workshop guidebook is intended to help communities identify the most appropriate land use related actions that will help them achieve their water resource management goals. It has been prepared for communities participating in the Utah Growing Water Smart workshops and is available to other communities as well. *Since this Guidebook is primarily aimed at community-level decision making and action, we use the more generic word "community" to refer to the municipalities, counties, or conservancy districts with legal authority to engage in planning and policy making for people and businesses within their jurisdictional boundaries.*

The guidebook is divided into four sections.

Section 1: Planning and Goal Setting
Summarizes opportunities to integrate water and land use during planning processes for new and existing areas.

Section 2: Water Smart Land Use and Development Policies
Provides a review of policies and requirements that help a community develop in a water smart manner.

Section 3: Watershed Resilience and Water Smart Infrastructure
Describes water smart infrastructure approaches to protect watersheds, support vegetation and wildlife, recharge local floodplains, and provide community amenities and open space.

Section 4: Water Conservation and Efficiency Tools
Summarizes water conservation and efficiency tools to manage existing community water demands.

Each section includes:

1. An overview that provides an explanation for the utility of each approach and the water saving impacts that can be expected.
2. Toolboxes of specific policy or management actions a community can take to achieve water conservation and efficiency outcomes.
3. Case studies that illustrate how Utah communities and institutions have integrated water and land use planning efforts using the tools described in this guidebook.
4. Approaches and strategies to implement the tools and model policies described.

The Growing Water Smart Resource Appendix at the end of the guidebook provides resources for more information and will be updated as more resources become available.

Section 1

PLANNING AND GOAL SETTING

Overview

Traditionally, water planning and land use planning processes have been conducted in separate departments or agencies with different mandates and responsibilities. Land use planners have focused on how much and what type of growth may take place in their communities, while water resource managers have focused on ensuring adequate water availability.

Comprehensive land use planning, water planning, and capital improvement planning are all interrelated, however, and integrating them requires breaking down traditional planning and operational silos. Done successfully, an integrated water resource and land use management plan can ensure the following:

- A community's vision for the future considers water and growth together.
- Plans for water resource management, community health, capital improvement, and economic development are consistent with both the community's vision for future land use and its goals for sustainability and resilience.
- Development occurs in a way that protects watersheds, including ecological functions, and the quality and quantity of water supplies.

Planning is a continuous process and includes developing and adopting written plans as well as a series of actions to implement, monitor and review, and update those plans. ***Current best practices in planning encourage collaboration among staff in various departments within a jurisdiction, partnerships with other jurisdictions, and robust engagement of all segments of a community.*** It is important to gather input from residents, community organizations, and private sector and non-profit groups in order to build public support for the plans and their implementation.

Goal setting is an important purpose and component of a planning process. A community's future goals are generally shaped by its historical context, affected by current trends and issues that need to be addressed, and guided by its shared values and aspirations. A variety of collaborative processes can be used to create a future vision, define guiding principles, and set goals that will direct and guide community actions toward integrated water

and land planning. Tools such as scenario planning are particularly useful for imagining and choosing between different community futures, offering communities pathways toward more sustainable alternatives in how they use and integrate water and land.

Setting the Foundation for Integrated Land-Water Planning

Planning provides the roadmap for a community's policies, programs, and regulations. Processes such as visioning, information sharing, data alignment, public education and engagement, and regional partnerships serve as the foundation for creating scientifically sound and community-supported plans.

Information Sharing

Land use and water departments often use different data sets and analysis methods in their decision-making processes, such as growth rates to inform future land use or water demand projections. Identifying the discrepancies and understanding the implications of different projection methods can help communities estimate the extent of uncertainty and error in the results. Coordinating around these differences, sharing information, and looking for ways to align data sets and methods will promote consistency and mutual understanding across departments and lead to better decision-making.

Community Engagement and Education

The support of community members and organizations is critical for integrated water and land use planning and implementation. Engaging in planning and goal setting provides community residents with opportunities to provide important feedback, learn from information provided during the process, and build a common understanding of how climate change and land use patterns are impacting water availability and quality. Education or training programs for staff, elected officials, and public stakeholders strengthen support for diverse perspectives and strategies that incorporate water-saving measures into land use.

Regional Collaboration and Partnerships

Some goals are attainable within a single governmental jurisdiction while others may require collaboration between jurisdictions and partnerships with regional organizations, the private sector, and non-profit organizations. Adding partners and coordinating across jurisdictions can identify shared interests, expand resources, and result in collective action strategies with larger impact. Regional committees and partnerships can provide an opportunity for cross-jurisdictional planning around shared and transboundary water resources. These processes offer a way for county, municipal, and water district staff members, as well as stakeholders, to collaboratively study local and regional issues, define desired future conditions, evaluate potential paths forward, and partner on implementation.

Approaches and Strategies for Strong Plans

The following approaches and strategies can help communities implement analytic and engagement processes for producing strong and integrated plans.

- Link water supply and demand to projected land use patterns in both general plans as well as water conservation plans for a more granular understanding of water demands by land use type.
- Reference general plan goals and strategies in the establishment or update of associated land use policies.

- Meaningfully address water throughout the community's general plan elements, especially in protecting water sources and promoting water-conscious growth patterns.
- Link water supply and demand, conservation, recharge and reuse priorities and policies across related plans—including stormwater management plans—to address common resource concerns through a variety of approaches and authorities.
- Set aside land for water-related infrastructure, such as recharge basins and treatment and recovery wells, in future land use maps.
- Use capital improvement plans to ensure investments are made in the physical infrastructure needed for water-conserving management. Such infrastructure includes advanced metering infrastructure, treatment facilities and water reuse infrastructure, and projects that manage stormwater through green infrastructure, infill development, hazard risk reduction, and watershed restoration.
- Increase the strength of community plans with consistency requirements, which require that future plans and zoning codes be consistent with the comprehensive plan.
- Look for confusing or conflicting language, goals, policies, processes, or regulations and take steps to clarify and align them.

TOOLBOX: GENERAL PLANS

General plans, sometimes referred to as master plans, are required of Utah municipalities (**Utah Code § 10-9a-4**) and counties (**Utah Code § 17-27a-4**) and guide how a community will manage future land use and its implications for a wide variety of functions, including transportation networks, parks and open space, natural resources, housing, economic development, and future infrastructure needs. One of the greatest values of a general planning process is that it provides opportunities for a communitywide dialogue about the future.

In 2022, the Utah Legislature passed **Senate Bill (S.B.) 110,** which amended the Land Use, Development, and Management Acts of municipalities (Utah Code 10-9a) and counties (Utah Code 17-27a). It requires municipalities (except cities of the fifth class or towns) and counties to include a water use and preservation element in their general plans by December 31, 2025. The legislation includes specific requirements on what the water use and preservation element must address. It requires general plans to account for the effect of land use on water demand and to integrate the land use element with the water use and preservation element.

S.B. 110 also directs planning commissions to consult with relevant public water systems and to consider regional water conservation goals, applicable municipal water conservation plans, and principles of sustainable landscaping. The planning commission must also make water conservation-related recommendations to the municipal or county legislative body.

Through S.B. 110, Utah joined several other states whose statutes require water as an element in comprehensive/general plans (**Rugland 2022:19**). Integrating water-related goals into one holistic plan or across plan elements ensures that the complex interrelationships between water systems, human systems, and ecological processes are considered together in relation to the land. General plans also offer an excellent educational opportunity for helping a community understand:

- projections for future population and drivers of growth;
- the type and location of development occurring in the community;

- the source, capacity, and conditions of a community's water supply, distribution systems, and water-related infrastructure;
- adequacy, sustainability, and vulnerability of the water supply;
- the health of a community's watershed;
- current community programs and projects;
- tradeoffs that may be involved in achieving the community's long-term goals.

A community can integrate water into traditionally land use-focused general plans by including goals for:

- water supply and demand management;
- wastewater treatment and disposal;
- watershed processes and health;
- floodplain and stormwater management;
- interagency coordination and collaboration.

Water-related goals and policies may be incorporated in a variety of ways in different general plan elements. One way is through the inclusion of a water resources element. Water resource elements can include: (1) the known legally and physically available surface water, groundwater and effluent supplies; (2) the total demand for water that likely will result from future projected growth in addition to existing uses; and (3) an analysis of how identified water supplies will serve projected future water demand and the plans to obtain additional necessary water supplies.

Water resource elements can also address various approaches to secure and preserve community water supplies outside of the state's regulatory roles (e.g., administering water rights and allowable uses, and permitting wells). A water resource plan element could, for example:

- Address concerns about sustainability of the water resource as part of the discussion of necessary water supplies.
- Evaluate conservation as a planning factor in demand modeling, among other things.
- Identify goals and approaches to coordinate and consult among departments and with other relevant entities to secure and preserve community water supplies through a variety of approaches and authorities.

Water-related goals and policies may also arise in other general plan elements, such as policies developed for environmental planning and cost of development, among other elements.

TOOLBOX: WATER CONSERVATION PLANS

Separate from general plans, the state requires water providers with more than 500 connections to submit a water conservation plan to the **Division of Water Resources** at least once every 5 years (**Utah Code § 73-10-32**). Providers with fewer than 500 connections may also submit plans for review, although they are not required. These plans describe existing and proposed water conservation measures that outline how water providers and the end users of culinary water will conserve water so that adequate supplies are available for future needs. The plans also describe

measures that will enable the water provider to meet the state's Regional Water Conservation Goals. Perhaps most relevant to the integration of water and land use planning, the state requires that these plans include information regarding statutes, ordinances, codes and/or regulations designed to encourage more efficient use of water such as water wise landscape codes or water efficiency fixture standards. Given this requirement, Water Conservation Plans also present an important opportunity for cross-department or inter-agency collaboration between water resource professionals and land use planners.

TOOLBOX: STORMWATER MANAGEMENT PLANS

Stormwater management becomes increasingly important as development intensifies and the potential for increased stormwater volume and contamination increases. The state's **Division of Water Quality** requires stormwater management plans from communities to meet the requirements of the **Utah Pollutant Discharge Elimination System** (UPDES) permit system which is mandated by the U.S. Environmental Protection Agency's **Clean Water Act**. Utah's stormwater program regulates stormwater discharges from municipal storm sewer systems (MS4s), as well as industrial and construction activities. Operators of these systems may be required to obtain a UPDES permit before they can discharge stormwater runoff that has the potential for delivering harmful pollutants into local surface waters such as streams, rivers, or lakes. This is an important water resource protection mechanism because water sources with impaired quality may no longer be available for beneficial uses, effectively reducing the quantity of available water supplies.

TOOLBOX: HAZARD MITIGATION, RESPONSE, AND RECOVERY PLANS

Hazard mitigation plans identify and plan for specific hazards likely to impact a community, including acute shocks such as wildfire or flooding, as well as long-term stressors such as drought. These plans outline pre-disaster risk reduction strategies as well as post-disaster response activities. Planning should include determination of how various hazards can impact water infrastructure and how to reduce vulnerability and risks of water shortages. Examples of communities running out of water due to drought are becoming more common throughout the western U.S., including the Utah towns of Scofield, Echo, and Hyde Park. During the drought of 2021, the town of Oakley, Utah stopped issuing building permits for projects requiring new water connections in response to its drought-limited water supply.

TOOLBOX: CAPITAL IMPROVEMENT PLANS

Capital Improvement Plans (CIPs) forecast and match a community's projected revenues and its capital needs over a multi-year period. Planning departments, parks, public works, and water and wastewater utilities often rely on grants and bonds to invest in green and gray infrastructure improvements or new construction. A CIP creates a long-term investment strategy for the infrastructure improvements identified in a general plan, water conservation plan, stormwater management plan or hazard response plan. It ensures that financial resources match community priorities and furthers water infrastructure that builds resilience to climate change and other future scenarios.

Case Study: Ivins City - Civic Engagement

Contributor: Mayor Chris Hart, *Ivins City, Utah*

In Ivins City, Utah, a master-planned community named **Kayenta** sits at the base of towering red cliffs surrounded by sagebrush-covered rangeland. This community, conceptualized in 1979, was developed northwest of St. George City and Santa Clara and there was reportedly not much there at the time.

Photo Credit
Kelly Kopp

From the very beginning, Kayenta was a conservation-minded community, and it had to be. There were no cities close enough at the time to provide services, so a private water system was built. Both structural and landscape requirements in the community focused on integration with the existing landscape, maintaining a true desert aesthetic, and judicious use of available water resources. The Santa Fe-style homes of Kayenta spring from the ground with virtually no disturbance whatsoever of the natural landscapes that surround them. As the nearby city of Ivins grew to has grown, the concepts demonstrated by Kayenta have served as an example of what a desert community can be.

As Ivins Mayor Chris Hart explains, historic droughts are not a thing of the past and actions that the city has undertaken to reduce water use will be critical to the local economy in the years and decades to come. In fact, Ivins City was recognized for its water conservation efforts when Mayor Hart and Public Works Director Chuck Gillette accepted the 2023 Water Conservation Award from Governor Spencer Cox during the October 2023 **One Utah Summit** held in Cedar City. The award recognized the city's success in reducing water use by 38% per capita since 2000, even as the number of residents has increased 105% over the same period.

How has Ivins achieved such success with water use reduction even as it has more than doubled in population? According to Mayor Hart, the key is getting buy-in from city residents. After that, a city council that "gets it" must be elected and that council must also be willing to lead the charge on ordinance debates that promote water conservation over time. Ivins is unique in the state in that both Mayor Hart and the city council are willing to lead that charge, and Ivins is now recognized as having the most stringent water conservation ordinances in Utah.

Mayor Hart certainly benefits from a willing city council, but his primary focus has been on getting buy-in from city residents. Residents have many opportunities to contribute to the political process as it relates to water conservation ordinance development and adoption. First and foremost, by participating in local elections, but also by coming to public hearings and forums and sharing their opinions and ideas.

To solicit input from Ivins' residents, Mayor Hart organizes and holds public meetings he calls "talkabouts". These town hall-style meetings focus on specific topics of concern in the community and the very first "talkabout", in February 2023, focused on water. Held in an auditorium on the Rocky Vista University campus (plus spillover to an adjacent room and online participation), city leaders and community members discussed how to secure the city's water future even as projections show that water will run out in coming decades unless action is taken.

Although initial comments from the audience leaned toward limiting growth to improve future water supplies, the "talkabout" also provided an opportunity for the mayor and city council to explain that limiting or stopping growth would impact the revenue needed to provide public services in the community such as policing and fire suppression. In addition, there could be legal ramifications from developers who might sue the city if they are not able to develop land they have already purchased for development.

In the end, public opinion leaned toward further building the culture of water conservation in the city through less use, reuse, and water recycling. And, as Mayor Hart shared, there is huge neighbor-to-neighbor inspiration for water conservation in Ivins, undoubtedly enhanced by "talkabouts" where everyone's ideas are valued and shared.

Section 2

WATER SMART LAND USE AND DEVELOPMENT POLICIES

Overview

Urban water demand is both a function of household size, income, and lifestyle habits, as well as how we plan, design, and maintain our communities, including their residential, commercial, industrial and institutional sectors. When it comes to saving water, where and how we grow and build truly matters.

