



Irrigation Companies and the Great Salt Lake: Managing Water in Utah Amidst Climate Change

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The Great Salt Lake, a key ecosystem and major component of Utah's identity and economy, is threatened by rapidly declining water levels. This problem has caused widespread and ongoing concern from the public, and the Utah Legislature is faced with making water allocation and management decisions to adapt to the state's growing population and changing environment. One important group in this discussion is irrigation companies. Here, we examine how irrigation companies receive and maintain water rights in Utah, their significant role in water management, and recent legislative efforts to incentivize efficient water use so more water reaches the Great Salt Lake. It is critical to understand the role of irrigation companies in water management as regional demands for water increase and supply decreases due to climate change.

Water Level Declines in the Great Salt Lake

The Great Salt Lake has experienced substantial declines in water level over the past two decades, posing ecological and economic challenges to the region (Figure 1; Utah Division of Water Resources, 2024). Key factors contributing to lake-level decline include irrigation for agriculture and use by the municipal and industrial sector. Together, water consumption via these pathways is responsible for an estimated 67%–73% of the current lake-level decline (Great Salt Lake Strike Team, 2023). An additional 8%–11% of current lake-level decline is attributed to reduced water supply from direct evaporation, which has been exacerbated by climate warming (Great Salt Lake Strike Team, 2023).

- **Agriculture** – Irrigation for agriculture is responsible for nearly two-thirds of diverted water consumption in the Great Salt Lake Basin (Utah Division of Water Resources, 2024).
- **Municipal and Industrial Sector** – The municipal and industrial (M&I) sector accounts for about 25% of diverted water consumption in the Great Salt Lake Basin. The largest proportion of M&I water usage is attributed to residential, institutional, and commercial landscape irrigation, with industries such as mineral extraction also contributing (Utah Division of Water Resources, 2024).
- **Drought and Climate Change** – Increased evaporation due to higher temperatures and reduced inflow due to declining snowpack contribute to lower lake levels (Utah Division of Water Resources, 2024). In northern Utah, annual mean temperature has increased by more than 3 °F since 1983 (Great Salt Lake Strike Team, 2023). And since 1979, the amount of water in Utah's annual peak snowpack has declined by 16%, reducing late-summer inflows (Natural Resource Conservation Service [NRCS], n.d.; NRCS and National Water and Climate Center, n.d.; U.S. Geological Survey, n.d.).

