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UTAH LEGISLATURE

How Utah Water Works

An Overview of Sources, Uses, Funding, and Pricing

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HIGHLIGHTS

- Utah, the second most arid state in the nation, receives most of its water supply from its 13 inches of average annual precipitation. Utah also shares some water sources with neighboring states.
- About 5.2 million acre-feet of water is annually diverted for use in Utah. Of this, agriculture diversions are about 82%, while diversions for home, business, and other uses are about 18%. About 4% of all diverted water is utilized for indoor residential use.
- Because state law provides that the water of the state belongs to the public, the state determines who has a right to use water and regulates that use.
- Many different federal, state, local, and private entities are involved in the process of developing, treating, and delivering water.
- The costs of providing water are currently funded through both user fees and general taxes, such as the property tax and sales tax.
- Utah's current policy of using general taxes such as the property tax and sales tax to help pay for water is controversial. Some argue that user fees should reflect the full cost of the water used, while others prefer to keep using general taxes.
- Cost estimates for proposed water projects over the next two decades exceed $16 billion. Projects include the Lake Powell pipeline, Bear River development, and various other replacement, dam safety, drinking water, and water quality projects.
- Policymakers face many challenges in ensuring an adequate, high-quality water supply for the state's rapidly growing population. Alternatives for providing future water supplies include changes in the use of existing water, conservation, and development of the state's undeveloped water resources.

INTRODUCTION

Water affects countless aspects of Utah citizens′ lives, impacting our health, economy, environment, and recreation. Yet, possibly because water seems so readily available, the relative scarcity of water in Utah′s semi-arid climate is often overlooked.

Utah′s anticipated population growth will fuel greater demand for its scarce water, particularly for home and business use. This increasing demand will likely require a combination of responses, including effective water conservation, reallocation of existing water uses, and investment in developing the state′s undeveloped water resources.

Policy decisions made in the near future regarding water supply, infrastructure, funding, quality, pricing, and conservation will impact Utah′s citizens for decades to come. This briefing paper addresses the following questions to assist policymakers as they consider competing water needs:

- Where does Utah′s water come from?
- How is Utah′s water used?
- Who has the right to use Utah′s water?
- How is Utah′s water managed and delivered?
- How is water in Utah priced?
- What are Utah′s future water needs?

Where Does Utah's Water Come From?

Precipitation, largely in the form of snow that falls within Utah, is the primary source of the state's water supply. Utah also receives water that originates in other states, and likewise, other states receive water that originates in Utah.

In-state Precipitation

With thirteen inches of statewide average annual precipitation, Utah is the second driest state in the nation (see Appendix 1).[1] Thirteen inches of precipitation generates about 61.5 million acre-feet[2] of water.

However, the amount of annual precipitation in Utah is not consistent from year to year. Precipitation and the resulting water supply in one particular year rarely match the average, but rather can fluctuate in the extreme from very wet years to very dry years.[3] As a result, monitoring each year's precipitation, streamflow, and existing water storage is critical in projecting the water supply in Utah. Storing water in reservoirs provides a more consistent water supply over time as fluctuations in precipitation occur.

Additionally, Utah's precipitation does not fall evenly throughout the state. Due to extreme variations in elevation, Utah's mountains receive up to 50 or 60 inches of water per year, mostly as snow, while many of its arid basins and valleys receive only 5 to 10 inches of water each year. The "snowpack" in Utah's mountains acts as an effective storage reservoir that is frozen in the winter and then, as it melts during the spring and summer, releases billions of gallons of water.

The vast majority of Utah's precipitation (87%, or about 53.8 million acre-feet of water) is utilized by the natural environment as it returns to the atmosphere through evaporation and plant transpiration. The remainder (13%, or about 7.7 million acre-feet of water) either flows directly into Utah's river systems as surface water or absorbs into the soil. Water absorbed into the soil may (a) remain groundwater, replenishing an aquifer; or (b) return to the surface, flowing into a lake or river or rising to the surface as a spring.

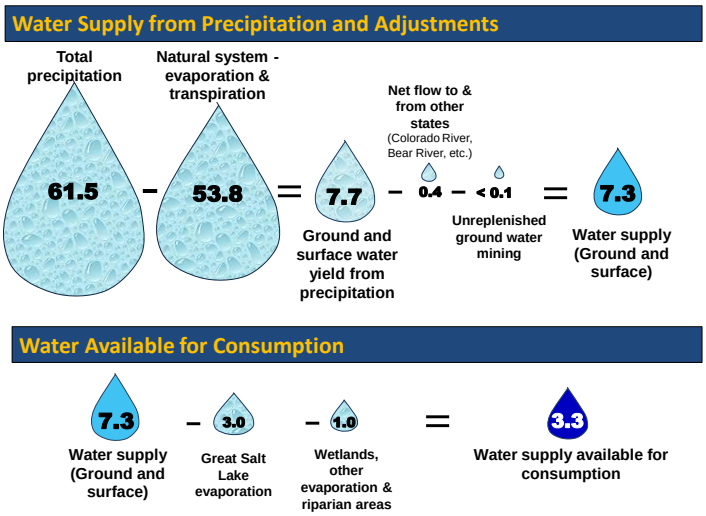
Supply Among States

Utah's water supply does not depend entirely on the amount of precipitation that falls within its borders. Utah shares some water sources with neighboring states.

For example, the Colorado River Compact of 1922 divided the Colorado River basin into upper and lower areas. Utah, one of the upper states, negotiated with several neighboring states as part of the Upper Colorado River Compact of 1948 to keep about 23% of the upper basin's total flow. In exchange, Utah agreed to allow other states to use a portion of Colorado River water that generates from Utah precipitation. Similarly, as part of the Bear River Compact, Utah receives a share of Bear River water and has obligations to allow some Bear River water to flow into Wyoming and Idaho. Utah also receives some inflow from Nevada into the West Desert.

As Figure 1 shows, combining in-state precipitation with the exchange of water supply among the surrounding states, and then accounting for areas of the state that withdraw more ground water than is replenished, results in an average ground and surface water supply of about 7.3 million acre-feet a year. This water supply, although potentially usable as ground and surface water, is further reduced by about 3 million acre-feet of water that evaporates from the Great Salt Lake each year, as well as about 1 million acre-feet of water depleted each year by wetlands, riparian areas, and evaporation from reservoirs. These depletions are in addition to the evaporation and transpiration mentioned earlier. The remainder of Utah's water supply, about 3.3 million acre-feet, is considered available for consumptive use in the state.

Figure 1
Utah's Water Supply (in millions of acre-feet)



Source: Utah Division of Water Resources

How is Utah's Water Used?

On average, Utah annually consumes about 2.6 million acre-feet of the 3.3 million acre-feet of water available for consumption. This leaves approximately 0.7 million acre-feet of unused water, which flows to surrounding states. This unused water, a portion of which is Utah's unused Colorado River allotment, is available for future development and use in Utah.

Water "Use" – Diversion vs. Consumption/Depletion – Return Flow

To understand water "use," it is important to distinguish between diverted water and consumed or depleted water and to understand the concept of return flow.

Diverted water is water withdrawn from a natural water system and put to use. ***Consumed or depleted water*** is that portion of diverted water that is consumed by plants, humans, or livestock and not returned to a water system. ***Return flow*** is that portion of diverted water that is not consumed or depleted that returns to the natural water system.