Efficiencies may be found in the design of buildings, sites, and infrastructure systems, especially for urban irrigation systems and landscaping. We know that:

- Higher density and cluster developments consume less water than other development patterns.
- High-performing, water-efficient plumbing and building standards contribute to community water savings.
- Newer appliances and plumbing fixtures are more efficient than older ones.
- Water-saving and climate-appropriate plantings, landscaping standards, and maintenance practices consume less and conserve more water.
- Households that conserve water save money for themselves and their water provider, while conserving water for other people and nature.

To use less water, the best development policy is to make water smart development the easiest and most incentivized type of development to build by promoting:

- higher density, cluster development, and infill, especially where infrastructure already exists;
- high water efficiency plumbing, building, and irrigation standards;
- water saving and climate appropriate landscaping standards and maintenance practices.

Putting in water-efficient infrastructure on the front end of development significantly reduces water use for decades. For an example, homes built after landscape regulations in the service area of the Southern Nevada Water Authority used 38% less water than homes built before the area's landscape regulations (**Blanchard 2018:32**).

TOOLBOX: ZONING ORDINANCES

Zoning ordinances are often the cornerstone of local land-use planning and are effective tools that municipalities and counties have to conserve and promote public health, safety, convenience, and general welfare.

Overlay Districts/Zones

Overlay districts are special zoning districts that modify the regulations applicable in an underlying zoning district. Overlay districts may cover one or more underlying zones. They cannot be used to require a use permit that would otherwise be allowable in the underlying district, but they may be used to apply additional requirements for uses permitted on a conditional basis in the underlying zone.

Overlay zones add an additional "layer" that increases or modifies regulations to the existing zoning of a particular geographic area. Though typically used to guide development in specific areas like central business and historic districts, overlay zones are also effective tools for natural resource protection and the preservation of other critical areas. For example, overlay zones may be used to protect working farms and ranches, ridgelines, riparian areas, and groundwater recharge areas, to name a few.

Examples of overlay zones in Utah for protection of water-related areas:

- **Agricultural Protection Areas in Utah:**
  https://ag.utah.gov/farmers/conservation-division/ag-land-preservation/

- **Lehi City Jordan River Protection Overlay Zone**
  www.lehi-ut.gov/wp-content/uploads/2013/09/Chapter-36-B-Jordan-River-Protection-Overlay-Zone.pdf

- **Lehi City Utah Lake Shoreline Protection Overlay Zone:**
  www.lehi-ut.gov/wp-content/uploads/2018/11/Chapter-36-Utah-Lake-Shoreline-Protection.pdf

- **Salt Lake County Foothill and Canyons Overlay Zone:**
  https://library.municode.com/ut/salt_lake_county/codes/code_of_ordinances?nodeId=TIT19ZO_CH19.72FOCAOVZOFC

- **Salt Lake City Groundwater Source Protection Overlay District:**
  https://codelibrary.amlegal.com/codes/saltlakecityut/latest/saltlakecity_ut/0-0-0-66854

- **Sandy City Floodplain Overlay Zone:**
  https://library.municode.com/ut/sandy/codes/city_code?nodeId=COOR_TIT21LADECO_CH21-16FLOVZO

- **West Jordan Drinking Water Source Protection Overlay Zone:**
  https://codelibrary.amlegal.com/codes/westjordanut/latest/westjordan_ut/0-0-0-12777

Cluster/Conservation Development

While most water conservation and efficiency efforts related to land use have focused on outdoor watering and indoor plumbing fixtures, there are considerable benefits to encouraging more clustered development patterns in urban design. Cluster development groups structures together on the most buildable portion of a site, preserving

remaining land for common open space uses and/or managing natural features such as drainage, stormwater, or soil erosion. Research employing urban growth modeling has demonstrated the ability and significance of land use planning decisions to condition the same amount of growth for water sustainability through different spatial layouts on available developable land (**Li et al. 2016**).

Water usage studies have consistently demonstrated that in urban areas, the largest consumption of water is by large-lot, single-family homes where most of the water consumed is used outdoors during spring and summer. Alternatively, higher density development can result in reduced water consumption. Research has demonstrated that developments between 3-8 units per acre achieve the most water efficiency and that even small adjustments to development density can yield large water savings for cities (**Stoker et al. 2019**).

Promoting water-efficient land use patterns provides many benefits in addition to saving water. It can also support the more efficient use of existing infrastructure, protect other natural resources, promote walkability, control flooding, and enhance neighborhood or community vibrancy. Another significant benefit to clustered development is the preservation of larger tracts of agricultural lands and open space through easement, covenant, or deed restrictions.

Strategies for Promoting Water Efficiency in Cluster Development:

- At pre-development review, make rezoning, annexations, and Planned Unit Development (PUD) applications conditional on meeting water conservation standards. For PUDs, this can include requiring a meter at each connection within the development and ensuring that standards within PUDs are the same as the requirements for the public utility distribution system.

  > Planned unit development is a distinct category of conditional use that is intended to promote the efficient use of land and resources, promoting greater efficiency in public and utility services, preservation of open space, efficient use of alternative transportation and encouraging innovation in the planning and building of all types of development.

- Develop plans for future land use that establish designated growth areas, both infill and greenfield, where adequate infrastructure exists for accommodating growth at higher and/or more urban densities.

  > Infill describes the construction of buildings in existing urban areas through redevelopment or use of vacant lots. It is generally employed as a method to reduce urban sprawl. Greenfield development occurs on land that has not been previously developed for any purpose.

- Change the zoning code to permit smaller lot sizes and higher densities by right in designated districts.

  > Zoning code is considered “by right” if the approvals process is simplified and projects receive approval without a discretionary review process, having met required zoning standards.

- Reduce or remove development standard barriers to cluster development, such as parking requirements, minimum lot sizes, and lot setbacks.
- Change zoning code to permit multiple types of residential development (e.g., multiplex, townhomes, apartments, accessory dwelling units) by right in designated growth areas to provide a diversity of housing options.

  > Accessory dwelling units are smaller, independent residential housing units located on the same size lot as single-family residences.

- In designated growth areas, change zoning code to permit cluster and mixed-use development by right.
- In exurban and rural areas, change zoning code to permit and incentivize cluster and conservation development by right.
- Provide incentives for increased densities using development or utility fee reductions/waivers and density bonuses for developers.

TOOLBOX: WATER BUDGETS

A foundational element of water supply planning is the development of a water budget—an estimation of water flows into and out of a system. Water budgets can be applied at various scales: for a single home, for a development, for a single water provider, or for a local government with multiple water providers. At development planning stages, calculating a water budget for buildout can allow a community to carefully craft a vision within the constraints of its anticipated water supplies.

Like financial budgeting, every line item of water supply and demand should be accounted for in a water budget and tradeoffs and opportunity costs should be carefully considered. For instance, such a budget provides guidance for evaluating water demand at the development or site scale. A community that adds water budgets to development review processes and site plans optimizes site performance, conformance with the community's vision, and stewardship of the overall water budget for buildout.

Approaches for Developing a Water Budget:

- **Examine and tailor calculation methodology.**
  The state has developed a **water budget model** to estimate water budgets at the state and basin level for planning purposes, and basin level budgets may be used by counties for planning purposes. The information is used to formulate plans for conservation, demand reduction, repurposing of water use, inter-basin transfers and other planning activities and may provide a basis for smaller-scale water budgeting.
- **Align methodologies and data sources across departments and communities.**
  Different departments or water providers may use disparate data sources or methodologies. Communities that compare and coordinate data and information build a mutual understanding, improve communication, and reduce uncertainty in their projections.
- **Use GIS to connect water billing and land use data.**
  Accurate and granular. information can help inform the development of rate structures and water efficiency programs. This approach helps communities better understand how a rezoning proposal could impact water demand. It also helps them understand and compare the water use patterns and trends of different land uses and densities.
- **Shift units of demand measurement to account for density.**
  Moving from a "per-acre" scale to a "per-unit" or "per-square-foot-of-building-area" scale can help account for increasing density in residential and commercial developments.
- **Set maximum amounts of water allowed for use on outdoor landscaping.**
  A landscaping allocation allows a developer to select plant materials that require watering in amounts at or below the total amount of water budgeted. Separately metering landscape water use increases the feasibility of monitoring landscape water budgets and limiting landscape water use in times of shortage.

TOOLBOX: DEMAND OFFSET PROGRAMS

Water demand offset programs require new development to offset projected water demand either through water conservation in existing development or transfer of water rights. The goal is to have all new development, including the expansion of existing homes or businesses, be "water neutral" in the water supply system. Some communities provide an in-lieu fee alternative. This concept can also apply to offsetting energy, wastewater, air quality, historic preservation, or watershed health impacts.

Approaches to Manage a Water Demand Offset Program:

- Establish an authority to monitor and administer the program.
- Determine the offset ratio. A ratio of 1:1 will maintain the current water supply and demand balance, and a 2:1 mitigation ratio will reduce the ratio of demand relative to supply. Wastewater reclamation projects are more reliable and are given a 1:1 offset value, and supplies created through demand management are considered temporary and are typically given a 2:1 ratio.
- If fee-based, ensure the charge reflects the costs of implementing the offset as well as administrative costs. Costs of developing new supplies are borne by the entity needing to offset demand. Fee schedules can be a flat rate or based on a percentage.
- Require verification of sufficient water supplies and water budgets. Work completed by developers must include documentation and verification by local program administrators.
- Consider the timing of the offset fee payment to allow enough time to procure or conserve water supplies with those fees by the time the development creates new demand.
- Promote infill development by giving priority access for new water supplies to new demands within the existing service area boundary. Maximize development opportunities within the target area before approving development in new regions.

Case Study: Water Demand Offset Policies for Water Neutral Growth

In communities where rapid development is occurring even as future water supplies are uncertain, approaches for "offsetting" the water demands of new development may help to mitigate the effects on total water demand. By offsetting new demand for water, growth can occur in a "water neutral" fashion, conserving existing water supplies for ongoing use.

Water demand offset policies require that developers ensure that their approaches to development do not increase overall water demands. Many such policies for offsetting demand have been implemented in communities across the country, often including on-site efficiency requirements.

The basic components of a water demand offset policy include:

- A condition that triggers the requirement for a water demand offset (e.g., new development and/or expanded use of an existing connection),
- Water demand projection of new development,

- Methodology for estimating savings of on-site and off-site efficiency measures,
- Water demand offset ratio (e.g., a ratio of 1:1 would require 100 percent of the projected demand to be offset, a ratio of 2:1 would require 200 percent of the projected demand to be offset),
- Demand mitigation implementation options, such as:
    - On-site efficiency measures,
    - Off-site efficiency measures,
    - On-site recycled water use, and
    - Possible fee option in lieu of developer-implemented efficiency measures.
- Administrative fees and other costs,
- Verification of demands and implementation of efficiency measures, and
- A rule that ensures demand reductions are permanent.

A sound methodology for estimating the water demand of new development is a key component to the success of water demand offset policies. The ability to calculate credits resulting from savings by related water efficiency measures is also required.

Facilitating growth may be one goal of water demand offset policies. However, allocating savings solely to growth could result in inadequate supplies, particularly if the demand projections are underestimated, and/or the water savings are overestimated. Some water providers may choose to allocate offset water savings to supply storage in order to increase resilience in the face of drought.

National examples of water demand offset policies are listed and described in: **Water Offset Policies for Water-Neutral Community Growth: A Literature Review and Case Study Compilation** by the Alliance for Water Efficiency (AWE). A model ordinance, user guide, offset methodology, and additional resources are also available through AWE's **"Net Blue: Supporting Water-Neutral Growth"** initiative.

*Case Study Example**

A notable example of a successful water demand offset program comes from Santa Fe, New Mexico. The City of Santa Fe, New Mexico began a Water Conservation Program in 1997 that has contributed to a per capita water use reduction of more than 50% since 1995 bringing demand down to 56 gallons per capita per day (GPCD).

A 2002 drought caused the City's demand to exceed supply. The City took aggressive action initiating a rate structure increase, a rebate program, and a water demand offset program. Their water demand offset program gained national recognition demonstrating its effectiveness as a way to meet future demand. The program set requirements for all new development to offset water demand either through conservation in existing development or transfer of water rights to the City. The requirements are as follows.

- For residential development requiring under 10-acre feet/yr and commercial development requiring under 5-acre feet/yr, the water demand offset could be met through conservation.
- For new development requiring greater than this demand, water rights would be required to offset new demand. To help developers offset demand, the City developed a toilet retrofits program.

The program connected willing homeowners who desired a retrofit to developers who could either buy credits from a qualified broker or do it themselves.

This program was so successful that the City nearly maximized its conservation potential. In response, the City updated its water demand offset program. The program includes the creation of a water bank to hold conservation credits for future development and a Water Conservation Credit Program. This program includes:

- the addition of rebates for more types of water use efficient appliances or retrofits of older ones and for outdoor watering equipment;
- a water budget program where a water user enters into an agreement to use less water and the City monitors the usage and pays the customer for the reduction in use; and,
- a "free stuff" program including low-flow faucet and shower heads.

The water demand offset program applies to commercial projects that require 5 acre-feet per year (AFY) or more, residential projects that require 10 AFY or more, and mixed-use projects that require 7.5 AFY or more.

**Santa Fe, NM example adapted from the Sonoran Institute's Growing Water Smart: The Water-Land Use Guidebook for Colorado (2021).*

Photo Credits
Kelly Kopp

Case Study: Desert Color Master-Planned Community

Contributors: Robert Behunin, *Ph.D., Director of Business Services* and Ryan Coates, *Director of Marketing, GWC Capital*

Created in 1994, the Utah School and Institutional Lands Trust Administration (SITLA) is charged with managing 3.4 million acres of state trust lands and generating revenue from these lands to support public schools, universities, hospitals, and other important institutions. In 2015, SITLA released a request for proposals to develop a parcel of land south of St. George and the project was awarded to GWC Capital for the development of **Desert Color,** a 3500-acre master-planned community.

From the beginning, the project benefited from SITLA's conception of the property as a water conservation development and its foresight in installing secondary water infrastructure throughout the property. This foundation, an extension of St. George's existing secondary water system, is one reason that Desert Color will ultimately use 40% less drinking or culinary water than other developments in Washington County. In addition, Desert Color is Utah's first Localscape-certified development. As such, the water-conserving principles of xeriscaping are fully realized throughout the development, including functional use of lawn grasses, low water use plants, and efficient irrigation using secondary water sources.

Early on, some builders had to be convinced that Desert Color's development plans could work. They needed to be sold on the product, the design guidelines, and particularly on the plans for xeriscaping. Some builders were immediately interested while others took longer to accept the innovation inherent in the plan. After a few months of initial work, both builders and consumers recognized the potential of Desert Color and the ways in which all the community amenities could work together to support residents. Today, local, regional, and national builders are working in the Desert Color development.

Initially, the overall community plan included plans for a new golf course. However, in considering the amount of water required for golf course irrigation in relation to the proportion of residents served, GWC Capital reconsidered how to develop community amenities. The need for a community "center of gravity" still existed, but it would not be a golf course. Nor would it be a sports complex once it was determined that this type of facility was not needed in the region. Instead, a 2.5-acre lagoon was built at the heart of the community.

Perhaps not the most obvious choice, the lagoon is actually a visible demonstration of putting low quality waters to beneficial use. A well on the property is the source of water for the lagoon, but the water is brackish and not suitable for human consumption. To improve the quality of the water to levels appropriate for a swimming lagoon, Desert Color built a private water treatment plant. The benefit-cost ratio of the lagoon for the entire community of residents is better than a golf course would have been, and there is the added benefit that fewer residents will build their own private swimming pools.