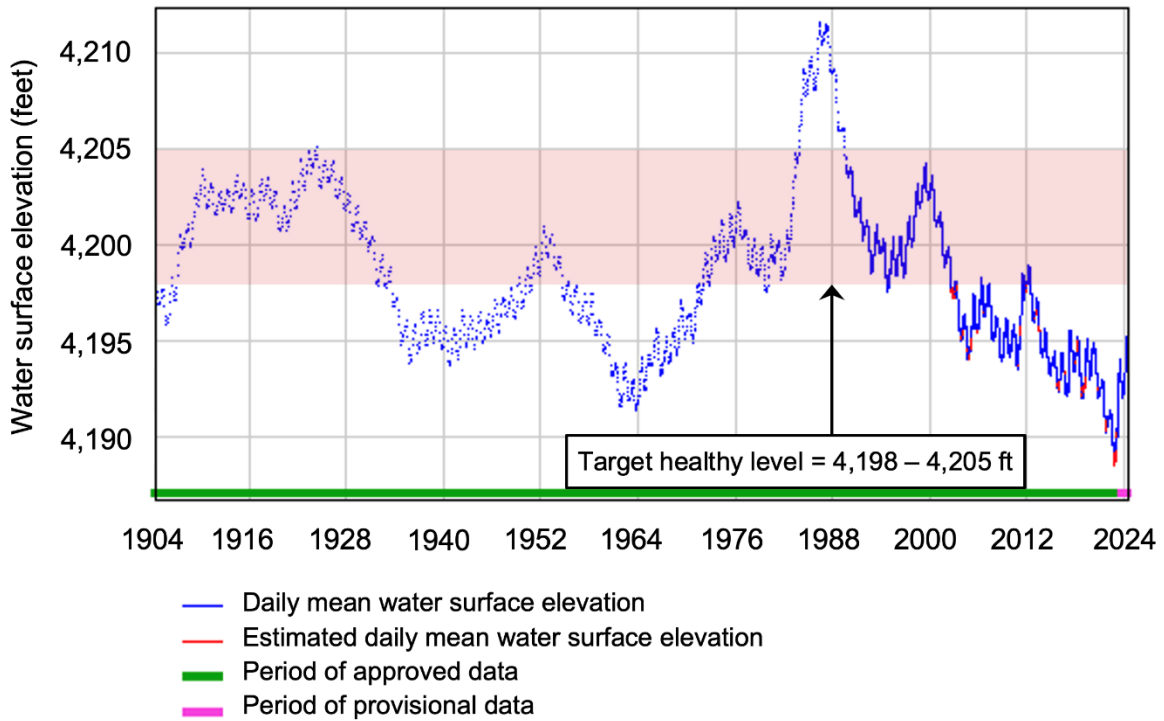


Figure 1. Daily Mean Water Surface Elevation of the Great Salt Lake at Saltair Boat Harbor

Note. The Great Salt Lake commissioner identifies 4,198–4,205 feet as the target healthy range for the lake level (Steed, 2024).

Source: U.S. Geological Survey National Water Information System, 2024.

Importance of the Great Salt Lake

Water in the Great Salt Lake is important for many ecological and economic reasons. The lake lies along the path of the Pacific Flyway, one of the major migratory routes for birds in North America. Over 10 million birds representing over 300 species use the Great Salt Lake as a stopover during migrations between breeding and wintering grounds (Utah Division of Water Resources, 2024). For many species, the lake provides a crucial resting and feeding area, allowing them to refuel before continuing their journey (Baxter & Butler, 2020). The Great Salt Lake also supports many archaea, bacteria, and phytoplankton as well as brine shrimp and brine flies, which are the primary food sources for birds and other types of animals (Figure 2; Utah Division of Wildlife Resources, 2021). Wetland plants such as bulrush, cattails, and duckweed make their home in the shallows or on the water's surface (Utah Geological Survey, n.d.). The Great Salt Lake also traps accumulations of heavy metals, toxins, and other harmful particles underwater (Wurtsbaugh et al., 2020). When submerged, lakebed sediments cannot become airborne during windstorms, and this protects air quality for the millions of people and animals living in the Great Salt Lake Basin (Figure 2; Baxter & Butler, 2020; Grineski et al., 2024).

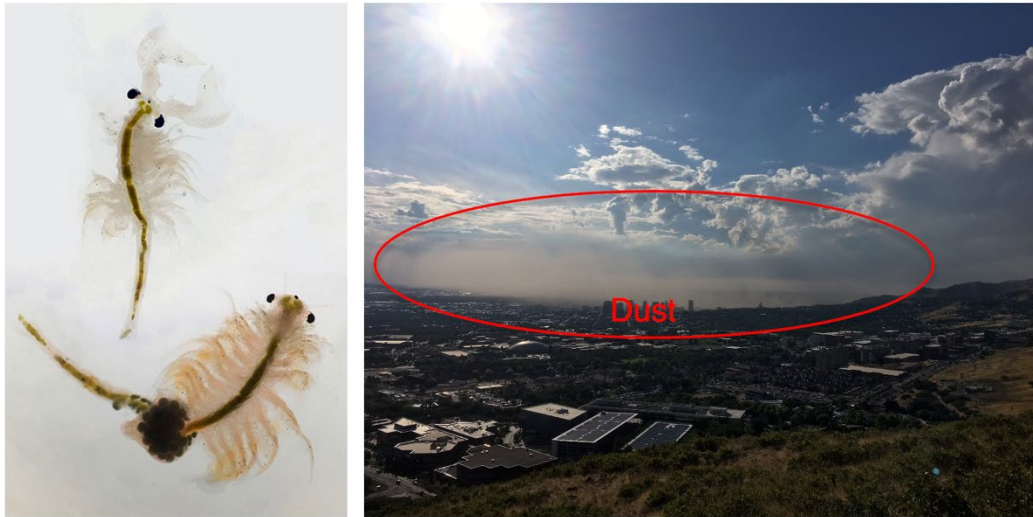


Figure 2. (left) Male and female (bottom) brine shrimp, with the female carrying eggs termed “cysts.” (right) A dust storm blows lakebed sediments from exposed portions of the Great Salt Lake into the densely populated urban area of Salt Lake City, UT, on September 13, 2023.

