HISTORIC ATTEMPTS TO COPE WITH LEVEL VARIABILITY OF GREAT SALT LAKE, UTAH: A CASE STUDY IN SOCIAL AND ENVIRONMENTAL RELATIONSHIPS

by

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ABSTRACT

The Great Salt Lake is typical of Great Basin and other arid land saline lakes in morphological and chemical characteristics. As with other terminal lakes, the level of Great Salt Lake is determined by the variable weather patterns that are typical of arid and semi-arid regions. Because of it's flat, gradually sloping basin, the lake's depth is normally less than 35 feet; this means that a small fluctuation in level inundates or exposes large amounts of land.

Such natural conditions present special problems for the land use planner and natural resources manager. The region's history is pervaded with frustrated attempts to develop the shores of the lake for recreation, wildlife, and industry.

This study examines human response to climatic variability and the problem of fluctuating lake level. It reviews the history of Great Salt Lake shoreline land use from the first settlers' arrival in the Salt Lake Valley to the recent flooding event of the 1980's, and reviews historic and present perceptions and attitudes about the Great Salt Lake environment.

Great Salt Lake level has been perceived as stable, and until the West Desert Pumping Project decision makers responded to immediate crises rather

than potentially long-term lake level rises. The pumping project represents the first attempt to deal with the issue of longer-term lake level rise.

INTRODUCTION

One of the unifying traditions in the diverse discipline of geography is human-environment interaction. Throughout history, humans altered and used the natural environment in the struggle to provide subsistence. Humans have always needed to evaluate their natural surroundings in terms of economic potential and the technological skill needed to effectively manipulate the environment.

Within the human time frame ecological changes are often difficult to detect and we tend to operate within the current environmental situation, disregarding potentials for sudden change. The level of the Great Salt Lake fluctuates from year to year and has almost unlimited potential for rising beyond it's current level, depending on extended weather patterns for the region. But since Europeans have occupied the basin, the level has remained low enough to allow development within a reasonable distance, and it seems policy makers have operated on the assumption that the lake would not swell beyond a given limit.

Within this context, historic land use patterns are examined in relation to perceptions about the lake and its potential to swell beyond its assumed meander line. How have humans dealt with lake level fluctuations in the past, and are these methods adequate for dealing with potential long-term rises? An understanding of these questions is important if we are to successfully manage future perturbations.

The historic approach is used in this study as it is best able to explicate the development of attitudes and perceptions that underlie management practices. Attitudes of the local public toward this arid environment are characterized by the general feeling the ecosystem is stable, at least in terms of the human time frame, and fluctuations in Great Salt Lake level are small enough to be easily managed.

This attitude is illustrated by the public response following implementation of the West Desert Pumping Project that came as a result of a major rise in lake level. Many people accused Governor Norm Bangerter of using bad judgement in supporting the project after the following year proved to be drier than normal, and the lake would have begun to recede on it's own (Deseret News 1988).

Until the pumping project, response to flooding crises had largely focussed on providing temporary solutions to potentially long-term problems (even this action was designed as a last-minute plan to ameliorate an emergency situation). Rather than acquiesce to the natural workings of the lake ecosystem, managers traditionally did little more than restrict development within 5 vertical feet of the "official meander line" established in 1855 (Greer 1972, Dewsnup 1980). The handling of the recent catastrophic flooding event (which focussed on rebuilding at slightly higher levels) is a classical reflection on the way local population has viewed the Great Salt Lake ecosystem.

PHYSICAL SETTING

The Great Salt Lake is typical of Great Basin and other arid land saline lakes in morphological and chemical characteristics. As with other terminal lakes, the level of Great Salt Lake is determined by the variable weather patterns that are typical of arid and semi-arid regions. Since no rivers flow from the lake, level regulation is entirely dependent upon rainfall, withdrawal from contributing rivers, and evapotranspiration. For these reasons the level varies greatly from year to year and season to season, depending upon the weather. Since there are no rivers flowing from the lake, all minerals that flow into the basin remain there. Over the millennia this has resulted in a very high concentration of minerals, particularly salts.

In 1959 the Great Salt Lake was divided into north and south arms by an almost non-permeable railroad causeway built by the Southern Pacific Railroad. The south arm receives most of the runoff which comes from the Bear, Weber, and Jordan Rivers. The north arm is about half the size of the south arm. Because it receives very little surface runoff, the north arm is lower by more than two feet. It also has a much higher salt concentration due to lack of incoming fresh water.

Because of it's flat, gradually sloping basin, the lake's greatest depth is normally less than 35 feet. This means that a small fluctuation in level inundates or exposes large amounts of land. Ware (1984) estimated that a five foot rise in level would cover an additional 267 square miles of land around the lake.

