Water Strategies for Great Salt Lake

Legal Analysis and Review of Select Water Strategies for Great Salt Lake

Final (Updated)

September 10, 2020

Prepared for:

GREAT SALT LAKE ADVISORY COUNCIL

Utah Department of Natural Resources
Utah Department of Environmental Quality

Water Strategies for Great Salt Lake

Document Title:	Legal Analysis and Review of Select Strategies for Great Salt Lake
Document Status:	Final (Updated)
Date:	September 10, 2020
Client Name:	Great Salt Lake Advisory Council
Project Manager:	Steve Clyde
Authors:	Steve Clyde, Emily Lewis, and others: Clyde Snow & Sessions Jeff DenBleyker, Bob Harding, and others: Jacobs Engineering Group Inc.

Acknowledgements: This project was identified and funded by the Great Salt Lake Advisory Council (GSLAC) through the Utah Division of Forestry, Fire & State Lands (DFFSL). Don Leonard and Leland Myers of the GSLAC and Laura Vernon of the DFFSL provided critical input and review comments that contributed toward preparation of this report.

Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
0	5/20/2020	Working Draft for GSLAC Review	Multiple	EL/JD	BH/SEC	SEC
1	6/15/2020	Final Draft for GSLAC Review	Multiple	EL/JD	BH/SEC	SEC
Final	7/17/2020	Final	Multiple	EL/JD	BH/SEC	SEC
Final (Updated)	9/10/2020	Final (Updated)	Multiple	EL/JD	BH/SEC	SEC

Discussion Document

This Report addresses the specific strategies prioritized by Great Salt Lake Advisory Council and is intended to both educate and engage the water user community. We recognize there may be other existing legal authorities and opportunities not discussed in this Report that may provide other means to securing water flows for Great Salt Lake and its wetlands. Neither the overall Report, nor the analyses for each of the individual strategies are intended to address all possible avenues for achieving the goal of maintaining or increase water flows to Great Salt Lake and its wetlands. It is hoped interested readers continue the discussion by exploring, implementing, and building on the Strategies and goals outlined herein.

This page is intended to be blank.

Executive Summary

Recent analyses indicate a historical decline of 11 feet in Great Salt Lake water levels due to human development and use of water in its watershed; a decline most recently accentuated by the recent drought of the 2000s and near-record low lake water levels in 2016 and 2018. A preliminary assessment of future conditions in Great Salt Lake's Watershed suggests this trend may continue with lake water levels continuing to decline. The worldwide decline and loss of similar saline lakes provides further perspective on the possibility, the consequences, and the opportunities the State of Utah must consider as it evaluates the resiliency of Great Salt Lake and that of the communities located on its shoreline.

The Great Salt Lake Advisory Council (GSLAC) sought to proactively understand if and how lake water levels could be maintained to protect the resources of Great Salt Lake and the environment, industries, and communities that rely upon the lake. The GSLAC began to screen and prioritize potential management strategies to enable the growth that is envisioned and avoid the potential costs of a declining lake. The GSLAC identified 12 high priority strategies that were thought to have a high potential to improve water management and increase water deliveries to Great Salt Lake. This Report summarizes a legal analysis and review of the 12 strategies in Figure ES-1.

Figure ES-1. Organization of GSLAC's Strategies for Delivering Water to Great Salt Lake

While each of the individual strategies will improve water management, none of the strategies evaluated herein, if implemented alone, can ensure that additional water will flow to and maintain Great Salt Lake. Rather, each strategy has a unique and essential function that, if implemented in concert with the others, could achieve the goal of increasing water deliveries to Great Salt Lake. Each strategy uniquely removes constraints, increases flexibility, informs decision-making, facilitates, and incentivizes transactions or protects, conserves, and makes water available. Each individual strategy is important but there must be an overarching, integrated strategy to truly optimize available water supplies, maximize benefits to water users, and increase water deliveries to Great Salt Lake.

Summary

The Foundational Strategies of recognizing the right to conserved water (Strategy No. 1), quantifying the conserved water (Strategy No. 12) and finally shepherding water (Strategy No. 3) are essential elements that must be addressed for available water, conserved or otherwise, to be delivered to Great Salt Lake. By themselves, these Foundational Strategies will remove important constraints and provide motivated water users with the required legal framework to deliver their own conserved water to Great Salt Lake. Implementation of these Foundational Strategies may enable some water to be appropriated for delivery to Great Salt Lake, but likely only a limited volume of water that may already be flowing to the lake. Additional strategies are needed to incentivize and facilitate new waters to be appropriated for beneficial use at Great Salt Lake.

The Operational Strategies serve to inform decision and policy makers and water users and managers (Strategy No. 6). Informed decisions lead to better results and stimulate innovation that optimizes available water supplies and improves the sustainability of Utah's water supply and Great Salt Lake. The Operational Strategies provide critical flexibility (Strategy No. 2) and backing (Strategy Nos. 7 and 10) that, rather than mandating water conservation, will incentivize water users and managers to want to conserve water and even deliver it to Great Salt Lake because it is in their best interest to do so.

The Tactical Strategies serve to incentivize water users to protect (Strategy No. 11), conserve, and make (Strategy Nos. 4, 5, and 8) available water that could be used for deliveries to Great Salt Lake. This is the point at which the strategy framework is put to a practical test to determine if there is enough social and economic incentive for water users and managers to conserve and deliver additional water to Great Salt Lake. These strategies strive to work with the individual or assembly of water users to achieve this goal.

Coordinating and integrating complex and interdependent strategies such as these will require strong leadership and synergy around a common goal. Strategy No. 9 enhances the existing Organizational Infrastructure that is critical for support, coordination, and oversight of the other strategies.

Table ES-1 provides on overview of the Team's conclusions for each of the GSLAC's strategies.

Table ES-1. Strategy Recommendations for Increasing Water Deliveries to Great Salt Lake Assessed as Part of this Project

Strategy No.	Strategy Recommendations
1	**Recognizing a Right to Conserved Water.** To incentivize conservation activities, Utah must modify its definition of beneficial use to allow water owners to retain a legal right to control conserved water and to protect conserved water from forfeiture.
2	**Split Season Leasing**. Split season Change Applications are now authorized by law. Such an arrangement enables the shared use of water resources rather than promoting the "buy and dry" approach that has been prevalent in the West. It will require careful determination of depletions, shepherding of the water from the original place of use to the intended place of the split season use, without adversely impacting other water rights. Distribution by the State Engineer's staff will be key to the implementation of split season Change Applications and may require additional financial support either in the form of appropriations or passing the costs of distribution on to the split season water users. Split season uses complement water banking and can be an effective tool to enable a shared sequential use of water on voluntary market-based transactions among willing water users.

Strategy No.	Strategy Recommendations
3	**Shepherding Water**. To ensure water rights intended for Great Salt Lake uses reach the lake, instream flow rights must be treated with equal dignity as other appropriated rights and protected from diversion by intervening water users, to ensure the water gets to its intended place of use. Perhaps a specific statutory section addressing instream flow Change Application to move water to Great Salt Lake would provide the legal basis to prevent diversion of instream flows by intervening appropriators.
4	**Secondary Metering**. It is well understood that un-metered secondary water use does not promote efficiency or sustainability by water users and secondary metering has been demonstrated to lower water use when implemented. Secondary metering is an important tool for consideration as the State of Utah pursues M&I water conservation throughout the State. The challenge facing the State is primarily one of funding the cost associated with installing meters on every secondary connection in the State. Further, technology may not currently exist to address all variations in water quality, or other nuanced distinctions between water systems and supplies. The State should consider funding an economic and engineering study to evaluate how best to implement measures to conserve water in secondary systems. This would likely involve a solution that would include some level of metering combined with other alternatives.
5	**Municipal and Industrial Water Conservation**. The State of Utah should continue to pursue M&I conservation throughout the State. Conserved M&I water should be used to reduce demand and stretch existing water supplies, which will reduce the need for the development of new water supply programs and indirectly increase the flow of water into the lake. In addition to changes in water rights, laws that incentivize water conservation and allow water rights holders to benefit from conserving water should be driven by consideration of the full economic implications of water management decisions and the value of water in a drainage basin or watershed. An integrated (water) resource management plan (IRP) process provides a means to evaluate the costs and value of water conservation in the context of managing a water system's entire water portfolio, achieving a community's vision for the future, and considering the true value of water. An IRP would provide decision-makers, including water users, with information on how water conservation can deliver desired outcomes with the highest return on investment; thereby, helping provide a basis for economic incentives for implementation.
6	**Watershed Best Practices**. An evidence-based policy to address watershed scale implementation of water conservation measures will require an inclusive and collaborative process to evaluate pertinent demand-side and supply-side management options. An integrated approach is recommended to consider the costs, the opportunities and return on investment from water conservation at a basin or watershed scale. An IRP not only enables water users, water managers, and policy makers to evaluate the consequences and benefits from implementation of water conservation practices at scale, but to evaluate them in the context of "one water", or the full hydrologic cycle. It enables a top to bottom and integrated approach to managing surface and groundwater supplies, M&I and agricultural uses, storm water, wastewater, and water reuse. Consideration of water conservation practices alone will not achieve that. An IRP can and should be completed to "incorporate best management practices for water conservation at the watershed scale into policy making decisions" and realize the future envisioned by our communities.
7 and 10	**Water Acquisition.** Strategy No. 7 will require legislation to expand the universe of stakeholders who can hold and manage water for instream flows and will involve coordinating between multiple stakeholders in the drafting stage of any new legislation, as well as the implementation stage when conveying water rights and filing Change Applications. Strategy No.10 would involve testing the limits of existing authority and building the political will to provide adequate funding to the agencies to enable them to effectively use their existing authority.

Strategy No.	Strategy Recommendations
8	**Agricultural Water Conservation.** The Utah Legislature should pass legislation to allow water rights holders to maintain rights to the water they conserve (Strategy No. 1), develop methods that enable water users and water managers to accurately quantify actual water depletion and manage their water rights by depletion (Strategy No. 12), and incentivize agricultural water users to conserve (Strategy Nos. 2, 3, 7, and 10). This will allow individual agricultural water right holders to make defensible, market-driven decisions that optimize use of their water supply, maximize their water's productivity, maintain, or increase their agricultural production, and possibly result in more instream flow. Continued investment, improved flexibility and market-driven incentives will benefit the individual agricultural producer and, if implemented widely, could result in significant volumes of conserved water to benefit downstream beneficial uses.
9	**Agency Coordination**. Existing organizational structure is already facilitating coordination among State and Federal agencies; in fact, it has improved significantly even in the last 5 to 10 years. However, there is only a recently emerging policy to support the health of Great Salt Lake and efforts are still impeded by a fragmented regulatory regime and a lack of funding to advance this new policy. Existing organizational structure should be evaluated and amended to better align the mandates, efforts, and investments of agencies with the State's policy for Great Salt Lake. The GSLAC should capitalize upon opportunities to collaborate among State agencies. The formation of a new Great Salt Lake Watershed Council to work in concert with the GSLAC could be an effective means of connecting a broader stakeholder group, including major water diverters from tributary sources, with the numerous other stakeholders within the lake's watershed.
11	**Groundwater Management**. Protecting groundwater inflows to Great Salt Lake not only helps maintain lake water levels but also helps maintain existing groundwater rights (both quantity and quality) for water users adjacent to Great Salt Lake. Protection of groundwater levels surrounding the Great Salt Lake, either through existing Prior Appropriation tools or through the adoption of a Groundwater Management Plan, will ensure stable rates of groundwater infiltration into and groundwater levels adjacent to the lake. Likewise, ensuring that surrounding groundwater basins are limited to safe yields will also improve surface water sources. The net effect of this effort is that lake levels will be maintained, and groundwater contributions or users will not be impaired or irreparably damaged.
12	**Quantifying Conserved Water**. If a right to conserved water is recognized under law, quantifying the amount of water available to dedicate to a conserved water right will require a nuanced legal and technical analysis. Depletion accounting is essentially the technical mechanism needed to quantify efficiencies, better manage water supplies and to allocate a right to conserved water. Based on how sister States have approached the matter, Utah's Change Application process may be an efficient, already-existing forum to quantify and condition Utah conserved water rights.

Implementation

Each of the 12 strategies were evaluated for individual implementation and include elements of change to the status quo. Implementing change is often a challenge as it includes uncertainty, the potential of new risk or unforeseen consequences, and the possibility of new opportunities. As such, implementation of each strategy will require a concerted effort to:

1) complete studies to better define the benefits and/or consequences of the proposed change;
2) communicate with, better understand, and address the concerns of, and incorporate the ideas of stakeholders; and
3) forge consensus around and implement the strategy.

The GSLAC should consider and develop a plan to implement these strategies. This process could take time, but there are already water users and managers and organizations considering or actively working on implementing many of these strategies at the local or basin level. The GSLAC's intent is to identify and provide these individuals and groups with this analysis with the goal of enhancing their success in implementing these or similar strategies.

Given the investment of time and resources to effect change in legal and policy affairs, the Team recommends that the GSLAC also consider further exploration and lend support to an additional strategy, water banking. Water banking legislation was enacted in 2020 and could be considered both a Foundational and Operational strategy in that it already facilitates, enables, and incentivizes water uses to conserve and delivery water to a bank located downstream.

Water banking could be implemented among a few water users, along a reach of a stream, within a sub-basin or basin, or even at the Great Salt Lake Watershed scale. Benefits to water users and downstream uses could be realized at the small scale all the way to the large-scale. The benefit is that water banking is "voluntary, temporary, and local", has already been enacted as law in Utah, and provides a legal framework that could be used now to begin to integrate the 12 strategies and increase deliveries of water to Great Salt Lake. The other 12 strategies are still important as they maximize the opportunities to increase deliveries of water to Great Salt Lake; water banking simply provides an existing framework that could facilitate, enable, and incentivize water users to integrate the strategies and do so now.

Conclusion

The need to maintain and/or increase deliveries of water to Great Salt Lake is certain. The challenges to do so are significant. However, the ability of water users and managers and decision and policy makers to overcome these challenges and optimize available water supplies to meet water demands and enable growth is proven. The 12 strategies evaluated in this Report are feasible and will improve water management throughout the watershed. If implemented individually or in concert, they afford the State of Utah an excellent opportunity to protect this invaluable resource, increase water deliveries to Great Salt Lake, and protect "the economic, recreational, and natural significance of the Great Salt Lake". With these in place, the State of Utah will enable the growth that is envisioned and protect livelihood we enjoy.

This page is intended to be blank.

Contents

Tables

Figures

Acronyms and Abbreviations

AF	acre-foot
AFA	acre-feet per acre
CFS	cubic foot per second
Council	Great Salt Lake Advisory Council
CU	consumptive-use
CWCB	Central and West Coast Basins
DFFSL	Division of Forestry, Fire & State Land
DPR	Division of Parks and Recreation
DWiR	Division of Wildlife Resources
DWRe	Division of Water Resources
DWRi	Division of Water Rights
DWQ	Division of Water Quality
EDU	equivalent domestic unit
ELU	equivalent livestock unit
ET	evapotranspiration
ET_{aw}	evapotranspiration of applied water
ET_c	crop evapotranspiration
ET_o	grass reference evapotranspiration
ET_r	alfalfa reference evapotranspiration
GMP	groundwater management plan
GSLAC	Great Salt Lake Advisory Council
GSLEP	Great Salt Lake Ecosystem Program
GSLIM	Great Salt Lake Integrated Water Resources Management Model
IRP	integrated (water) resource management plan
K_c	empirical crop coefficient
LACFCD	Los Angeles County Flood Control District
M&I	Municipal and Industrial
MDNRC	Montana Department of Natural Resources and Conservation
MWD	Metropolitan Water District of Southern California
NGO	non-governmental organization
OWRD	Oregon Water Resources Department
Report	Legal Analysis and Review of Select Water Strategies for Great Salt Lake

SAC	Salinity Advisory Committee
SCPP	System Conservation Pilot Program
SWRCB	State Water Resources Control Board
TAG	Technical Advisory Group
Team	Clyde Snow and Jacobs Engineering Group Inc.
Tech Team	Great Salt Lake Technical Team
UAES	Utah Agricultural Experiment Station
UDEQ	Utah Department of Environmental Quality
UDNR	Utah Department of Natural Resources
WBWCD	Weber Basin Water Conservancy District
WMIP	Water Management Improvement Plan

1. Introduction

> "NOW, THEREFORE, BE IT RESOLVED that the legislature of the state of Utah recognizes the economic, recreational and natural significance of the Great Salt Lake."
>
> **Joint Resolution Recognizing the Significance of the Great Salt Lake, HJR 20**
>
> *2014 General Session, State of Utah*

The importance of Great Salt Lake cannot be overstated. Great Salt Lake is a veritable $1.3 billion/year economic engine supplying more than 7,000 jobs to Utahns (Bioeconomics 2012). Its resources are globally critical to agriculture, industry, and the food supply (Bioeconomics 2012). It is a key stopover for migratory birds in the western hemisphere (Jehl 1988); its importance increasing even as other lakes and wetlands in the western United States dwindle and dry up (AECOM 2019). It is the namesake for Utah's capital city and an inescapable feature in the landscape that includes more than 80 percent of Utah's population (Harris 2017); a true icon known nationally and internationally. Great Salt Lake is a critical economic, environmental, and cultural driver for the State of Utah (HJR 20 2014) and beyond.

> "NOW, THEREFORE, BE IT RESOLVED that the Legislature of the state of Utah the Governor concurring therein, recognize the critical importance of ensuring adequate water flows to Great Salt Lake and its wetlands, to maintain a healthy and sustainable lake system.
>
> BE IT FURTHER RESOLVED that the Legislature and the Governor recognize there is a need for an overall policy that supports effective administration of water flow to Great Salt Lake to maintain or increase lake levels, while appropriately balancing economic, social, and environmental needs, including the need to sustain working agricultural land."
>
> **Concurrent Resolution to Address Declining Water Levels of the Great Salt Lake, HCR 10**
>
> *2019 General Session, State of Utah*

Great Salt Lake's importance is also reflected in its symbiotic relationship with its watershed. Lake waters contribute an estimated 5 to 8 percent of the annual snow falling in the lake's watershed (University of Utah 2013) and contribute to a microclimate (Alder et al. 1998) that benefits its residents and the agricultural industry. Even as climate drives the snowpack in Great Salt Lake's headwaters and the flow in its tributaries, the water that finally reaches its shoreline is determined by water management policies and decisions made throughout its vast watershed. Significant depletions supporting our Region's economy have taken a toll over time (Wurtsbaugh et al. 2016). Declining lake levels are influencing lake resources (SCWA & Applied Conservation 2012). Increasing quantities of dust from Great Salt Lake are degrading air quality in its watershed (Goodman et al. 2019; Brigham Young University 2019), melting snow in the lake's headwaters earlier and faster (Skiles et al. 2018), and having an impact on water quality (Miller 2020). While long a beneficiary of Great Salt Lake and the water from its watershed, the State of Utah has initiated efforts to identify and consider new policies and strategies to optimize management of the available water supply, protect Great Salt Lake, and enable the growth that is envisioned for its watershed—to protect the resources and livelihood we all enjoy (HCR 10 2019). This Legal Analysis and Review of Select Water Strategies for Great Salt Lake Report (the Report) provides an assessment of a series of potential strategies to do exactly this.

1.1 Purpose and Need

Extremes in Great Salt Lake water levels have historically motivated calls to develop long-term policies and strategies for lake management. Record high-water levels of Great Salt Lake in the 1980s prompted significant attention and highly publicized investments in infrastructure to mitigate flood damage. The high-cost of mitigation resulted in calls in 1987 to develop long-term policies aimed at adapting to fluctuating lake levels rather than responding with costly ad-hoc, crisis management approaches (Morrisette 1988). The more recent drought of the 2000s has similarly given rise to significant attention and calls to develop long-term policies to protect and maintain Great Salt Lake and its watershed (GWSAT 2017; SWCA 2017; HCR 10 2019).

Recent analyses indicate a historical decline of 11 feet in Great Salt Lake water levels due to human development and use of water in its watershed (Wurtsbaugh et al. 2016); a decline most recently accentuated by the recent drought of the 2000s and near-record low lake water levels in 2016 and 2018 (Figure 1-1). A preliminary assessment of future conditions in Great Salt Lake's Watershed suggests this trend may continue with lake water levels continuing to decline (Jacobs 2019). The worldwide decline and loss of similar saline lakes (AECOM 2019) provides further perspective on the possibility (UDNR 2013), the consequences (SWCA and Applied Conservation 2012; ECONorthwest 2019), and the opportunities (GWSAT 2017; HCR 10 2019) the State of Utah must consider as it evaluates the resiliency of Great Salt Lake and that of the communities located on its shoreline.

Figure 1-1. Historical Great Salt Lake Water Surface Elevation, South Arm USGS Station 10010000, (1847-2019)

The "green" zone suggests a typical management zone with an optimal elevation range to support Great Salt Lake resources; the "yellow" zone suggests a transitional management zone with less than optimal, but still functional, lake levels; the "orange" zone suggests an extreme management zone with lake levels that could substantially impact many Great Salt Lake resources; and the "red" zone represents extreme conditions not previously observed and likely resulting in significant impact upon Great Salt Lake resources (UDNR 2013; Jacobs 2019).

The task of maintaining Great Salt Lake levels could be formidable and will require a significant investment of resources and political will. The Great Salt Lake Advisory Council's (GSLAC's or the Council's) recent analysis of potential future scenarios suggests a 3- to 4-foot decline in lake level by 2030 primarily associated with moderate climate variability and growth. Improvements in water use efficiency, water conservation, and increases in cloud seeding envisioned in the State Water Strategy scenario suggest a reduction in declines in lake level to about 2 feet. An Adaptive Innovation scenario with more aggressive water use efficiency, water conservation, and cloud seeding measures suggests lake levels could be managed within 1 to 2 feet of the baseline conditions (Jacobs 2019). While indicative that proactive growth and water planning could be effective, natural climatic variations, significant water demands, and the significant natural inertia of such a complex and large system will make finding lasting gains for lake levels difficult but also imperative.

An additional challenge is that most, if not all, of the water in the Great Salt Lake Watershed is already allocated and currently dedicated to use under water rights appropriated under the Prior Appropriation Doctrine. "Finding" additional water in the system necessitates fundamental shifts in how water is governed, used, and managed. As an extremely valuable asset, there will be heavy competition for any water gains found through these activities. Ensuring some water is re-allocated to the Great Salt Lake will require creating a mix of incentives, including making the lake a larger public policy priority and establishing mechanisms that allow the lake to aggressively participate in water market activity.

1.1.1 The Need

Cognizant of these factors, the GSLAC first commissioned a study in 2017 to solicit ideas from the public to maintain and/or increase the water levels of Great Salt Lake (SWCA 2017). The GSLAC sought to proactively understand if and how lake water levels could be maintained to protect the resources of Great Salt Lake and the environment, industries, and communities that rely upon the lake. The GSLAC began to screen and prioritize potential management strategies (Jacobs 2019) to enable the growth that is envisioned and avoid the potential costs of a declining lake (ECONorthwest 2019).

1.1.2 Background

The GSLAC's 2017 effort to identify strategies to maintain and/or increase water levels in Great Salt Lake resulted in a list of 72 strategies that were submitted by a wide range of individuals and organizations. Each strategy was described and organized into five strategy categories: coordination, environmental, operational, policy, and structural (SWCA 2017). The GSLAC reviewed each of the strategies and ranked 18 "consensus support strategies" for further consideration (GSLAC 2018). Of the strategies, 12 were identified by the GSLAC as most likely to succeed and were recommended for further analysis (Table 1-1).

While each of these 12 strategies represents a potentially helpful water management tool or application, they do not exist in the abstract, and their effectiveness is impacted by the pre-existing conditions of the real world. Of particular importance to analyze is the existing legal system governing how water in Utah is controlled and allocated.

1.1.3 Objective

To move the analysis forward, the GSLAC contracted with Clyde Snow and Jacobs Engineering Group Inc. (the Team) to prepare a report that examines and summarizes relevant legal and policy considerations for successfully implementing each of the 12 strategies (the Report). The objective of the Report is to inform policy makers, water managers, water professionals, and concerned citizens who already have a basic understanding of and interest in resolving the challenges facing the Great Salt Lake.

This is an action document: not a persuasion document. The Report is intended to provide specific useful information on each strategy so the water user community can choose where to spend their resources in achieving the overarching goal of maintaining or increasing Great Salt Lake levels.

Table 1-1. Selected Strategies to Increase Water Deliveries to Great Salt Lake Assessed for this Project

Strategy No.	Strategy Description
1	**Recognizing a Right to Conserved Water**. Allow irrigators or other water users to send unneeded water downstream without being penalized or at risk of losing water rights. (Strategy No. 39, SWCA 2017)
2	**Split Season Leasing**. Authorize split season leases such as where a portion of the water right is used for irrigation for part of the irrigation season, and then the remainder of the water right is made available for instream use during the same calendar year. (Strategy No. 30, SWCA 2017)
3	**Shepherding Water**. Develop and implement other measures to supply water to Great Salt Lake primarily by ensuring that water conserved upstream makes it to Great Salt Lake (shepherding). (Strategy No. 40, SWCA 2017)
4	**Secondary Metering**. Meter all secondary water, thereby creating a financial incentive to conserve secondary water and allow more water to reach Great Salt Lake. (Strategy No. 44, SWCA 2017)
5	**Municipal and Industrial (M&I) Water Conservation**. Increase the efficiency of residential, commercial, institutional, and agricultural systems (water conservation), which would result in more surface water in streams for delivery to Great Salt Lake. (Strategy No. 50, SWCA 2017)
6	**Watershed Best Practices**. Incorporate best management practices for water conservation at the watershed scale into policy making decisions. (Strategy No. 5, SWCA 2017)
7	**Water Acquisition.** Expand the ability to purchase or otherwise acquire water for instream flow uses to entities other than State agencies. (Strategy No. 26, SWCA 2017)
8	**Agricultural Water Conservation**. Increase the water use efficiency of agriculture by increased efficiency of irrigation systems leaving more surface water in the streams for possible delivery to Great Salt Lake. (Strategy No. 47, SWCA 2017)
9	**Agency Coordination**. Improve coordination among State agencies that have the authority to make decisions affecting Great Salt Lake. (Strategy No. 10, SWCA 2017)
10	**Water Acquisition.** Expand State agency acquisition of water with appropriated funds or acquisition of water rights by gift, donation, lease, or other arrangements. (Strategy No. 25, SWCA 2017)
11	**Groundwater Management**. Protect groundwater levels beneath Great Salt Lake and the broader Great Salt Lake basin from pumping that can affect surface hydrology. (Strategy No. 17, SWCA 2017)
12	**Quantifying Conserved Water**. Determine consumptive-use (CU) coefficients, such as evaporation and transpiration, for various water applications to improve efficiency by returning water back into the hydrological cycle, which could result in more water reaching Great Salt Lake. (Strategy No. 1, SWCA 2017)

Note: Strategy numbers are consistent with the GSLAC's numbering scheme.

1.2 Approach

The Team completed an initial assessment of the GSLAC's 12 strategies and reviewed its findings with representatives from the GSLAC. Each individual strategy was found to already be, or could be made to be, feasible and could be implemented to the benefit of water users; whether individuals or organizations. Of the individual strategies; however, none were found to be capable to deliver water to Great Salt Lake on their own.

The Team identified a subset of the 12 strategies, identified herein as Foundational Strategies, that must be addressed for available water, conserved or otherwise, to be delivered to Great Salt Lake (Figure 1-2). The Foundational Strategies, if and when implemented, enable efforts conducted as part of the remaining individual strategies also to be implemented to the benefit of the Great Salt Lake. The remaining strategies could benefit water users; however, they will not likely deliver water to the Great Salt Lake without implementation of the Foundational Strategies.

Figure 1-2. Functional Categories for the GSLAC Strategies to Deliver Water to Great Salt Lake

The remaining individual strategies were categorized as Operational Strategies, Tactical Strategies, or providing Organizational Infrastructure (Figure 1-2). Operational Strategies include strategies that inform decision and policy makers and facilitate transactions that incentivize water conservation that may then be delivered to Great Salt Lake. Tactical Strategies include strategies that are focused on incentivizing individual water users to protect, conserve, and make available water that could be re-allocated on a temporary or longer-term basis, and used for deliveries to the Great Salt Lake. Strategy No. 9, Agency Coordination, enhances the existing Organizational Infrastructure that is critical for support, coordination, and oversight of the other strategies. Figure 1-3 illustrates how each of the strategies listed in Table 1 have been categorized according to the role they could play in delivering water to Great Salt Lake. Note that Strategy Nos. 7 and 10 were combined as part of this analysis due to their similarity.

The fiscal impact of the strategies on the Local and Statewide economy, the financing of the infrastructure improvements and other means necessary to implement the strategies, and the determination of who will bear the burden of the debt service and other financial costs associated with each strategy, are beyond the scope of this Report. It is clear that the financial impacts could be substantial and far reaching, and the infrastructure costs could reach into the hundreds of millions of dollars. Similarly, the cost of not addressing the challenges could be substantial and far reaching, one estimate reaching $1.69 billion to $2.17 billion per year if the lake were to continue to decline (ECONorthwest 2019). As such, the financial aspects of each of these strategies deserve a more thorough and diligent study providing acceptable recommendations as a condition precedent to the implementation of each strategy.

1.3 Document Organization

Section 2 of this document summarizes the assessment completed for the three Foundational Strategies. Section 3 of this document summarizes the assessment completed for the remaining individual strategies in numerical order. Section 4 provides a final summary and conclusions.

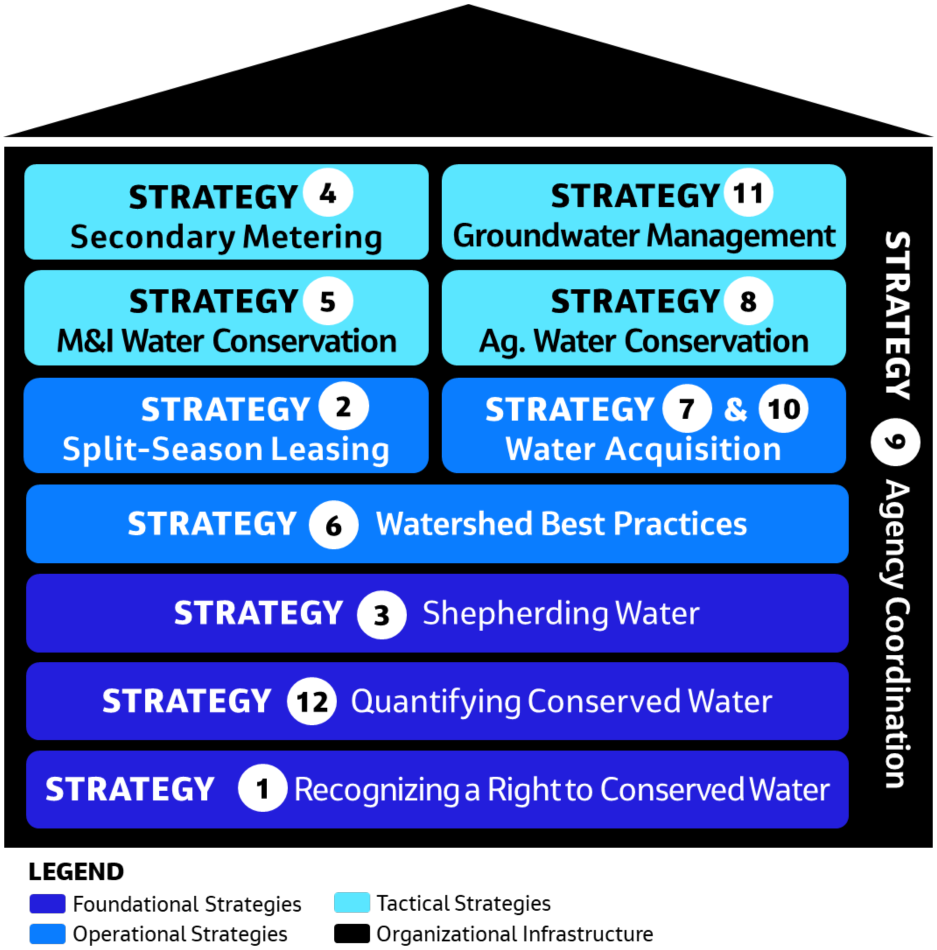


Figure 1-3. Organization of GSLAC's Strategies for Delivering Water to Great Salt Lake

Each strategy analysis (in Sections 2 and 3) was completed independent of the others, unless otherwise noted. Each begins with a statement of the strategy, a Summary of the Issue, and a Summary Recommendation. To comprehensibly assess each strategy, the Team reviewed four categories of information:

1) Background and Context – Gives the reader important general information that informs a basic knowledge of what the strategy entails and how it "fits" in the larger water story

2) Tools and Techniques – what legal or other mechanisms currently exist or that can be implemented through legislative action to execute the specific strategy

3) Impacts, Barriers, and Considerations – specific existing issues or anticipated concerns a decision-maker should weigh in determining how and whether to execute a strategy

4) Options for Future Action – specific actions or recommendations a decision-maker could take to execute a strategy and more specifically to further the goal of providing water to the Great Salt Lake

Each category of information (excluding Background and Context) is reviewed for six key viewpoints: Legal, Hydrologic, Financial, Technical, Political, and Administrative. Not every viewpoint is analyzed for every category. These considerations are also summarized in several easily viewable tables within each strategy discussion.

2. Foundational Strategies

Most, if not all, of the proposed strategies are underpinned by the need to understand several key tenets of Utah Water Law. These foundational principles must be discussed first as they inform the analysis for all the other GSLAC prioritized strategies and enable them to contribute toward the objective of increasing the flow of water to Great Salt Lake. The three GSLAC Foundational Strategies that encompass and build on these fundamental principles of Water Law are as follows (Figure 2-1):

1) **GSLAC Strategy No. 1**: Allow irrigators or other water users to send unneeded water downstream without being penalized or risk losing their water rights.
2) **GSLAC Strategy No.12:** Determine CU coefficients, such as evaporation and transpiration, for various water applications to improve efficiency by returning water back into the hydrologic cycle, which could result in more water reaching Great Salt Lake.
3) **GSLAC Strategy No. 3**: Develop and implement other measures to supply water to the Great Salt Lake primarily by ensuring that water conserved upstream makes it to the Great Salt Lake.

The following discussion unpacks how these three Foundational Strategies reflect the mechanics of the Prior Appropriation Doctrine and the relevant considerations for implementing each of the strategies.

Figure 2-1. Foundational Strategies for Delivering Water to Great Salt Lake

STRATEGY 1 Recognizing a Right to Conserved Water **FOUNDATIONAL STRATEGY**

2.1 Strategy No. 1 – Recognizing a Right to Conserved Water

GSLAC Strategy No. 1: Allow irrigators or other water users to send unneeded water downstream without being penalized or risk losing their water rights.

2.1.1 Strategy Summary

Issue: Presently, Utah Water Law discourages conservation of water by penalizing water right owners who do not use the full quantity of their water rights, providing no incentive for users to use less water.

Water in Utah is owned by the public and governed by the Prior Appropriation Doctrine. Developed in the 19th century to advance western settlement and settle disputes between competing parties, the Prior Appropriation Doctrine's primary function is to promote and manage the use of scarce, and therefore valuable, water resources. The law discourages wasting water and conditions the issuance of water rights on the requirement that water be put to use in way that benefits society, commonly known as "beneficial use."

The State owns all water resources in trust for its citizens. Water rights are granted as a conditional property interest, protected by the priority of appropriation and the non-impairment doctrine. Water rights, once perfected by application to beneficial use, are limited to the quantities of water historically diverted and historically depleted by use. Return flows to the system must be maintained to avoid impairing other water users who rely on return flows in satisfaction of their water rights.

Water rights are administered through the Utah Division of Water Rights (State Engineer). An appropriator may change the nature of use, point of diversion and place of use, among others by filing a change application with the State Engineer. Such a change of use will be approved, subject to prior rights, so long as the historic diversion, depletion, and return flows remain the same. The State may impose conditions on the requested use to protect other water rights from being impaired.

Because of the scarcity of water in Utah, the law favors the continued beneficial use of the water. If an appropriator ceases to use all of the water appropriated, all or the unused portion of the water right will be forfeit for non-use and the water re-allocated to others who will place the water to beneficial use. In that context, Utah's application of the Prior Appropriation Doctrine is not conducive to conservation, as it tends to take the conserved water away from the party that conserved it, as it is assumed that they no longer need the water.

Accordingly, appropriators who invest in conservation often are unable to benefit from the investment, as they do not retain a legal right to market, sell, or control any of the water "conserved" through those activities. Without an incentive to conserve, few water users see the advantage of investing in conservation efforts.

The vast majority of Utah's water resources are already appropriated for use. Additionally, future supply is anticipated to both diminish and become more irregular. At the same time, Utah faces a multitude of growing and pressing demands, including increased pressure on the Great Salt Lake. Water conservation efforts will be a cornerstone strategy to meeting the realities of the future and "stretching" Utah's limited water supply. Establishing a legal right to conserved water provides the incentive to engage in these efforts. A right to conserved water is a fundamental prerequisite to successfully implementing the strategies outlined in this Report, as well as meeting numerous other State water policy objectives.

> To optimize the State's water resources, Utah law will need to expand its notion of what constitutes a beneficial use of water to enable and encourage conservation and providing a legal right for a water user who invests in conservation and gains in efficiency, to benefit from that investment. For the purposes of this Report, conserved water is understood to be the difference between the amount of water historically depleted by the authorized use, and the reduced depletion achieved by implementation of conservation measures. A "conserved water right" is the legal right to use conserved water for some other beneficial use.

Conclusion: To incentivize conservation activities, Utah must modify its definition of beneficial use to allow water owners to retain a legal right to control conserved water and to protect conserved water from forfeiture.

2.1.2 Discussion

2.1.2.1 Background and Context

The Prior Appropriation Doctrine: In the Western United States, including Utah, water is generally owned by the public. Private rights to use that water is typically governed by the Prior Appropriation Doctrine, a common law set of principles developed in the mid-19th century to quell tensions in mining camps and to facilitate Euro-American settlement of the American West. The Prior Appropriation Doctrine is designed to orderly allocate and distribute limited water amongst competing parties and prospectively determine curtailment in times of shortage. It also rewards those who invest in useful enterprises with a private right of use of the public's water.

In practice:

These "In practice" sections are intended to be "story" or real-world examples relating to this Report. In this case, how a water user may currently consider practices to conserve water.

- Farmer Joe in Cache County has an irrigation right for # acre-foot (AF) based on the State's duty
- Farmer Joe currently grows tomatoes with flood irrigation
- Farmer Joe wants to adopt XYZ technology to improve irrigation efficiency, conserve water and optimize water use and productivity
- Farmer Joe will reduce his water consumption by # amount through implementation of XYZ technology
- However, Farmer Joe cannot use conserved water on additional acreage, market the conserved water or designate the conserved water for downstream use
- Thus, Farmer Joe has no incentive to adopt XYZ technology or optimize water use

The Prior Appropriation Doctrine operates on several key principles, each discussed in various portions of this Report. The first and foremost tenet, is the concept of beneficial use. Beneficial use dictates that public waters can be appropriated only for uses that benefit society and one cannot obtain a water right for "wasteful" practices.[1] The traditional understanding is that beneficial use is associated with CUs of water like irrigation, mining, domestic uses, industry, and so forth. To further society's progress, a traditional application of the Prior Appropriation Doctrine works to maximize beneficial use across a watershed. In other words, the law is designed to put the most water to use as possible. If a water right holder does not use their water right, the water right is vulnerable to forfeiture and the water will be redistributed to satisfy other water rights (discussed in-depth as follows).

Utah's water laws, generally found under Title 73 of the Utah Code, have codified the common law tenets of beneficial use to inform a statutory structure for allocating and administering water rights (see Utah Appropriation process). The Utah State Engineer's Office is tasked with overseeing the State's water rights and does so using statutory tools, duly adopted administrative rules, and non-binding policies and guidance.

Utah's application of the Prior Appropriation Doctrine has worked extremely well to meet the priorities of the past. However, meeting the priorities and complexities of today, such as growing and diverse demand patterns, incorporating historically excluded water needs like instream flows, and adapting to a changing climate, will require rethinking how the Prior Appropriation Doctrine is applied.

To unpack the Report's understanding of conserved water and conserved water rights, this Background and Context section discusses two key issues:

1) Beneficial Use - how Utah interprets and has codified its understanding of beneficial use generally; and
2) Rights to Water - how Utah 's application of beneficial use works in practice over an ever-connected hydrologic system to define what water a user has a right to, what water others have a right to, and what water is potentially available to be dedicated to a conserved water right.

[1] *See* Utah Code Ann. § 73-1-1.

Beneficial Use: Water rights are conditional property rights based on the concept that one does not own the physical corpus of the water itself, but rather owns the right to use the public's water subject to conditions set by society. The primary condition is that one must continue to put their water right to full beneficial use or risk the unused portion being forfeited back to the public to satisfy downstream water rights. As long as you continue to fully use your water right, under the law it will be delivered in order of priority and protected from impairment and interference by other water users (non-impairment is discussed in Strategy No. 12; priority distribution is discussed in Strategy No. 3).

Utah's current understanding of beneficial use is based on the following principles. These concepts work in concert to define the legal parameters of a water right and are codified under Utah Code Ann. § 73-1-3.