Photo credits: (left) Utah Division of Wildlife Resources, 2023a; (right) Molly Blakowski.

Economic activities relating to the Great Salt Lake generate \$1.9 billion annually, or about 0.88% of Utah’s total gross domestic product (GDP) (Great Salt Lake, n.d.). The brine shrimp industry helps feed millions of people globally and is valued at \$10–\$67 million (Utah Division of Water Resources, 2024; Utah Division of Wildlife Resources, 2023b). In addition, water evaporated from the lake is responsible for 5%–10% of local snowfall, which contributes to a \$1.2 billion ski industry along the Wasatch Front (Great Salt Lake, n.d.). Future financial benefits may also result if healthy lake levels keep harmful particles submerged and prevent toxic dust (Baxter & Butler, 2020).

However, before water can reach the Great Salt Lake, it is needed for an array of uses, including irrigation as part of Utah’s agricultural industry. Agriculture is important in Utah, especially in the Great Salt Lake Basin. In 2017, almost 2% of Utah’s population was employed in agricultural activities (Department of Workforce Services, 2021), and in 2021, revenue from agriculture equaled that of the Great Salt Lake, making up another 0.88% of Utah’s GDP (Hilton et al., 2022). The Great Salt Lake Basin supports about 623,800 acres of irrigated farmland, including 421,700 acres in Utah, which represents nearly 40% of Utah’s total irrigated farmland (Barker et al., 2022; Zesiger et al., 2023).

Agriculture in Utah and economic activities related to the Great Salt Lake each generate about \$1.9 billion annually.

With water needed both along the route to the lake and in the lake, Utah is challenged to provide adequate water for ecosystems, people, and industries in the Great Salt Lake Basin. Many bills concerning water management for the Great Salt Lake have been introduced in the Utah Legislature, with some already passed and others set aside for potential consideration in the future. [House Bill 491](#), “Amendments Related to the Great Salt Lake,” passed in 2023 and established the Office of the Great Salt Lake Commissioner (H.B. 491, 2023). The commissioner plays a role in designing a holistic approach to water management for the Great Salt Lake, striving to balance diverse interests related to its health. One partner of the commissioner is the Great Salt Lake Strike Team, which was formed in 2022 to provide crucial data and research to decision-makers regarding watershed and water level management strategies (Steed, 2024). These initiatives reflect Utah’s effort to ensure the sustainability of the Great Salt Lake ecosystem through effective water management.

Because irrigated land in the Great Salt Lake Basin consumes 64% of the diverted water and much of this use is brokered by irrigation companies, it is important to understand the water law framework and role that irrigation companies play in Utah's water management (Utah Division of Water Resources, 2024). Background on water law and irrigation companies in Utah provides context for recent legislative actions that affect water rights and water allocation to the Great Salt Lake.

Water Law

In Utah, water is allocated by the government through water rights or water shares (Division of Water Resources, 2021; Water and Irrigation, n.d.). A water right is established when the Utah Division of Water Rights gives a landowner or entity permission to use a set amount of water from a particular source for what is deemed a beneficial use, typically one that supports the economy (Division of Water Rights, 2024). A water share is when a water owner, often an irrigation company, grants shareholders access to a portion of the water rights held by the company (Israelsen et al., 1946; Gittins, n.d.).



Irrigated land in the Great Salt Lake Basin consumes 64% of the diverted water.



The Great Salt Lake needs water, as do ecosystems, people, and industries in the surrounding basin.

