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FRIENDS of Great Salt Lake

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Volume 9 Number 2 Winter 2003

Sunset at Promontory Point, 1901 Alfred Lambourne

The mission of FRIENDS of Great Salt Lake is to preserve and protect the Great Salt Lake ecosystem and to increase public awareness and appreciation of the lake through education, research, and advocacy.

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Winter 2003 Calendar of Events

January 28	Tuesday	General Program 7pm - The Timeless Earthworks of Utah - Spiral Jetty & Sun Tunnels
February 25	Tuesday	General Program 7pm - Forecasting Levels of Great Salt Lake
March 25	Tuesday	General Program 7pm - Great Salt Lake Nature Center at Farmington Bay

Watch the local papers for announcements of speakers and topics at our General Programs, or call our hot-line at 801-583-5593, and press 1 for monthly activities. NOTE: General Programs are held at the Sugarhouse Garden Center, located in the northeast corner of Sugarhouse Park, 2100 South 1650 East in Salt Lake City.

On the Cover

Sunset at Promontory Point, 1901 22"X32" gouache on board Alfred Lambourne

Early Utah landscape painter and writer Alfred Lambourne [1850-1926] loved the Great Salt Lake. He knew the salty inland sea for what it was, both beautiful and ugly, placid and furious. Still he saw the lake with an artist's eye and adored it with an artist's soul.

In 1902 he wrote:

"The truth is that the Inland Sea, or the Great Salt Lake as it is more commonly called, is neither [a] sullen, listless, deadly sheet of water..., nor is it, on the contrary, a realm of endless charm.... It is composite. Alternately, we are captivated by the strange beauty it presents, and repelled by the ugliness that is seen along its shores. By the low ground..., the ugliness is most apparent... white with encrusted salt and alkali, the beaches...are truly forbidding. The eye is offended, the mind is distressed. Melancholy has taken up its permanent abode along these repellent and desolate shores.

Elsewhere, despite this fact, attractions, and even remarkable beauties, are seldom wanting. Where the mountains stoop precipitously to the sea, or where the islands lift abruptly from its shining surface, are scenes both grand and imposing. The pale green water breaks in turquoise waves upon beaches of glistening pebbles, or lies stilly transparent upon stretches of soft, white sand. Where the streams enter the sea on its eastern side, are extensive marshes haunted by the birds..., and other wild birds dwell on the islands. The western shores are strewn with monstrous boulders, or littered with great heaps of fallen stone; high cliffs look down upon the passer-by; along the far horizons are chains of lofty mountains, and always is the inland sea strangely respondent to the changing skies and the light of a brilliant and prismatic luminary."

Weaving an irresistible magic, the Great Salt Lake cast a spell over Alfred Lambourne. Admittedly bewitched by the beauty of the lake, this impassioned admirer ardently and frequently expressed his feelings on canvas, painting splendid vistas of his beloved Great Salt Lake during his nearly fifty-year career. In addition, he portrayed the lake in "pen pictures," writing eloquent descriptive essays and books, including Our Inland Sea in 1909.

Prepared by Lyndia Carter

President's Message

Thanks from Don Paul

Dear Great Salt Lake Friends,

A few weeks ago I broke open my latest issue of FRIENDS of Great Salt Lake and read with great emotion, surprise and abashment some very kind words. I didn't know salt people could be so sweet. So, I thank you for your thoughtfulness and kindness. I'm intrigued by how place can build enduring friendships. It is the common values that we each discovered in this special place that lattice us together toward a shared vision of what is substantive and enduring in our yearning for quality of life. In my personal Great Salt Lake adventure, there have been treats found in unusual places and sorrows, too. Like a slight - of - hand trick performed by a master of party deceit, the lake can fool and play with you as one surprise after another emerges from Her ephemeral backdrop. But more often than not, it is a pleasant surprise. Among my most prized serendipitous discoveries as I've wandered Her mud, sea salt, and islands are Bruce, Lynn, Joe, Paul, Clay,Wayne, Joan, Joel, Yae, Neka, Jack, Edie, and two special Anns. You good friends are better than the taste of a fresh picked, snappy apple dipped into the GSL brine on a crisp fall afternoon! You and many more have given me hope in a cause that sometimes seems extremely lonely. Your energy, wisdom and good humor have lifted me. Thanks.

photo by L. de Freitas

When I travel to special wet places, I take with me a pocket stone from the shores of the Great Salt Lake, a kind of emissary of good will between vast habitats of importance to my feathered friends. I cast the stone as gesture of connectivity - a gift from one great place to another. In return, I travel back to the Great Salt Lake with a pocket gem to be cast into Her waters. Now, the Lake shares common geomorphic artifacts with the sub-arctic of Hudson Bay, Siberia's Lake Bikal, Saskatchewan's Chaplin Lake, Mexico's Marismas Nacionales, Great Britain's North Sea, California's Mono Lake and others.

As I have selected these stones during solitary moments from the shores, beaches and mangroves, I have contemplated this great planet and how it is shrunk by the passage of marathon bird populations. They pulse across vast continental landscapes with their different landforms and ethnicity. I have contemplated how important place is to them just as it is to us. I once stood at the lip of a tiny Least sandpiper's nest near Churchill, Manitoba with my good friend Joe Jehl, who predicted that the nest would be there and active. Upon approach; we discovered it was. The little bird emerged with a band on one leg, a band that had been placed there in years past. She had traveled to South America to over winter and had returned several thousand miles with precise fidelity to the same nest. Place is important to birds.

At these special places, the GSL included, my thoughts have turned from biology to conservation and how these places can be protected. Often, I have thought about the good things that are happening at the GSL my special place. The organizations and those that staff them are informing the public of lake values. Festivals and those that help make them happen are celebrating the Lake. Individuals that walk shorelines counting birds are describing the lakes ecological importance. Educators are teaching and influencing citizens to make wise choices. Special people through skill and tenacity are providing conservation leadership.

I will think of you when I pick up the next stone but don't worry, they will be thankful thoughts.

Don

FRIENDS OF GREAT SALT LAKE

ORGANIZATIONAL STATEMENT

FRIENDS of Great Salt Lake was founded in 1994 with a guiding mission to preserve and protect the Great Salt Lake Ecosystem and to increase public awareness and appreciation of the lake through education, research, and advocacy.

Led by a highly active Board of Directors and an Advisory Board consisting of professionals in the scientific, political, literary, and broadcast communities, FRIENDS holds monthly meetings that feature guest speakers and presentations focusing on subjects and issues related to the Great Salt Lake. The organization received special recognition for its efforts in 1998, when it was awarded the Conservation Achievement Award by the Utah Chapter of the Wildlife Society.

FRIENDS has organized and sponsored an array of materials, events, and activities in pursuit of its mission. The quarterly newsletter includes information on important meetings and activities, articles pertaining to lake ecology, issues updates, maps, data tables, photographs, and future events notices.

We also sponsor a biennial Great Salt Lake Issues Forum, which provides a gathering for local citizens who care about Great Salt Lake. The goal of the Forum is to encourage constructive dialogue about the future of the lake's ecosystem and its resources, and to illuminate the complexities involved in research, management and planning for the lake.