- <u>Beneficial use is the basis of water right (BASIS)</u>.[2] Historically, beneficial use generally equated to economic activities that consume water, such as mining, agricultural, domestic use, livestock, and M&I uses. Accordingly, individual water rights are designed to satisfy the particular conditions needed to fulfill that specific use. Water rights are hyper-defined property rights that specify the source of water, point of diversion, season of use, place of use, and, most importantly, the prescribed beneficial use. The activity and physical parameters for how water is intended to be used forms the underlying basis of a water right. For example, domestic water rights are designed to meet specific domestic uses; irrigation rights are designed to meet specific irrigation purposes; power water rights are designed to meet specific power purposes; and so forth. Without a designated beneficial use upon which to base and form a water right, there can be no water right.
- <u>Beneficial use is the measure of a water right (ACTUAL DEPLETION)</u>.[3] Once the underlying basis of a water right has been established and defined, beneficial use next determines the amount of water associated with a water right. In Utah, the *measure* of a water right is the amount of water physically consumed or depleted by the use. Almost all uses of water remove some water from the hydrologic system: plants consume water through transpiration, stock animals drink water, water for industry consumes water in its production processes, and so forth. Accordingly, even if a water user diverts more water from the system (discussed as follows), a water right holder has no legal title to or control over water in excess of the amount actually depleted by their use. Actual depletion is a critical component of a beneficial use, informs the amount of water available for a conserved water right, and is discussed at length in this Report.
- <u>Beneficial use is the limit of the water right (DIVERSION/DUTY AND AUTHORIZED DEPLETION RATE)</u>.[4] Beneficial use also prevents wasteful practices by setting an upper limit on the amount of water a water user can divert and apply to a specific use. Using water in excess of these limits has been determined by the State of Utah to be wasteful and is not a beneficial use of the public's water. Limits also provide a framework for administering, accounting for, and allocating water rights. To establish the limits of a water right, the State Engineer sets two metrics:
    1) A "duty value" in the form of a diversion rate or water on a per AF or cubic feet per second (CFS) basis per unit. This is the maximum amount of water to be diverted from the source to fulfill the intended use.
    2) An "authorized depletion rate" which establishes how much of the water diverted is depleted by the use. Water diverted, but not depleted, is returned to the hydrologic system and used by other water users downstream as return flows (discussed as follows).

[2] *See* Utah Code Ann. § 73-1-3.
[3] *See* Utah Code Ann. §73-1-3
[4] *See* Utah Code Ann. §73-1-3

For example, one equivalent livestock unit (ELU) (such as, a horse or cow) has a duty value diversion of .028 AF per ELU and an authorized depletion rate of 100 percent. This means that all of the water diverted is authorized to depleted.

One equivalent domestic unit (EDU) has a duty value diversion of .45 AF per EDU and an authorized depletion of 20 percent (assuming on a septic system). Accordingly, of the .45 AF diverted, .018 AF is actually consumed through household uses and .36 AF is returned to the hydrologic system through septic leeching.

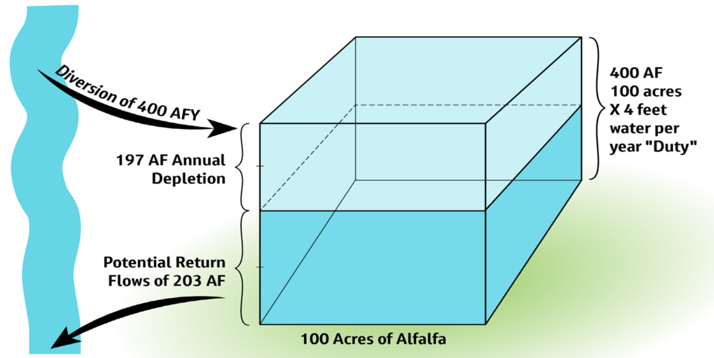


Figure 2-2. Example of water right duty values, authorized depletion rates, and potential return flows (Logan, Utah)

Another example, for irrigation in the Logan area, one acre of alfalfa, the irrigation standard, may require a diversion of 4 AF and an authorized depletion rate of 49 percent. Of the 4 AF diverted 1.97 AF is consumed by the plants and 2.03 AF is returned to the hydrologic system (Table 2-1 and Figure 2-2).

Diversion duty values and authorized depletion rates are also a critical component of beneficial use and a conserved water right and are discussed at length in this Report.

- Beneficial use is required (FORFEITURE). Although a perfected water right is a vested property right, it is a conditional property right. As discussed above, Utah currently understands the Prior Appropriation Doctrine as prioritizing maximum beneficial use of the public's water. Accordingly, if the appropriator fails to keep their end of the bargain by not beneficially using all the water, they are penalized with a forfeiture of the water right and the State makes the unused water available to satisfy downstream water rights. Forfeiture of water due to non-use is often described using the adage, "use it or lose it." Under Utah law, if an appropriator fails to use the water for 7 consecutive years, without a defense for the non-use, the water right is vulnerable to judicial forfeiture[5] The right to divert up to the full duty value can be lost to forfeiture for non-use, and it would have a corresponding loss of depletion value. Because forfeiture impacts title to a property interest, only the courts may forfeit a water right via a judicial action [6]. The loss of water via forfeiture is not considered a constitutional taking[7] as all water is initially appropriated subject to the permanent requirement of continuous beneficial use.
- Beneficial use is flexible (THE FUTURE). The Prior Appropriation Doctrine is a common law doctrine and can be modified to accommodate the changing needs of society. Traditional beneficial uses were those that supported economic activity of people allowing the settlement and economic expansion of the West. The notion of what constitutes a beneficial use can and has evolved over time to adjust to the contemporary water needs of society.

[5] *See* Utah Code Ann. § 73-1-4

[6] *See* Utah Code Ann. § 73-1-4 *See also, Jensen v. Jones,* 2011 UT 67.

[7] *See* U.S. Const. amend. V (". . . nor shall private property be taken for public use, without just compensation.").

Table 2-1. Example Allowable Irrigation Duties, Estimated Depletions, and Potential Return Flows for Logan and St. George, Utah

	Logan	St. George
Maximum Allowable Irrigation Duty Value (AFA)	4.00	6.00
Authorized Depletion Rate and AFA Depleted	49% x 4.00 = 1.97	60% x 6.00 = 3.58
Estimated Return Flow (AFA)	51% x 4.00 = 2.03	40% x 6.00 = 2.42

Note:
AFA = acre-feet per acre

These beneficial use concepts work in tandem to maximize beneficial use of water across a water system, often at the expense of individual water rights. The measure of a water right is the amount of water actually depleted by the use. The limit of a water right is the maximum amount of a water right holder can divert and consume under their authorized duty value and depletion rates. If there is any difference between the amount of water actually depleted and the amount of water authorized to be diverted and depleted, that water can be forfeited to meet downstream water rights. Thus, Utah's current understanding of beneficial use incentivizes water users to use of <u>all</u> of their authorized water to avoid forfeiture, even if some of the water is not actually needed to satisfy a use. Continuing to operate in this manner encourages wasteful practices that are counterproductive to meeting Utah's growing water demands.

Incentivizing water users to adopt and implement conservation measures will require adjusting Utah's understanding of beneficial use to recognize a property right to the difference between the amount of water authorized to be depleted and the amount of water actually depleted by a use. If water users deplete less water to achieve the same or similar results, they are conserving water. With legal recognition, this conserved water can be dedicated to a conserved water right and used for other purposes therefore "stretching" Utah's limited water supply.

Rights to Water in an Interconnected Hydrologic System:
While beneficial use sets the legal standards for water rights, water does not operate in a legal vacuum. The practical reality is that water rights operate in an interconnected hydrological water system regularly disrupted by human activities. Under the Prior Appropriation Doctrine, vested water rights are protected from impairment from other users. Accordingly, if Utah seeks to recognize a right to conserved water, it may not do so at the expense of water users downstream.

It is therefore important to understand what water a right holder has title to, what water others have a right to, and the amount of water potentially available to dedicate to a conserved water right. To do so requires a foundational explanation of several categories of water recognized under the Utah Prior Appropriation Doctrine. It is also important to understand how Utah understands these terms because other States use similar terminology to refer to different water uses.

<u>Salvaged or Saved Water</u>

Water right priority dates in Utah date back to as early as the 1850s. Over time, the means of conveyance, particularly earthen ditches, can become less efficient as water originally appropriated for beneficial uses is lost to seepage through canals and/or the growth of water-thirsty vegetation along ditch banks.

As water rights in Utah are measured by, and limited to, the amount of water actually beneficially used, the appropriator has no legal right to water lost through such inefficiencies. Any water lost through inefficiency is forfeited back to the system to satisfy downstream water rights. If the appropriator wants to save or salvage the lost water by making their means of conveyance more efficient or removing vegetation, they must file a new application to appropriate under Utah Code Ann. § 73-3-1. To be approved, the appropriator must demonstrate that the salvaged water was not already appropriated by others and meets the criteria for approval under Utah Code Ann. § 73-3-8. If the application is approved and perfected, it will have the most junior priority on the stream, and among the first rights curtailed in times of shortage.

Thus, there is currently little incentive to invest in water-saving activities because the economic return has rarely proven to be worth the investment. Unless changes to Utah law occur, canal lining and similar efficiency projects will not result in making water available to dedicate to a conserved water right but may result in a late priority right of marginal value.[8]

Developed Water

Developed water is water that is new to the system, and but for the acts of an individual, would not have been available to the river system.[9] In Utah, the party who claims to have discovered groundwater and claims it as their own must prove by a preponderance of the evidence that they are not intercepting the tributaries of appropriated streams or the sources of supply of prior appropriators.[10] The presumption is that the water encountered in a mine tunnel, for example, is tributary to the surface stream and that the right to use the water is vested in the prior appropriators of that stream.

If that presumption is rebutted by the claimant showing that the water is non-tributary, the water is considered developed and title vests in the developer. That title is essentially absolute, meaning that the developed water is free from the constraints of downstream appropriators and the general tenets of beneficial use. The water may be wasted, recaptured, reused, and fully consumed by the party who developed it. Downstream users may use the water while it is available to them, but they acquire no vested rights as against the developer that would compel the developer of the water to continuing wasting if for their benefit.

Not tied to the general constraints of the Prior Appropriation Doctrine, downstream water users do not have a legal right to any water gained through efficiency improvements and could potentially be recognized as "new" water available to dedicate to a conserved water right that could be put to other uses.

Return Flow Water

Return flow is generally defined as seepage water not consumed by plants, which, if not intercepted, would return to the stream from which it was diverted. These flows are therefore a part of the stream and available to downstream right holders. In Salt Lake City v. Telluride Power Co., the court held that:

> "[w]e are of the opinion that, after the water has run through the canals and been used upon the lands of the parties operating the pumps, they have no interest or right in the water after it leaves their lands

[8] See Howcroft v. Union & Jordan Irr. Co., 25 Utah 311, 71 P. 487, 489 (1903). See Little Cottonwood Water Co. v. Kimball, 280 P. 116, 119 (Utah 1930) (upholding applicant's right to apply for rights to water saved by improving water delivery system).
[9] Silver King Consol. Mining Co. v. Sutton, 85 Utah 297, 39 P.2d 682 (1934).
[10] Mountain Lake Mining Co. v. Midway Irr. Co., 149 P. 929, 934 (Utah 1915).

> and finds its way again into the main channel, either as run-off water, or as seepage water, for as soon as it reaches the main channel, its identity is lost, and it again becomes a part of the natural flow." [11]

Return flow is extremely important and downstream water users frequently rely on upstream return flows to satisfy their water rights. If irrigation methods change to become more efficient, in recognizing any complimentary conserved water right, return flows need to be accounted for to protect downstream water users from impairment to their water rights. This may result in a much smaller amount of water available to dedicate to conserved water rights than water right holders anticipate (see Strategy No. 12 for discussion adjusting the impairment analysis to require those claiming impairment to demonstrate their own reasonable means and methods of diversion).

Wastewater

Wastewater is water that has been applied to land and then captured by the appropriator before it leaves their control by leaving their property and rejoining the natural stream. An appropriator can use and reapply captured wastewater on their approved acreage. Using captured wastewater on new acreage is a prohibited because it is considered to be an expansion of a water right that could impair other water rights by depleting more water from the system.

Adjoining landowners can capture their neighbor's wastewater before it returns to the stream and appropriate it for use under Utah Code Ann. § 73-3-1. The appropriation is prioritized against other junior appropriators but does not vest against the senior appropriator who made the wastewater available. [12] In other words, a neighboring landowner can enforce his right to waste water against more junior users seeking to use the wastewater but cannot compel the original appropriator to continue to produce wastewater for their benefit.

As waste water is merely an added benefit to downstream water users, but not an enforceable right, waste water at its point of origin may be a good candidate to capture to dedicate to a conserved water right because its use will not impair downstream water rights.

Imported Water

Water imported by human actions into a drainage or stream to which it is not naturally tributary is treated as a source of foreign or developed water that has been added to the stream, and therefore it belongs to the party who imported it. [13]

Imported water has the same attributes as a developed water source, in that it can be recaptured, reused, and fully consumed without regard to downstream users who had no right to rely on the continued availability of this foreign source of water to support their water rights. Not tied to the general constraints of the Prior Appropriation Doctrine, efficiency improvements in the use of developed water could potentially be recognized as new water under a conserved water right.

[11] 17 P.2d 281, 284 (Utah 1932)
[12] Estate of Steed v. New Escalante Irrigation Co., 846 P.2d 1223 (Utah 1992).
[13] Tanner v. Bacon, 103 Utah 494, 136 P.2d 957 (1943).

Reused or Recycled Water

Reused and recycled water is different than the categories listed above in that the source of water making up the corpus of reused or recycled water can be a combination of regularly appropriated water and/or the above categories.

Water reuse and recycling is increasingly becoming a discussed means of conservation and "new" source of water to meet impending water demands. In Utah, reused water "means domestic wastewater treated to a standard acceptable under rules made by the Utah Water Quality Board." [14]

Utah Code Ann. § 73-3c-101 et seq. governs the reuse of water. Water reuse projects require both an application to the Water Quality Board and special reuse application to the Utah State Engineer. The reuse application requires the State Engineer to assess, among other items, both the overall depletion to the hydrologic system, the effect of reuse on return flows, whether the proposed reuse expands or is otherwise consistent with the underlying water right. If this use remains consistent with the underlying water right, the priority date of the reuse remains the same. The public agency owning or operating a publicly owned treatment works may use or contract for the use of reused water if they own the underlying water right and the underlying water right is authorized for Municipal uses.

While water reuse may theoretically "stretch" Utah's water supply, one important consideration of water reuse is that the release of treated effluent is a large component of instream flows. For example, a significant portion of the present flow of the Jordan River comes from treated effluent from the numerous wastewater treatment facilities in Utah and Salt Lake County. Accordingly, while reuse may play a role in Utah's future water management, its use needs to be considered carefully to ensure that widespread Municipal reuse does not create adverse effects on water quality by reducing flows in natural waterways or further diminishing flows to the Great Salt Lake.

Carrier Water

Carrier water is the water needed to move a water right through a distribution system and deliver it to the designated place of use. The right to divert carrier water is protected as part of a water right, but there is no right to deplete it. The carrier water is generally required to return to the stream and constitutes return flow that is relied upon to satisfy downstream water rights. Accordingly, efforts to line canals may not result in water available to dedicate to a conserved water right.

As demonstrated by the foregoing explanations, when assessing whether water is available to allocate to a conserved water right, it is critically important to understand exactly how the water in question is being used and how others in the system are relying on that water. Without making these determinations, the recognition of a conserved water right may end up impairing other water users, depleting additional water from the stream, or negatively impacting the perception and political will needed to make the necessary changes to Utah law and its understanding of beneficial use.

2.1.2.2 Tools and Techniques

The available tools and techniques to recognize a conserved water right are primarily legal.

[14] *See* Utah Code Ann. § 73-3c-102(7).

Table 2-2. Tools and Techniques for Strategy No. 1 – Recognizing a Water Right to Conserved Water

Tools and Techniques	
Legal	Expand the concept of beneficial use to include a right to retain the water conserved and avoid forfeiting conserved water back to the system.
Hydrological	See Strategy No. 12: Quantifying Conserved Water and Strategy No. 3: Shepherding Water.
Financial	Promote the simultaneous development of more efficient water market tools as a forum to place a value on conserved water rights and therefore build support for their recognition under the law.
Technical	See Strategy No. 12: Quantifying Conserved Water.
Political	If re-allocated to environmental uses, a right to use conserved water is an alternative to a politically unpopular and disfavored public trust lawsuit.
Administrative	See Strategy No. 12: Quantifying Conserved Water and Strategy No. 3: Shepherding Water.

Legal: Most other western States employ some form of the Prior Appropriation Doctrine to allocate and regulate water rights. Several of Utah's sister States have adapted laws and practices to create a legally enforceable property right to conserved water that may provide lessons for Utah. In reviewing these statutes, it is important to keep the terminology discussed in the Background and Context section in mind.

Montana: The Montana Legislature has declared "conservation and full use of water" to be "[t]he public policy of the State" [15] and "holders of appropriation rights who salvage water [to] retain the right to the salvaged water for beneficial use." [16] Accordingly, conserved water is not forfeited and junior appropriators have no claim to conserved water. The Montana Rules further define salvaged water to include "seepage, wastewater, or deep percolation water." [17] However, destruction of trees that would otherwise consume some of the water is explicitly excluded from being a qualifying water-saving method. [18] Montana's savings statute has been challenged and upheld on at least two instances. [19]

California: California's water conservation statute defines "water conservation" broadly as any "use of less water to accomplish the same purpose or purposes of use allowed under the existing appropriative right." [20] The statute explicitly applies to agricultural conservation and fallowing/crop rotation." [21] Section 1013 establishes a "presum[ption] that any water conserved… through land fallowing conservation measures has been conserved in the same volume as if conserved by efficiency improvements, such as by reducing canal seepage, canal spills, or surface or subsurface run-off from irrigation fields." [22]

[15] Mont Code § 85-2-419 (citing id. § 85-1-101(2)).
[16] *Id.* § 85-2-419
[17] Mont. Admin. R. 36.12.2001(1).
[18] *Id.* R. 36.12.2001(3).
[19] In one case, the United States challenged the salvage statute as applied, arguing that the applicant should not be granted the right to any salvaged amount beyond the amount of water it is already permitted to divert *See* In re Appropriation Water Rights, No. CDV 99-28, 1999 Mont. Dist. LEXIS 433 (Mont. Dist. Ct., 1st Dist. Nov. 9, 1999). In other words, the United States argued that Montana's salvage statute should only allow appropriators to recover the quantity of water they already use, rather than expanding their water rights to include any conserved water. The court rejected this argument, opining that it was "unrealistic and completely at odds with the policy in Montana to 'provide for the wise utilization, development, and conservation of the waters of the state for the maximum benefit of its people with the least possible degradation of the natural aquatic ecosystems.'" (quoting Mont. Code 85-2-101(3)). *See also* Hohenlohe v. State, 240 P.3d 628 (Mont. 2010), which is analyzed in further detail below.
[20] *See* Cal. Water Code § 1011(a).
[21] Id.
[22] Id. § 1013(c).

Oregon: The Oregon Legislature has adopted a robust water conservation statutory regime finding that water conservation "benefits all users, provides water to satisfy current and future needs through reduction of consumptive waste, improves water quality… and allows increased instream flow."[23] Oregon defines conservation as "reduc[ing] the amount of water diverted to satisfy an existing beneficial use achieved either by improving the technology or method for diverting, transporting, applying or recovering the water or by implementing other approved conservation measure."[24]

A conserved water right in Oregon is granted "the same legal status as any other water right for which a certificate has been issued"[25] preventing conserved water from being subject to forfeiture. Oregon allows users to "reserve" the conserved water instream for future out-of-stream uses.[26] Any conserved water that is reserved instream maintains the same priority date and is also not subject to abandonment or forfeiture.[27] Water reserved instream pursuant to the statutory requirements also becomes unavailable to those with subsequent priority water rights.[28] Thus, the statute explicitly rejects the common law Prior Appropriation principle that unused water automatically becomes available to junior appropriators.

Hydrological: Many of the tools and techniques for addressing the hydrologic considerations of recognizing a legal right to conserved water are discussed in Strategy No. 12: Quantifying Conserved Water and Strategy No. 3: Shepherding Water.

Financial: The simultaneous development of more efficient water market tools provides a forum to potentially valorize conserved water rights and therefore builds support for their recognition under the law. The basic function of a market is to bring together willing sellers and willing buyers. In the context of water, markets provide an organic means to re-allocate water based on willingness to pay. Without an easy means for those investing in conservation measures to make their conserved water right available for others to buy or lease, the financial benefits of recognizing a conserved water right are limited to expanding the owner's existing operations. At some point, water right owners will want to look beyond their own water needs and use their conserved water rights as standalone assets. This is especially true in areas with active market drivers that raise the value of water, such as municipalities purchasing water rights for secondary use, water shortages or regulatory reforms limiting use. Markets create an incentive to recognize conserved water rights because they provide the venue to monetize that right. In areas that allow for instream flows, non-traditional actors are invited into the market and, if willing to pay, can organically re-allocate water to meet contemporary environmental needs.

Technical: Technical tools for recognizing a right to conserved water are discussed below in Strategy No. 12: Quantifying Conserved Water.

Political: Discussed as follows, it will require a political commitment to change a longstanding interpretation and understanding of Utah's beneficial use statute. A political argument or tool available to advocate for recognizing a right to conserved water is that if designated for Great Salt Lake purposes, a right to conserved water could prevent a public trust lawsuit. A public trust lawsuit is a judicial means of re-allocating water for environmental needs based on the public's common law right to use water for fishing, navigation, and commerce. Public Trust Lawsuits in other States, such as California, have involuntarily taken water rights from others to meet environmental needs.

---

[23] Or. Rev. Stat. § 537.460(1).
[24] Id. § 537.455(1).
[25] Id. § 537.500(1).
[26] Id. § 537.490(1).
[27] Id. § 537.500(2); Or. Admin. R. 690-018-0080(2).
[28] *See* Or. Rev. Stat. § 537.490(1).

Administrative: Administrative tools of recognizing a right to conserved water are discussed in Strategy No. 12: Quantifying Conserved Water and Strategy No. 3: Shepherding Water.

2.1.2.3 Impacts, Barriers, and Considerations

While crucial for incentivizing conservation practices, recognizing a conserved water right is not without impacts, barriers, and considerations.

Table 2-3. Impacts, Barriers, and Considerations for Strategy No. 1 – Recognizing a Water Right to Conserved Water

Impacts, Barriers, and Considerations	
Legal	Water rights are legally protected from impairment from other users. Recognizing a legal right to conserved water, if not appropriately quantified and conditioned, could impair downstream water rights by depriving them of access to water they have relied on to satisfy their water rights.
Hydrological	If conserved water rights are not accurately quantified, there is a risk of expanding water rights and depleting more water from system than used under the original use. Further, financial incentives to quantify and market conserved water rights may encourage speculators to attempt to revive long-dormant or forfeited water rights in an effort to participate in the conservation market, which could result in even greater depletions than currently exist. Care must be taken to ensure that only valid existing water rights, whether or not in authorized non-use status, are available for conservation.
Financial	Modifying surface interference standards to mirror groundwater standards and require water right holders to use reasonable means of diversion may require water users to make expensive modifications that will require additional public or other funding.
Technical	Understanding and quantifying the amount of water actually consumed by a use will require verifiable data gained through an increased use of meters, telemetry, and other tools to assess depletion. See Strategy No. 12: Quantifying Conserved Water.
Political	Expanding the concept of beneficial use to include the right to retained control over conserved water is a dramatic change to Utah law and will require significant political will and education to gain public acceptance.
Administrative	Additional resources for the State Engineer may be needed to assess and regulate conserved water rights.

Legal: As discussed above, Utah law has a very distinct understanding of beneficial use. A key metric is that the measure of a water right is the actual amount of water depleted and that unused water is forfeited to satisfy downstream water rights. Utah also recognizes a non-impairment standard where one water user cannot impair the water right of another. In the real world, water use is complicated and determining when one water user's right ends and another is beginning requires a fact specific analysis (as demonstrated by the various categories of water evidenced previously).

The biggest legal barrier and consideration for recognizing a right to conserved water is ensuring that the process does not impair other water right holders. Any process must provide adequate measures to:

1) Review whether the water requested to dedicate to a new conserved water right is water that would otherwise be under the control of the water right holder and has not already been lost to forfeiture. For example, switching to a crop with a lower rate of depletion/consumption than the authorized rate of depletion, results in water available to dedicate to a conserved water. Whereas, water "savings" from a canal lining project may be subject to a new appropriation if the water is salvage water. However, if that water represents return flows to the system, it is not available to dedicate to a conserved water right because the water has left the control of the appropriator and has potentially been appropriated by others.

2) Accurately quantifying the amount of water available to dedicate to a conserved water right by measuring the actual amount depleted by a use against the legal diversion limit and authorized depletion rate (discussed in Strategy No. 12: Quantifying Conserved Water).
3) Assess whether recognizing a right to conserved water would impair other water users, including its impact on return flows, placing needed conditions on use, and allowing other water users to protest and bring additional information relevant to recognizing a conserved water right (discussed in Strategy No. 12: Quantifying Conserved Water).

Hydrological: The Change Application process assesses potential impairment to water users (discussed in Strategy No. 12: Quantifying Conserved Water). The goal of that review is to verify that after the change is implemented, downstream water users are not deprived of the water they have lawfully relied on to satisfy their water rights. If conserved water rights are allowed, but not accurately defined, the underlying water right could be expanded leading to increased depletion from the hydrologic system.

Additionally, under current Utah law, many water rights remain valid water rights but are not currently in use through several statutory use exemptions under Utah Code Ann. § 73-1-4 (Change Application development, non-use applications, or public water supplier exceptions, and so forth). Recognizing conserved water rights may incentivize these water right holders to place these water rights back into use or to use these rights more fully. This may create additional water use in the system not currently occurring.

Financial: Recognizing a right to conserved water may deprive downstream water users of water they have historically relied on. To mitigate these impacts, surface water interferences standards may need to be changed to mirror groundwater standards and require downstream diverters to upgrade their diversion and conveyance facilities if within their reasonable economic means (discussed in-depth in Strategy No.12). If the cost of upgrading is beyond their ability, public or other funding may be necessary to fund the upgrades and mitigate interference.

Technical: Implementation of water conservation will require adjustments to water use applications and practices, such as changing crop cultivation, new irrigation techniques, and water conservation methods. Understanding and quantifying the amount water actually consumed by a use will require verifiable data gained through an increased use of meters, telemetry, and other tools to assess water depletion. Without a robust means to measure and consistently monitor water use, it will be difficult to quantify and track conserved water rights and ensure their recognition does not impair other water users or result in a net increase of water use.

Political: The most significant barrier to recognizing a conserved water right is garnering the political will to make change. State legislators, water users, and administrators must see the value in legally recognizing a conserved water right. Redefining beneficial use to include a conserved water right is a significant change to Utah Water Law and fundamentally alters the State's historic understanding and applications of beneficial use. While a conserved water right could be used for numerous purposes, dedicating conserved water to instream flow at this time in Utah remains a sensitive issue. Some water user groups remain wary of instream flows and see the drive to create a conserved water right as a pathway to re-allocating valuable water resources toward non-CUs. Legislators and key constituencies will need to be educated and lobbied to support a change in the law.

Administrative: While State statutory changes are needed to recognize a right to conserved water, much of the work of quantifying and recognizing a conserved water right will occur at the administrative level, particularly with the Utah State Engineer's Change Application process.

While flexibility is desired in developing strategies to assess a depletion-based water rights and complimentary conserved water rights, clearly defined goals and objectives will be needed to ensure the practices employed by the agency meet the statutory intent and survive administrative turnover.

The State Engineer's Office is a central player in numerous State policy objectives. To achieve success on multiple fronts, the water user community must be cognizant of limited State Engineer resources. It may necessary to lobby for additional funding for State Engineer support and resources to complete the many responsibilities of the State Engineer.

2.1.2.4 Options for Future Actions

Several specific changes to the law can be made to establish a water right to conserved water.

Table 2-4. Options for Future Action for Strategy No. 1 – Recognizing a Water Right to Conserved Water

Options for Future Actions	
Legal	Supplement Utah Code Ann. § 73-1-3 with a new statute to allow for a water right to conserved water (that is, the difference between actual depletion and the authorized rate of depletion). Make complimentary changes to the Utah Code Ann. § 73-3-3; and § 73-3-8, Change Application statutes to require the pertinent information needed to quantify the amount of conserved water available to dedicate to a conserved water right. Once quantified and approved, a Request to Segregate can be filed to administratively monitor and track the conserved water right.
Hydrological	Addressed under other sections of the Report (such as, Strategy No. 3: Shepherding Water).
Financial	Continue to support water marketing efforts, like the water banking statute under Utah Code Ann. § 73-31 et seq. Begin to explore the creation of a fund to fund the purchase or lease of conserved water rights.
Technical	Addressed under Strategy No. 12: Quantifying Conserved Water.
Political	Care must be taken to emphasize the benefits of a conserved water right and retaining local control of the right to avoid perceptions that a specific sector of the water community is being targeted. Education is needed to inform water users their water rights are currently limited by actual use and they do not own the water up to their duty value diversion.
Administrative	Addressed under Strategy No. 12: Quantifying Conserved Water and Strategy No. 3: Shepherding Water.

Legal: Incentivizing water users to adopt and implement conservation measures will require adjusting Utah's understanding of beneficial use to recognize a property right to the difference between the amount of water authorized to be depleted and the amount of water actually depleted by a use. To execute this change, a new statute would need to work in tandem with the existing statutes governing beneficial use, forfeiture, and Change Applications.

Presently Utah Code Ann. § 73-1-3 defines beneficial use: "as the basis, the measure, and the limit of all rights to the use of water in this State."[29] Most likely this definition of beneficial use needs to continue to stand as the foundational frame and outside limits (that is, authorized diversion duty value and depletion rate) of a water right from which to quantify the amount of conserved water to be dedicated to a conserved water right.

[29] *See* Utah Code Ann. § 73-1-3.

The Utah Legislature can either add a new section to Utah Code Ann. § 73-1-3 or create and reference a new standalone statute that explicitly authorizes a right to conserved water. A conserved water right statute most akin to Utah's goals is the Oregon conservation statute. However, instead of focusing on the reductions in the amount of diversion, Utah law would need to focus on recognizing the difference in reductions in depletion rates.

Utah Code Ann. § 73-3-2 governs applications to appropriate unappropriated water. This statute is a poor fit for recognizing a conserved water right as conserved water is part of an existing water right and is not unappropriated water. However, as increases in efficiency become more widely adopted, it may be worth reviewing this statute to better account for "new" appropriations from salvaged water projects like canal lining projects.

Once recognized as available under the law, the "work" in quantifying the amount of conserved water available to dedicate to a conserved water right comes during a Change Application proceeding. This will consist of assessing the difference between actual depletion and authorized depletion rate.

Utah Code Ann. § 73-3-3 and 73-3-8 may need to be changed to add additional sideboards on what specific information is needed from the applicants to assess and quantify a conserved water right. The burden of proving a Change Application lies with the Applicant, this burden of proof should continue with any Change Application requesting to quantify and recognize a conserved water right.

Change Applications are triggered to assess prospective changes to an element of a water right. Here, none of the elements may be changing except for the approved depletion value and many operations may have already adopted measures they now would like to receive a conserved water right for. Timing will be key, as it will be hard for projects that have adopted conservation methods prior to the 7-year forfeiture window to argue that the water conserved has not already be lost to forfeiture and depended on by downstream water users. Going forward, Change Applications to recognize a right to conserved water would be most easily administered for prospective projects.

A robust impairment analysis will be needed to show that recognizing a conserved water right will not impair downstream water users (discussed further in Strategy No. 12: Quantification of Conserved Rights).

An approved Change Application will likely need to be followed with an administrative Request to Segregate to create a new water right number and file jacket to track and follow the conserved water right just like any other water right. For example, the new water right should be subjected to the same proof standards under Utah Code Ann. § 73-3-17. However, the State Engineer may want to set shorter proof due dates on the approved Change Application (1 to 2 years) to keep better track of monitoring the impacts of the change. Similarly, once a conserved water right is quantified under a Change Application, it should be treated as regular water right for forfeiture purposes under Utah Code Ann § 73-1-4.

Hydrological: Most of the actions that could be taken to address the hydrological implications of a conserved water right are addressed in Strategy No. 12: Quantifying Conserved Water and Strategy No. 3: Shepherding Water.

Financial: Fundamental to raising the political will for a legal change to allow conserved water rights is having a robust water market to place those conserved water rights. Without a monetary incentive to sell or lease conserved water rights, there is diminished incentive for water users to invest in the expensive and onerous activities needed to conserve water. There should be continued support of efforts such as water banking under Utah Code Ann. § 73-31 et seq.

If the Great Salt Lake is to benefit from conserved water rights, representatives of lake use/interests will need to participate in the market like any other water user and purchase or lease water for the lake. A fund and organizing body to manage the fund and enter arrangements to purchase or lease water rights is most likely needed to facilitate these transactions and meet the goals of securing water for the lake.

Technical: The technical actions needing to be taken to measure and allocate water to conserved water rights are addressed in other sections of this Report, primarily Strategy No. 12: Quantifying Conserved Water.

Political: Much of the work of getting a right recognized for conserved water will be political. This will be a fundamental shift in how Utah understands Water Law and water rights. Many sectors of water users are still wary of any change that will be perceived as “targeting” or “marking” specific kinds of water rights for re-allocation. This is especially true if the stated intent for any activity is to “find” water for instream flows, which are still perceived by some in Utah as being a wasteful use of water. In moving toward recognizing a legal basis for a conserved water rights, education on the existing status of the law and focusing on the free market opportunities of the change will be crucial.

Many water users understand their water right to currently extend to the limit of their water right, or the administratively set duty value. They may not understand that their water right is also limited to the actual amount of water they deplete, which may be much less. In other words, they may think they already have a right to their conserved or unused water, which they do not. Educating water users on the benefits of recognizing a conserved water right will be key to showing this change in is not adverse, but beneficial to their interests.

Additionally, while water is owned by the public, usufructuary water rights represent valuable private property rights. It is important that water users feel they maintain control of their rights. Free market dynamics allow the water user to control how and when their water is used. Due to the generally localized nature of water, markets will most likely develop in a manner that reflects local conditions and local control. Discussions about recognizing a legal right to conserved market may benefit most from emphasizing the free market aspects and benefits of doing so.

Administrative: Once a legal right to conserved water is recognized, the State Engineer will be the primary body reviewing, allocating, administering, and distributing conserved water rights. The specifics of these tasks are discussed in Strategy No. 12: Quantifying Conserved Water and Strategy No. 3: Shepherding Water.

2.1.3 Strategy Conclusion

Water is owned by the public and governed by the tenets of the Prior Appropriation Doctrine. Under that doctrine, water users can appropriate a conditional right of private use of the public’s water. A central component of a water right is that water must be put to beneficial purposes and must not be wasted. In Utah beneficial use defines the basis, measure, and limit of a water right. These components work together to maximize beneficial use across a water system, often at the expense of individual water rights. For example, the measure of a water right is the amount of water actually depleted or consumed by a use. The limit of a water right is both the amount of water authorized to be diverted from the water system according to a set duty value and the amount of water estimated to be depleted according to an authorized depletion rate. If a water user uses less that the limit of their water rights this water is forfeited back to the hydrologic system to satisfy downstream water rights.

The result of Utah's application of beneficial use is that it encourages water users to use water up to the limits of their water right so as to avoid forfeiting it to other users. While this understanding has successfully met society's past desire to maximize the CUs of water, it is ill suited for the complex needs of today.

Recognizing a conserved water right is a critical piece of the future of water use and management in Utah, and Great Salt Lake in particular. Redefining beneficial use to include conserved water would create an incentive for water users to adopt and employ many of the conservation methods and practices necessary to meet State water management goals. Further, conserved water could be transferred to other downstream beneficial uses, which could include environmental flows or maintenance of lake levels, as examples, thereby, creating sources of water for the Great Salt Lake by leaving more water in its tributaries.

To incentivize conservation activities, Utah must modify its definition of beneficial use to allow water owners to retain a legal right to control conserved water and to protect conserved water from forfeiture.

STRATEGY 12 Quantifying Conserved Water FOUNDATIONAL STRATEGY

2.2 Strategy No. 12 – Quantifying Conserved Water

GSLAC Strategy No. 12: Determine CU coefficients, such as evaporation and transpiration, for various water applications to improve efficiency by returning water back into the hydrologic cycle, which could result in more water reaching Great Salt Lake.[30]

2.2.1 Strategy Summary

Issue: Once a legal right to conserved water is recognized under Utah law, it is next necessary to quantify how much water is available to dedicate to the conserved right. Recognizing the extent of a conserved water right requires both technical and legal analysis. The determination and use of CU coefficients gets at the heart of quantifying the actual amount of water depleted, thus defining the scope of a conserved water right.

A technical analysis is needed to determine the actual amount of water a beneficial use depletes from the water system. This is often called a depletion analysis. An accurate depletion analysis considers a number of factors. Evolving technologies are allowing water users to collect useful data faster and less expensively.

A legal analysis establishes the amount of water legally available to allocate to a conserved water right. This includes assessing the legal limits of the existing right (duty) against the results of the depletion analysis. A legal analysis may further limit or condition the amount of conserved water recognized to protect other water users from impairment or implement public policy priorities.

Sister States use an administrative process similar to Utah's Change Application proceedings to collect and review a depletion analysis, determine the amount of water available for a conserved water right, conduct an impairment analysis, and set any conditions for use.

Conclusion: If a right to conserved water is recognized under law, quantifying the amount of water available to dedicate to a conserved water right will require a nuanced legal and technical analysis. Depletion accounting is essentially the technical mechanism needed to quantify efficiencies, better manage water supplies and to allocate a right to conserved water. Based on how sister States have approached the matter, Utah's Change Application process may be an efficient, already-existing forum to quantify and condition Utah conserved water rights.

[30] Note: As discussed in Strategy No. 1, traditionally under the prior appropriation doctrine, water authorized to be consumed under a water right not used by an upstream water user does not belong to the water user but is allocated toward fulfilling downstream senior water rights. Accordingly, without a right to conserved water as discussed under Strategy No. 1, water returned to the hydrologic cycle through improved efficiency techniques will not automatically reach the Great Salt Lake but most likely will be used by downstream water users. Accordingly, it is a threshold precondition to have a right to conserved water for depletion analysis to be useful and relevant.

2.2.2 Discussion

2.2.2.1 Background and Context

Quantifying how much water is consumed or depleted and thus, determining how much water is physically and legally available, is an essential element for optimizing management of limited water resources and is critically important for allocating a conserved water right. Quantifying a conserved water right requires assessing the legal limits of the amount of water authorized to be diverted under a water right and the actual amount of water used or depleted by the use. In practicality, this analysis determines the actual amount of water depleted from the system and sets conditions to avoid impairment to other water users. This is also called a depletion analysis. Methods to estimate changes in diversions and depletions have historically varied from application to application but are critical in terms of water rights administration and basin water planning. CU coefficients, unique to each water use within Utah, are currently a central means of estimating the efficiency of each water use and thus a critical element in water planning.

Duty Value: As discussed above, in Utah, beneficial use sets the limit of a water right.[31] The Utah State Engineer applies an administrative metric "duty value" to determine the maximum amount of water authorized under a water right, or its limit. This is the amount of water needed to be diverted from the water source to satisfy a specific use.

Duty values are typically represented as an annualized amount of AF per unit needed to fulfill that specific use. For example, duty values for irrigation vary depending on where in the State the irrigation is occurring and range from 3 to 6 AFA, with about a 4 AFA average value (UAES 1994). Duty values for other uses are static—such as 0.45 AF per EDU for domestic uses, or 0.028 AF per ELU.

M&I uses are capped based on the total beneficial use identified with the specific water right. The current duty value metrics used by the State of Utah are derived from in a 1994 "Consumptive Use of Irrigated Crops in Utah: Research Report 145" by Robert Hill and produced by the Utah Agricultural Experiment Station (UAES) at Utah State University (Hill Report) (UAES 1994).

Diverting within the "limit" of a water right and complying with the State administered duty values requires knowing how much water was actually diverted from a water source. Utah Code Ann. § 73-5-4 requires that a person using water in the State shall construct or install and maintain controlling works and a measuring device at "each location where water is diverted from a source and any other location required by the State Engineer." Additionally, all contemporary State Engineer orders require a measuring device as a condition of the Change Application approval. However, most irrigation diversions in the State of Utah do not currently have a measuring device. Such devices will be necessary to accurately determine the quantity of water actually diverted from the system and the corresponding amount of water potentially available to re-allocate to water right for conserved.

Depletion/Consumption: Beneficial use is also the legal "measure" of a water right, meaning water rights are limited to the amount of water physically depleted from the water system when using the water. In Utah, the term "depletion" means the CU, or for agricultural water use, the evapotranspiration (ET) of applied water (ET_{aw}). Overall ET includes ET_{aw} but also ET from other sources of water such as precipitation, available soil moisture, and shallow groundwater (Figure 2-3). ET_{aw} is also known in the context of irrigation water planning as actual depletion.

[31] *See* Utah Code Ann. § 73-1-3.

Typically, depletion amounts associated with ET_{aw} are estimated based on several physical conditions such as crop type, soil type, temperatures, wind factors, and so forth. Depletion values can range from 40 percent to about 70 percent of the water diverted from the use. The current consumption metrics currently used by the State of Utah are also derived from the Hill Report (UAES 1994).

Depletion also greatly depends on the means of water conveyance and delivery. For example, many of the conveyance and delivery systems within the drainage basins within Great Salt Lake's Watershed are based on flood irrigation techniques. As such, conveyance losses are typically high, and system efficiency is low. Additionally, open ditches and canals require a surplus of carriage water to overcome evaporation, seepage, and other carriage losses to successfully deliver water to crops. Efficiency improvements, such as piped/lined canals, can increase the efficiency and reduce the amount of water depleted from the system. This can also reduce the amount of water infiltrated into the groundwater basin, depriving downstream water users of return flows they have legally relied on to satisfy their water rights. Efficiency improvements that can improve crop yields, such as conversion to some types of sprinklers, can also increase crop evapotranspiration and depletions (UAES 1982; Samani and Skaggs 2008; Ward and Pulido-Velazquez 2008).