For example, water that flows out of a canal or other water system for agricultural use, such as crop or livestock production, is diverted water. Consumed or depleted water is that portion of the diverted water that evaporates, is transpired by plants, is incorporated into crops, or is consumed by livestock. Return flow is that water that is not consumed by crops or livestock and returns to the natural water system (e.g., water absorbed into the soil but not consumed by plants, or excess that runs off the end of the field).

Another example of diverted water is water piped to a residential property for domestic use. Consumed or depleted water is that portion of the diverted water that is consumed by humans or animals or that is absorbed or transpired by plants. Return flow is that portion of diverted water that returns to a water system (e.g., water that runs down the drain into a wastewater system, is treated, and returns to a natural system).

Reuse of Return Flow From Diverted Water

Return flow can be diverted and reused multiple times as it moves through a natural water system. In fact, Utahns divert a much greater volume of water (5.15 million acre-feet) than the amount of the water supply actually consumed (2.60 million acre-feet). This reuse of water as it returns to the natural system gives water managers flexibility in delivering water to those who have the right to use water, since the same water is used to supply multiple water users as it moves through the state's water systems.

Water Diversion in Utah

Each year, Utah water users divert approximately 5.15 million acre-feet of water from natural water systems for agricultural, residential, and business use. As Figure 2 shows, agricultural irrigation is the primary use of developed water in Utah (4.20 million acre-feet/year or 82%). Municipal and industrial (M&I) users use the rest of the diverted water (0.95 million acre-feet/year or 18%), with homes and commercial businesses constituting the largest M&I water users. Due to projected population growth, M&I use is expected to experience the greatest future growth.

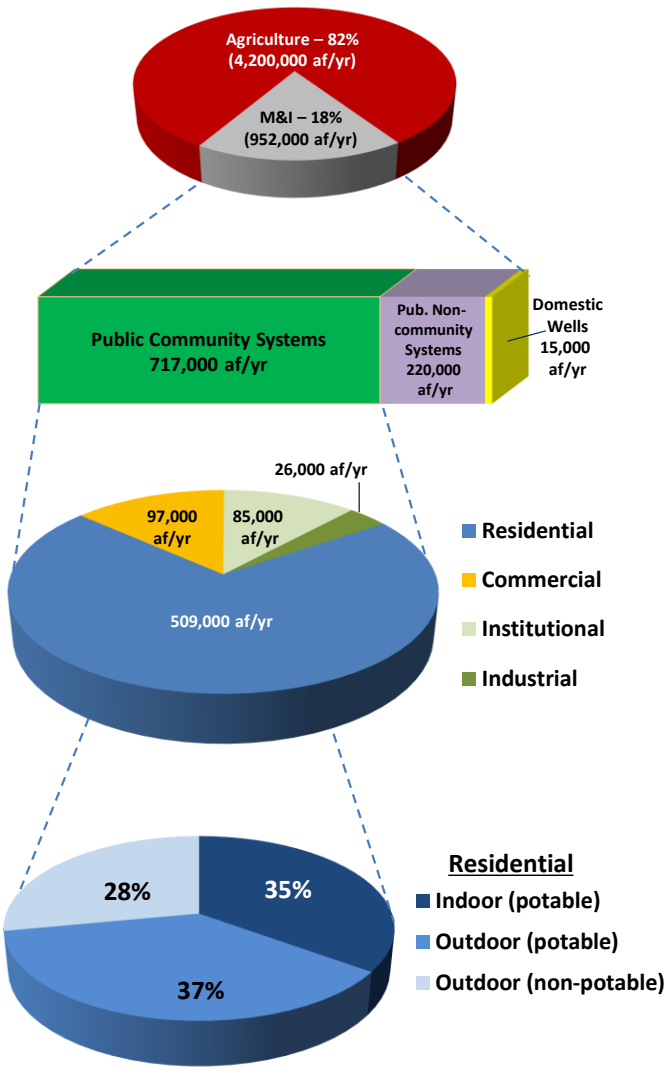
As Figure 2 further shows, 952,000 acre-feet/year of M&I water is diverted using three delivery systems:

(1) public community systems (such as systems run by municipalities) that deliver water to most businesses and all but very small residential systems (717,000 acre-feet/year);
(2) public non-community systems, such as self-supplied industries not connected to a public community system and having their own water source (e.g., ATK, oil refineries in Davis county, Uintah Basin oil and gas companies, national and state parks, and campgrounds) and

certain small businesses and small subdivisions (220,000 acre-feet/year); and

(3) residential wells owned by an individual homeowner (15,000 acre-feet/year).

Figure 2
Distribution of Diverted Water

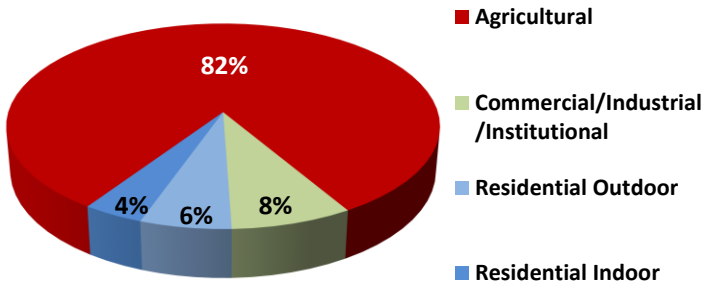


Source: Utah Division of Water Resources

Both potable (treated) and non-potable (untreated) water are delivered to residential, commercial, institutional, and industrial customers in the amounts shown in Figure 2. Public community water systems deliver water to 98% of Utah's residential population. As shown in Figure 2, of the 509,000 acre-feet of water delivered to residential customers of public community systems, about 72% is potable water and 28% is non-potable water that is used outdoors. About 65% of residential water is used outdoors and 35% indoors.

Of the total 5.15 million acre-feet of water diverted in Utah for agricultural and M&I use, only about 4% is for residential indoor use, as illustrated in Figure 3.

Figure 3
Use of Diverted Water



Source: Utah Division of Water Resources

Water Use Comparison

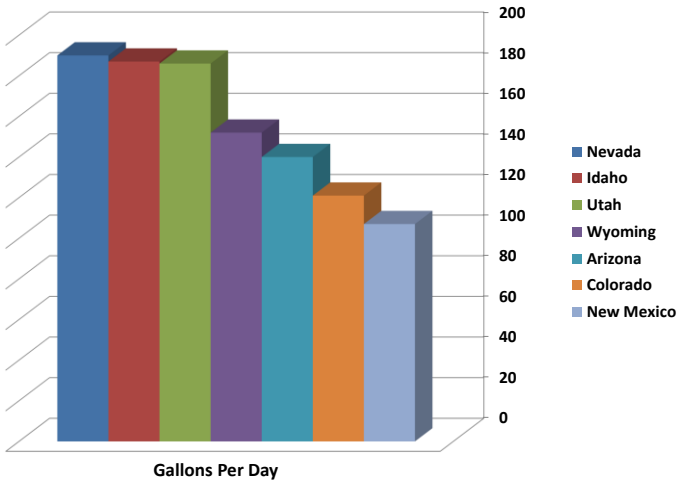
Describing water use in per capita (per person) terms allows for a more meaningful comparison that takes population differences into account (such as when comparing between different areas or different time periods).