In 1997, FRIENDS hired its first education director and initiated a major regional education project designed to enhance both the knowledge about and care for the future of Great Salt Lake. With that goal, a live-narrative slideshow program, entitled *The Lake Affect: Living Together Along the Shores of Something Great*, was born. Audiences have included Envision Utah, the Utah Department of Natural Resources, and the Salt Lake Olympic Committee's Environmental Advisory Committee, along with numerous school and civic groups.

In an effort to reach even more citizens with its message about Great Salt Lake, FRIENDS is working on a video version of *The Lake Affect*. With this video and the Project SLICE fourth grade Great Salt Lake curriculum, we hope to achieve a positive, long-lasting impact on the future of Great Salt Lake and those who dwell upon its shores.

The Timeless Earthworks of Utah

Join FRIENDS on January 28th, 2003, starting at 7pm at the Sugarhouse Garden Center, located in the northeast corner of Sugarhouse Park, 2100 S. 1600 E. in SLC.

Spiral Jetty, located on the north shores of the Great Salt Lake at Rozel Point, was created in 1970 by Robert Smithson. Built with shoreline rocks and basalt, the 1500 foot-long spiral embraces salt crystals and the Lake's microscopic organisms to present an artwork of extraordinary beauty. Spiral Jetty has been seen only sporadically since it was built in 1970, due to fluctuations in the Lake's rising and falling levels. Since it has emerged this past summer, many have made the journey to the Jetty.

Sun Tunnels is located in the Great Basin's western Desert, NE of Wendover. Built from 1973 through 1976 by Nancy Holt, the Tunnels are four concrete tubes oriented to capture the rising and setting sun of the summer and winter solstices. A permanent fixture in an otherwise barren landscape, the Tunnels each mark a specific constellation and assist in bringing the heavens to the earth.

Smithson and Holt both produced documentary/art films of each artwork, which will be shown.

Hikmet Sidney Loe earned an MA in Art History from Hunter College, CUNY. Her master's thesis, "An Intermittent Illusion: Local Reaction to Robert Smithson's Spiral Jetty" has been published in abbreviated format in the Utah Geological Survey's 2002 "The Great Salt Lake: An Overview of Change." Also included in this publication is an interview with Nancy Holt on Sun Tunnels.

Waiting for the Lake to Come Up

by Heidi Hoven Chair FoGSL Research Committee

It was a sunny, fall morning when a van-full of archaeology enthusiasts drove up to meet Dr. Steven Simms for a walking tour of an area with some of the highest concentrations of prehistoric archaeological sites in the Great Basin. We met in Ogden and continued on through the outlying residential area of northern Ogden and then through farmed land that seemed miles and miles from anywhere. Eventually we reached the Harold Crane Refuge, managed by the Division of Wildlife Resources: acres of open land and wetlands directly east of the well named Promontory Point.

photo by Max Reid

As we looked out onto the landscape, it was hard to believe that land so densely vegetated surrendered all plants to the not-so-long-ago floods of the 1980s. When flood waters receded in 1987, more than vegetation was stripped from the land. Sediment was eroded by water and wind leaving a barren appearance to the untrained eye. However, something remarkable had happened as the water and sediment drew away. Hundreds of prehistoric sites were exposed, including 85 skeletal remains, enabling Dr. Simms and other anthropologists to discover answers to questions of a past culture buried for over 1,000 years.

The Fremont culture was widespread across Utah, eastern Nevada, southern Idaho, southern Wyoming and northwestern Colorado. Across this enormous area, the Fremont may represent various ethnic groups of different origins with the common bond of foraging and farming. The Fremont population adjacent to Great Salt Lake first grew in numbers between A.D. 400 and 1300 and reached peak densities between A.D. 900 and 1200 (Simms and Stuart, 2002). The Fremont flourished until the 17th century when a rapid decline ended their use of the area. Speculations of rising lake level (and subsequent inundation of the wetlands) flooding their homes, or the negative effects of climate change on Fremont agriculture suggest reasons why they left. What is not understood, though, is why the Fremont failed to return. Perhaps disease introduced to the Americas by European colonization in the 16th and 17th centuries made its way to Utah and prevented the return of the Fremont. The horse, introduced to the region in the 18th century, altered mobility patterns and fundamentally changed Native American life.

While we wandered across playas and stream channels, Dr. Simms described the typical daily lives and seasonal demands of the foragers and farmers. Foragers set up more temporary housing made of reeds and poles that could be reused during foraging seasons with little upkeep, while farmers established more permanent dwellings. The reed structures were usually 5 meters in diameter and had a hearth inside and out. The hearths were lit 24 hours a day and after a month or so the surrounding area gradually was denuded from use. The inhabitants would subsequently move on to another location to set up a new dwelling. The Fremont culture lived in a highly structured environment, analogous to modern day lifestyles. Gathering, hunting, and processing required various equipment so there were strategically placed storage structures for the foragers to move to and from – alleviating the need to carry everything at all times.

It was easy to see how the Fremont lived off the land once we learned how it was done. At first, all we saw was a landscape defined by grasses, cattail, and Phragmites and we wondered what could they possibly have used? It turns out that the very plants we were looking at were those that the Fremont depended on for subsistence. For example, most of their clothing was made of plant fibre and in the winter, they made warmer layers such as leggings of reeds, breastplates of sage brush and cedar bark, and then covered themselves with a rabbit skin robe. In addition to building some of their dwellings with plant material, they wove rabbit nets out of milkweed fibre. Local seeds and roots supplemented much of their diet and they used Phragmites for arrow shafts, and cattail stalks for boats and duck decoys.
(continued on pg. 12)

Is Farmington Bay Healthy?

Continuing Studies of Water Quality in the Great Salt Lake

by Amy M. Marcarelli and Wayne A. Wurtsbaugh[1]*, with Brandon Albrecht, Erik Archer, Jennie Bassett, Mark Beckstrand, Michael Hadley, Jason Kling, Olivia Lester, Peter MacKinnon and Te-hui Ting.*

For the past three years, an Aquatic Ecology Practicum class at Utah State University has conducted research examining pollution in Farmington Bay. In 2000, our class discovered that Farmington Bay had excessive levels of nutrients and phytoplankton (a condition known as eutrophic) compared to the Great Salt Lake proper (Marcarelli et al. 2001). In 2001, individual projects concluded that sewage treatment plants discharged sufficient nutrients to the bay to make it highly eutrophic and that brine shrimp biomass was 5 times lower in Farmington Bay than in the Great Salt Lake proper. In addition, sampling on a windy night revealed that the entire water column in Farmington Bay lacked oxygen, resulting in a condition known as anoxia (Wurtsbaugh et al. 2002). Additional sampling in 2002 indicated that brine flies were less abundant in Farmington Bay than in less eutrophic Ogden Bay. These results prompted us to examine two major research themes in October of 2002: oxygen effects on chemical, physical, and biological characteristics of Farmington Bay, and other factors that may control the abundance of organisms in Farmington Bay and the Great Salt Lake.

photo by Amy Marcarelli

Since we previously observed high nutrient loads into Farmington Bay, Olivia Lester conducted a laboratory assay of algae from the Great Salt Lake to determine whether nitrogen or phosphorus limited phytoplankton growth. Her results indicated that nitrogen was the primary limiting nutrient, as has been reported previously for the Great Salt Lake (Wurtsbaugh 1988). However, when the salinity was reduced to 30 g/L phosphorus also stimulated algal growth. Analyses of this experiment are still ongoing, but it suggests that nutrient control of algal growth in the dynamic Farmington Bay may be more complex than in freshwater lakes.

