UTAH LAKE

Introduction

Utah Lake is one of the largest natural freshwater lakes in the western United States. It occupies much of Utah Valley, and is used by Salt Lake Valley as a water source. The Provo, Spanish Fork and American Fork Rivers are primary inflows, and the Jordan River drains the lake north to the Great Salt Lake. While it is large in surface area, the average depth is only about 10 feet. This allows winds to constantly stir up bottom sediments, resulting in turbid water. The lake is commonly perceived as being polluted and undesirable for water recreation. This is in part because of human-caused pollutants, such as agricultural uses around the lake, steel mill effluent, nutrients from sewage treatment facilities and overgrazing in the watershed, but because of its shallowness, the lake has always been somewhat turbid. The turbidity of the lake exerts a controlling influence on the productivity as it controls the photosynthetic activity by limiting light penetration throughout the water column. Although the appearance of the lake may tend to be offensive and initiates concern

Characteristics and Morphometry

Lake elevation (meters / feet)	1,368 / 4,489
Surface area (hectares / acres)	39,214 / 96,900
Watershed area (km^2 / miles^2	8,920 / 3,444
Volume (m^3 / acre-feet)	
capacity	1,113,112,125 / 902,400
conservation pool	0
Annual inflow (m^3 / acre-feet)	754,313,643 / 611,771
Retention time (years)	1.5
Drawdown (m^3 / acre-feet)	750,552,993 / 608,721
Depth (meters / feet)	
maximum	4.27 / 14
mean	2.74 / 9.4
Length (km / miles)	38.3 / 23.8
Width (km / miles)	20.4 / 12.7
Shoreline (km / miles)	122.3 / 76

Location

County	Utah
Longitude / Latitude	111 47 33 / 40 11 45
USGS Map	
DeLorme's Utah Atlas & Gazetteer™	Page 45, A-5, 53, D-5
Cataloging Unit	Utah Lake (16020202)

water quality data does not substantiate the fact that there are significant health risks exist and that water quality is highly impaired.

The area between the Wasatch Front and the Sierra

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Nevada Mountains is stretching and collapsing, leaving the area topographically lower than the mountains to the east and west, forming what is geologically referred to as "the Basin and Range Province. Hydrological, much of the area does not have a route to the ocean for precipitation. (hydrological, the "Great Basin" includes the entire Wasatch Range and the western Uintas.) In moister eras, such as the cold periods of the ice ages, the great basin has filled with water, creating Lake Bonneville, and eventually flooding to the north into the Snake River and to the Pacific Ocean. The drainage was not able to maintain itself as decreased precipitation lowered the lake level of Lake Bonneville, and the remnants are Utah Lake and the Great Salt Lake. Utah Lake remained intact due to its mountainous watershed which contributes a significant amount of water to the area.

Utah Lake currently is controlled by man influence. Without this influence Utah Lake through natural processes could have essentially drained itself The Traverse Mountains originally separated Utah Valley from the Salt Lake Valley, has been removed many years ago. An isthmus formed across the Point of the Mountain during the Lake Bonneville period (much like the isthmus impounding Rush Lake in the next valley to the west) has been downcut by the Jordan River through a natural chain of events. Utah Lake regularly overflowed the isthmus, and has cut it 600' below its original height about 300' above the I-15 level down to the Jordan Narrows. If outlet structures were not in place and the river cut itself 15' deeper, Utah Lake would cease to exist. The hydrology of the river under mans influence has a developed a dynamic meander pattern, indicating that it is at equilibrium and energy is not being spent to further cut the channel. Although, the lake is now controlled by people, which has temporarily halted downcutting of the river, on occasion efforts are expended to deepened the channel to secure the release of more water than would naturally drain. Currently water level are managed to regulate water for Salt Lake County. A dam, at the source of the Jordan River as it leaves the lake, was built in the 1800's to facilitate the management of the waters of Utah Lake.

Over the years, many proposals have been made to artificially raise or control the water level to allow for the development associated with the lands adjacent or even in the lake proper. Proposals have been initiated to drain the lake, to drain Provo and Goshen Bays, to create an island in the lake for recreation or residential development, to construct a causeway across the lake to open development on the western shores, to enhance wetlands associated with the lake proper or other things that creative minds can imagine, but currently none of these ideas have ever left the planning stages. Other plans include the protection of the south half of Provo Bay for wildlife refuge status and the extension of the Provo Airport into Provo Bay

As the Central Utah Project comes to completion and various alternatives for development are evaluated and implemented Utah Lake proper will become more stable, but future appearance may differ dramatically from its current state. Many of the issues associated with development and use are clearly not defined or resolved.