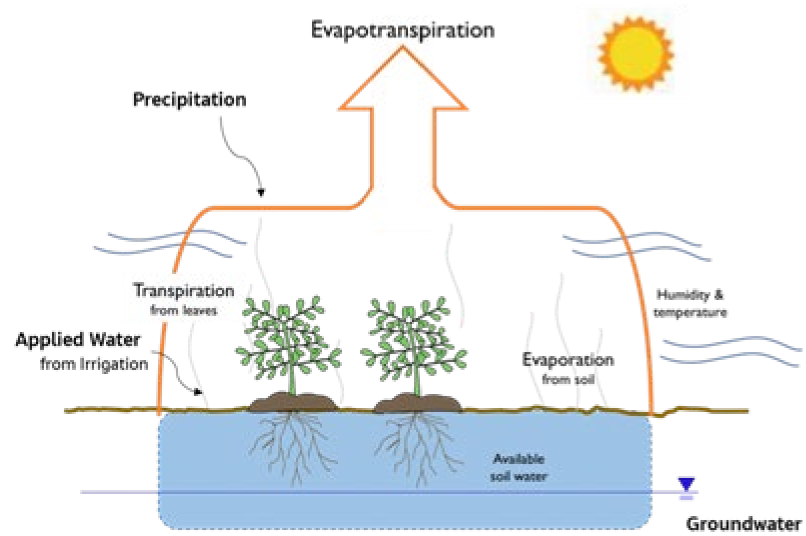


Figure 2-3. Evapotranspiration of applied water must be separated from evapotranspiration of water from other sources to derive actual depletion of diverted water

Non-Impairment and Expansion of a Water Right: Prior Appropriation Doctrine protects each water right against interference from other appropriators, regardless of whether they are junior or senior. Accordingly, a change of use by one appropriator that alters stream conditions to the detriment of another may constitute impairment and may therefore be enjoined.[32] A water user may change the point of diversion, nature of use, place of use, and season of use, so long as the proposed change does not impair another water right[33].

To ensure non-impairment, a change of use cannot "expand" a water right by increasing the quantity of water historically depleted. [34] Accordingly, when changing from one use to another, the owner of a water right is limited by the historic parameters of his or her water right. The change of use can be approved only so long as the historic rates of diversion and depletion are not increased (non-enlargement), and historic return flows are maintained to protect downstream rights from interference.

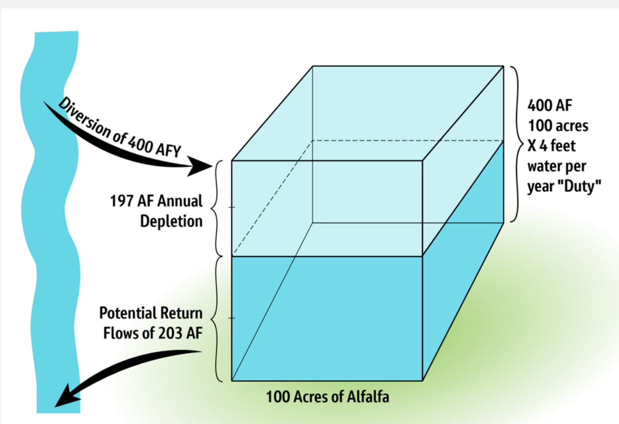
32 *See* Utah Code Ann. §73-3-3
33 *See* Utah Code Ann. §73-3-8
34 *See* Utah Code Ann. §73-3-3 and §73-3-8;

Additionally, to ensure that a new use consumes or depletes no more water than the original use, the State Engineer may also make other adjustments to keep the hydrologic system whole. An example would be accounting for a "full supply equivalent," which reduces the amount approved for new uses to mirror the temporal nature of a right (such as, a physical surface source typically producing more water in the spring and less in the fall) or, if a source has consistently produced less water than when the right was first appropriated (that is, many mountain streams produce significantly less water than in the mid-19th century when many senior water rights were initially appropriated).

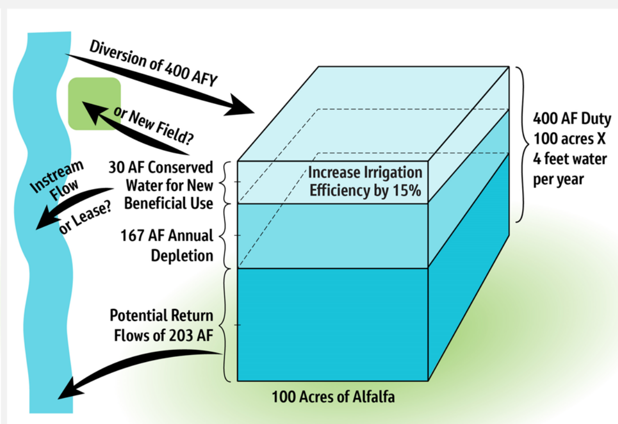
In practice:

Farmer Joe has a 100-acre field of alfalfa near Logan, Utah. Farmer Joe's water right has a duty value of 4 AFA, thus Farmer Joe is entitled to divert up to 400 AF per year. The authorized depletion rate is currently calculated using consumptive-use coefficients in UAES 1994 and is estimated as1.97 AFA, or a total of 197 AF per year for this particular field and water right. This translates to potential return flows of 2.03 AFA, or a total of 203 AF per year for this field (refer to graphic 1).

If Farmer Joe were to improve the efficiency of his irrigation practices on this field by 15 percent, he has the potential of conserving 30 AF per year (refer to graphic 2). Depletion accounting would be needed to document the actual depletion of applied water and the volume of conserved water available for a different beneficial use (Strategy No. 12: Quantifying Conserved Water). If Farmer Joe had a right to this conserved water (via Strategy No. 1: Recognizing a Right to Conserved Water), the conserved water could then potentially be used for irrigation on additional land (via Change Application), for instream use, or potential lease to downstream water users (via Strategy No. 2: Split-Season Leasing and Strategy No. 3: Shepherding Water).



1. Existing Water Right



2. With Conserved Water Right

2.2.2.2 Tools and Techniques

Once a legal basis for conserved water exists, the legal system must quantify the extent and form of the conserved right. Once quantified, the conserved water right can be dedicated to new uses, including traditional beneficial uses and instream flows if allowed by law. Quantifying a conserved water right requires the legal system not only to apply legal standards set for a water right but also review detailed technical information.

Table 2-5. Tools and Techniques for Strategy No. 12 – Quantifying Conserved Water

Tools and Techniques	
Legal	An impairment analysis is typically conducted to determine whether the recognition of a Change Application (such as, a conserved water right) will impair other water rights, and if so, can the impairment be reasonably mitigated to allow the use of conserved water to occur.
Hydrological	See Technical tools to measure water.
Financial	A functioning and active water market will help incentive the creation and use of conserved rights and should be studied and piloted. Depletion analysis is expensive and publicly funded efforts may be needed to conduct the necessary experiments to determine what efforts best fit Utah's unique needs.
Technical	Improving the assessment of depletion amounts will require a technical analysis of the actual amount of water depleted by the beneficial a use compared with the duty value authorized for the use. The State of Utah is currently completing a case study to validate recommended ground-based and remote sensing methods for agricultural depletion accounting in Utah.
Political	The quantification of a conserved water can be a means to enact State water policy goals, such as dedicating a portion of conserved water rights to instream flow uses like Oregon.
Administrative	Administrative processes are often used to quantify the amount of water available to allocate toward a conserved water right. An administrative process is also where State agencies can condition the use of water to ensure water is used within approved limitations.

Legal: Like Utah, western sister States have adopted means and processes to assess whether recognizing a conserved water right will impair other water rights.

The California State Water Resources Control Board (SWRCB) must make general factual findings that the proposed temporary change: 1) will not injure other water rights, and 2) will not "unreasonably affect fish, wildlife, or other instream beneficial uses."[35] For requests to transfer conserved water SWRCB must make an additional factual finding that the quantity of water proposed in the transfer corresponds to the amount of water that is actually conserved.[36] Upon the completion of a temporary transfer, the right to the conserved water reverts to the original transferor "as if the water transfer had not been undertaken."[37]

In Montana, the Applicant retains the burden of demonstrating that using conserved water "will not adversely affect the use of the existing water rights of other persons."[38] The Montana Supreme Court has held that when assessing a Change Application for conserved water, the Montana Department of Natural Resources and Conservation (MDNRC) should take historic CU and return flow into account.[39]

[35] Cal. Water Code § 1727(b).
[36] *Id.* § 1726(e).
[37] *Id.* §1011(c).
[38] Mont. Code. Ann. § 85-2-402(2)(a).
[39] Hohenlohe v. State, 240 P.3d 628 (Mont. 2010). In *Hohenlohe*, an applicant salvaged water and wanted transfer the water to be used as instream flow in a tributary that feeds into the Missouri River. The MDNRC argued that, because the user's historic return flows went directly into the Missouri River instead of back into the tributary, the applicant had to demonstrate that the change would not have a negative impact on downstream users in the Missouri. The court clarified that, when assessing a change application from salvaged water, the MDNRC should take historic consumptive use and return flow into account. However, the court held that the applicants met the statutory criteria by demonstrating that there would be no adverse effect on downstream users on the tributary, and that any impact on the flows of the Missouri River would be so negligible that requiring the applicants to search for an appropriator who might be impacted would be a "heavier burden on the applicant than the statutory provisions warrant."

Like other States, Oregon Water Resources Department (OWRD) assesses whether there will be any effect on other water rights; if so, then it will limit the quantification of the conservation water accordingly.[40] When considering an application, OWRD studies five factors: 1) the project's compliance with Statewide planning, 2) compliance with applicable land use plans, 3) the application's completeness, 4) reduced diversion for the original right's uses, and 5) harm to existing water rights.[41]

Hydrological: The hydrologic tools for quantifying a right to a conserved water right are primarily reflected in the technical tools used to measure a conserved water right discussed below.

Financial: As discussed in other sections, having a functioning and active water market will help incentive the creation and use of conserved rights.

Conducting and replicating depletion analysis on a scale to make measurable differences in Utah water management will require large sums of money. To ensure the State is most effectively spending its resources, small "trial balloons" and pilot projects testing various technologies, applications, and methods should be encouraged. The depletion accounting case study by the Utah Agricultural Optimization Task Force is a good example of the use of public funds in funding and analyzing test projects and identifying those that "fit" Utah conditions.

Technical: CU coefficients indicate "the percentage of water removed from the immediate environment by evaporation, transpiration, incorporation into products or crops, or consumption by humans or livestock" (UAES 1994).

The most common method used for estimating crop ET (ET_c) involves the use of meteorological measurements, either by pan evaporation or weather station data, to estimate the ET of a reference crop (grass [ET_o] or alfalfa [ET_r]) coupled with CU coefficients (that is, empirical crop coefficients [Kc]), to estimate potential ET_c. This process is based on research that developed standard methods for relating meteorological measurements to direct lysimeter measurements of actual ET for the reference crop under ideal growing conditions. The K_c values applied to estimate crop-specific ET are likewise typically developed with paired reference ET measurements and direct lysimeter or other actual ET measurement methods of a specific crop under similar ideal growing conditions. When properly developed and then applied under similar conditions as used to develop the K_c values, the combination of accurate weather station data, information on crop start and end of growth periods, and cutting or harvest dates can provide a defensible method for estimating the potential ET of specific crops.

While use of reference ET measurements and K_c is a standard method for estimating potential ET_c under ideal conditions and as a target for irrigation scheduling, actual ET_c often departs from and is lower than potential ET_c when considered at the field-scale. This is the result of conditions that impair optimum growing conditions such as non-ideal soil conditions, excess salinity, fertility limitations, physiological limitations to transpiration, pests, disease, variations in crop variety, and non-uniform or inadequate irrigation applications. To estimate actual ET_c under non-ideal conditions, additional information on factors that limit ET_c, such as soil moisture, soil salinity, and actual plant cover, can be used to develop adjustments to ideal K_c values. Due to the differences between potential and actual ET_c, application of meteorological measurements and crop coefficients typically overestimate actual ET_c with greater deviation between actual and estimated ET_c as the scale of measurement increases.

[40] *Id.* § 537.470(3).
[41] Or. Admin. R. 690-005-0030, -005-0035, -018-0040, -018-0050. For the form listing these criteria and the general process, see https://www.oregon.gov/owrd/WRDFormsPDF/conservedwatercriteriareview.pdf.

CU coefficients have been developed for most major crops globally to guide water users in irrigation water management. For major crops in Utah, historic estimates of potential ET_c using the 1982 Kimberly Penman method and estimated depletion were presented in the Hill Report and are still used by the Division of Water Rights (DWRi) and Division of Water Resources (DWRe) for potential depletion estimates (UAES 1994). Additional crop coefficients were presented by the UAES (2011) for crops and open water in Utah and by Allen and Robison (2007) for crops grown in Idaho, including crop coefficients developed by Wright (1982) using lysimeters at the Kimberly, Idaho, research station.

ET_r and thus by extension the estimated ET_c, estimated using the CU coefficients and methods from UAES 2011 are generally higher than when using the methods from UAES 1994 (UAES 2011). These publications provide relevant information for estimating potential ET_c using valid reference ET measurements, crop phenology and irrigation management data, and applicable crop coefficients. For highest accuracy, the crop coefficients are partitioned into transpiration and soil evaporation components using the dual crop coefficient approach with daily calculation timesteps.

Political: The quantification of actual depletion and conserved water can be a means to enact State water policy goals. Accurate and timely monitoring of water supplies, demands, and consumption and forecasting of conditions provide farmers, ranchers, and water managers with the knowledge to make informed decisions. Informed decisions lead to better results and innovation that improves the sustainability of Utah's water supply and the profitability of Utah's agricultural operations

Oregon has elected to use the conserved water statute as a vehicle to meet State instream flow goals and dedicate water to instream flow purposes. After quantifying a conserved water right, OWRD allocates 25 percent of the conserved water to the State to remain in the stream for instream flows or other uses. Once conserved water has been allocated to instream use, OWRD is tasked with managing that water under the administrative rules pertaining to instream water rights generally.[42]

Water right holders opting to use their remaining 75 percent of a conserved water rights for CUs (that is, not instream flows) face additional requirements. Applicants are required to notify OWRD of any change in place of use, type of use, or point of diversion.[43] OWRD will approve the change if the new use is in the same place of use as the initial allocation, it will not constitute an expansion of the right, and consistent with the five factors outlined previously.[44]

The methods used for depletion accounting for irrigation water rights will document actual CU or ET_{aw} for each field where it is implemented. This data could be aggregated to document actual depletions at the basin-scale for planning and reporting purposes and could also be used to improve consumptive-water use coefficients for use in forecasting water depletions.

[42] *Id.* R. 690-018-0080(1).
[43] Or. Admin. R. 690-018-0090(1).
[44] *Id.* R. 690-018-0090(2), 690-005-0045.

Administrative - Process for Quantifying Water: In most States, an administrative process is used to collect the information needed to quantify the amount of water available to be recognized as conserved water, review whether use of the conserved water will impair other water users and set conditions for use.

The Montana conservation statute allows appropriators to transfer the quantity of salvaged water to new uses, including instream flows. The MDNRC reviews and approves salvaged water rights using Montana's existing Change Application process and a supplemental "Salvage Water Report Addendum." [45] This Addendum requires listing the savings method used, the quantity of water saved, and the quantification method used.[46] The standard Change Application form also includes a checkbox entry where users indicate whether the change is being made available by a conservation project.[47]

California's water savings statute allows appropriators to sell, lease, exchange, or transfer the water rights derived from conserved water,[48] including temporary transfers.[49] However, in California to transfer and protect conserved water from forfeiture, it must first be recognized in the appropriator's annual progress report, which requires water users file records of actual diversion and use under their water rights.[50] Annual progress reports require permittees to indicate whether they plan to carry out conservation projects in the coming year and, if so, whether they plan to "claim credit for the amount of water conserved".[51] To then transfer any claimed conserved water, California appropriators submit a temporary Change Application to the SWRCB, allowing the saved water to be temporarily transferred to other uses.[52]

> In practice:
>
> **Depletion Accounting for Irrigation Water Rights in Utah**
>
> Agricultural producers have asked the Utah Division of Water Rights to consider new means of administering water rights by depletion rather than the historic method of irrigation diversion duty and number of acres irrigated. Administering irrigation rights by depletion requires accurate, effective, and defensible means to measure and account for actual depletion. With numerous available and emerging methodologies to do so, the Legislative Agricultural Water Optimization Task Force sought to evaluate and identify the most practical, effective, and defensible means of measuring and accounting of actual depletion in Utah. Depletion accounting provides a means to quantify water use and incentivize and enable water optimization at the field scale and basin scale. The objectives of this project were to identify and evaluate available methodologies and recommend methodologies for depletion accounting to be validated for use in Utah via a pilot program (Jacobs 2020). The Task Force intends to begin the field pilot program in the summer of 2020.

[45] Available at http://dnrc.mt.gov/divisions/water/water-rights/docs/forms/606_swa.pdf
[46] See id.
[47] Available at http://dnrc.mt.gov/divisions/water/water-rights/docs/forms/606-irrigation-r-10-2019_fillable.pdf.
[48] See Cal. Water Code § 1011(b).
[49] See Cal. Water Code § 1011(b), §1011(c).
[50] Cassidy Woodard, *A Look at Laws Authorizing Uses of Conserved and Saved Water in California, Montana, Oregon, and Washington* 5 (Univ. of Colo. Law School, 2016); *see* SAMPLE ANNUAL PROGRESS REPORT FOR PERMITEE, CAL. STATE WATER RES. CONTROL BD., http://www.waterboards.ca.gov/waterrights/water_issues/programs/ewrims/docs/permit.pdf.
[51] *See* Sample Annual Progress Report, *supra*, at pt. 9.
[52] Woodard, *supra*, at 5; *see* Cal Water Code §§ 1726, 1727.

Oregon has a robust statutory scheme and administrative process for recognizing, or certificating, water rights to conserved water. Water rights to conserved water can be severed from the land where it was originally used, and can be transferred to others.[53] The user transferring the conserved water rights needs only to notify OWRD and submit other information about the entity and place of use where the water is going.[54] Following this initial allocation decision, however, any future transfers become subject to the normal change process.[55] A water user interested in pursuing a conservation project must submit an application to the OWRD that includes a description of the improvements and the estimated amount of water saved.[56] An Applicant can submit an application before or up to 5 years after the measures are completed.[57]

The administrative process is also the place where the State agencies can place conditions on use, such as requiring metering, monitoring, and reporting water use to ensure it stays with approved limitations.

2.2.2.3 Impacts, Barriers, and Considerations

Table 2-6. Impacts, Barriers, and Considerations for Strategy No. 12 – Quantifying Conserved Water

Impacts, Barriers, and Consideration	
Legal	Downstream water users have vested rights to the continued receipt of return flows from upstream water users. The loss of returns flows constitutes interference and may be enjoined if it cannot be mitigated..
Hydrological	Optimization of agricultural water use through depletion accounting could, in some instances, increase actual depletion in the system and reduce return flows to the system.
Financial	Funding is needed to better understand actual depletion throughout Utah, develop and implement methods for depletion accounting, and create market drivers that incentivize implementation of agricultural water conservation practices. May need to provide funding to downstream water users adapting to less available flow.
Technical	There is currently a lack of information on depletions that would enable the State to accurately measure and track depletions versus the existing duty.
Political	Utah water users have not agreed on acceptable depletion accounting methodologies.
Administrative	Quantifying a conserved water right through the Change Application process is going to require significant State Engineer resources.

Legal: Downstream water users have vested rights to the continued receipt of return flows from upstream water users. The loss of returns flows constitutes interference and may be enjoined if it cannot be mitigated. Quantification of a conserved water right will need to ensure that downstream water rights are not impaired

Hydrological: Measurement and accounting of actual depletion by some agricultural producers may determine that they are already conserving water (that is, depleting less than currently allowed, and are allowing excess water to return into the system). As a result, unless there is an incentive to contribute conserved water back into the system, they may then optimize irrigation practices to increase actual depletion to the allowed volume and return less water into the system (such as, extending the irrigation season if allowed).

[53] Or. Rev. Stat. § 540.510(2).
[54] *Id.* § 540.490(1).
[55] *Id.* § 540.490(3); *see* Or. Admin. R. 690-018-0090(4)(c).
[56] Or. Rev. Stat. § 537.465, .470(1). For a list of application requirements, see Or. Admin. R. 690-018-0040.
[57] *Id.* § 537.470(2).

Financial: The State Legislature will need to pass legislation funding significant studies related to measuring depletion and infrastructure and staff to manage the new data and analysis load. Funding may also be necessary to assist downstream water users to become more efficient in their own diversion and conveyance of water to mitigate loss of historic return flows they have relied on in satisfaction of their water rights.

Technical: The use of CU coefficients typically provides an overestimate of the potential ET_c from agricultural use. This method does not measure actual depletion (ET_{aw}). The current and historical use of CU coefficients has resulted in a lack of information on actual depletion that would enable the State to better complete basin water management plans and accurately measure and track depletions versus the existing duty. Without this information, it will be difficult to ascertain the amount of consumptively used water (ET_{aw}) and any conserved water and incentivize the means to transfer conserved water to downstream uses.

Developing and improving upon CU coefficients for use in Utah is a challenging endeavor. It will require detailed measurements of actual meteorological conditions and actual ET_c for a variety of crops, cropping methods, irrigation methods, geographies, and climates within Utah.

UAES (2011) summarizes an extensive effort to collect new data to improve upon the CU coefficients and methods described in UAES (1994) with variable results. Others have also worked to improve upon available CU coefficients. Even so, improvement of CU coefficients, while assisting with basin water planning, only improves the estimate of potential ET_c. Methods for measuring actual ET_c (and determining ET_{aw}) throughout the State could be a more accurate means of verifying water right Change Applications, validating actual depletion from existing water rights, complying with interstate compacts, and measuring and accounting for actual conserved water.

Political: Utah State water users have not agreed on acceptable depletion accounting methodologies. It will take broader efforts and collaboration among many members of the water user community to come to established standards that are known by an understood by all.

Administrative: Quantifying a conserved water right is going to take substantial time and resources from the State Engineer. Each Change Application requesting a conserved water right be recognized and accounted for will require State Engineer staff to interpret the data presented by the Applicant, field and review protests by other users, and make the necessary adjustments and conditions to protect other water users from impairment and implement State policies. Moreover, the current system of duty value and authorized depletion rates is deeply entrenched in the State Engineer's processes and systems. Making simple adjustments to incorporate information about conserved water rights into items like the website and databases will take a significant effort.

2.2.2.4 Options for Future Actions

Most actions needed to quantify a conserved water right are technical and administrative.

Table 2-7. Options for Future Actions for Strategy No. 12 – Quantifying Conserved Water

Options for Future Action	
Hydrological	Develop methods to quantify, report, and validate actual depletion.
Financial	Consider means to fund further development and implementation of depletion accounting methods. Link subsidies to optimization of water use via new selection criteria to improve agricultural production and participation in means to augment surface water supplies for downstream uses.
Technical	Improve quantification of meteorology, groundwater and surface water conditions, diversions, and actual water depletions. Validate recommended depletion accounting methods through implementation of a robust case study in Utah. Develop Statewide infrastructure to gather and maintain required data to improve the transparency of water diversions, water use and to validate data from emerging remote sensing methods.
Political	Capitalize on existing momentum to move to depletion-based water right, like the efforts of the Legislative Agricultural Water Optimization Task Force.
Administrative	Provide funding and guidance to the Utah State Engineer in how to administratively administer the Change Application process to account for a conserved water right.

Legal: Like its sister States, Utah's administrative Change Application process is the appropriate venue to conduct a depletion analysis and quantify the amount of water available to dedicate to a conserved water right. Under Utah law the Applicant of a Change Application retains the burden of proof to provide sufficient evidence that there is a "reasonable belief" the Change Application can be approved under Utah Code Ann. § 73-3-8[58] and the application will not impair other users.

Utah Code Ann. § 73-3-3 enumerates the steps required to file an application for change of use, the attributes of the water right that may be modified, and the procedure followed. While the statute sets general criteria, the State Engineer administratively does the actual analysis of the Change Application, and in accordance with Utah Code Ann. §73-3-8. It is arguable that if a right to conserved water is recognized by statute, a Change Application requesting a depletion analysis could be filed today under existing code. For example, among other general criteria, Utah Code Ann. § 73-3-3(4)(b)(x) states that an Applicant must submit "any other information that the State Engineer requires." This general catchall provision could be read to already authorize the State Engineer to have the authority to administratively request the information needed to assess a request to move to a depletion-based water right. The benefit of not making a statutory change is that the State Engineer has the flexibility to develop and evolve a process for evaluating such requests.

However, to avoid controversy, maintain consistency, and place potential applicants on notice, it may be prudent to adjust the statute to establish explicit authority to assess a conserved water right and codify the information needed to make such an analysis. If the State wanted to move in a direction closer to Montana's specific Salvage Water Report, the Legislature could create a new section under Utah Code Ann. § 73-3-3(4) that enumerates exactly what an Applicant needs to provide to assess a conserved water right (that is, measuring data, means of evaluating ET, and so forth).

[58] *See* Utah Code Ann. § 73-3-3(5); Utah Code Ann. § 73-3-8(1); East Bench Irrigation Co. v. Deseret Irrigation, 271 P.2d 449 (1954); Tracy v. Bullock, 294 P.2d 707 (1956); Searle v. Milburn, 133 P.3d 382 (2006).

Utah Code Ann. § 73-3-3 and § 73-3-8 governs Change Application approvals and Utah Code Ann. § 73-3-15 governs protest to Change Applications. A Change Application cannot be approved if it will impair existing water right holders. A request to change a water right from duty-based right to a depletion-based right and recognize a complimentary right to the resulting conserved water needs to meet the same non-impairment standard. Presently groundwater and surface water impairment analysis are treated differently under the law. Generally, if a protestant raises an impairment claim in a surface water context, the protestant is generally entitled to be protected as to their method and means of diversion, so long as they are considered to be reasonable. The rules are different in the groundwater context. All ground water appropriators are required to maintain their own reasonable means of diversion. If a new appropriation lowers the water table, but the prior appropriator still can access the water by deepening their well, then the prior ground water appropriator is required to follow the water and not seek to enjoin further ground water appropriations, provided deepening the well is within the prior appropriator's economic means. If it is not, then the junior appropriator may mitigate the harm by providing some economic support.

If that State recognizes a right to conserve water, it may upset the hydrologic balance. That may in turn necessitate a change in the rules as to what constitutes interference in the surface water context, similar to the changes adopted to make the development of groundwater possible. That way the entire system is pushed toward being more efficient with their diversions and application of water. Interference would then be recognized only if the cost of gaining efficiency of a downstream use is beyond their economic means, or otherwise cannot be mitigated. In that instance, the upstream conservation effort could be enjoined, or perhaps the upstream appropriator and/or the State could make funding available to assist the downstream user to also gain in efficiency. In essence this would be placing conservation and further use of water ahead of protecting return flows as a matter of State policy.

Hydrological: Quantification of the actual depletion of agricultural water use provides farmers, ranchers, and water managers with the knowledge to make informed decisions. Informed decisions lead to better results (such as, conserved water) and innovation (such as, markets for conserved water) that improves the profitability of Utah's agricultural operations and sustainability of Utah's water supply.

Financial: Development and implementation of depletion accounting for water rights in Utah will require funding of studies that validate recommended methods. Further, infrastructure and staff resources to collect, maintain and analyze data at the basin-scale will require financial investment. Infrastructure and resources to collect, maintain and analyze data at the field-scale may require financial investment until the financial benefits of depletion accounting can be realized by producers (that is, via expanded production or market incentives for conserved water). Subsidies for the required investment to implement depletion accounting could be linked to new selection criteria that encourage the use of conserved water to increase agricultural production and/or conversion of conserved water to downstream uses. Alternatively, depletion accounting could be used to prioritize and then validate investments in optimizing agricultural water supply and use and/or conserving agricultural waters for downstream use.

Technical: If depletion accounting for irrigation water rights are not implemented, then determine CU coefficients for various water applications and use the data to rank efficiency of water use. CU coefficients are central to the means of estimating potential depletion from different water applications and are thus an important cornerstone of effective water planning. Improved estimates of depletion enable water users to better understand the benefits and consequences of how water is used, improve the efficiency of water use, and optimize the productivity from water use. Thus, water users have a reliable and effective means to prioritize the beneficial use of available water. The rankings could be used to prioritize water uses that could be modified or altered to improve efficiency of use thereby returning more water back into the hydrological cycle, which, pending other changes (such as, water rights beneficial uses), could result in more water reaching Great Salt Lake. Measurement and accounting of actual depletion (ET_{aw}) (that is, depletion accounting), in turn provides the means to verify water rights and management decisions and improve upon the CU coefficients and methods used to estimate future depletions.

Implement a new depletion accounting approach using ground-based methods for field-scale depletion reporting and validation and remote sensing methods for field-scale to basin-scale depletion assessment (Jacobs 2020). The approach integrates the applications to provide scalability and defensibility and maximize value to water users, water managers, and the State of Utah over time. A new depletion accounting approach should also include robust quantification of the water cycle:

1) Maintain a robust network of meteorological stations throughout the State, particularly in basins where there is significant irrigation water use.
2) Maintain a network of groundwater monitoring wells to confirm groundwater levels and conditions at or near sites where water rights are managed by depletion.
3) Require the measurement and reporting of flow measurements in rivers, canals and at diversions and points of application to the parcel.
4) Maintain a robust database to house the information from these methods and make the data freely available to water users.

Political: The State of Utah may be able to improve CU coefficients by capitalizing upon a concept that was originally proposed by water users and is currently under study by the Legislative Agricultural Water Optimization Task Force – depletion accounting for irrigation water rights. Depletion accounting provides a means to quantify water use, incentivize and enable water optimization at the field- scale and basin-scale, and protect water rights, water quality, and the environment. In other words, moving this direction will help a number of water interests and can expedite problem solving on a number of fronts.

Administrative: Utah statutes generally leave the specifics governing the Change Application process to the State Engineer. Retaining the ability to set the standards to assess and authorize use of a conserved water right at the administrative level may be prudent and preferred as it allows the agency more flexibility to develop appropriate procedures and practices.

The State Engineer does not currently regulate or monitor water rights based upon the type of crop grown, the specific use made, or the means of diversion and conveyance. Further, the changing nature of uses (such as, crop rotation, field rotation, ongoing efficiency improvements) will necessitate that water users report changes, which will calculate and apply new diversion and depletion rates in response.

The Change Application process is similar to sister State Change Application processes in that the primary function of the process is to only allow a change of use to occur if it will not result in impairment of other water rights. Like sister States, the Change Application process is an appropriate venue to address the complexities of quantifying and conditioning the use of a conserved water right.

Once a right to conserved water is established by statute, the State Engineer will need to implement that policy, and using best available science, determine the quantity of water conserved, and whether the use of conserved water will cause impairment to other water users. Retaining the ability to set the standards to assess and authorize use of a conserved water right at the administrative level may be prudent and preferred as it allows the agency more flexibility to develop appropriate procedures and practices.

2.2.3 Strategy Conclusion

If Utah is to make its scare water resources “stretch” to meet coming demand, it will need to invest in and explore new methods of using its water resources more efficiently. Depletion accounting is essentially the technical mechanism needed to quantify efficiencies, better manage water supplies and to allocate a right to conserved water. Coupled with the legal right to use conserved water, depletion accounting is a critical tool for determining the quantity of water conserved, and therefore available for allocation on a temporary or more long-term basis for additional use. For Utah, depletion accounting is probably best executed as part of Utah’s Change Application process. There the Applicant can submit the relevant information to assess the amount of water actually consumed by a use and the State Engineer can determine the amount of water potentially available for re-allocation. Additionally, the Change Application process can implement policy goals, like preserving a portion of a conserved water for instream flow or Great Salt Lake purposes. Most of the technical and legal infrastructure already exists to make these determinations. To make depletions accounting and depletion-based water rights a reality in Utah will take political will and investment in technologies and practices.

STRATEGY 3 Shepherding Water

FOUNDATIONAL STRATEGY

2.3 Strategy No. 3 – Shepherding Water

GSLAC Strategy No. 3: Develop and implement other measures to supply water to the Great Salt Lake primarily by ensuring that water conserved upstream makes it to the Great Salt Lake.

2.3.1 Strategy Summary

Issue: Physically distributing and allocating water in a manner that complies with Water Law is a complex task. At its core, the Prior Appropriation Doctrine serves two primary purposes:

1) putting water to use in priority; and
2) prospectively ordering curtailment in times of shortage to protect the rights of senior priority rights to receive their water supply before others may have access to the source.

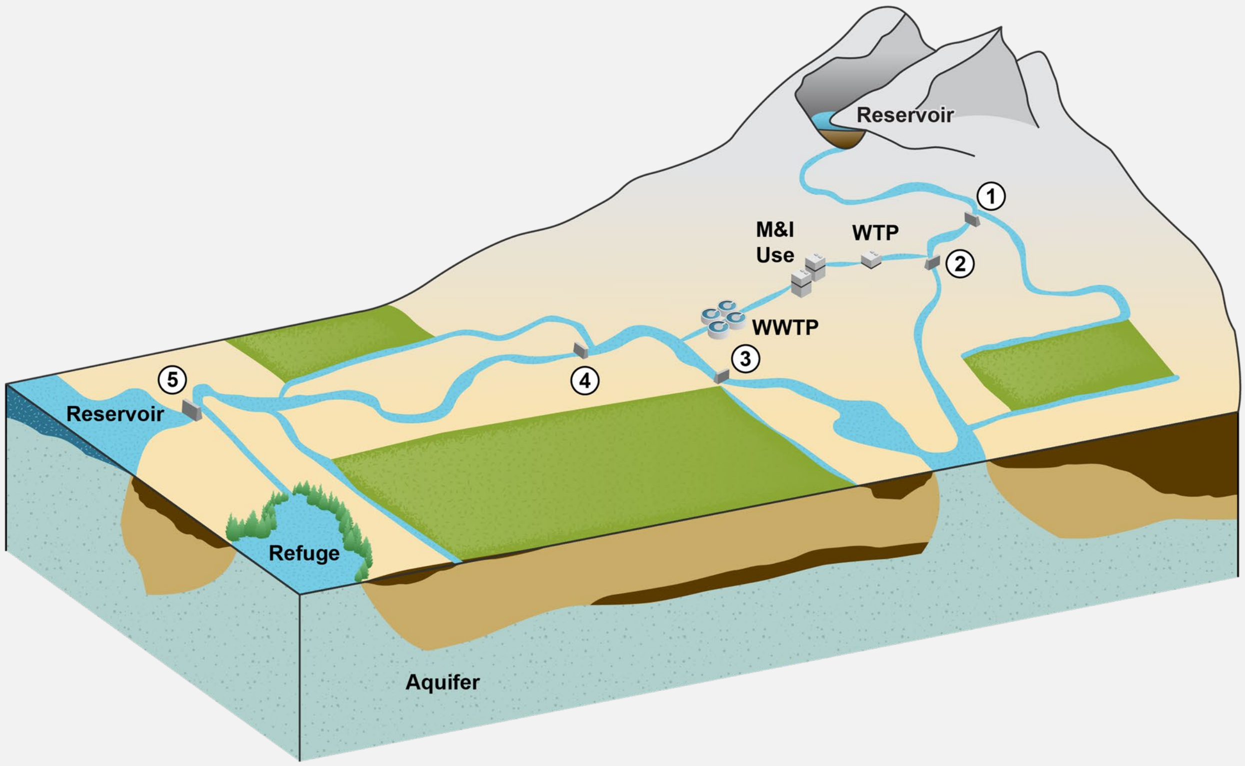
To ensure water right holders physically receive water in conformance with their water right, water rights are "shepherded" through a watershed subject to specific rules and practices set by the Prior Appropriation Doctrine. These rules include distribution based on priority and preventing impairment to other water. The Utah State Engineer regulates the distribution of water and assists water users in physically allocating water accordingly to local water rights.

Water rights are based on beneficial use. Currently, Utah law primarily recognizes CUs of water. Using water for instream flows has now gained legal acceptance as a beneficial use, but in Utah, the right to use water for instream flows is limited to two State agencies and fishing groups, but only in very limited circumstances. Under the Prior Appropriation Doctrine any water allowed to bypass the upstream appropriator's point of diversion is available for diversion by the next appropriator downstream in priority, in satisfaction of their water right. For water intended for the Great Salt Lake to reach the lake and not be consumed by junior users, instream flows must be shepherded under the Prior Appropriation system.

Conclusion: To ensure water rights intended for Great Salt Lake uses reach the lake, instream flow rights must be treated with equal dignity as other appropriated rights and protected from diversion by intervening water users, to ensure the water gets to its intended place of use. Perhaps a specific statutory section addressing instream flow Change Application to move water to Great Salt Lake would provide the legal basis to prevent diversion of instream flows by intervening appropriators.

In Practice:

Farmer Joe has a 100-acre field of alfalfa and his duty allows him to divert up to 400 AF per year at Diversion No. 1. He improves the efficiency of his irrigation practices by 15 percent and is able to reduce his depletion by 30 AF per year. Assuming Farmer Joe has a right to this conserved water (Strategy No. 1: Recognizing a Right to Conserved Water) and is able to quantify it (Strategy No. 12: Quantifying Conserved Water), Strategy No. 3: Shepherding Water could enable him to lease and shepherd the conserved water to the public water system at Diversion No. 2, Farmer Jane at Diversion No. 4, to the Refuge at Diversion No. 5, or even the Reservoir at the downstream end of this stream reach.



2.3.2 Discussion

Addressing shepherding is a critical component for getting water to Great Salt Lake. Without determining how water for instream or lake purposes moves through the watershed without first being diverted and used by junior water right holders to fulfill their water rights, few efforts can be made to improve or affect lake levels.

2.3.2.1 Background and Context

With beneficial use as the basis, measure, and limit of an appropriated water right, the Prior Appropriation system adheres to two other central tenets that define how water is distributed.

- **Priority - First in time is first in right.**[59] Water rights are administered on a priority basis. In times of shortage junior rights are curtailed in order to satisfy senior prior rights. The senior right holder can

[59] *See* Utah Code Ann. §73-3-1;

take all of their water before the junior right holder can take any of their water. The priority date of a water right is the date water is either first put to use or, for rights initiated post-1903, the date an Applicant files an application to appropriate.

How priority is applied can be quite complex depending on the number and make-up of water rights in a system, the physical ability of the stream source to provide water, and the approved place of use for a water right.

For example, surface flows often have a large flow at the beginning of the season that taper off as natural snowpack dissipates. Many of the most senior water rights in the State were initiated prior to 1903 when the appropriation statute was passed and are often defined by Court Decree. These Court Decrees often consider the physical characteristics of the water system and issue water rights based on both priority and water availability (that is, certain water rights may be quite senior but only available when the systems physically provide water). Senior water rights are often diverted and used in areas that are conducive to farming, like valley floors, and are often found at the "bottom" of the river system. In times of shortage these senior water rights "call" on junior rights to stop using water into order to receive their full allocation. Water must often physically pass the diversion structures for upstream junior users to meet these senior needs.

Hence to shepherd water through a system, the State Engineer must know the priority date of the right, and the physical characteristics of the right such as the diversion limitations and point of diversion.

- **Water Rights for Instream Flows**[60]**:** Historically, beneficial use equated with economic benefit to man-kind. Water for irrigation results in a robust food supply. Water applied to domestic uses is used by households, and water applied to industrial purposes fuels industrial production and goods. The few non-CUs recognized under law, such as water for power production or geothermal heating and cooling, is still primarily associated with a specific use that immediately benefits man.

  Under a traditional view of the Prior Appropriation Doctrine, water left in the stream for innate purposes, or instream flows, is not deemed useful because society received no perceived economic value. Accordingly, without fulfilling an underlying beneficial use, the Prior Appropriation Doctrine does not recognize a water right for instream flow purposes.

  The Prior Appropriation Doctrine is however a common law doctrine that can and has changed over time to meet the changing needs of society. The doctrine can be modified by the courts or by legislative action to address the modern needs of society. All water is appropriated subject to the public welfare, and therefore a water right may be modified to address the broader needs of society.

  For water to be shepherded through a water system to reach the Great Salt Lake, Utah will need to expand its definition of beneficial use to include instream flows, possibly identify Great Salt Lake levels as both a place and nature of use for purposes of Change Applications. Further, the Legislature may need to modify the rules relating to the right to receive return flows and what constitutes interference in order to shepherd instream flows to the intended place of use. Existing water rights could be changed to be recognized for instream flows or, if the law is changed to recognize a right to conserved water, conserved water rights could be dedicated to instream flows and then shepherded to the intended place of use such as Great Salt Lake.

[60] *See* Utah Code Ann. § 73-3-1.

2.3.2.2 Tools and Techniques

Most of the tools and techniques needed to shepherd an instream flow are legal, administrative, and technical tools.

Table 2-8. Tools and Techniques for Strategy No. 3 - Shepherding Water

Tools and Techniques	
Legal	Expand definition of beneficial use to include water rights for instream flows. Extend to instream flow water rights a priority date like other water rights to ensure it can be shepherded through the watershed.
Hydrological	Hydrologic concerns are addressed in the Technical section.
Financial	Water markets should continue to be supported as a means for non-traditional interests to access water while still maintaining the economic benefit with water right holder. Public monies or a fund may be needed to garner sufficient purchasing power to lease or buy instream flows for the lake.
Technical	Currently, to quantify an instream flow, a water user needs to have measuring devices at the original points of diversion and a system or means of redirecting water back to the natural stream source.
Political	Creating a coalition of interested parties may be the politically popular and successful way to lobby for greater instream flows to the Great Salt Lake.
Administrative	Once recognized and quantified, the State Engineer can distribute instream flow rights like any other water right through its administrative distribution systems.

Legal: Expand the definition of beneficial use to include water rights for instream flows or maintenance of lake levels. For water to have a legal right to be shepherded through the water system and reach the Great Salt Lake unused, Utah needs to expand the definition of beneficial use and allow water rights to be dedicated to instream flow or in situ lake purposes. Currently, there are two statutory means in Utah to recognize instream flows:

1) Utah Code Ann § 73-3-30 – allows certain entities to file a Change Application to change the beneficial use to instream flow uses (see more as follows).
2) SB 26 – Water Banking Amendments governs the creation of local, temporary, and voluntary water banks designed to facilitate water market transactions. Under the statute water rights are authorized to be used and distributed by the bank by completing the traditional Change Application process. Once approved for use in the bank that water can be used for numerous purposes, including for instream flow to support environmental and water quality purposes.

Extend to instream flow water rights a priority date like other water rights to ensure it can be shepherded through the watershed. The priority date of a water right is important as the more senior the water right the higher the likelihood of water being available to fulfill the water right. Priority for instream flows is incredibly important because instream flows are most often most desired in the late season. In Oregon, any right to use the conserved water (instream or otherwise) is given either the same priority date or one minute later than the original water rights. The Applicant completing the conservation project can choose which of these priority dates will correspond with the new conserved water rights, but the State's and the Applicant's portions must have the same priority date. [61]

[61] *Id.* § 537.485(2). Or. Rev. Stat. § 537.465, .470(1). For a list of application requirements, see Or. Admin. R. 690-018-0040

Hydrological: Hydrologic considerations are below in the Technical section.