Microbes such as bacteria decompose organic matter such as dead algae that settle to the bottom of the lake. During decomposition, microbes can deplete oxygen in the water, causing anoxia. Anoxia slows decomposition and causes organic matter accumulation. Sampling in Farmington Bay in 2000 and 2001 revealed that oxygen was usually absent in the deeper waters of Farmington Bay where intruding high-salinity water from the main lake prevents water mixing. This "salt wedge" protrudes several miles into the bay. Previous sampling showed that the sediments beneath the salt wedge were black and appeared to be rich in organic matter. We were unsure, however, of the sediment characteristics in other parts of the bay where the salt wedge was absent. Two students, Brandon Albrecht and Mark Beckstrand, were interested in whether the abundant algae in the bay settled to the bottom, and if so, whether microbial decomposition prevented the accumulation of organic matter. Using sediment traps to catch falling plankton, Beckstrand found that about 4 g/m^2 (21,000 lbs/mi^2) of organic matter sedimented to the bottom of Farmington Bay each day. Albrecht found that organic matter content in the sediments under the salt wedge were 5-times higher than in areas where oxygen was abundant. These results suggest that organic matter may accumulate primarily in the area beneath the salt wedge and may result in anoxia in this portion of the bay.

When anoxic conditions prevail in the water column and sediments of lakes, distinctly different chemical reactions occur. In particular, sulfate, which is abundant in the saline waters of the Great Salt Lake, is converted to hydrogen sulfide. Hydrogen sulfide, also known as "the rotten egg gas," is one of the odors that sometimes plague communities surrounding the Great Salt Lake. Peter MacKinnon examined the sediments at five sites in Farmington Bay and found that hydrogen sulfide concentrations just above the sediments were only high in the deep water (>1.5 m or 5 feet) where oxygen concentrations were low. However, the noxious gas was present within the sediments at all five sites. This early work suggests that much of the odor produced in the bay could be localized in

the salt wedge area, but if the sediments are stirred by strong winds, additional hydrogen sulfide may be released from other parts of the bay. Additionally, we don't know if additional hydrogen sulfide is produced at night if the water column goes anoxic.

We hypothesized that low oxygen levels in Farmington Bay at night may be contributing to the low biomass of brine shrimp in Farmington Bay. Jennie Bassett conducted experiments to determine the sensitivity of juvenile brine shrimp (nauplii) to oxygen. She found that nauplii were very sensitive to anoxic conditions, with 50% of nauplii dying after 3 hours without oxygen. This indicates that anoxic events that last longer than could have a large effect on brine shrimp populations. However, very low concentrations of oxygen (0.6 mg/L) were not as lethal to nauplii (50% dead after 16-20 hrs), indicating they could survive under these conditions.

As an alternative to oxygen, we examined the potential of predation by an insect (water boatmen, or corixids) to control brine shrimp populations. Erik Archer examined the distribution of corixids from the shore to the open water and found them to be evenly distributed with a mean density near 50 organisms/m^3. Mike Hadley conducted lab experiments and found that these corixids could eat 14-34 brine shrimp per day, depending on the size of the shrimp. With the density of corixids we found in the lake they have the potential to eat 20% of the adults and 60% of the juvenile brine shrimp in Farmington Bay each day. This is equal to or higher than the population growth rate of 20% per day that has been reported for another brine shrimp population (Zhang and King 1993), suggesting that corixids have the potential to significantly impact brine shrimp populations. However, water clarity in the experiments was high compared to conditions in Farmington Bay, where abundant phytoplankton greatly reduce water clarity. Because corixids are a visual predator, actual predation rates will need to be determined in field experiments.

Since little research has been conducted on brine flies in the Great Salt Lake, we examined the distribution of brine fly larvae in Farmington Bay and Ogden Bay. These larvae live primarily in algal mats (periphyton) growing on hard substrates (Collins 1980). Te-hui Ting found mean densities of brine fly larvae on benthic (or bottom) substrates near 50 organisms/m2 in Farmington Bay, but densities over 7000 organisms/m2 were present in Ogden Bay. However, these results were highly variable because it was difficult to sample the benthic substrates in both bays. We have two hypotheses to explain the much lower densities that may occur in Farmington Bay. First, the periphyton that the brine fly larvae feed on may not grow well in Farmington Bay because the extreme populations of phytoplankton may "shade-out" the algae on the bottom. We found that benthic chlorophyll concentrations were 2.5 times higher in Ogden Bay than in Farmington Bay, and brine fly abundance was related to benthic chlorophyll levels. Secondly, we hypothesized that the different densities of brine fly larvae could be due to lower dissolved oxygen concentrations in Farmington Bay than in Ogden Bay. However, Jason Kling conducted oxygen sensitivity experiments that indicated that brine fly larvae are less sensitive to anoxic conditions than brine shrimp (50% of pupae dead in 6.8 hrs). This indicates that anoxia events in Farmington Bay may not be long last enough to result in significant brine fly death. Much more work needs to be done to understand the factors controlling brine flies in Farmington Bay and elsewhere because brine flies are an important food resource for bird populations, and because they are often perceived as a nuisance species.

Although these field examinations and experiments are simply a snapshot of chemical, biological and physical conditions in October, 2002, the results have implications for management issues in Farmington Bay. While microbes decomposed large amounts of organic matter, anoxia in the sediments did result in high organic matter content in 2 of 5 sites examined. In these same two sites, hydrogen sulfide production was high, indicating that anoxia was changing chemical conditions in the bay. Experiments indicated that anoxic events have the potential to limit brine shrimp survival. However, predation of brine shrimp by corixids may also limit populations, and the interaction of these two factors must be further examined. While juvenile brine flies are not as sensitive to oxygen as brine shrimp, the low benthic periphyton levels in Farmington Bay may limit brine flies populations. Lowered oxygen levels and decreased benthic algae are conditions caused by pollution in Farmington Bay, and they clearly have the potential to impact the Farmington Bay ecosystem.

Although the results of the student's projects have greatly increased our understanding of pollution issues in Farmington Bay, we must be careful in interpreting information collected from just a short period during the fall. Fortunately, the Utah Division of Water Quality has recently developed a working group of scientists and managers from agencies, NGOs and universities that will soon bring the needed resources to understand water quality issues in the bay.