Two important concepts have evolved that will directly influence and perhaps control activities associated with Utah Lake. In 1988 a "Compromise Elevation" which governs the maximum level of the lake as a result of a lawsuit between Salt Lake and Utah counties was established at a level of 4489.045 feet above sea level. When the water level in Utah Lake exceeds this level the Jordan River gates controlling the outflow from the lake are to be "left wide open". The other decision that exerts an influence is a decision by the Unites States Supreme Court which in June, 1987 confirmed title of the bed of Utah Lake to the State of Utah. The court ruled that since the lake was not reserved by the federal government prior to statehood, Utah acquired the lands under navigable waters (called "sovereign" lands) by virtue of its sovereignty and admittance into the union "on an equal footing with the original states" (Utah Enabling Act Ch. 138, 28 Statutes At Large 107. July 16, 1894). The Utah Legislature has provided statutory authority and direction for the management of the State's sovereign lands through the Board and Division of State Lands and Forestry. A general management plan has been developed through that office in conjunction with other interested parties and is available for review through their agency.

Although the shoreline is mostly privately owned with little of it developed, access is usually unrestricted. The water is used for irrigation and culinary water, but due to its high mineral content it must be mixed with water from other sources for satisfactory culinary use.

Recreation

Utah Lake is easily accessible from various points around the lake. Utah Lake State Park is at the west end of Provo's Center Street. From Exit 258 off I-15, a road follows the shore behind the steel mill, from 2000 North in Orem, or northwest from Geneva Road at about 400 S in Orem. American Fork has a marina, access to which is signed from downtown. West of Lehi is Saratoga Springs resort with waterslides and pools and U-68 (Redwood Road) follows the west shore fairly closely for about 22 miles. The road around the west side of West Mountain, from Genola to the Benjamin area, follows the shore closely for about 11 miles, offering easy access to rocky beaches. The lake is accessible by all of these sites, as well as Hobble Creek from the overpass on the west frontage road of I-15 between Exits 265 and 263 (the two Springville exits).

The lake is popular for fishing, boating, sailing, and waterskiing. There are abundant supplies of fish including carp and bullhead in the lake. Anyone fishing should carefully acquaint themselves with drawings of the June Sucker, a endangered fish whose natural range is limited to the lake and the Provo River. Care should be taken to protect these endangered species to assure their propagation and survival

Recreational facilities are fairly well developed at some sites. The State Park has 70 campsites, a marina, boat ramps, flush toilets, a handicap fishing area and an ice rink. The American Fork Marina and Saratoga Springs are also developed. At most access sites, however, visitors may simply walk from the road to the lake. The lake is visible from most areas of the valley, and clearly visible from roads following its perimeter.

In addition to Saratoga Resort, Lakeside Campground is 0.5 miles east of the state park on Center Street in Provo. Camping at the lake itself is allowed in most areas.

Watershed Description

Utah Lake's watershed includes areas east and west of the Wasatch Fault, in both (geologically speaking) the Basin and Range province and the Rocky Mountains. The lake itself, and Utah Valley itself, are part of the Basin and Range province, while the mountains bordering the valley to the east are part of the Rocky Mountains.

The Basin and Range area is generally very flat, with small mountains ranges jutting above it. The climate is clearly arid. West Mountain, the Tintics, and the Lake Mountains are classic ranges.

The Rocky Mountains are much higher, and consequently have more precipitation and large areas of lush vegetation. Continual uplift (as much as 10'/1,000 yrs) results in rocky outcrops wherever soil building processes are outstripped by erosion. In the high elevations, glaciers turned narrow canyons into broad valleys, and the quantity of rock removed is evidenced by the massive Provo bench, the Provo River delta in Lake Bonneville.

Among the tributaries, the Provo River is the largest. It flows through the Wasatch Range in an ancient canyon, which has carried rivers in the past from west to east. The present Provo River has captured drainage in fairly recent history that has added a portion on the Uintas to the watershed. (Details of this process are in the Deer Creek Reservoir report.) Man has further augmented the watershed with diversions from the Duchesne River and the Weber River. The Spanish Fork River has been similarly augmented, receiving water carried from the south face of the Uintas, from Upper Stillwater Reservoir in the Rock Creek Drainage to Strawberry Reservoir, including the Duchesne River, Currant Creek, Layout Creek and Water Hollow Creek. All of this water is drained through the Strawberry Tunnel into the Diamond Fork Drainage, which is a tributary of the Spanish Fork River.