Generally, the first person or entity to use a water source for what is deemed a beneficial use is given priority to use it, known as the “first in time, first in right” principle, officially referred to as *prior appropriation* (Division of Water Resources, 2021; Gittins, n.d.). However, if water is not used, the water owner risks losing the associated right (Division of Water Rights, 2024; Israelsen et al., 1946). This facet of water law is critical during drought, when non-use and strategic allocation of water are essential, yet water rights holders can reasonably feel pressure to demonstrate continuous use (Division of Water Resources, 2021; Gittins, n.d.).

Those with a claim to the water in the Great Salt Lake Basin or an interest in how it is allocated include the Ute, Paiute, Goshute, and Shoshone nations; local, state, and federal government; environmental

organizations on behalf of species that need the water for survival; recreation authorities; businesses; landowners; scientists; and—our focus below—irrigation companies (Northwestern Band of the Shoshone Nation, n.d.; Utah American Indian Digital Archive, 2008a; Utah American Indian Digital Archive, 2008b; Division of Water Resources, 2021; Southern Ute Indian Tribe, 2024).

Role of Irrigation Companies

For centuries before the arrival of Euro-American settlers, the Ute, Paiute, Goshute, and Shoshone peoples lived in the Great Salt Lake Basin, sustained by hunting and foraging (Northwestern Band of the Shoshone Nation, n.d.; Utah American Indian Digital Archive, 2008a; Utah American Indian Digital Archive, 2008b; Southern Ute Indian Tribe, 2024). In 1847, Mormon settlers began damming creeks and digging ditches to facilitate agriculture, leading to the establishment of today's irrigation companies (Armstrong & Jackson-Smith, 2017; Clyde, 1959; Israelsen et al., 1946). Adopting the "first in time, first in right" water rights principle coincided with the creation of these irrigation companies, which then took precedence over future users (Division of Water Resources, 2021; Gittins, n.d.). As a result of their substantial water use for agriculture, irrigation companies have held considerable influence over water resources in Utah (Division of Water Resources, 2021; Israelsen et al., 1946).

Irrigation companies sell water shares to farmers for agriculture (Armstrong & Jackson-Smith, 2017) and, in return, maintain infrastructure like canals and pipes. Irrigation companies often prioritize water use efficiency by implementing modern irrigation practices (e.g., efficient sprinkler systems, drip irrigation, soil moisture monitoring) and help farmers generate income by providing technical assistance to optimize water usage (Agricultural Water Optimization Task Force, 2022; Israelsen et al., 1946). Over 700 irrigation companies operate in the Great Salt Lake Basin (Larsen, 2023; Figure 3). Larger companies can include hundreds of shareholders who typically must agree by majority on how to allocate the water and spend the company revenue (Larsen, 2023).