Another water-conserving aspect of Desert Color is the density of building. Residential density is higher and building lots are smaller than other developments in the region, with even the largest lots not exceeding 10,000 square feet. Instead, the focus of the development plan is on supporting shared community amenities. For example, communal lawn areas, pocket parks, trail systems, nature preserves, and the lagoon all provide social and recreational opportunities that residents no longer need to create for themselves on their individual lots. Centralized management of these areas also increases maintenance efficiency and eases financial and time burdens on individual residents.

In developing Desert Color, GWC Capital had an advantage in that SITLA had the foresight to conceive of a water conservation community and make that a condition of developing that land. GWC Capital communicated early and often with St. George City and the Washington County Water Conservancy District to make sure that Desert Color would fit into the community and fulfill the vision of having "a holistic community built around a plan of connectivity, community, and sustainability" and would accommodate growth in a water conscious way. Close working relationships between St. George's mayor and city council and GWC Capital helped shape the development plan and continue to inform relationships with the community being established there. While the process has not always been easy, early and ongoing communication has helped to build consensus. According to Robert Behunin of GWC Capital, "They now own the plan as much as we own our own plan."

TOOLBOX: BUILDING AND DESIGN CODES

Setting water efficiency standards for indoor plumbing fixtures can reduce residential and business indoor water use. The installation of high efficiency plumbing fixtures is important for managing long-term water demand because fixtures installed today will likely last 20-30 years. A bill was passed during the 2022 legislative session (House Bill (H.B.) 39 regarding State Construction Code Amendments) which updated some of Utah's maximum flow rates for indoor plumbing fixtures to be consistent with **Environmental Protection Agency (EPA) WaterSense** product standards. Toilet maximum flow rates, however, remain comparable to federal standards. Local jurisdictions are not allowed to require fixtures that are more efficient than the state construction code, however, they may elect to incentivize water-efficient plumbing fixture installation through local ordinances and retrofit programs.

Table 2. Water efficiency standards comparison.

	UTAH CODE 15A-3-306(3)	FEDERAL STANDARDS	E.P.A. WATERSENSE PRODUCTS
Residential Toilets	1.6 gallons/flush	1.6 gallons/flush	1.28 gallons/flush
Bathroom Faucets	1.5 gallons/minute @ 60 psi*	3.0 gallons/minute	1.5 gallons/minute
Showerheads	2.0 gallons/minute @ 80 psi	2.5 gallons/minute	2.0 gallons/minute
Urinal	0.5 gallons/flush	1.0 gallons/flush	0.5 gallons/flush

**pounds per square inch, unit of pressure*

Strategies to Implement Plumbing Fixture and Building Efficiency Standards:

- Use green plumbing codes as a guide or adopt a green plumbing code that requires high-efficiency faucets, showerheads, and toilets into the plumbing code.

  Green plumbing codes encourage sustainable construction practices and supplement the **Uniform Plumbing Code** or the **International Plumbing Code**. There are currently two organizations leading the development of green plumbing codes, the **International Code Council** and the **International Association of Plumbing and Mechanical Officials**.

- Adopt building code standards that permit the use of graywater recycling systems.

  In response to the 2002 drought, the Utah Water Quality Board adopted a graywater rule in 2004. However, the initial rule was very restrictive and was revised in 2020 to allow simple gravity-fed systems and expanded applications to include multi-family and commercial properties. **Utah Code § R317-401** defines graywater and places authority for administration with local health departments that may or may not permit graywater systems and use. Where permitted, systems must be designed by a certified professional.

- Adopt building code standards for the submetering of multifamily units.
- Incentivize the replacement of higher water use toilets and faucets with water efficient fixtures through rebates or replacement programs.
- Lower impact fees for developers who meet water efficiency standards beyond the requirements of the building code.
- Link impact fees to water budgets to guarantee that the water demands projected at the time impact fees are paid are maintained over time.
- Manage commercial demand by making water-intensive uses, such as canning and bottling plants, data centers, etc., conditional instead of by right. Issue permits based on regulations to meet water conservation and efficiency standards such as water recycling.

  Salt Lake City code prohibits commercial and industrial uses of water that exceed 200,000 gallons per day (**Salt Lake City § 21A.33.010**). The ordinance was developed in response to ongoing drought conditions and to prevent water-intensive industries such as bottling plants and data centers relocating to the city.

TOOLBOX: DEVELOPMENT REVIEW PROCESSES

The development review process encompasses all the procedures necessary to ensure development applications meet a community's land use regulations. Communities' development review processes may vary, but engaging water providers in the process is an important best-practices strategy to support water resilient outcomes.

Approaches for Integrated Development Review:

- Document the development review process. Identify opportunities to add water conservation managers and other sustainability or resilience experts to the land review process to identify and resolve water-related challenges.
- Promote collaboration and relationship building between water and land professionals. Hold regular water and land use meetings to maintain a shared understanding of the community's strategic vision and priorities.
- Ensure that water-related compliance challenges are addressed and alternative approaches are considered early by involving water managers at pre-application and preliminary plat review meetings.
- Seek review and agreement from water resource departments on final approval of land use decisions.
- Ensure that a development is built, operated, and maintained as stated in the proposal by training site inspectors to recognize and enforce compliance on water-efficient design elements.
- Shape development agreements or planned unit developments (PUDs) to include water efficiency standards, alternative water use, and watershed protection efforts.
- Integrate low-impact development design recommendations into the site planning review.
- Use connection charges, such as impact and other fees, as incentives to guide development to areas with existing or planned infrastructure and to reduce water demand. Connection charges can reflect water budgets and allocation policies. For additional information on designing system connection charges to incentivize more efficient development, see **A Guide to Design Conservation Oriented Water System Development Charges**.

- Promote voluntary, incentive-based programs to implement creative plat designs with open space, water-use offsets, and water efficient plumbing, landscaping, and rainwater harvesting systems (in new builds and/or retrofits). Such incentives can be used, for instance, to encourage developers to exceed the required water efficiency standards.
- Develop a guide to sustainable building and design code alternatives for residents and builders.

TOOLBOX: WATER EFFICIENT LANDSCAPING

In Utah, landscape irrigation accounts for 50-70% of per capita water use and represents a significant water conservation opportunity (**Utah Water Resources Plan, 2021**). In 2022, the state legislature enacted then updated in 2023 code defining and incentivizing water wise landscaping. The section pertaining to municipalities is **Utah Code § 10-9a-536** and the section pertaining to counties is **Utah Code § 17-27a-532**.

Utah code broadly defines water wise landscapes as ones suited to the microclimate and soil conditions of a given location, that have the ability to remain healthy with a minimum amount of irrigation once established, and that use proper and efficient irrigation system designs. In addition, the code prohibits municipalities from enacting or enforcing "an ordinance, resolution, or policy that prohibits, or has the effect of prohibiting, a property owner from incorporating water wise landscaping on the property owner's property."

Municipalities may still require property owners to comply with review processes before installing water wise landscaping, to maintain plant material in a healthy condition, or to follow water wise design requirements adopted by the municipality. Importantly, the code states that a municipality may no longer require a property owner to install or maintain lawn or turfgrass in areas less than 8 feet wide (enabling property owners to change landscaping in parking strips, which can be difficult to water efficiently).

The legislature also enacted **Utah Code § 57-8a-218(16)** in 2022 and updated it in 2023, which addresses water efficient landscaping in community associations, such as homeowner associations (HOAs). This code requires community associations to adopt rules that support water efficient landscaping, including allowances for reduced lawn irrigation during drought conditions (making grass dormancy acceptable). It also prevents HOAs from prohibiting or restricting the conversion of a grass park strip to water-efficient landscaping.

Additionally, during the 2022 session, the legislature also enacted H.B. 121, creating the country's first state-wide turf replacement funding program with an initial appropriation of $5 million to the Division of Water Resources (and supplemented by a $3 million annual appropriation during the 2023 legislative session). In order **to qualify for the statewide rebate program**, municipalities must adopt minimum water-efficient landscaping ordinances for new construction.

Communities working towards water wise landscaping should integrate tools to reduce water demand at the time of new construction. There are many options to integrate landscaping best practices into development codes to encourage water conservation and efficiency. These **best practices** may include requirements like the following.

- Plant materials that are best suited for the local climate and soil conditions.
- Grouping of plants into hydrozones.

  Hydrozones are areas of the landscape that group plants with similar water requirements.

- Limited use of turfgrasses to practical and functional applications, or to a maximum percentage of a landscape.

- Low-flow and efficient irrigation technologies, including drip irrigation, smart irrigation controllers, and pressure-regulating irrigation valves and sprinkler heads.
- Rain sensors with a shutoff mechanism to prevent irrigation during natural rainfall events.
- Soil enhancements and mulching to optimize moisture holding capacity.
- Training for landscape contractors and professionals on water-efficient landscaping techniques and irrigation water budgeting, like the **Qualified Water Efficient Landscaper** (QWEL) training program.
- Model **maintenance standards** and agreements for landscape professionals, architects, contractors, homeowners, and others to use in contracting landscape services.
- A total amount of landscaped area permitted based on lot size percentage or square footage.
- A water budget for outdoor water use, ideally tied to tiered water rate structuring, that sends a price signal to ratepayers.

Since mandatory requirements pertaining to new development significantly increase water savings over decades, the goal of a community committed to water conservation should be to require all new developments and retrofits to meet robust water efficiency standards. Consistency among these standards between communities makes implementation easier for developers and fosters a consistent landscape aesthetic among residents of an area.

Strategies for Promoting Water Efficient Landscaping:

- Adopt **community water efficiency standards** that allow residents to take advantage of **rebate programs** offered by the state.
- Change subdivision codes to include residential, commercial, and public landscaping standards that reduce the use of water for irrigation by regulating:
    - irrigation system efficiency and size of irrigated area;
    - plant materials;
    - rain sensors and/or smart irrigation controllers that adjust irrigation in accordance with local weather conditions;
    - irrigation scheduling (frequency and depth);
    - soil amendments; and,
    - water loss limits.
- Provide incentives for developers to install water-efficient landscapes through reduction of impact fees. For additional information on designing system connection charges to incentivize more efficient development, see **A Guide to Designing Conservation Oriented Water System Development Charges**.

Photo Credit
Kelly Kopp

Case Study: Water Conservation Ordinances in Southwest Utah

Contributors: Doug Bennett, *Conservation Manager* and Karry Rathje, *Communications and Government Affairs Manager, Washington County Water Conservancy District*

In Washington County, UT, water efficiency standards and ordinances are bridging the distance between land use planning and efficient water use to help ensure adequate water supplies for the future. Non-functional turfgrass has been banned for new commercial, institutional, and industrial developments and there are limitations on the amount of grass allowed in newly constructed home landscapes. As Doug Bennett and Karry Rathje of the Washington County Water Conservancy District (WCWCD) put it, "Water is the fuel of our economy and water issues are the single greatest threat to our region's economy."

The process for developing water efficiency standards and conservation ordinances and inspiring community buy-in began in 2021. At that time, WCWCD organized a meeting of the District's member agencies and invited representatives of the state's Department of Natural Resources, Division of Water Resources, and Division of Water Rights to attend. The meeting was professionally moderated by an independent, third-party and audience members were asked to indicate agreement, disagreement, or uncertainty toward a series of proposed water conservation and efficiency measures that could inform standards and ordinance development.

The stakes were—and are—high. The primary water source in the region, the Virgin River basin, is fully allocated and growth continues at an incredibly fast pace. As a result, regional cooperation, as described in **WCWCD's 20 Year Plan**, is essential for supplying sufficient water resources to the region's expanding economy and growing population. Most necessary water efficiency standards and codes were already in place, according to Bennett and Rathje, and the District evaluated existing ordinances to determine what needed to be added. The process was challenging, but consistent and unified standards across the region would optimize use and management of the shared water resource.

Following the 2021 meeting, representatives from each participating municipality met with the county commissioner to consider their water efficiency standards and ordinances. The county attorney then drafted new ordinances for each community, which were then introduced to city councils for consideration and adoption. The District then identified consistent themes among the ordinances and recommended additions. For example, the **state requires certain ordinances** be adopted by communities for participation in landscape transformation rebate programs. Other common elements include:

- hot water recirculation systems;
- WaterSense labeled fixtures;
- Energy Star appliances;
- submetering of multi-unit facilities;
- restrictions on water features including misting systems;
- water budgets for golf courses; and,
- limits on the amount of water used by car wash facilities.

Photo Credit
Candace Schaible

Photo Credit
Kelly Kopp

Case Study: Cedar City Water Wise Demonstration Street

Contributors: Candace Schaible, *Water Conservation Coordinator, Utah Division of Water Resources* and Jake Powell, *Extension Landscape Architecture and Environmental Planning Specialist, Utah State University*

Cedar City is the largest city in Iron County, Utah. Located 250 miles south of the state capital, it is the home of Southern Utah University, the Utah Shakespeare Festival, and the Utah Summer Games. The city has a population of approximately 36,000 and encompasses roughly 20 square miles on the western edge of the Markagunt Plateau in the Cedar Valley. Although the Cedar Valley rests on top of a natural aquifer, the city does not have access to sufficient water supplies at current levels of use.

Rural communities are often physically distanced from the water conservation and demonstration gardens located along the Wasatch Front. However, these demonstration gardens provide tangible examples of how water wise landscapes can look and feel and provide an opportunity for homeowners to gather landscape ideas and inspiration. In 2019, Iron County Extension Assistant Professor, Candace Schaible, wanted to make access to such demonstrations easier for Cedar City residents by installing water wise landscapes in a new suburban neighborhood.

To make this goal a reality, she collaborated with USU Landscape Architecture and Environmental Planning Specialist, Jake Powell, on an Extension Water Initiative grant to help design, fund, and install a water-wise demonstration street in the city. The two brought the idea to the Iron County Home Builders Association and one builder volunteered to take on the project.

Working with local real estate developer, **Alex Meisner Construction**, the team created a series of front yard designs showcasing water-wise landscape design principles and techniques and then installed the designs at nine model home sites. Demonstrating water wise landscape design principles at the model homes has helped provide homebuyers with water wise landscape construction ideas and principles that they may then apply on their own properties.

The nine home landscapes are helping to change the landscape vernacular in Cedar City and more water wise landscapes continue to be installed in the neighborhood. The project includes a **website** that details the landscape designs and will also share water use data from the demonstration landscapes over time. A series of associated courses and resources teaching and reinforcing the principles displayed at the homes is also planned.

Photo Credit
Joanna Endter-Wada

Case Study: Utah Department of Facilities Construction and Maintenance

Contributor: Andy Marr, *Assistant Director of Facilities, Utah Department of Facilities Construction Management*

The mission of the Utah Department of Facilities Construction and Management (DFCM) is to provide professional services to assist State entities in meeting their facility needs for the benefit of the public. The department has jurisdiction over nearly 4,000 state-owned properties and their landscapes including state agency buildings, universities, community and technical colleges, the Utah State Fair Park, and other sites.

In 2021, in response to the ongoing drought, Governor Spencer Cox issued **Executive Order 2021-10** requiring state agencies to follow the Utah Division of Water Resources' **weekly lawn watering guide**. All DFCM facilities complied with the executive order, but the public noticed sprinklers running and green grass on some state facilities, which presented a public relations challenge. In 2022, the state legislature passed **H.B. 121**, adding more robust guidance to the executive order to require turfgrass dormancy at state facilities to help conserve additional water. To meet the requirements of the new legislation, Andrew Marr, Assistant Director of Facilities, DFCM, consulted with Utah State University's **Center for Water Efficient Landscaping**.