The shoreline of the lake is surprisingly devoid of riparian vegetation. There are few cottonwoods or other common trees and shrubs of desert riparian areas. There are multiple beach lines from fluctuating lake levels, and that may cause enough variability in groundwater levels to preclude cottonwood growth. The flat nature of the valley makes Utah Lake similar to other Basin and Range water bodies, such as Mona Reservoir and Sevier Bridge Reservoir, where fluctuations of one or two vertical feet expose or drown several hundred feet of beach.

The watershed high point, Bald Mountain in the High Uintas, is 3,641 m (11,947 feet) above mean sea level, creating a complex slope of 2.7% to the lake. Mount Nebo is a mere 5 m shorter (3,636 m / 11,929 feet), but is 50 km closer, resulting in an 8.7% slope. Slopes of 100% are not uncommon along the Wasatch Front with some areas in excess of 100%.

The principle inflows are the American Fork River, the Provo River, Mill Race Creek, Hobble Creek, the Spanish Fork River, and Currant Creek. The American Fork River and Currant Creek are entirely diverted for much of the year. Many other tributaries once flowed into the lake during the spring floods, but have since been diverted for culinary or agricultural uses, a partial listing of which includes (clockwise from the Jordan River): Dry Creek (Alpine), Grove Creek, Battle Creek, Slate Canyon Creek (ephemeral), Dry Creek (Mapleton), Benjamin Slough (Beer Creek, Peteetneet (Payson) Creek and Spring Creek), Santaquin Canyon Creek (all from the Wasatch Range) and West Canyon Wash (from the Oquirrh Mountains). A very rough approximation of the average stream gradient above the lake is 2.3% (124 feet per mile).

Most tributaries are impounded to divert water into culinary systems or onto agricultural lands, or to regulate the flow of water into the lake. Tibble Fork Reservoir and Silver Lake Flats Reservoir are impoundments in the American Fork River Drainage. Deer Creek Reservoir and the Jordanelle Reservoir are impoundments of the Provo River. Hobble Creek and the Spanish Fork River have no reservoirs, but both like other tributaries have diversions to shunt water into culinary or irrigation systems. Salem Pond is an impoundment of the source of Beer Creek. The Payson Lakes are augmented natural impoundments in the Peteetneet Creek (Payson Canyon) drainage. Mona Reservoir is an impoundment of Currant Creek.

This diverse watershed contains soils of many different types. A partial listing (omitting all of the artificially diverted watersheds) of the soil associations that compose the watershed are listed in Appendix III.

The vegetation communities consist of all types found in the state. The watershed receives 25 - 152 cm (10 - 60 inches) of precipitation annually. The frost-free season around the reservoir is 120 - 160 days per year.

Land use in the natural watershed is 53% multiple use (logging, mining, grazing and recreation on BLM, State, and USFS lands), 31% agricultural, and 16% Urban which includes industrial areas around the lake.

Perhaps the greatest impact that humans have had on Utah Lake has not been changing the biota, dumping sewage and industrial wastes, logging the watershed, grazing the watershed, agricultural runoff or paving the watershed, but has been the elimination of most of the natural inflow to the lake. Before settlement by Europeans, there were no dams, no irrigation systems, and no household use of water.

Limnological Assessment

The historical information contained in this summary of Utah Lake water quality conditions was derived from several reports prepared for the Bureau of Reclamation by Erying Research Institute and Brigham Young University in 1981 and 1982. These studies were conducted to determine the affects of the proposed Central Utah Project on the Utah Lake ecosystem. The water quality data for these studies was collected mainly since 1970 with more than half collected specifically for the BOR studies from 1977 through 1981. Data for Utah Lake and its tributaries are almost nonexistent prior to 1960. Additional data has been collected by the Utah Division of Water Quality (DWQ) within the Department of Environmental Quality and by Mountainlands Association of Governments under contract with DWQ to complete a Clean Lakes Phase I diagnostic/feasibility study study. A final report of their findings is expected by the end of 1995.