Financial: As discussed above, creating a robust water market will not only incentivize water users to invest in practices that result in a conserved water right, but it will also boost the ability of non-traditional water users to participate in the market and access water. By using market-based principles water right holders can still be compensated for the use of their water while allowing for water to be dedicated and used for instream flows. Efforts should be taken to support the creation of water markets.

However, the purchasing power of those interests who champion instream flows for environmental or lake purposes, is generally limited. While municipalities may have more purchasing power for instream flows to meet water quality concerns, which may have ancillary benefits to the lake, for environmental interests to lease or purchase water for the lake may require additional public funding or the creation of a specific fund that brings in revenue from numerous sources.

Technical: Distributing an instream flow is heavily dependent on have the right infrastructure on the ground to measure a diversion. Utah Code Ann. § 73-5-4 requires that any person using water as an instream flow "shall install and maintain a measuring device or stream gauging station in the section of the stream within which the instream flow is maintained."

Presently, for instream flows based on former irrigation rights, the practice of measuring an instream flow is for the water to first be actually diverted and measured at the original point of diversion, be directed down a waste ditch or canal, and then redirected back into the stream/river. Accordingly, actualizing an instream flow is going to require an appropriator to install additional measuring devices and potentially modify their diversion structure to create a system for redirecting the water back into the natural system.

Political: Stabilizing the water levels in the Great Salt Lake provides a number of benefits that can be championed to bring together a coalition of supporters. For example, exposed lakebed creates dusts storms that present a serious public health concern in the form of degraded air quality. Similarly, lake effect snow is huge selling point and boon to the outdoor ski industry. Creating a coalition of interested parties may be the politically popular and successful way to lobby for greater instream flows to the Great Salt Lake.

Administrative: In areas of Utah where there are disputes between water users or frequent shortages, the Utah State Engineer's Distribution Office primarily oversees distribution of water rights. The Distribution Office employs local Water Commissioners who enforce a Distribution Order that distributes water rights based on priority and hydrologic characteristics. The State Engineer keeps a working database for each distribution system and works with local water users to ensure no one is diverting out of priority and that water physically reaches its destination.

Once there is a legal means to recognize instream flows, the State Engineer already has the tools to administratively track and distribute the instream flow like it does with other water rights.

2.3.2.3 Impacts, Barriers, and Considerations

Table 2-9. Impacts, Barriers, and Considerations for Strategy No. 3 - Shepherding Water

Impacts, Barriers, and Considerations	
Legal	Utah Code Ann. § 73-3-30 is limited and an inflexible tool for recognizing instream flows. SB 26 – Water Banking Amendments is more flexible but will require a water bank with the Great Salt Lake within its designated watershed; §§73-3-3 and 73-3-8 may need to be amended to redefine what constitutes interference in an instream flow context.
Hydrological	The amount of water needed to make a meaningful impact to Great Salt Lake levels is significant. As there are no currently unused water rights available for the Great Salt Lake, other sources, such as conservation with the needed changes in State Law, will have to be developed.
Financial	Installing the necessary metering to measure and distribute instream flows will be expensive.
Technical	Extensive meters and measuring devices will be needed to distribute and monitor instream flows.
Political	Instream flows continue to be a politically sensitive topic in Utah and will require significant political will to gain widespread support and participation.
Administrative	Additional resources will be needed to implement the distribution systems and staff needed to distribute additional instream flows.

Legal: The current legal grounds for recognizing an instream flow are limited and restrictive and not well suited for widespread recognition of instream flows.

Under Utah Code Ann. § 73-3-30, only the Division of Wildlife Resources (DWiR), Division of Parks and Recreation (DPR), and certain tax-exempt fishing groups can file to Change Application for instream flow purposes. Additionally, there are limitations on how those entities may acquire a water right for instream flow purposes. The statute only authorizes the acquisition of a water right by gift or donation, or by purchase with monies specifically appropriated for that purpose. These funds are limited and not generally available. Additionally, the instream flow Change Application is distributed based on the priority date of the Change Application. This practically makes the water right one of the most junior water rights in the system and one of the earliest to be cut off in times of shortage. Instreams flows are often needed in the hot late summer months when there is the least amount of water to satisfy existing rights. Lastly, an instream flow may only exist between its historic point of diversion and next authorized point of diversion downstream where the next diverter may take water under her water right in priority to the extent it is available in the source. Accordingly, under these conditions the instream flow right is essentially moot.

SB 26 - Water Banking Amendments was passed in the spring of 2020 and is a very new program. In that context water rights can only be used if part of a water bank. While a promising program, it will most likely take several years for water banks to be established. Moreover, water rights approved to be used in the water bank can only be used within the bank's designated service area. For an instream flow approved under the water banking statute to reach the Great Salt Lake the water bank would need to include the Great Salt Lake in its service area and would most likely need to be a specific bank designed for Great Salt Lake purposes.

Hydrological: As discussed in the introduction, the amount of water needed to actually impact lake levels is significant. To supply this much water will require an extensive re-allocation of water toward instream flows. There may be hydrological limitations on the abilities of the watersheds supplying the Great Salt Lake to provide a meaningful amount of water for lake purposes, while meeting other competing demands for water.

Financial: Presently there is no market for instream flows for the Great Salt Lake, without a market driver there is little incentive for water owners to dedicate water rights for lake purposes. While conservation measures will assist in making water more available for instream flows, re-allocating enough water to instream flows to impact lake levels will most likely require extensive actions within the agricultural community, such as: conservation, facility and practice improvements, crop rotations, and fallowing. This will have economic impacts on the local areas as water moves from productive uses benefitting local communities to Great Salt Lake uses that have a more dispersed and less quantifiable beneficial impact on the local area. Quantifying and mitigating these impacts will be important to garnering support for these efforts.

Technical: Distributing instream flows is going to require extensive retrofitting of diversions to be able to measure and allocate water for instream flow purposes. These improvements could be costly.

Political: Instream flows continue to be a politically sensitive matter. Many in the agriculture community see the creation of instream flows as a driver to move water away from agricultural production to other uses. There are number of instream flow discussions currently occurring in the State regarding how to best implement expanded instream flows (free market vs. State funding activities, and so forth). It will take considerable political will to come to a consensus on expanded instream flow opportunities and design a system that incentivizes water users to participate and compensates those whose rights are potentially adversely impacted in the process.

Administrative: If instream flows are desired in areas that do not have an existing distribution system established, the State Engineer's Office will need to a new distribution system to administer the system and shepherd instream flows.

2.3.2.4 Options for Future Action

Table 2-10. Options for Future Action for Strategy No. 3 - Shepherding Water

Options for Future Action	
Legal	Create a new statute that allows for protecting instream flows from diversion from intervening water users to ensure that instream flow can be shepherded from their prior point of diversion to the desired new place of use. This might be accomplished by enacting a new statute addressing change applications for instream flows intended for Great Salt Lake Such a Change Application might identify Great Salt Lake as the place of use, the nature of use would be for instream flows and maintenance of optimum lake levels. It would need to include provisions to prevent intervening diverters from diverting the available water; and ensure the ability to shepherd the water to the lake. The law would also need to address mitigation to address adverse impacts to downstream water users who have historically relied on the receipt of return flows to help satisfy their water rights.
Hydrological	Optimize instream flows by coordinating and consolidating instream flows for numerous purposes such as the need for flows for both environmental and water quality concerns.
Financial	Promote the greater creation of water markets to allow for lake users to access water for the Great Salt Lake. A fund will most likely be necessary to acquire or lease the quantities of and scale of water needed to help stabilize lake levels.
Technical	The State Engineer will most likely need to require each Change Application seeking to move or distribute an instream flow to have multiple measuring devices. Eventually the Great Salt Lake Watershed will have sufficient measuring devices to have a watershed-level understanding of flows and water availability. This will allow the State Engineer to have much greater ability to control a monitor the system to the efficacy of instream flows.
Political	Advocating to protect an instream flow to ensure its delivery to Great Salt Lake and prevent its diversion and use by intervening users will take political will to meet the needs of Great Salt Lake.
Administrative	The administrative infrastructure to shepherd an instream flow already exists but should be bolstered with additional support to the State Engineer's Distribution Office.

Legal: For the greatest flexibility, expand the definition of beneficial use to include water for instream flows; create a new instream flow provision in law that is outside of Utah Code Ann. § 73-3-30 and SB 26 – Water Banking amendments that could allow any water user who wants to change a water right for instream flow purposes to do so.

However, as discussed instream flows are still controversial in Utah. Another option may be to create a specific instream flow provision the solely allows for instream flows that are dedicated to the Great Salt Lake. This could be a statute where any water, appropriated or conserved, could be dedicated to lake purposes.

For a more assertive approach, Utah could create an instream flow credit similar to Oregon's conserved water right statute. Under that circumstance, a portion of every conserved water right approved in the Great Salt Lake Watershed would be dedicated to Great Salt Lake's purpose.

Hydrological: Greater use of coordinated watershed planning can make use of and optimize instream flows in a watershed. Instream flows can be used for a number of purposes such as environmental flows for native habitat and wildlife and for meeting water quality standards. It may be possible to maximize the impact and extent of instream flows in a particular watershed by optimizing and consolidating various planning functions.

Financial: As discussed, surface water in the Great Salt Lake Watershed is mostly already appropriated meaning there is not water available to dedicate to Great Salt Lake purposes. Accordingly, for water to reach the Great Salt Lake it will have to come from existing sources. Water markets, and in particular the temporary leasing arrangements contemplated by SB 26, are a means to dedicate water to the Great Salt Lake while still maintaining the economic value of the water with the water right holder.

Most likely a fund will be needed to secure the amounts of water needed to make a significant difference in Great Salt Lake levels. In addition to funding the acquisition or lease of water, a fund with the flexibility to assist water users in investing the monitoring and measuring equipment needed to facilitate shepherding instream flows may be preferable. Without such technology there is no assurance the acquired water will reach its intended destination.

Technical: Increased metering and monitoring is needed to measure and distribute instream flows. The State Engineer will most likely need to condition Change Application requests to for applicants to install such devices. As more devices are installed, each water system can be more tightly controlled and monitored to better optimize water use.

Political: The health of the Great Salt Lake is vital to a number of interests. The most effective way to have an instream flow right recognized, would be collaborate with those groups and emphasize the public health and economic benefits to all of the communities within the lake's watershed.

Additionally, having an instream flow recognized by law may thwart the desire for a judicial interposition of the Public Trust Doctrine, which would involuntarily re-allocate water rights to the lake and provide no economic benefit back to the water right holders.

Administrative: Much of the infrastructure to shepherd an instream flow already exists and is used by the State Engineer. As with elements of this Report, to make shepherding of instream flows a greater practical reality, the State Engineer will need to be bolstered with additional resources, including staff and technical resources to track and monitor instream flows.

2.3.3 Strategy Conclusion

To ensure water rights intended for Great Salt Lake uses get to the lake, they must be first recognized as a legitimate beneficial use of water and then shepherded through the local water system. To ensure other water users along the way do not take instream flows intended for lake uses to satisfy their own rights, there must be a legal recognition of an instream flow that sits in a similar standing with other appropriated water rights.

Utah currently has two instream flow provisions available, though both have limitations. To ensure water gets to the Great Salt Lake, it may be prudent to adopt a standalone provision that authorizes instream flows for the lake and adjusts priorities of such instream flow Change Applications to the priority equal to that of the right upon which they are based in order to ensure delivery to Great Salt Lake. If Utah wanted to aggressively dedicate water to the Great Salt Lake, it would style an instream flow bill similar to Oregon's conservation statute that allocates a portion of every conserved water right to instream flow purposes. Once the legal right to an instream flow is recognized as a beneficial use, it can be shepherded down the river system like any other water right. Priority adjustments may be necessary to protect the instream flow right from diversion by prior right holders in satisfaction of their water rights. The administrative infrastructure to do so already exists, however, shepherding such rights will take additional State Engineer resources.

2.4 Foundational Strategies Conclusion

These three Foundational Strategies are critical to implementing an array of other techniques and strategies.

- Strategy No. 1 – Recognizing a Right to Conserved Water
- Strategy No. 12 – Quantifying Conserved Water
- Strategy No. 3 – Shepherding Water

Without recognizing a legal right to conserved water, establishing a means to quantify a conserved water right so it does not impair other users, and establishing a legal basis for instream flows, it will be exceedingly difficult to secure water for the Great Salt Lake. For the purposes of the remainder of this Report, it is assumed the three Foundational Strategies are in place and functioning.

3. Individual Strategies

The remainder of the Council's selected strategies address more specific means of either changing water uses and practices to dedicate water for Great Salt Lake purposes or support the agencies and institutions with a significant impact on or authority over the lake (Figure 3-1). The individual strategies include:

1) **GSLAC Strategy No. 2:** Authorize split season leases such as where a portion of the water right is used for irrigation for part of the irrigation season, and then the remainder of the water right is made available for instream use during the same calendar year.
2) **GSLAC Strategy No. 4:** Meter all secondary water, thereby creating a financial incentive to conserve secondary water and allow more water to reach the Great Salt Lake.
3) **GSLAC Strategy No. 5:** Increase the efficiency of residential, commercial, institutional, and agricultural systems (water conservation), which would result in more surface water in streams for delivery to Great Salt Lake.
4) **GSLAC Strategy No. 6:** Incorporate best management practices for water conservation at the watershed scale into policy making decisions.
5) **GSLAC Strategy No. 7 and No. 10:** Expand the ability to purchase or otherwise acquire water for instream flow uses to entities other than State agencies.
6) **GSLAC Strategy No. 8:** Increase the water use efficiency of agriculture by increased efficiency of irrigation systems leaving more surface water in the streams for possible delivery to Great Salt Lake.
7) **GSLAC Strategy No. 9:** Improve coordination between State agencies that have the authority to make decisions affecting Great Salt Lake.
8) **GSLAC Strategy No. 11:** Protect ground water levels beneath the Great Salt Lake and the broader Great Salt Lake basin from pumping that can affect surface hydrology.

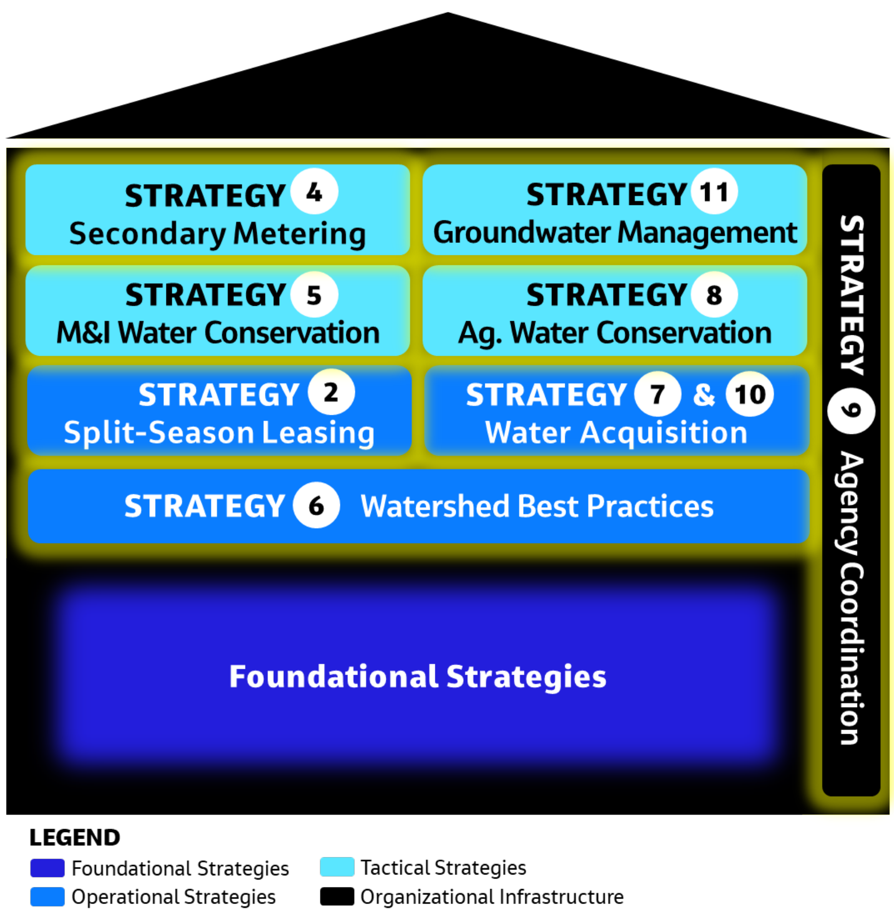


Figure 3-1. Operational, Tactical, and Organizational Infrastructure Strategies for Delivering Water to Great Salt Lake

STRATEGY 2 Split-Season Leasing

OPERATIONAL STRATEGY

3.1 Strategy No. 2 – Split Season Leasing

GSLAC Strategy No. 2: Authorize split season leases such as where a portion of the water right is used for irrigation for part of the irrigation season, and then the remainder of the water right is made available for instream use during the same calendar year.

3.1.1 Strategy Summary

Issue: Water rights are traditionally issued according to a specific period of use. For example, irrigation rights are generally issued from sometime in March or April through the end of October. Domestic water rights are issued for year-round uses. Presently, water rights must be used throughout the period of use at the same location to maintain the validity of the water right. A split season use would allow a water user to file a Change Application to "split" their season of use and make sequential use of the water at another location.

Split season leases are a means to potentially maximize the value of a water right by allowing water users to use water when it is most impactful and dedicate to other uses when it is less impactful. For example, an irrigator could choose to use her water right during the first two-thirds of the season when the fields are the most productive and then lease the remaining one-third of the water right for instream flows when yield is less productive, and water is critically needed for instream flows.

Much of the legal and administrative infrastructure already exists to facilitate split season uses. The primary issue needing to be addressed to facilitate a split season use of water is a technical analysis to ensure changing to a split season use will not result in expansion of a water right and increased depletions from the water system.

Conclusion: Split season Change Applications are now authorized by law. Such an arrangement enables the shared use of water resources rather than promoting the "buy and dry" approach that has been prevalent in the West. It will require careful determination of depletions and shepherding of the water from the original place of use to the intended place of the split season use without adversely impacting other water rights. Distribution by the State Engineer's staff will be key to the implementation of split season Change Applications and may require additional financial support either in the form of appropriations or passing the costs of distribution on to the split season water users. Split season uses complement water banking and can be an effective tool to enable a shared sequential use of water on voluntary market-based transactions among willing water users.

3.1.2 Discussion

3.1.2.1 Background and Context

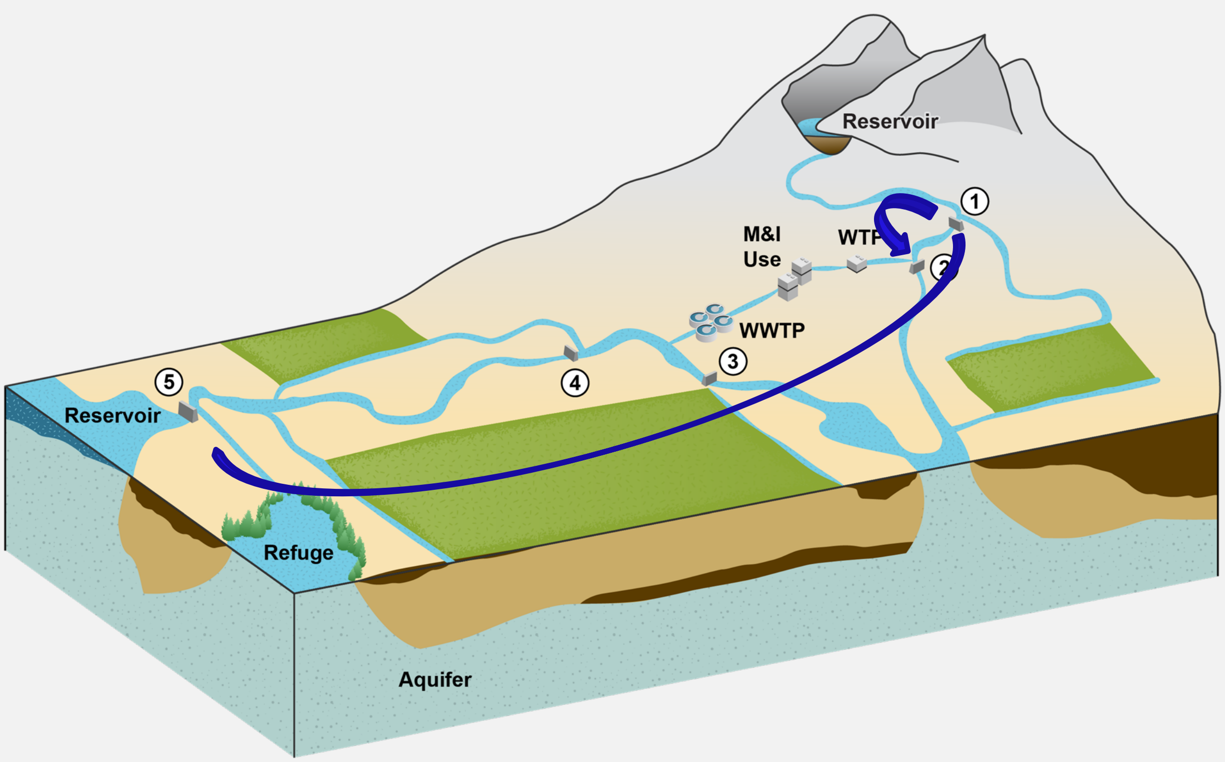
The split season use of water was identified as one of the critical strategies of the Governor's Water Strategy Report, July 2017, and as a complement to water banking. The objective of the split season change is to allow the sequential shared use of water resources through voluntary, temporary, market-based transfers of water among willing parties.

The split season use of water is viewed as a preferred alternative to the "buy and dry strategy" that has been prevalent in the West, and that has led to devastating economic impacts to agriculture. Rep. Tim Hawkes and Sen. Jani Iwamoto sponsored HB 130 in the 2020 General Session of the Utah Legislature creating a statutory right to file split season Change Applications on perfected water rights. The bill passed and has been enrolled into law. The Governor's signed this bill on March 31, and it became effective May 5, 2020.

This bill enables an agricultural irrigator to use a portion of the water right early in the irrigation season, and then allow the balance of the water to be used by others under a split season Change Application for the balance of the irrigation season. The terms of such an arrangement would be worked out between the parties in a voluntary, market-based transaction, typically in the form of a lease. A split season use would provide a revenue stream to the agricultural water user without the inherent risks of agriculture. Water would be used in a sequential sharing arrangement for temporary periods as determined by the parties to the agreement. Water could then be used in part for agricultural irrigation early in the year, and in the later part of the year for various other short-term uses including M&I use, irrigation by other agricultural producers, environmental groups to protect instream flows for fishery habitat maintenance, maintain a healthy stream environment and lake levels, or for drought relief, and so forth.

In Practice:

Farmer Joe has a 100-AF of alfalfa and his duty allows him to divert up to 400 AF per year at Diversion No.1. He decided to only complete two cuttings of alfalfa this year, stop irrigating by June 30 and lease his remaining annual water right to the public water system at Diversion No. 2 to augment its summer outdoor watering supplies or to the refuge at Diversion No. 5 to supplement waters needed for fall bird migrations.



3.1.2.2 Tools and Techniques

Table 3-1. Tools and Techniques for Strategy No. 2 – Split Season Leasing

Tools and Techniques	
Legal	HB 130 was signed into law on May 5, 2020 allowing water right holder the ability to file a Change Application to use their water right sequentially within the same season of use.
Hydrological	The water user will need to cease diversions at a set time and allow the water to remain in the system. DWRi will need to ensure this water reaches its destination contracted for use.
Financial	Increased measurement capacity and participation in the split season market will facilitate inflows to the lake.
Technical	Accurate quantification of diversions and actual depletion is necessary to ensure flows are accurately accounted for.
Political	Care should be taken to maintain the current political consensus.
Administrative	The current administrative framework facilitates split season uses but may require some changes in distribution policy.

Legal: As of May 5, 2020, the necessary statutory authority now exists to file a split season Change Application on a perfected water right. HB 130 uses the existing Change Application procedures under Utah Code Ann. § 73-3-3 and Utah Code Ann. § 73-3-8 to authorize the split season uses. Under Utah Code Ann. §73-3-3, a split season change "means a change when the holder of a perfected right grants to a water user the right to make sequential use of a portion of the water right."

Hydrological: The key benefit of split season uses is allowing water to be more efficiently used by making additional water available in the system during later parts of the irrigation season. This late season water can, when combined with increased availability and use of instream or environmental flows, be utilized to augment stream flows and inflows into the lake. This will require some adjustments in shepherding, administration, and accounting of water rights by DWRi, but the hydrological process simply involves the agricultural user ceasing diversions at a set time and allowing that water to remain in the system. The role of DWRi is to ensure that the water made available by the split season change reaches its destination contracted for use.

Financial: Essential to split season changes is the accurate measurement of diversions by the parties to the split. Achieving accurate measurement requires the installation of adequate measurement devices, which may not currently exist. Additionally, monitoring and analysis of diversion and depletion data is essential to adequately account for and accommodate the split in use. Accordingly, the bulk of the financial impact rests primarily in securing and analyzing accurate diversion and depletion data. However, there will also be transaction costs, such as contract drafting, associated with accommodating the split season lease. Finally, direct participation in the split season market can ensure that water is available at Great Salt Lake.

Technical: The State Engineer's distribution section will need to work with agricultural scientists to develop better methods for determining actual depletion from the use of water to determine what water has been depleted in the initial agricultural use, and what remains available for use by a split season user. This is necessary to avoid the enlargement of a water right and avoid impairing other water rights. To properly administer, all diversions would need to be measured to ensure that the water right is not being enlarged by allowing excess diversions to occur. This technical data will need to be generated and maintained in order for a split season change to become effective and efficient.

Political: HB 130 was easily passed by both the House and the Senate during the 2020 General Session. There was broad public and political support for this bill. Given the broad support, this is likely to become a valuable tool for the more efficient use of water in Utah. Particular benefits are likely to accrue to environmental and instream uses, which are typically later in priority but are increasing in importance.

Administrative: The State Engineer will have the primary responsibility to review and administer a split season Change Application, which would be administered under existing requirements under §§73-3-3 and 73-3-8. A split season change would be approved only if the applicants can demonstrate that no other water right will be impaired by the shared use of the water right. The State Engineer through its Distribution Office will administer the split season change to ensure that the water right is not enlarged, and that historic return flows are maintained. The river commissioners will have the duty to distribute the water to the split season users as directed by them, and to ensure that the water can be shepherded past intervening diverters so that the split season user can receive the water at their desired point of diversion and place of use.

3.1.2.3 Impacts, Barriers, and Considerations

Table 3-2. Impacts, Barriers, and Considerations for Strategy No. 2 – Split Season Leasing

Impacts, Barriers, and Considerations	
Legal	Shepherding is the key constraint and requires care to ensure other water rights are not impaired.
Hydrological	Ensuring that contracted for split season flows remain in the system is the key challenge.
Financial	Increased costs are likely to be borne by other parties unless stakeholders directly participate in the market.
Technical	The challenges are primarily shepherding and measurement of water.
Political	This issue is currently settled but buy-in needs to be maintained.
Administrative	The State Engineer should assist with shepherding and technical issues.

Legal: The adoption of split season changes may create several legal challenges. First, shepherding the split water right to the intended point of diversion and place of use of a split season user may deprive other appropriators, between the historic place of use and the new place of a split season use, of water they may have otherwise been able to divert and use in priority. Second, careful attention will need to be paid at the administrative level to ensure that diversion and depletion do not increase resulting in harm to intervening water users. Finally, legislation to expand the universe of entities that may hold instream water rights will likely be necessary in order for Great Salt Lake to see the most benefit from split season water rights.

Hydrological: The hydrological aspects of split season changes are rather straightforward. Downstream water users simply sequentially use the water. However, the challenges of ensuring depletion and return flows are not impacted may require additional study and administration. Finally, in order for maximum benefit to accrue to Great Salt Lake, the late season use will require that water be left instream for use at the Lake. As such, the greatest threats are diversion by intervening users, evaporation, and seepage losses.

Financial: Although the State Engineer has expressed confidence that the office can administer a split season use without adding new staff members, it may require the addition of distribution staff and river commissioners to ensure that the water is being delivered and used as intended by the parties to the split season Change Application. The potential increase in distribution costs could be passed on to the split season Change Application parties thereby minimizing the fiscal impact on the State Engineer. Additionally, there may be an increase in measurement and monitoring costs, which are as of yet unknown.

Technical: The technical obstacles have been largely discussed above and include challenges in measurement, shepherding and depletion analysis. The key concepts necessary to accommodate split season changes are ensuring that the water right is not enlarged, and depletion is otherwise increased. This will require detailed depletion and use analysis at both the early and late season places of use. Additionally, accurate shepherding may require additional stream flow data to carry out the intent of the split season change.

Political: The politics of split season changes appears to be settled, with most stakeholders in favor of the concept. However, challenges may arise if it is perceived that the implementation of split season changes is negatively impacting specific groups. This could occur if groups seeking more instream flows are cut out of the market or if agricultural use is restricted in unforeseen ways.

Administrative: The key administrative challenges stem primarily from shepherding and accurate distribution of water. The challenges with shepherding were discussed at length in the foundational concepts portion.

3.1.2.4 Options for Future Action

Table 3-3. Options for Future Action for Strategy No. 2 – Split Season Leasing

Options for Future Action	
Legal	Increase instream and environmental flows as late season uses for split season changes.
Hydrological	Focus on strategies to increase actual instream and environmental flows.
Financial	Direct financial participation in the split season market will have a direct impact on the lake.
Technical	Improvements in measurement, monitoring, shepherding, and depletion analysis will improve efficiency.
Political	Ensure stakeholders remain engaged and are bought into the process.
Administrative	Offer assistance to the State Engineer and lobby for increased budget appropriations.

Legal: To facilitate increases in split stream changes it is likely necessary to implement some of the other strategies addressed in this Report. For example, increases in the universe of parties that can hold instream flows will expand the market for split season changes. Likewise, if the presence of water in Great Salt Lake was considered a beneficial use in and of itself, a water right might be split between early season agriculture and late season Lake flows. Accordingly, future legal options are legislative changes that augment the existing split season law.

Hydrological: The key hydrological option is to secure more flows for use instream and in Great Salt Lake. This can be done through a number of strategies, but for purposes of split season changes the most benefit would be from an increased focus on environmental flows. Increased environmental flows would ensure that water remains in the system to reach the lake, where the benefits would accrue.

Financial: There are a number of financial opportunities related to split season changes that would directly benefit Great Salt Lake. At the outset, if Great Salt Lake's stakeholders were able to financially participate in the split season market, water could be directly purchased for the benefit of the Great Salt Lake. Direct participation would ensure that flows reach the lake. Likewise, partnering with non-governmental organization (NGOs) to secure late season environmental flows would have the same benefit. Additionally, the funding and creation a water bank can significantly decrease transactional costs and increase the efficiency of split season changes.

Technical: Future opportunities exist in increasing the technical knowledge of depletion amounts and the accuracy with which water is shepherded downstream. Increased knowledge and measurement will inevitably lead to more accurate, transparent, and efficient water use. As such, supporting technical studies and installing better monitoring equipment are opportunities to improve split season changes

Political: The politics of split season changes appears rather settled, but it is critical to ensure that stakeholders are engaged, and problems are quickly addressed as they arise.

Administrative: The administrative realm presents many opportunities for future action. However, these processes are largely internal to DWRi and local water banks that arise. The bulk of the opportunities are derived from increased personnel and technical knowhow within the agencies. These benefits can be unlocked through increased budget appropriations to DWRi.

3.1.3 Strategy Conclusion

Split season Change Applications are now authorized by law. Such an arrangement enables the shared use of water resources rather than promoting the "buy and dry" approach that has been prevalent in the West. It will require careful determination of depletions, shepherding of the water from the original place of use to the intended place of the split season use, without adversely impacting other water rights. Distribution by the State Engineer's staff will be key to the implementation of split season Change Applications and may require additional financial support either in the form of appropriations or passing the costs of distribution on to the split season water users. Split season uses complement water banking and can be an effective tool to enable a shared sequential use of water on voluntary market-based transactions among willing water users.

STRATEGY 4 Secondary Metering | **TACTICAL STRATEGY**

3.2 Strategy No. 4 - Secondary Metering

GSLAC Strategy No. 4: Meter all secondary water, thereby creating a financial incentive to conserve secondary water and allow more water to reach the Great Salt Lake.

3.2.1 Strategy Summary

Issue: Secondary water systems are non-potable (that is, untreated) water systems that deliver water for outdoor use. These systems are distinct from potable (that is, treated) water systems and run the gamut from rudimentary earthen canals to sophisticated piped systems. Secondary systems are often used or installed to reduce the amount of water needed to be treated and distributed through potable systems.

Figure 3-2. A Typical Urban Secondary Water Diversion with a Flow Meter Only at the Diversion, Salt Lake County, Utah

Secondary irrigation systems have been targeted as a potential source of significant water savings, due to perceived inefficiencies and over-use of water. Improved measurement or metering of secondary water use have revealed that many water users over-apply water to their yards and gardens. Once metered, water users and water managers can know how much water secondary systems are actually using. Through pricing and other means, wasteful outdoor watering practices can be curtailed, and the water conserved can be stretched to meet expanding demand or applied to other uses, if only on a temporary basis. This measure will thereby delay development of additional water supplies or could, with proper incentives, be dedicated to instream flows for the Great Salt Lake.

delaying development of additional water supplies or could, with proper incentives, be dedicated to instream flows for the Great Salt Lake.

Secondary metering can be expensive to install, and metering capabilities vary greatly depending on system configurations and water quality conditions. For example, metering is difficult in water with high turbidity rates (Figure 3-2, as a result of suspended and dissolved solids). For older established secondary systems, retrofitting the system with secondary meters is difficult and can be prohibitively expensive. Water savings from secondary metering are generally under the control of the system operator and are used to meet existing or anticipated future system demands. It is not anticipated that secondary metering will create a large block of water available for Great Salt Lake, however, some water might be made available, even on a temporary basis, with additional incentives.

Senate Bill (SB) 51 adopted in 2020 provides $10,000,000 in loans for to assist water systems with the installation of meters. Secondary metering is still expensive to install on new systems, and in some cases prohibitively expensive to retrofit established systems. One estimate puts the cost at up to $400 million.

Conclusion: It is well understood that un-metered secondary water use does not promote efficiency or sustainability by water users and secondary metering has been demonstrated to lower water use when implemented. Secondary metering is an important tool for consideration as the State of Utah pursues M&I water conservation throughout the State. The challenge facing the State is primarily one of funding the cost associated with installing meters on every secondary connection in the State. Further, technology may not currently exist to address all variations in water quality, or other nuanced distinctions between water systems and supplies. The State should consider funding an economic and engineering study to evaluate how best to implement measures to conserve water in secondary systems. This would likely involve a solution that would include some level of metering combined with other alternatives.

3.2.2 Discussion

3.2.2.1 Background and Context

Historic irrigation canals and ditches crisscross the Metropolitan areas along the Wasatch Front: a remnant of the areas' agrarian past. Many of these water conveyance systems continue to convey water, primarily from early priority surface water sources, for the irrigation of private lawns, gardens, and lots (Figure 3-2). Secondary water systems are non-potable water systems that deliver water for outdoor use. These systems are referred to as secondary water systems, as they are often used or installed to supplement or reduce the amount of water needed to be treated and distributed through potable water systems. These systems are distinct from potable systems and run the gamut from rudimentary earthen canals to sophisticated piped systems. A number of these systems, particularly those in Davis, Weber, Salt Lake and Utah Counties, have been pressurized and deliver large quantities of water for residential irrigation. However, most secondary systems lack the means to adequately measure, meter or monitor actual water delivery and use at the point of use. Thus, water managers are seriously considering how to implement "secondary metering" as a means to determine actual water use and as a tool to promote water conservation.

Water that is conserved as a result of secondary metering (or any water conservation measure) could be considered by water managers as a "new" water supply; it is yet another alternative water supply for managers to consider as part of their water portfolio. Utah has almost 300 secondary water providers – including Municipal utilities, non-profit shareholders companies, irrigation companies and conservancy districts (Western Resources Advocates 2018). While most have not installed secondary metering, a number of early adopters have implemented secondary metering to varying degrees. Secondary metering is seen by many as "low hanging fruit" and offers the promise of an easy fix to a portion of Utah's water supply and demand issues.

The reason for the optimism for secondary metering are early findings for reduced water use from implementation of secondary metering. The Weber Basin Water Conservancy District saw reductions of 22 percent to 40 percent per customer in secondary water use, as a result of metering and communications with their customers about their lawn's actual water needs compared with what the customer had been applying. Saratoga Springs saw a reduction of 27 percent per customer in secondary water use, as a result of metering and implementing a tiered rate structure (Western Resources Advocates 2018). These results are promising, but it is also important to compare the cost of installing a secondary metering system against the value of the conserved water.

The Western Resources Advocates have estimated that the cost of installing a meter – including parts and labor – can be about $1,500 to $1,800 per customer. There are an estimated 200,000 secondary meters yet to be installed. Western Resources Advocates documented the following “back-of-the-envelope” calculation as part of a focus group of Utah’s water managers:

> “There are an estimated 200,000 secondary meters yet to be installed. Assuming the high-end cost is $1,800 per meter to install (parts and labor):
>
> - This implies a $400 million cost Statewide, which includes a 10 percent contingency (and is rounded up).
> - In order to help finance this, the State could provide an annual $28 to $30 million revolving loan fund over the course of 20 years. This figure assumes a 3.5 percent interest rate.
> - This would result in an increase of $8.30 per bill per month over a 20-year period.“ (Western Resources Advocates 2018)

As noted in the report, this is an extremely rudimentary estimate, but it serves as a comparison for other actions that the State might take. Most communities with secondary water service as well as those planning the construction of a secondary system have considered the possibility of metering. As noted previously, there have been demonstrated water savings in a number of instances. However, the economics of the saved water versus the cost should be examined. The idea of a secondary water system is that the cost of the water is less because it avoids costly treatment. In evaluating the secondary water system, any costs that reduce the difference between potable and non-potable water decreases the incentive to have a secondary system and could also decrease the incentive to reduce the use of treated potable water. In addition, the costs of completely metered secondary systems in Utah and the saved water should be evaluated against other conservation measures, especially agricultural options.

One of the challenges with installing meters on secondary water systems is the water quality of most irrigation water sources. Secondary systems, by definition, are unfiltered, which causes problems for standard meters.

> “Modern technology has provided ways to meter water that do not pose a problem to secondary systems. Two examples are the magnetic flow meter and the ultrasonic flow meter – meters that have no moving parts and can readily pass debris. These meters can cost thousands of dollars, however, whereas standard residential meters generally cost less than one hundred dollars. Accuracy, durability, and cost are important considerations for metering secondary water. Despite the inherent difficulties associated with secondary water metering, experimentation has not been inhibited. Existing and new meter technologies have been used, and filtration techniques have been utilized. Those experimenting in secondary water metering have exposed a variety of problems as well as possible solutions.” (Richards 2009)

The costs noted above reflect this difficulty in metering unfiltered water. It should also be noted that even advanced, expensive meters are not without issues in the secondary environment. The meter may require a power source, or it may be susceptible to issues when the secondary system is shut down for the winter.

In fact, the obstacles in metering secondary are so significant, that some evaluators have suggested the following:

> "Essentially, there are four basic alternatives to consider when determining an approach to secondary water metering:
>
> 1) Install a centralized filter station;
> 2) Install individual filters at each user connection;
> 3) Install currently available meters with no filtration; and
> 4) Do nothing and wait for metering technologies to advance." (Richards et al. 2009)

Metering will solve the issue of determining just how much secondary water is being used and how much might be conserved. In the State of Utah Water Collection Data Report completed by Bowen and Collins and Hansen Allen and Luce, the consultants estimated the amount of secondary water use in Utah. They noted that:

> "Most providers of secondary water—whether Municipal water systems or private irrigation companies—do not meter customer deliveries. As such, this type of data was largely unavailable. A further complication is that irrigation in Municipal settings may occur with either potable or secondary water, and the extent of the latter is usually not known, making a complete characterization almost impossible. With these limitations in mind, data were received from several pressurized irrigation systems, irrigation companies, and water master plans where available. This included full-metered use data for just a few systems where secondary meters exist. It also included collection of secondary production data (i.e. water into the system) for several more systems where adequate source metering was available. This effort was supplemented by the collection of potable water use data as described above and was sufficient to characterize irrigation use when combined with other methods. In the absence of complete secondary water use data, relevant irrigated area was estimated. The Team employed a remote sensing approach using National Agricultural Imagery Program (NAIP) four-band aerial imagery and a method known as the Normalized Difference Vegetation Index (NDVI), which detects vegetated (irrigated) areas. Appendix D describes how the data were prepared and analyzed for this study. Saratoga Springs and Spanish Fork were selected as case studies due to the project teams' familiarity with these systems and the availability of outdoor water use data. (Both have complete, metered pressurized irrigation systems.) Several of the conclusions about outdoor water use elsewhere in the report were drawn from these case studies." (BC&A and HAL 2018)

Assuming secondary water use in the State of Utah in 2015 was 181,647/AF and assuming a low end of estimated savings by the Weber Basin Water Conservancy District of approximately 20 percent, the conserved water would be about 36,000/AF. Assuming the State's estimated secondary water use of 255,774/AF and the upper bound of estimated savings of 40 percent, the saved water would be 102,000/AF. Thus, assuming the costs estimated by Western Resource Advocates' focus group, the rough unit cost of conserved water from secondary metering would range between $11,000/AF and $4,000/AF. Using Saratoga Springs' reduced water use of 27 percent with secondary metering and the consultant's estimate of secondary water use, the cost would be approximately $6,000/AF. Yet another data point is from the State of Utah's Regional Water Conservation Goals report where the unit cost of water savings from secondary meters was $4,567/AF. This report uses a lower cost of $1,300 per meter (HAL and BC&A 2019). These estimated costs for conserved water are important as a point of comparison with other options and other supplies in a water system's portfolio.

For the last several legislative sessions secondary metering has been an active legislative topic. Much debate has occurred in the water community about how best to implement secondary metering and whether the costs for the projects justify the water gains created. A general consensus is that the success and cost effectiveness of secondary metering is highly system dependent.