Quantitative guidelines for irrigation of state facilities were developed, including only allowing ½ inch of irrigation water applied weekly during spring and fall and 1 inch applied weekly during the hottest weeks of the summer. Slightly higher irrigation amounts were allowed in southern Utah to accommodate a longer growing season and higher temperatures. These guidelines were approved by the Governor's cabinet, and the new requirements were issued to all facilities under DFCM jurisdiction. In addition to the new irrigation requirements, all grounds supervisory staff of DFCM were required to complete the **Qualified Water Efficient Landscaper** training program to learn how to install and maintain their landscapes and irrigation systems for water efficiency.

DFCM has also implemented other processes to facilitate the success of their response to the Governor's executive order and H.B. 121. A database is now maintained for all managers to indicate their compliance with H.B. 121 as well as record any factors that may prevent that compliance (e.g., local city or water district requirements). Monthly meetings provide an opportunity for managers and stakeholders to discuss questions regarding the new irrigation practices and to request funding for water meters, smart irrigation control technologies, rezoning of irrigation systems, and water efficient landscaping to bring facilities into compliance.

Andrew Marr describes DFCM's efforts as an ongoing progression of learning and implementation that is just beginning. "It's time to figure out our process and in the coming seasons our managers will know what to do," he says. "It's more about the buy-in, the common goal and common mission. It's hard to turn the ship around but (by) providing incentives and recognition…we're getting there."

These efforts to reduce water use across state government facilities is intended to show Utahns that every level of government needs to do their part and contribute to statewide efforts to reduce water use.

Photo Credit
Aaron Fortin

Section 3

WATERSHED RESILIENCE AND WATER SMART INFRASTRUCTURE

Overview

How we manage all forms of water, from stormwater to wastewater, impacts both the built and natural environment. Approaches that incorporate an **Integrated Water Resource Management** (IWRM) methodology into building, site, subdivision, and infrastructure standards can protect ecosystems, enhance watershed resilience, and harness the utility of all forms of water. An IWRM approach can help to mitigate the factors that can degrade ground and surface water quality and quantity including:

- pollution from urban and agricultural runoff and natural disasters like floods and wildfires;
- sedimentation due to soil disturbances, vegetation loss, and erosion from road construction and new development;
- destruction of riparian areas due to development and changes in climate;
- increased amounts of stormwater due to increases in impervious surface area from development;
- decreased or lost water infiltration resulting from increases in impervious surface area and more rapid runoff; and,
- variability in water supplies caused by drought.

Municipal and county governments are also tasked with providing necessary public services within their jurisdictions, which may involve community-scale water, wastewater, sewer, and other infrastructure and improvements. Such infrastructure development usually occurs over many years and depends on local goals, development and buildout needs, and sufficient revenue and financing. Water smart approaches like green infrastructure can provide several additional benefits to traditional 'gray' infrastructure, such as recharging local floodplains, supporting vegetation and wildlife, providing community amenities like open space, mitigating urban heat island effects, and protecting watershed health and resilience.

Green infrastructure describes a range of measures that use permeable surfaces, plants, and soils to keep stormwater onsite, thereby reducing flows into community sewer systems or to nearby surface waters.

Gray infrastructure describes engineered collection and diversion systems designed to move stormwater away from the built environment.

TOOLBOX: WATERSHED PLANNING FOR RESILIENCE

Landscape scale changes resulting from both human and natural forces have a significant impact on natural ecosystems and water resource availability. Safeguarding available water resources through watershed protection standards and policies is an important but often overlooked goal of communities in the western U.S. Watershed planning and protection has often been considered a function of collaboratives and nonprofits working with local, state, and federal agencies to restore ecological processes and functions. However, the way communities develop and redevelop can either escalate threats to our watersheds or nurture nature and enhance the ecosystem benefits that watersheds provide.

Watershed planning for resilience focuses on minimizing negative impacts as new development occurs. Watershed protection goals should be included in a wide variety of community plans, such as comprehensive plans, emergency management plans, watershed plans, water resource management plans, and open space plans. Converting these planning goals into concrete policy implementation in development codes is essential to prevent watershed degradation and enhance community resilience.

Approaches for Enhancing Watershed Resilience:

- Map all sensitive areas including wetlands, riparian corridors, infiltration zones, water supply watersheds, groundwater basins, and natural disaster-prone areas, such as flood, drought, and wildfire areas.
- Adopt plans for wildfire mitigation, watershed management, stormwater management, and floodplain management that designate sensitive areas and goals for mitigation. These community plans should reference each other so that priorities and objectives build on and reinforce each other and the natural and built environments are viewed holistically.
- Limit development in sensitive areas by clustering homes within a smaller geographic zone, incentivizing infill development in less sensitive areas, and providing low impact design standards/guidelines.
- Create zoning districts with lower densities and/or cluster development to protect surface and groundwater sensitive areas.
- Adopt development standards for stream buffers and setbacks to protect water quality. Adopt vegetation protection standards that minimize disturbance to vegetation within the riparian corridor.
- Adopt stormwater management and site design standards that utilize best practices for low impact design to reduce storm event runoff and increase water infiltration.
- Adopt site level soil erosion mitigation standards for new development to reduce sedimentation and run-off and protect water quality from land disturbances.
- Adopt surface and/or groundwater standards and protections to minimize contamination of streams and shallow aquifers and protect existing and potential sources of drinking water supplies.
- Participate in collaborative efforts to preserve hydrologic and ecological functions through watershed restoration projects.

Communities should identify the top multi-benefit and integrated strategies and projects, then implement these projects ahead of less integrated proposals (unless crucial urgency demands otherwise). Policies, plans, programs, and projects should be monitored and evaluated to determine if the expected results are achieved, and to improve future practices.

TOOLBOX: GREEN INFRASTRUCTURE AND LOW-IMPACT DEVELOPMENT

Green infrastructure uses the natural ability of permeable surfaces to absorb stormwater.
Low-impact development (LID) includes the retention or restoration of natural hydrologic patterns by using landscape and site design to keep as much rainwater as possible from leaving the site. Instead of designing a site or streetscape to funnel stormwater off-site as fast as possible, green infrastructure and LID approaches use vegetation, porous materials, rain gardens, and detention basins to reduce stormwater runoff and encourage the onsite infiltration of stormwater.

COMMON WATER SMART INFRASTRUCTURE TECHNIQUES	
APPLICATION	**DESCRIPTION**
Bioretention basins, stormwater harvesting basins, and rain gardens	Small to large scale planting areas within the hardscape containing shrubs, trees, and grasses.
Bioswales	Shallow and uncovered channels that induce meandering and are placed inline within a drainage channel.
Curb extensions and chichanes	Traffic calming measures which widen the sidewalk and/or narrow the street for a short distance and allow for additional stormwater retention area.
Curb openings	Drainage inlets that divert stormwater into bioretention basins.
Detention ponds	Basins that provide flow control by collecting stormwater runoff.
Permeable pavement, gravel, or pavers	Methods of paving that allow infiltration and can be used in low to moderately trafficked areas like sidewalks and parking lots.

Green infrastructure provides communities with many benefits, both direct and indirect.

- Direct benefits are included in the following features.
    - Native and adapted plants may be used to revegetate channels and basins and survive with naturally occurring rainfall once established, thus reducing the need for outdoor irrigation.
    - Stormwater that is retained onsite and not used by plants is cleaned as it recharges into the ground, thus reducing stormwater runoff and peak flooding, diminishing pollutant loads downstream, and lowering the risk of sewer overflow.
    - Additional vegetated areas in a community can help to mitigate heat impacts by providing shade, sequestering carbon, and absorbing solar radiation in urban neighborhoods.
    - Compared to other types of traditional or gray infrastructure for stormwater management, green infrastructure is more affordable to install and maintain.

    - Particularly in shallow groundwater areas or near riparian areas, increased stormwater infiltration can improve water quality and restore watershed health and other natural hydrologic functions in urban areas.

- Indirect benefits include:
    - Increased public safety due to reduced flooding, improved emergency vehicle access, and reduced property damage;
    - Expanded landscaped areas that produce more oxygen, cool neighborhoods, and reduce energy consumption;
    - More attractive neighborhoods that foster pedestrian and cycling activity, reduce traffic speeds, and enhance feelings of safety;
    - Job creation through installation and maintenance of LID and, indirectly, landscape industry jobs (plant production and sales).

Strategies for Implementing Water Smart Infrastructure:

- Preserve regional open space by clustering development, thereby maximizing unpaved areas for stormwater retention.
- Consider the potential to use stormwater recapture for a centralized urban natural open space. Conveying this water to a common area or neighborhood park may enhance aesthetics and other amenities of your community or neighborhood.
- Incorporate water holding areas into the landscape, such as dry creek beds, recessed athletic fields, ponds, cisterns, and other features.
- Adopt development standards for stream buffers and setbacks to protect water quality.
- Design all aspects of landscaping—from the selection of plants to soil preparation and installation of irrigation systems—to reduce water demand, retain runoff, decrease flooding, and recharge groundwater.
- Use permeable surfaces for hardscapes whenever possible.
- Work with transportation and civil engineers to update development standards and to map streets and areas that have the highest flood potential, as well as the widest setbacks where there will be room for tree plantings.
- Use green infrastructure for traffic calming, beautification, and placemaking. Consider placing green infrastructure along areas where vehicle speeds need reducing or where bicycle and pedestrian traffic is more concentrated.

  Placemaking is the participatory process of creating places where people want to live, work, play, and learn.

- Connect infrastructure and improvements in the capital improvement plan with relevant goals and policies adopted in the general plan.

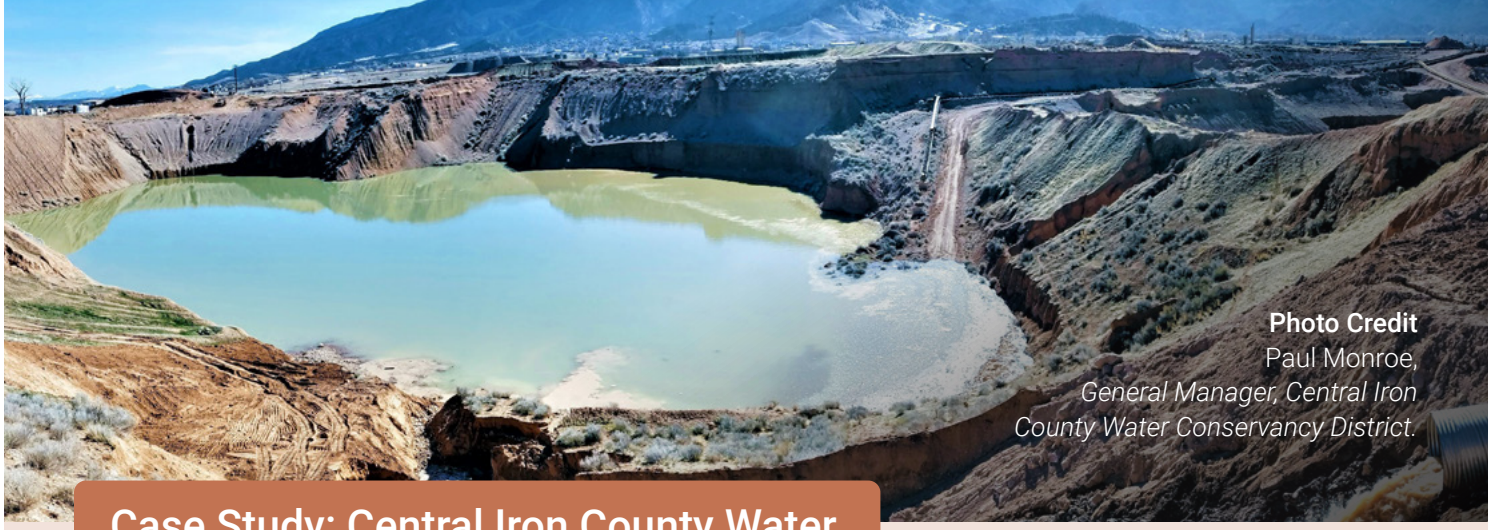


Photo Credit
Paul Monroe,
General Manager, Central Iron County Water Conservancy District.

Case Study: Central Iron County Water Conservancy District Aquifer Recharge

Contributors: Paul Monroe, *General Manager* and Jessica Staheli, *Public Relations and Conservation*

In accordance with **Section 73-5-15** of Utah Code, the state engineer may regulate groundwater withdrawals in specific groundwater basins by adopting a groundwater management plan. The primary objectives of such a plan are to limit groundwater withdrawals to safe yields, to protect the physical integrity of aquifers, and to protect water quality. Such a **management plan** was adopted for the groundwater basin of the Cedar City Valley in Iron County on January 11, 2021.

Prior to implementation, studies had determined that average annual groundwater withdrawals in the Cedar City Valley exceeded safe yield amounts, making the basin a critical management area as defined by state code. Safe yield of the basin was estimated at 21,000 acre-feet per year while average annual depletion was 28,000 acre-feet per year. Therefore, a reduction of 7,000 acre-feet per year was required to balance the basin's recharge and depletion amounts.

With the strong motivation of the state's groundwater management plan and recognition of the fact that Cedar City Valley is a closed basin, **Central Iron County Water Conservancy District** set out to address safe yield concerns through aquifer recharge projects. Paul Monroe, General Manager of CICWD, emphasizes that collaboration and partnerships on many levels have been critical to the success of recharge projects in the basin and everyone's contributions and contributions were needed to meet the requirements of the Cedar City Valley Groundwater Management Plan.

When the District was first approached by the state engineer in 2016 about safe yield concerns, additional studies were recommended to determine a path forward. However, one District board member strongly urged the District to forego additional studies and instead use funds for actual projects to address the problem. Private, public, and state partnerships were formed, grants were solicited, and the effort began with a single aquifer recharge experiment.

Efforts started small. Flows of 5-10 cubic feet per second were taken from Coal Creek and transferred to the Western Rock gravel pit. There were challenges, but the learning process happened quickly. Over time, 6 additional recharge projects have been implemented across the District's service area at the Schmidt Pit, the Airport, Horse Alley, Quichipa Lake, Enoch Graben, and Quichipa Creek.

Each of these recharge areas has evolved and grown over time to include improved diversions, automated valves, and flow sensors to quantify the amount of recharge water going in as well as the recharge rate. And, as of June 2023, 20,000-acre feet of water has been stored through these local recharge projects.

Photo Credit
Kelly Kopp

Case Study: Green Infrastructure at Our Village Community Center in Moab, UT

Contributor: Jeff Adams, *Founder and Principal, TerraSophia LLC*

On August 20, 2022, Moab, Utah experienced an unprecedented rainstorm that led to a 100-year flood. The total amount of rainfall attributed to the storm ranged from 1 to 1.5 inches, but close to 1 inch of that amount fell within a 20-minute span. The rain fell southeast of town, draining county and Bureau of Land Management land into Mill Creek, a typically small creek that originates in the nearby La Sal Mountains and meanders through the heart of town.

Moab was unprepared for the amount of destruction and property damage that a storm of this magnitude would cause. In some cases, detention ponds that had been designed to blow out under previously approved plans and flood neighbors did so and in other cases, detention ponds that had been designed to retain stormwater blew out and flooded neighboring properties. A wall of water rushed down Main Street, flooding businesses. Desperate cleanup efforts were launched as Labor Day, the busiest tourism weekend of the year, quickly approached. A lack of integrated land and water use planning was on display.