The U.S. Geological Survey and the Utah Division of Water Resources publish estimated water use statistics, including residential per capita use. Residential use includes indoor and outdoor uses at residences (e.g., food preparation, washing clothes and dishes, flushing toilets, watering lawns, gardening, and washing cars).

Figure 4 shows that Utah is third in residential per capita use among the states that surround it, using slightly less water per capita than Nevada and Idaho.

Utah's relatively high per capita water use is tied to several factors. These include a semi-arid climate, the settlement patterns of early pioneers desiring to create familiar green landscapes, larger city lot sizes, the close proximity of surface and ground water sources to the state's population, low culinary water rates, and inexpensive secondary water (untreated water intended for outdoor use).

Figure 4
Residential Per Capita Water Use in Utah and Surrounding States (2005)



Source: U.S. Geological Survey

WHO HAS THE RIGHT TO USE UTAH'S WATER?

The process of taking water from a ground or surface source and putting it to agricultural or M&I use involves significant complexity, both legally and practically. The next two sections provide an introduction to water rights and delivery in Utah. By giving a brief history and description of water rights in Utah, this section describes how a water user or water delivery entity must have a legal right to divert water out of Utah's water system.

Public Ownership of Water

Because state law provides that the water of the state belongs to the public, the state determines who has a right to use water and regulates how it is used. In other words, even if water falls or flows naturally onto a person's property, the person must have permission from the state to divert the water, or to collect more than a certain amount of the water, as specified in statute. This permission from the state to use water is called a water right and entitles its holder to a prioritized distribution of a certain amount of water for a specific purpose, time of year, and location.

History of Water Rights in Utah

Although some of Utah's Native Americans successfully used small-scale irrigation to grow crops, major irrigation projects began with the arrival of the pioneers. The pioneers who settled the arid Salt Lake valley understood that, in order to achieve the society they desired, they would need to bring water to their communities. Early settler Orson Pratt recorded that within two hours of moving to the City Creek area on July 23, 1847, ". . . [the pioneers] began to plow, and the same afternoon built a dam to irrigate the soil, which at the spot where [they] were plowing was exceedingly dry."[4] But as the early settlers began to build canals from the mouths of canyons to irrigate their first small farms, they also gained an immediate appreciation for the scarcity of water in Utah and the difficulty of bringing water to the valley.

Utah's pioneers rejected the riparian legal theories of their wetter homelands and instead instituted a system for allocating available water to the highest economic and beneficial uses. Water was thought to belong to everyone, but the right to divert and use water was not a given - that right had to be allocated. As the early settlers built community irrigation systems and made water allocations, preference was given to individuals who would put the water to economic and beneficial uses that would most benefit the community, not just the individual.

As the settlers built larger and more complex irrigation systems that could support more productive agricultural operations, Utah's water laws evolved. By the 1880s, the right to divert and use water could be severed from the land. Many water or irrigation companies were formed where water users pooled water rights, transferring title to the company in order to better facilitate and maintain water distribution to the company's shareholders. By combining their resources, the shareholders were able to produce more efficient and sophisticated irrigation systems. Later, during a reorganization of water law and policy at the turn of the century, the state engineer's office (now called the Division of Water Rights – see Appendix 3) was created to manage water rights in the state.

Throughout the 20th century, the federal government frequently partnered with Utah communities to build Bureau of Reclamation projects, including reservoirs, power plants, and dams. For some of the projects, the federal government directly acquired the rights to the water being developed by filing applications for appropriation with the state engineer's office. For other projects, the federal government required that those who owned rights to the water being developed transfer their water rights to the federal government until the water users finished repaying the federal

government for the cost of the project. As a result, although the federal government may not actually put the water to beneficial use, it still holds title to many water rights in Utah and receives water distributions according to those rights, with the water then passed on to the actual water users.

Water Rights in Utah Today

Water law in Utah today is based on the same principles embraced by the pioneers, that is, public ownership of water and the doctrines of prior appropriation and beneficial use.

Public Ownership of Water. Even though all water belongs to the public, an individual can own a water right to divert water and put it to use. A corollary of the principle of public ownership is that because the public owns the water, the public has the right to allocate or "appropriate" the water. Under current law, the Division of Water Rights regulates Utah's water rights and works to ensure distribution of water according to those rights.

Prior Appropriation. The right to divert and use water is based on the doctrine of prior appropriation. This doctrine is commonly referred to as "first in time, first in right," which means that available water must be distributed according to a priority system where water is distributed first to the person with the oldest water right, then to the person with the next oldest water right, and so on. When water supply decreases, as in times of drought, those with lower priority may receive a reduced distribution or no distribution at all.

Beneficial Use. Under the doctrine of beneficial use, a water right must be put to a useful, beneficial purpose. If an individual fails to use a water right or fails to put the water to beneficial use, the water right may be forfeited.

A water right entitles a person to a very specific kind of water distribution. As Figure 5 illustrates, a water right sets out what priority the distribution should receive (based on the date the right was first used or filed), how much water the person should receive, and exactly how and where the water can be used, along with other information.

Figure 5
Water Right Example

Owner	**Priority Date**	**Source**	**Flow**
MTN Water Company	July 6, 1901	Underground water well	4.45 acre-feet/year

Point of Diversion	*Underground:* *Well Diameter:* *Well Depth:*	South 409 feet East 200 feet from the North quarter corner of Section 5, Township 3 South, Range 4 West of the Salt Lake Baseline & Meridian 8 inches 245 feet	
Beneficial Use	*Type of Use:*	**Irrigation**	**Domestic**
	Period of Use: *Amount of Use:* *Place of Use:*	April 1 through October 31 4.00 acre-feet The Northwest quarter of the Northeast quarter of Section 5, Township 3 South, Range 4 West of the Salt Lake Baseline & Meridian.	January 1 through December 31 0.45 acre-feet The Northwest quarter of the Northeast quarter of Section 5, Township 3 South, Range 4 West of the Salt Lake Baseline & Meridian.

How Is Utah's Water Managed and Delivered?

This section gives an overview of how water is delivered and of the entities that construct, oversee, and maintain water delivery systems.

Figure 6 shows the location of Utah's surface water and population (a great majority close to mountainous water sources) and the location and amount of Utah's precipitation.

Delivering water to the location of water users, such as homes and businesses, involves both natural and human-made processes. While gravity, along with streams, rivers, and other geographical features, all contribute to water distribution, human intervention (dams, canals, wells, pipes, etc.) in water delivery is essential to our society.

Water Rights and Distribution

As described in the previous section, to divert and use water out of Utah's water system, one must have a water right. In accordance with that right, a water right holder can divert water from a surface water source or pump water from the ground. To ensure that water in Utah is distributed according to existing water rights, the state engineer (who directs the Division of Water Rights) organizes distribution systems and appoints river commissioners to oversee the distributions.

Within an assigned distribution system, a river commissioner either monitors surface water diversions according to water right ownership or oversees ground water use, depending on whether a system distributes surface or ground water. Surface water diversions in more populated areas are most often made to major water wholesalers or to irrigation or water companies. In more rural areas, more diversions are made to individual water right owners.

