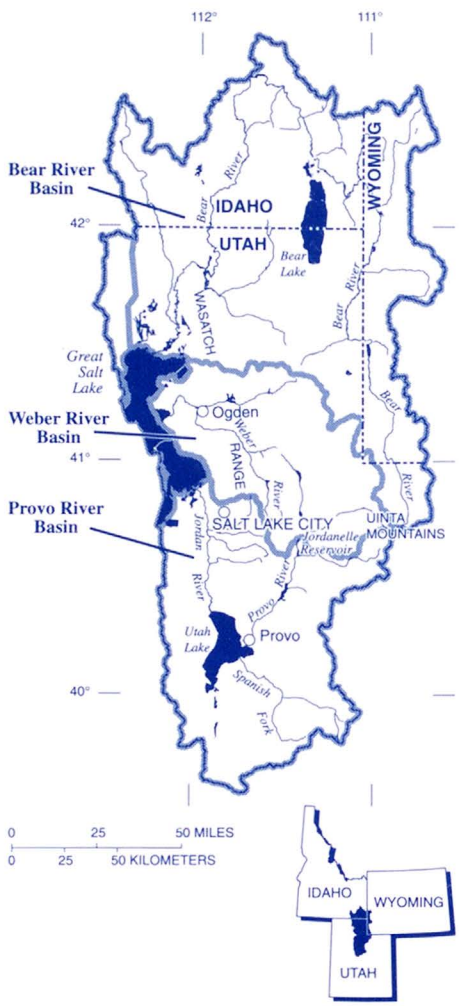
U.S. Department of the Interior
U.S. Geological Survey

Great Salt Lake Basins study unit

NAWQA
Fact Sheet

In 1991, the U.S. Geological Survey (USGS) began implementing a full-scale National Water-Quality Assessment (NAWQA) Program.

The long-term goals of the NAWQA Program are to describe the status and trends in the quality of a large, representative part of the Nation's surface- and ground-water resources and to provide a sound, scientific understanding of the primary natural and human factors that affect the quality of these resources. In meeting these goals, the program will produce a wealth of water-quality information that will be useful to policy makers and managers at Federal, State, and local levels.



A major design feature of the NAWQA Program will enable water-quality information at different areal scales to be integrated. A major component of the program is study-unit investigations, which are the principal building blocks of the program upon which national-level assessment activities will be based. The 60 study-unit investigations that make up the program are hydrologic systems that include principal river basins and aquifer systems throughout the Nation. These study units cover areas from less than 1,000 to greater than 60,000 mi^2 and incorporate from about 60 to 70 percent of the Nation's water use and population served by public water supply. In 1993, assessment activities began in the Great Salt Lake Basins NAWQA study unit.

Description of the Great Salt Lake Basins study unit

Most of the 14,500 mi^2 Great Salt Lake Basins study unit is in Utah but also includes areas in Idaho and Wyoming. The study unit encompasses three major river systems that enter Great Salt Lake; the Bear, the Weber, and the Jordan. The Provo River and the Spanish Fork are large tributary drainages to Utah Lake, which is considered to be the headwaters of the Jordan River. The Jordan River flows northward from Utah Lake through the Salt Lake City metropolitan area before discharging to Great Salt Lake.

The study area includes Utah's three largest cities (the Salt Lake City metropolitan area, Ogden, and Provo) and about 1.4 million people, or 85 percent of the population of the State. The population is expected to grow nearly 50 percent in the next 20 years with most of the increase occurring in the study area.

The NAWQA study unit includes an area of diverse topography, geomorphology, natural vegetation, geology, and climate. Altitude and types of vegetation range from barren mud flats and desert shrubs near the shore of Great Salt Lake at about 4,200 feet (ft), to conifer forests in the Wasatch Range and Uinta Mountains above about 8,000 ft, to areas above the timberline at 10,000 to 12,000 ft.

The headwaters of the Bear, the Weber, and the Provo Rivers are in the western end of the Uinta Mountains. These streams flow through the wider valleys east of the Wasatch Range, emerge through the Range to the west, and discharge into Great Salt Lake.

The western side of the NAWQA study unit is in the Basin and Range Physiographic Province and the eastern side is in the Middle Rocky Mountains Physiographic Province. The stratigraphy is varied and includes formations from many geologic eras and periods and most types of rocks. Limestone and dolomitic rocks have the most effect on the natural chemistry of ground and surface waters. Most of the ground-water supply in the study area is provided by aquifers in either the unconsolidated basin-fill deposits along the Wasatch Front, which is along the mountain front on the western side of the Wasatch Range, or in unconsolidated valley-fill deposits along the major stream and structural valleys east of the Wasatch Range.