[1]Department of Aquatic, Watershed and Earth Resources, Utah State University, Logan, UT 84322-5210

Please direct correspondence to amym@cc.usu.edu
More about this work can be found on the class webpage, http://www.cnr.usu.edu/online/awer4510/.
(continued on pg. 14)

A Slice of SLICE

Base from U.S. Geological Survey digital data, 1:100,000, 1978, 1979, 1980, 1984
Universal Transverse Mercator projection, zone 12

Great Salt Lake

Map adapted by Bruce Thompson for FRIENDS of Great Salt Lake from graphics provided by U.S. Geological Survey

0 10 20 MILES
0 10 20 KILOMETERS

EXPLANATION

- Great Salt Lake, altitude 4,200 feet
- Intermittent water body
- Waterfowl Management Area (WMA) or other wildlife reserve

Project SLICE: The FRIENDS of Great Salt Lake Initiative for Conservation Education
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Inquiring Minds Want to Know

We Welcome Your Questions Via Email or Phone

I am in 4th grade and we are learning about different lakes. We are wondering if you could tell us the level of salinity in the Great Salt Lake?

Thank you,
Amanda Conn

Dear Amanda,

Your question about Great Salt Lake salinity has been forwarded to me, the Director of Education for FRIENDS of Great Salt Lake. Thank you for your interest in our spectacular and sometime mysterious neighbor.

The salinity at Great Salt Lake varies from close to 0(zero) all the way to 28%. When you read in some books that the lake "averages 13%," that number is really meaningless. There are actually very few spots in the lake where the salinity is ever 13%. Sometimes averages are just a way to confuse things!

To best answer your question, then, I must go into a little detail. It would also be helpful if you had a map of Great Salt Lake. If you need to you can look at (or even download) a map of the lake from the Resources section of the Education menu on our Website - www.fogsl.org/education/ed_resources.html

You ready? Here goes . . .

As you know, salinity is the word we use to describe the amount of minerals dissolved in water. These minerals can include many different salts and other material, and come from the erosion of rocks and soils by rain and snowmelt at higher elevations. Gravity brings many tons of these minerals downhill every day of the year to our Great Salt Lake, dissolved or suspended in streams and rivers.

But, Great Salt Lake's salinity varies dramatically in both LOCATION and over TIME.

Salinity varies by LOCATION, depending on how close an area is to fresh water coming into the lake. If you look at a good map of Great Salt Lake you will see four major bays, or "arms." One is way up to the northeast, named Gunnison Bay after the island found up there. (This is also sometimes called the North Arm). Here the salinity is as high as water at outdoor temperatures can get–close to 28%. It is so high because almost NO fresh water enters the lake in that area, AND the less saline water to the south can no longer mix with Gunnison Bay because of a railroad causeway. This causeway was built across the middle of the lake in 1959.

Another "arm" of the lake is Gilbert Bay, sometimes called the South Arm. This is the large bay to the south and east of Antelope Island. This part of the lake is now around 9%.

A third major section of the lake is the northeastern part, Bear River Bay. Here the lake gets diluted by the fresh water of Bear River. Salinity varies from fresh at the mouth to about 3% in the main part of the bay.

Farmington Bay is the fourth main section of the lake, found to the southeast. Similar to what happens in Bear River Bay, here the fresh water from the Jordan River causes lake salinity to vary from near zero at the mouth to around 3% in the center of the bay.

Just to complicate things a little more, the salinity of ANY of the bays of Great Salt Lake changes over TIME. It varies at least a little from season to season AND sometimes a lot from year to year. In general, the higher the lake rises, the less saline it becomes because more fresh water has come in. The lower the lake gets, the more saline it becomes, because less fresh water has entered.

First, let's look at changes from SEASON to SEASON. If you think about it this makes sense, because more fresh water enters the lake in spring (from snow melt) than in fall (when it has been warmer and there is more evaporation). Every year the lake is at its highest during April and May and at its lowest during October and November. The depth of the lake can vary by serveral FEET between these periods.

Changes in salinity from YEAR to YEAR happen whenever our weather goes through cycles of high or low precipitation. Years when there has been a lot of rain or snow, our rivers carry more water into the lake. When there has been less rain or snow for a while, the rivers bring less water to the lake. Again, less water in the lake means higher salinity, more water means lower salinity. As you know, these last three years have been very dry, so Great Salt Lake has lowered more than five feet from its normal elevation of 4202 feet above sea level down to around 4197 feet. A few years ago Gilbert Bay was at 8% salinity, now it has gone up to 9%.

I'll bet you were thinking that someone was just going to send you a short answer to your question, like "Great Salt Lake salinity is about 13%." I hope you can see now why one simple answer is impossible! I also hope my information was helpful to you and your class.

Happy Trails,

Bruce Thompson
Education Director

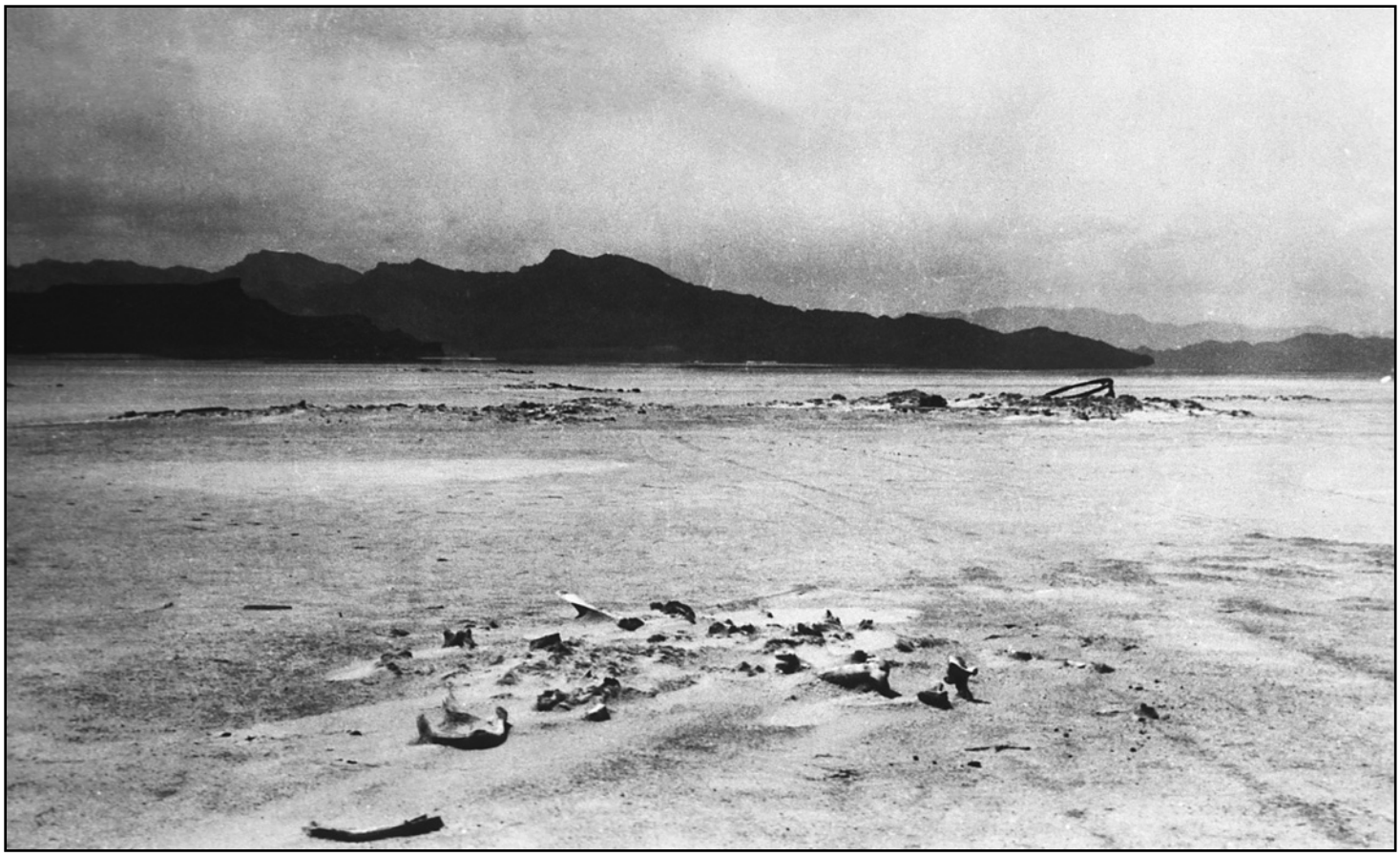
Lake Fact:

Up to how much salinity can pickleweed tolerate in soils (in percent)?