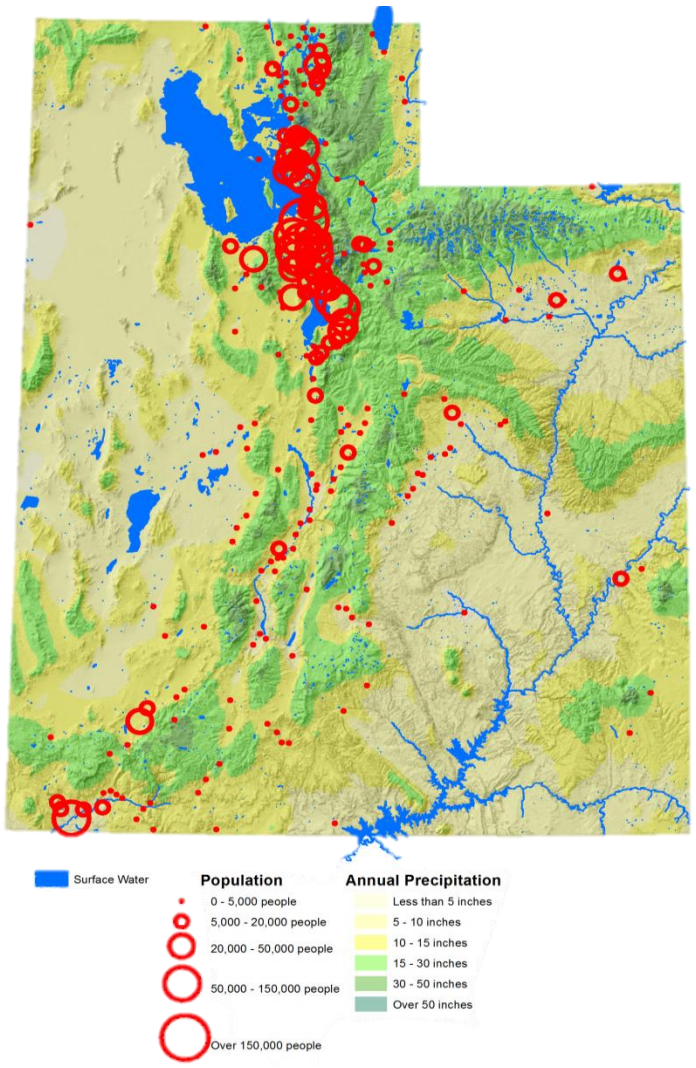
A large part of a river commissioner's job is to adjust diversions as water supply fluctuates throughout the year. The water supply in a river varies seasonally as temperatures rise, snow melts, or additional precipitation occurs. There are also annual variations according to Utah's wet and dry years. As the available flow of water decreases, a commissioner must oversee a decrease in diversions, based on the priority of a water right and the percentage of available water.

Development

Water is considered "developed" when human intervention brings water into a water system for beneficial use. For example, the federal Bureau of Reclamation is well known for developing water by building dams, power plants, reservoirs, and canals in the western states. Utah has been the beneficiary of many federal water projects, power plants, and dams, most notably the Central Utah Project, the Provo River Project (Deer Creek Dam), the Weber River Project, the Strawberry Valley Project, and the Glen Canyon Dam (which created Lake Powell).

Utah itself has also constructed thousands of smaller-scale water projects. The Division of Water Resources manages Utah's revolving loan funds for water development projects and has provided financial assistance for many of these projects, such as the Recapture Dam (Blanding), Piute Reservoir and DMAD Dam (Sevier River), and Porcupine Reservoir (Cache Valley).

Figure 6
Map of Utah's Precipitation, Surface Water, and Population



Source: Utah Automated Geographic Reference Center (AGRC)

The proposed Lake Powell pipeline is a large-scale state water development project that is similar in scope to the large federal projects constructed in the past by the Bureau of Reclamation. As planned, the pipeline would deliver Colorado River water from Lake Powell to residents of Kane and Washington Counties, putting to use approximately 86,000 acre-feet of Utah's Colorado River allotment. Unlike previous large-scale projects that were funded by the federal government, the Lake Powell pipeline would need to be funded by non-federal sources.

Delivery

To provide water to an end user, extensive infrastructure and management are usually required.

Each water system is unique, and different types of water entities exist to fulfill the roles required by that system.

Wholesale. A water entity that acts as a water wholesaler typically has the necessary infrastructure to first divert and store water in reservoirs, and then to transport large amounts of water over large areas in order to deliver water to its customers. A wholesaler may use large-scale water meters to deliver the correct amount of water. Wholesalers typically sell to other wholesalers, cities and towns who retail the water to end users, and, in some cases, larger retail customers. Examples of water wholesalers are the federal Bureau of Reclamation, local water conservancy districts (such as the Central Utah Water Conservancy District and Weber Basin Water Conservancy District), and local metropolitan water districts (such as the Metropolitan Water District of Salt Lake and Sandy).

Retail. A water entity that acts as a water retailer typically has the necessary infrastructure to provide water to end users, usually over a designated service area or to a set group of customers the entity is established to serve. Although water pricing structures exist at the wholesale and retail level, retailers dictate the pricing structure citizens are generally most concerned about as end users. Retail customers include residences, businesses, and agricultural operations. Although larger entities, like water conservancy districts, may provide some retail water, smaller entities like municipalities provide the greatest amount of retail water.

Purification. Water used for drinking must meet federal drinking water standards. Water entities may own and utilize treatment facilities or may obtain water that has already been treated. Utah's Division of Drinking Water administers the federal Safe Drinking Water Act in Utah and oversees drinking water standards for public water systems in the state.

Water entities can fulfill more than one of these roles at different times and places. For example, through its role in building and maintaining projects such as the Strawberry Reservoir, the Central Utah Water Conservancy District is a developer of water. It also acts as a wholesaler when it sells that water, either to other wholesalers, such as the Jordan Valley Water Conservancy District, or directly to retail providers, such as cities and towns. Appendices 2 and 3 include further information on entities involved in water.

Private Water Systems

Private entities play a significant role in developing and delivering water in the state. A private water system may deliver water to many users or be as simple as one residence or business that obtains water from a private well. Private water systems include the hundreds of irrigation or shareholder companies across the state (that often began from early Utah settlers pooling their water rights). Examples include the Davis and Weber Counties Canal Company and the North Jordan Canal Company. Similarly, several hundred private for-profit residential providers exist, such as the Draper Irrigation Company/WaterPro and the Summit Water Distribution Company.

How is Water in Utah Priced?

Water Infrastructure, Treatment, and Quality

Obtaining and delivering water to homes, businesses, and farms requires extensive physical infrastructure, including a large number of dams, canals, and pipes. To construct, maintain, and replace this massive infrastructure requires significant funding.

For drinking water, an essential part of delivery is treating the water to make it safe to drink. This requires treatment facilities. Monitoring water quality and ensuring that potable water delivered to homes and businesses meets clean water standards also requires significant funding.

Utah's Division of Water Quality monitors and assesses water quality. The division works to prevent and mitigate pollution of Utah's water to protect its beneficial uses. Specific efforts to support baseline water quality in Utah include establishing standards to

protect the quality of surface water and groundwater sources, such as streams, rivers, lakes, and aquifers; monitoring and regulating wastewater, storm water, and industrial discharges into water sources; controlling pollution; and rehabilitating polluted waters. Each of these efforts requires funding.