Though many neighborhoods and businesses were devastated by the flood, others not only survived the storm, but did so without any damage. One of these properties was Moab's **Our Village Community Center**. The Center, a local non-profit located on a 5.5 acre farm in the heart of town, runs a pre-school and childcare center as well as many other community-focused programs.

In the spring of 2020, Annie Thomas, director of the Center, reached out to Jeff Adams, founder and principal of TerraSophia LLC, to address a legacy of stormwater runoff from an adjacent property, a tourism-related business. Drainage from that business's roofs and parking lot had often flooded the farm buildings now occupied by the Center. The Center had recently completed an extensive remodeling project to bring its facilities up to code to be used as a daycare center and the continued flooding put its mission and goals at risk.

Annie and Jeff developed a project to intercept the sheet flow of stormwater using three basins and swales that intercepted the flow and then poured from one basin into the next. A shallow rolling dip in the Center's access road allowed overflow from the basins to cross the road and enter another series of basins on the other side, ultimately draining to one of the farm's fields.

TerraSophia staff led the backhoe and rock work and volunteers transplanted plants salvaged from the local middle school renovation. In all, the project required 3 or 4 days of machine work, 5 or 6 days of rock work, and hours of planting, mulching, and irrigation work. **Bee-Inspired gardens** and shrubs were also installed to add beauty and privacy.

The Center's green infrastructure system has served its purpose well, even during the August 20, 2022 flood. Stormwater has been redirected to soak into the Center's grounds, and most of the donated plants are still thriving.

In the spring of 2022, a second phase of the project installed gentle earthworks around a new heritage tree orchard on the property. Now, when one of the city's nearby storm ditches overflows and floods the property, the water is directed around the orchard, successfully joining with the initial green infrastructure project to move excess water offsite. Ongoing maintenance is the new focus; some puddling that has started to occur on the access road will be addressed by the addition of gravel and cobblestones.

One month after the 100-year flood shocked the Town of Moab, there were still large debris piles and layers of sand and mud in some areas. However, the Moab community rallied, and the city and state have worked effectively together to support the citizens and businesses affected by the historic event.

The storm in August 2022 highlighted weak areas in the city's planning processes and a lack of water and land use integration. The county has since reviewed stormwater management codes, specifically maintenance practices, to ensure that gray and green stormwater infrastructure is appropriately sized, built, and maintained, and that existing code is enforced.

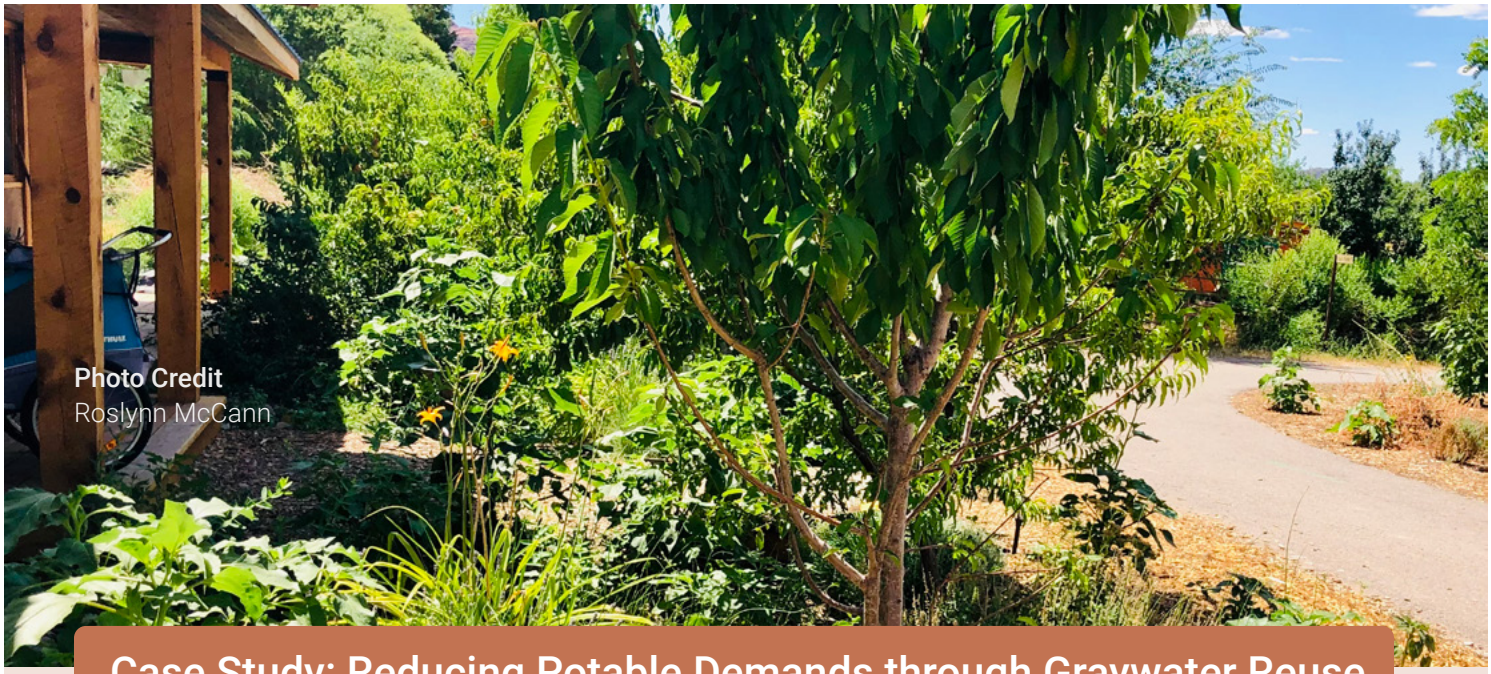


Photo Credit
Roslynn McCann

Case Study: Reducing Potable Demands through Graywater Reuse

Contributors: Roslyn McCann, Professor and Extension Sustainability Specialist, Utah State University and Jeff Adams, Principal of Terrasophia, LLC

After attending a graywater workshop in Albuquerque, New Mexico in 2014, Dr. Roslyn Brain McCann, USU Extension Sustainability Specialist, returned to Utah excited to install a residential graywater system in the home she was building in Moab. However, she was soon frustrated by the state's strict requirements which specified that graywater systems needed to include a holding tank, pump, filters, and engineered plans, which seemed excessive for a simple residential system.

With the help of Jeff Adams, Principal of Terrasophia, LLC, and Orion Rogers, Environmental Health Director of the Southeast Utah Health Department, she began planning for a gravity-fed graywater system in her new home.

In 2016, she received the first permit in the state for the installation of a residential graywater system as a pilot program. The goals of the installation were to demonstrate to state authorities that residential graywater systems are an effective approach to reduce the use of culinary water for outdoor irrigation and that graywater is a valuable water resource that may be used safely. If successful, the pilot project would result in a revision to the state's graywater policy to allow simple, gravity-fed residential systems.

In Utah, graywater is defined as water drained from bathtubs, showers, bathroom wash basins, and laundry washing machines. Simple, gravity-based graywater systems route this water out of the home directly into mulched landscape areas. Systems are sized according to the type and number of fixtures plumbed or the size of the home. Design considerations for these systems include: the size of the discharge area, pipe size and slope, the number of water outlets and mulch shields, and the depth of the gap between the bottom of water outlets and the top of mulch shields. In addition, best management practices for residential graywater systems include prohibition of human contact with graywater, prohibition of ponding, runoff, and/or spraying of graywater, prohibition of contact with the edible portions of plants, and prohibition of biologically or chemically hazardous materials (i.e., bleach) in home fixtures prior to drainage of the water outside the home.

The site context of residential graywater systems must also be considered and include integration of the system with other landscape features and uses, elevations and grading, water sources, and plant water requirements. Differences between the plant water requirements of mature plants and the graywater supply must also be considered, although landscape plant water requirements may be fine tuned to match the graywater budget of the residence.

Dr. Brain's home gray water system has been a resounding success and is still operating effectively 7 years after installation. As a result of the success of the pilot program, in 2020, the state updated Utah Administrative Code R317-401-1 regulating Graywater Systems to allow Tier 1 and Tier 2 gray water systems. Tier 1 systems are simple, gravity-fed residential systems and Tier 2 systems are anything larger than single or multi-family residential units. The code also requires that graywater installers hold an active Onsite Systems Certification and that an operations and maintenance guide be developed for the graywater system, both for the homeowner and when home ownership changes.

To permit residential graywater systems, local health departments must "opt in" to the new code. Determining whether a local health department has done so is the first step toward facilitating residential graywater systems in local jurisdictions. If a local jurisdiction has not "opted in", Dr. McCann advises that a signature campaign can be an effective approach in support of the change.

Resources

Gray Water Webinar: https://youtu.be/WEfppCoKbLk

Gray Water Fact Sheet: https://digitalcommons.usu.edu/extension_curall/805/

Relevant Utah Code: https://adminrules.utah.gov/public/rule/R317-401/Current Rules#

Section 4

WATER CONSERVATION AND EFFICIENCY TOOLS

Overview

A community can grow water smart from the start by establishing water conservation, efficiency, and reuse in all stages of new development and redevelopment, as covered in Section 2. Programs that encourage, inform, financially incentivize, or require consumers to reduce water demand in existing developments also play an important role in achieving community water conservation goals and promoting a continued focus on water wise use. Strategies to promote conservation progress in existing as well as new development is important for equitable allocation of scarce water supplies within communities.

Conservation and efficiency programs can promote efficient water use by:

- helping consumers invest in and manage efficient fixtures, appliances, and irrigation systems;
- sending a price signal to encourage water conservation;
- monitoring and communicating data about water usage to consumers;
- limiting summer outdoor water use to specific days and times or to certain quantities of use; and,
- educating community members about the importance of reducing water waste.

Conservation rate structures may be implemented to signal inefficient water use to customers. Drought water rates or use restrictions may also be implemented in times of emergency to address acute shortages.

Communities may approach rate structures and changes to those structures in many ways. Salt Lake City's Department of Public Utilities, for example, conducts a full rate study every 6 to 8 years to assess the fairness and fiscal soundness of its water rates. A rate advisory committee composed of a diverse group of community members conducts the study, which is then evaluated and approved by the Public Utilities Advisory Board. The city's current increasing block rate structure increases the cost per unit of water as water use increases to encourage use efficiency.

Other communities may implement drought water rates or restrictions in times of shortage. In 2022, for example, Riverdale City implemented drought water rates to both encourage water conservation and to meet the financial requirements of the city's water system (**Administrative Order No. 2022-01**). In addition to an increasing block rate structure, the city restricted the number of irrigation days allowed per week, including a time-of-day restriction. Indoor use reductions were also implemented.

TOOLBOX: CONSERVATION RATE STRUCTURING

Water providers set rates to collect the revenue they need for operations, infrastructure investments, and to protect public health. Once a revenue goal is identified, providers can develop a rate structure to meet additional objectives, including water conservation and acquisition of supplies. The state code also requires water retailers to establish increasing block rates for culinary water as use increases and to provide information on those block rates and individual customer water usage in customer billing notices (**Utah Code § 73-10-32.5**). Prioritizing conservation and mitigating water demand can reduce water provider expenses by sizing water supply acquisition or storage to the lower level of demand.

Water rates are determined by two factors: fixed and variable costs. The fixed costs of water are determined by the costs of water acquisitions and the costs to establish, operate, and maintain the infrastructure to convey, treat and distribute the water. The variable costs are based on the amount of water that consumers use.

The adoption of water conservation rate structures can help water retailers:

- reduce daily peak usage;
- reduce seasonal peak usage;
- reduce total system demand.

Consumer water conservation does not create financial strain for a utility if the offset demand allows new customers to be added to the system while maintaining overall water use with existing supplies. If it is possible that customer conservation may present a revenue challenge, community leaders can engage with the public to design solutions and rate structures that reflect the community's values and needs. Lower demand pressure can result in considerable cost savings over time by reducing strain on water system infrastructure, delaying the need for maintenance, retrofits, or infrastructure expansion.

Conservation-oriented rate structure options include:

- **Drought demand pricing:** rates are higher during drought periods;
- **Excess use:** rates are higher for above-average water use;
- **Inclining block rates:** rate per block increases as water use increases;
- **Different indoor and outdoor rates:** indoor and outdoor water use is tracked with separate meters and rates for indoor use are lower than rates for outdoor use;
- **Penalties:** customers are charged for exceeding allowable water usage limits;
- **Scarcity pricing:** the costs of developing new supplies is added to water bills;

- **Seasonal pricing:** water rates are higher during the season with the most demand;
- **Sliding scale:** the unit price increases based on an average consumption;
- **Spatial pricing:** water rates are determined by the actual costs to supply water to specific locations;
- **Time-of-use:** water rates are higher during peak days of the week or specific hours of the day;
- **Water Budget:** block rate is defined for each individual customer based on water budgets calculated for that customer.

Approaches to Conservation Rate Structures

- Develop a utility water conservation plan to clarify water conservation goals.
- Conduct a rate assessment to determine rate structuring options.
- Develop a rate structuring plan and conduct community education and outreach to solicit input from customers, gain community support and minimize opposition to potential rates increases.
- Adopt a conservation rate structuring strategy.

TOOLBOX: POST-OCCUPANCY INCENTIVES AND EDUCATIONAL PROGRAMS

Both land use entities and water providers can engage consumers and provide incentives and education on the benefits of efficient water use in their homes and businesses. Technology like advanced water meters and sub-metering can help tailor post-occupancy interventions.

Conservation Rebate Programs

Incentive programs can be a useful way to reduce current water demands for both residential and commercial properties and water users. They can serve as a complementary way to involve current residents and post-occupancy developments in implementing water smart building and design features. Providing rebates for homeowners and businesses to remove water-intensive landscaping and retrofit water-smart plumbing fixtures is a well-tested tool that can generate meaningful water savings.

Approaches for Conservation Rebate Programs:

- Offer rebates to residents to install low flow plumbing fixtures such as toilets and showerheads, appliances such as high efficiency washing machines, and “smart” home water monitors to reduce indoor water use.
- Offer rebates to residents and commercial customers for weather-based, “smart” irrigation controllers, high efficiency sprinkler heads, and to replace high water use landscapes with low water plants and efficient irrigation systems to reduce outdoor water use.
- Use rebates or grants to incentivize HOAs to install water efficient landscapes, irrigation systems, and controllers in common areas that they maintain. These areas are often a significant percentage of landscaped area in HOA developments and often can achieve savings through working with the professional landscapers who maintain those areas.

- Establish a rebate program for multi-family residential buildings that have cooling towers to upgrade their conductivity controllers.

  Cooling tower conductivity controllers monitor the electrical conductivity of the water in the tower. If the water's conductivity exceeds a set point, a "blowdown" process is activated and water is released. Carefully controlling the quantity of blowdown water provides a significant opportunity for water conservation in these systems.

Water Metering, Audits, and Leak Detection

Water customers, including commercial, industrial, and residential users, may not be aware that water leaks and inefficient fixtures may be unnecessarily increasing their water use. While water providers may perform their own system-wide water loss audits, they can also support and incentivize customers to do the same.