Utah Lake's water quality history has fluctuated with the overall Northern Utah climate. Notable rises in total dissolved solids have occurred during the drought period of 1933-34 and during 1977. The hydrologic cycle has an important impact on water quality in Utah Lake. During drought periods, salinity increases as the inflow to the lake is reduced. Evaporation from the lake, can exceed 300,000 acre feet per year. The agricultural water quality standard set by the state for total dissolved solids (TDS) is 1200 mg/L, and Utah Lake's TDS has ranged from a low of 300 to a high of over 4000 during the 1933 drought. Major tributaries such as the Provo, American Fork, and Spanish Fork rivers whose waters are primarily snowmelt produced and have a diluting effect on the lake.

It is known that springs feeding the Northeast side of the lake have a TDS concentration 400 mg/L, while saline springs exist at Lincoln Point with TDS concentrations as high as 6,150 mg/L. The fresh springs are not controlled by faults in the area, but are controlled by depositional deposits associated with the Spanish Fork, Provo, and American Fork rivers entering the lake. The lake model developed by Merritt(1982) predicted that as much as 15 to 20 percent of the inflow to the lake is spring water.

Data from the Provo airport on Utah Lake has provided 5600 daily readings over a four year period on wind speed and direction. Twenty-five percent of the time, wind comes from the Northwest, 10% from the South, and 18% from the Southeast. Only very rarely do winds occur from East to West. Given the physical configuration of Utah Lake, wind is a powerful influence on water quality and mixing in the shallow lake.

Winter ice flows are the most notable physical feature of Utah Lake. Some with walls as high as 10 feet have destroyed most of the old buildings along the shores of the Utah Lake. With some 13 to 20 miles of unobstructed opportunity for prevailing winds to move the ice, and the relatively flat terrain in the vicinity of the lake, surprising distances of shorelines have been covered by ice flows in the winter. Ice as thick as three feet has been measured at some locations in recent years. Recently, sheets of ice as high as 10 feet have damaged facilities at Utah Lake State Park.

Transparency is generally poor due to the shallow nature of the lake and wind action. Measurements made during May, August and September 1975 showed that the transparency averaged ten inches.

Historical water quality data for Utah Lake and its tributaries are almost nonexistent prior to 1960. Most of the date have been collected since 1970 and the majority since 1977 as a result of studies at the Erying Research Institute, Inc. The available water quality date have been tabulated in the report, "Utah Lake Phase I Report #20, by Merritt and Wood. The quality of lake and tributary water ranges from poor to good when compared when compared to the Utah water quality standards prior to the recent revision. A discussion by Merritt and Wood concerning existing water quality versus existing state standards at the time shows few violations in free-flowing streams and natural drainage flows except when those waters receive effluent from wastewater treatment plants (WWTP). The majority of violations were associated with ammonia (NH3), orthophosphorus (OP), biochemical oxygen demand (BOD) with some violations associated with dissolved oxygen (DO), total dissolved solids (TDS), and heavy metals.

The heavy metal violations were usually associated with WWTP effluent, but were relatively infrequent with limited duration. It was concluded that heavy metal violations were of little concern because of infrequent incidents, their minor nature, and their occurrence in relatively alkaline waters which tends to reduce toxicity.

TDS violations are largely due to natural conditions and nonpoint source return flow and seepage from irrigated lands. In addition, the TDS concentrations within the lake vary markedly over time. These variations consist of not only seasonal cycles buy cycles over extended periods of time. These changes are due largely to climatic conditions associated with wet and dry climatic cycles.

The EPA National Eutrophication Survey Program conducted in 1973-74 reported Utah Lake to be the most eutrophic lake of the 27 lakes survey in Utah. Furriman (1981) reported the lake to be hypereutrophic with a mean in-flow of phosphorus concentration of 0.218 mg/l and inorganic nitrogen concentration of 2.065 mg/l. Merritt and Wood reported mean phosphorus concentration of 0.3 mg/l and nitrogen concentration of 1.56 mg/l.

Pollution indicators have been established as part of the Standards of Water Quality for waters of the state for phosphate as P at 50 ug/L in streams and 25 ug/L in lakes; and nitrate as N at 4.0 mg/l. Applying these indicator values, it is evident that there is a very large nutrient loading into the lake to sustain algae growth. However, the dominant limiting factor associated with algal growth in the lake is the presence of high turbidity. High turbidity limits light penetration and hence limits algal growth.

