

Basin Profile: Great Salt Lake Basin**Original Report By:** Emily Powell, University of Virginia**Profile Prepared By:** Laura Szczyrba**Water Scarcity Status**

- The waters of the Great Salt Lake Basin (GSLB) never reach the ocean (it is a terminal lake).
- The Utah Water Resources Department has forecasted a shortfall of 800,000 acre-feet per year for consumptive uses within the GSLB by 2050.
- On the lake itself, industrial evaporation ponds for salts and other minerals are the primary human consumptive use of water, consuming hundreds of thousands to possibly millions of acre-feet per year.
- There is substantial concern that pollutants like mercury, excess nutrients, arsenic, and lead could be harmful to the reproduction cycle of the lake's shorebirds and ducks.

Basin Overview

Utah, United States of America

Area: 85,470 square kilometers (33,000 square miles)

Climate: Arid

Basin population: 2,700,000

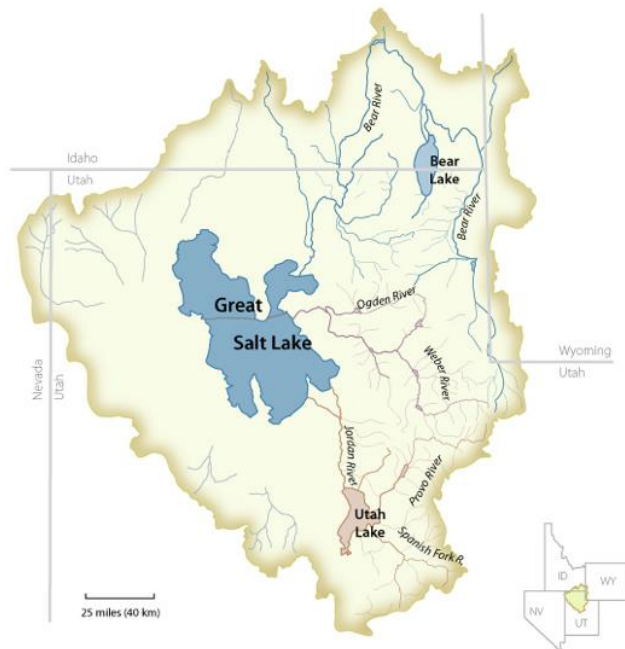


Figure 1: Great Salt Lake Basin (Learn.Genetics, University of Utah, 2012)

The basin covers 33,000 square miles (85,470 square kilometers) and four states: Utah, Idaho, Wyoming, and Nevada. The Great Salt Lake Desert borders the GSLB to the west and contains the Bonneville Salt Flats, which is used as an automobile raceway and testing grounds. The Wasatch Mountain Range forms the northern, eastern, and southern borders of the basin.

The GSL receives an average of 2.9 million acre-feet (3.6 cubic kilometers) of inflow annually. The majority of this water comes from surface flows: 66% comes from rivers and streams, while 31% comes from direct precipitation and just 3% from groundwater. The surface water comes from three main sources: the Bear River, the Jordan River, and the Weber River.

Most of the people in the GSLB live in the Salt Lake City metropolitan area, including Ogden to the north and Provo to the south. There are approximately 2.7 million people living in the basin (as of 2000), with 1.2 million living in the Salt Lake City area and 1.7 in the Wasatch Front, which includes Salt Lake City, Ogden, and Provo (as of 2012). The population of the region has been growing steadily over the past few decades, and this growth is expected to continue well into the future.

Water rights within this basin are legally established, but there is room for improvement in the monitoring of those rights. Each state administers its own water rights, often regardless of what other states are doing. Most of the basin is within Utah, but parts of it also stretch into Idaho, Wyoming, and Nevada, and each state has its own management practices for the water within its boundaries. It also contains three distinct watersheds. Two rivers are entirely within Utah, yet are still managed independent of one another and mostly independent of the lake. There not a basin-wide management system in place, and this dearth of leadership and coordination is setting the stage for difficulties down the road.

For the lake and the rivers that are entirely within Utah (the Weber and Jordan), the Utah Department of Water Quality is starting to look at the whole picture with regards to water quality, as discussed in the previous section. The Utah Department of Water Quality has begun studying the effects of various pollutants, and is creating a TMDL (total maximum daily load of pollutants) plan for the Jordan River. Utah has also re-established the Great Salt Lake Advisory Council, with the purpose of advising the legislature about sustainable management of the lake. Finally, Utah has created the Great Salt Lake Comprehensive Management Plan. This plan aims to take a holistic view in managing the lake and its ecosystem sustainably, but focuses almost entirely on the lake.

Several sectors of local economy rely directly on the lake or inflowing rivers: the mining of brine shrimp for their eggs, mineral extraction, and agriculture. Salt and mineral harvesting is by far the largest industry dependent upon the lake. The US Magnesium plant is one of the largest alloy producers globally. It supplies all of the primary magnesium metal in the United States, and 14% of the global supply. It is estimated that the lake alone contributes \$1.3 billion annually to Utah's economy. \$1.1 billion of this is directly from the industrial sector, and the remaining amount is primarily from recreation and brine shrimp harvesting. Additionally, it is estimated the lake contributes an estimated \$100 million annually in passive value to the region. Passive value reflects the importance of preserving the lake as a natural resource, and is mainly created by the habitat for resident and migratory waterfowl. The final major economic contribution of the lake is in wastewater treatment. Wastewater discharged into the lake is not required to meet freshwater standards and therefore requires less treatment. This saves the state an estimated \$10-59 million each year.

Water Scarcity Impacts

Environmental Impacts

The Bear River Project (BRP) is a major hydropower development owned by PacifiCorp that is located along 135 miles of the Bear. It was authorized in 1907 for flood control, irrigation, and hydropower, and was completed in 1927. There were no minimum required water releases from any of the dams, which often resulted in wild fluctuations in river levels. The lack of basic environmental flows and unregulated release fluctuations were highly destructive to the ecosystem of the river. In the Black Canyon, below Oneida, this was particularly obvious: trees and shrubs were growing in the middle of the riverbed. These unpredictable flows were also damaging to water quality. Sediment was allowed to build in certain areas of the riverbed instead of naturally flushing with annual floods.

The single greatest human impact on salinity has been the Lucin Cutoff. It is an east-west railroad causeway that was built in 1959. This causeway divided the lake into two parts, which has affected both water quality and water levels. The northern part, Gunnison Bay, receives very little freshwater inflow, while the southern part, Gilbert Bay, receives almost all of it. Due to this, Gunnison Bay is considerably more saline than Gilbert Bay. This higher salinity, on average 27%, in Gunnison Bay prohibits even salt-adapted brine shrimp from surviving there. The only aquatic life in Gunnison Bay is brine flies and photosynthetic sulfur bacteria.

Economic and Social Impacts

When the lake level falls, the wetlands are the first areas to lose water, which has negative consequences for these delicate ecosystems and for the birds that depend on them. High water can also have detrimental impacts. In 1986 and 1987, the lake rose to record high levels that threatened built infrastructure, including the Lucin Cutoff, highway causeways, and water treatment plants. To protect these investments, the Utah government built a series of water pumping plants. These cost \$60 million and drained 2.73 million acre-feet of water into the west desert.

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