3.2.2.2 Tools and Techniques

Table 3-4. Tools and Techniques for Strategy No. 4 – Secondary Metering

Tools and Techniques	
Legal	SB 51 requires meters on some secondary systems for new buildout, reporting of metered water, and assessments and reports on the feasibility of other systems.
Hydrological	Utah has poor data related to the use of secondary water use. The installation of expensive meters could solve this. The State should also evaluate other methodologies for measuring secondary water use, such as evolving remote sensing technology.
Financial	Estimated costs to install meters on all secondary systems is in the range of $400 million dollars. Although the Legislature appropriated $10,000,000 to provide loans for the installation of secondary metering, much more financial assistance will be required to achieve the goal of metering all secondary connections.
Technical	Numerous options for secondary meters exist but their ability to function properly depends on the local conditions. The State could investigate tools for measuring secondary water use that are less expensive than meters. Regardless, the State should continue its efforts to improve data collection for secondary water use.
Political	There is substantial political momentum for secondary metering. However, it is important that the State continue to evaluate the economics of secondary metering versus other option for conserving water.
Administrative	Administration of secondary metering programs remains with operator. Water conserved, like water conserved in other M&I programs, will likely be used to enhance the reliability of the conserving entity's water supply, and not for Great Salt Lake enhancement.

Legal: Metering of secondary water sources has been a hot button issue in Utah for the past several legislative sessions. During the 2019 Legislation Session, Senator Andregg sponsored and the Legislature passed Senate Bill 52 ("Secondary Water Requirements")[62]. This Bill was not a Utah Water Task Force endorsed bill and went through several iterations adjusting the scope and scale of the bill. In the 2020 General Session of the Utah Legislature, Senate Bill 51, Secondary Water Requirements ("Secondary Water Bill") was passed and amended the 2019 bill[63].

The 2020 Secondary Water Bill made the following changes to existing Utah Water Law requirements:

1) Removed the requirement that any secondary water provider who provides pressurized secondary water develop a plan for metering the use of the pressurized water and file the plan with the DWRe.

2) Removed the requirement that the Utah Department of Natural Resources (UDNR) oversee a study by the Utah Water Task Force related to secondary water metering and all reporting requirements related to the study.

[62] *See* Utah Code Ann. § 73-10-34
[63] *See* Utah Code Ann. § 73-10-34

3) Exempted secondary water suppliers supplying secondary water to third, fourth, fifth, or sixth class Counties.
4) Exempted secondary water suppliers to the extent that meter manufacturers would not warranty the meters due to water quality in a specific location.
5) Reaffirmed the water right holder's obligation to measure and report water usage.

The current requirements under the Secondary Water Bill are that:

1) Secondary water suppliers who design work for new services on or after April 1, 2020 must meter the use by commercial, industrial, institutional, or residential water users.
2) Secondary water suppliers must report the use of metered secondary water for the preceding 12-month period on or before March 31 of each year and provide the number of meters in the supplier's service boundary, a description of the service boundary, the number of connections for each industrial, commercial, institutional and residential users, the total volume of water received from its sources, and the dates of service water was supplied.
3) The Board of Water Resources may make up to $10,000,000 in low-interest loans available for the financing of secondary water metering available each year.

Hydrological: The DWRi data collection form has not historically collected any information regarding actual secondary water use since most of the systems do not meter individual deliveries. As such, information available to even estimate secondary use is difficult to obtain and estimates of secondary use have been far less accurate than compiled results for potable use.

The solution to this problem of lack of information has historically been to install meters on secondary water systems, or to call for the complete metering of all secondary use systems. The State of Utah could also evaluate other, potentially less expensive options, such as remote sensing, to gather secondary water system use data.

Financial: HB 51 provides up to $10,000,000 in low-interest loans to finance the installment of secondary meters. The Western Resources Advocates have estimated that the cost of installing meters on all of Utah's un-metered secondary connections at $400 million. $10 million represents 2.5 percent of that cost. The State could apportion a part of these funds to pilot projects and another part to investigations of less expensive means for measuring secondary water use. In addition, the State could perform an economic analysis of metering versus other conservation measures that could reduce depletions from outdoor water use and provide additional water supply.

Technical: Secondary metering is premised on the installation of meters and the infrastructure needed to maintain and monitor the meters and the information they collect (SCADA systems, repair, and maintenance, and so forth). When installed with adequate supporting software, the information can be collected and manipulated in numerous ways to show real time use. Currently, remote sensing for water use is primarily used in potable water and agricultural applications. However, as the technology continues to mature, remote sensing could also be used for measuring outdoor water use.

Political: Legislative action to mandate the installation of water meters to measure secondary water use has been discussed much in recent legislative sessions. The main discussions have centered around mandating metering for secondary systems. While there is significant momentum and support for secondary metering, the State should support the development of options that may be more appropriate for some systems.

Administrative: The administration and implementation of this strategy primarily falls upon the operators of the secondary systems. These systems typically operate on tight budgets and are funded by assessments and fees. As such, these systems are somewhat insulated from interference with their operations. Water conserved by installing expensive secondary meters would likely be targeted for use within the system and not for enhancing Great Salt Lake.

3.2.2.3 Impacts, Barriers, and Considerations

Table 3-5. Impacts, Barriers, and Considerations for Strategy No. 4 – Secondary Metering

Secondary Metering: Impacts, Barriers, and Considerations	
Hydrological	Defining the quantity of secondary water use can be challenging, especially when secondary water systems include urban outdoor water users and agricultural users.
Financial	The true cost of installing secondary meters on all secondary connections is unknown. However, better data on the extent of secondary water use is being gathered by providers, and that will aid in understanding the costs involved in accomplishing this goal. These costs could then be compared against other alternatives.
Technical	Inexpensive meters may not always reliably operate in unfiltered secondary systems. Meters that operate more effectively in secondary systems that have poor quality water often cost in the thousands of dollars, putting metering out of reach without outside financial assistance. Manufacturers may not want to warrantee their products without a guarantee of a certain level of water quality. This may then impact a water system's financing options.
Political	There is existing will to implement some form of mandatory secondary water metering. It is likely that the full economic impact is not well understood. The Utah Legislature should commission additional studies to fully understand the impact and benefits of mandatory secondary metering.
Administrative	A critical mass of water suppliers within Utah will need to install meters on their secondary systems. This will require a large capital investment. It is not likely that they will make this decision without significant investment from the State and confirmation that it is the most economical option.

Legal: The legal infrastructure for beginning to require secondary meters was established in 2019's SB 52 and 2020's SB 51. However, widespread adoption is far off and legally requiring all secondary systems to install meters may not be responsive to the needs of individual systems. The costs of such requirements might be better spent on other projects, such as canal lining or pipe upgrades that may result in larger water gains for less money.

The water saved through secondary metering is ultimately attributed to specific water rights within a portfolio of rights owned by the operator. As with M&I water conservation, entities that invest large amounts of capital will be motivated to use the saved water within their own system to increase reliability and defer capital expenses for new water supply projects.

Hydrological: The delivery of non-potable secondary water is an important component of M&I water use. However, many of the secondary water systems are part of a larger agricultural irrigation system. As a result, demands on the overall secondary system are from both M&I and agricultural users. Separating the quantity of M&I secondary water use from agricultural use is mostly estimated due to lack of metering. This causes confusion at the State-level when accounting for secondary water use.

Financial: Even with loan funding, the costs of installing meters on secondary systems will fall to the owner of the system. As such, the system owner will have the option to spread these costs out over a period of years or all at once if funds are available. There is also a question as to whether the large amounts of money earmarked for secondary metering projects will achieve the most water gains for the system. Alternative improvements within secondary water systems may provide equal or greater benefits for the same cost. An in-depth study of the economics of water conserved by secondary metering versus other projects would inform the discussion of this issue.

Technical: By definition most secondary systems deliver untreated and, in most cases, unfiltered water. Simple, less expensive meters are easily clogged in an unfiltered system, and the more technically advanced meters that are more resistant to clogging cost in the thousands of dollars, as shown above. In addition, secondary systems are drained in the winter and this can cause additional operational problems for the meters. Many meter manufactures will not warranty their product if the water does not meet certain minimum standards. Much of the success of a secondary metering program will depend on what stage the secondary system is in. Retrofitting existing secondary systems could be prohibitively expensive.

Political: There seems to be a fair amount of political will for secondary metering. The idea of giving consumers the needed information for them to conserve water and to also charge consumers more accurately for their water use has merit. While some secondary water systems may have completed an economic evaluation of secondary water metering and compared the cost of potential conserved water versus the cost of other water supplies, many systems have likely not. In short, the Utah Legislature will likely desire additional information to fully apprise future actions. There is a fair amount of political opposition from water suppliers who do not feel that mandatory secondary water metering is a good fit for their system, and they do not want to be forced to spend time and money on a retrofit/installation that may not meet their needs. These concerns can be alleviated, or validated, based upon further study of the options available to each system.

Administrative: The major obstacle to this strategy is that it requires widespread implementation by diffuse and unrelated secondary systems. Given the expense of installing meters on all of their un-metered secondary connections, it is unlikely that a critical mass of water suppliers will voluntarily chose to implement this policy. As noted, a critical mass of metering would be required in order to achieve noticeable benefits at the lake.

3.2.2.4 Options for Future Action

Table 3-6. Options for Future Actions for Strategy No. 4 – Secondary Metering

Options for Future Action	
Legal	Revise land use ordinances to consider the value of water to the community and incentivize water conservation. Require new developments to include water-saving landscaping and secondary meters on all new connections to secondary water systems. Require accounting of secondary water use as part of current system water use reporting.
Hydrological	Continue to improve data on secondary use. Actual conservation of secondary water could be accomplished through metering or other options such as smart weather-based irrigation controllers, soil sensors, and remote sensing.
Financial	A "one-size-fits-all" approach of mandatory secondary metering may not be the most economical approach. The State should develop guidelines to determine which types and sizes of systems should install secondary meters and which systems should explore other options.
Technical	Problems of metering unfiltered water are significant. Options include some level of filtering or evaluating other technologies to reduce secondary water use. The State should initiate an economic and engineering study to evaluate how best to implement measures to conserve water in secondary systems.
Political	A blanket regulatory ruling mandating secondary metering may be expensive and not address the best approach for each individual water supplier.
Administrative	DWRi could require all water suppliers to provide accurate reports of water use within their systems. The method for acquiring this data could be left to the individual water supplier. If the data is not provided or if it is not of the quality needed, the Legislature could then mandate secondary water metering.

Legal: If the State pursues options that would mandate secondary metering for all un-metered connections, it is likely that the water suppliers would not voluntarily send conserved water to the Great Salt Lake. Much like the conserved water discussion in the M&I section, the cost for this water is high and suppliers will be motivated to use it within their service area. The State should change its water rights laws and/or communities should change their ordinances to encourage Municipal water rights holders and developers to consider the value of water to the community and to benefit from delivering conserved water to downstream uses. Current law does not encourage water conservation (especially in the agricultural sector) because there are no economic or other incentives to do so. The State of Utah should continue to pursue better, and more accurate, reporting of actual water use throughout the State. It is difficult to optimize the value of available water and its use if it is not measured or quantified.

Hydrological: The State needs to improve its ability to measure and evaluate secondary water use. Mandatory secondary metering is certainly an option to achieve this. The State of Utah Water Use Data Collection Program notes:

> "…secondary water supply is even less certain than potable supply. It is simply assumed to be equal to use or production. Secondary supply is difficult to estimate due to the fact that it is often coming from shared sources with potable water. For example, Weber Basin Water Conservancy District's (WBWCD) supply is mainly surface water that is used as a potable and secondary source. The Weber Basin Project (WBWCD's primary source) has an annual reliable yield of 206,914 acre-ft. This water can be treated for potable water or used untreated as secondary. Also, several irrigation and canal companies each have rights in the same sources, and they provide water to different systems and customers, with the majority going to agricultural use. All of this makes it difficult to distinguish what is reserved for potable, M&I secondary, and agricultural uses." (BC&A and HAL 2018)

Remote sensing technology continues to improve and become more economical. The ability to determine water use at the parcel level could become economically viable in the future. It should be emphasized that the goal of metering secondary connections is not to simply have better data. The goal is to conserve water to reduce costs, improve efficiency and to potentially use some of this conserved water to enhance the reliability of water supplies and sustainability of the Great Salt Lake. It is possible that these results could be achieved through a different program. For example, a combination of smart weather-based irrigation controllers, soil sensors, and remote sensing to monitor usage might achieve similar results as installing secondary meters.

Financial: Given the technological obstacles of metering unfiltered water and the sheer number of un-metered connections in Utah, the cost of installing meters on all of Utah's un-metered connections will be high. Some will argue that it is cost-prohibitive. To control costs, the State should evaluate other options rather than a "one-size-fits-all" option. The State could evaluate what types of systems would benefit from secondary metering. As noted above the WBWCD has a large secondary system with intermixed supplies that are difficult to parse out without metering. Smaller systems, or systems with high turbidity and low water quality that would raise the cost of metering might want to approach the issue from the customer side and promote programs that use different technologies.

Technical: The technical issues surrounding mandatory metering for secondary systems are significant. There is the data issue noted in the Hydrological section and the expense of the meters. As detailed previously, some evaluators believe that with regard to secondary metering there are only four options:

> "Essentially, there are four basic alternatives to consider when determining an approach to secondary water metering: 1) Install a centralized filter station, 2) Install individual filters at each user connection, 3) Install currently available meters with no filtration, 4) Do nothing and wait for metering technologies to advance." (Richards et al. 2009)

For these and other reasons, the "one-size-fits-all" option of mandatory metering should continue to be evaluated. Not only are metering technologies advancing, but other, related, technologies are advancing. The idea of a physical meter as necessary to save water might not be the most effective or economical option. Before committing to the "one-size-fits-all" regulatory action of mandatory secondary metering, the State should consider the following:

1) An in-depth study of the actual costs for installing meters on secondary connections, including operational constraints and long-term maintenance and replacement costs
2) An economic comparison of mandatory secondary meters versus other conservation options
3) An evaluation of other options to conserve secondary water
4) An evaluation of a segmented approach to secondary water conservation

Political: Secondary metering has been demonstrated to lower water use when implemented. However, the problem facing the State is the cost associated with installing meters on every secondary connection in the State. This "one-size-fits-all" may be appealing from a regulatory approach, however it may miss the many nuances associated with the different issues facing each individual water supplier. The State should initiate an economic and engineering study to evaluate how best to implement measures to conserve water in secondary systems. This would likely involve a solution that would include some level of metering combined with other alternatives.

Administrative: The secondary systems could, through rulemaking, legislative action, or otherwise, be required to supply the annual reports of water use within the system. The methodology used to gather this information could be left to the individual supplier but with approval of the method and validation of the data by the State. If the information is not supplied or the quality of the information is not sufficient, the Legislature could then mandate the installation of secondary water meters.

3.2.3 Strategy Conclusion

It is well understood that un-metered secondary water use does not promote efficiency or sustainability by water users and secondary metering has been demonstrated to lower water use when implemented. Secondary metering is an important tool for consideration as the State of Utah pursues M&I water conservation throughout the State.

The challenge facing the State is the cost associated with installing meters on every secondary connection in the State. This "one-size-fits-all" may be appealing from a regulatory approach, but it may miss the many nuances associated with the different issues facing each individual water supplier. The State should initiate an economic and engineering study to evaluate how best to implement measures to conserve water in secondary systems. This would likely involve a solution that would include some level of metering combined with other alternatives.

STRATEGY 5 M&I Water Conservation | TACTICAL STRATEGY

3.3 Strategy No. 5 - Municipal and Industrial Water Conservation

GSLAC Strategy No. 5: Increase the efficiency of residential, commercial, institutional, and agricultural systems (water conservation), which would result in more surface water in streams for delivery to Great Salt Lake.

3.3.1 Strategy Summary

Issue: The concepts of M&I water conservation are generally understood, proven water conservation practices are available, and excellent recommendations to improve M&I water conservation have been proposed (HAL and BC&A 2019). However, a central challenge for implementation is educating and incentivizing (rather than mandating) water users, managers, and policy makers to adopt the required changes and investments. A driver for change is needed.

The effort and investment in implementing M&I water conservation measures is generally commensurate to how water is valued. The value of water and the methods to conserve that water are complex and are unique to each community. Communities generally approach water conservation with unique assumptions regarding:

1) Existing and potentially conserved water is but one asset in any public drinking water system's water portfolio,
2) A public drinking water system (and its water portfolio) is a required and an assumed service for any community, and
3) The value of water to a community is unique to its service area and typically does not include downstream uses.

Figure 3-3. Conservation of Municipal and Industrial Water Supplies is a Critical Component of Sustainable Water Management

How each community frames these assumptions often shapes their approach to water conservation.

Another challenge in M&I water conservation is that future water supply reliability, downstream beneficial uses and the value of water may not be fully integrated into water management decisions and water conservation practices. It is a question of the balance between reliability and economics. Water supply reliability is often tied to the next large water supply project; however, additional conserved water can also be considered a new water supply. While conserved water is not "new" water, it can stretch existing supplies, and depending on the conservation measures, it may be less costly than new supplies. If the value of conserved water is not understood or the cost is too high, water systems will often seek other less costly options to increase the reliability of their water supplies.

Conclusion: The State of Utah should continue to pursue M&I conservation throughout the State. Conserved M&I water should be used to reduce demand and stretch existing water supplies, which will reduce the need for the development of new water supply programs and indirectly increase the flow of water into the lake. In addition to changes in water rights, laws that incentivize water conservation and allow water rights holders to benefit from conserving water should be driven by consideration of the full economic implications of water management decisions and the value of water in a drainage basin or watershed. An integrated (water) resource management plan (IRP) process provides a means to evaluate the costs and value of water conservation in the context of managing a water system's entire water portfolio, achieving a community's vision for the future, and considering the true value of water. An IRP would provide decision-makers, including water users, with information on how water conservation can deliver desired outcomes with the highest return on investment; thereby, helping provide a basis for economic incentives for implementation.

3.3.2 Discussion

3.3.2.1 Background and Context

M&I water use makes up about 15 percent of all water withdrawals within the State of Utah (Dieter et al. 2018). The Utah State Engineer defines Municipal use to be simply "water used by a municipality within its Municipal limits and/or service area."[64] Accordingly, M&I use can cover a number of different kinds of water use such as domestic use in homes and apartments buildings, irrigation use in city parks and facilities, institutional uses in schools and State office buildings, commercial use in facilities like shopping malls and hotels, and industrial uses for manufacturing. Due to the varied and numerous uses to which M&I water is applied, the State Engineer allocates and perfects M&I water rights on a CFS flow basis and not an AF volume based on a specific duty value.[65]

M&I water is distinguishable from agricultural water in that it is generally treated for human consumption and is delivered to discreet end users. This occurs through a sophisticated water system that can extend to portfolios of water rights and water sources, underground and above ground pressurized pipes, storage reservoirs and tanks, water treatment facilities, waste water treatment plants, stormwater systems, buildings and facilities, vehicles, water technology like SCADA systems and software, employees, including highly trained and specialized professionals, and many more components needed to sustainably deliver safe potable water. Many M&I systems also extend to natural "infrastructure" like ownership or control of lands around water sources. M&I water systems are capital, resource, and operationally intensive.

Due to the complex and multifaceted nature of M&I water, M&I water suppliers are often subject to a number of regulatory requirements. For example, if the supplier supplies water to an end user, it must meet certain sizing requirements required by the Division of Drinking Water to ensure there are adequately sized pipes and water supply to meet certain system metrics like average day demand, peak day demand, and fire flow requirements. The Division of Water Quality (DWQ) requires M&I water to meet certain quality standards to meet to protect public health and safety. M&I systems often extend to numerous "kinds" of water and may be required to meet various specific regulatory requirements for operations related to secondary water, storm water, sewage treatment, and so forth.

---

[64] Utah State Engineer, Glossary,- https://www.waterrights.utah.gov/wrinfo/glossary.asp#M.

[65] Water rights become vested property interests when they complete the appropriation process and receive a Certificate of Appropriation under Utah Code Ann. § 73-3-17. To come to the final amount of water bestowed by a municipal water right, the State Engineer assesses the individual uses to which a municipal water right is applied and calculates the total volume associated with the those uses (X number of homes at .45 AF + X number of acres at local diversion and duty value + X AF of industrial use etc.). The State Engineer then converts the sum of the various AF uses to a corresponding CFS flow.

M&I water can be delivered by a number of different kinds of entities - municipalities, limited purpose local government entities like special service districts organized to provide water under Utah Code Ann. § 17D-1-101 et seq. or a local water conservancy districts organized under Utah Code Ann. § 17B-1-101 et seq., mutual shareholder owned non-profit companies organized under Utah Code Ann. § 16-6a-101 et seq., or infrequently in Utah, for profit water companies regulated by the Utah Public Service Commission. Often times M&I water will move between multiple entities through various contractual arrangements before ultimate delivery to the end user.

The corporate form of an M&I water supplier will dictate how it controls and pays for water distribution. For example, mutual shareholder non-profit companies are private companies that raise revenue through shareholder assessments, limited purpose local governments usually have a publicly appointed or elected board and raise revenue through property taxes and fees, Municipalities are governmental entities that set rates through a public rate making process, and publicly regulated companies are privately controlled companies that go through a public tariff process. The ability of a M&I water provider to adopt and invest in water conservation measures will depend greatly on how the entity is formed and the ability of its end user to pay for improvements.

Water conservation measures to reduce consumption of M&I water exist for all categories of M&I water use. For example, residential indoor water conservation is generally done through conversion of shower heads, toilets, and washing machines to low-flow, high-efficiency units. Water savings in residential outdoor, commercial, and institutional use categories largely consist of improving metering, changing irrigation practices, irrigation scheduling, and conversion to using non-treated secondary water supplies. Water conservation can also be found through operational efficiencies like water audits of an M&I water system that highlights leaking pipes or broken meters. Water audits can also result in additional revenue by highlighting unbilled or underbilled water use.

Conversion to more water-efficient technology has been either mandated or encouraged on a national scale by legislation and U.S. Environmental Protection Agency programs (such as, Energy Star). At the State-level, water conservation measures are not applied consistently throughout the State due to varying geography, climates, populations, development patterns and cultural norms about water use. The Recommended State Water Strategy acknowledged this and recommended that water conservation goals be developed that considers the unique characteristics of the State's various regions (GWSAT 2017). The DWRe responded with development of new regional M&I water conservation goals to provide guidance M&I water suppliers as they develop and implement their own water conservation plans (HAL and BC&A 2019).

Many Utah residents have already eliminated wasteful water use or implemented "free" conservation. For example, many Utahn's have moved to lower water use yards and irrigation practices. The next levels of conservation will likely come at a significant cost. For example, the Metropolitan Water District of Southern California (MWD) estimated that its most recent turf removal program cost an estimated $ 600 per AF[66] of saved water. MWD also estimates that in 2018/19 they spent $34 million on conservation and saved approximately 5,000 AF[67]. Capital costs associated with achieving conservation goals would be in addition to the already significant costs of delivering treated water to M&I customers.

[66] http://mwdh2o.com/PDF_Newsroom/Turf_Removal_Program.pdf

[67] http://www.mwdh2o.com/PDF_About_Your_Water/3.1_1.2_Regional_Progress_Report.pdf

When M&I suppliers expend large sums of money to save water, they intend to use this water to increase the reliability of their own customer's water supply. Unless a M&I user is incentivized to do so, conserving M&I water presently does not directly create additional water supply for downstream users but instead works to reduce demand, which stretches and increases the reliability of the M&I provider's existing developed water supply. Being more efficient with its existing resources can then delay potential development of new water sources and reduce overall pressure on the water system.

3.3.2.2 Tools and Techniques

Table 3-7. Tools and Techniques for Strategy No. 5 – Municipal and Industrial Water Conservation

Tools and Techniques	
Legal	The State of Utah has water supply requirements for M&I uses and has recommended water conservation practices and Region-specific water conservation goals for the years 2030, 2040, and 2065.
Hydrological	Various agencies already work to quantify and manage available M&I water supplies according to demands and applicable water rights.
Financial	Water systems already invest in water conservation according to their system's priorities and their understanding of the value of water to the community and downstream uses.
Technical	Water users and managers generally understand the concepts of M&I water conservation, proven water conservation practices are available, and excellent recommendations to improve M&I water conservation have been proposed. New Statewide regional water conservation goals are in place.
Political	Awareness of the need and benefits of water conservation are increasingly being understood and a part of policy discussions.
Administrative	Conservancy districts and public community water systems have water conservation plans in place.

Legal: Existing law recognizes an indoor residential duty of 0.45 AF per connection per year and public community water systems have required that this water supply be provided for each connection. Results from conservation efforts indicate that this amount may no longer be needed to meet the needs of residential users and the State Engineer will currently consider a reduced requirement of water per connection if the reduced need can be proven (Jones 2018). Further, UAC R309-510 also specifies minimum requirements for water supply to ensure systems can supply adequate water quantities of water to protect public health. Reduced sizing requirements are allowable if a reduced need can be demonstrated and legally enforceable water conservation measures exist.

The State of Utah initially passed the *Water Conservation Plan Act*[68] in 1998 requiring conservancy districts and public community water systems with more than 500 connections to prepare a water conservation plan and update it every 5 years. State funding was made contingent upon preparation of a plan that outlined water conservation goals and measures to reduce M&I water consumption. The State's first M&I water conservation goal was published in 2001 to reduce water use in public community water systems by at least 25 percent (or approximately 400,000 AF per year) by 2050 (DWRe 2001). This goal was modified in 2014 to target a 25 percent reduction more aggressively by 2025 (DWRe 2014). The State of Utah developed new Region-specific water conservations goals in 2019 for the years 2030, 2040 and 2065 (HAL and BC&A 2019).

[68] *See* Utah Code Ann. § 73-10-32

Hydrological: Various agencies already work to quantify and manage available M&I water supplies according to demands and applicable water rights.

Water systems use water conservation to increase the reliability of their water supplies. For example, if storage is available, reduced demands allow more water to be retained in storage reservoirs until later in the season (or for subsequent years) when it is needed. Further, water conservation is a mechanism that can help a water system defer development of new water sources and the costs associated with the new infrastructure. Conservation of treated water supplies, along with development of untreated secondary water systems, also allows water systems to better allocate and stretch existing treated water supplies and defer expansion of treatment works.

Financial: Conservancy districts and public community water systems already invest in water conservation to varying degrees. Investments in water conservation are typically based upon varying goals for reducing water demands, available revenue and the system's understanding of the value of water to the community and downstream uses, that is, their understanding of the return on investment.

The cost of treated water supplies is higher than that of untreated water supplies. Water conservation is enabling water systems to stretch these treated supplies for use where they are most required.

Technical: Significant research has already been and continues to be completed to develop the best means to educate, incentivize and implement measures to reduce M&I water consumption. Expertise, tools, and resources are readily available.

The State of Utah recently developed new methods to measure and report M&I water use (BC&A and HAL 2018) and recommended regional goals and practices for water conservation Statewide (HAL and BC&A 2019).

Political: The challenges of managing a limited water supply in an uncertain climate to meet the needs of a rapidly growing population and economy are daunting but are increasingly understood and becoming a priority to overcome (GWSAT 2017). As the "open space" between our communities, water service areas and homes diminishes and boundaries that used to divide interests begin to blur, water is increasingly viewed not simply from the perspective of an individual water user or service area but from the perspective of the basin or watershed.

In practice:

The Central Utah Water Conservancy District—An Emphasis on Conservation

In 1994, the Central Utah Water Conservancy District (District), in compliance with the *Central Utah Project Completion Act* (Act), completed its initial Water Management Improvement Plan (WMIP). Section 207(b) of the Act requires the District, after consultation with the State and each petitioner of project water, to prepare and maintain the WMIP to document progress, among other things, on the District's water conservation goal of 39,294 AF per year.

As reported in the 2019 WMIP supplement, the District has exceeded the conservation goal, established in the 2006 WMIP supplement, of conserving of 80,100 AF by the year 2033. The District reported in 2019 that completed and ongoing projects had conserved 143,274 AF, which exceeds the ultimate 2033 water conservation goal by 79 percent.

The District has moved well beyond the minimum requirements of efficient water management resulting in long-term, significant benefits to Utah. The Federal partnership has been crucial to the success of this program. However, since 2014, the absence of Federal funding has stalled development and implementation of new conservation projects. (Source: Central Utah Water Conservancy District.)

The impacts from an extended drought and consequences of water management decisions are increasingly felt and understood. Limited water resources in some basins in Utah are encouraging water users to investigate and implement methods to reduce their diversions or depletions. New laws are being developed and proposed by the Legislature to provide new flexibility and incentives for water users to reconsider how they manage and use their water supply. Improvements in water management practices and new funding from the Legislature have created new opportunities for water users to optimize water productivity and maximize their yields and revenues. Taken together, water users have significant incentives to innovate and are increasingly seeking direction, resources and flexibility from their water providers and the State's policy makers.

Administrative: Conservancy districts and public community water systems already plan for and implement water conservation practices per the water conservation plans they are required to prepare and implement. These plans will incrementally be revised to include the State of Utah's new reginal water conservation goals.

3.3.2.3 Impacts, Barriers, and Considerations

Table 3-8. Impacts, Barriers, and Considerations for Strategy No. 5 – Municipal and Industrial Water Conservation

Impacts, Barriers, and Considerations	
Legal	M&I duties and minimum sizing requirements may serve to disincentivize additional water conservation. Reducing M&I duty demand could increase the quantity of water available for conservation. M&I conservation could help increase lake levels, but only if the conserved water can be effectively shepherded to the lake in a way that does not also interfere with other vested water rights. Land use ordinances may not adequately consider the value of water.
Hydrological	As a result of existing water rights laws, M&I water conservation may not translate to increased streamflow. Climate change could impact water supply availability and reliability, thus serving as a potential driver for increased water conservation to augment existing supplies.
Financial	The value of water is often not fully incorporated into water management decisions. Water conservation will become more expensive; thus, the highest economic use of conserved water may remain in the community.
Technical	Quantifying water use and water conservation is challenging. Implementing water conservation measures can have unintended consequences if not carefully considered.
Political	Education and incentives will be required for effective and efficient investments in water conservation.
Administrative	Water conservation is generally a local endeavor. It may not be fully integrated into a community's planning and management objectives and truly reflecting the value of water.

The following is a discussion of the impacts, barriers, and considerations of M&I conservation issues.

Legal: Existing residential water duties and water system sizing requirements may incentivize water supplies that exceed requirements and disincentivize water conservation. While M&I water suppliers have a recognized right to use their conserved water within their system, Utah's Current Prior Rights Water Law does not allow for conserved water to be shepherded to downstream uses. Further, M&I water suppliers do not have an incentive or a means to benefit from delivering conserved water to downstream uses. Junior water rights holders currently have the right to the conserved water that is delivered from upstream sources.

Land use ordinances may not adequately consider the value of water, water conservation policies, and water planning objectives. Ordinances may not incentivize water conservation or provide adequate flexibility in determining lot size and density, the use of high-water demand landscaping, and the use of water in required green space. Many ordinances may presume an indefinite and reliable water supply and not fully consider the value of the water to the community and potential benefits and impacts to downstream uses. Integrating water planning, specifically water conservation strategies, into land planning may be a strategy that is not employed enough.

Hydrological: Although M&I water conservation will likely not directly translate to increased streamflow and inflow to Great Salt Lake, conserved M&I water is an important component of the water supply. Reduced demands that result from water conservation efforts typically augment existing water supplies by:

1) Improving the reliability of a water supply (that is, storage reservoirs are able to store more water for longer periods, deliver the water when it is needed, and reduce the risk of reduced water supply during drought or system failure). If reservoirs remain full, they may be more likely to spill and then contribute waters to downstream uses.
2) Reducing or deferring the need to develop new water supplies (that is, new wells, diversions, or storage are not needed as urgently because growth in demand has decreased).

The volume of conserved water and the associated cost to implement the conservation measures that make the water available are thus an important component of a water systems water supply portfolio and decisions to manage that portfolio.

Studies evaluating potential climate change scenarios indicate that a warmer and wetter (or drier) future has the potential of having a detrimental impact on future water supplies in the State of Utah (HAL and BC&A 2019; Jacobs 2019). This could be a driver for more aggressive implementation of water conservation to preserve the reliability of the water supply. Warmer temperatures, even with higher precipitation, could reduce the snowpack that currently provides invaluable natural water storage for Utah's water systems. Existing reservoirs may thus not be adequate and be able to provide the intended storage benefits and improved reliability to water systems. Warmer temperatures could also increase ET rates resulting in higher water consumption from natural areas and outdoor water use and reductions in available water supply. Warmer temperatures may not only reduce natural storage in mountain snowpack, but it also may cause spring run-off to come earlier, before Municipal demands need it. While this could negatively affect M&I water suppliers, there is the potential that the loss of this natural snowpack storage means that additional water could flow toward Great Salt Lake. Accelerated water conservation efforts in this context provide direct benefits to M&I water systems.

M&I water use only represents approximately 15 percent of water diversions in the State of Utah. Given the cost of M&I water conservation and the value of treated water supplies, there may be alternative strategies that are more cost effective to provide conserved water to downstream uses.

Financial: The value of water may not be fully integrated into water management decisions and water conservation implementation in practice. The effort and investment in implementing water conservation is generally commensurate to the value of that water. The value of water and conserving that water is complex and is unique to each community. However, communities generally approach water conservation with these assumptions:

1) existing and potentially conserved water is but one water supply asset in any public drinking water system's water portfolio,

2) a public drinking water system (and its water portfolio) is a required and an assumed service for any community, and
3) the value of water to a community typically does not include downstream uses.

It is a question of the balance between economics and reliability. A water utility is concerned with rates and reliability, both current and future. The assumption that water supply reliability is tied to the next large water supply project is being reconsidered. Additional conserved water can be considered a new water supply. While conserved water is not "new" water, it can stretch existing supplies, and depending on the conservation measures, it may be less costly than new supplies. The highest use of water conserved by water utilities and districts is likely to be consumption by their customers. The cost for additional water conservation to Utah's water districts will be high but will likely be lower than new water supply or storage projects. This will incentivize water districts to continue to look to conservation to stretch the reliability of their existing water supplies. Every conserved AF of water is an AF of water that does not have to be developed or stored by a new project and is an AF of water that could benefit downstream water uses. Conserving untreated water supplies for non-potable water uses may be more cost effective than conserving treated water for uses that require treated water.

Many Utah residents have already eliminated wasteful water use or implemented "free" conservation. Marginal costs for future water conservation (that is, turf buy back) programs are likely to be high. The higher the cost for conserved water that water districts pay, the less likely they will be willing to allow that water to flow to the Great Salt Lake.

Technical: M&I water conservation measures must be carefully considered to ensure they achieve the intended objectives and do not result in unintended consequences. For example, the reuse of wastewater effluent is a recognized M&I water conservation practice[69]. Reuse represents an available water supply that could be used to meet new indoor or outdoor water demands, augment the reliability of the system's water supply, and/or defer development of new sources of water. While reuse could defer development of new sources of water, it also increases Municipal depletions and reduces flows historically returned to streams. Thus, reuse could result in unintended consequences in a watershed like Great Salt Lake's.

It is difficult to quantify exactly how much water is conserved by a water system. Conserved water is not so much "wet water" as it is reduced demand, which stretches and makes more reliable the existing water supply. The State of Utah should continue to invest in improving water use measurement and reporting capabilities to better understand the amounts of conserved water and the most efficient methods for conserving water.

Political: A central challenge for implementation of M&I conservation, is educating and incentivizing (rather than mandating) water users, managers, and policy makers to make the required changes and investments. Water conservation can remain a passive endeavor if there is not an incentive to implement water conservation more aggressively or the perceived benefits do not exceed the costs.

Administrative: M&I water conservation goals and measures are largely driven by local conservancy districts and public water systems. If they are not partnering with other water systems within their basin or watershed, they may not be capitalizing upon opportunities to maximize the return on investment and value of water.

[69] *See* Utah Code Ann. § 73-10-32

Future water supply reliability, downstream beneficial uses and the value of water may also not be fully integrated into water management decisions and water conservation implementation in practice. Water management may not be integrated into land use and economic development planning. If water is inexpensive, if it is plentiful and these characteristics are largely taken for granted, it is only natural that water conservation is not viewed as a priority or integrated into a community's planning and management processes. A comprehensive understanding of future water reliability, how the water could benefit downstream uses and thus benefit the community, and the savings water conservation could represent to the community in the long-term are what provide a more accurate understanding the value of water.

3.3.2.4 Options for Future Action

Table 3-9. Options for Future Action for Strategy No. 5 – Municipal and Industrial Water Conservation

Options for Future Action	
Legal	Change laws to shepherd conserved water to the lake or other downstream uses. Revise land use ordinances to incentivize water conservation, require installation of less water intensive landscaping, and consider rate adjustments to more fully recognize the value and cost of water to the community.
Hydrological	Evaluate the benefits and costs of water conservation in light of the value of water not just to the community but also downstream uses. Consider implementing water conservation as a means to counter the potential consequences of climate change upon the reliability of the water supply.
Financial	Offer incentives to conserve and use water more economically. Study the feasibility, benefits, and impacts of a more open water market that incentivizes water users to optimize the value, productivity, and benefits of their water.
Technical	Invest in developing, demonstrating to, and educating water users about the benefits and practice of successfully implementing water conservation practices. Improve quantification of M&I water supplies, depletions, the amounts of conserved water, and the most efficient methods for conserving water.
Political	Increase Statewide education on the benefits of water conservation and incentives for implementation.
Administrative	Work cooperatively with Utah's water districts and stakeholders.

Legal: Requirements for residential duties and minimum sizing requirements should be evaluated to not simply provide flexibility but to provide specific guidance that incentivizes water conservation. The State of Utah should change its water rights laws to allow Municipal water rights holders to benefit from delivering conserved water to downstream uses. Current law does not encourage water conservation (especially in the agricultural sector) because there are no economic or other incentives to do so. Water planning should be incorporated into land use and economic development planning and decisions. Ordinances should be reconsidered to incentivize water conservation in light of water as a limited resource and its value to the community and downstream uses.

Hydrological: Water managers should implement an IRP process to evaluate the costs and value of water conservation in the context of managing a water system's entire water portfolio, achieving a community's vision for the future, and considering the value of water. It provides decision-makers, including water users, with information on how water conservation can deliver desired outcomes with the highest return on investment; thereby, helping provide a basis for economic incentives for implementation.

The State of Utah should continue to invest in tools to evaluate the impacts of climate change on future water supplies in the State of Utah. Rather than waiting to see if climate change reduces available storage and the reliability of M&I water supplies, water utilities and districts could aggressively pursue implementation of water conservation to increase the reliability of water supplies even if climate change reduces available storage. Added benefits include delaying development of new water supplies, more sustainable growth, and more inflows to Great Salt Lake in the near term (that is, lower demands result in more storage and likelihood of reservoirs overflowing to Great Salt Lake).

Financial: Economic incentives to improve M&I water efficiency, and thereby implementation of water conservation practices, should be driven by consideration of the full economic implications of water management decisions and the value of water in a drainage basin or watershed. An IRP process provides a means to evaluate the costs and value of water conservation in the context of managing a water system's entire water portfolio, achieving a community's vision for the future, and considering the true value of water. It provides decision-makers, including water users, with information on how water conservation can deliver desired outcomes with the highest return on investment; thereby, helping provide a basis for economic incentives for and investment in implementation.

Economists speak of using resources at their highest use. An argument could be made that using high-cost conserved water for M&I uses would be using that water at its highest use. A better understanding of the value of water and increased flexibility in recognition of the right to conserved water, quantification of conserved water and the means to deliver conserved water to downstream uses could be the incentives needed toward creating a market where the value of water (such as, cost of implementing water conservation) in the market (such as, basin or watershed) incentivizes investment in the optimal water use.

Technical: The State of Utah must maintain and increase investments in developing, demonstrating to, and educating water users and managers regarding the benefits and practice of successfully implementing water conservation practices. There are already many proven water conservation practices and programs. It is critical that the benefits and potential consequences of their implementation be considered not only in light of the water system's service area but in the context of the watershed (such as, reuse of wastewater effluent should be carefully considered prior to implementation). A combination of increasing the awareness of the need, the benefits of participation, and available expertise, tools and resources and incentivizing their use is needed. They are not needed to simply begin or maintain water conservation programs, but to increase implementation in a manner that maximize benefits of conserved water to the community and downstream uses.

The State of Utah should continue to invest in improved measurement capabilities to better quantify M&I water supplies, depletions, the amounts of conserved water, and the most efficient methods for conserving water. An IRP process provides a means to evaluate the costs and value of water conservation in the context of managing a water system's entire water portfolio (that is, in comparison to other water supplies). An accurate accounting of M&I depletions is needed to optimize management of available water supplies.

Political: Incentives for implementation and investments in M&I water conservation should remain a high priority in water management strategies and water portfolios across the State. An IRP process could be an effective mechanism to inform water users and managers and policymakers alike regarding the value of water and the opportunities and benefits of water conservation. The State of Utah must increase its education activities to inform the general public of the importance of conserving water and its linkage to sustainable growth and protecting the benefits communities derive from Great Salt Lake.

> A key goal is to change the "culture of water" into one where conservation of water (both indoor and outdoor) is the norm and reflects the value and scarcity of water.

A key goal is to change the "culture of water" into one where conservation of water (both indoor and outdoor) is the norm and reflects the value and scarcity of water. The State of Utah should continue to stress conservation and develop messages that convey the idea that M&I conservation has direct positive benefit upon existing communities, enables sustainable growth and a reliable water supply and has an indirect positive impact on the levels of the lake.

Administrative: Working with Utah's water utilities and districts will be key. M&I water providers will implement almost all M&I conservation in the State to increase their water supply. Water districts and M&I water supply reliability will be a key component in the effort to balance a reliable M&I water supply with the need for a healthy Great Salt Lake, which will require increases in inflow to the lake. Utah water districts should continue to implement M&I water conservation that will decrease demand, decrease the need for new water supply projects, and increase the reliability of their existing water supplies.