Cost and Utah's Geography and Hydrology

The following geographic features significantly affect Utah's water infrastructure and treatment costs.

Proximity. Not only do most Utahns live close to mountainous water sources (as illustrated in Figure 6), but many original settlements were established above fairly large ground water aquifers. Thus, water in Utah is often used within a relatively short distance from its source and does not usually require costly, long-distance transportation.

Gravity. Utah's mountain snowpack effectively acts as a reservoir that, over time, releases water as it melts. The fact that the water is stored in the mountains is significant because gravity does the majority of the work in moving the water toward population centers. This means that energy costs for pumping water are less and construction costs for water storage facilities are reduced because water can be stored in below-ground or ground-level storage facilities, often on hillsides, instead of the elevated water towers required in other parts of the country to create the necessary water pressure. In addition, Utah also has comparatively low energy costs for water that needs to be moved.

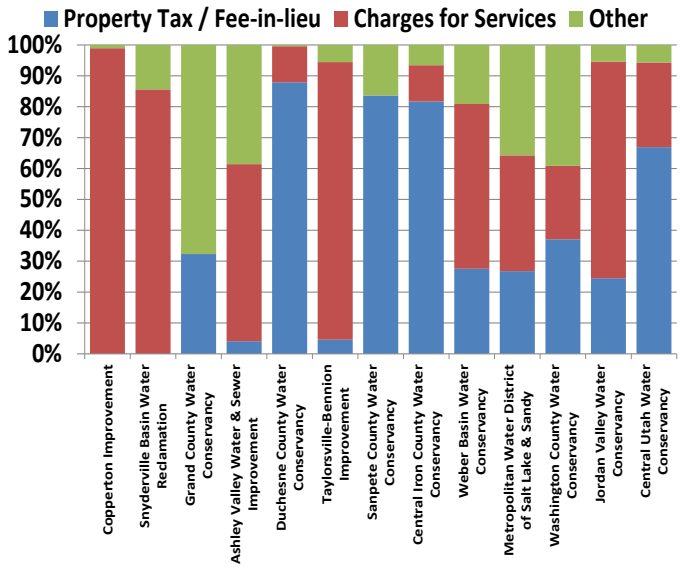
Purity. Because Utah's water source is replenished each winter through snowfall, treatment costs are generally lower than in other states because the water source is generally quite pure to begin with.

Paying for Water

Because there are substantial costs required to develop, deliver, and purify water, funding mechanisms are required to cover the costs. The two main options are general taxes and user fees.

Figure 7 shows a comparison of the use of property taxes, user fees (charges for services), and other revenue sources (such as grants and interest) for selected entities. As the figure shows, some entities rely extensively on taxes, while other entities rely almost exclusively on user fees.

Figure 7
Property Taxes & Charges for Service as a Percent of Total Budget, Selected Local Entities



Source: Utah State Auditor's website, entity budget reports

General Taxes. Although precise numbers are difficult to determine due to the complexity of the various water delivery systems, an estimated one-third of local entity water costs not paid by federal funds are covered through general state and local taxes.

Local Property Taxes. Water-related conservancy, improvement, and other local districts imposed nearly $120 million in property taxes in FY 2012 to pay for the cost of providing water. This $120 million represents nearly 5% of all property taxes imposed in the state.

Five entities impose about 75% of this $120 million in property tax: Central Utah Water Conservancy District ($48 million), Jordan Valley Water Conservancy District ($12 million), Washington County Water Conservancy District ($11 million), Metropolitan Water District of Salt Lake and Sandy ($9 million), and Weber Basin Water Conservancy District ($9 million).

In addition, municipalities may use some revenue from general taxes, such as property taxes and sales taxes, to provide water.

In some cases, local entities have pledged future property taxes through bonds or other agreements. For example, the Central Utah Water Conservancy District has long-term bond agreements that require the use of

property tax revenues as a source of repayment for capital infrastructure expenses as well as normal operations and maintenance expenses.

Property tax subsidies of water shift who pays for water away from users to property owners by decreasing water user costs and increasing property owner costs, in proportion to taxable property values.

When examining the combined amount paid for water in property taxes and user fees, use of the property tax funding mechanism tends to reduce the amount paid by (a) those who use more water; (b) those who are exempt from property tax (e.g., government entities like the state, school districts, and municipalities, and nonprofit entities such as churches, nonprofit private universities, and nonprofit hospitals); and (c) those whose property receives preferential property tax treatment (e.g., greenbelt agricultural property and primary residential property). Since higher prices tend to influence consumer behavior by reducing the quantity demanded, use of a general tax like the property tax is more likely to increase the amount of water used, compared to a system relying only on user fees.

State Sales Taxes. The state also helps fund water through the sales and use tax ("sales tax"). The Legislature annually appropriates general resources to the Division of Water Resources, the Division of Water Rights, the Division of Drinking Water, and the Division of Water Quality (see Appendix 3) for general statewide oversight and administrative functions. In addition, in FY 2012, state sales tax earmarks for water exceeded $25 million and were used for cloud seeding, dam safety, watershed restoration, species protection, water rights administration and adjudication, as well as for various revolving loan funds for water conservation and development, drinking water, and water quality.

The water revolving loan funds are used to provide loans, grants, or interest buy-downs to both public and private water entities for water projects throughout the state. When loans are repaid, as they historically almost always have been, those revenues become available to make new loans. The current portfolio size of these revolving loan funds is approximately $700 million, currently allocated among nearly 700 loans.

User Fees for Water. User fees are an important component of Utah's water funding system. However, the use of user fees varies in water funding structures throughout the state. As Figure 7 illustrates, in some areas, water is funded almost entirely through user fees because the local entity either does not have taxing authority or chooses not to impose property taxes. In other areas, water is subsidized by general taxes such as the property tax and sales tax.

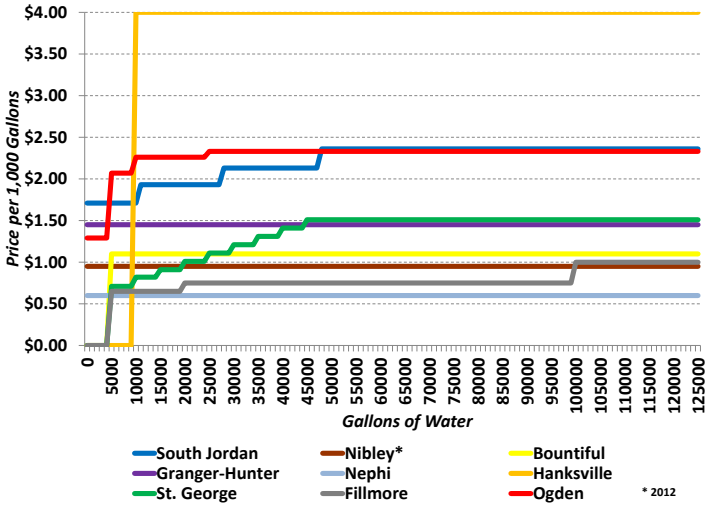
To encourage conservation, more local water retailers now charge their retail customers based on how much water they use. For example, a 2006 survey of local water providers estimated that about 48% of drinking water systems charged a flat fee that did not vary based on the quantity used. A 2010 survey found that only 7% of drinking water systems had a flat fee for water use, while 93% now have a rate structure in which prices increase with usage.[5]

Figure 8 illustrates retail water user rates in various locations throughout the state at various levels of water usage. In each of these cases, the water retailer charges a base fee (which sometimes includes a base amount of water) plus a certain amount per thousand gallons. In some cases (e.g., Nephi, illustrated by the light blue line), one rate is charged at all usage levels. In other cases (e.g., South Jordan, illustrated by the dark blue line), water rates increase as the amount of water used increases. This is known as an increasing block rate.