See page 19 for answer.

"The Field of Desolation"

The Hastings Cutoff Across the Great Salt Lake Desert by Peter H. DeLafosse



Remains of abandoned wagons and animals along the Hastings Cutoff. Floating Island at left; Silver Island Mountains in the distance. Photo by Charles Kelly. Used by permission, Utah State Historical Society, all rights reserved.

> "We reached the flat shore of the magnificent Salt Lake, the waters of which were clear as crystal, but as salty as the strongest salt brine.... The clear, sky-blue surface of the lake, the warm sunny air, the nearby high mountains, with the beautiful country at their foot, through which we on a fine road were passing, made on my spirits an extraordinarily charming impression. The whole day long I felt like singing and whistling."

So wrote California-bound emigrant Heinrich Lienhard in August 1846. Lienhard was enchanted by the scene, but the setting of the lake, mountains and valley was in stark contrast to what awaited him and his traveling companions as they approached the Great Salt Lake Desert. Lienhard was a member of one of four emigrant groups that traveled through Utah in 1846 along the Hastings Cutoff, a variant of the California Trail.

The Oregon and California trails that year diverged some fifty miles west of Fort Hall, located near Pocatello, Idaho. The California Trail followed the Raft River to City of Rocks, near the point where Utah, Idaho and Nevada meet, and then continued southwest to the Humboldt River. The trail followed the Humboldt and Truckee rivers and eventually crossed the Sierra Nevada.

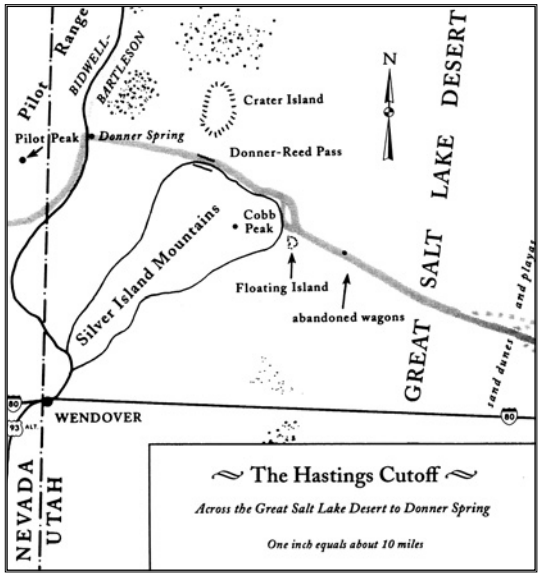
In his *Emigrants' Guide to Oregon and California,* published in 1845, Lansford W. Hastings proposed a shortcut to the California Trail that would divert emigrant traffic at Fort Bridger to travel an alternate route around the southern end of the Great Salt Lake. "The most direct route, for the California emigrants, would be to leave the Oregon route, about two hundred miles east from Fort Hall; thence bearing west southwest, to the Salt Lake; and thence continuing down to the bay of San Francisco."

The 1846 emigrants were not the first to cross the Great Salt Lake Desert. The Bidwell-Bartleson party of 1841, the first overland emigrants to reach California, traveled along the Bear River through Cache Valley and around the north and west sides of the Great Salt Lake. Near the 10,700-foot mountain on the Utah-Nevada border that John C. Frémont would later name Pilot Peak, this group

of 32 men, one woman and one child turned west into Nevada and continued on to California.

Frémont's explorations of the Salt Lake Valley in 1843 and 1845 convinced him that the Great Salt Lake and Desert were part of a large area between the Sierra Nevada and the Rocky Mountains that he named the "Great Basin." After exploring the Great Salt Lake in 1845, Frémont traveled west across the Great Salt Lake Desert along the route that became the Hastings Cutoff and continued on to California.

In the summer of 1846, Hastings and his partner, James Hudspeth, met several California-bound emigrant groups at Fort Bridger and persuaded them to follow the Hastings Cutoff. The first group was a nine-member party riding mules known as the Bryant-Russell party. They traveled through the Wasatch Mountains and entered the Salt Lake Valley via the Weber River. Led by Hudspeth, the group continued around the south end of the lake to Skull Valley and crossed the Cedar Mountains. From the summit they saw the landmark Pilot Peak, which guided them across the desert. Hudspeth exclaimed, "Now, boys, put spurs to your mules and ride like hell!"



From Trailing the Pioneers. © 1994 by Utah State University Press and Utah Crossroads. Reprinted by permission.

The next group was a large wagon train known as the Harlan-Young party. After some difficulty navigating their wagons down the Weber River, they rounded the south end of the lake and prepared to cross the desert. Several wagons and animals were abandoned during the crossing and were recovered after the group rested at the spring at the base of Pilot Peak, later named Donner Spring. A much smaller wagon train, known as the Hoppe-Lienhard party, was the third group to cross the desert. Better organized than the Harlan-Young party, this group crossed the desert without abandoning wagons or animals.

The Donner-Reed party was the last of the emigrants to travel the Hastings Cutoff in 1846. They pioneered the Emigration Canyon route into the Salt Lake Valley, which was followed in 1847 by Brigham Young's company and became the final segment of the Mormon Trail. Their crossing of the Great Salt Lake Desert was horrific. It took the Donner-Reed party six days to cross the desert, and they abandoned four wagons and livestock in the process. The delays they experienced in pioneering the Emigration Canyon route and crossing the Great Salt Lake Desert led to their entrapment in the Sierra Nevada by an early snowfall. Thirty-five members of the Donner-Reed party perished in the mountains and some ate the flesh of the dead before their rescue the following spring.

Emigrant travel across the Hastings Cutoff continued through 1850, when this route was abandoned in preference for Hensley's Salt Lake Cutoff. Hensley's route followed the I-15 corridor north along the east side of Great Salt Lake to join the California Trail at City of Rocks. John Wood was one of the last emigrants to cross the Hastings Cutoff in 1850. He abandoned one wagon near the Donner-Reed wagons. Wood called the desert "the field of desolation." Of the ordeal in crossing the desert he recalled "having to walk all the way almost without stopping, with but little to eat and drink, and no sleep, was soul-trying in the extreme. We dropped our bodies under the wagons and in less than five minutes were in a state of unconsciousness."

