Definition and Assessment of Great Salt Lake Health

©Gary Crandall

Executive Summary of 1/18/12 Report prepared by Applied Conservation, SWCA and nine leading scientists for The Great Salt Lake Council.
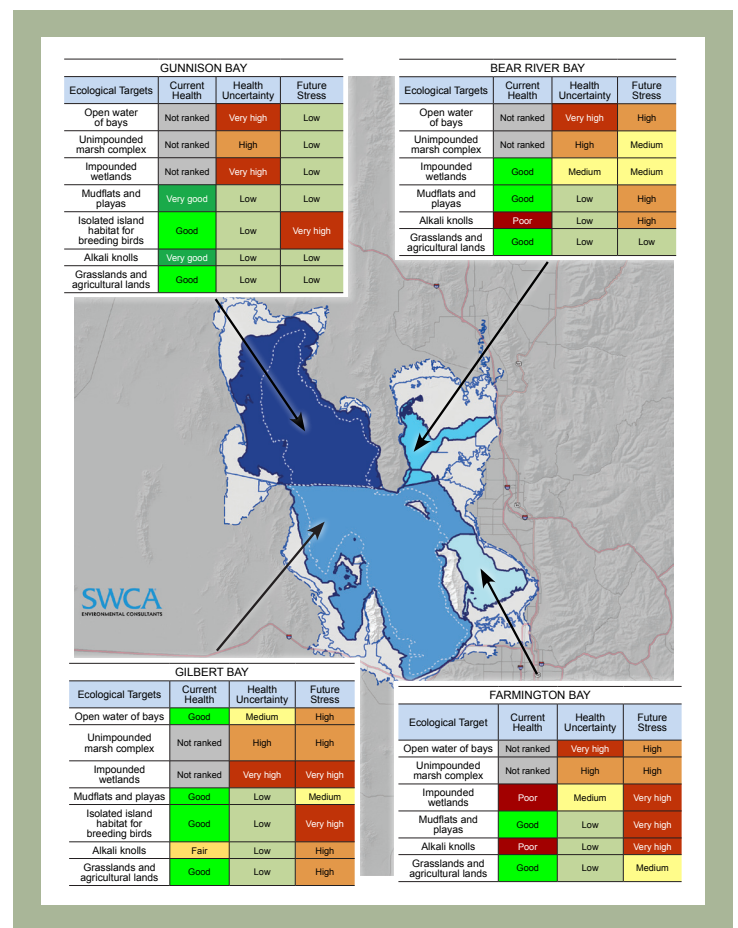
Background Information

The Great Salt Lake is one of the most important and least understood ecosystems in Utah, and possibly North America. In its current form, it is of worldwide importance for migratory bird populations, and its shorelines represent some of the premier wetland areas in the United States. It is home to the most significant (largest) populations of Artemia franciscana (brine shrimp) in the Western hemisphere. It is influenced by an array of natural and human factors resulting in a dynamic and complex web of natural habitats and human uses. This project, commissioned by the Great Salt Lake Advisory Council, comprises a definition of health, an assessment of current health, and an identification of critical future stresses to Great Salt Lake health.

Defining Lake Health

In the context of this project, the term health refers to ecological health, in particular how well the lake functions to support significant bird populations, brine shrimp, and stromatolitic structures. Human uses of the lake for public health, recreation, minerals extraction, and brine shrimp cyst harvest were not considered. Ecological health was based on the lake's current physical form, including dikes and causeways that segment the lake into four bays and impounded wetlands created to increase habitat for waterfowl and other birds. This project does not attempt to define health as the "natural" pre-settlement condition of the lake, because this condition is not feasibly attainable and it is unknown to what extent it would support current populations of significant species. The project does not form any policy or management recommendations. Rather, the information provided in this document is objective, based on science, and is intended to be used to advise government officials on the sustainable use, protection, and development of Great Salt Lake.

©Louenda Downs

GUNNISON BAY

Ecological Targets	Current Health	Health Uncertainty	Future Stress
Open water of bays	Not ranked	Very high	Low
Unimpounded marsh complex	Not ranked	High	Low
Impounded wetlands	Not ranked	Very high	Low
Mudflats and playas	Very good	Low	Low
Isolated island habitat for breeding birds	Good	Low	Very high
Alkali knolls	Very good	Low	Low
Grasslands and agricultural lands	Good	Low	Low

BEAR RIVER BAY

Ecological Targets	Current Health	Health Uncertainty	Future Stress
Open water of bays	Not ranked	Very high	High
Unimpounded marsh complex	Not ranked	High	Medium
Impounded wetlands	Good	Medium	Medium
Mudflats and playas	Good	Low	High
Alkali knolls	Poor	Low	High
Grasslands and agricultural lands	Good	Low	Low

GILBERT BAY

Ecological Targets	Current Health	Health Uncertainty	Future Stress
Open water of bays	Good	Medium	High
Unimpounded marsh complex	Not ranked	High	High
Impounded wetlands	Not ranked	Very high	Very high
Mudflats and playas	Good	Low	Medium
Isolated island habitat for breeding birds	Good	Low	Very high
Alkali knolls	Fair	Low	High
Grasslands and agricultural lands	Good	Low	High

FARMINGTON BAY

Ecological Target	Current Health	Health Uncertainty	Future Stress
Open water of bays	Not ranked	Very high	High
Unimpounded marsh complex	Not ranked	High	High
Impounded wetlands	Poor	Medium	Very high
Mudflats and playas	Good	Low	Very high
Alkali knolls	Poor	Low	Very high
Grasslands and agricultural lands	Good	Low	Medium

