

Integrated Water Resources Management for Great Salt Lake

Description of Priority Research

Overview

Understanding changes in future water supply and its relationship to lake level in Great Salt Lake (GSL) is central to managing the lake's health and contribution to Utah's economy. Over the last 5 years, improved coordination among agencies, researchers, and stakeholders has allowed for significant progress in research, management, and planning related to GSL. Integrated water resources management (IWRM) is critical for long-term, sustained protection of the economic and ecological viability of GSL resources. IWRM for GSL will involve analysis and management of all aspects of water resources, quantity, and quality, in both the lake itself and its contributing basin. This includes management of mineral leases, development of water quality standards, and management of a healthy ecosystem supportive of valuable brine shrimp and bird populations.



Project Description

IWRM requires a framework to examine future water supply and demand and lake response in terms of lake level, salinity, and circulation. The framework would include modeling and analysis of regional climate, basin hydrology, water use, future land use and population change, lake responses, salt input and extraction, and related economic impacts. The resulting modeling framework will be scientifically sound, collaborative, policy-relevant to resource managers, and cost-effective. It will answer questions related to hydrology, salt balance, lake level, and economics.

Research Objectives

Characterizing the relationship between the flow of water and salt to the lake and GSL economic and ecological viability is the primary objective. This topic is identified as an important research priority by the Department of Natural Resources, the Department of Environmental Quality, and the GSL Advisory Council. This research will improve understanding of

- water delivered to the lake in terms of timing, total quantity, and quality;
- pathways of water, minerals, and pollutants through the unique wetland and open water ecosystems of GSL;
- water circulation between GSL's four bays;
- relationship of lake level to critical ecological features and economic resources (e.g. brine shrimp, recreation, and mineral industry)

Another objective is to provide a decision support tool that managers can use to answer questions related to future water supply, lake level, and economic value including the following examples:

- How would land-use change, population growth, and climate change water supply and demand in the future? What are the effects of these changes on seasonal and annual lake level fluctuations?
- Will the seasonality and/or intensity of water delivery to the GSL system change in the future, and will changes positively or negatively affect the economic and ecological viability of the lake and its resources?
- Is it likely that the lake will dip below minimum lake levels identified in the *GSL Comprehensive Management Plan*?
- How can we protect multiple uses with changes in future water supply and demand?
- Can the rate of mineral extraction from the lake continue in the long term?
- How do hydrology and lake circulation affect pollutant fate and transport?

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Critical Elements of Approach

The first phase of the project will develop the details of the selected modeling framework. However, the following elements are critical to the success of the project regardless of the specific framework selected:

Collaboration: The biophysical and legal complexity of water supply to GSL requires clear articulation of management objectives and coordination between multiple agencies and researchers who are already engaged in studying, monitoring, and modeling various aspects of GSL and its basin. The project will include consultation with representatives from state and federal agencies with GSL and/or water resource management mandates; research scientists working on hydrologic analysis and modeling in the GSL basin; and water masters for the Bear River, Weber River, and Jordan River systems. The resulting framework will make best use of existing analyses and incorporate input from multiple state agencies, federal agencies, and research organizations.

Decision Support: The selected modeling framework for GSL will be accessible to a variety of water resource planners, engineers, and decision-makers to test future scenarios and evaluate alternatives. Therefore, the supporting models require easy set-up and use with reasonably short computation time, and must be able to simulate management alternatives.

Integration: Better prediction of lake level fluctuations in the future requires modeling of future water supply and demand scenarios as well as lake response to those changes. This requires combining climate, hydrology, lake, and economic models at appropriate temporal and spatial resolutions.

Transparency: Because the answers resulting from the modeling framework could have significant implications to the management of water in GSL and its basin, the modeling framework including key assumptions, process equations, and input data must be transparent and available to stakeholders and scientists representing diverse interests.

Mission of the Great Salt Lake Advisory Council

...to advise on the sustainable use, protection, and development of GSL.

Duties of the Council

...to advise the Governor, the Department of Natural Resources, and the Department of Environmental Quality on the sustainable use, protection, and development of GSL in terms of balancing sustainable use, environmental health, and reasonable access for existing and future development.

IWRM as a Research Priority

In the past year, the Council has sponsored studies on the economic value of the lake and defined ecological health for the unique GSL ecologies. Recently, the Council assembled a master list of research priorities drawn from these studies and from other DNR and DEQ management and planning efforts, and they have solicited input from GSL scientists and managers via a survey to prioritize the most critical research priorities. This project, aimed at developing tools to support IWRM for GSL, represents the selection of the top research priorities for GSL based on the survey and needs identified by industry and lake managers.