Water metering is a method of measuring water consumption. Advanced metering technology, also known as "smart metering," eases the data collection process and increases the specificity and frequency of the water use data for individual locations. This increased granularity of information creates the opportunity for easily justifiable rate structures, rapid leak detection, and customized demand management programs. Utilities that pair metering and water use rate structures report a 15% to 30% reduction in water consumption.

Privately purchased metering devices are also growing in popularity because they connect consumers to their water data in real time. In the absence of utility-wide advanced metering infrastructure (AMI), encouraging consumers to purchase their own water monitoring devices may achieve similar water demand reductions at individual properties.

Furthermore, sub-metering multi-family, commercial, and outdoor uses can provide data granularity to empower refinement and optimization of water policies, rates, and fees. The value to a utility of this information may be worth more than the cost of installing extra meters, while the value to its customers is more transparent billing that can aid them in reducing their water bills and tracking their own conservation success.

Metering and corresponding audits and interpretation can identify opportunities to modify water-consumption behaviors. They can also detect leaks in the system and signal when infrastructure updates are necessary to mitigate water loss.

Approaches for Water Metering, Audits, and Leak Detection:

- Deploy leak detection equipment, such as specialized meters temporarily attached to the main meter, in scenarios where low staff capacity limits on-site visits.
- Offer landscape audits (or Water Checks) that recommend watering schedules, infrastructure upgrades, and drought-tolerant plants.
- Offer audits at no cost to customers or pair it with an incentive, like a free fixture.
- Encourage community participation by providing water audit results of public buildings as examples that demonstrate potential water saving outcomes.
- Use the aggregated analysis of audit results to identify potential code and policy changes.
- Update codes to allow individuals to install privately purchased metering devices on the utility meter and provide guidance on how to attach them in a way that avoids disturbance to utility operations.

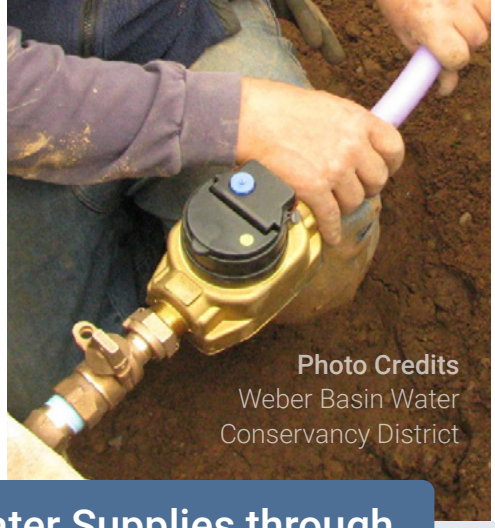


Photo Credits
Weber Basin Water Conservancy District

Case Study: New Water Supplies through Secondary Metering in Weber Basin

Contributors: Darren Hess, *Assistant General Manager for Operations,* and Jon Parry, *Assistant General Manager for Strategic Initiatives, Weber Basin Conservancy District*

In 2022, the Utah Legislature passed H.B. 242 followed by amendments though SB 251 in 2023 (**Utah Code 73-10-34**) which requires water meters be installed by 2030 on all new and existing pressurized secondary water systems. They also appropriated $250 million in ARPA funding for grants to help operators of those systems comply with the requirement (**Utah Code 73-10-34.5**). The Legislature took this action based on documented success of water savings from metering secondary water. In 2023, an additional $18 million was appropriated for the Secondary Water Meters Program.

Utah has approximately 260,000 locations statewide that use secondary, untreated (non-potable) water for irrigation of lawns, gardens, parks, and landscapes. In many areas, this secondary water is attached to urban properties that previously were agricultural land. In the land transition process, treated culinary water was provided for indoor use, but untreated irrigation water was provided through secondary systems for use on outdoor landscapes, primarily as a cost saving measure to the providers and users. In Utah, secondary water often comes from Bureau of Reclamation storage projects. Properties receiving secondary water have water allotments for the amount they can use and property owners are assessed fees for these allotments on their property bills. Approximately 85% of all locations with access to secondary water were unmetered in 2022.

The success of secondary metering as a water conservation strategy was originally demonstrated by **Weber Basin Water Conservancy District** (WBWCD), which has the largest contiguous secondary water system in the United States. Many areas with secondary water had piped and pressurized delivery systems for years, but the district's challenge was finding the right technology to meter "raw" (untreated) water. When functional secondary water meters became available in 2009, WBWCD planned and implemented their first retrofit projects, installing approximately 1,100 meters between 2011-2013 in three neighborhoods where they retail secondary water. The aim of WBWCD was to determine if water use was within the property allocations, educate users on how water they were using compared to the needs of their landscape, and eventually charge people for water use using a tiered water rate structure to incentivize conservation. By 2022, the district had metered approximately 14,000 locations and had documented reductions in use of approximately 20-30% compared to unmetered areas and compared to use when the secondary meters were first installed, according to Jon Parry, WBWCD's Assistant General Manager for Strategic Initiatives.

The key to WBWCD's conservation success in metering secondary systems is its approach to sharing meter information with users through **secondary water use reports** and near real time access to their water usage via the District's Customer Portal. Developed in conjunction with the WaterMAPS™ program in the Center for Water Efficient Landscaping at Utah State University, the reports use a landscape water budgeting approach to show water users

how much water they are applying to their landscapes in comparison to how much water their landscapes need. This information, individualized to each property, informs water users of their ability to reduce overuse or waste, which has been a powerful educational motivator for landscape water conservation. WBWCD provides these reports monthly from May-October to help users track the efficiency of their water use and conservation success.

"We learned you can't just meter the water, you have to educate the consumer, and we are seeing some significant water savings as a result," said Darren Hess, WBWCD's Assistant General Manager for Operations. He noted, "This is really the largest water supply project we have. Every gallon we save is another gallon that can be stored in our existing reservoirs for the next season, which helps with future uncertainty in water supply." Saved secondary water has also helped WBWCD delay additional water supply projects and provide water for environmental flows to Great Salt Lake.

Other cities in Utah that implemented secondary metering prior to the recent legislation and availability of grant funding showed similar success in reducing water use. Saratoga Springs implemented secondary metering to address overwatering of landscapes that was serious enough to cause flooded basements and damage to homes, as well as to be fiscally responsible in avoiding costs of other more expensive water supply infrastructure. Saratoga Springs, Spanish Fork, and Santaquin have seen water savings of 25-50% through metering. They provided implementation advice to other communities undertaking metering in a spring 2022 Utah League of Cities and Towns **training session**.

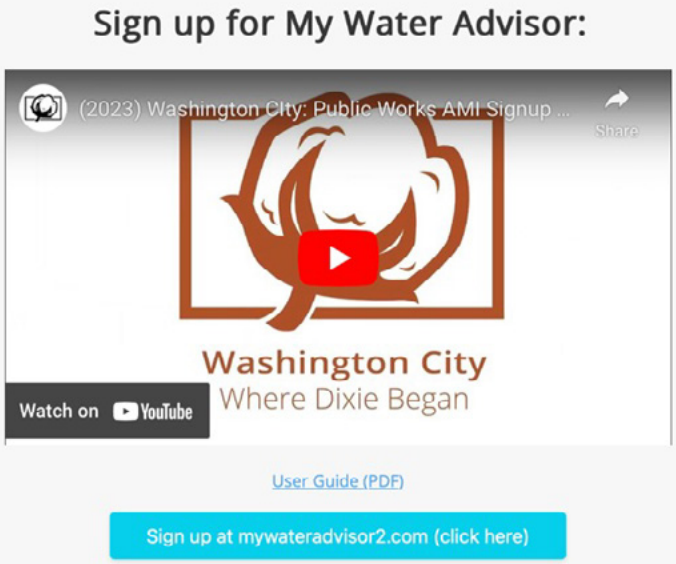
WBWCD is realizing additional conservation programming benefits from secondary metering. Programs for indoor and outdoor water efficiency are somewhat distinct, and metering on dual systems helps the district determine an appropriate amount of water for each type of use and refine the delivery and assessment of their water conservation programs. The secondary meters also enable WBWCD to monitor for leaks and use of seasonal allocations and alert customers, provide flexibility in implementing watering restrictions, and find opportunities to financially incentivize customers to use less than their full allocations. WBWCD is promoting low water landscape alternatives on new development throughout the District's secondary retail service area, which would result in lesser allocation volumes being contracted and lower annual assessments for that water. In West Haven City, WBWCD is incentivizing developers to adopt low water landscapes by reducing the amount of water they have to turn over to the district to be served through secondary systems.

As of the end of 2023, the Board of Water Resources has allocated all $250 million of state appropriations for secondary irrigation system metering projects through grants to water conservancy districts, irrigation companies, municipalities and other water users. Other avenues for funding implementation of metering on secondary systems are still available. See the Utah Division of Water Resources **webpage** on Secondary Irrigation System Metering.

Case Study: Automated Metering Infrastructure in Washington City, UT

Contributors: Mayor Kress Staheli and *Assistant Public Works Director* Lester Dalton *of Washington City, UT*

In 1857, Brigham Young established a Cotton Mission in the southwestern corner of Utah and Washington City–named for the first U.S. President George Washington–became the home of the state's first cotton mill. Today, this thriving city of more than 30,000 is ranked #1 in the country as the "best small city to start a business" by Wallethub



and commercial growth keeps pace with a quickly growing residential population. It is noteworthy that the top three cities in this national ranking are in Southwest Utah, with St. George and Cedar City ranked second and third.

In a region with limited water supplies, however, both commercial and residential growth require the most efficient use of available water. Washington City is now also known as the first in the state with advanced metering infrastructure (AMI) for 100% of its residential water users. Advanced metering infrastructure integrates smart water meters, communication networks, and data management systems, facilitating monitoring of water usage and communication between utilities and customers. The city began its transition to AMI 9 years ago. As standard automated meter reading meters failed, the city replaced them with AMI. Today, there are 14,000 residential AMI meters installed in the city and efforts are underway to transition commercial properties as well.

Installing AMI meters was the first step in the process. In 2021, the city requested a propagation study from its meter provider, Master Meter, Inc., to locate and install the radio towers and repeaters needed to support data collection from the city's AMI. Once the study was complete and the cost for the towers and repeaters was determined, Assistant Public Works Director Lester Dalton requested city council approval for the installation of the towers and repeaters on city property. On April 1, 2023, the system was completed and launched for utility customers.

One day ahead of launching the system for the city's residents, on March 31st, Washington City's Utilities Department pulled leak alarms for meters registering more than 7 gallons per hour of use for 24 consecutive hours. The results were "mind blowing". Seven hundred gallons per minute–more than 1 million gallons per day–were leaking from the city's water system on the customer side of the meters! Because the leaks were on the customer side of the meters, the utility continued to receive payment for the water, but the primary goal of water conservation was not being met. Since then, the utility has actively reached out to customers with leaks, contacting them to make them aware of the issue.

According to Mr. Dalton, "There's not a better conservation measure to put in place than AMI." The technology empowers the city's utility customers to better understand their own water consumption patterns by providing hourly water use data. The associated smart phone-based application may also be configured to provide leak alerts in the case of continuous water flow through the meter for 24 consecutive hours. "Customers want to conserve, but they may not know that they have a leak or how much water they're actually conserving," says Mr. Dalton.

Today, the city has red, yellow, and orange leak alerts–depending on volume–and the alerts are delivered to customers through the MyWaterAdvisor smart phone application. On the city's internet home page, there is also a link with additional resources for residents to support AMI data use and adoption of the application, including a video tutorial for setting up the app and leak alerts. The city has also received grant funding through the Utah Division of Water Resources and the Washington County Water Conservancy District to support customer communications.

For other communities considering AMI, Mr. Dalton recommends being ready with policies to back up the effort. Typically, AMI is focused on making billing easier but there are other potential benefits to having detailed water use data. Washington City found out that there were many leaks in the city's water system by using AMI but had to consider how to address them in the city's code of ordinances. Title 7, Chapter 1 on "Water Use and Service" addresses water waste, however, the original concept for the "Rules" was to address sprinkler overspray and other visible water waste. Advanced metering infrastructure extended understanding of water waste to leaks that are most often not visible.

"We'd like to have 100% adoption of the [MyWater Advisor] app and leak alerts," says Mr. Dalton, "so we'll see how we're doing in a year. People need to have an idea of what they're using. Can I skip an irrigation day every week? Can I do that all summer long? That can result in a lot of savings, but they can't change what they're not aware of."

For more information on Washington City's AMI system and My Water Advisor, see:
https://washingtoncity.org/services/publicworks/water/ami

TOOLBOX: CONSUMER EDUCATIONAL CONSERVATION MESSAGING

There are many ways for planners and water providers to reach consumers with conservation messaging. Utility bills often include an educational insert or other content to inform the reader about policy changes and to encourage water savings with tips and tricks. Some may include warnings and fear-inducing messages designed to curb water use. However, these messages often miss the mark because people tend to defend themselves from fear or negative self-images by ignoring these messages or rationalizing why the new information does not apply to them. Instead, studies show that messaging techniques that promote a sense of control, offer social incentives, provide immediate rewards, and are framed positively are more effective in changing behavior.

Approaches for Compelling Conservation Messaging

- Help your customers feel they have control or influence. Provide tangible acts or decisions they can make to "move the needle" toward a goal.
- People generally want to be either the same or better than their peers. Offer comparisons or share high compliance figures (e.g., "Nine out of ten residents follow these irrigation best practices to save water.").
- Near-term rewards make people feel good. This reward structure can even motivate behavior changes that relate to long-term goals or outcomes that are not immediately visible. The reward can be external or intrinsic.
- People are more likely to believe and act on positive rather than negative information. So, when given an opportunity to describe a trend, note progress toward goals.
- People can also be motivated to contribute to larger neighborhood, community or regional goals when they understand the mutual benefits their own and other people's actions can achieve and when they are convinced that people are contributing in ways that are fair and equitable.

Photo Credit
Kelly Kopp

Case Study: Red Hills Desert Garden

Contributor: Ryan White, *Garden Manager, Red Hills Desert Garden, Washington County Water Conservancy District*

In the spring of 2015, Utah's first desert conservation garden opened in St. George, UT as a cooperative venture between Washington County Water Conservancy District (WCWCD), the City of St. George, and the Virgin River Program. Featuring more than 5000 water efficient plants, a 1,150-foot stream, a replicate slot canyon, and dinosaur tracks found onsite, the Red Hills Desert Garden promotes and exhibits the toughest desert plants available for use in ornamental landscapes in the region.

Beautiful plants, semi-shaded walkways, and educational exhibits are certainly highlights of Red Hills Desert Garden, but the true objective of the garden is to normalize the look of desert landscaping in the eyes of the community. More than half of the plants in the garden are native to the southwestern U.S., including the Mojave and Sonoran Deserts, but plants from every continent are also on display. All plants in the garden are meant to demonstrate resilience in the face of periodic drought.

The garden is relatively young, however many of the shrubs have reached maturity and the trees are well on their way. Ultimately, most of the garden will be shaded by the trees as they mature. The trees also produce wide-ranging levels of shade, depending on leaf shape and density, and most allow enough filtered sunlight to support the plant canopy below. In time, much of the garden will be shaded in some way.

Public perception of the garden has also exceeded expectations, according to garden manager Ryan White. And though it was initially controversial due to cost, Red Hills Desert Garden has become a major asset to the community as well as a popular tourism destination. The landscape aesthetic of the community is also shifting in response to the garden's demonstration of beautiful, water-wise design and plant materials.