SWCA
ENVIRONMENTAL CONSULTANTS

The Planning Process

The definition of health was developed using the Conservation Action Planning (CAP) framework, drawing on the scientific expertise of lake researchers. The project's Science Panel consisted of a group of prominent scientists with extensive experience and knowledge of the varied Great Salt Lake habitats and species. The Panel chose to define health for eight separate ecological targets in and around Great Salt Lake up to an elevation of 4,218 feet (1,286 meters). The eight ecological targets are: 1) system-wide lake and wetlands, 2) open water of bays, 3) unimpounded marsh complex,

Ecological Targets	Gilbert Bay	Gunnison Bay	Bear River Bay	Farmington Bay	OVERALL RANKING	Uncertainty[1]
Table 10. Current Overall Health of Eight Ecological Targets for Great Salt Lake Summarized by Bay						
System-wide Lake and Wetland	Good				Good	Medium
Open Water	Good	Not ranked	Not ranked	Not ranked	Not ranked	Very High
Unimpounded marsh complex	Not ranked	Not ranked	Not ranked	Not ranked	Not ranked	High
Impounded wetland complex	Not ranked	Not ranked	Good	Poor	Not ranked	Very High
Mudflats and playas	Good	Very Good	Good	Good	Good	Low
Isolated island habitat for breeding birds	Good	Good	NA	NA	Good	Low
Alkali knolls	Fair	Very Good	Poor	Poor	Fair	Low
Adjoining grasslands and agricultural lands	Good	Good	Good	Good	Good	Low
SUMMARY					Good	Medium

[1] Ecological targets with very high uncertainty are those for which more than 75% of the indicators could not be evaluated with current data for at least 2 bays. Ecological targets with high uncertainty are those for which more than half of the indicators but less than 75% could not be evaluated with current data. Those with Low uncertainty are those for which all indicators could be evaluated with current data. Those with medium uncertainty are those for which one or two indicators could not be evaluated. See Table 11 for a detailed summary of indicators for each ecological target and bay.

4) impounded wetlands, 5) mudflats and playas, 6) isolated island habitat for breeding birds, 7) alkali knolls, and 8) adjoining grasslands and agricultural lands. Collectively, these eight ecological targets capture the full biological diversity of the lake ecosystem. Moreover, these targets support an array of significant species, including brine shrimp, migratory shorebirds, waterfowl, colonial nesting waterbirds, and other birds by providing diverse foraging, breeding, resting, and refuge habitat as well as distinctive habitats for reef-like stromatolitic structures. Health is defined separately for each ecological target found within each of the four distinct bays of Great Salt Lake: Gilbert Bay, Farmington Bay, Bear River Bay, and Gunnison Bay. Because salinities vary greatly between these bays, they support very different ecological communities, ranging from a strictly microbial community in hypersaline Gunnison Bay, brine shrimp and brine flies in Gilbert bay, to gnats (midges) and fish in fresher portions of Farmington and Bear River bays. In turn, the different bays support varying communities of birds.

Key Findings

Based on the definition of health developed through this project, most ecological targets surrounding Great Salt Lake are in good health; although, some of the ecological targets had a high level of uncertainty due to insufficient data and could not be ranked. Specifically, current health rankings for open water of bays and unimpounded marsh complex have a high degree of uncertainty. Several habitats are in poor or fair health, including alkali knolls around Bear River, Farmington, and Gilbert bays, and the impounded wetlands around Farmington Bay. Of the four bays, Farmington Bay was the least healthy, with two ecological targets that were rated in poor condition (Figure ES1).

Stresses Impacting Lake Health

Although the lake's current health is relatively good, a number of future stresses are looming, which could degrade its condition. Many targets faced high to very high ranked stresses. The Panel ranked future stresses to each ecological target. In general, the three highest ranked stresses to Great Salt Lake ecosystems were as follows:

• Reduced lake levels that could cause myriad impacts on the ecosystem, including changes in salinity and increased vulnerability to predators of nesting birds on isolated islands, and stress to the brine shrimp population in Gilbert Bay

• Increased Phragmites and other undesirable plant cover throughout the habitats surrounding the lake and especially around Farmington Bay, also a consequence of reduced lake levels

• Additional permanent loss of alkali knolls, especially in Farmington and Bear River bays where there has already been significant habitat loss

In some cases, these stresses are projected to severely threaten the integrity of Great Salt Lake habitats and the ability of migratory bird species to use the lake ecosystem. In addition, additional loss of other habitats surrounding the lakes is of great concern because they support significant bird populations. There is also concern that increased water development and degraded water quality in the Great Salt Lake Basin could alter the hydrologic regime and delivery of high quality water necessary to support the health of unimpounded marsh complexes. Of all the bays, the habitats in and around Farmington Bay are clearly the most stressed followed by those in and around Bear River and Gilbert bays. Habitat surrounding Gunnison Bay are the least stressed.

Summary

©Louenda Downs

This project represents a first iteration of a definition and assessment of health for Great Salt Lake based on the best science available to the Panel as of December 2011. Ongoing research on the lake and its surrounding habitats will no doubt lead to the need to modify and improve the definition. The method used to define and assess health is based on the first several steps in the CAP process. The CAP workbook, delivered with this report, is set up to continue the process by identifying key sources of stress to the lake and developing effective strategies to protect and improve lake health. The CAP workbook will be most useful as a dynamic, adaptive management tool that is periodically updated by a body of active research scientists and used by lake managers in broad-scale lake planning, including future revisions of the Great Salt Lake Comprehensive Management Plan by the Division of Forestry, Fire, and State Lands.