An associated problem which may develop with the production of algae and aquatic plants due to high availability of nutrients is oxygen loss during the decomposition phase of the plant growth cycle. These appear to be only a minor problem due to the lake of thermal-density stratification of the lake and the high frequency of wave action which aids in the oxygenation of the water during spring, summer and fall. During the winter, lack of decomposing organic matter under the winter ice which forms on a limited basis precludes serious oxygen depletion.

Although oxygen depletion has not been extensively documented under winter ice there is some evidence (odor's, visual evidence, and low oxidation reduction potential measure shortly after off-ice in the spring) of anoxic conditions in some areas of the lake. These areas are usually confined to the margins and bay areas.

The turbidity which limits algal productions is the source of the public perception that the lake is polluted. The lake's relative shallowness and flocculent calcite bottom sediments, couples with climatic conditions producing frequent wave action, allows for the continual resuspension of bottom sediments into the water column. These resuspended calcium carbonate calcite crystals and algae account for the gray-green turbidity associated with the lake. Merritt and Word reported that water in the bay areas and near tributaries is relatively clear. It was estimated that about 50 percent of the total sediments and 65 percent of the calcite appear to be originating in the lake itself via mineral precipitation.

Other pollutants which need consideration which need consideration are pathogenic microbes, organic materials, pesticides, and heavy metals. Merritt and Wood felt at the time of their work that there were no significant concerns for these pollutants. They concluded:

1) Pathogenic microbes die off rapidly in open-water environment,
2) organic debris degrades quite rapidly over time, and
3) pesticides, herbicides and other relatively non-biodegradable compounds may cause long-term pollution problems.

However, pesticides and herbicide tests on tributary water, lake water and sediments, generally show concentrations to be one of three orders of magnitude lower than state standards required. In addition, they cited reports indicating low concentration of pesticides and heavy metals in fish tissue analyses.

Utah Lake is a highly productive ecosystem with the majority of production occurring as massive bluegreen algal "blooms" late in the summer and fall. The dominant planktonic bluegreen algae present in the lake are *Aphanizomenon flos-aquae*, *Anabaena spiroides var. crassa* and species of *Microcystis*. All of these species are nuisance algae which cause various water quality problems in eutrophic systems throughout temperate regions.

The diversity of diatoms in Utah Lake is high. The planktonic diatoms are mostly centric species typical of eutrophic systems. The dominant diatoms in the littoral regions are mostly pennate diatoms. The majority of the dominant species in the littoral are also typical of eutrophic systems.

The soft bottom benthos community of Utah Lake makes up 93 to 99% of the total area depending on the level of lake drawdown. Chironomid larvae (blood worms or midge flies) and oligochaetes (fresh water worms) are the dominant benthic community members. Studies determined that Provo Bay supports lower densities of oligochaetes and chironomids than Goshen Bay and the

Main Lake. Both Goshen Bay and the Main Lake are more similar to each other than to Provo Bay.

The highest zooplankton numbers were found in summer and late fall while the lowest numbers were present during the winter, when the lake was iced over and immediately after the ice melt in April. The Provo Bay area of Utah Lake had the highest concentrations of zooplankton.

Goshen Bay and the main lake were more similar to each other than either were to Provo Bay, in terms of seasonal density trends and seasonal changes in the zooplankton community composition. During summer and fall zooplankton composition underwent distinct change. The major component change was a dramatic increase in cladocerans in all lake areas. The summer and fall zooplankton community in Provo Bay underwent a similar change in that a cladoceran became the dominant organism, but there was no shift in species as *Ceriodaphni*a was the dominant organism during the summer (59%) and fall (44%).

Two other significant trends are: first, the general increase of *Cyclops* into the fall and the fact that they made up 15 to 20% of the total community year round in Provo Bay; and second, the area Main Lake North – the northern end of Utah Lake – had very high numbers of *Daphni*a and *Diaptomus*.

A fresh water sponge, *Ephydatia fluviatilis*, present in the littoral habitat of Utah Lake have the greatest percent cover in water greater than one meter deep with a hardpan matrix and a small amount of silt deposition. Acceptable substrate were readily colonized by new sponge colonies.

Mosquito production is high around Utah Lake from early spring to late fall during most years. Production is related to water depth and level fluctuations and vegetation type and cover. The higher production occurs in areas of saltgrass mixed with willows, sedge or other emergent vegetation types and where water depth is less than 12 inches and water level frequently changes. Approximately 80% of the mosquito producing areas around Utah Lake area presently under a regular mosquito control program.