The level of the lake is directly linked to weather trends and patterns in the lake's drainage basin, and wide variability in yearly precipitation is "normal" for this arid climate. Inversely, the lake has a direct effect on the climate of the basin as shown by the positive feedback model established by Eubank and Brough (1980).

Such natural conditions present unique problems for the land use planner and natural resources manager. Indeed, it is this setting, along with a variable climate that forms the basis for a long history of frustrated attempts to develop the shores of the lake for recreation, wildlife, and industry.

FIRST INHABITANTS

The Great Salt Lake basin was probably first occupied about 10,000 years ago by Paleo-Indians. Until about 600 years ago, resources of the lake's marshes and shores were of primary importance in the subsistence economies of local prehistoric Indians. Lake level fluctuations greatly affected the availability of these resources. Changes in population density and settlement patterns may be attributed to changes in the lake's ecosystem. These early Indians relied on the availability of big game as well as the many varieties of birds, plants and insects[1] of the lake margins.

About 8,500 years ago, relatively sedentary Archaic peoples occupied cave and other rock shelters near the lake edge. By 5,500 to 3,500 years ago, many of the lake's resources were depleted, resulting in a shift to a more nomadic lifestyle which included exploitation of upland resources. Also at this time, flooding had destroyed most of the remaining lake margin resources. This resulted in abandoned lake shore settlements and a shift toward utilization of mostly upland resources. By about 2,500 years ago, there were no settlements located on the lake's margins.

1,500 to 600 years ago, a Formative Stage Culture had been reestablished. It was characterized by small villages, domesticated plants, and pottery. Their subsistence techniques were similar to those of the earlier groups. By 500 years ago, Shoshonians had moved in from the southwestern Great Basin and replaced these people. The Shoshonians, unlike the earlier inhabitants, relied more on upland resources than lake margin resources (Madsen 1980).

EUROPEANS

When the first European settlers arrived in the Great Basin, the general trend of Great Salt Lake level was downward (fig. 1). When the Mormons arrived the Salt Lake valley in 1847 the lake's level was approximately what is today considered average (4200 ft. above mean sea level). During the 1860's,