The five abandoned wagons on the Great Salt Lake Desert remained a curiosity as visitors burned parts of them for firewood and collected artifacts from the site. The powerful images of the abandoned wagons were brought to public attention through the desert explorations of Charles Kelly during the 1920s. A printer by trade and a historian by avocation, Kelly tracked down the records of all crossings of the Great Salt Lake Desert and published them in 1930 in his book *Salt Desert Trails*. Kelly's Hastings Cutoff photographs are among the most haunting images ever captured of Utah's desert landscapes.

Apart from some traces of the Hastings Cutoff, few physical reminders exist of the emigrants who crossed the Great Salt Lake Desert. Remnants of the five abandoned wagons have completely vanished. Historians have researched the desert route of the Hastings Cutoff and have marked the remaining remnants of the trail. Rumors of a cache of gold, allegedly buried in the desert by George and Jacob Donner, have attracted treasure hunters. But a fascinating mystery remains unsolved–the identity of the emigrant known as T.H. Jefferson.

A member of the 1846 Hoppe-Lienhard party, Jefferson published in 1849 his *Map of the Emigrant Road from Independence Mo. to St. Francisco California*. Jefferson is not mentioned in any journal kept by his traveling companions, and only two copies of the map have survived with the *Accompaniment*, a pamphlet containing Jefferson's practical tips for travelers.

(continued on pg. 14)

"Waiting for the Lake to Come Up"
(continued from pg. 5)

The foragers lived near their food source from spring through fall, specifically, wetlands and stream channels that provided suckers, seeds and roots in the spring and summer, and geese and seeds in the fall. In the winter, they moved to the outskirts of the wetlands where they had cached food supplies. The farmers lived off of their stores of maize, beans, and squash and stayed at their dwellings year-round.

Social networks were likely fluid, and if the historic period is any guide, there was multi-lingualism across the landscape. Trade from this area was with the west coast consisting of obsidian from southern Idaho, and the Sevier Desert, and veracite beads from Snowville. Even a shaman's sucking tube, a healing implement, is known from the area, and it is made of steatite from near Spokane, Washington. Although the trade was long distance and the Fremont thrived on the wetlands of Great Salt Lake, it was not to last forever.

One of the last areas we investigated was the only site we saw any evidence of archeological activity. It was the site excavated by Mel Aikens during 1964 and 1965 that contained circular clay-rimmed fire pits, patterns of post holes and adobe structures for corn storage. This site, too, was overgrown with vegetation and left our imaginations to take a glimpse at the past lives of the Fremont farmers. This site was one of only three in the area that radiocarbon dates later than A.D. 1600. Apparently there is no archaeological record to explain why the Fremont left after that time. Dr. Simms is looking for the relationship between prehistoric and modern day cultures to try to find the answer. It is not clear where the Fremont went after the 1600s and perhaps even more intriguing, is why they didn't return. Simms hopes to discover and study younger sites to find the missing link, but in the mean time, he might have to wait for the Lake to come up and retreat again to uncover the unsolved mystery.

Reference

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Great Salt Lake Level Forecasting

Join FRIENDS on February 25th, 7pm at the Sugarhouse Garden Center.

The lake level variations of the Great Salt Lake impact many aspects of the ecosystem and society from Brine-shrimp harvesting to flood impacts. Although lake-level forecasts based on typical time-series statistical models failed to provide useful information during the flooding in the late 1980s, this inspired Dr. Upmanu Lall to apply more advanced statistical models that showed better forecasts were possible. Since this research project concluded in the early 1990s, the forecasting methodology has not been used for management of the Great Salt Lake. The forecasting methodology has been used to provide infrequent forecast updates primarily for media purposes, but not for decision-making.

In addition to the statistical methodology that uses only previous lake-level information, research has shown that anomalously warm or cool sea surface temperature in the tropical Pacific ocean (El Niño/La Niña), and the North Atlantic ocean impact lake levels. This information is not currently being used in the forecasting methodology and has the potential for improving the forecast accuracy and reliability.

Visit the GSL forecast web site for a preview of the program
http://www.engineering.usu.edu/uwrl/CBaldwin/gslforecast

Connely K. Baldwin, a Research Engineer at the Utah Water Research Laboratory at Utah State University, received a Masters degree in Civil and Environmental Engineering under Dr. Upmanu Lall in 1998. He has been responsible for updating the Great Salt Lake forecast since Dr. Lall left Utah State University. Connely's primary interest is in developing and implementing long-range hydrologic forecasts for specific management purposes.

Great Salt Lake is an Enormous Habitat

Thoughts from a 4th Grader by Will Floor, St. Sophia School

Some people think the Great Salt Lake is a dirty, smelly, buggy world. It is really a place that has many extraordinary animals. It is an enormous habitat for bugs, birds and brine shrimp.The brine shrimp eat the algae to keep the lake clean. The birds eat the bugs to keep their population down and the coroxid bugs eat the brine shrimp to keep their population down also. It is a very unique life cycle.

In October my 4th grade class went on a field trip to Antelope Island on the Great Salt Lake. Our teacher, Mrs. Allen, lead the expedition. Before we crossed the causeway, we observed pickleweed and banded gneiss. Going across the causeway we encountered many birds including Avocets, California Gulls, and a great Blue Heron. We went to Bridger Beach on Gilbert Bay. Mrs. Allen explained to us the difference between sand on an ocean beach and the ooids on this beach. We collected brine shrimp for our classroom ecosystem. The brine shrimp and the algae have been doing well in the ecosystem we created for them.

Since we returned from the Great Salt Lake, Mrs. Allen has given lots of information that she learned through project SLICE. She explained, "Bruce Thompson, my Project SLICE teacher, opened up a whole new world to me. The curriculum provides me with a truly exciting way to teach science!"

She has taught me to understand what a wonderful, interesting place Great Salt Lake is. If she had not participated in Project SLICE and taken the time to share it with my fellow classmates, we would still think the Great Salt Lake is just a dirty, smelly, buggy world.

photo by Amy Marcarelli

"The Feild of Desolation"

(continued from pg. 11)

"Upon this journey the bad passions of men are apt to show themselves." He advised emigrants to "Avoid all partnership if possible. Provide your own outfit, and expect to take care of yourself." He instructed travelers how to carefully prepare for crossing the Great Salt Lake Desert.

Motorists who travel from Salt Lake City to Wendover along I-80 follow the travel corridor used by these 1846 pioneers. Those who intend to leave I-80 and explore the Great Salt Lake Desert will face the same waterless and featureless plain as the overland emigrants. T.H. Jefferson's advice is still applicable to modern explorers—be prepared!

For Further Reading

DeLafosse, Peter H., ed. *Trailing the Pioneers: A Guide to Utah's Emigrant Trails, 1829-1869*. Logan: Utah State University Press and Utah Crossroads, Oregon-California Trails Association, 1994. Contains maps and instructions for following the emigrant trails around the Great Salt Lake: Bidwell-Bartleson trail, Hastings Cutoff and Hensley's Salt Lake Cutoff.