Figure 8 also illustrates that although user costs in each of the selected areas increase with more water use, the rate structures can vary substantially. For example, the highest rate charged for water in Hanksville is nearly seven times the rate charged for water in Nephi (which charges a single rate) and four times the highest rate charged in Fillmore (which uses increasing block rates).

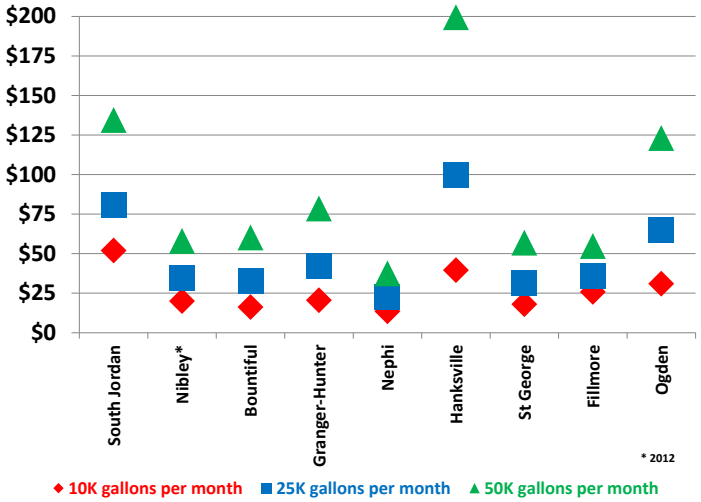
Figure 9 illustrates the impact of these varying rate structures on a retail water bill at different amounts of water use. Even though all of the selected areas charge for increased use, the amounts charged do not always change dramatically based on increased usage (for example, Nibley, Nephi, and Fillmore). In other areas, the rate structure substantially increases the amount charged as more water is used (for example, Hanksville, South Jordan, and Ogden).

Figure 8
Marginal Water Rates, Selected Utah Areas (2010)



Source: 2010 Survey of Community Drinking Water Systems

Figure 9
Estimated Monthly Bill at Different Water Usage Levels in Selected Utah Areas (2010)



Source: OLRGC calculations, based on data in 2010 Survey of Community Drinking Water Systems

As Figure 9 illustrates, depending on the rates charged, the increasing block rate structure can make high water use much more expensive than low or moderate water use. This increasing block rate structure encourages water conservation, especially among high water users. Some increasing block rate structures provide a stronger conservation incentive than others, depending on the steepness of each increase and the usage point at which the increases occur. In addition, if the water rate structure is not known or is unclear to water users, as is the case in areas where the increasing block rate structure does not appear on the retail customer's bill, the incentive to conserve is not nearly as strong.

To the extent policymakers wish to encourage conservation through market pricing mechanisms, the water rate structure is one alternative for accomplishing that goal.

Pricing Policy - Mix of User Fees & General Taxes

Water costs can be paid for in three ways: (a) user fees, such as monthly water billings and connection fees; (b) general taxes, such as the property tax and sales tax; or (c) a combination of the two.

Proponents of water user fees argue that the price paid by water consumers should embed the full cost of that water into user rates, thereby allowing price to encourage water conservation as people only use water they are willing to pay for. Artificially reducing the price of water charged to water users through general tax subsidies encourages overconsumption because the market signal of price is distorted (reduced) through the tax subsidies. They also assert that water entity budget stability and infrastructure financing issues can be handled under a user rate structure, such as by using a combination of base fees and retail water rates to cover costs and by issuing bonds for which the property tax is not the source of repayment.

Opponents of the exclusive use of water user fees argue that property taxes provide budget stability for the taxing entities and that bonds using property tax as the source of repayment are necessary to fund large projects. They further argue that society in general benefits from water, so general tax resources should be used to fund water. In addition, they point out that removing current general tax subsidies will shift who pays for water.

As noted earlier, Utahns currently pay for water with a combination of general tax revenues and user fees.

Utah User Fees Compared to Other States

As Appendix 1 illustrates, most states in the western half of the United States are much drier than those in the east and thus provide a more meaningful basis of comparison for Utah. Figure 10 shows that, even compared to these drier cities in western states, Utah's largest city (Salt Lake City) has low water user prices. Other studies done on a statewide basis using different methodologies also show that Utah generally has lower water costs charged to water users.[5]

Figure 10
Comparison of Western US City Water Bills at Different Consumption Levels*

	Gallons Per Person Per Day		
City	50	100	150
Fresno, CA	$15	$20	$25
Salt Lake City, UT	$16	$25	$35
San Antonio, TX	$13	$21	$35
Las Vegas, NV	$25	$41	$62
Phoenix, AZ	$11	$37	$64
Denver, CO	$22	$39	$70
San Jose, CA	$27	$48	$71
Tucson, AZ	$21	$40	$89
Dallas, TX	$18	$40	$96
Houston, TX	$28	$54	$96
Los Angeles, CA	$26	$59	$106
San Francisco, CA	$41	$77	$114
San Diego, CA	$49	$81	$116
Seattle, WA	$48	$84	$136
Santa Fe, NM	$51	$142	$263

* Monthly bill for a family of four

Source: Circle of Blue

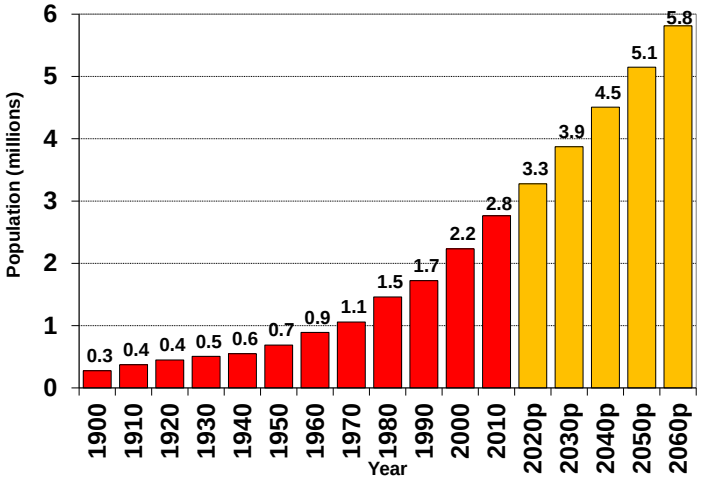
WHAT ARE UTAH'S FUTURE WATER NEEDS?

Projected Population Growth

As Figure 11 illustrates, Utah's population is projected to grow by over 1 million people by 2030 and by an additional 1.3 million people by 2050. By 2060, Utah's population is projected to double from the current population, reaching almost 6 million. Most of this growth is projected to take place along the Wasatch Front and in and around Washington County.