3.3.3 Strategy Conclusion

The amount of future M&I water conservation will likely not have significant direct impacts upon the levels of the Great Salt Lake and will be expensive. However, M&I water conservation is a critical element of water management planning, an essential element of water systems' water portfolios. and can still be a key component of the plan to increase flow into the Great Salt Lake. Any water that is conserved and subsequently used to offset M&I demand will free up water for other uses, including increasing flows into the lake.

The State of Utah should continue to pursue M&I conservation throughout the State. Conserved M&I water should be used to reduce demand and stretch existing water supplies, which will reduce the need for the development of new water supply programs. Conserved M&I water should be used to meet M&I demand, which will indirectly increase the flow of water into the lake. Entities throughout the world, including Utah, have demonstrated the benefit, need, and feasibility in pursuing conservation measures to reduce the need to develop new sources of water and increase the overall reliability of existing supplies.

In addition to changes in water rights, laws that incentivize water conservation and allow water rights holders to benefit from conserving water should be driven by consideration of the full economic implications of water management decisions and the value of water in a drainage basin or watershed. An IRP process provides a means to evaluate the costs and value of water conservation in the context of managing a water system's entire water portfolio, achieving a community's vision for the future, and considering the true value of water. An IRP would provide decision-makers, including water users, with information on how water conservation can deliver desired outcomes with the highest return on investment; thereby, helping provide a basis for economic incentives for implementation.

STRATEGY 6 Watershed Best Practices — **OPERATIONAL STRATEGY**

3.4 Strategy No. 6 – Watershed Best Practices

GSLAC Strategy No. 6: Incorporate best management practices for water conservation at the watershed scale into policy making decisions.

3.4.1 Strategy Summary

Issue: There are numerous best management practices for water conservation that have been and are being developed for and implemented by M&I and agricultural water users. Many are already being implemented in Utah. The technologies used, their costs, their performance, and the value derived from their implementation vary widely depending upon the application and, perhaps most importantly, the objectives of the individual water users or managers who are implementing them within their service area.

Conservation practices can be, and have been, implemented very effectively. The value in conserving water, however, is relative. It depends upon the individual and scale in which it is implemented. It depends upon the objectives, the value of the conserved water and the direct and indirect benefits derived from conserving by those implementing the practices. The power of water conservation begins with the individual but can multiply exponentially when implemented and assessed in the aggregate. A challenge lies in understanding the value of conserving water when it is implemented at scale; a driver for change is needed. If understood, water users and managers can better understand their true area of influence and the true consequences, good and bad, from water management decisions. If understood, they and policy makers can make more informed decisions about how and where to invest limited resources to maximize the benefits, productivity, and growth that water provides to our communities.

Conclusion: An evidence-based policy to address watershed scale implementation of water conservation measures will require an inclusive and collaborative process to evaluate pertinent demand-side and supply-side management options. An integrated approach is recommended to consider the costs, the opportunities and return on investment from water conservation at a basin or watershed scale. An IRP not only enables water users, water managers, and policy makers to evaluate the consequences and benefits from implementation of water conservation practices at scale, but to evaluate them in the context of "one water", or the full hydrologic cycle. It enables a top to bottom and integrated approach to managing surface and groundwater supplies, M&I and agricultural uses, storm water, wastewater, and water reuse. Consideration of water conservation practices alone will not achieve that. An IRP can and should be completed to "incorporate best management practices for water conservation at the watershed scale into policy making decisions" and realize the future envisioned by our communities.

3.4.2 Discussion

Utah's water community faces a growing gap between its demand and its firm supplies. Future increases in environmental regulations, drought, and the attendant competition for water could result in decreased reliability of its water supply. Simultaneously, demand is rising within the Region due to continued population growth. To address these issues, a unified and coordinated approach to water resources planning in Utah is needed to meet the Region's future resource needs.

3.4.2.1 Background and Context

> "To augment water efficiency and conservation options, water planning should consider these additional strategies:
>
> i. utilization of integrate water resource management (IWRM) as an effective method for assessing adaptation options and their implications in the context of an evolving regulatory environment with its competing demands"
>
> *Recommended State Water Strategy, July 2017 (GWSAT 2017)*

The Great Salt Lake Watershed is a large and diverse watershed with numerous stakeholders and varied interests. If the challenges facing the Great Salt Lake, and indeed, the entire watershed are to be solved, it is likely that a process that engages all of the stakeholders will be necessary. An IRP is just such a process. The American Water Works Association (AWWA 2001) describes the IRP process as follows:

> "IRP is a comprehensive form of planning that encompasses least-cost analyses of demand-side and supply-side management options as well as an open and participatory decision-making process, the development of water resource alternatives that incorporates consideration of a community's quality of life and environmental issues that may be impacted by the ultimate decision, and recognition of the multiple institutions concerned with water resources and the competing policy goals among them. IRP attempts to consider all direct and indirect costs and benefits of demand management, supply management, and supply augmentation by using alternative planning scenarios, analyses across disciplines, community involvement in the planning, decision-making, and implementation process, and consideration of other societal and environmental benefits. IRP includes planning methods to identify the most efficient means of achieving the goals while considering the costs of project impacts on other community objectives and environmental management goals. These planning methods specifically require evaluation of all benefits and costs, including avoided costs and life-cycle costs." (AWWA 2001)

In other words, an IRP process allows the Region's stakeholders to establish and implement a regional resource strategy that achieves regional water resources goals after considering the full range of options for a healthy watershed. To succeed, the IRP process relies on participation and input from all stakeholders. One of the most important strengths of the IRP process is that it is designed to include a wide range of resource options and participants in the development of a strategy for meeting regional goals. Many of these options are clearly outside of the direct control of any single entity. To realize these benefits, a high level of consensus and cooperation must be achieved among all participants.

An IRP process evaluates the watershed as a system and follows seven basic principles:

1) Consider all sources of water (surface, groundwater, reclaimed water, stormwater, imported water, and others)
2) Seek sustainability and equity in water resources
3) Account for all end users/uses of water
4) Consider water quantity and quality
5) Provide opportunities for stakeholders to participate in planning process
6) Align local water-related decisions with broader community and State objectives (agriculture, land use, growth)
7) Integrate social, economic, and environmental goals into strategies

The future includes uncertainty; however, uncertainty need not hamper progress. Our communities can grow sustainably, they can be resilient, they can adapt; however, no one part of the government or our communities can act alone to achieve the outcomes. There must be alignment of:

1) Knowledge – the technologies we have to implement change and address challenges
2) Societal Values – how values are understood, promoting, and driving a need for change, accepting of change
3) Rules – governance that enables smart change to occur, where even status quo is challenged to ensure alignment with today and tomorrow

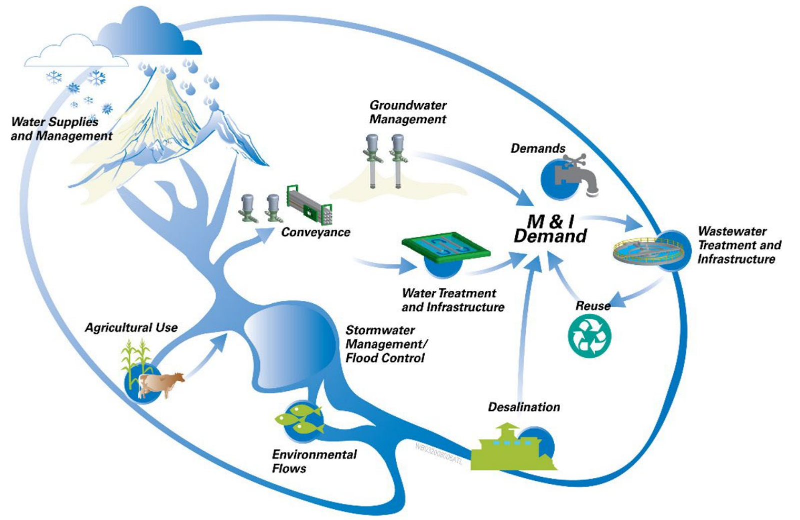


Figure 3-4. An Integrated Watershed

Our communities must be aligned with all three to maximize their opportunities to challenge, to adapt, and to become resilient and overcome the challenges of tomorrow.

Utah's water community has already proven its capability to successfully plan and manage its water supplies in the midst of significant change and scarcity. Individual water users are faced with decisions every day in how to use their available water to maximize its productivity. They effectively implement available technology to address challenges and achieve their objectives. They make decisions that maximize the value of their water for themselves and their community. Utah has an effective framework of Water Law and administrative processes and has demonstrated the foresight to adapt these rules to provide water users with new flexibility to overcome new challenges (such as, water banking[70], split season leasing[71]). The challenge is continuing to do so in the face of ever-increasing change and compounding impacts from an increasingly interconnected society.

Can we maintain the status quo when impacts are compounded at the basin and watershed scale? Are we considering the full range of options and the potential consequences and benefits from these choices at a basin or watershed scale? An IRP engages stakeholders, evaluates options in the context of their watershed, and identifies the "best" solutions that enable their communities to adapt and shape the future they envision.

The fundamental goal of an IRP is to create as reliable a water system for the future as the Region has enjoyed for decades, regardless of future challenges. The most important outcome of an IRP process is a regional planning framework for making decisions about reliability and resource development. It is a framework that will enable policy makers to assess the most effective investments in water conservation practices in the context of the full range of its water management options. It will enable policy makers to reduce risks, maximize flexibility and diversify and optimize their resources to maximize the value of the available water resources.

[70] *See* Utah Code Ann. § 73-1-4
[71] *See* Utah Code Ann. § 73-3-3 and § 73-3-8

3.4.2.2 Tools and Techniques

Table 3-10. Tools and Techniques for Strategy No. 6 – Watershed Best Practices

Tools and Techniques	
Legal	Existing laws allow water conservation at the watershed scale and development of an IRP. Existing strategies recommend water planning based upon IRP principles. HCR 10 encourages UDNR and Utah Department of Environmental Quality (UDEQ) to "engage with stakeholders to develop recommendations for policy and other solutions to ensure adequate water flows to Great Salt Lake and its wetlands". HB 166 provides means for creation of a Great Salt Lake Watershed Council.
Hydrological	Public water systems already invest in planning for their individual systems. The GSLAC has developed an initial Great Salt Lake Integrated Model of the lake and its watershed for use in an IRP process.
Financial	Conservancy districts and public community water systems already invest in planning for their individual service areas. The GSLAC is actively seeking funding for integrated water resource management at the Great Salt Lake Watershed scale.
Technical	The GSLAC has developed an initial Great Salt Lake Integrated Model of the lake and its watershed for use in an IRP process.
Political	The GSLAC has served as an important forum to facilitate communication and collaboration among stakeholders representing users of water in the Great Salt Lake's Watershed and the lake itself.
Administrative	The Legislature recently funded a new Great Salt Lake Coordinator position within the UDNR to facilitate communication and collaboration among State agencies and lake stakeholders.

Legal: Existing law does not preclude water conservation at the watershed scale or development of an IRP. The Recommended State Water Strategy and HCR 10 both identify integrated water resource management principles as important in both addressing the State of Utah's future water needs and ensuring adequate flow to Great Salt Lake (GWSAT 2017; HCR 10 2019). The State of Utah is currently developing a new State Water Plan. HB 166 provides means for creation of a Great Salt Lake Watershed Council as a forum of stakeholders from across the watershed to discuss water policy and water management issues[72].

Hydrological: Utah's water community has already invested in the development of water models that simulate specific systems and basins to enable informed decisions. The IRP process has been successfully implemented worldwide to maximize the return on investment in water management practices and to prevent and overcome significant impacts from water scarcity.

For example, the GSLAC, in conjunction with the UDNR and UDEQ, has already developed a Great Salt Lake Integrated [Water Resources Management] Model (GSLIM) to better understand how changes throughout Great Salt Lake's Watershed may impact water supply and Great Salt Lake water levels.

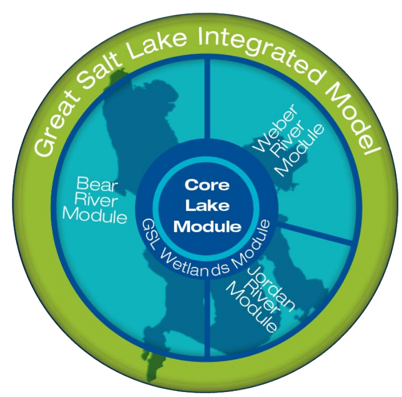


Figure 3-5. Great Salt Lake Integrated Model

[72] *See Watershed Council Act,* Utah Code Ann. § 73-10g-301

The GSLIM was built to aid resource managers and policymakers in understanding how changes in climate, population, land use, and water use in the Great Salt Lake Watershed might impact the Great Salt Lake ecosystem and its uses. It already allows a user to evaluate various M&I and agricultural water conservation practices at the sub-basin level.

The GSLIM, initially completed in 2017, was updated and enhanced in 2019 through an interactive process including State of Utah agency staff, GSLAC members, and stakeholder feedback (Jacobs 2019). The core outputs from GSLIM include depictions of Great Salt Lake health, elevation, and salinity based on various scenario assumptions. The objective of the GSLAC's implementation of GSLIM in 2019 was to better understand the sensitivity of Great Salt Lake's water levels and salinity to potential changes in its watershed and begin to screen and prioritize potential management strategies for further study and implementation. The GSLIM could be an effective tool and a basis for developing and evaluating the information necessary for a Great Salt Lake IRP. More specifically for this strategy, it is an example of how an IRP could be used to evaluate the benefits and impacts from implementation of water conservation practices at the watershed scale.

Financial: Water systems already invest in water planning and development and implementation of water conservation plans for their individual service areas. The GSLAC secured funding for development of the GSLIM and is actively seeking additional funding to further develop the model and partner with water systems throughout Great Salt Lake's Watershed. New monies will be needed to implement an IRP at the scale of Great Salt Lake's Watershed.

Technical: The GSLAC has developed an initial Great Salt Lake Integrated Model of the lake and its watershed for use in an IRP process. See discussion in the Hydrological section.

Political: The GSLAC has served as important forum for communication and collaboration among stakeholders throughout the lake's watershed and driver for studies that seek to better understand water management challenges and how they pertain to protecting the resources of Great Salt Lake.

Administrative: The 2020 Legislature provided ongoing funding for a new Great Salt Lake Coordinator position within the UDNR. The role of the Coordinator is to assist the State in making informed management decisions regarding the health of the lake and facilitate collaboration among public, private, and local partners to better manage the lake for the Public Trust.

3.4.2.3 Impacts, Barriers, and Considerations:

Table 3-11. Impacts, Barriers, and Consideration for Strategy No. 6 – Watershed Best Practices

Impacts, Barriers, and Considerations	
Legal	No legal barriers were identified to evaluate best management practices at a watershed scale. Legal barriers for implementation of potential strategies are described in the other strategies. An IRP could help evaluate the benefits and impacts from implementing other strategies.
Hydrological	Accuracy of planning will depend upon the accuracy of available information.
Financial	The cost of a Great Salt Lake Watershed IRP would not be insignificant.
Technical	A Great Salt Lake Watershed IRP would be complex both technically and politically.
Political	There would need to be agreement between political entities to proceed with an IRP.
Administrative	There would need to be agreement between political entities to proceed with an IRP.

There could be a number of obstacles to implementing the recommendations of this strategy. First there is the number of entities required to participate in the IRP. There would have to be a consensus of the goals, objectives, and general procedures. Without this, it would be extremely difficult to proceed with the IRP. The entities would also have to provide a significant amount of funding for this effort. Without universal participation from all of the entities within the watershed, the entire project would be at risk.

The impact of not implementing a watershed-level IRP will be the continued challenge of coordinating efforts to address the issues surrounding the reliability of water supplies and potential impacts from water management decisions across the basin or watershed. This will likely lead to the inability to implement meaningful efforts to integrate the basin's water portfolio and enable communities to adapt and shape the future they envision. Policy makers will continue to experience challenges in coordinating implementation of watershed scale water conservation practices. This is simply because they do not have the information required to educate constituents and make informed decisions that direct investment and implementation of the most effective practices.

Legal: An IRP can be completed within the existing legal framework and will not inherently require any legal changes. Development of an IRP; however, could benefit from implementation of other water strategies that do require legal and administrative changes. The IRP could be used to evaluate potential benefits and consequences from legal and administrative changes.

Hydrological: The quality and effectiveness of an IRP is dependent upon the quality of available data that quantify available and future water supplies, actual and potential water demands, and key drivers that can influence supplies and demands (such as, population growth, land use changes, climate, and so forth).

Financial: The cost of an IRP process is directly related to the stated objective for the IRP and the complexity of the watershed. The cost of implementing an IRP can be significant; however, when compared to the alternatives, it will create a significant environmental, water supply and economic benefit not only for the watershed, but for the State of Utah as a whole. It enables policy makers to make informed decisions to achieve the future they envision. It minimizes risks and maximizes the return on investment in water conservation practices and water management decisions as a whole.

Technical: IRPs are technically complex; they require integration of multiple disciplines and the practices and objectives of numerous stakeholders. They are; however, feasible to implement and have a high rate of success when implemented by qualified practitioners.

Political: Developing a watershed scale IRP requires a high degree of cooperation from a wide range of public and private entities within the watershed. This can be driven by the water users and communities themselves, or, in most cases, is driven by policy makers with active support from the communities.

Administrative: Watersheds are composed of many different public and private entities. A watershed IRP would, of necessity, be a comprehensive effort requiring extensive coordination between these interests. The level of authorization, oversight, and funding is directly related to the scale of the watershed. An IRP for the Great Salt Lake Watershed will likely require direction from leadership that has jurisdiction over all entities within that watershed.

3.4.2.4 Options for Future Action

Table 3-12. Options for Future Action for Strategy No. 6 – Watershed Best Practices

Options for Future Action	
Legal	State-level support and funding will be critical to complete a comprehensive IRP that spans the Great Salt Lake Watershed.
Hydrological	Develop an IRP for the Great Salt Lake Watershed. Begin efforts to identify data needs and collaborate with partners to acquire improved data for planning efforts. A Great Salt Lake Watershed Council may be good vehicle to bring these various stakeholders to the table.
Financial	Develop a cooperative funding effort for the IRP.
Technical	Develop an IRP for the Great Salt Lake Watershed. A broad spectrum of technical experts will be necessary for a Great Salt Lake IRP. Continue to validate and develop the GSLIM for use in the IRP.
Political	Legislative support and engagement from State entities will be necessary. A new Great Salt Lake Watershed Council may be a good means of facilitating collaboration across the watershed.
Administrative	The GSLAC (or a new Great Salt Lake Watershed Council) could take the lead in developing a Great Salt Lake Watershed IRP, however, this approach will require a cooperative partnership among various governmental and private stake holders to achieve an IRP for Great Salt Lake.

Legal: Legislative support, and likely funding, will be critical to complete a comprehensive IRP that spans the Great Salt Lake Watershed.

Hydrological: An IRP should be completed for the Great Salt Lake Watershed. The success of the IRP is premised upon a collaborative effort to identify and procure the best available data describing the watershed. Water users, utilities, and districts will need be actively engaged, participate in development of models and simulations of the systems they are experts in and assist in integrating available data and their expertise into a representation of the integrated system. They must participate to enable them to accept, own and fully leverage the IRP for decisions that shape their future.

Financial: IRPs are most successful when the users of the IRP have a stake in and own the process and products. This should not be solely a State effort, but the effort of the communities within the watershed. Significant funding from the Legislature will be needed, but watershed partners must actively participate and have ownership of the IRP. This may be implemented numerous ways (such as, in kind services, data, software, or matching funds) and could be coordinated via a new Great Salt Lake Watershed Council[73].

Technical: An IRP should be completed for the Great Salt Lake Watershed. An IRP is a" team event"; however, required multi-disciplinary expertise is scalable to the scope of the IRP. The Team may include individuals with an intimate understanding of the water uses, systems and communities within the watershed, data science, public involvement, governance, hydrology, water management, natural resources, economics, and modeling. The GSLAC should continue to work with the State of Utah to validate and further develop the GSLIM in collaboration with conservancy districts and public community water systems. A new Great Salt Lake Watershed Council could be one means of accomplishing this[74].

[73] *See Watershed Council Act,* Utah Code Ann. § 73-10g-301
[74] *See* Utah Code Ann. § 73-10g-301

Political: Legislative support, State agency engagement, and community participation will be essential to the success of an IRP that spans the Great Salt Lake Watershed. The GSLAC should consider if creation of a new Great Salt Lake Watershed Council is warranted (Strategy No. 9: Agency Coordination)[75].

Administrative: The GSLAC (or a new Great Salt Lake Watershed Council) could take a central role in guiding, shaping, and overseeing the effort. An IRP for the Great Salt Lake Watershed could be completed using the GSLIM as a starting point. The GSLAC has already developed recommendations for the Organizational Infrastructure to support and continue development of the GSLIM. Funding will be required; however, engaging the water districts in a review of the most current version of GSLIM will be critical for it to have a solid foundation for an IRP.

In practice:

A Regional and Integrated Approach - The Metropolitan Water District of Southern California

The Metropolitan Water District of Southern California prepares for tomorrow with an evolving long-term water strategy known as the Integrated Water Resources Plan, or IRP. Southern California uses less imported water than it did a generation ago even though the population has grown by five million people.

To continue to meet Southern California's demands into the future in an environmentally responsible and economical manner, the 2015 IRP Update calls for:

- ▲ Stabilizing and maintaining imported supplies
- ▲ Meeting future growth through increased conservation and existing and new local supplies
- ▲ Pursuing a comprehensive transfers and exchanges strategy
- ▲ Building storage in wet and normal years to manage risks and drought
- ▲ Preparing for climate change with Future Supply Actions – recycled water, seawater desalination, stormwater capture and groundwater cleanup

The development of Metropolitan's Integrated Resources Plans reflects the intensely collaborative nature of water planning in Southern California, involving numerous stakeholders. Water agencies throughout the region also offer visions of their futures through their Urban Water Management Plans. These and other planning documents provide important insight into both local supplies that are likely to come online soon, as well as supplies with a more uncertain future. Any robust outlook about supplies must consider the many variables that face all the potential sources of water for the region.

3.4.3 Strategy Conclusion

An evidence-based policy to address watershed scale implementation of water conservation measures will require an inclusive and collaborative process to evaluate pertinent demand-side and supply-side management options. A process is needed to understand how alternatives can influence a community's quality of life and objectives for the future and the environment in which the community exists. It must serve to identify the programs and policies that provide the highest return on investment. It must effectively consider how decisions could influence alternative future scenarios and identify the most efficient means of achieving the community's goals without harming the watershed's beneficial uses of water. Consideration of water conservation practices alone will not achieve that. An IRP can and should be completed to "incorporate best management practices for water conservation at the watershed scale into policy making decisions" and realize the future envisioned by our communities.

[75] *See* Utah Code Ann. § 73-10g-301

STRATEGIES 7 & 10 Water Acquisition OPERATIONAL STRATEGY

3.5 Strategy No. 7 and Strategy No. 10 – Water Acquisition

GSLAC Strategy No. 7: Expand the ability to purchase or otherwise acquire water for instream flow uses to entities other than State agencies.

GSLAC Strategy No. 10: Expand State agency acquisition of water with appropriated funds, or acquisition of water rights by gift, donation, lease, or other arrangements.

3.5.1 Strategy Summary

Issue: Currently, Utah law only allows the DWiR, DPR, and fishing groups to acquire rights to instream flow. The ability of fishing groups to dedicate water to instream flow is limited to habitat of certain species and other constraints.

Strategy No. 7 may require new legislation to enable other water users to participate in instream flow efforts, whereas Strategy No.10 contains broad existing authority, but without adequate funding. The use of this authority has been limited to situations where donated water rights have been made available for instream flow use.

Strategy No. 7 will require building coalitions among stakeholders to generate the necessary political will to expand the universe of water users who could hold instream flow rights, as well as the filing of instream flow change applications and shepherding this water to its intended destination.

The agency stakeholders discussed below would serve in a variety of roles. For instance, DWiR and DPR personnel can share expertise for how they have handled the water right acquisition and Change Application processes. Other agencies have expertise relating to the importance of historic flow regimes to the Great Salt Lake ecosystems. Some agencies, such as the DWiR, could also be allowed to acquire water rights directly and change to instream flow under the amended statute.

The non-profit/citizen group stakeholders listed below would serve an important role in helping to create a demand for water rights to be purchased and subsequently transferred to instream flow use. These stakeholders could also help in the drafting stage, as they would be some of the key entities given the new ability to acquire water rights. The amendments would be structured to encourage these entities to seek out water rights for purchase and strive not to make the process overly burdensome.

Conclusion: Strategy No. 7 will require legislation to expand the universe of stakeholders who can hold and manage water for instream flows. It will involve coordinating between multiple stakeholders in the drafting stage of any new legislation, as well as during the implementation stage when conveying water rights and filing Change Applications. Strategy No.10 would involve testing the limits of existing authority and building the political will to provide adequate funding to the agencies to enable them to effectively use their existing authority.

In Practice:

- Farmer Joe has applied to DWRi to recognize his conserved water from a project to upgrade his existing irrigation technology to be more efficient.
- The National Migratory Bird Association has offered to purchase Farmer Joe's conserved water rights, and Farmer Joe agrees.
- This voluntary arrangement that would benefit both parties, as well as Great Salt Lake and instream ecosystems, is presently not allowed under Utah law.
- If the law is changed to allow other entities to acquire water rights for instream use, it will facilitate the ability of similar free-market solutions to occur, allowing more water to reach the lake.

3.5.2 Discussion

3.5.2.1 Background and Context

Instream flow is the amount of water flowing within a constrained stream channel over a particular period of time and, when considered in aggregate, constitutes the discharge associated with a particular stream. Instream flow characteristics are important to instream ecology and fisheries, the riparian zones, and downstream ecosystems.

Instream flows were not historically recognized as a beneficial use under traditional Utah Water Law doctrine. However, this changed in 2008 when a new law was enacted recognizing the limited ability to dedicate water rights to instream flows via the Change Application process.[76]

Section 73-3-30 of the Utah Code furnishes three entities with the ability to purchase water rights and file a Change Application to dedicate those water rights to instream flow uses: the DWiR, the DPR, and "fishing group[s]."[77] This statute also recognizes that any water used for instream flow pursuant to its provisions constitutes beneficial use.[78]

Either DWiR or DPR can file such Change Applications on water rights that they already own, purchase using funds appropriated for instream flow purposes, or water rights acquired by either division by lease agreement, donation, or other means.[79] The statute identifies three purposes for which instream flow rights can be purchased by the agencies: fish propagation, public recreation, or the "reasonable preservation or enhancement of the natural stream environment."[80]

[76] See Instream Flow to Protect Trout Habitat, 2008 Utah Laws 311.
[77] *See* Utah Code Ann. § 73-3-30(1).
[78] *See* Utah Code Ann. § 73-3-30(7); see id. § 73-3-1.
[79] *See* Utah Code Ann. § 73-3-30(2)(b).
[80] *See* Utah Code Ann. § 73-3-30(2)(a).

Fishing groups, defined as 501(c)(3) organizations that "promote fishing opportunities in the State,"[81] face an entirely different process and several additional conditions to file a Change Application for instream flow. First, fishing groups may only file instream flow changes relating to habitat for three species of trout (Bonneville, Colorado River, and Yellowstone cutthroats).[82] Second, the area dedicated to instream flow "may not be further upstream than the water right's original point of diversion nor extend further downstream than the next physical point of diversion made by another person."[83] Third, fishing groups must obtain DWiR's approval before filing a Change Application with the State Engineer.[84] The DWiR Director can only approve a proposed change if it is in a stream reach that historically or currently supports one of the listed species, and may deny a proposed change if the Director deems it "not in the public's interest."[85]

3.5.2.2 Tools and Techniques

Table 3-13. Tools and Techniques for Strategies 7 and 10 – Water Acquisition

Available Tools and Techniques	
Legal	There is an existing framework and process to acquire water rights and transfer to instream flow.
Hydrological	Increasing instream flows in Great Salt Lake tributaries should augment total amount of water entering the lake over time, but only if the flows can be shepherded past intervening diverters who might otherwise divert and use water left in the stream for their own benefit. Shepherding is therefore a major factor in providing for increased flows to the lake.
Financial	There is some funding available from State resources and conservation/advocacy organizations.
Technical	There is existing expertise available from agency personnel and researchers at Utah universities.
Political	Coalition building can create consensus regarding the expansion of who may hold instream rights.
Administrative	Currently authorized agencies can be encouraged to expand the acquisition of instream rights to support Great Salt Lake habitats.

Legal: The existing statutory scheme can serve as a baseline for the new amendments. For instance, the process for NGOs to purchase water rights and dedicate them to instream flow can follow a similar structure as the process laid out for fishing groups in the current statute.

Hydrological: The major tributaries to the Great Salt Lake are the Bear, Weber, and Jordan Rivers. Studies show that leaving more water instream will greatly benefit Great Salt Lake ecosystems (Jacobs 2019).

Financial: There are numerous agencies and organizations that have a vested interest that relates to the long-term vitality of the lake. Many additionally have financial resources that they may be willing to dedicate to help acquire water rights for instream flows.

A few examples of entities that may have the interest and ability to purchase instream flow water rights include:

Agencies:

- DWiR
- DPR

[81] *See* Utah Code Ann. § 73-3-30(1)(b).
[82] *See* Utah Code Ann. § 73-3-30(3)(a).
[83] *See* Utah Code Ann. § 73-3-30(3)(c).
[84] *See* Utah Code Ann. § 73-3-30(3)(d).
[85] *See* Utah Code Ann. §§ 73-3-30(3)(e), (f).

- DWRi
- DWRe
- Utah Division of Forestry, Fire & State Land (DFFSL)
- Department of Agriculture & Food, Conservation Division

Non-profits/Citizens groups:

- Ducks Unlimited
- Trout Unlimited
- Utah Stream Access Coalition
- The Nature Conservancy
- National Audubon Society
- FRIENDS of Great Salt Lake
- Utah Open Lands

Technical: There is a robust community of experts studying the Great Salt Lake and working on solutions. These institutions include Utah State University, the University of Utah, the Great Salt Lake Institute (Westminster College), and the Utah Water Science Center at the U.S. Geological Survey, to name a few. These institutions and the research they produce can be utilized to emphasize and understand the importance of instream flows to the lake's long-term vitality.

Political: Engage stakeholders in the non-profits/citizens groups listed above to build coalitions for legislative change.

Administrative: Engage stakeholders in agencies listed above early and often to facilitate implementation of new policy.

3.5.2.3 Impacts, Barriers, and Considerations:

Table 3-14. Impacts, Barriers, and Considerations for Strategies 7 and 10 – Water Acquisition

Impacts, Barriers, and Considerations	
Legal	An individual has the present ability to purchase a water right and donate it to one of the State agencies for instream flow purposes. New authority for individuals is needed through the means of a water bank and/or utilization of split season change applications. This would allow the water of the individual donors to be used for instream flows on a temporary basis without losing title by donating the water to the State. Leasing is a possibility under current law. Fishing groups are limited in their ability to dedicate water to instream flows, and the authority that does exist is cumbersome to use and of limited application. This is due to there being no current method for them to shepherd water beyond the next point of diversion downstream.
Hydrological	Water left instream will need to be shepherded to ultimately make it to the Great Salt Lake (Strategy No. 3: Shepherding Water).
Financial	The acquisition of instream water rights requires the purchase of water rights and contracting with agencies and/or NGOs, where applicable. Funding sources will need to be identified.
Technical	Instream flow amounts will need to be quantified and shepherded through the system.
Political	There are political barriers to amending statute to allow other entities to acquire instream flow rights for expanded purposes.
Administrative	Agencies are reluctant to put the State in the middle of potential disputes among water users over access to water left in the stream for environmental purposes.

Legal: At present, the ability to purchase a water right and dedicate it for instream flow to support a downstream habitat is not possible under existing statutory framework.

Hydrological: The major tributaries to the Great Salt Lake are the Bear, Weber, and Jordan Rivers. Studies show that leaving more water instream will greatly benefit Great Salt Lake ecosystems (Jacobs 2019).

Financial: Funding sources will need to be secured in order for this strategy to succeed. Owners of water rights need to be willing to sell or lease their rights at market price in order to facilitate transactions.

Technical: The DWRi would need to expend additional time and energy in quantifying and studying the instream flow tied to a particular water right, as well as the broader context in that river system. However, expertise from other agencies and stakeholders listed can help ease the additional burden placed on DWRi.

Political: The major obstacles to Strategy Nos. 7 and 10 are largely political—amassing the political capital from various stakeholders to encourage the Legislature to amend the statute to allow for water rights to be applied to instream flow by entities other than those currently allowed under the statute.

Administrative: There are also potential pragmatic barriers. Successful implementation of Strategy Nos. 7 and 10 will involve educating current appropriators about their ability to transfer water rights to instream flow purposes. It will also require involving NGOs and other stakeholders from an early stage to ensure there is a demand to acquire water rights for instream flow. Additionally, the agencies will need sufficient time to process and administer the instream water rights.

3.5.2.4 Options for Future Action

Table 3-15. Options for Future Action for Strategies 7 and 10 – Water Acquisition

Options for Future Action	
Legal	Develop amendments that would allow other State agencies and NGOs to acquire water rights for instream flow purposes. Develop amendments to recognize other authorized reasons for changing a water right to instream flow use. Expand the authority to file instream flow change applications to private parties who wish to convert a consumptive right to a non-consumptive instream flow right on a temporary or permanent basis.
Hydrological	Shepherd the approved instream flows to ensure that they reach the lake (Strategy No. 3: Shepherding Water).
Financial	Investigate and develop potential sources of funding.
Technical	Train agency employees to assess and quantify instream flow water rights.
Political	Build coalitions to improve the validity and efficacy of instream and environmental flows.
Administrative	Facilitate and encourage water right transactions leading to instream flow transfers and public outreach and stakeholder education.

Legal:

1) Amend Section 73-3-30 of the Utah Code to allow other State agencies (such as, DWRe) to acquire water rights for instream flow purposes.
2) Amend Section 73-3-30 of the Utah Code to expand the NGOs able to acquire water rights from instream flow from fishing groups to include other organizations with a stated interest in protecting downstream ecosystems relying on instream flow (such as, The Nature Conservancy, National Audubon Society, Ducks Unlimited, and so forth).

3) Amend Section 73-3-30 of the Utah Code to recognize additional ecosystem functions for instream flows aside from important fishery habitat in the watercourse itself:
   - Expand purposes to include habitat of other species and improved water quality.
   - Recognize a new purpose for protecting instream flows tied to the impacts on downstream ecosystems (including the Great Salt Lake). For example, the maintenance of the lake as habitat or as a beneficial use on its own could be added to the definition of beneficial use.

These changes would facilitate the dedication of water for ultimate use downstream at the Great Salt Lake and make the lake's continued viability a priority.

Hydrological: See Strategy No. 3.

Financial: Explore potential funding sources, including private donations or impact fees from extractive industries that rely on the lake.

Technical: Train agency personnel on how to initiate water rights transactions and administer their instream flow water rights once acquired. DWRi personnel will need training on how to quantify instream flow water rights for the new purposes of protecting Great Salt Lake habitats.

Political: Build coalitions to encourage policymakers that there will be sufficient demand from both agencies, non-profits, and private parties to support new instream flow water rights acquisitions.

Administrative:

1) Facilitate and encourage transactions between entities that might be interested in purchasing the rights for instream flow and parties potentially interested in selling all or a portion of their water rights.
2) Educate the public and advise key stakeholders on the differences between changing a water right to be used in a water bank and permanently (or temporarily) conveying a water right to another entity to be used beneficially for instream flow.

3.5.3 Strategy Conclusion

Currently, Utah law only allows the DWiR, DPR, and fishing groups to acquire rights to instream flow. The ability of fishing groups to dedicate water to instream flow is limited to habitat of certain species and other constraints. Strategy No. 7 will require legislation to expand the universe of stakeholders who can hold and manage water for instream flows and will involve coordinating between multiple stakeholders in the drafting stage of any new legislation, as well as the implementation stage when conveying water rights and filing Change Applications. Strategy No.10 would involve testing the limits of existing authority and building the political will to provide adequate funding to the agencies to enable them to effectively use their existing authority.

STRATEGY 8 Agricultural Water Conservation **TACTICAL STRATEGY**

3.6 Strategy No. 8 – Agricultural Water Conservation

GSLAC Strategy No. 8: Increase the water use efficiency of agriculture by increased efficiency of irrigation systems leaving more surface water in the streams for possible delivery to Great Salt Lake.

3.6.1 Strategy Summary

Issue: Approximately 82 percent of water use in the State of Utah is used in agricultural applications (GWSAT 2017). Allowed seasonal diversion volumes for irrigation water rights are determined by the DWRi on the basis of the irrigation area described in the water right and the allowed irrigation duty, which varies depending upon climate conditions throughout the State. The assumed irrigation depletion for each irrigation water right is defined by the DWRi as the volume of water that is potentially consumed as ET during beneficial use for irrigation on the basis of the most consumptive crop which can be grown on the limited acreage, usually alfalfa.

Figure 3-6. Center Pivot Sprinkler System (top) and Center Pivot System fitted with Mobile Drip Irrigation in an Alfalfa Field (bottom)

(Barber et al. 2020)

Prior Appropriation Doctrine provides that any saved or conserved water will be forfeited due to lack of use. This leads to two results: 1) users are not incentivized to conserve because they will forfeit their right to any amount of water saved; and 2) salvaged water cannot be transferred to a use elsewhere, or changed to instream use, without first showing that the same quantity of water is not relied upon by downstream users.

There is simply little to no economic incentive for agricultural water rights holders to conserve or improve efficiency in the context of downstream beneficial uses. Since water rights holders cannot benefit from the efficient use of their water, there is little incentive to make improvements and agricultural producers will continue to use older, less efficient practices.

Conclusion: The Utah Legislature should pass legislation to allow water rights holders to maintain rights to the water they conserve (Strategy No. 1), develop methods that enable water users and water managers to accurately quantify actual water depletion and manage their water rights by depletion (Strategy No. 12), and incentivize agricultural water users to conserve (Strategy Nos. 2, 3, 7, and 10). This will allow individual agricultural water right holders to make defensible, market-driven decisions that optimize use of their water supply, maximize their water's productivity, maintain, or increase their agricultural production, and possibly result in more instream flow. Continued investment, improved flexibility and market-driven incentives will benefit the individual agricultural producer and, if implemented widely, could result in significant volumes of conserved water to benefit downstream beneficial uses.

3.6.2 Discussion

Approximately 82 percent of water use in the State of Utah is used in agricultural applications; therefore, improved efficiencies in agricultural water use may represent the greatest potential for water savings and maximizing benefits to downstream beneficial uses. Numerous strategies for improving agricultural water use efficiency, from lining irrigation canals to improving the irrigation scheduling and the actual method of crop irrigation, provide significant opportunities for water savings. While the technology to improve the water use efficiency of agriculture exists, several challenges currently limit agricultural water conservation in Utah. If the challenges are overcome and water conservation is then widely implemented, there may be significant potential to benefit both agriculture and downstream beneficial uses at the field, farm, basin, and watershed scale.

3.6.2.1 Background and Context

Unintentional consequences from water conservation: Utah Water Law currently limits practical consideration of agricultural water conservation to the field or farm scale. Prior Appropriation Doctrine provides that any water saved or conserved by a water user will be forfeited due to lack of use[86], thus often precluding water conservation efforts that could benefit downstream beneficial uses. Strategy No.1 provides a detailed analysis of the challenges of this law and recommendations for improvements.

There are several benefits to a water user from optimizing irrigation to increase agricultural production at the field and farm scale; however, there are also several concerns with optimizing irrigation that can impact overall depletions of water resources at the basin-scale and on downstream water users. With irrigation improvements that increase crop yields, there is often an associated increase in crop ET and depletions (UAES 1982). Irrigation water optimization projects that increase irrigation efficiency and crop yields can actually increase depletions. Thus, conserving water or increasing the water use efficiency of agriculture within only the scope of a field or a farm could potentially either: 1) harm the water user through the potential forfeiture of their water right because they are not putting their water to use or 2) benefit the water user at the expense of downstream beneficial uses.

House Bill 381 formed the Agricultural Water Optimization Task Force (Task Force) in 2018[87]. One of the Task Force's mandates was to identify and initiate research that identifies how the State could optimize agricultural water supply and use.

---

[86] *See* Utah Code Ann. § 73-1-4
[87] *See* Utah Code Ann. § 73-10g-201

House Bill 381; however, also provided crucial context by further directing that recommendations to accomplish these goals should "maintain or increase agricultural production while [emphasis added] reducing the agriculture industry's water diversion and consumption". Thus, House Bill 381 recognized maintaining or increasing agricultural production and water conservation are not necessarily mutually exclusive[88].

Quantification: It is important to note that even if Utah Water Law was modified to allow water owners to retain a legal right to control conserved water and to protect conserved water from forfeiture (implementation of Strategy No. 1), there must also be a means to accurately quantify conserved water for benefit to be recognized and realized (Strategy Nos. 12 and 3).

Allowed seasonal diversion volumes for irrigation water rights are determined by the DWRi on the basis of the irrigation area described in the water right and the allowed irrigation duty, which varies depending upon climate conditions throughout the State. The assumed irrigation depletion for each irrigation water right is defined by the DWRi as the volume of water that is potentially consumed as ET during beneficial use for irrigation on the basis of the most consumptive crop which can be grown on the limited acreage, usually alfalfa. Conserved water is that portion of permitted water depletion that was not depleted and is available to put to an alternative beneficial use. Thus, accurate quantification of conserved water will require accurate quantification of actual depletions.

Figure 3-7. Soil moisture balance station; evaluating depletion accounting methods in Weber County, Utah

A second mandate for the Task Force was to identify and initiate research to improve quantification of agricultural water use on a basin level. Accurate, effective, and defensible means to measure and account for actual depletion provide a means to quantify water use and conserved water, incentivize water optimization at the field-scale and basin-scale, and protect water rights, water quality, and the environment. The Task Force is currently completing a study reviewing potential agricultural depletion accounting methods with the objective of recommending methods for use in Utah.

Incentives: With available technology to improve water use efficiency in agriculture and if producers have the potential of a legal right to control conserved water (Strategy No. 1) and new means to accurately quantifying the volume of the conserved water (Strategy No. 12), a water user must also have reason to change from status quo and invest in practices that conserve water. Regulation can be used to mandate change; however, this means is rarely as effective as market-driven incentives for change that benefit both the agricultural water user and downstream beneficial uses. Potential incentives include:

1) Direct financing of infrastructure to water users to change their practices. For example, the State of Utah invested almost $3,000,000 in matching funds in 2019 to agricultural producers for implementation of on-farm water optimization practices. It is estimated that this investment alone could conserve approximately 27,000 AF per year (J. Olsen pers. comm. 2020).