Hawkins, Bruce R. and David B. Madsen. *Excavation of the Donner-Reed Wagons*. Salt Lake City: University of Utah Press, 1990. Because of the rising waters of Great Salt Lake in the 1980s, the State of Utah sponsored an archaeological study of the remaining artifacts from the site of the five abandoned wagons on the Great Salt Lake Desert. This book is a summary report from this study.

Kelly, Charles. *Salt Desert Trails*. Salt Lake City: Western Epics, 1996. First published in 1930, this is the "granddaddy" of Utah trails books.

Korns, J. Roderic and Dale L. Morgan, eds. *West from Fort Bridger: The Pioneering of the Immigrant Trails across Utah, 1846-1850*. Revised and Updated by Will Bagley and Harold Schindler. Logan: Utah State University Press, 1994. This book was originally published in 1951 as volume 19 of the *Utah Historical Quarterly*. It includes original journals and much documentary information about the opening Utah's emigrant trails from Fort Bridger, with extensive annotations. This classic work was reprinted in a new edition revised and updated by Will Bagley and Harold Schindler.

Spedden, Rush. "Who Was T.H. Jefferson?" *Overland Journal*, Vol. 8, No. 3 (Fall 1990). The author presents evidence suggesting that T.H. Jefferson was Tom Hemings Jefferson, the son of President Thomas Jefferson and Sally Hemings.

"Is Farmington Bay Healthy?"

(continued from pg. 7)

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Collins, N.C. 1980. Population ecology of Ephydra cinerea jones, the only benthic metazoan of the Great Salt Lake, USA. Hydrobiologia 68: 99-112.

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Zhang, L., and C.E. King. 1993. Life-history divergence of sympatric diploid and polyploid populations of brine shrimp Artemia parthenogenica. Oecologia 93: 177-183.

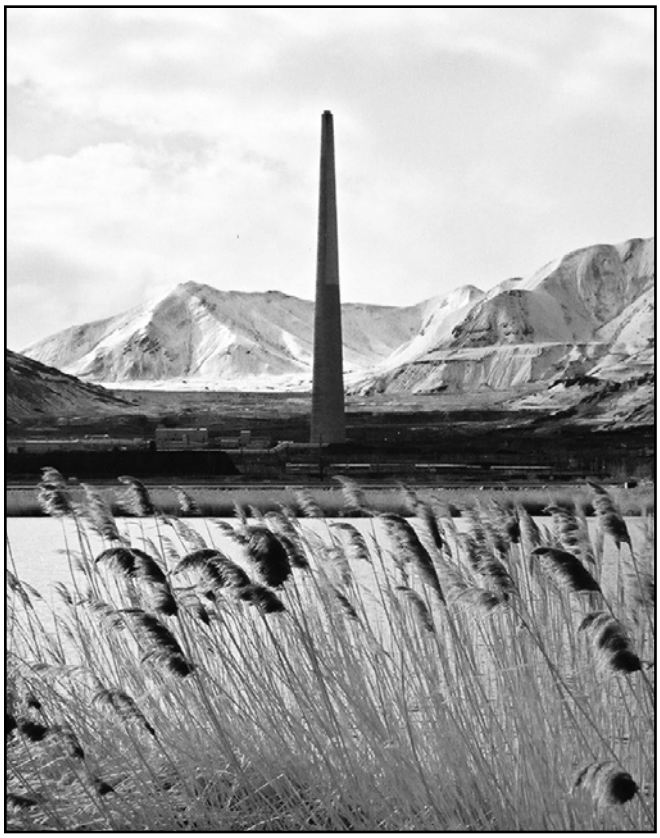

photo by Max Reid

Hurricane Kenna Devastates San Blas, Mexico

Greater San Blas Hurricane Kenna Conservation Assistance Proposal by Don Paul

On October 25, 2002 the eye of Hurricane Kenna traveled through the small coastal city of San Blas, Nayairt, Mexico and through the neighboring National Marsh. This is the exact area of the, "Linking Communities, Wetlands, and Migratory Birds" (LC) focus that was established in the mid 1990s. The Linking project ties three important Western Hemispheric Shorebird Network sites together to address the year-round conservation needs of migratory birds that use them, they are the Marismas Nacionales (San Blas area), Chaplin Lake, Saskatchewan and The Great Salt Lake, Utah. A tri national initiative committee has been active on several fronts working on conservation. Most recently the Shorebird Sisters Schools program has been initiated to tie formal education of school children in the three countries together by developing an interest in shorebirds and their conservation. Part of the effort to do this in Mexico was lost in the Hurricane. For example, citizens of Pimientillo lost their boats, observation towers, and binoculars just as they were getting started with their Shorebird Sister School education and ecotourism efforts. They are forging ahead in spite of the damage according to Carlos Villar, LC cooperator. They are rebuilding and have moved forward with their plans and held a festival in November. The Pimientillo School and Ecotourism Group celebrated, "Los Amigos del Norte" (Friends of the North) a festival of shorebirds.

Carlos says that the community and others interested in conservation need help in rebuilding. Fortunately there was no loss of life but there is wide spread damage to homes, infrastructure of the towns and massive downing of large forest trees. "The worse damage is the loss of habitat for aquatic and ground birds and mammals", said Carlos. As many of you know Mark Stackhouse of Westwings and I representing the U.S.A. Linking Communities Committee, and others have been working to establish appropriate assistance to our friends in Mexico. Mark is looking into how we might be able to help with humanitarian needs and I have been working with the Great Salt Lake Bird Festival Committee to address ways we can assist with conservation needs. We are interested in providing legitimate opportunities that will directly help in our areas of interest. Mark is still working on the best legitimate humanitarian means of contribution.

We do have a non-profit system in place to provide assistance to the communities and organizations that need assistance with conservation and conservation education. The Linking Communities, Wetlands and Migratory Birds Bike Ride and Fun Run initiative was established in 1997 as a service project component of the Great Salt Lake Bird Festival to assist our Mexican partners in carrying out environmental education and avian conservation projects. One of the main LC objectives is to encourage small community nature based tourism to assure sustainable habitats and diversify local economies.

We are making this non-profit initiative available to you as a means of supporting conservation project and wildlife habitat recovery in the aftermath of Hurricane Kenna. The advantages of using LC and the GSL Bird Festival programs for assistance are that a system of communications is in place, we know and have direct contact with Mexican conservationists, It directly targets existing partners and the area where many breeding Pacific Flyway birds winter. We have ongoing-shared conservation initiatives and have developed trusted relationships.

Go to http://www.reliefweb.int/w/map.nsf/w for a map of the hurricane's path.

Proposal:

The Great Salt Bird Festival Committee will oversee fund raising through its nonprofit status and will highlight the need to assist San Blas and other neighboring communities through the 2003 festival. Don Paul, Mark Stackhouse and Carlos Villar will oversee the distribution of donations to assist in conservation projects that are needed in the hurricane affected area to include La Libertad and Pimientillo. For interested individuals and organizations here are the details:

- Funds and binoculars will be excepted through the GSL Bird Festival, May 24, 2003.
- Binoculars can be delivered to the Davis County Economic Development and Tourism Office during office hours(28 East, Farmington) or to the Davis County Fair Park on May 17, 2003(opening day of the Festival).
- Funds can be remitted to The Davis County Tourism Office as follows:
  GSL Bird Festival - Attention San Blas, Mexico
  P.O. Box 618
  Farmington, Utah
  84025

A report on the expenditure of funds will be provided to each interested person by December 31, 2003. Please include your return address with your remittance and a statement that you are interested in a report.