As population growth occurs, it will place significant demands on Utah's water resources. In addition, prolonged increases or decreases in the state's water supply will impact the strain on Utah's water resources. Population growth will likely require a change in the use of existing water (e.g., converting water currently used for agriculture to residential and business use or using reclaimed water more efficiently), the development of new water, increased conservation efforts, or a combination of all three. Policymakers will need to balance various competing interests in ensuring quality water that meets the needs of the growing state population.

Figure 11
Utah Population, 1900 through 2060p



Source: Governor's Office of Planning and Budget

Conservation

The Division of Water Resources has set a statewide goal to reduce residential and business per capita water use 25% by 2050. Conservation efforts have increased substantially in recent decades and Utah's per capita water usage has declined substantially over the past decade (by 18% between 2000 and 2010). If conservation leads to lower usage rates, less water would need to be developed or converted from other uses. However, even significant home and business conservation may be limited in its impact because M&I use constitutes only 18% of water diversions.

To the extent policymakers want to encourage conservation for homes and businesses, future conservation options include removal of general tax subsidies for water; incentives for more water-efficient landscape design, sprinkler systems, and appliances; state statutes or local ordinances regulating watering times and water-efficient landscaping; water rate structures such as increasing block rates and seasonal rates; and more dense land use.

Agricultural Irrigation – Efficiency – Conservation

The following factors, among many, affect efforts to achieve agricultural water efficiency and conservation:

- More efficient irrigation can result in more water available for use (e.g., to irrigate an additional crop or grow another alfalfa cutting), but that more efficient use may result in less return flow and reduce the water available for downstream users.
- Sprinkling systems may divert less water but consume more of the diverted water due to increased evaporation.
- Lining or piping a canal may result in less water absorbing into the soil, but again, may diminish return flow, impacting a downstream user or other use such as wetlands.
- Increased irrigation diversion and return flow may degrade downstream water quality as the water absorbs minerals and salts.
- Crop choice affects water consumption since some crops require more water than others.

Efforts to be efficient and conserve have an impact on the overall water system. For example, efficiency measures taken on an individual farm may negatively impact the supply, distribution, and quality of water in the surrounding hydrologic basin. Furthermore, each water basin is unique and may require different approaches to efficiency and conservation.

Despite the difficulty to define and implement agricultural water efficiency and conservation, water providers, managers, and users, along with policymakers and other affected parties, can work together to achieve the wise use of water to the benefit of all citizens of the state while respecting existing water rights. Since agricultural water constitutes such a large use of Utah′s water, to the extent increased agricultural conservation can be achieved, additional water could potentially be made available for other uses. In addition, market forces will likely continue to bring willing buyers and willing sellers together to convert agricultural water to water for home and business use.

Water Funding

Currently, funding and financing for water projects comes from various sources, including private lenders, developers of commercial and residential property, irrigation company shareholders, wholesale water providers, and federal, state, and local governments.

Because of population growth, economic development, and an aging water infrastructure, numerous water projects are proposed over the next several decades. As shown in Figure 12, cost estimates for water supply and infrastructure, wastewater and storm water, dam safety, the Lake Powell pipeline, and Bear River development projects over the next couple of decades exceed $16 billion.

Figure 12
Cost Estimates of Proposed Water Projects

CATEGORY	ESTIMATED COST (billions)
Water Supply and Infrastructure	$10.0
Wastewater and Storm Water	$3.5
Dam Safety	$0.1
Lake Powell Pipeline	$1.0
Bear River Development	$1.5
TOTAL	$16.1

Source: Utah Division of Water Resources

***Water Supply and Infrastructure*.** The estimated cost over the next 20 years for various water supply and infrastructure development projects is about $10 billion, including:

- **Water development** – The Utah Division of Water Resources estimates a cost of about $4.3 billion for various development projects (e.g., rebuilding the diversion dam at Green River, enclosing the Strawberry Highline Canal, and irrigation systems and secondary water systems improvements) to be built throughout the state. Historically, revolving loan funds administered by the Utah Board of Water Resources have provided about 20% of project costs.
- **Water districts** – Several Utah water districts (Jordan Valley, Weber Basin, Bear River, and Central Utah water conservancy districts, and Metropolitan Water District of Salt Lake and Sandy) have estimated a total cost of about $3.2 billion for various supply and infrastructure projects, including system upgrades, expansions, and repairs; new wells; pumping stations; and water right purchases. Historically, some of

these kinds of projects have been self-funded, and some have been partially financed by state revolving loan funds.

- **Drinking water** – The Utah Division of Drinking Water estimates that drinking water projects will cost about $1.9 billion. In the past, the revolving loan funds administered by the Utah Drinking Water Board have financed about 10-20% of smaller drinking water project costs.
- **Community Impact Board projects** – The estimated cost of water supply and development projects that will be funded by Community Impact Board revenues is about $0.6 billion.

Wastewater and Storm Water Projects. The Utah Division of Water Quality estimates water quality project costs over the next 20 years at about $3.3 billion ($1.2 billion for wastewater projects, $1.4 billion to address nutrient pollution, and $0.7 billion for storm water projects). Historically, revolving loan funds administered by the Utah Water Quality Board have provided about 20% of certain project costs. Additionally, the estimated cost of wastewater and storm water projects that will be funded by Community Impact Board revenues is about $0.1 billion. The total estimated cost is nearly $3.5 billion.

Dam Safety. Under the federal Dam Safety Act (1990), certain potentially unsafe dams must be rehabilitated. Utah′s share of dam rehabilitation costs is estimated at $0.1 billion. Historically, with its state sales tax earmark, the Utah Board of Water Resources has funded about 90% of the dam safety costs, with the remaining 10% often financed through revolving loan funds administered by the board.

Lake Powell Pipeline. The estimated cost of the Lake Powell pipeline, which would provide water to Washington and Kane counties, is approximately $1 billion in total costs over the next 12 years. The Lake Powell Pipeline Development Act (Title 73, Chapter 28) provides that the state will build and finance the project "as funded by the Legislature." The act also provides for the repayment of reimbursable costs. Non-state financing would be more expensive than state financing.

Bear River Development. The estimated cost of the Bear River development, which would provide water to Box Elder, Cache, Davis, Salt Lake, and Weber counties, is approximately $1.5 billion, beginning in about 20 years. The Division of Water Resources estimates that the timing and amount of repayments from the Lake Powell pipeline project would allow the repayment proceeds to fund the Bear River project.

The proposed Lake Powell pipeline and Bear River development present a unique challenge due to their large scope and broad applicability. Unlike previous large-scale federally-funded projects, the Lake Powell and Bear River projects will require major funding from non-federal sources. Therefore, policymakers are debating whether greater state involvement in these major projects is warranted.

As previously noted, the state has historically issued loans on a relatively small but very important percentage of generally smaller-scale projects. However, given the estimated cost of these types of projects in the future, current state funding for water projects will not be sufficient to fund or finance future projects at the same level as in the past, resulting in the state providing a declining share of project costs. With extensive water project costs and increasing state budget demands, policymakers are debating how to best meet future water needs and, for projects that are approved, whether water users or state or local taxpayers should bear a greater portion of the cost through private sector bonding, higher water rates and fees, property and sales taxes, and assessments. It is important to note that the state is not expected to fund or finance all water projects. Meeting Utah′s future water needs will continue to require a mixture of private and public funding and financing.