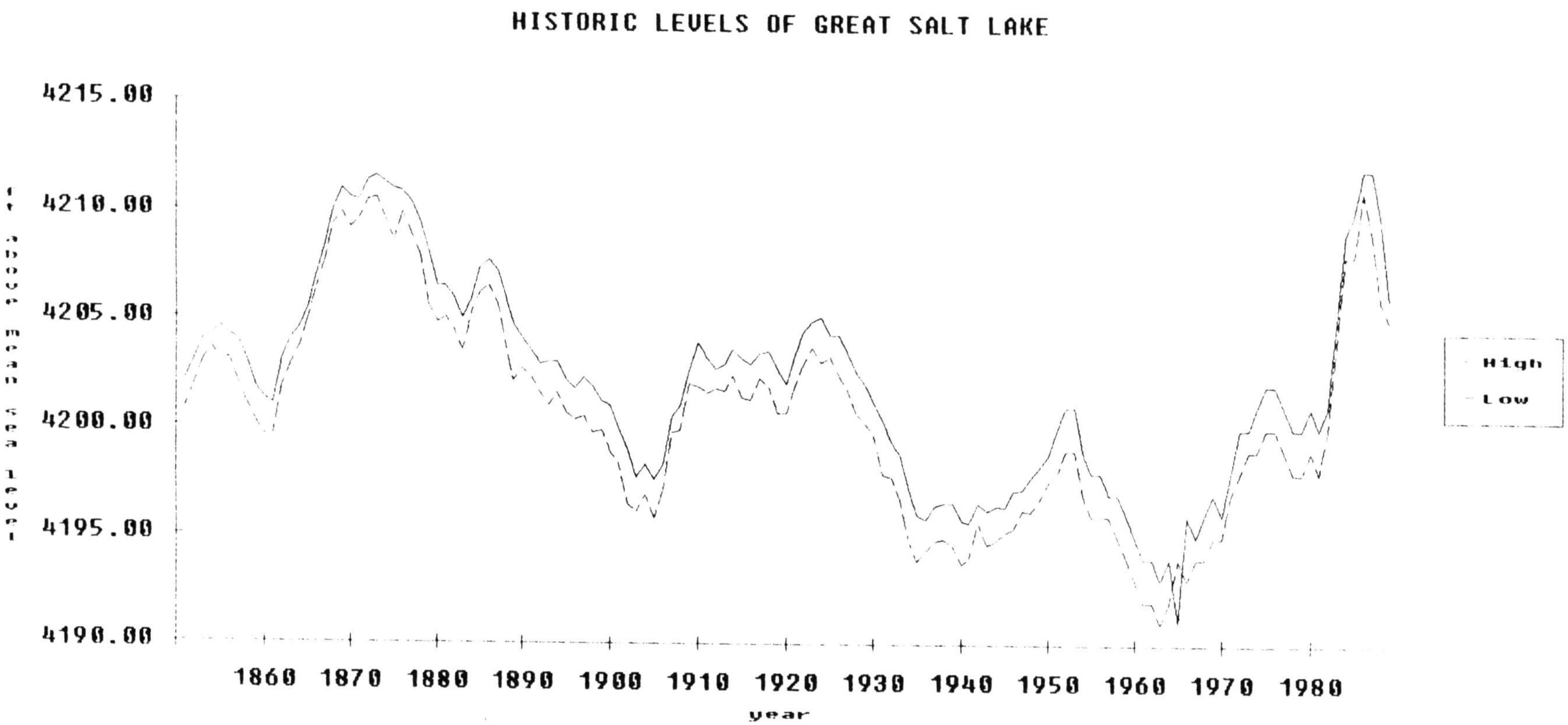

HISTORIC LEVELS OF GREAT SALT LAKE
4215.00
4210.00
4205.00
4200.00
4195.00
4190.00
1860
1870
1880
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
year
High
Low

Fig. 1

after a succession of wetter than normal years, the level rose to over 4210 ft. (Karl and Young 1986, Arnow 1980) and threatened agricultural development along the shores. The problem became serious enough that lake shore land owners appealed to Brigham Young for relief from the problem. Brigham Young at that time considered digging a long canal that would connect to the Snake River through Red Rock Pass in Idaho thereby providing the needed drainage (Greer 1980). Red Rock Pass was the main outlet which helped to drain ancient Lake Bonneville, but the proposed solution would have been impossible to accomplish since this pass is 600 feet above the level of the lake. The remedy to the problem luckily turned out to be a natural one with subsequent dry years, thereby allowing the lake level to recede on it's own. After this time lake level rose on occasion but maintained a general downward trend until it reached a historic low of 4193.35 ft. in 1963, when it was widely believed that the lake would eventually dry up completely.

This trend was interrupted by several years that were wetter than normal until in the late 1970's the lake reached a peak level of over 4202 ft. Many of the lake shore industries and marshes were threatened or damaged. This problem was not nearly as great as the one less than 10 years later. The following three years were very dry and lake level receded.

PLANS TO CONTROL THE LAKE

During the early part of this century there were many proposals for manipulating the natural mechanisms of the Great Salt Lake by impounding inflowing fresh water from the Bear, Weber, and Jordan Rivers. The plans were aimed at creating reservoirs on the eastern side of the lake to provide a steady and stable supply of fresh water. These proposals were made at a time when the lake level was on a downward trend, more than half a century after the historic high of 4211.5 had been reached, and it was assumed that the lake would never again reach this high mark of 1873. These proposals were ignored the possibility of another upward lake level trend and expressed much confidence that any development along the shore above 4200 feet would be safe (Morrisette 1987).

LAKESIDE DEVELOPMENT

Recreation Areas

An early visitor to the Great Salt Lake gave his cheerful description of a bath in the lake:

> When the north wind blows, bathing in Salt Lake is a glorious baptism, for then it is all wildly awake with waves, blooming like a prairie in snowy crystal foam. Plunging confidently into the midst of the grand uproar you are hugged and welcomed, and swim without effort, rocking and whirling up and down, round and round in delightful rhythm, while the wind sings in chorus, and the cool, fragrant brine searches every fibre of your body, and at the end of your excursion you are tossed ashore with glad God-speed, braced and salted, and clean as a saint (from Utah and Nevada Railway 1886).

Though not usually as enthusiastic as this bather, other visitors to the lake have found a "float" in the lake's brine to be a very unique experience. Attempts to develop recreation facilities along the lake shores were among the first efforts to exploit the lake's economic potential.

On July 4, 1851, four years after Mormons arrived in the Salt Lake Valley, Brigham Young led the first organized bathing excursion to the lake. Nearly the entire population of Salt Lake City attended the activity which lasted until the following day. This activity spurred plans to build a bath house, hotel and boating facilities on the lake, though these plans did not materialize for several years.

"Lake Side" was the first commercial resort on the lake and was completed in 1870. It was to be the first of several attempts to develop what some people see as the lake's recreation potential. Some of these developments did well for a time, but most were short lived for reasons to be discussed later.

The year after Lake Side opened, another resort was constructed along the south shore of the lake called "Lake Point". Since Lake Side was located near the railroad between Ogden and Salt Lake City, it received a much greater patronage than did Lake Point, which turned out to be a short-lived venture (Czerny 1976).