The development community in the region has also responded positively to the garden. Local homeowner's associations have sought out guidance from garden staff to update their landscaping standards and landscape designers can often be seen walking clients through the garden to choose plants. Other developments promote the garden as a local amenity and share its social media posts with residents. Signage throughout the garden identifies each plant and includes QR codes that connect visitors to more information.

The garden relates to the community in other ways as well. Local Parade of Homes tour homes are presented annual water efficiency awards from the garden and WCWCD. Winners are chosen based on implementation and demonstration of local water efficient landscaping standards with beautiful designs and water wise plant choices.

Photo Credit
Dennis Hinkamp

Case Study: Salt Lake City Turf Trade Program

Contributor: Stephanie Duer, *Water Conservation Manager, Salt Lake City*

Salt Lake City is the largest metropolitan area within Utah and the Salt Lake Valley. The city has a population in excess of 360,000 (plus 150,000 daily commuters) and encompasses approximately 110 square miles within the lower Jordan River Basin. Commercial and industrial users in the city receive half of water deliveries and residential and institutional users receive the remainder.

Salt Lake City's Department of Public Utilities has a variety of outdoor water conservation programs for its customers that focus on different landscape topics. These programs include **best management practices** for water efficiency in the landscape, landscape and park strip **plant lists**, irrigation and landscape **evaluations/audits**, planting and landscape maintenance guides, and **virtual water conservation garden** tours. The city also participates in the state's **Flip Your Strip program**, which incentivizes the removal of lawn from park strips with a $1.25 per square foot rebate. Related to turfgrass water use, the city has also developed an innovative conservation program, **SLC Turf Trade**.

Following a 2020 utility master plan update, which evaluated indoor and outdoor water use, the city determined the need to decrease outdoor irrigation from a city-wide average of 38" to 24" annually to meet conservation goals. Additional evaluations of the city's landscapes and water use characteristics by the **WaterMAPS™** and **Water Check** programs indicated that 68% of the city's households were overwatering, presenting a significant opportunity for reducing outdoor water use. The city was already taking a multi-faceted approach to landscape water conservation but needed a program to assist those customers who wanted to reduce their water use but still needed functional and practical turfgrass areas. In 2021, SLC Turf Trade was born.

In cooperation with **USU's Center for Water Efficient Landscaping** and the **Turfgrass Water Conservation Alliance**, a customized blend of turfgrass seed was developed for the program and packaged for sale by the city. The grasses needed to have the color and quality of standard Kentucky bluegrass lawns, good pest and disease resistance, and—most importantly—a drastically reduced water requirement. Salt Lake City's seed mixture uses 30-40% less water than standard varieties. **Educational videos** demonstrating the process for transitioning an existing lawn to the low water use seed were created. The videos were filmed at the city's Concord Lift Station, which was planted and established with the seed in the fall of 2021, and still serves as a practical demonstration of the value and aesthetics of using alternative turf grasses today.

ADDITIONAL RESOURCES

Section 1: Water Supply & Demand, Planning and Development

State of Utah: Water Plans and Data

Utah's Coordinated Action Plan for Water

A collaborative effort from Governor's Office of Planning & Budget, Governor's Office of Economic Opportunity, Department of Agriculture and Food, Department of Environmental Quality, Department of Natural Resources, and Colorado River Authority of Utah; Full Report released November 2022.

Plan available at: **https://gopb.utah.gov/waterplan/**

Water Resources Plan (Utah State Water Plan)

Utah Department of Natural Resources, Utah Division of Water Resources; December 2021

Plan available at: **https://water.utah.gov/2021waterplan/**

Utah's Regional M&I Water Conservation Goals

Utah Department of Natural Resources, Division of Water Resources; November 2019

Report available at: **https://conservewater.utah.gov/regional-water-conservation-goals/**

Utah's Open Water Data

Utah Department of Natural Resources, Division of Water Resources

Includes extensive visualized and downloadable publicly available data related to Municipal and Industrial Water Use, Water-Related Land Use, Water Budgeting, an online Water Resource Map Gallery, and More Water Data Resources.

Website: **https://dwre-utahdnr.opendata.arcgis.com/**

Washington County: Land and Water Plans and Reports

Washington County, Community Development

Washington County land use planning resources and zoning information, including the county General Plan, Resource Management Plan, and interactive maps.

Website: **https://www.washco.utah.gov/departments/community-development/**

Water Efficiency Standards

Washington County Water Conservancy District; October 2023

See: **https://www.wcwcd.gov/wp-content/uploads/2023/10/WaterEfficiency-Standards-Oct-2023.pdf**

20 Year Plan to Secure New Water Supplies for Washington County, Utah

Washington County Water Conservancy District; July 2023

Plan available at: **https://www.wcwcd.gov/wp-content/uploads/2023/07/20-Year-Plan-071023.pdf**

Washington County Water Conservancy District Water Conservation Plan

Washington County Water Conservancy District; Updated July 2021

Plan available at: **https://www.wcwcd.gov/conservation/plan/**

General Land and Water Planning Resources for Sustainability

The Comprehensive Plan: Sustainable, Resilient, and Equitable Communities for the 21st Century

By David Rouse and Rocky Piro

Published in 2022 by Routledge (New York) as part of the American Planning Association (APA) Series on Planning Essentials. Available through APA, Amazon, or other book sellers.

Net Blue: Supporting Water-Neutral Growth

Alliance for Water Efficiency

A suite of resources designed to help communities grow sustainably through a water demand offset approach. Includes a research report, User Guide, Model Ordinance, Offset Methodology and example ordinances.

Available at: **https://www.allianceforwaterefficiency.org/resources/topic/net-blue-supporting-water-neutral-growth**

A Guide to Designing Conservation-Oriented Water System Development Charges

By Western Resource Advocates and Raftelis Financial Consultants, May 2018

Report available at: **https://westernresourceadvocates.org/publications/a-guide-to-design-conservation-oriented-water-system-development-charges/**

Resources for Integrating Land and Water Planning

From the Utah Department of Natural Resources, Division of Water Resources:

Integrated Water and Land Planning

Website: **https://water.utah.gov/integrated-water-land-planning/**

Water as Part of a General Plan (General Plan Primer)

Available at: **https://water.utah.gov/wp-content/uploads/2023/07/General-Plan-Primer.pdf**

Integrated Water & Land Use Element: General Plan Requirements (Requirements Guide)

Available at: **https://water.utah.gov/wp-content/uploads/2023/07/Requirements-Guide.pdf**

Incorporating Water into General Plans in Utah

A recorded presentation by Erin Rugland for Utah Growing Water Smart; November 2022

Available at: **https://drive.google.com/file/d/1aLuLWhBdzCLYkn9egCCrff-huQowZ1Uo/view**

Integrating Water Efficiency into Land Use Planning in the Interior West: A Guidebook for Local Planners

By Jennie C. Nolan Blanchard. Prepared by the Land Use Law Center at Pace Law School for Western Resource Advocates, November 2018.

Comprehensive Guidebook including:

- **Part I:** Background and Getting Started (includes how to work together and engage or lead the process).
- **Part II:** Integrating Water Efficiency into Land Use Documents (includes sections on the Comprehensive Master Plan, the Sustainability Plan, The Zoning Code, Subdivision Regulations, and Site-Plan Regulations).
- **Part III:** Additional Strategies (includes sections on Building and Plumbing Codes, Supplemental Regulations, Development Moratoria, Development Agreements, Non-Zoning Incentives, and Post-Occupancy Enforcement).

Guidebook available at: **https://westernresourceadvocates.org/wp-content/uploads/2019/06/Integrating-Water-Efficiency-into-Land-Use-Planning_6.3.2019.pdf**

Integrating Land Use and Water Management: Planning and Practice

A report by Erin Rugland for the Lincoln Institute of Land Policy; February 2022

Report available at: **https://www.lincolninst.edu/publications/policy-focus-reports/integrating-land-use-water-management**

Incorporating Water into Comprehensive Planning: A Manual for Land Use Planners in the Colorado River Basin

A manual by Erin Rugland for the Lincoln Institute of Land Policy; February 2020

Manual available at: **https://www.lincolninst.edu/publications/other/incorporating-water-comprehensive-planning**

Growing Water Smart Metrics: Tracking the Integration of Water and Land Use Planning

A report by Sarah Martin, Shelby Sommer and Amy Volckens of Brendle Group. Prepared for the Sonoran Institute; 2020

Available at: **https://sonoraninstitute.org/resource/growing-water-smart-metrics-report/**

Assured Water Supply Laws in the Western States: The Current State of Play

An article by Monica Green and Anne Castle. Colo. Nat. Resources, Energy & Envtl. L. Rev. (2017) 28:1, 67-145.

Article available at: **https://www.colorado.edu/law/sites/default/files/attached-files/castle_final.pdf**

Guiding Principles for Equitable Engagement in Coordinated Planning

CivicWell, Local Government Commission and Smart Growth California

Principles available at: **https://civicwell.org/wp-content/uploads/2022/01/Guiding-Principles-for-Equitable-Engagement-2.pdf**

American Planning Association Water and Planning Network

This group sponsors webinars, meetings, research projects and a newsletter about integrating land and water planning. Description: **https://www.planning.org/divisions/groups/water/**

To join (free), email: **water@planning.org**

Resources for Land Use Policy and Planning

Handbook for Planning Commissions and Land Use Authorities

Utah League of Cities and Towns, 2021

Available at: **https://luau.utah.gov/home/showpublisheddocument/3826/637556563571130000**

Utah League of Cities and Towns

Statewide organization that represents municipal governments, provides land use resources, hosts trainings and events, and tracks land use policy and legislation.

Website: **https://www.ulct.org/home**

Utah Association of Counties

Statewide private, non-profit organization whose members are the 29 Utah counties. Provides management, training and intergovernmental relations services to counties and its officials.

Website: **https://www.uacnet.org/**

Land Use Academy of Utah

Funded by the Utah Legislature and spearheaded by the Utah League of Cities and Towns, this consortium of Utah groups supports training and education in land use for local elected and appointed officials.

Website: **https://luau.utah.gov/**

The Utah Land Use Institute

Sponsors conferences, seminars and workshops and maintains a Land Use Library focused on land use issues and law in Utah.

Website: **https://utahlanduse.org/**

Lincoln Institute of Land Policy

Founded in 1946, this nonprofit private operating foundation works to improve the quality of life through the effective use, taxation and stewardship of land. Its extensive international work in education, training, publications and events includes work in the areas of sustainably managed land and water resources and climate-resilient communities. It is a founding organization of the Growing Water Smart Program.

Website: **https://www.lincolninst.edu/**

Urban Land Institute

Founded in 1936, it is the oldest and largest network of real estate and land use experts in the world. It works to promote best practices for equitable and sustainable land use through educational and networking opportunities.

Global ULI: **https://uli.org/**

Utah ULI website: **https://utah.uli.org/**

Resources for Specific Types of Water Planning (Public Works)

Public Water Supplier 40 Year Water Requirement Plan Standards

Utah Office of Administrative Rules – Natural Resources – Water Rights – R655-18

Available at: **https://adminrules.utah.gov/public/rule/R655-18/Current Rules#**

Financing Sustainable Water: Rates, Revenue, Resources

Alliance for Water Efficiency

Suite of resources for developing, evaluating, and implementing effective rate structures that supports water efficiency and revenue stability in the short term and enables utilities to realize the many long-term benefits of water efficiency, including avoided cost savings.

Available at: **https://www.allianceforwaterefficiency.org/resources/financing-sustainable-water**

A Guide to Low Impact Development within Utah

Utah Department of Environmental Quality, Division of Water Quality, 2020

Guidebook available at: **https://documents.deq.utah.gov/water-quality/stormwater/updes/DWQ-2019-000161.pdf**

Utah Water Conservation Plan Resources

Utah Department of Natural Resources, Division of Water Resources

Includes a Water Conservation Plan Guide, Best Management Practices, and plan examples.

Available at: **https://conservewater.utah.gov/water-conservation-plans/conservation-plan-resources/**

Preparing Source Water Protection Plans

Utah Department of Environmental Quality, Division of Drinking Water

Available at: **https://deq.utah.gov/drinking-water/preparing-source-protection-plans**

Environmental Protection Agency – Source Water Protection

Available at: **https://www.epa.gov/sourcewaterprotection**

Stormwater Planning: Community Solutions for Voluntary Long-Term Stormwater Planning

Guidance, Green Infrastructure Modeling Toolkit, and Technical Assistance from the U.S. Environmental Protection Agency

Available at: **https://www.epa.gov/npdes/stormwater-planning**

Integrated Planning for Municipal Stormwater and Wastewater

Guidance, Story Map, Toolkit, and new provisions in Water Infrastructure Improvement Act (WIIA) from the U.S. Environmental Protection Agency

Available at: **https://www.epa.gov/npdes/integrated-planning-municipal-stormwater-and-wastewater**

Drought Planning

Utah Drought Response Plan: Triggers and Actions, prepared by the Division of Water Resources (2022).

Report available at: **https://water.utah.gov/wp-content/uploads/2022/07/Drought-Response-Plan-070822.pdf**

Other resources available from State of Utah agencies:

Updates on current conditions, impacts and restrictions from the Department of Natural Resources: **https://drought.utah.gov/**

Drought guidance for public water systems from the Department of Environmental Quality: **https://deq.utah.gov/drinking-water/drought-guidance-for-public-water-systems**

Webinars and information on defining, managing and measuring drought from the Division of Water Resources: **https://water.utah.gov/drought/**

Utah Hazard Mitigation Planning

Planning resources, mitigation strategies, and grant funding for hazards including water-related ones (climate change, dam failure, drought, flood, severe weather, and wildfire) from the Utah Department of Public Safety.