We thank you for your kind consideration in donating to this worthy conservation effort and assistance to our Mexican partners in wildlife conservation.

Citizen Monitors Working in Utah Wetlands

Photos and Words by Brian Nicholson

Dedicated hunter collecting a water quality sample Salt Creek WMA

Black-crowned night heron...muskrat...beaked sedge... dragonfly larvae –committed Utah citizens are encountering and counting all these and more in a wetland monitoring program within the Great Salt Lake Basin. Wetland Partners, sponsored by the Utah Division of Wildlife Resources (DWR), is funded by EPA Region VIII Wetland Protection and Environmental Education grants, and has been gathering data since 2000. As of Winter 2003, ten groups of trained volunteers seasonally monitor 11 wetlands from Draper to Cache Valley.

Citizen monitors range in age from 15 to 75 and are interested in wetlands for a wide variety of reasons. Three of the volunteer groups are composed of high school students, who monitor as part of their environmental science classes. Five groups are participating in DWR's Dedicated Hunter Program, and are interesting in protecting and learning more about the sites in which they recreate. The remaining three groups are composed of citizens who wish to explore Utah's wetlands, contribute and/or learn a specific skill, and increase our understanding of this valuable resource.

Each citizen group monitors six different wetland parameters. These include birds, land use, macroinvertebrates, vegetation, water quality, and wildlife. In addition, participants establish long-term photo points and record monitoring station locations using a GPS unit. Data on each parameter are collected seasonally, and entered into an on-line database. Data are used by state and federal agencies, municipalities, private landowners, and a home-owner association to measure change at a site over time and inventory wetland flora and fauna.

Citizen monitor collecting macroinvertebrates at Farmington Bay WMA

Ten Monitoring Sites

Mehraban Wetlands Park, Draper: This wet meadow is located in the center of a residential neighborhood in Draper, and consists of a wetland fed by storm runoff and an adjacent fish pond. A group of citizens began monitoring this site in the Summer of 2001.

South Jordan Mitigation Project, South Jordan: This mitigation site along the Jordan River is in the first year of a five year monitoring plan. Citizen monitors began work at this site in August 2002 in collaboration with the City, the Army Corps of Engineers, and an environmental consulting firm.

Lakefront Duck Club: This is a privately owned hunting club on the south shore of the Great Salt Lake. Dedicated Hunters who are members of the club began monitoring on their property in the Summer of 2001 in an effort to better manage their property, specifically to control the spread of Phragmites.

Oquirrh Duck Club: This private duck club is located just off I-80, on the shores of the Great Salt Lake. A father/son team, participating in the Dedicated Hunter program have been monitoring birds at this site for two years.

Farmington Bay WMA: This riparian site adjacent to Farmington Bay is on DWR property in the Farmington Creek drainage . It has been monitored since the Summer of 2001, by a group of Dedicated Hunters who frequently hunt at this wetland.

Diamond Ranch: Just north of the Antelope Island causeway, a group of local Dedicated Hunters are monitoring a slough on the shore of the Great Salt Lake. This property is privately owned and managed for hunting. Data gathered by these monitors will be used to improve wildlife habitat.

Salt Creek WMA: A small group of Dedicated Hunters began monitoring at this site last August. DWR will use the data to assess the condition of a Heron Pond, a constructed wetland and the surrounding habitat.

Bear River Bottoms WMA, Cache Valley: This palustrine wetland formed over time in the remains of an old oxbow on the Bear River. Logan High School environmental science students monitor this site in Trenton, UT. This site has been monitored since the Fall of 2000.

Bud Phelps WMA, Cache Valley: This site is a mitigation wetland created in 1995 by Pacificorp. It consists of a large pond with two islands, fed by nearby Spring Creek canal. Mountain Crest High School environmental science students have been monitoring this site since the Fall of 2000.

Benson Bridge, Cache Valley: This is a Pacificorp recreation access site on the Bear River. A Cache Valley citizen group and a class from Cache High monitor two areas at this location. Monitoring began in November 2000.

20-20 Ponds, Cache Valley: These ponds are privately owned, are in the Spring Creek drainage, and home to a variety of waterfowl. The Cache Valley group of adult volunteers has been monitoring this site since November 2000.

If you are interested learning more about these sites or joining Wetland Partners, contact:
Brian Nicholson or Barbara Daniels at 435-797-8058 or wetlandpartners@utah.gov.

Volunteers setting up a monitoring site. South Jordan

Heron Pond, Salt Creek WMA

HOW TO REACH US
FRIENDS of Great Salt Lake
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Salt Lake City, UT 84110-2655
801-583-5593
www.fogsl.org / mail@fogsl.org

Special Thanks

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Genevieve Atwood and Don Mabey
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Will Floor
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WE want to thank **The Tides Foundation, Xmission.com, Tooele Transcript Bulletin** and all who have donated to the **Transit First/Legacy Highway Lawsuit Campaign.**

SUBMITTING MATERIAL FOR PUBLICATION

Mail or Deliver to: 1117 E. 600 S. Salt Lake City, UT 84102,
E-mail to: ldefreitas@earthlink.net. Please call 801-583-5593 to confirm receipt of e-mail or with any questions, suggestions, comments, or ideas.

Deadlines: Sept. 16 (Fall), Dec. 16 (Winter), Mar. 16 (Spring), and June 16 (Summer).

The Importance of Your Membership

The strength of FRIENDS comes from its members. All of you, with your individual contributions to Great Salt Lake awareness, help provide this organization with the momentum it needs to carry on its work for the lake. We all know about the tremendous challenges and opportunities for Great Salt Lake. Knowing those challenges and opportunities, FRIENDS' board of directors works hard to identify the best ways to respond to them. Some of our critical activities:

- The Legacy highway campaign
- Commenting on the Great Salt Lake Comprehensive Management Plan
- Educating the public at large about the importance of our big, salty neighbor
- Participating in public hearings and on committees that address development around the lake,

But without the support and participation of the membership, the work of the board is limited. General meetings, field trips, and volunteering are all ways that you can help build public recognition of FRIENDS and its mission. Through these means, you also become more knowledgeable about the lake, its science, its history, and our relationship to it.

One of the goals that the board continues to identify at its annual retreat is building membership. How can we develop a robust and active membership ? We need to develop a critical mass of lake advocates, true friends of Great Salt Lake.

So, FRIENDS is asking you, our members, to keep active through participation and by keeping your membership current. Check your mailing label for your membership renewal due date. Renew promptly if you have expired. If you have questions about your membership, please call Lynn at 801-583-5593.

And do what you can to help recruit new members to strengthen our voice for Great Salt Lake protection and preservation.Consider a new year's gift to FRIENDS - recruit a new member. Pass on your newsletter to a friend or neighbor. Spread the news about who we are and how we are working for Great Salt Lake.

Big Thanks!

PS. Does this sound like your mother?

Lake Fact Answer:

Approximately 6%

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