During the decade of 1870, the lake level began to recede and the shore line changed. The retreating lake shore left Lake Side with a muddy, slimy, smelly beach. After patronage declined, the facilities were moved away from the lake to Farmington where they were developed as an amusement park.

Following establishment of these facilities, a number of other recreational enterprises were undertaken, including Garfield Pavilion (1885), Black Rock (1891), and the most successful, Saltair, was completed in 1893.

Saltair was built upon piles 4,000 feet into the lake on the south shore. The building was two-storied and included restaurants, lobbies, view areas, refreshment stands, 650 bath houses, and a boardwalk on the lower level. On the second floor was a dance hall. The resort did very well until it was destroyed by fire in 1925. A new building was soon erected on top of the old pilings and the resort prospered until it was again burned down in 1970. A third Saltair was constructed, but as it was about to open, the lake level began to rise, and threatened to flood the facilities.

The Great Salt Lake Boat Harbor was constructed in 1934 by the Federal Work Administration. Silver Sands Beach was built near the harbor in 1963 by John Silver, who had obtained the lease to boat harbor in 1959 (Rosenvall 1965, Gadd 1967, Allan 1975, Czerny 1976).

There are a number of natural problems that prevent much development of the Great Salt Lake for recreational use. Perhaps most limiting of all the environmental factors is the problem of a fluctuating lake level. As has been shown, a small fluctuation means that the lake shore will travel a relatively great distance. This creates obvious problems for the beach front developer. As has been proven many times, projects that are located on the lake shore will eventually be either flooded or left far from the shoreline. These fluctuations must also be coped with on a seasonal basis as well. The most popular proposals for controlling the seasonal and yearly migration of the shoreline have been to establish dikes. Every diking project that has been undertaken, however, has proven to be very costly, and designed for short-term lake level rises.

Another limiting factor to lakeside recreational development is the objectionable odor of decaying brine shrimp, which die and wash up on the shores of the lake in such numbers as to produce a thick, black muck. The smell from these decaying brine shrimp are enough to deter the potential beach patron from a visit. Brine flies are also a nuisance. Though they do not bite, their great numbers are a menace to the beach goer.

Another problem that has had to be dealt with is the sudden lake storms that arise, driven by powerful and damaging winds.

These problems are probably at least in part responsible for the relatively short stay of the average visitor. In 1974 a survey was taken that determined the average length of stay to be less than one hour. This may also be partly because many of the visitors are just passing through the area on their way across the state and pause just long enough for a photograph (Hunt, et al 1974).

Wildlife Refuges

The Great Salt Lake is a major stopover and nesting site for many migrating birds within the Pacific Flyway and is famous for the abundant waterfowl found there. The abundant bird life, fluctuating lake levels, withdrawal of freshwater for irrigation, and avian botulism elicited the establishment of refuges and managed marshes. These began in 1923 with construction of the first State refuge at Public Shooting Grounds in 1923. The first Federal refuge, Bear River Migratory Bird Refuge was established in 1929 (Smith and Kadlec 1986). This refuge was created at the mouth of Bear River with goals to (1) control avian botulism (Alexander Wetmore studies 1915-1923), raise water levels and reduce the random spread of water over the alkali flats; (2) improve the necessary habitat of nesting birds; and (3) provide a resting place for the thousands of migratory birds on their yearly routes (Behle 1958).

It was during the lowering trend of lake level in the late 1920's that the first dikes were constructed for purposes of impounding fresh water, and preventing the flow of brackish water into the marshes. Huge earth embankments were built to form the outer dike which was 20 miles long. Fluctuations of the lake had been known to be as great as 18 feet, which was one major issue to be considered: but lake level had been so low for 20 years and salt water had not backed up as far as the planned dikes, so construction began. Several administration buildings were also erected (Behle 1958).

Chemical and mineral Industries

Though table salt has been produced for many years, it was only recently that the economic potential of Great Salt Lake minerals has been explored. Very little research or investment had taken place to extract other, potentially more profitable chemicals because of a lack of technology. In 1967, domestic and foreign chemical producers began to study the feasibility of extracting a variety of chemicals from the lake brine by a process which involves the use of large evaporating ponds. Today the mineral industries are the most important economic enterprise surrounding of the lake.