Deerflies and horseflies are a serious nuisance in many areas around Utah Lake from mid-summer through late fall. They are commonly found in areas of shallow marshlands, associated with low ground gradients and slowly receding waters. In Utah County there is no control program for deer and horse flies.

The fish life inhabiting the Utah Lake has changed since the valley was first permanently settled. Trout and suckers were highly visible during early years, but wasteful fishing practices and the introduction of new species such as the carp have all but wiped out those populations. Utah Lake presently supports a population of channel catfish(*Ictalurus punctatus*), black bullhead (Ictalurus melas), walleye (*Stizostedion vitreum*), large mouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), black crappie (*Pomoxis nigromaculatus*), yellow perch (*Perca flavescens*) and white bass (*Morone chrysops*). Non-game species such as carp (*Cyprinus carpio*), Utah suckers (*Catostomus ardens*), fathead minnows (*Pimephales promelas*), and spottail shiner (*Notropis hudsonius*) also inhabit the lake and comprise approximately 66% of the total fish population.

The fish concentration in Provo Bay represents the younger fish spawned that year. The adult fish move out into the main body of the Lake and into Goshen Bay.

A commercial fish operation works from Utah Lake on a year-round basis. The operator harvests the carp to meet large orders from outside the Utah area.

A nearly extinct species known as the June Sucker (*Chasmistes liorus*) also lives in the waters of Utah Lake near the Provo River. This is the only known spawning found in the world for the fish and it appears from more recent studies that populations are dying out with few new generations being produced. As a consequence, the June Sucker is listed as and endangered species and is protected by law. Any actions which could conceivably be detrimental to the survival or recovery of the June Sucker is protected under the Threatened and Endangered Species Act.

Critical spawning habitat for the June Sucker has been identified on the lower Provo River from Columbia Lane to Utah Lake.

Birds are abundant with the passerine or similar small bird comprising 43% of the avifauna. Twenty-seven percent are shore or other aquatic species, 15% are waterfowl, 12% are raptures, and 3% are of the upland game varieties. Utah Lake is an important habitat for the mallard, pintail, redhead, and canvasback ducks. Canadian geese are also highly visible during certain times of the year.

Five migratory bird species nest and/or feed in the marshes and bays. These include the white pelicans, great blue herons, black-crowned night heron, double crested cormorants, and the western grebes.

An evaluation of current data obtained by the DWQ indicates the water quality of Utah Lake is fairly good. It is considered to be very hard with a hardness concentration value of approximately 399 mg/L ($CaCO_3$). Those parameters that have exceeded State water quality standards for defined beneficial uses continue to be total dissolved solids, total phosphorus and on occasion dissolved oxygen sporadically in the water column. The average

Limnological Data

Data averaged from STORET sites*: 491731, 491737, 491739, 491750, 491752

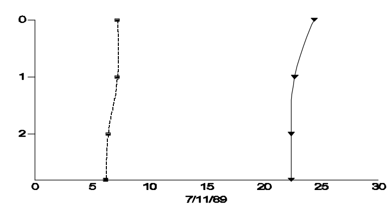
Surface Data	1981	1989	1991
Trophic Status	H	E	H
Chlorophyll TSI	72.3	70.07	65.77
Secchi Depth TSI	80.89	57.22	66.25
Phosphorous TSI	78.70	49.95	71.41
Average TSI	77.29	59.08	67.81
Chlorophyll a (ug/L)	-	69.4	50.0
Transparency (m)	-	2.2	0.5
Total Phosphorous (ug/L)	40	122	79
pH	8.6	8.1	8.4
Total Susp. Solids (mg/L)	-	97	106
Total Volatile Solids (mg/L)	-	-	135
Total Residual Solids (mg/L)	-	-	89
Temperature (ºC / ºf)	15/59	25/77	21/70
Conductivity (umhos.cm)	1392	1712	1914
Water Column Data			
Ammonia (mg/L)	0.07	0.02	0.05
Nitrate/Nitrite (mg/L)	0.19	-	0.05
Hardness (mg/L)	369	390	437
Alkalinity (mg/L)	-	206	198
Silica (mg/L)	-	-	-
Total Phosphorous (ug/L)	40	127	82
Miscellaneous Data			
Limiting Nutrient	N	N	N
DO (Mg/l) at 75% depth	-		
Stratification (m)	-		
Depth at Deepest Site (m)	-		