[88] *See* Utah Code Ann. § 73-10g-101

2) Investment in research that develops, documents, and communicates the benefits from agricultural water optimization. The Legislature created the Task Force in 2018 and provided $1,300,000 in funds to start.
3) Authorizing split season leases where a portion of a water right may be made available for alternative beneficial uses for a portion of the calendar year. The Legislature codified this change in 2020 (Strategy No. 2).
4) Water banking could provide the structure required for local, basin-wide, and even watershed-wide water markets. The Legislature codified this change in 2020 (Senate Bill 26, Water Banking Amendments[89]).
5) Expand the ability to purchase or otherwise acquire water for instream flow (Strategy No. 7).
6) Expand State acquisition of water with appropriated funds, or acquisition of water rights by gift, donation, lease, or other arrangements (Strategy No. 10).
7) Authorizing depletion accounting for water rights management could provide water users with additional flexibility for utilizing available water within their prescribed depletion limits (Strategy No. 12).

3.6.2.2 Tools and Techniques

Table 3-16. Tools and Techniques for Strategy No. 8 – Agricultural Water Conservation

Tools and Techniques	
Legal	Recognizing a right to and quantifying conserved water and providing mechanisms to shepherd water are important legal tools that could be developed to incentivize agricultural water conservation.
Hydrological	An integrated water resources planning process could be used to better understand the available water supplies, water demands, optimize benefits, and minimize impacts from water use, and maximize return on investment across a basin or watershed. Watershed Councils could facilitate this process.
Financial	Investment will be needed for planning, study, and implementation. Market-driven incentives, such as water banking and split season change applications, are important to this effort.
Technical	Existing practices and strategies can be evaluated and optimized for implementation in Utah. New criteria should be developed to help guide prioritization of available funds.
Political	Ongoing education efforts on the value of water and importance of instream flows and a healthy Great Salt Lake are critical for efficient and effective implementation.
Administrative	Leadership and coordination between stakeholders will be key in this effort.

The following are tools and techniques that could be used to increase the water use efficiency of agriculture.

Legal: There are several legal tools available for consideration:

1) To incentivize conservation activities, Utah must modify its definition of beneficial use to allow water owners to retain a legal right to control conserved water and to protect conserved water from forfeiture (Strategy No. 1).

[89] *See* Utah Code Ann. § 73-1-4

2) Authorize and encourage split season leases to encourage the market to determine the most beneficial use of available water supplies (Strategy No. 2).
3) Expand the definition of beneficial use to include instream flows to allow for water intended for a downstream beneficial use to be shepherded under the Prior Appropriation Doctrine and physically reach the intended point of use (Strategy No. 3).
4) Expand the ability to purchase or otherwise acquire water for instream flow (Strategy No. 7).
5) Expand State acquisition of water with appropriated funds, or acquisition of water rights by gift, donation, lease, or other arrangements (Strategy No. 10).
6) Expand the State's ability to manage water rights by depletion rather than the historic method of irrigation diversion duty and number of acres irrigated (Strategy No. 12).

Hydrological: An IRP process, similar to a Groundwater Management Plan (GMP), could be used to better understand the available water supplies, water demands, optimize benefits, and minimize impacts from water use, and maximize return on investment across a basin or watershed. Watershed Councils could provide an ideal venue to bring diverse interests together to discuss water policies and develop IRPs that effectively consider how decisions could influence the future and identify the most efficient means of achieving agriculture's goals without harming the watershed's beneficial uses of water.

Financial: Provide additional flexibility under Utah Water Law, develop a means to quantify, account for and distribute conserved water, and provide adequate oversight to enable market-driven incentives for change. Significant investment by the State of Utah will likely be required for initial development and implementation of water optimization practices and markets, but, if implemented correctly with market-driven incentives, could then become self-sustaining. Recent water banking legislation (SB 26 2020) very well may provide a mechanism to initiate these markets.

Technical: There are many tools and techniques for agricultural water conservation used worldwide that could be adapted and implemented by water users in Utah. Ongoing efforts to educate water users by the Utah State University extension, UDNR, UDEQ, and National Resource Conservation Service should be continued and expanded. There are numerous successful examples of agricultural water optimization practices implemented around Utah, the nation, and the world. The Task Force recently reviewed practices implemented in Emery County to better quantify and manage available water supplies (Green et al. 2020) and available irrigation, cropping and tillage practices (Barber et al. 2020). Water banking should be investigated and developed as a means to provide a market within which water users can be compensated for temporary water sales or leases[90].

The Task Force should continue to seek to identify and invest in the development and implementation of agricultural water optimization methods that maintain or increase agricultural production while minimizing impacts upon water supply, water quality, and the environment. A common set of criteria should be developed for use in prioritizing available funds and selecting grant proposals that maximizes benefits for agricultural producers and downstream uses.

The Task Force and UDNR should continue to investigate and develop an accurate, effective, and defensible means to measure and account for actual depletion (Strategy No. 12).

[90] *See* Utah Code Ann. § 73-31-101

Political: The economic, environmental, and social importance of the health of the Great Salt Lake is not well understood by a significant portion of the population of Utah. Additionally, the relationship between agricultural conservation of water and the economic, environmental, and social importance of instream flows and Great Salt Lake is even less well understood. The State of Utah must increase its education activities to inform the general public of the importance of the Great Salt Lake and conservation efforts.

Administrative: Many of the proposed tools and techniques will require an investment of time for development, management, and oversight. Invariably, the greatest effort will be initially and will require clear leadership to establish a successful trajectory. Effective administration, including funding for staff support, will be required to ensure long-term success.

In Practice:

Agricultural Conservation—Success in the Colorado River Basin

The Colorado River System Conservation Pilot Program (SCPP) (UCRC Staff and Wilson Water Group 2018) was a partnership between the Bureau of Reclamation and four Colorado River municipal water users-the Central Arizona Water Conservation District, the Southern Nevada Water Authority, the MWD, and Denver Water. The purpose of the SCPP was to determine whether a voluntary, temporary and compensated reduction in consumptive use in the Upper Basin is a feasible method to partially mitigate the decline of or to raise water levels in Lake Powell. This would be a similar effort to the efforts to increase flows into the Great Salt Lake.

The primary objective of the pilot program was not to test whether conserved water reaches Lake Powell, but rather to assess the feasibility of system conservation as a future means of increasing storage at the reservoir. From 2015-2017, the Upper Basin SCPP funded 45 projects, for a consumptive use reduction of approximately 22,116 AF at a total cost of $4,555,747.

There was significant interest and program participation in the Upper Basin. With assistance from the four Upper Colorado River Division States (Colorado, Utah, Wyoming, and New Mexico) as well as facilitation by key NGOs, the Upper Basin SCPP received 93 applications.

The SCPP successfully demonstrated water user interest, administrative capabilities and requirements, as well as greatly advanced learning – all of which have contributed to a better understanding of whether and how voluntary reductions in consumptive use in the Upper Basin may help protect critical reservoir levels during drought.

3.6.2.3 Impacts, Barriers, and Considerations

Table 3-17. Impacts, Barriers, and Considerations for Strategy No. 8 – Agricultural Water Conservation

Impacts, Barriers, and Considerations	
Legal	Utah Water Laws do not provide an incentive for agricultural water conservation.
Hydrological	There may be unintended consequences from changing irrigation practice. Climate change could reduce future supplies and negatively impact reliability.
Financial	There is little economic incentive to implement agricultural water conservation.
Technical	Quantification of water supplies and depleted and conserved water is critical to improving water conservation.
Political	Changing Utah Water Law will require significant political leadership and will to change the status quo.
Administrative	Coordination with all stakeholders will be the key to success for this effort.

The following is a discussion of the impacts, barriers, and considerations of agricultural conservation issues.

Legal: Water rights in Utah have been firmly established through a long legal history. Water in the State is the property of the public and the Legislature is to govern the use of water as limited by constitutional protections for private property[91]. Any effort to change or limit this right will face an uphill battle. In concert with establishing a strong property right, Utah Water Law does not offer incentives for conserving water. Any water conserved by a senior right holder passes to the water rights holder who is next in line. Accordingly, if a water rights holder invests in improving their operations and conserving water, any water that is conserved would pass to the next water right holder in line.

Efforts to regulate, or mandate, water users to conserve may actually disincentivize water conservation.

Hydrological: Unintended consequences from changing current practices must be considered. For example, changing from surface (that is, flood) irrigation to using center pivot sprinkler systems can change the local hydrology as a result of changing return flow patterns. This may affect existing practices of water users downstream and habitat for wildlife (Figure 3-8) (Peck & Lovvorn 2001; Sketch et al. 2020).

Figure 3-8. The Natural Resources Conservation Service in Idaho is calling for flood irrigation projects to protect habitat on agricultural lands
Credit: Jeff Klausmann for CapitalPress.com

Climate change could impact future water supplies in the State of Utah. Reduced snowpack and increased ET could affect the need for storage, water supplies, and, ultimately, the health of the State's watershed. Increased precipitation, reduced snowpack, and the inability to capture and store this water could result in impacts to M&I and agricultural water users.

Financial: There is little economic incentive for agricultural water rights holders to conserve or improve efficiency. Since water rights holders cannot significantly benefit from the efficient use of their water, there is little incentive to make improvements, thus farmers maintain use of traditional, less efficient practices until it is no longer economically viable to farm. Current laws may actually incentivize the "buy and dry" problem.

Economists speak of using resources at their highest use. Farmers with the discretion to use conserved water would make decisions based on business needs and economics. Changing the State's water laws to allow agricultural water rights holders to benefit from conserved water will open up significant amounts of water for a water market in Utah. The State of Utah should explore options, such as the State purchasing water or a conserved water program similar to the State of Oregon's program, to ensure that instream flows are part of that market.

[91] *See* Utah Code Ann. § 73-1-1

Technical: It is difficult to quantify exactly how much water is depleted and conserved by water users at the field, basin, or watershed scale. This is especially true in the agricultural sector. The State of Utah should invest in improved measurement capabilities to better understand the amounts of depleted and conserved water and the most efficient methods for conserving water.

Political: The main risks associated with this strategy are in the change to Utah Water Law. It will take significant political leadership and will to make these changes.

The Legislature may be wary of changing the basic foundation of Utah Water Law to allow agriculture to benefit from conserved water. Agricultural entities may oppose a fundamental change to the current law because they may be unsure of the actual impacts to their water rights. NGOs may oppose the change in Water Law because they may feel that agricultural interests will unfairly benefit from the change. The impact of not changing the law could be amplification of current impacts in the watershed scale water balance and potential compounding of costs to mitigate and or restore function from those impacts.

If the State does not make these changes it will not be able to use progressive water management methods to meet its water demands. This could force the State to develop additional, expensive water and restoration projects.

Administrative: The State of Utah should work with the Legislature and the key stakeholders noted above to implement a strategy that will allow agricultural entities to benefit from conserved water. This will include changes to the existing prior rights Water Law and requisite changes to how water rights are administered, and water is distributed.

3.6.2.4 Options for Future Action

Table 3-18. Options for Future Action for Strategy No. 8 – Agricultural Water Conservation

Options for Future Action	
Legal	Recognizing a right to and quantifying conserved water and providing mechanisms to shepherd water are important legal tools that could be developed to incentivize agricultural water conservation.
Hydrological	Evaluate the effects of a changing climate on water supply, and the potential for cloud seeding to increase the available snowpack to boost water supplies.
Financial	Invest in planning efforts to improve future water management. Implement market-driven solutions to incentivize water conservation, such as, water banking and split season change applications. Provide funds for continued optimization of agricultural water management.
Technical	Invest in tools to improve the State's planning capabilities
Political	Invest in educational activities to increase awareness of the benefits of a healthy Great Salt Lake.
Administrative	Improve coordination between stakeholders to increase the likelihood of success.

Legal: Utah's Prior Rights Water Law is likely flexible enough to allow water rights holders to conserve and benefit from conserved water; however, it will likely need legislative changes. The State should:

1) To incentivize conservation activities, Utah must modify its definition of beneficial use to allow water owners to retain a legal right to control conserved water and to project conserved water from forfeiture (Strategy No. 1).
2) Promote conservation of agricultural water to increase flows to downstream beneficial uses (such as, Great Salt Lake).
3) Authorize and encourage split season leases to encourage the market to determine the most beneficial use of available water supplies (Strategy No. 2).
4) Expand the definition of beneficial use to include instream flows to allow for water intended for a downstream beneficial use to be shepherded under the Prior Appropriation Doctrine and physically reach the intended point of use (Strategy No. 3).
5) Expand the ability to purchase or otherwise acquire water for instream flow (Strategy No. 7).
6) Expand State acquisition of water with appropriated funds, or acquisition of water rights by gift, donation, lease, or other arrangements (Strategy No. 10).
7) Expand the State's ability to manage water rights by depletion rather than the historic method of irrigation diversion duty and number of acres irrigated (Strategy No. 12).

Hydrological: The State of Utah should evaluate cloud seeding to determine if it could increase precipitation and benefit water supplies. The State of Utah should continue to evaluate the impacts of climate change on future water supplies in the State of Utah. The State should evaluate mitigating measures to deal with climate change effects on Great Salt Lake.

Financial: It is critical to evaluate all options for providing an adequate and sustainable water supply to enable desired growth in Utah. Investments will be required to integrate water planning into all planning decisions (such as, economic development, land use, transportation, and so forth). Water banking could be evaluated as a mechanism to incentivize market-based water conservation solutions at the local, basin, and watershed-level. The State of Utah should consider continued funding of agricultural water optimization practices.

Technical: The State of Utah should continue to invest in tools to evaluate the potential of and develop contingencies to protect against the impacts of climate change on future water supplies in the State of Utah. Additional investments should be made to expand the work of the Agricultural Water Optimization Task Force.

Political: The State of Utah must increase its education activities to inform the general public of the value of and the role that they play in the protection of their water and Great Salt Lake.

Administrative: Integrating the efforts of water users, utilities and districts across basins and watersheds will be critical toward providing the "best" solutions for protecting Utah's water supply. The State of Utah should continue to stress conservation and develop messages that convey the idea that agricultural conservation has an indirect positive impact on the levels of the Great Salt Lake.

3.6.3 Strategy Conclusion

The Utah Legislature should pass legislation to allow water rights holders to maintain rights to the water they conserve (Strategy No. 1), develop methods that enable water users and water managers to accurately quantify actual water depletion and manage their water rights by depletion (Strategy No. 12), and incentivize agricultural water users to conserve (Strategy Nos. 2, 3, 7, and 10). This will allow individual agricultural water right holders to make defensible, market-driven decisions that optimize use of their water supply, maximize their water's productivity, maintain, or increase their agricultural production, and possibly result in more instream flow. Continued investment, improved flexibility and market-driven incentives will benefit the individual agricultural producer and, if implemented widely, could result in significant volumes of conserved water to benefit downstream beneficial uses.

STRATEGY 9 Agency Coordination **ORGANIZATIONAL INFRASTRUCTURE** Tactical Operational Foundational

3.7 Strategy No. 9 Agency Coordination

GSLAC Strategy No. 9: Improve coordination between State agencies that have the authority to make decisions affecting Great Salt Lake.

3.7.1 Strategy Summary

Issue: A challenge in the State's mission to manage and protect the resources and uses of Great Salt Lake is coordinating the mandates, efforts and investments of numerous State and Federal agencies whose mission it is to do so (UDNR 2013). Organizational structures are often complicated, but they must consistently align with their core mission; ambiguity, inefficiencies, and contradictions can result if they do not.

Fostering collaborative efforts among the agencies that are responsive to the needs and interests of the lake's stakeholders adds further complexity to the efforts of each individual agency, but even more so for the agencies in aggregate. Integrating the agencies' mission for Great Salt Lake with the mandates, needs, and decisions made by the myriad of agencies and stakeholders within the lake's watershed further compounds the challenges to serve this mission.

Improved leadership and coordination between agencies and improved legal or regulatory mechanisms that facilitate agencies to work directly with others could improve decision-making, capitalize upon opportunities, and help to better protect the lake's resources.

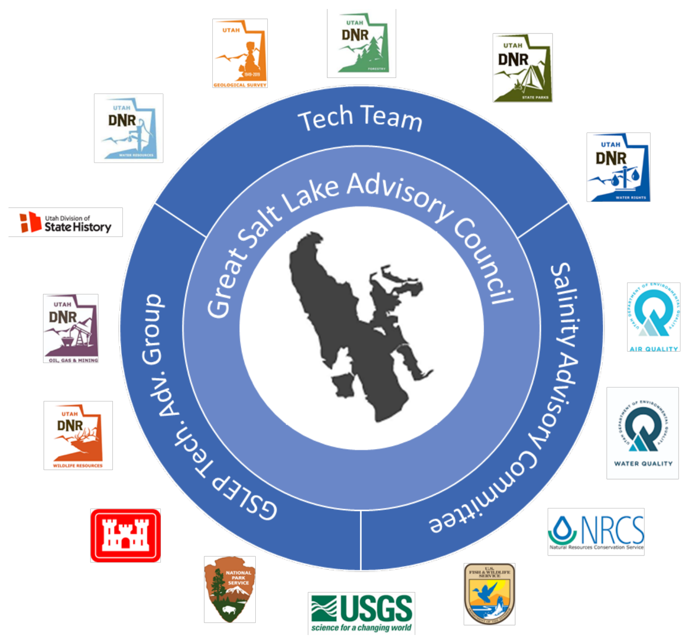


Figure 3-9. A challenge in the State's mission to manage and protect the resources and uses of Great Salt Lake is coordinating the numerous State and Federal agencies

Conclusion: The existing organizational structure is already facilitating coordination among State and Federal agencies; in fact, it has improved significantly even in the last 5 to 10 years. However, there is only a recently emerging policy to support the health of Great Salt Lake and efforts are still impeded by, a fragmented regulatory regime and a lack of funding to advance this new policy. . Existing organizational structure should be evaluated and amended to better align the mandates, efforts, and investments of agencies with the State's policy for Great Salt Lake. The GSLAC should capitalize upon opportunities to collaborate among State agencies. The formation of a new Great Salt Lake Watershed Council to work in concert with the GSLAC could be an effective means of connecting a broader stakeholder group, including major water diverters from tributary sources, with the numerous other stakeholders within the lake's watershed.

3.7.2 Discussion

A mission of State agencies is to protect and manage the resources and uses of Great Salt Lake (UDNR 2013). Increasingly, achieving this mission also includes coordinating with additional groups and stakeholders within Great Salt Lake's Watershed to maintain the lake's water levels (HCR 10 2019). This section provides an overview of existing organizational structure, challenges, successes, and opportunities.

3.7.2.1 Background and Context

Ten State and five Federal agencies have responsibility either for elements of Great Salt Lake or over decisions that affect the lake and lake levels. Each agency provides an important function relating to resource management, permitting and research that is essential in managing and protecting the multiple uses of the lake (Figure 3-9) (Table 4-1 in UDNR 2103).

Existing Coordination Efforts. The DFFSL, DWQ, and DWiR provide important leadership and coordination among State and Federal agencies as part of their statutory responsibilities. Groups such as the GSLAC, Great Salt Lake Technical Team (Tech Team), Great Salt Lake Salinity Advisory Committee (SAC), and Great Salt Lake Ecosystem Program (GSLEP) Technical Advisory Group (TAG) provide organizational structure to facilitate coordination among agencies, researchers, and stakeholders (CH2M 2017) (Figure 3-9). Figure 3-10 illustrates the formal responsibilities between each of these groups. Most if not all State and Federal agencies and many stakeholders participate with the GSLAC, Tech Team, SAC, and TAG in different capacities. The Tech Team, SAC, and TAG provide forums for coordinating research and monitoring activities among the various agencies and stakeholders.

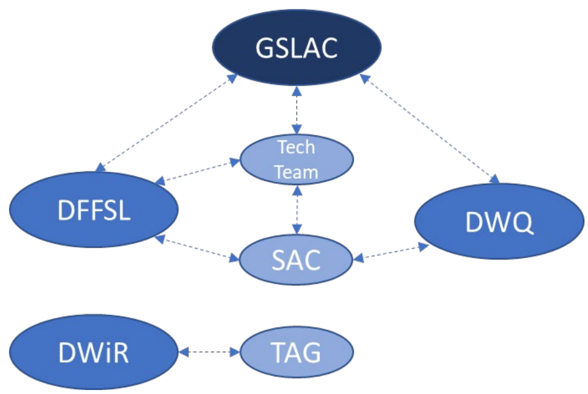


Figure 3-10. Organizational Structure for Coordinating Great Salt Lake Efforts
(Only Formal Interactions and Great Salt Lake Centric Groups are Illustrated)

Utah Department of Natural Resources, Division of Forestry, Fire & State Land. DFFSL is the "executive authority for the management of sovereign lands" in Utah, including the sovereign lands, that is the lakebed, of Great Salt Lake[92]. Among the numerous responsibilities DFFSL has for Great Salt Lake, DFFSL is to[93]:

- Prepare and maintain a comprehensive management plan for Great Salt Lake
- Initiate studies of the lake and its related resources
- Publish scientific and technical information concerning the lake
- Determine the need for public works and utilities for the lake area
- Implement the comprehensive plan through State and Local entities or agencies
- Coordinate the activities of the various divisions within the DNR with respect to the lake
- Coordinate and provide staff assistance to the GSLAC
- Retain and encourage the continued activity of the Tech Team
- Retain and encourage the continued activity of the SAC
- Coordinate control of invasive species (such as, phragmites) at Great Salt Lake

[92] *See* Utah Code Ann. § 65A-1-4
[93] *See* Utah Code Ann. § 65A-1-8

The Great Salt Lake Coordinator (described as follows) is employed by the DFFSL.

Utah Department of Environmental Quality, Division of Water Quality. DWQ and the Utah Water Quality Board are charged by law to protect Great Salt Lake's beneficial uses – "frequent primary and secondary contact recreation, waterfowl, shorebirds, and other water-oriented wildlife including their necessary food chain"[94]. This includes setting water quality standards, implementing the Utah Pollution Discharge Elimination System (that is, discharge permits), monitoring water quality, and developing and implementing other regulations, policies, and strategies to protect the beneficial uses of Great Salt Lake. DWQ also coordinates with and provides staff assistance to the GSLAC and the SAC.

Utah Department of Natural Resources, Division of Wildlife Resources. The DWiR serves the people of Utah as trustee and guardian of the State's fish and wildlife and is responsible for conserving, enhancing, and actively managing the wildlife of Great Salt Lake. DWiR achieves this through implementation of the GSLEP, regulation of hunting, fishing[95] and the commercial harvest of brine shrimp eggs at Great Salt Lake[96], operation of several Waterfowl Management Areas along the shoreline of Great Salt Lake[97], and conserving the non-game bird populations that utilize Great Salt Lake.

Great Salt Lake Advisory Council. The Utah Legislature formed the GSLAC in 2010 through passage of House Bill 343 (the Act).[98] The GSLAC was created to advise the Governor, the UDNR, and the UDEQ "on the sustainable use, protection, and development of Great Salt Lake"[99] with regard to balancing sustainable use, environmental health, and reasonable access for existing and future development[100]. In addition to the creation of the Council, the Act required the Governor to appoint several individuals, including representatives from the following groups: the extractive industry; aquaculture; conservation interest groups; migratory bird areas; elected official(s) from Municipal and county government from five Utah Counties; and one representative from a publicly owned treatment works.[101]

The GSLAC is to assist the DFFSL, DWQ and their applicable boards in accomplishing their responsibilities for the GSL. Both DFFSL and DWQ coordinate with and provide necessary staff assistance to the GSLAC[102]. The GSLAC may recommend appointments to the Tech Team and receive and utilize technical support from the Tech Team[103]. Over the years of its existence, the GSLAC has commissioned several studies of the economic value and ecological health of the Great Salt Lake. These analyses have incorporated the concerns of multiple agency personnel and serve as building blocks for the points of view that stakeholders bring to the table.

Great Salt Lake Technical Team. The Tech Team was originally created in 1988 with a mission to provide DFFSL with guidance and recommendations for monitoring, management, and research efforts of the Great Salt Lake ecosystem and to provide a forum for the interchange of information on ideas, projects and programs that affect the activities and natural systems of the Great Salt Lake (CH2M 2017). As described above, the GSLAC may recommend appointments to the Tech Team and utilize the Tech Team for technical support. DFFSL provides assistance and oversight to the Tech Team in coordination with the GSLAC.

---

[94] *See* Utah Code Ann. § R317-2-6
[95] *See* Utah Code Ann. § 23-19 and 23-20-3 and Utah Admin. Code R657-9
[96] *See* Utah Admin. Code R657-52-1
[97] *See* Utah Code Ann. § 23-21-5
[98] *See* Utah Code Ann. § 73-29-101 – 202.
[99] https://deq.utah.gov/great-salt-lake-advisory-council/great-salt-lake-advisory-council.
[100] *See* Utah Code Ann. § 73-29-202
[101] *See* Utah Code Ann. § 73-29-201
[102] *See* Utah Code Ann. § 73-29-201
[103] *See* Utah Code Ann. § 73-29-201

Great Salt Lake Salinity Advisory Committee. The SAC was formed in 2017 with the goal of guiding the process of developing and providing recommendations to DFFSL and DWQ on long-term management of the salinity of Great Salt Lake and providing guidance and recommendations regarding the new Union Pacific Railroad causeway opening. The SAC is composed of key experts in Great Salt Lake salinity from State and Federal agencies, academia, and industry, reports to DFFSL and DWQ, and coordinates closely with the Tech Team.

Great Salt Lake Ecosystem Program Technical Advisory Group. The DWiR began the GSLEP in 1996 to complete research and monitoring required to understand the ecology of the lake (avian and aquatic communities including brine shrimp), manage and regulate the commercial harvest of brine shrimp eggs from the lake, and ensure the sustainability of the Great Salt Lake ecosystem[104]. The TAG was assembled as part of the GSLEP to advise DWiR on scientific/biological issues and research needs associated with the Program. The TAG is composed of key experts from State and Federal agencies, academia, and industry, reports to DWiR and, coordinates with the Tech Team.

Great Salt Lake Coordinator. The Utah Legislature provided new, ongoing funding in 2020 for DFFSL to hire a Great Salt Lake Coordinator that will serve as staff support for the GSLAC and as liaison between agencies, the GSLAC, Tech Team, SAC, and TAG on Great Salt Lake matters. This was a critical step forward in fostering more effective communication and collaboration among and enabling the agencies to make better informed and coordinated decisions.

3.7.2.2 Tools and Techniques

Table 3-19. Tools and Techniques for Strategy No. 9 – Agency Coordination

Available Tools and Techniques	
Legal	There are numerous agencies with individual mandates for managing and protecting various resources and uses of Great Salt Lake.
Hydrological	The GSLAC and State agencies have recently begun integrating the hydrology of the various basins of Great Salt Lake's Watershed with the lake to understand the effects of multi-jurisdictional water management decisions.
Financial	Ongoing Great Salt Lake research and management activities are funded via numerous, disparate sources. Funding is generally inadequate in meeting the needs.
Technical	There is significant interest in understanding the complexity of Great Salt Lake. Existing groups harness available expertise to identify, oversee and complete technical studies.
Political	HCR 10 (2019) provides a driver to maintain Great Salt Lake. There are numerous existing efforts to communicate the challenges and risks that Great Salt Lake faces with the greater water community and State of Utah.
Administrative	Various groups and a new Great Salt Lake Coordinator currently serve to coordinate the efforts of State and Federal agencies. The Great Salt Lake Comprehensive Management Plan (UDNR 2013) provides guidance to agencies and stakeholders.

Legal: Each of the State and Federal agencies have individual mandates for managing and protecting various resources and uses of Great Salt Lake as described in the Great Salt Lake Comprehensive Management Plan (UDNR 2013).

[104] See Utah Admin. Code R657-52-1

The GSLAC, Tech Team, SAC, TAG, and Great Salt Lake Coordinator each have a role in facilitating communication, coordination, and collaboration among the agencies, researchers, and stakeholders of Great Salt Lake. All State agencies do have statutory requirements that extend beyond the shoreline of Great Salt Lake and throughout its watershed and State.

Hydrological: Analyses of the hydrology of the Great Salt Lake system have typically been segregated into different analyses of the lake and of each of its tributary river basins. An integrated model of the Great Salt Lake Watershed did not exist until the GSLAC completed the GSLIM in 2017 (CH2M 2018). The GSLIM has provided the State of Utah with the means to understand how water management decisions by numerous water users and managers throughout the watershed can affect flows and lake water levels in the system. DWRe is also currently completing a new integrated Bear River Basin model in conjunction with the States of Wyoming and Idaho and the Bear River Commission with a similar goal of understanding the effects of multi-jurisdictional water management decisions.

Financial: Current funding for management activities on Great Salt Lake comes from legislative appropriations from fees and royalties paid by users of the lake. The Utah Legislature currently provides the GSLAC with $125,000 per year of funding (funded by brine shrimp royalties via GSLEP) and is now funding a new Great Salt Lake Coordinator role (funded by DFFSL's restricted account which is funded by Great Salt Lake mineral extraction royalties) to provide the GSLAC with staff support (among other responsibilities). The GSLAC has historically augmented these funds with special appropriations from the Legislature and contributions from GSLAC members and leverages these funds through partnerships with State and Federal agencies for special projects. In all, the GSLAC strives to work with its members and Great Salt Lake stakeholders to identify, prioritize and then utilize available funds to complete studies and investigations that contribute toward its mission. Additionally, the DFFSL invests $200,000 per year into studies directed by the Tech Team. Work completed by the DWiR and TAG as part of the Program are funded by permit fees paid by regulated lake users (brine shrimp harvesters).

Technical: State agencies have historically formed temporary stakeholder and expert committees to help guide and complete specific technical and policy evaluations for Great Salt Lake. The GSLAC regularly polls its members, researchers, and Great Salt Lake stakeholders to identify the most important data gaps and needs. The Tech Team, SAC, and TAG serve as important focal points for discussion, analyses, and development of the technical research and tools needed by State agencies to manage and protect the resources of Great Salt Lake. Members of each of these organizations do not receive compensation for their contributions. Their contributions are compounded by their creativity and passion; however, recommended actions are often limited by available funds.

Political: HCR 10 provided a mandate in 2019 to develop "an overall policy that supports effective administration of water flow to Great Salt Lake to maintain or increase lake levels, while appropriately balancing economic, social, and environmental needs, including the need to sustain working agricultural land (HCR 10)." This legislative resolution provided clarity to agencies and is synergistic with the GSLAC's mission and the Great Salt Lake Comprehensive Management Plan.

The GSLAC provides the Governor's Office and Legislature with an annual report summarizing its activities and recommendations. The GSLAC is working with partners from NGOs, academia, and industry to improve communication with and the education of policy makers and the public. State and Federal agency personnel working on Great Salt Lake matters work within their agencies to communicate and advise the Executive Branch and respond to inquiries from the Legislature**.** GSLAC members work within their respective organizations to also communicate with and advise both the Governor's Office and Legislature.

Outreach efforts to Utah's water community have been helpful in developing partnerships and increasing the profile of potential risks if water levels in Great Salt Lake were to continue to decline. Particular legislators who have a demonstrated track record in working with the water community and or Great Salt Lake issues have also been helpful in this regard.

Administrative: The current organizational structure and means for coordination are described above and in the Great Salt Lake Comprehensive Management Plan (UDNR 2013).

3.7.2.3 Impacts, Barriers, and Considerations:

Table 3-20. Impacts, Barriers, and Considerations for Strategy No. 9 – Agency Coordination

Impacts, Barriers, and Considerations	
Legal	State and Federal agencies often have different mandates and conflicting goals when it comes to Great Salt Lake. Continued efforts are required to collaborate among agencies to achieve common goals of improving and preserving the health of the lake, its ecosystem, its economic contribution to the State, and improving overall public health. Otherwise, agency mandates may result in conflicting outcomes.
Hydrological	Natural drainage features, political boundaries, and service areas have naturally resulted in segregated water resource management efforts across the watershed and with Great Salt Lake.
Financial	The costs of needed research, monitoring, and planning efforts exceed available funds.
Technical	A fragmented regulatory regime can lead to ambiguity, inefficiencies, contradictions, and inadvertently contribute to and even exacerbate some challenges in protecting the lake.
Political	Existing water rights and water management practice have impeded connectivity of water users in the watershed to Great Salt Lake. Separate collaborative efforts at Great Salt Lake and within individual drainage basins and water service areas serve as a successful model going forward.
Administrative	HCR 10 has provided new clarity to agencies protecting and managing Great Salt Lake. Connectivity between organizations representing Great Salt Lake and those from its watershed is lacking. The existing organizational structure can be challenging but these challenges may be overcome by creating a collaborative process that invites and encourages cooperation and fosters communication among the agencies to achieve common goals.

Legal: There is no one agency or organization with clear leadership, responsibility, and funding to manage and protect the resources and uses of Great Salt Lake and coordinate with its watershed. Each of the State and Federal agencies operate per their individual mandates for managing and protecting the resources and uses of Great Salt Lake.

While there are likely no rules that prevent agencies from working collaboratively, individual agencies operating solely within their own mandate may result in conflicting outcomes if agency actions are not proactively coordinated with other agencies. Some statutes may encourage interagency cooperation. For instance, the State Engineer "is authorized to enter into agreements with any Federal or State agency, subdivision or institution for cooperation in making snow surveys and investigations of both underground and surface water resources of the State."[105] This broad language applies to other State agencies in collaboratively working toward better management of the Great Salt Lake as a surface water of the State, as well as the Council itself, which would probably qualify as a "State . . . institution."

[105]*See* Utah Code Ann. § 73-2-15 (emphasis added).

State and Federal agencies are increasingly working to coordinate and collaborate with each other to leverage each other's expertise and resources, become more proactive in protecting and managing the lake's resources and uses, minimize conflicts and duplicative efforts, and finding lasting solutions. The GSLAC has been a key factor in this success. The new Great Salt Lake Coordinator's role is intended to build upon these efforts.

Hydrological: A critical challenge in managing the water resources of a complex watershed like that of Great Salt Lake is the natural segregation of efforts that occurs as a result of natural drainage features, political boundaries, and service areas.

Great Salt Lake's lakebed lies in four different counties and includes seven different water right management areas. The lake's watershed includes 3 primary river basins and 15 water right management areas. The challenges of local growth, water management and water rights obligations have historically kept the focus of water districts, irrigation companies and public water systems upon their own service area. There is currently not an incentive to fully consider the value of water in the entire basin or watershed and thus not a strong incentive for watershed organizations to coordinate with Great Salt Lake organizations. While political, legal, and service area boundaries are typically aligned with river and drainage basins and facilitate water management within the watershed, these boundaries can impede coordination of water management across the watershed, including Great Salt Lake.

In practice:

Integrating Potentially Conflicting Mandates to Optimize Solutions

The Challenge: Impounded wetlands basins with a limited water supply and that are managed to maximize benefits to waterfowl (such as, storing all water for long periods) can inadvertently create water quality problems within the basins (such as, increased occurrence of algae). If agency actions are not coordinated, the water quality problems can lead to regulatory action by another agency to limit upstream pollutants. This solution could result in another agency to reuse wastewater effluent, reduce stream flows, inadvertently exacerbate water quality problems, and reduce waterfowl habitat downstream.

The Solution: Integrating habitat and water quality objectives in optimizing management of water within the impounded basins could maximize both habitat and water quality conditions at less cost and with less risk of loss of flow.

Financial: The GSLAC has achieved much with minimal resources. Even so, the cost of identified research, monitoring, and planning efforts typically exceeds available funds. The GSLAC has been prioritizing planning efforts to better inform research and monitoring activities and decision-making. It does not; however, have adequate resources to complete its strategic planning efforts and mount a significant collaborative effort with water users and managers and policy makers in the watershed. Relying upon unpaid contributions from GSLAC members and minimal staff support and funding can contribute to uncertainty in what can and should be done.

Technical: Managing and protecting the resources and uses of a system as complex as Great Salt Lake through the lens of multiple agencies' sometimes conflicting mandates can inadvertently contribute to and even exacerbate some challenges. The lack of one agency or organization with clear leadership and responsibility can naturally result in ambiguity, inefficiencies, contradictions, or inaction as agencies attempt to coordinate and reconcile differences among themselves.

Political: Implementation of existing water rights law and water management practice have historically not incentivized consideration of potential impacts of water use upon downstream water uses such as Great Salt Lake. This has in turn impeded the connectivity of water users in the watershed to Great Salt Lake and its stakeholders and consideration of potential consequences or benefits from water management choices. Without an understanding of the impacts, water users may be inadvertently impacting their own livelihood. Without an understanding of the watershed's stakeholders, it is difficult to communicate their connection to the lake.

Efforts to manage Great Salt Lake's resources and, in a greater context, the State of Utah's water resources have each had a long history of challenges and disputes. However, agencies and stakeholders have proven that when they are determined to overcome differences, collaborate to develop the science required to inform decisions, and forge consensus around a common goal, they can typically find agreement and implement innovative and effective solutions. That is true with how stakeholders have overcome challenges in managing and protecting the resources of Great Salt Lake and it is true with how water districts, irrigation companies and public water systems have similarly been determined to find solutions for their water users with limited water supplies. These collaborative efforts could serve as a successful model going forward.

Administrative: Agencies can be complex and answer to different mandates and responsibilities. In some instances, legal and regulatory mechanisms simply do not exist and would have to be created in ways that foster rather than frustrate informed decision-making. The existing organizational structure facilitating coordination among agencies has significant challenges to overcome (that is, groups naturally tend to be insular). Significant efforts by individuals at the GSLAC, DFFSL, DWQ, and the lake's stakeholders have been instrumental toward overcoming organizational challenges. There is no formal connection or coordination between Great Salt Lake organizations and sister organizations in its watershed (such as, Jordan River Commission, Utah Lake Commission, and so forth). The GSLAC does not have significant participation by water managers in the lake's tributary basins, further distancing integrated water management efforts.

3.7.2.4 Options for Future Action

Table 3-21. Options for Future Action for Strategy No. 9 – Agency Coordination

Options for Future Action	
Legal	Assess and amend the existing organizational structure to ensure alignment with State policy for Great Salt Lake. Amend regulations to authorize/encourage collaboration among agencies with regard to decisions affecting the Great Salt Lake.
Hydrological	Improve collaboration with water users and managers within the watershed to integrate water resources management across basin boundaries, capitalize upon opportunities that provide mutual benefit and better achieve cross-basin objectives.
Financial	Funding for managing Great Salt Lake and its watershed should be commensurate to the opportunities that could be realized and the potential risks that must be managed and mitigated.
Technical	An integrated water resources plan should be developed for the Great Salt Lake Watershed to facilitate an inclusive and collaborative process for ensuring adequate water flows to Great Salt Lake.
Political	The GSLAC should investigate if formation of a Great Salt Lake Watershed Council is warranted to facilitate coordination and implementation of State policy among a wide group of stakeholders that would include the GSLAC, major water diverters, and those with environmental and economic interests to help frame water policy affecting the lake. The State should assess the stakeholders within the lake's watershed and develop a plan to improve their connectivity to the lake.
Administrative	Fully cooperate with the Great Salt Lake Coordinator to capitalize upon the benefits the role can provide. Leverage the GSLAC's existing influence and relationships to institute systemic changes that encourage agencies to collaborate more often when making decisions that affect Great Salt Lake ecosystems.

Legal: The State's existing organizational structure should be assessed and statutes amended to ensure alignment of individual agency mandates, administrative rules, priorities and activities with the State's policy to "ensure adequate water flows to Great Salt Lake and its wetlands, to maintain a healthy and sustainable lake system" and development of new policy to "support effective administration of water flow to Great Salt Lake to maintain or increase lake levels, while appropriately balancing economic, social, and environmental needs, including the need to sustain working agricultural land" (HCR 10 2019). Political and legal boundaries should similarly be evaluated to eliminate unnecessary obstacles that disincentivize collaboration across those boundaries.

Evaluate existing legal or regulatory mechanisms that could be utilized or amended to improve decision-making and help to better protect the resource, including inflows. These changes could be standalone additions to the existing statutory/regulatory framework or be tacked on as a provision to a more comprehensive legal change. For instance, if a statute is enacted recognizing conserved water rights, a provision could be included in the bill that directs DWRi to work with other agencies in assessing the needs of leaving water instream and the effects on Great Salt Lake ecosystems.

Hydrological: A key objective should be to improve collaboration with water users and managers within the watershed to integrate water resources management, capitalize upon opportunities that provide mutual benefit and better achieve cross-basin objectives.

Financial: Challenges are increasing in number and complexity. The effort to investigate, manage and overcome these challenges is also increasing. Funding for managing Great Salt Lake and its watershed should be commensurate to the opportunities that could be realized and potential risks that must be managed and mitigated.

Technical: An IRP should be considered for the Great Salt Lake Watershed to facilitate an inclusive and collaborative process to evaluate pertinent demand-side and supply-side management options across the watershed, understand their potential consequences, and realize the future envisioned by our communities.

Numerous Great Salt Lake investigations completed by the State of Utah and others have illustrated the benefits of a systems thinking approach to research and management solutions (such as, GSLEP, Willard Spur water quality study, and so forth) (Arnold & Wade 2015). A similar holistic approach could be helpful in evaluating and applying the mandates of each of the agencies with responsibilities for Great Salt Lake; understanding how agency mandates and efforts interrelate, are interdependent and how they can best be applied in the context of the overall system. This same approach toward agency coordination extends into Great Salt Lake's Watershed (see Watershed Council concept as follows). Water management solutions are generally developed for a defined system or service area; coordinating or integrating the efforts across a basin or watershed would enable optimal solutions for the larger basin or watershed system.

Political: The GSLAC should explore if creation of a Great Salt Lake Watershed Council[106] is warranted. A Great Salt Lake Watershed Council should not replace the GSLAC but partner with the GSLAC to facilitate discussion of water policy and integrated water resources management by water users and managers and policy makers across the Great Salt Lake Watershed (Figure 3-11). As such, the Watershed Council could serve to integrate water management objectives across the watershed, collaboratively address challenges, evaluate solutions, and better understand their potential benefits and consequences.