Though sodium chloride is by far the most abundant chemical in the lake brine, it is least important economically. Commercial value of magnesium salts is greatest of all minerals, even though they comprise a mere 4% of the total lake solids (Toomey 1980). Other important chemicals are potassium sulfate, sodium sulfate, magnesium chloride, magnesium sulfate. Some trace elements are also extracted such as lithium, bromine, iodine, cobalt, and strontium (Greer 1972). Gold and silver have also been mined (Roylance 1982). The mining of these elements has required the construction of several evaporating ponds which cover many acres of land along the shores of the lake. Stokes (1966) has estimated the total value of all mineral salts in the lake to be many billions of dollars. According to a Utah Geological and Mineralogical Survey, the lake contains between "4 and 6 billion tons of dissolved mineral solids" (ibid). In 1972, Dr. Glassett of Brigham Young University estimated the worth of lake chemicals to be between 60 and 75 billion dollars (Greer 1972).

Brine Shrimp

During the 1940's a tropical fish enthusiast heard of the Great Salt Lake's brine shrimp and investigated their use as a better and less expensive food for his fish. He discovered that the brine shrimp (*Artemia salina*) of the Great Salt Lake makes an excellent and nutritious tropical fish food. In 1950, C.C. Sanders published an article in The Aquarium magazine which described his discovery. Soon afterward he began to receive requests for frozen brine shrimp and the Sanders Brine Shrimp Company was established to harvest, clean, package, and market the shrimp (Sturm 1980).

LAND OWNERSHIP DISPUTES

A dispute occurred during the 1970's that involved the State of Utah and the Federal Government. At this time, lake level was on a downward trend and newly exposed land was sought after by mineral companies for ponding operations and also the State of Utah for tax and royalty revenues. Because of nebulous laws, the land could belong to either the State of Utah, or the Federal Government. Both contended for ownership on the basis of the doctrine of navigability and intrastate commerce[2]. The Federal Government claimed ownership on the basis that the lake fell into the category of navigable waterways that could only be controlled by a higher authority. The State of Utah argued that title to any navigable water body occurring entirely within a state belonged to that state government.

The Federal Government was at that time the largest owner of land above the shoreline, and the State of Utah sued to acquire title of all relicted lands (fig. 2. Dewsnup and Jensen 1980). Many private owners of land adjacent to the shoreline were also eager to participate in the proceedings as the size of their holdings were affected by the outcome (Greer 1972).

The conflict over ownership of the lake bottom had an inherent second part to the problem; the dilemma over what would constitute a valid shoreline (Greer 1980). This is a unique problem to terminal lake basins since freshwater lakes are regulated by a steady outflow of water and therefore exhibit a relatively unchanging shoreline. There were several possibilities in determining a valid shoreline. The first possibility rested on a surveyed meander line made by U.S. Government surveyors in 1855. This survey was not precise and even included several straight lines drawn across very flat areas around the lake. A second possibility included the lake level at the time Utah entered the Union in 1896. At the time the State Government took control over its territory the amount of land covered by the lake would, it was argued, be owned by the state. A third