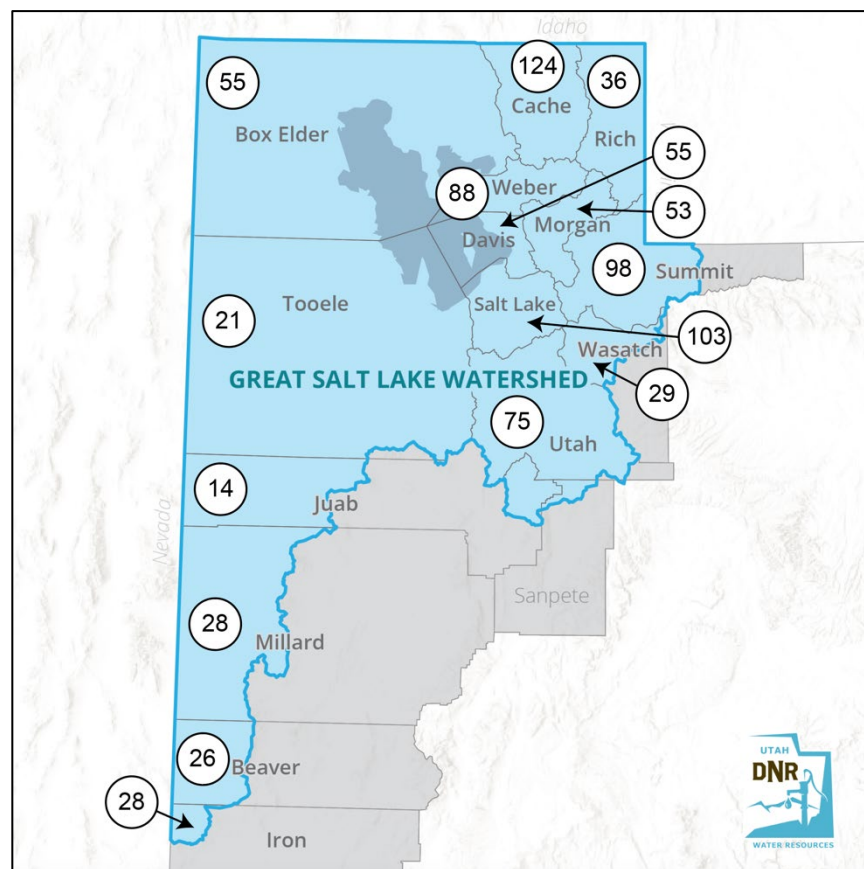


Figure 3. Number of Irrigation Companies by County in the Great Salt Lake Basin

Source map: Utah Division of Water Resources, n.d.; Data source: Utah Division of Water Rights, 2023.

Current Legislation Affecting Irrigation Companies

Legislation shapes the operations of irrigation companies, influencing their ability to manage water rights effectively. In recent years, bills passed and requests made have empowered and constrained irrigation company activities. Four examples follow.

H.B. 33, Instream Water Flow Amendments

This bill changed Utah’s water law in two major ways. First, it expanded “beneficial use” to include environmental needs, such as maintaining lake levels. Thus, entities like the Utah Division of Forestry, Fire, and State Lands can buy water leases or water rights and let that water flow into the Great Salt Lake. Second, the bill upended the “use it or lose it” doctrine, allowing those with water rights (e.g., irrigation companies) to lease out water they choose not to use. H.B. 33 took effect on May 1, 2022.

H.B. 520, Fallow Land Amendments

Fallowing land refers to leaving agricultural lands unirrigated or unfarmed for one or more growing seasons. This bill clarified that fallowed land should be assessed on its productive capacity rather than its market value, thus making it eligible for tax benefits. This legislation seeks to encourage water conservation practices and responsible land management among farmers by permitting non-use of water without taking away water rights. H.B. 520 took effect on May 1, 2024.

S.B. 18, Water Modifications

This bill described how water rights holders can lease water they save by using water-efficient technologies without forfeiting their water rights. This incentivizes irrigation companies to optimize their water use and account for saved water in their operations. S.B. 18 took effect on May 1, 2024.

Request for Appropriation (RFA): Great Salt Lake Split-Season Lease Project

This initiative requested \$500,000 to establish split-season programs so irrigation companies can lease water during the growing season without losing their water rights, thereby allowing the water to flow toward the Great Salt Lake instead of being used for agricultural purposes. During the 2024 legislative session, \$170,600 was allocated for these programs.

Together, these legislative actions allow irrigation companies to lease water without losing water rights and establish funding to purchase leases on behalf of the Great Salt Lake. Still, implementing effective leasing programs remains challenging. First, irrigation companies need to be willing and able to lease water. This requires both shareholder approval and available water to lease. Many companies with agricultural shares have little or no excess water to lease without sacrificing agricultural production and profits. Another challenge is shepherding leased water. This requires coordination among shareholders so that leased water is not consumed and can be traced downstream. It also requires accurate monitoring of reduced water diversion and depletion—many leases could be based on depletion, which is difficult to measure (Allen et al., 2020). Other needs include skilled labor to monitor and manage the leased water and accounting and transaction infrastructure for tracking water purchases.

Conclusion

The Great Salt Lake is at risk, largely due to the combined effects of agricultural water consumption, population growth, and climate change. Irrigation companies are therefore important in Utah's decisions about water

allocation to address the lake's water shortage. Recent legislation encourages water optimization strategies such as allowing the non-use of water and leasing saved water, but water gauges, meters, skilled labor, and other resources are needed to ensure that leased water is making it to its intended destination. Both accurate monitoring and sustainable water management practices are crucial for adapting to the environmental challenges facing the Great Salt Lake.

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