Available at: **https://hazards.utah.gov/**

Utah Watershed Councils Act & Implementation

Utah Department of Natural Resources, Division of Water Resources

Available at: https://water.utah.gov/watershed-councils/

Examples of Municipal Planning Documents

Bluffdale Floodplain Management Plan (2018):

https://www.bluffdale.com/DocumentCenter/View/2900/Floodplain-Management-Plan-Final-9-13-18

Ivins City Water Conservation Plan (2023):

https://ivinsutah.gov/wp-content/uploads/2023/12/2023-Ivins-City-Water-Conservation-Plan-Final-Adopted-2023-11-02.pdf

La Verkin City Water Conservation Plan (2020):

https://conservewater.utah.gov/wp-content/uploads/SubmittedWaterPlans/LaVerkin-City-Water-System-2020.pdf

Millcreek Community Wildfire Preparedness Plan (2021):

https://millcreek.us/AgendaCenter/ViewFile/Item/303?fileID=10095

Payson City Pressurized Irrigation Water Master Plan and Capital Facility Plan (2020):

https://www.paysonutah.org/sites/default/files/fileattachments/public_works/page/2280/payson_pi_water_master_plan_-_jul_2020.pdf

Salt Lake City Climate Plan (2017):

http://www.slcdocs.com/slcgreen/CP0320.pdf

Salt Lake City Water Conservation Plan (2020):

http://www.slcdocs.com/utilities/PDF%20Files/conservation/2020WaterConservationPlan.pdf

Santa Clara 2023 Culinary Water Master Plan:

https://cdn.santaclarautah.gov/file/santaclarautah/2023/11/Santa-Clara-2023-Culinary-Water-Master-Plan.pdf

South Jordan Low Impact Development Handbook (2020):

https://sjc.utah.gov/DocumentCenter/View/518/Low-Impact-Development-Handbook-PDF

St. George Secondary Irrigation Master Plan (2020):

https://www.sgcity.org/pdf/waterdepartment/waterdistribution/waterdepartmentmasterplandocumentsandresources/stgeorgesecondaryirrigationmasterplan-final-09-28-2020-update.pdf

Washington City Storm Water Management Program:

https://washingtoncity.org/publicworks/stormwater/WashingtonCitySWMP2021-2026.pdf

SECTION 2: Water Conservation

Conservation Programs, Grants & Rebates

Utah Division of Water Resources | Conserve Water

Summarizes many programs available throughout Utah at: **https://conservewater.utah.gov/**

Includes links to:

Weekly Lawn Watering Guide: **https://conservewater.utah.gov/weekly-lawn-watering-guide/**

Slow the Flow: **https://slowtheflow.org/**

Utah Water Savers (rebate programs): **https://utahwatersavers.com/**
(includes landscape conversions, smart controllers, toilet replacement, water conservation programs)

Report Water Waste and Wins: **https://conservewater.utah.gov/report-water-waste-wins/**

Water Check Program: **https://extension.usu.edu/cwel/watercheck**

Localscapes: **https://localscapes.com/**

Flip Your Strip: **https://utahwatersavers.com/Program/2/flip-your-strip**

Home Water Use Calculator: **https://home-water-works.org/calculator**

Conservation Plan Resources: **https://conservewater.utah.gov/water-conservation-plans/conservation-plan-resources/**

Water Conservation Rebate Programs

Utah Division of Water Resources: **https://utahwatersavers.com/**

Central Utah Water Conservancy District: **https://www.cuwcd.gov/rebates.html#gsc.tab=0**

Washington County Water Conservancy District: **https://www.wcwcd.gov/conservation/rebates/**

Weber Basin Water Conservancy District: **https://weberbasin.gov/Conservation/Rebates**

Secondary Irrigation System Metering

Utah Division of Water Resources

Information for water users and water providers on legislative requirements and grants and loans to purchase meters for metering secondary water used for outdoor irrigation.

Website: **https://water.utah.gov/secondary-metering/**

Rain Barrels

Rain Barrels in Utah. Utah State University Extension Information by Brian Greene, Nancy Mesner, and Roslynn Brain.

Website: **https://extension.usu.edu/sustainability/research/rain-barrels-in-utah**

Rainwater Harvesting Registration, Utah Division of Water Rights: **https://waterrights.utah.gov/forms/rainwater.asp**

Graywater Systems in Utah

Gray Water Use and Regulations in Utah:

Webinar by Rosylnn Brain McCann and Jeff Adams for USU's Center for Water Efficient Landscaping: **https://www.youtube.com/watch?v=WEfppCoKbLk**

Graywater Regulations in Utah:

https://adminrules.utah.gov/public/rule/R317-401/Current Rules#

Examples of Implementation:

Moab City Gray Water Systems Permitting:

Municipal Code 13.20.210: **https://moab.municipal.codes/Code/13.20.200**

Summit County Graywater Administration and Permitting: **https://summitcountyhealth.org/enviro/graywater-systems/**

U.S. Bureau of Reclamation Grant Programs

WaterSMART Water and Energy Efficiency Grants: **https://www.usbr.gov/watersmart/weeg/**

Small-Scale Water Efficiency Grants: **https://www.usbr.gov/watersmart/swep/index.html**

Landscape Water Conservation

Center for Water Efficient Landscaping, Utah State University Extension

Website on USU research, Extension programs, webinar series, publications, education, and training. Focus is on water efficient landscaping, sustainable turfgrass management, ornamental and landscape horticulture, and human dimensions to improve the efficient use of water for landscape irrigation.

Website: **https://extension.usu.edu/cwel/**

How to Have a Water Efficient Landscape

Center for Water Efficient Landscaping, Utah State University Extension

Online course covering the principles of Water Wise Landscaping with related USU Extension Fact Sheets.

Available at: **https://extension.usu.edu/cwel/principles**

Design 4 Everyone: Advanced Landscape Design Process

Utah State University Extension

Online course covering the landscape design process with readings, demonstration videos, assignments, and individual consultation with a landscape architect for feedback on developed designs.

Available at: **https://extensioncourses.usu.edu/product/design-4-everyone/**

Conserving Water in Your Landscape in times of Drought, Utah State University Extension

Resources for preparing for and responding to drought in landscape irrigation and maintenance.

Website: **https://extension.usu.edu/drought/in-the-landscape**

Qualified Water Efficient Landscaper (QWEL)

A certification program designed to educate landscape professionals and their customers on the benefits of water efficient landscape design, management and irrigation practices.

Utah QWEL Program: **https://extension.usu.edu/cwel/education**

National QWEL Program: **https://www.qwel.net/**

Localscapes

Resources on landscaping patterns and practices designed for Utah including guides, landscape designs, and classes from Jordan Valley Water Conservancy District.

Website: **https://localscapes.com/**

Firewise Landscaping for Utah

Utah State University Extension publication by Michael Kuhns and Barbara Daniels

Available at: **https://extension.usu.edu/forestry/files/publications/other-publications/firewise-landscaping-for-utah.pdf**

Landscape Transformation: Assessment of Water Utility Programs and Market Readiness Evaluation

Alliance for Water Efficiency

Analysis and report of research covering Impact Analysis and Process Evaluation of programs, practices, and irrigation technologies that can support effective utility-driven outdoor water efficiency standards.

Available at: **https://www.allianceforwaterefficiency.org/impact/our-work/landscape-transformation-assessment-water-utility-programs-and-market-readiness**

Learning Landscapes: Outdoor Water Efficiency and Conservation Lessons

Alliance for Water Efficiency

Lessons designed to be used by educators in grades 3-8 that align with the associated Next Generation Science Standards.

Available at: **https://www.allianceforwaterefficiency.org/impact/our-work/learning-landscapes-outdoor-water-efficiency-and-conservation-lessons**

Water-Efficient Plant Lists and Demonstration Gardens

Water-Wise Plants for Utah Landscapes

Center for Water-Efficient Landscaping, Utah State University Extension

Library of water-wise plant lists, Extension Fact Sheets, and Publications (including books such as the Center for Water Efficient Landscaping's Combinations for Conservation).

Available at: **https://extension.usu.edu/cwel/water-wise-plants**

Native Plants for the Utah Landscape

Center for Water-Efficient Landscaping, Utah State University Extension

Available at: **https://extension.usu.edu/cwel/native-other**

Utah State University Tree Browser

Utah State University Extension

Website: **https://extension.usu.edu/treebrowser/**

Utah State University Botanical Garden Water Wise Plant List

Available at: **https://extension.usu.edu/cwel/files/Utah_House_Plant_List_v2_4p.pdf**

Garden Wise in Salt Lake City

Landscape galleries, plant lists, weed control strategies, landscape best management practices for water resource efficiency and protection, and watering guides.

Website: **https://www.slcgardenwise.com/**

Red Hills Desert Garden Plant List

Washington County Water Conservancy District, St. George City, and Virgin River Project.

Water Wise Plant List for Desert Landscapes.

Available at: **https://redhillsdesertgarden.com/find-plants/**

Water Conservation Learning Garden Plant Database

Weber Basin Water Conservancy District

"Find a Plant" master database of plants in the District's garden and "Water Wise Plant List"

Available at: **https://weberbasin.gov/Conservation/LearningGarden**

Conservation Garden Park Plant Database

Jordan Valley Water Conservancy District

Available at: **https://conservationgardenpark.org/plants/**

Native Plants for the Intermountain West

Intermountain West Native Plant List

Website: **https://cwelwnp.usu.edu/westernnativeplants/index.php**

Demonstration Gardens

Center for Water-Efficient Landscaping, Utah State University Extension

Select list of demonstration gardens maintained by government institutions in Utah.

Website: **https://extension.usu.edu/cwel/demonstration-garden**

Utah Public Gardens

Utah State University Extension

Complete list of public gardens in Utah.

Website: **http://www.utahpublicgardens.org/**

Landscape Water Efficiency Standards

Guidance Documents

Jordan Valley Water Conservancy District – Water Efficiency Standards:

Available at: **https://jvwcd.org/public/wes**

Washington County Water Conservancy District – Water Efficiency Standards:

Available at: **https://wcwcd.gov/wp-content/uploads/2023/10/WaterEfficiency-Standards-Oct-2023.pdf**

Article from American Planning Association Utah Chapter about the WCWCD standards: **https://apautah.org/new-conservation-ordinances-adopted-for-new-development-in-washington-county-considered-strictest-in-utah/**

Model Regional Water Efficient Landscape and Irrigation Ordinance

South Metro Water Supply Authority (Denver, Colorado)

Available at: **https://southmetrowater.org/application/files/1915/7894/2140/FINAL_SMWSA_ModelLandscapeOrdinance_2017-1.pdf**

Model Water Efficient Landscape Ordinance

California Department of Water Resources

Adopted by the American Society of Irrigation Consultants (ASIC): **https://asic.org/wp-content/uploads/2016/03/MWELO.pdf**

Available in the California Code of Regulations:

California Code of Regulations, Title 23-Waters, Division 2-Department of Water Resources, Chapter 2.7 – Model Water Efficient Landscape Ordinance. See: **https://govt.westlaw.com/calregs/Browse/Home/California/CaliforniaCodeofRegulations?guid=IBBB0A9505B6E11EC9451000D3A7C4BC3&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default)**

Sample Utah City and County Ordinances Implementing Water Efficiency Standards

Bluffdale City:

Municipal Code, Section 11.150.050 "General Requirements and Landscaping"

https://bluffdale.municipalcodeonline.com/book?type=ordinances#name=11.150.050_General_Requirements_And_Landscaping

Bluffdale City:

Municipal Code, Section 11.150.050 "General Requirements and Landscaping"

https://bluffdale.municipalcodeonline.com/book?type=ordinances#name=11.150.050_General_Requirements_And_Landscaping

Draper:

Municipal Code, Chapter 23, "Landscaping and Screening"

https://codelibrary.amlegal.com/codes/draperut/latest/draper_ut/0-0-0-36558

Herriman City:

Municipal Code, Chapter 10-32 "Water Efficiency Standards"

https://www.herriman.org/water-efficiency-standards.php

Ivins City:

Municipal Code, Chapter 11, "Regulations for Landscaping and Water Conservation for Developing Land"
https://codelibrary.amlegal.com/codes/ivinsut/latest/ivins_ut/0-0-0-14319

La Verkin City:

Municipal Code, Chapter 8, "Conservation Landscape Requirements"

https://codelibrary.amlegal.com/codes/laverkinut/latest/laverkin_ut/0-0-0-12308

Salt Lake County:

County Code Ordinances, Title 19, Chapter. 19.77 – Water Efficient Design and Development Standards

https://library.municode.com/ut/salt_lake_county/codes/code_of_ordinances?nodeId=TIT19ZO_CH19.77WAEFLADEDEST

Sandy City:

Municipal Code, Title 21, Chapter 21-25, Section 4, "Water Efficient Landscaping"

https://library.municode.com/ut/sandy/codes/city_code?nodeId=COOR_TIT21LADECO_CH21-25LAST_S21-25-4WAEFLA

Santa Clara City:

Municipal Code, Chapter 17.92, "Water Efficient Landscaping and Conservation Standards"

https://codelibrary.amlegal.com/codes/santaclaraut/latest/santaclara_ut/0-0-0-13076

South Jordan City:

See: https://www.sjc.utah.gov/531/Water-Smart-SoJo

Municipal Code:

Chapter 13.04.260, "Waste Prohibited"

https://southjordan.municipalcodeonline.com/book?type=ordinances#name=13.04.260:_WASTE_PROHIBITED

Chapter 16.30, "Water Efficiency Standards"

https://southjordan.municipalcodeonline.com/book?type=ordinances#name=CHAPTER_16.30_WATER_EFFICIENCY_STANDARDS

St. George City:

Municipal Code, Chapter 23, "Landscape Standards"

https://stgeorge.municipal.codes/Code/10-23

Washington City:

Municipal Code, Title 8, Chapter 9 "Landscaping and Water Conservation"

https://codelibrary.amlegal.com/codes/washingtonut/latest/washington_ut/0-0-0-23679

Washington County:

County Code, Chapter 27, "Landscape and Water Conservation Standards"

https://codelibrary.amlegal.com/codes/washingtoncout/latest/washingtonco_ut/0-0-0-14022

West Jordan City:

Municipal Code, Section 13-13-5, "Water Efficiency Standards" https://codelibrary.amlegal.com/codes/westjordanut/latest/westjordan_ut/0-0-0-51790

Tools for Quantifying Water Conservation

Conservation Tracking Tool, Version 4.0 (2021)

From: Alliance for Water Efficiency

Excel-based model and guide for evaluating the water savings, costs, and benefits of conservation programs for a specific water utility.

Website: https://www.allianceforwaterefficiency.org/impact/our-work/conservation-tracking-tool

Home Water Works – Water Calculator

From: Alliance for Water Efficiency

This online calculator estimates household water use and compares your home to a typical household and an efficient household in your zip/postal code.

Website: https://home-water-works.org/calculator

Water Budget Tool

From U.S. Environmental Protection Agency.

Excel-based tool for estimating a landscape water budget based on local weather data.

Website: https://www.epa.gov/watersense/water-budget-tool

SECTION 3: Climate Resources

Climate Change, Water Resources, and Potential Adaptation Strategies in Utah

Report by Krishna Khatri and Courtenay Strong for Utah Division of Water Resources; March 2020

Available at: **https://water.utah.gov/wp-content/uploads/2020/11/Finaldraft_ClimateChangeUtah__March2020.pdf**

Planning for Climate Change in the West

Policy Focus Report by Rebecca Carter and Susan Culp for the Lincoln Institute of Land Policy, The Sonoran Institute, and Western Lands and Communities; 2010.

Available at: **https://www.lincolninst.edu/publications/policy-focus-reports/planning-climate-change-in-west**

Utah Climate Center

Utah State University

Weather data and forecasts, climate information, maps, research, and other resources.

Website: **https://climate.usu.edu/**

Utah Water Supply, Forecasts, and Reservoir Storage

Water supply data updated throughout the year from the National Water and Climate Center, Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture.

Available at: **https://www.nrcs.usda.gov/wps/portal/wcc/home/quicklinks/states/utah/water/**

Western Regional Climate Center

One of six regional climate centers in the U.S., the center delivers climate services working with NOAA partners in the National Climate Data Center, National Weather Service, the American Association of State Climatologists, the Regional Sciences and Assessment Program, and other NOAA Research Institutes.

Website: **https://wrcc.dri.edu/**

Western Water Assessment

Applied research program located in Boulder, Colorado that works across the Intermountain West states of Colorado, Utah, and Wyoming and focuses on addressing societal vulnerabilities to climate variability and change, particularly those related to water resources.

Website: **https://wwa.colorado.edu/**

National Integrated Drought Information System (NIDIS)

A multi-agency partnership that coordinates drought monitoring, forecasting, planning, and information at national, tribal, state, and local levels.

Website: **https://www.drought.gov/**

Climate Change Science Essentials

Utah State University Extension

Online course focused on minimizing the changes and risks associated with a changing climate and the science behind the actions.

Available at: **https://extensioncourses.usu.edu/product/extension-climate-change-science-essentials/**

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