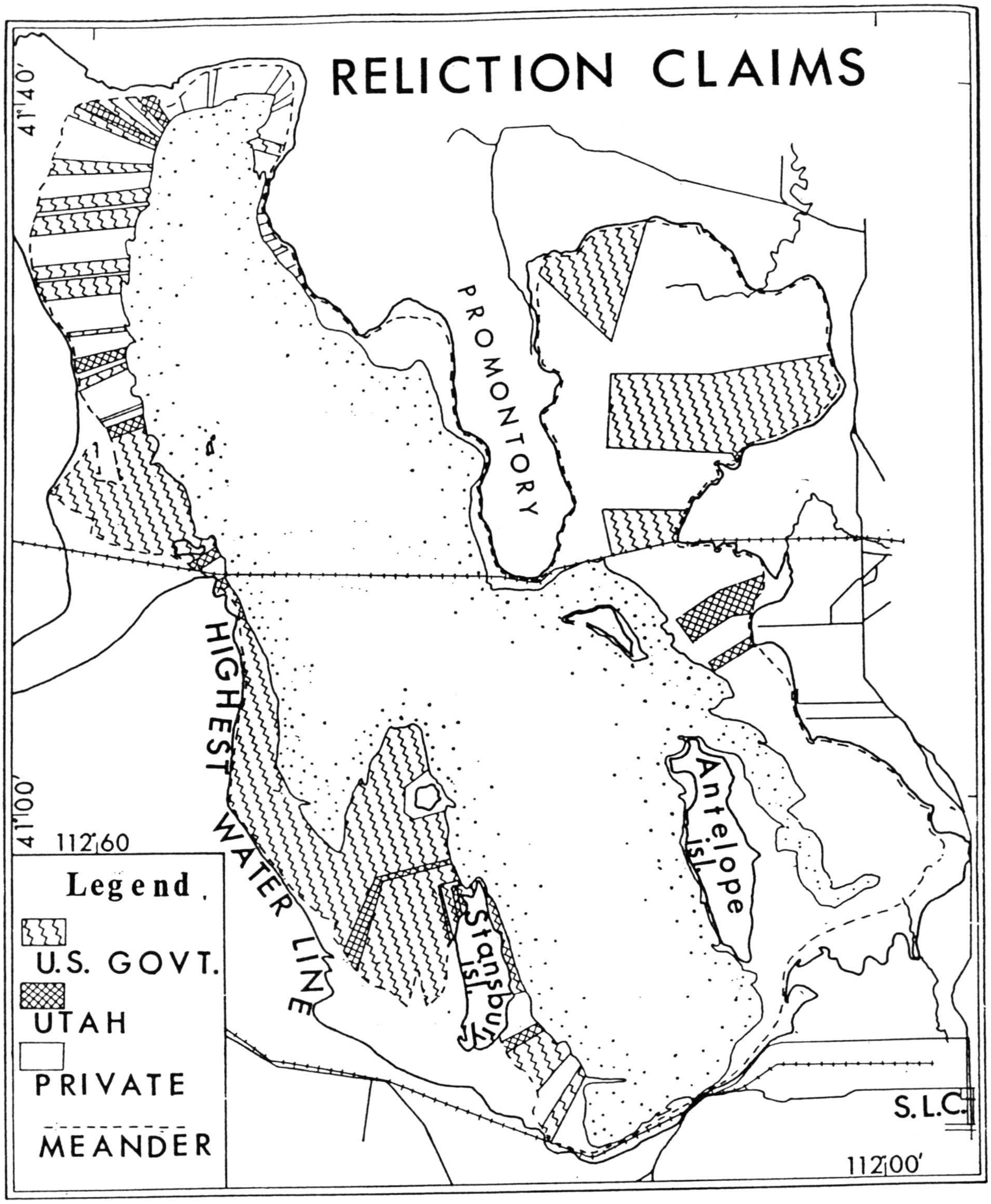


Fig. 2 (Greer 1972)

possibility may have included the lake level at the time the court began deliberation over ownership.

During the early 1970's the Supreme Court of the United States decided that the State of Utah was the rightful owner of the Great Salt Lake including the land it covered. In 1976, the same court concluded that the official lake level should be the same as that when Utah entered the Union.

As these discussions were taking place, a wetter than normal trend in climate was occurring. The consequence was that the amount of land resting below this newly established official meander line was zero, and attention of all interested parties was now turned to the problem of how to deal with the rising lake which was threatening the millions of dollars worth of structures that had been constructed during the time that the lake was at a lower level (Greer 1980).

EFFECTS OF RECENT FLOODING

The rise in lake level continued until 1976 when the lake began again to subside. But this relief was short-lived, and beginning in 1982, a four-year period of heavy precipitation hit northern Utah. Most of this excess moisture terminated in the basin after spring thaws in the nearby Wasatch Mountains. Lake level during this period rose to its historic record of 4211.65 ft above mean sea level (fig. 1). This rise in level increased the lake's area from 1,000 sq. miles in the 1960's to 2,500 sq. miles in the mid 1980's (Ware 1984, Barnes-Searney 1986, Cornman 1987).

This increased volume of water encroached rapidly upon businesses, homes, essential services, and wildlife refuges. Commercial and residential lakefront properties were deluged, septic systems failed, agricultural fields flooded, and highways and railways were damaged or threatened. Capital damages were estimated at 260 million dollars including but not limited to; breaching of waterfowl management area dikes, destruction of refuge administration buildings, and devastation of brine evaporation pans. Significant damage was also sustained by inundation of highways, railroads, recreation areas, public facilities and private holdings (fig. 3, FEMA 1984).

Several alternatives were proposed to ameliorate the situation, including several extensive diking projects. These proposals were turned down because of the high cost involved (U.S. Army Corps of Engineers 1986, Eckhoff 1987).

Estimate of Capital Damages as a Function of Great Salt Lake Level
(thousands of dollars)