Annual precipitation ranges from less than 12 inches (in.) in the valley west of the Wasatch Range to greater than 50 in. in the Wasatch Range 10 to 15 miles east. About 85 percent of the annual precipitation occurs as snow, which accumulates during October to April. Most of the runoff from the melting snowpack occurs during May to July.

Most of the urbanized area in the Great Salt Lake Basins NAWQA study unit is along the Wasatch Front near the mouths of the major rivers. Although grazing on desert shrubland and open woodland is the principal land use in the Bear River Basin, farming and grazing on irrigated land are the uses that most affect water quality in the Basin. Along the highly populated Wasatch Front, urban and industrial land uses most affect the quality of ground water,

and storm-water and wastewater discharge affects the quality of the Jordan River.

The estimated total quantity of water withdrawals (off-stream) in the Great Salt Lake Basins NAWQA study unit was 3,110 million gallons per day (Mgal/d) in 1990. Of the total water withdrawals, 528 Mgal/d (17 percent) was from ground-water sources (wells and springs) and 2,582 Mgal/d (83 percent) was from surface-water sources. Hydroelectric water use (on-stream) was estimated to be 1,708 Mgal/d in 1990.

Bear Lake and several of the major reservoirs in the NAWQA study unit are operated for hydroelectric power, irrigation, public water supply, recreation, flood control, and fish propagation. The new Jordanelle Reservoir was developed as part of the Central Utah Project and is expected to provide, when filled to operational level, about 100,000 acre-feet of water per year for municipal and industrial uses to several counties along the Wasatch Front.

Water-quality issues

Nonpoint sources of pollution are the major impediments to use of streams and lakes in the study area. The major pollutants that affect the use of streams by aquatic life are metals and nutrients. The major pollutant that affects the use of streams for agriculture is dissolved solids. Excessive nutrient levels have caused eutrophication in major reservoirs in the NAWQA study area. Point and nonpoint sources of pollution, including leachates from mining and mill tailings, urban activities, industrial activities, and wastewater from storm sewers and treatment plants, have severely affected the ground- and surface-water resources in Salt Lake Valley.

On the basis of previous and ongoing studies and on discussions at the first liaison committee meeting, the following issues have been identified:

- Contamination from industrial and urban land use in ground-water recharge areas along the Wasatch Front;
- Leachate from mine and uranium tailings and waste from metals refineries in the highly urbanized areas of the Wasatch Front;
- Contaminants in sediments and water in wetland areas;
- Effects of transbasin diversions into the Provo River and the Utah Lake drainages;
- Sediments eroded from stream banks as a result of fluctuating streamflow downstream from hydroelectric plants, modification of land cover, hydrologic changes that result from road development, and urbanization;
- Bacterial contamination that results from grazing, feedlots, and wastewater; and
- High concentrations of nitrogen and phosphorus as a result of grazing, feedlots, and natural factors causes eutrophication, the process by which surface waters increase in biological productivity in response to natural or man-induced nutrient enrichment.

Communication and Coordination

Communication and coordination between USGS personnel and other interested scientists and water-management organizations are critical components of the NAWQA Program. Each of the study-unit investigations will have a local liaison committee that consists of representatives from Federal, State, and local agencies, universities, and the private sector. Specific activities of each liaison committee will include the exchange of information about water-quality issues of regional and local interest, identification and exchange of sources of data and information, assistance in the design and scope of project products, and review of project-planning documents and reports. The liaison committee for the Great Salt Lake Basins study unit was formed in 1994.

References

Fenneman, N.M., 1931, Physiography of the western United States: New York, McGraw-Hill, 534 p.

Toole, T.W., 1992, State of Utah Water Quality Assessment for 1992: Utah Department of Environmental Quality, Division of Water Quality, Section 305(b) Report.

—Kidd M. Waddell and Robert L. Baskin

Type of water use	Estimated surface-water withdrawals (million gallons per day)		Estimated ground-water withdrawals (million gallons per day)		Total withdrawals (million gallons per day)
Irrigation	2,355	(94%)	155	(6%)	2,510
Public supply	190	(43%)	251	(57%)	441
Other[1]	37	(23%)	122	(77%)	159

[1]Other is self-supplied domestic, self-supplied commercial, self-supplied industrial, and mining, fossil-fuel, and livestock/animal specialties.

Information on technical reports and hydrologic data related to the NAWQA Program can be obtained from:

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Water Resources Division
U.S. Geological Survey
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Salt Lake City, Utah 84104