Conclusion

Despite the relative scarcity of water in semi-arid Utah, effective planning and development of water resources has consistently led to the reliable delivery of high quality water. Projected population growth will lead to greater demand for water, particularly for homes and businesses. Meeting this demand may require a combination of strategies, including water conservation, the reallocation of current water uses, and the development of additional water resources.

Policymakers and water managers face many challenges as they seek to assure an adequate, high-quality future supply of water, including how to effectively encourage water conservation, how to price and fund water, how to best use limited water, and how and where to use limited public funds to develop additional water resources.

Appendix 1
Map of U.S. Average Annual Precipitation

Source: National Atlas

Appendix 2
Case Study of Jordan Valley Water Conservancy District

The Jordan Valley Water Conservancy District (Jordan Valley) provides water on a wholesale basis to most of Salt Lake County outside of Salt Lake City and Sandy City. Although it owns other water rights, Jordan Valley's water primarily comes from the Jordanelle and Deer Creek reservoirs by way of the Provo River. Jordan Valley obtains rights to this Provo River water supply in two ways. First, it is a large shareholder in the Provo Reservoir Water Users Company. Second, Jordan Valley has contracted with the Central Utah Water Conservancy District to receive a large distribution of wholesale water.

A diversion structure on the Provo River conveys Jordan Valley's water to the Jordan Aqueduct, a 38-mile long, large-capacity pipeline owned by the U.S. Bureau of Reclamation and operated by Jordan Valley. The water from the Jordan Aqueduct ultimately reaches and is treated at the Jordan Valley Water Treatment Plant (JVWTP) in Bluffdale, the state's largest treatment facility for drinking water purposes. Treated water then continues northward in the Jordan Aqueduct (at approximately 3200 West).

At this point, water can be delivered on a wholesale basis to Jordan Valley's member agencies. North of JVWTP, treated water from the Jordan Aqueduct is conveyed through many water transmission pipelines extending across the valley. Jordan Valley uses metered turnouts along the Jordan Aqueduct to deliver water to its wholesale member agencies. Jordan Valley's 17 member agencies (for example, South Jordan City, Utah Department of Corrections, Kearns Improvement District, and Willow Creek Country Club) then provide the water to their retail customers. Additionally, Jordan Valley provides some water on a retail basis to portions of unincorporated Salt Lake County (approximately 8,500 connections).

Jordan Valley also conveys and treats water on behalf of its peer agency, Metropolitan Water District of Salt Lake and Sandy (Metro). Metro holds significant shares in the Provo River Water Users Association, but, like Jordan Valley, also contracts with CUP to receive wholesale water. After being treated, Jordan Valley conveys Metro's share of the water through the Jordan Aqueduct to 2100 South for wholesale delivery to Salt Lake City, which then delivers this water to its retail customers.

Appendix 3
Water-Related Public Entities

Federal Agencies	Roles
Army Corps of Engineers (Department of Defense)	Issues permits under the federal Clean Water Act (CWA) for proposed projects that will discharge into waters protected by the CWA. Maintains safe recreational navigation in several Utah waterways. Constructs some small-scale wastewater treatment and water development projects in rural areas of Utah.
Bureau of Reclamation (Department of the Interior)	Constructed many water development projects in Utah. Now maintains and operates federal projects in Utah, provides wholesale water, and produces hydropower.
Environmental Protection Agency	Establishes federal water quality and drinking water standards.
State Agencies	**Roles**
Division of Water Resources (Department of Natural Resources)	Provides comprehensive water planning for Utah, protects the state's rights to interstate waters, and manages Utah's revolving loan funds for water development projects. **Utah Code Title 73, Chapter 10**
Division of Water Rights (Department of Natural Resources)	Regulates Utah's water rights and oversees the distribution of water according to those rights. **Utah Code Title 73, Chapter 2**
Division of Water Quality (Department of Environmental Quality)	Administers federal water quality standards (Clean Water Act) as well as Utah's Water Quality Act; generally protects rivers, streams, and groundwater from pollution; and manages Utah's revolving loan fund for water quality projects. **Utah Code Title 19, Chapter 5**
Division of Drinking Water (Department of Environmental Quality)	Administers the federal drinking water standards for Utah, oversees drinking water standards for public water systems in the state, and manages Utah's revolving loan fund for drinking water projects. **Utah Code Title 19, Chapter 4**
Political Subdivisions	**Roles**
Water Conservancy District (WCD) Primarily Wholesaler	Broad power to develop, treat, and provide water wholesale and retail, although a WCD acts primarily as a wholesaler. A WCD may develop water for both unincorporated and municipal areas. The structure of a WCD was designed in particular to contract with the federal government to deliver federally developed water. **Utah Code, Title 17B, Chapter 2a, Part 10**
Metropolitan Water District (MWD) Primarily Wholesaler	Slightly narrower powers than a WCD in that water is almost exclusively developed for municipal areas, but still has broad power to develop, treat, and provide water wholesale and retail, although a MWD acts primarily as a wholesaler. The MWD structure was created to provide water to municipalities. **Utah Code, Title 17B, Chapter 2a, Part 6**
Improvement District Retailer	Retails primarily culinary (treated) water to residents within the improvement district, but also provides some secondary water (untreated water for outdoor use). **Utah Code, Title 17B, Chapter 2a, Part 4**
Irrigation District Retailer	Originally created to provide irrigation water within a district, but now irrigation districts often run secondary water systems for non-agricultural retail customers. Typically do not provide culinary water. **Utah Code, Title 17B, Chapter 2a, Part 5**
Service Area Retailer	Typically provides services other than water, such as law enforcement or fire protection services, but some service areas provide retail water service to residents of the service area. **Utah Code, Title 17B, Chapter 2a, Part 9**
City or Town (Municipality) Retailer	May provide water directly to residents within a municipality as a retailer under the broad municipal health, safety, and welfare powers. Water may be obtained wholesale and from water rights owned by the municipality. **Utah Code, Title 10, Utah Municipal Code**
Special Service District Retailer	A separate legal entity created and controlled by a municipality or a county. May be created to provide retail water service within a designated area. **Utah Code, Title 17D, Chapter 1**

1 Office of the State Climatologist estimates from 1961-1990.
2 An acre-foot is a commonly used water measurement equal to the volume of water covering an acre of land to a depth of one foot, or about 326,000 gallons.
3 For example, Utah received over 19 inches of precipitation in one year (Sept 2010 through Aug 2011) and just 10 inches of precipitation the next year (Sept 2011 through Aug 2012) – Oregon State University PRISM.
4 George Thomas, *The Development of Institutions Under Irrigation*, The Macmillan Company (1920).
5 *2010 Survey of Community Drinking Water Systems*, Utah Department of Environmental Quality Division of Drinking Water.
6 The Cost of Water in Utah, Utah Division of Water Resources.

This briefing paper draws heavily from various reports by the Utah Division of Water Resources. In addition, we greatly appreciate the insights and assistance provided by the state Division of Water Resources, Division of Water Rights, Division of Drinking Water, and Division of Water Quality.