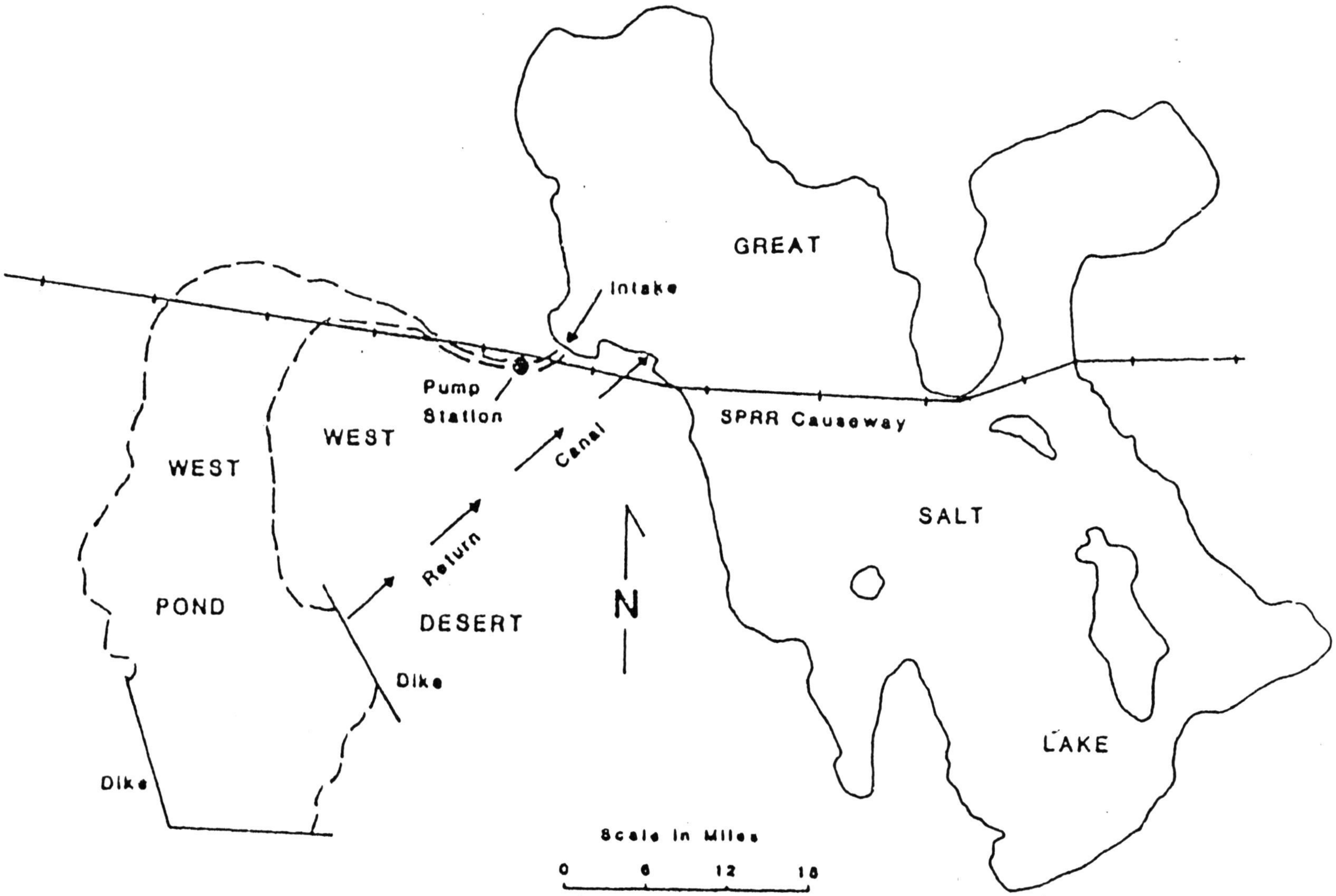
Lake Elevation	Lakeside Industries	Roads and Highways	Railroads	Wildlife Refuges	Recreation Areas	Public Utilities	Other Facilities	Cumulative Total	Change Per Foot
4200		882						882	882
4201	25	882						907	25
4202	1025	882						1907	1000
4203	2861	882						3743	1836
4204	4761	882						5643	1900
4205	19276	14812	23037	2500	657			60282	54639
4206	31666	14812	23537	7500	1207	203		78925	18643
4207	37206	40562	24037	13700	1207	304		117016	38091
4208	107206	42007	24537	21500	4707	710	188	200855	83839
4209	107206	42377	25037	28500	7707	710	198	211735	10880
4210	133206	42657	25537	34400	7707	710	273	244490	32755
4211	134486	42907	42037	37800	7707	710	273	265920	21430
4212	135486	43157	42537	38700	7707	1088	394	269069	3149

Source: Interagency Hazard Mitigation 180 Day Post-Flood Recovery Report, FEMA, February 14, 1984

Fig. 3

One of the first steps taken was to breach the Southern Pacific Railroad causeway that separated the north and south arms of the lake. Since most of the surface runoff occurs in the southern arm of the lake, the level of the northern arm was lower. The breaching of the causeway lowered the level of the southern arm by about one foot. This was an important action, since practically all of the development occurs around the shores of the southern arm.