Local watershed councils are intended to be advisory in nature and are not vested with regulatory, infrastructure, financing or enforcement power or responsibilities[107]. Whereas the GSLAC is an advisory group composed of representatives of lake interests, a Great Salt Lake Watershed Council would be an advisory group composed of representatives from across the Great Salt Lake Watershed. This includes a representative from each of the five basins that drain into Great Salt Lake (the Bear River, Weber River, Jordan River, Utah Lake and West Desert watersheds[108]). Similarly, the *Watershed Council Act* provides for a representative of the Great Salt Lake Watershed to participate in each of the local watershed councils for these five basins[109].

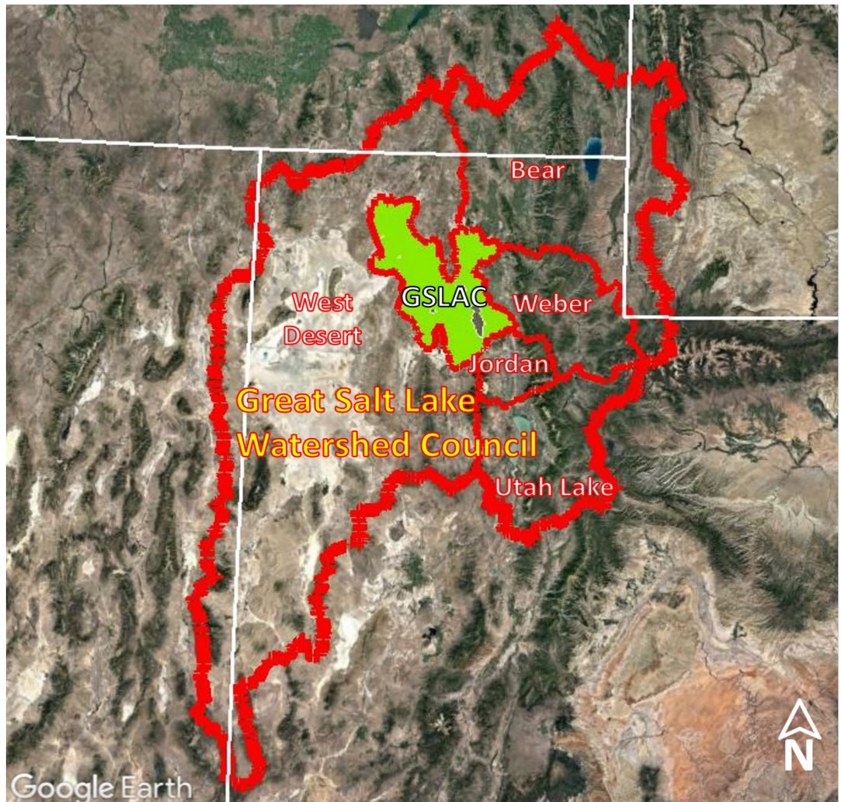


Figure 3-11. A New Great Salt Lake Watershed Council Could Provide a Means for the GSLAC to Improve Connectivity between the Watershed's Stakeholders and Great Salt Lake

Aerial Image ©2020 Google. Annotation ©2020 Jacobs.

The GSLAC and its stakeholders should also consider whether formation of a Great Salt Lake Commission is warranted for Great Salt Lake (such as, the Jordan River Commission or Utah Lake Commission). The GSLAC has been very effective; however, a Commission may provide additional opportunities for focused leadership for Great Salt Lake matters, greater authority for agency coordination, and required staff and funding to manage lake resources.

The economic, environmental, and social importance of the health of the Great Salt Lake is not well understood by a significant portion of the population of Utah. Additionally, the relationship between agricultural conservation of water and the economic, environmental, and social importance of instream flows and Great Salt Lake is even less well understood. The State of Utah must assess the understanding and needs of stakeholders within the lake's watershed and increase its education activities to inform the general public of the importance of the Great Salt Lake and conservation efforts.

[106] *See Watershed Council Act,* Utah Code Ann. § 73-10g-301
[107] *See* Utah Code Ann. § 73-10g-302
[108] *See* Utah Code Ann. § 73-10g-303
[109] *See* Utah Code Ann. § 73-10g-306

Administrative: Establishing the role of a Great Salt Lake Coordinator is a positive first step. The coordinator should receive full cooperation from all agencies to optimize coordination of objectives, priorities and activities and enable implementation of the State's policy for Great Salt Lake. An assessment of existing organizational structure should be a high priority.

The GSLAC should consider how to engage with water users and managers more effectively within Great Salt Lake's Watershed. Coordination and collaboration between managers and policy makers for Great Salt Lake and in its watershed should become the norm rather than the exception. The GSLAC should be fully engaged with similar groups within its watershed and vice versa (such as, Jordan River Commission, Utah Lake Commission, and so forth).

3.7.3 Strategy Conclusion

Existing organizational structure is already facilitating coordination among State and Federal agencies; in fact, it has improved significantly even in the last 5 to 10 years. However, there is only a recently emerging policy for supporting the health of Great Salt Lake and efforts are still impeded by fragmented regulatory regime and a lack of funding to advance this new policy. Existing organizational structure should be evaluated and amended to better align the mandates, efforts, and investments of agencies with the State's policy for Great Salt Lake. The GSLAC should capitalize upon opportunities to collaborate among State agencies and groups within Great Salt Lake's Watershed and be provided with the resources required to achieve its mission and support development of new State policy for Great Salt Lake (HCR 10 2019). A new Great Salt Lake Watershed Council could be an effective means to connect the stakeholders directly affiliated with the lake with the numerous stakeholders within the lake's watershed.

STRATEGY 11 Groundwater Management | **TACTICAL STRATEGY**

3.8 Strategy No. 11 – Groundwater Management

Strategy No. 11: Protect ground water levels beneath the Great Salt Lake and the broader Great Salt Lake basin from pumping that can affect surface hydrology.

3.8.1 Strategy Summary:

Issue: Groundwater contributions from Great Salt Lake's Watershed are an important component of the lake's water balance and a variable influencing lake water levels (Arnow & Stephens 1975, 1987). Lake water levels are in turn an important variable influencing groundwater levels and quality adjacent to the lake (Wallace & Inkenbrandt 2013). As such, this strategy addresses potential methods and approaches to ensure that groundwater levels in and around Great Salt Lake are protected and sustained. This is a wide-reaching strategy and will require participation from nearly all the stakeholders surrounding the lake in order to achieve cognizable benefits. However, there are also options to target individual basins and isolated aquifers, if any exist, that will ensure groundwater withdrawals are sustainable.

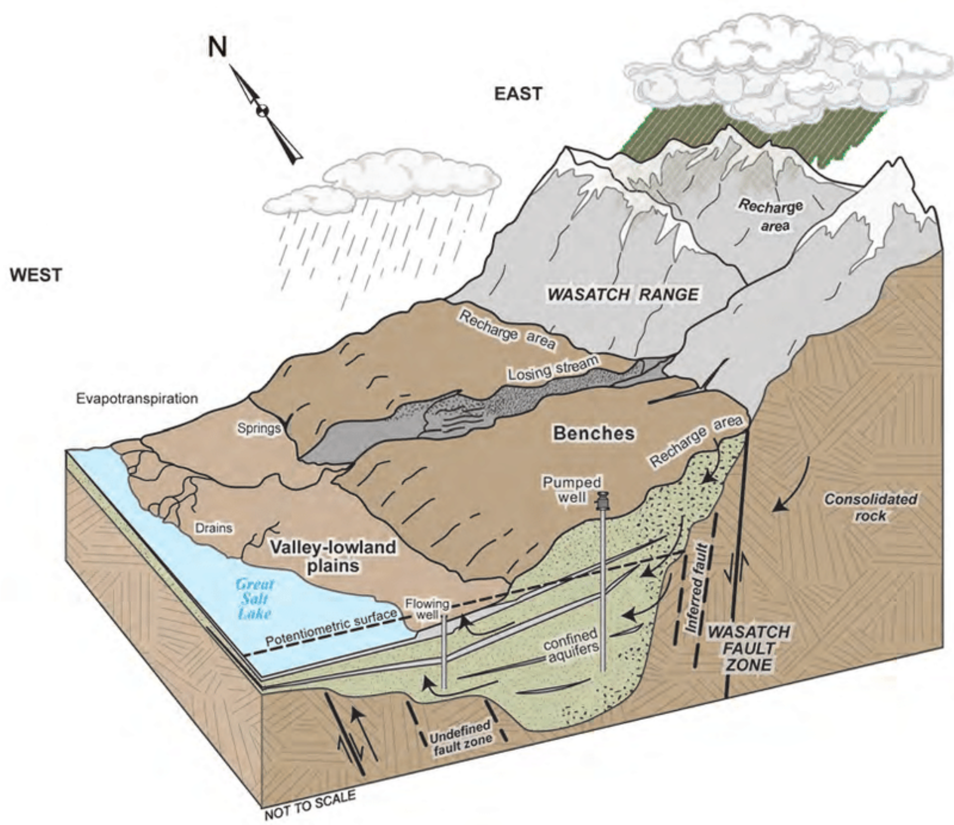


Figure 3-12. Geologic profile through the central Weber Delta subdistrict, east shore area of Great Salt Lake, Utah

(Wallace and Inkenbrandt 2013)

Utah has several mechanisms for addressing groundwater levels and ensuring that withdrawals do not exceed the inflow. The maximum amount of water that can be withdrawn without reducing water levels is called the safe yield. The safe yield is calculated by creating a water budget which determines the current quantity of water withdrawn from the aquifer (withdrawals) and also the amount of water that flows into the aquifer (the recharge rate). The goal is to limit withdrawals to a level that is below the recharge rate. However, in many instances the rate of withdrawal often exceeds the rate of recharge. In such cases the aquifer is being "mined" and existing withdrawals are unsustainable.

Conclusion: Protecting groundwater inflows to Great Salt Lake not only helps maintain lake water levels but also helps maintain existing groundwater rights (both quantity and quality) for water users adjacent to Great Salt Lake. Protection of groundwater levels surrounding the Great Salt Lake, either through existing Prior Appropriation tools or through the adoption of a GMP, will ensure stable rates of groundwater infiltration into and groundwater levels adjacent to the lake. Likewise, ensuring that surrounding groundwater basins are limited to safe yields will also improve surface water sources. The net effect of this effort is that lake levels will be maintained, and groundwater contributions or users will not be impaired or irreparably damaged.

3.8.2 Discussion

3.8.2.1 Background and Context

Safe Yield: The amount of groundwater that can be withdrawn from a groundwater basin over a period without exceeding the long-term recharge of the basin or unreasonably affecting the basin's physical and chemical integrity.

The primary mechanism for preventing groundwater mining is the creation of a GMP. A GMP is a statutory mechanism whereby DWRi may regulate groundwater withdrawals within a specific groundwater basin or aquifer or combination of hydrologically connected groundwater basins or aquifers.[110] The goal of adopting a GMP is to limit withdrawals to the safe yield of the groundwater source.[111] A GMP can be created by two different means. First, the DWRi may determine that it is necessary to adopt a GMP to protect groundwater resources within a certain basin. This is a regulatory action and is constrained by the Prior Appropriation Doctrine. Conversely, if 1/3 of the interested parties in a groundwater basin request that DWRi creates a GMP; the parties may voluntarily consent to regulation of withdrawals in order to reach a safe yield. The key difference between the community-driven GMP and DWRi-driven approach is that the community may consent to subjugation of priorities in an effort to preserve the overall health of the aquifer.

There are currently several GMPs in the areas surrounding the Great Salt Lake. These include the Weber Delta Subarea GMP, Salt Lake Valley GMP, and the Tooele Valley GMP. However, the best example of a GMP in Utah is the Beryl-Enterprise GMP. During the mid-2000s this area was experiencing significant and unsustainable declines in groundwater levels. Recognizing that business as usual could not continue, the Division determined that it was necessary to reduce diversions by approximately 31,000 AF. In response to this reality, the community came together and aided in the establishment of a GMP to address these issues.

[110] *See* Utah Code Ann. § 73-5-15(2)(a).
[111] *See* Utah Code Ann. § 73-5-15(4)(a)(i).

Notable components of the Beryl-Enterprise GMP included pro-rata reductions of diversion and use of water. In order to be effective, these reductions must apply across the spectrum of priority dates. As such, those water users with the most senior rights must consent to limiting withdrawals and eschewing some of the benefit of their early priority dates. This was done to preserve the longevity of the aquifer and ensure the continued ability to divert.

There are several other avenues available to protect groundwater levels utilizing the tools existing in the Prior Appropriation Doctrine. These tools include prohibitions on interference, non-impairment, priority and also renewed efforts to enforce compliance with water rights. These existing tools can be utilized to regulate groundwater withdrawals by protecting the senior water rights of surrounding water users. They are, however, imprecise tools to address the safe yield of a groundwater source and the benefits to the Great Salt Lake will be slow to accrue. However, the goal remains the same whether by GMP or through existing Prior Appropriation Doctrine: to limit diversions to the safe yield of the groundwater basin.

3.8.2.2 Tools and Techniques

Table 3-22. Tools and Techniques for Strategy No. 11 – Groundwater Management

Tools and Techniques	
Legal	A Ground Water Management Plan may be adopted to limit withdrawals from aquifers surrounding the lake to safe yields.
Hydrological	Limiting groundwater withdrawals to less than the recharge rate creates a safe yield.
Financial	This strategy may require additional DWRi personnel to administer, such as a Great Salt Lake Commissioner.
Technical	Additional basin-wide groundwater studies are required to determine safe yields.
Political	The municipalities surrounding the lake will need to coordinate and cooperate on groundwater withdrawals.
Administrative	The lake is surrounded by several water right administrative areas, which will need to coordinate and cooperate regarding administration of the lake and groundwater levels.

Legal: DWRi may adopt a GMP to regulate certain groundwater withdrawals within a specific groundwater basin or aquifer. This is a discretionary DWRi action. However, if more than 1/3 of the water right owners in the basin request it do so, the DWRi shall adopt a GMP. The objectives of a GMP are to:

1) limit groundwater withdrawals to safe yield,
2) protect the physical integrity of the aquifer, and
3) protect water quality.

The key tool is reduction of withdrawals to reach the safe yield. DWRi is responsible for administering the GMP and ensuring compliance with the safe yield.

The GMP statutes allow the DWRi to create a GMP for "a combination of hydrologically connected groundwater basins or aquifers."[112]

[112] *See* Utah Code Ann. § 73-5-15(2)(a)

Accordingly, there is currently a mechanism to accommodate the needs of the lake. However, it may be necessary to authorize a lake-specific GMP. This could address the particular needs of the lake and ensure that the overall health of the lake is a goal of the GMP. Otherwise, the current law is sufficient to create a GMP for the lake.

Any lake-specific GMP will require coordination and alignment with the existing GMPs surrounding the lake. Alternatively, a newly adopted Great Salt Lake GMP could supersede and replace the existing GMPs. However, any newly adopted GMP will need to address the conditions previously addressed in existing GMPs.

Technical: Successfully establishing a water budget for the groundwater inflows to the lake requires detailed modeling of the relevant water sources. The U.S. Geological Survey and Utah Geological Survey have the expertise and often taken the lead in studies to better understand the groundwater hydrology in various basins within Great Salt Lake's Watershed. Some groundwater modeling has occurred related to the Bear River National Migratory Bird Refuge, the Weber/Ogden river delta, the Salt Lake Valley, the Tooele Valley, and the west desert. However, these studies will need to be greatly expanded, developed, and integrated to provide an accurate and complete picture of the groundwater system supporting Great Salt Lake. This effort will require substantial engineering and hydrology work to obtain the necessary information to characterize Great Salt Lake's hydrogeology and determine a safe yield that supports Great Salt Lake levels and adjacent groundwater users.

Administrative: DWRi through its river commissioners, remains the best placed agency to administer this strategy. Additionally, DWRi could create a new position of a Great Salt Lake Commissioner that could ensure a holistic approach is taken for the larger lake ecosystem. This will foster coordination between the various groundwater basins and protect the interests of the lake. The DWRi currently has a number of groundwater models available online; however, existing models are not integrated and were generally not constructed with the objective of evaluating potential downgradient impacts or managing groundwater inflows to Great Salt Lake.

In practice:

Understanding Regional groundwater and lake interactions is a critical means of protecting users of groundwater and Great Salt Lake alike.

Seawater intrusion is the movement of ocean water, or in the case of the Great Salt Lake, saltwater, into fresh groundwater, causing contamination of the groundwater by salt. It is a natural process that can be made worse by human activities. Virtually all coastal aquifers around the world experience seawater intrusion to some degree due to the density differences between saltwater and fresh water.

In areas where groundwater is used for potable or agricultural purposes such as the Central and West Coast Basins (CWCB) in California, intrusion can be a serious problem resulting in the shutdown of wells or necessitating expensive desalination treatment. In the early half of the 20th century, groundwater extractions in the CWCB were double natural replenishment, causing severe overdraft and lowering of the groundwater elevations to over 100 feet below sea level.

To address this problem, the CWCB basins were adjudicated to address the over-pumping, and the Los Angeles County Flood Control District (LACFCD) used an abandoned water well in Manhattan Beach to inject potable water to test whether pressure could be built up in a confined aquifer to block additional intrusion (Lipshie and Larson 1995).

Based on the success of the tests, the LACFCD eventually constructed the West Coast Basin Barrier Project, the Dominguez Gap Barrier Project, and the Alamitos Gap Barrier Project. The barrier projects have been successfully protecting the freshwater aquifers since the 1950s.

One additional administrative challenge is the required coordination with the many different water right administrative areas that surround the lake. These areas are, in some cases, administered by different regional engineers and have differing restrictions on appropriation. Any lake-specific GMP will require coordination among these various administrative areas. This coordination could be satisfied with the creation of Great Salt Lake Commissioner or other position to oversee the administration and coordination of the GMP.

3.8.2.3 Impacts, Barriers, and Considerations

Table 3-23. Impacts, Barriers, and Considerations for Strategy No. 11 – Groundwater Management

Impacts, Barriers, and Considerations	
Legal	The current framework is already in place to adopt a GMP, but substantial outreach will be required to achieve consensus.
Hydrological	A study of the interactions of groundwater basins within the watershed and Great Salt Lake is needed to understand potential consequences and benefits from different management decisions. The groundwater users surrounding the lake will need to understand that a GMP may result in decreased diversions under certain circumstances and conditions.
Financial	A holistic study of groundwater impacts on the lake is necessary to ascertain a safe yield and understand potential consequences of decisions. This will require funding to conduct.
Technical	A holistic groundwater study will need to be done to incorporate all relevant information into a comprehensive document. The contribution of groundwater to Great Salt Lake is still not fully understood.
Political	Outreach to adjacent municipalities and groundwater users is necessary to obtain buy-in.
Administrative	Coordination among differing administrative areas may be difficult to achieve due to varying water needs and development goals.

Legal: The current framework is already in place to adopt a GMP, but substantial outreach will be required to achieve consensus.

Hydrological: An integrated study of the interactions of different groundwater basins within the watershed with each other and Great Salt Lake is needed to better understand the potential consequences and benefits from different management decisions.

It is possible that the groundwater basins connected to Great Salt Lake are already at a safe yield. Under such circumstances, additional efforts to regulate groundwater would not result in any additional water being made available at the lake. Rather, this would be a strategy to ensure that groundwater levels do not decline or otherwise negatively impact the lake. However, a new GMP could still be adopted that defines, and thereby protects, the safe yield of the larger lake groundwater system. As part of this process existing GMPs could be updated and the overall safe yield of the Great Salt Lake basin could be taken into consideration.

Financial: The framework and legislation already exist to put a Great Salt Lake-specific GMP in place. However, there are associated costs and increases in DWRi capacity that are likely necessary to implement a large-scale lake-wide GMP. The DWRi's capacity to undertake such a task may be the key obstacle to achieving this strategy. Additionally, if a Great Salt Commissioner is appointed, this will require additional appropriations to fund the additional salary demands of this position(s).

Technical: Existing hydrologic models of Great Salt Lake (USGS 1977, 2000; HDR 2014; Jacobs 2019) rely upon estimates of groundwater inflow completed by Arnow and Stephens (1975). The quantity and accuracy of existing groundwater data and models is presently unknown.

Political: Increased coordination among water users and managers across drainage basins and with Great Salt Lake stakeholders will be required, especially if community-based solutions are desired. There is currently not an incentive to reach outside a basin or across a watershed and thus not a strong incentive for groundwater users or managers to coordinate with Great Salt Lake organizations. While political, legal, and service area boundaries are typically aligned with river and drainage basins and facilitate groundwater management within a basin, these boundaries can impede coordination of water management across the watershed, including Great Salt Lake.

Administrative: This is not a strategy that can be implemented quickly. For example, the Beryl-Enterprise GMP took approximately 5 years from proposal to adoption. Accordingly, this is something that will take time to implement and will require staff resources to complete.

3.8.2.4 Options for Future Action

Table 3-24. Options for Future Action for Strategy No. 11 – Groundwater Management

Options for Future Action	
Legal	Expansion of the current GMP mechanism to accommodate lake-specific goals and needs.
Hydrological	Need to better characterize groundwater interactions across the watershed and with Great Salt Lake to better understand the consequences and benefits of integrating groundwater management among basins and the lake. Establish minimum lake levels to be achieved through a combination of strategies.
Financial	Funding of groundwater studies and the position of a Great Salt Lake Commissioner.
Technical	A holistic groundwater and water resource study on impacts to lake levels.
Political	Public hearings and open houses to present and explain the GMP concept.
Administrative	Facilitate discussions with DWRi to foster communication and coordination among water right administrative areas and enforcement capabilities and development of a Great Salt Lake GMP.

Legal: The necessary framework for implementing this strategy currently exists in Utah Water Law. Utah Code Section 73-5-15 authorizes the creation of GMPs. As such, no legislation is necessary to proceed with a GMP. Additionally, certain aspects of the *Clean Water Act* and *Utah Clean Water Act* might be utilized in conjunction with the GMP to prevent degradation and draining of wetlands surrounding the lake.

Hydrological: A concerted effort should be undertaken to better understand the consequences of groundwater management upon downgradient uses, more accurately define groundwater contributions to Great Salt Lake, define a safe yield to support beneficial uses in Great Salt Lake and determine how changes in lake level are linked to groundwater levels along the lake's shoreline, wetlands and adjacent groundwater basins.

Financial: Funding will need to be identified to complete the recommended studies, facilitate coordination among groundwater users and managers, and fund a new Great Salt Lake Commissioner position.

Technical: Existing groundwater data and models should be reviewed and integrated in such a way that groundwater conditions in and around Great Salt Lake can be better characterized and inflows to Great Salt Lake can be better defined. This is a critical element in the lake's overall water balance that must be more accurately understood. The role of groundwater inflow vs. surface water inflow in maintaining lake water levels should be determined to characterize impacts from the use of these two sources of water by upstream water users.

The impact of lake levels upon groundwater levels and water quality in adjacent wells should be determined to better understand potential impacts upon these water users. A review of how groundwater levels in adjacent wells should also be completed to understand how they are potentially impacted by declining lake levels.

The impact of lake levels upon groundwater levels in adjacent mudflats should be evaluated to determine potential changes in beneficial uses and dust emissions.

Political: As noted, a substantial amount of buy-in and community involvement is required to achieve the maximum benefit. Accordingly, a community-based approach is the best avenue to explore this option. The GSLAC, along with DWRi, has capability to reach out to the community and seek involvement and buy-in. However, this should be approached on an incremental sub-basin basis. This approach will allow relevant communities to be targeted and the demonstrable benefits shown to subsequent sub-basins.

Administrative: Whereas there is already a legal basis to coordinate among water right administrative areas and create a Great Salt Lake GMP, DWRi should facilitate communication and coordination among the various water rights administrative areas to assess available information, challenges, needs, and objectives and develop an approach for developing a Great Salt Lake GMP. The GMP should build upon and integrate existing GMPs to protect groundwater levels adjacent to and inflows into Great Salt Lake to protect the water quantity and quality of adjacent groundwater users. A Great Salt Lake Commissioner could be invaluable in coordinating not only groundwater resources but surface water management as well.

3.8.3 Strategy Conclusion

Groundwater management in the Great Salt Lake Watershed is largely aligned to surface water drainage basins that contribute to Great Salt Lake. Although groundwater basins are managed in a disparate manner, all are connected at Great Salt Lake; all have a similarly complex and synergistic relationship with lake water levels. The central challenge is linking the groundwater basins in practice. Protecting groundwater inflows to Great Salt Lake not only helps maintain lake water levels but also helps maintain existing groundwater rights (both quantity and quality) for water users adjacent to Great Salt Lake. Protection of groundwater levels surrounding the Great Salt Lake, either through existing Prior Appropriation tools or through the adoption of a GMP, will ensure stable rates of groundwater infiltration into and groundwater levels adjacent to the lake. Likewise, ensuring that surrounding groundwater basins are limited to safe yields will also improve surface water sources. The net effect of this effort is that lake levels will be maintained, and groundwater contributions or users will not be impaired or irreparably damaged.

4. Summary and Conclusion

The GSLAC identified 12 high priority strategies for further legal and policy review that were thought to have a high potential to improve water management and increase water deliveries to Great Salt Lake. This Report summarizes a legal analysis and review of these 12 strategies.

While each of the individual strategies will improve water management, none of the strategies evaluated herein, if implemented alone, can ensure that additional water will flow to and maintain Great Salt Lake. Rather, each strategy has a unique and essential function that, if implemented in concert with the others, could achieve the goal of increasing water deliveries to Great Salt Lake. Each strategy uniquely removes constraints, increases flexibility, informs decision-making, facilitates, and incentivizes transactions or protects, conserves, and makes water available. Each individual strategy is important but there must be an overarching, integrated strategy to truly optimize available water supplies, maximize benefits to water users, and increase water deliveries to Great Salt Lake.

4.1 Summary

The Foundational Strategies of recognizing the right to conserved water (Strategy No. 1), quantifying the conserved water (Strategy No. 12) and finally shepherding conserved water (Strategy No. 3) are essential elements that must be addressed for available water, conserved or otherwise, to be delivered to Great Salt Lake. By themselves, these Foundational Strategies will remove important constraints and provide motivated water users with the required legal framework to deliver their own conserved water to Great Salt Lake. Implementation of these Foundational Strategies may enable some water to be appropriated for delivery to Great Salt Lake, but likely only a limited volume of water that may already be flowing to the lake. Additional strategies are needed to incentivize and facilitate new waters to be appropriated for beneficial use at Great Salt Lake.

Figure 4-1. Functional Categories for GSLAC Strategies to Deliver Water to Great Salt Lake

The Operational Strategies serve to inform decision and policy makers and water users and managers (Strategy No. 6). Informed decisions lead to better results and stimulate innovation that optimizes available water supplies and improves the sustainability of Utah's water supply and Great Salt Lake. The Operational Strategies provide critical flexibility (Strategy No. 2) and backing (Strategy Nos. 7 and 10) that, rather than mandating water conservation, will incentivize water users and managers to want to conserve water and even deliver it to Great Salt Lake because it is in their best interest to do so.

The Tactical Strategies serve to incentivize water users to protect (Strategy No. 11), conserve, and make (Strategy Nos. 4, 5, and 8) available water that could be used for deliveries to Great Salt Lake. This is the point at which the strategy framework is put to a practical test to determine if there is enough social and economic incentive for water users and managers to conserve and deliver additional water to Great Salt Lake. These strategies strive to work with the individual or assembly of water users to achieve this goal.

Coordinating and integrating complex and interdependent strategies such as these will require strong leadership and synergy around a common goal. Strategy No. 9 enhances the existing Organizational Infrastructure that is critical for support, coordination, and oversight of the other strategies.

4.2 Implementation

Each of the GSLAC's 12 strategies were evaluated for individual implementation and include elements of change to the status quo. Implementing change is often a challenge as it includes uncertainty, the potential of new risks, and the possibility of new opportunities. As such, implementation of each strategy will require a concerted effort to:

1) complete studies to better define the benefits and/or consequences of the proposed change;
2) communicate with, better understand, and address the concerns of, and incorporate the ideas of stakeholders; and
3) forge consensus around and implement the strategy.

The GSLAC should consider and develop a plan to implement these strategies. This process could take time, but there are already water users and managers and organizations considering or actively working on implementing many of these strategies at the local or basin level. The GSLAC's intent is to identify and provide these individuals and groups with this analysis with the goal of enhancing their success in implementing these or similar strategies.

Given the investment of time and resources to effect change in legal and policy affairs, the Team recommends that the GSLAC consider further exploration and lend support to an additional strategy, water banking. Water banking legislation was enacted in 2020 and could be considered both a Foundational and Operational strategy in that it already facilitates, enables, and incentivizes water uses to conserve and delivery water to a bank located downstream. It could be implemented among a few water users, along a reach of a stream, within a sub-basin or basin, or even at the Great Salt Lake Watershed scale. Benefits to water users and downstream uses could be realized at the small scale all the way to the large-scale. The benefit is that water banking is "voluntary, temporary, and local", has already been enacted as law in Utah, and provides a legal framework that could be used now to begin to integrate the 12 strategies and increase deliveries of water to Great Salt Lake. The other 12 strategies are still important as they maximize the opportunities to increase deliveries of water to Great Salt Lake; water banking simply provides an existing framework that could facilitate, enable, and incentivize water users to do so now.

4.3 Conclusion

The need to maintain and/or increase deliveries of water to Great Salt Lake is certain. The challenges to do so are significant. However, the ability of water users and managers and decision and policy makers to overcome these challenges and optimize available water supplies to meet water demands and enable growth is proven. The 12 strategies evaluated in this Report are feasible and will improve water management throughout the watershed. If implemented individually or in concert, they afford the State of Utah an excellent opportunity to protect this invaluable resource, increase water deliveries to Great Salt Lake, and protect "the economic, recreational, and natural significance of the Great Salt Lake". With these in place, the State of Utah will enable the growth that is envisioned and protect livelihood we enjoy.

5. References

5.1 Personal Communication

Olsen, Jay. Utah Department of Agriculture and Food, Environmental Program Manager, 2020. Personal communication (email) with DenBleyker, Jeff, Jacobs.

5.2 Literature Cited

AECOM. 2019. Consequences of Drying Lake Systems Around the World. Prepared for the Great Salt Lake Advisory Council. February 15.

Alder, William J., Laurence S. Nierenberg, Sean T. Buchanan, William Cope, James A. Cisco, Craig C. Schmidt, Alexander R. Smith, and Wilbur E. Figgins. 1998. "Climate of Salt Lake City, Utah." Elusive Documents. Paper 57. https://digitalcommons.usu.edu/elusive_docs/57.

Allen, R.G., and C.W. Robison. 2007. Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho. University of Idaho. September 2006, Revised April 2007.

American Water Works Association (AWWA). 2001. AWWA M50 Water Resources Planning. 2001 First Edition.

Arnold, R.D., and Wade, J.P. 2015. A Definition of Systems Thinking: A Systems Approach, Procedia Computer Science, Volume 44, Pages 669-678, ISSN 1877-0509. https://doi.org/10.1016/j.procs.2015.03.050.

Arnow, Ted, and Stephens, J.C., 1975. Ground-water inflow to Great Salt Lake, Utah: Geological Society of America. Abstracts with Programs (1975 annual meeting). p 981.

Arnow, Ted, and Stephens, Doyle. 1987. “Hydrologic Characteristics of the Great Salt Lake, Utah: 1847 – 1986.” U.S. Geological Survey Water-Supply Paper 2332.

Barber, M., Khanal, R., and Peters, T. 2020. Literature Review of Current & Upcoming Irrigation Technologies and Practices Applicable to Utah. Draft report prepared for the Utah Legislative Agricultural Water Optimization Task Force. May.

Bioeconomics, Inc. 2012. Economic Significance of the Great Salt Lake to the State of Utah. Prepared for the Great Salt Lake Advisory Council. January.

Bowen Collins & Associates and Hansen, Allen & Luce (BC&A and HAL). 2018. State of Utah Water Use Data Collection Program. https://water.utah.gov/water-reports/WaterUseCollectionReportFINAL1_29.pdf.

Brigham Young University. 2019. "How are Utah's dry lakes impacting air quality and human health? New study reveals that 90 percent of urban dust comes from dry lakebeds." *ScienceDaily*. December 11. www.sciencedaily.com/releases/2019/12/191211100304.htm.

CH2M HILL (CH2M). 2017. *Existing Great Salt Lake Organizational Structures; Where does the GSL Salinity Advisory Committee Fit in?* Fact sheet prepared for the Division of Forestry, Fire and State Lands as part of formation of the Salinity Advisory Committee.

CH2M HILL (CH2M). 2018. Great Salt Lake Integrated Model, v1.10: An Integrated Water Resource Management Tool for the Great Salt Lake Watershed. Draft report prepared for the State of Utah. January.

Dieter, C. A., Maupin, M. A., Caldwell, R. R., Harris, M. A., Ivahnenko, T. I., Lovelace, J. K., Barber, N. L., and Linsey, K. S. 2018. Estimated Use of Water in the United States in 2015. U.S. Geological Survey Circular 1441. https://pubs.er.usgs.gov/publication/cir1441.

Division of Water Resources (DWRe). 2001. Utah's Water Resources: Planning for the Future. Salt Lake City: DWRe. https://drought.unl.edu/archive/plans/Water/state/UT_2001.pdf

Division of Water Resources (DWRe). 2014. Utah's M&I Water Conservation Plan: Investing in the Future. Salt Lake City: DWRe. https://water.utah.gov/wp-content/uploads/2019/01/MIConservation_Revision_2012.pdf.

ECONorthwest. 2019. Economic Costs of a Declining Great Salt Lake. Prepared for the Great Salt Lake Advisory Council. June.

Goodman, Michael M, Gregory T. Carling, Diego P. Fernandez, Kevin A. Rey, Colin A. Hale, Barry R. Bickmore, Stephen T. Nelson, and Jeffrey S. Munroe. 2019. "Trace element chemistry of atmospheric deposition along the Wasatch Front (Utah, USA) reflects regional playa dust and local urban aerosols." *Chemical Geology*. Vol. 530, Issue 119317. December 30.

Governor's Water Strategy Advisory Team (GWSAT). 2017. Recommended State Water Strategy. July. Accessed May 17, 2019. https://gomb.utah.gov/wp-content/uploads/2019/04/Recommended-State-Water-Strategy-2017.pdf .

Great Salt Lake Advisory Council (GSLAC). 2018. "Water for Great Salt Lake: Prioritization of Strategies". In audio recording and notes of GSLAC meeting 10 January 2018. Davis County Administration Building. Retrieved from https://deq.utah.gov/great-salt-lake-advisory-council/meetings-great-salt-lake-advisory-council

Green, A., Hansen, R., Narayanan, R., and Green C. 2020. Case Study of Emery County Real-time Monitoring and Control System Implementation. Final report to the Utah Legislative Agricultural Water Optimization Task Force. March 2.

Hansen, Roger D. 1983. Water and Wastewater Systems in Imperial Rome. Water Resources Bulletin. 19:263-269. Retrieved from http://www.waterhistory.org/histories/rome/rome.pdf

Hansen Allen & Luce, Inc. and Bowen Collins & Associates, Inc. (HAL & BC&A). 2019. Utah's Regional M&I Water Conservation Goals. Final report prepared for the Utah Division of Water Resources. https://water.utah.gov/wp-content/uploads/2019/12/Regional-Water-Conservation-Goals-Report-Final.pdf

Harris, E. 2017. "State and County Population Estimates for Utah: 2017." Policy Brief prepared for Kem. C. Gardner Policy Institute. November.

HDR Engineering, Inc. (HDR). 2014. Union Pacific Railroad Great Salt Lake Causeway Final Water and Salt Balance Modeling Report: Final Report – Modeling Steps 1, 2 and 3. Prepared for Union Pacific Railroad. April 4.

House Concurrent Resolution (HCR) 10 to Address Declining Water Levels of the Great Salt Lake. 2019. State of Utah General Session. https://le.utah.gov/~2019/bills/static/HCR010.html.

House Joint Resolution (HJR) 20 Recognizing the Significance of the Great Salt Lake. 2014. State of Utah General Session. https://le.utah.gov/~2014/bills/static/HJR020.html.

Jehl, J. R., Jr. 1988. "Biology of the Eared Grebe and Wilson's Phalarope in the nonbreeding season: a study of adaptations to saline lakes." Studies in Avian Biology No. 12. 74 pp.

Jacobs Engineering Group Inc. (Jacobs). 2019. Great Salt Lake Integrated Model (GSLIM); An Integrated Water Resource Management Tool for the Great Salt Lake Watershed, Phase II – GSLIM Evaluation. Prepared for the Great Salt Lake Advisory Council. September 26.

Jacobs Engineering Group Inc. (Jacobs). 2020. Depletion Accounting for Irrigation Water Rights in Utah: A Review of Potential Agricultural Depletion Accounting Methods. Completed in conjunction with an expert panel for the Utah Agricultural Water Optimization Task Force. June.

Jones, K. 2018. Policy for Domestic Duty Considerations. Memorandum to Water Rights Division Staff. December 28.

Lipshie, S.R., and Larson, R.A. 1995. Battling Seawater Intrusion in the Central & West Coast Basins https://www.wrd.org/sites/pr/files/TB13%20-%20Battling%20Seawater%20Intrsusion%20in%20the%20Central%20&%20West%20Coasts%20Basins.pdf

Miller, T. 2020. "Update on Atmospheric Deposition to Utah Lake." Presented at the Utah Lake Water Quality Studies Steering Committee Meeting. Virtual. June 4.

Morrisette, P.M. 1988. The Rising Level of the Great Salt Lake: Impacts and Adjustments.1988. Bulletin American Meteorological Society. Vol. 69, No. 9, September 1988.

Peck, D.E., and Lovvorn, J.R. 2001. The importance of flood irrigation in water supply to wetlands in the Laramie Basin, Wyoming, USA. *Wetlands* **21,** 370–378. https://doi.org/10.1672/0277-5212(2001)021[0370:TIOFII]2.0.CO;2

Richards, G.L. 2009. Metering Secondary Water in Residential Irrigation Systems. All Graduate Theses and Dissertations. 391. Retrieved from https://digitalcommons.usu.edu/etd/391

Richards, G., Johnson, M., and Barfuss, S. 2009. Metering residential irrigation water: Technological approaches and cost estimations. Journal / American Water Works Association. 101. 52-63+12. 10.1002/j.1551-8833.2009.tb09906.x.

Samani, Z., and R.K. Skaggs. 2008. "The multiple personalities of water conservation." *Water Policy*, 10 (2008), 285-294.

Sketch, M., Dayer, A.A., and Metcalf, A.L.. 2020. Western Ranchers' Perspectives on Enablers and Constraints to Flood Irrigation. Rangeland Ecology & Management. 10.1016/j.rama.2019.12.003.

Skiles, S.M., Mallia, D., Hallar, A.G., Lin, J.C., Lambert, A., Petersen, R., and Clark, S. 2018. Implications of a shrinking Great Salt Lake for dust on snow deposition in the Wasatch Mountains, UT, as informed by a source to sink case study from the April 13th, 2017 dust event. Environmental Research Letters. Published, 12/2018. https://iopscience.iop.org/article/10.1088/1748-9326/aaefd8/pdf

SWCA Environmental Consultants and Applied Conservation (SWCA and Applied Conservation). 2012. Definition and Assessment of Great Salt Lake Health. Prepared for the Great Salt Lake Advisory Council. January.

SWCA Environmental Consultants (SWCA). 2017. "Water for Great Salt Lake." Prepared for the Great Salt Lake Advisory Council. September.

UCRC Staff and Wilson Water Group. 2018. Colorado River System Conservation Pilot Program (SCPP) .http://www.ucrcommission.com/RepDoc/SCPPDocuments/2018__SCPP_FUBRD.pdf

University of Utah. 2013. "Lake Effect Snow Sometimes Needs Mountains." The University of Utah News Center. February 19. https://archive.unews.utah.edu/news_releases/lake-effect-snow-sometimes-needs-mountains/#:~:text=Lake%2Deffect%20storms%20account%20for,effect%20snowstorms%2C%E2%80%9D%20Steenburgh%20says.

Utah Agricultural Experiment Station (UAES). 1982. *Crop Yield Models Adapted to Irrigation Scheduling Programs*. UAES Research Report 99.

Utah Agricultural Experiment Station (UAES). 1994. *Consumptive Use of Irrigated Crops in Utah*. UAES Research Report 145. October.

Utah Agricultural Experiment Station (UAES). 2011. *Crop and Wetland Consumptive Use and Open Water Surface Evaporation for Utah*. UAES Research Report 213. August 16

Utah Department of Natural Resources (UDNR). 2013. Final Great Salt Lake Comprehensive Management Plan and Record of Decision. Prepared by SWCA Environmental Consultants for the Utah Division of Forestry, Fire & State Lands. Marc.

U.S. Geological Survey (USGS). 1977. Model for evaluating the effects of dikes on the water and salt balance of Great Salt Lake, Utah. Water-Resources Bulletin 21.

U.S. Geological Survey (USGS). 2000. Water and Salt Balance of Great Salt Lake, Utah, and Simulation of Water and Salt Movement through the Causeway, 1987–98. Water-Resources Investigations Report 00-4221

Wallace, Janae & Inkenbrandt, Paul. (2013). Groundwater quality classification for the principal basin-fill aquifer, east shore area, Davis County, Utah. 10.13140/RG.2.1.1698.4801.

Ward, F.A. and M. Pulido-Velazquez. 2008. "Water conservation in irrigation can increase water use." *Proceeding of the National Academy of Sciences,* Vol. 105, No. 47. November.

Western Resources Advocates. 2018. Accelerating the Implementation of Secondary Water Metering in Utah. February. Retrieved from https://westernresourceadvocates.org/publications/accelerating-the-implementation-of-secondary-water-metering-in-utah/.

Wright, J.L. 1982. "New Evapotranspiration Crop Coefficients." *J. Irrig. Drain*. Div., 108(1), 57-74.

Wurtsbaugh, Wayne, Craig Miller, Sarah Null, Peter Wilcock, Maura Hahnenberger, and Frank Howe. 2016. "Impacts of Water Development on Great Salt Lake and the Wasatch Front." *Watershed Sciences Faculty Publications.* Paper 875. https://digitalcommons.usu.edu/wats_facpub/875.