* There were a significant larger amount of stations during the 1991 Clean Lake study period.

concentration of total phosphorus in the water column for the last two study periods was 127, and 82 ug/L both of which exceed the recommended pollution indicator for phosphorus of 25 ug/L. The state standard for total dissolved solids (TDS) for Class 4 waters is 1,200 mg/L. This is a measurement in general of dissolved inorganic salts, somewhat equivalent to salinity. A general rule of thumb to evaluate TDS from the conductivity for a given water is approximately 60% of the known conductivity is equivalent to the TDS concentration (1,000 conductivity = approximately 600 mg/L TDS). The conductivity of Utah Lake has show a gradual increase in recent years. Although not included in the limnological data, in 1990 the average conductivity was over 2,000 indicating that the state standard had been exceeded at some point in time. Actual TDS data obtained in the Clean Lakes Phase I study conducted via a contract with Mountainland Association of Governments for the period 1990-91 substantiated the exceedences with an average value of 1,187 mg/L in the lake with a maximum value of 1,330 mg/L reported and average annual values over 1,200 mg/L at several of the seventeen stations identified for monitoring.

Data suggest that the reservoir is currently a nitrogen limited system, however, turbidity in the water column form the resuspension of sediments is probably control the productivity of the lake by limiting the penetration of light in the water column and therefore controlling the algal production. TSI values indicate the reservoir is hypereutrophic. The reservoir does not stratify due to its shallow nature and climatic conditions which continually mix the water column as indicated in the profile of July 11, 1989.

According to DWR no lakewide fish kills have been reported in recent years, but some localized fish kills occur periodically due to discharges from point sources. The lake has not been chemically treated by the DWR, so populations of native fishes are present in the lake. Lake Trout in excess of 50 pounds once inhabited the lake, but were finally fished to extinction in the 1940's. The June Sucker still holds a tenuous grip on existence, with the tremendous populations of non-native bass and carp resulting in very low reproductive rates for these fishes.



D	ºC	pH	DO	Cond
0	24.4	8.0	7.2	1700
1	22.7	8.0	7.2	1700
2	22.4	8.0	6.4	1700
2.8	22.4	8.0	6.2	1700

Temp (solid line) DO (dashed line)

Phytoplankton in the euphotic zone include the following taxa (in order of dominance)

Species	Cell Volume (mm^3/liter)	% Density By Volume
Aphanizomenon flos-aquae	158.460	85.20
Euglena species	12.343	6.64
Pennate diatoms	11.565	6.22
Centric diatoms	1.168	0.63
Ankistrodesmus falcatus	.873	0.47
Mallomonas sp.	.667	0.36
Unknown spherical chrysophyte	.667	0.36
Total	2.958	

Shannon-Weaver [H']	0.60
Species Evenness	0.29
Species Richness	0.27

The phytoplankton community is presently dominated by the presence of noxious blue-green algae. This is indicative of a system rich in nutrients with fairly high production.

Pollution Assessment

Nonpoint pollution sources include the following: waste and litter from recreation; treated sewage, household chemicals, and oils from urban areas; toxins, nutrients, and heavy metals from industry; pathogens, sediments, nutrients, chemicals from agriculture; and sedimentation and nutrient loading from grazing, construction or development.

Gravel pits and constant construction in Utah Valley result in a continuous influx of sediments. All commercial mines and timber sales are buffered by one or more reservoirs. Agricultural use of lands occur in direct proximity to the lake shore in many areas.

Point sources of pollution in the watershed include municipal and industrial discharges directly into the lake or in tributaries that are in close proximity to the lake itself.

Beneficial Use Classification

The state beneficial use classifications include: boating and similar recreation (excluding swimming) (2B), warm water game fish and organisms in their food chain (3B), wildfowl and associated organisms (3D), and agricultural uses (4).

Information

Management Agencies	
Mountainlands Association of Governments	377-2262
Division of Wildlife Resources	538-4700
Division of Water Quality	538-6146
Recreation	
Mountainland Travel Region (Vernal)	377-2262
Provo/Orem Chamber of Commerce	224-3636
Lakeside Campground (Provo)	373-5267
Saratoga Springs Resort (Lehi)	768-8206
Utah Lake State Park	375-0731
American Fork Marina	
Reservoir Administrators	
C.U.P.	226-7100