Since evaporation is the only way water can be effectively removed from the basin, engineers designed the West Desert Pumping Project to increase evaporation. In May, 1986, the State of Utah authorized the expenditure of $60 million for a project that would create a 500 sq. mi. pond by using low lift pumps to push lake water to a natural basin in the West Desert, approximately 40 miles west of the Great Salt Lake. Roughly 40% of this water would evaporate, which would reduce the peak level of the lake between 6 and 12 inches annually. The remaining water, with its salt and minerals, would be allowed to flow back into the lake (fig. 4, Eckhoff 1987, Pearce 1987).


GREAT
SALT
LAKE
Intake
Pump
Station
SPRR Causeway
Canal
Return
WEST
WEST
PEND
POND
DESERT
N
Dike
Dike
Scale in Miles
0
6
12
18

HUMAN IMPACT ON LAKE LEVEL

From the time of the earliest European settlers in the Great Salt Lake basin, humans have had a significant impact on the level of the lake. Perhaps the most significant of all these activities has been to divert fresh water from the contributing rivers for irrigation and other uses. Mineral and chemical industries have also diverted water to be used in their solar evaporation ponds. The overall effect of water diversion projects has been estimated by Arnow (1984). He postulated that under natural conditions, without any human influence, the lake would have been 5 feet higher in 1983. Thus the lake level would have peaked at 4214.25 rather than 4209.25. Such a flood would have surely had an extremely severe impact on Utah's economy, and illustrates the lake's potential to rise.

DISCUSSION

The preceding synopsis allows us to derive some general observations:

(1) The Great Salt Lake ecosystem is perceived as being stable, with little potential for long-term change. One piece of evidence for this is the

existence of a perceived "normal" lake level. This normal level is an average of observed levels from the time the first observations were made. Some acknowledgement has been given to the fact that the level does fluctuate, as a meander line was declared. But it was assumed that the lake would stay within the bounds that had been delimited, with little thought for the lake's true potential to swell beyond it's assigned boundaries.

An important consequence of this attitude is that decision makers have responded to immediate crises rather than the long-term potential for the lake level to rise (Morissette 1988). The only acknowledgement of the lake's devastating potential has come too late in the form of the West Desert pumping project.

(2) Until the installation of the pumping project, management solutions tended to be short-range, or "quick fix" policies. These policies were meant to deal with immediate situations, without much thought about the possibility of a longer-term rise (money is also a major constraint).

3) The preceding observation is not meant to be a harsh critique of the mode of dealing with the lake. It should be recognized that at this late point in the human occupational history of the lake, a wide

range of options do not exist. Certainly, given the situation at the time, the pumping project was the best way to implement a permanent mechanism for controlling lake level.

Of course, there is no way to control a very long upward trend in lake level. Given any management strategy, flexible or not, a continuously rising lake would force evacuation of increasingly higher elevations within the basin. Perhaps the only truly flexible management strategy is to prevent any development and occupation within the entire Great Salt Lake basin. Following this philosophy, we would also have to prevent occupation of areas prone to severe earthquakes, tornadoes, volcanoes, and all other types of devastating natural disasters.

CONCLUSIONS

This paper has shown historic land use patterns and attempts to deal with lake level variability. The general pattern of resource managers has been a tendency to make short-term responses to potentially long-term problems. The West Desert Pumping Project was finally implemented after millions of dollars had been spent in repairing damaged structures. Many of these structures had been repaired several times during the same flooding event (numerous Deseret News and Salt Lake Tribune articles during the flood report on these rebuilding projects).

Future contingency plans for the Great Salt Lake should include a recognition of the lakes long term potential to rise. Such flexible policies are most beneficial in the long run for coping with lake level fluctuations.

NOTES

1. While investigating Lakeside Cave near the shore of Great Salt Lake, Madsen (1988) and a team of archaeologists found tens of thousands of grasshopper fragments. One spring they also discovered millions of grasshoppers lying on the eastern margin of the shore. Madsen describes them as lying in rows up to 6 ft. wide and 9 inches thick. Laboratory analysis of the hoppers indicated a yield of just over 1,365 calories per pound (compared to 1,590 calories for a pound of wheat flour and 1,240 for medium fat beef). He continues by estimating that for every hour of collecting the grasshoppers, 273,000 calories could be obtained, compared to the 300-1,000 calories per hour for collecting seeds, even higher than the estimated 25,000 calories per hour for large game such as deer or antelope.

2. In 1824 Chief Justice John Marshall declared in the Gibbons v. Ogden case that "navigable" water bodies come under the jurisdiction of the "Commerce Clause" and are therefore controlled only by the Federal Government. Subsequent decision by the Supreme Court have further defined Marshall's interpretation to allow State control of these "navigable" water bodies which lie completely within their boundaries (Greer 1972).

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