# FRIENDS of Great Salt Lake

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www.fogsl.org
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*Crane Reflections* by Gary Crandall, 2000

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.

www.fogsl.org

# Executive Director's Message

## Two Years and Counting - Working Toward a Numeric Water Quality Standard for Selenium in Great Salt Lake.

*Antelope Island* courtesy FOGSL

"The potential exists here and now to develop numeric standards to prevent future impairment of a unique natural resource. This process will require understanding the Great Salt Lake Ecosystem beyond controlling discharges."

Maunsel Pearce, Chair of the Great Salt Lake Alliance

In the summer of 2004, the Department of Environmental Quality established the Great Salt Lake Water Quality Steering Committee to guide the process of developing a numeric standard for selenium in the open waters of Great Salt Lake.

The formation of this committee was a major first step in charting a new course for the future of Great Salt Lake water quality management. It represents a significant change from using a narrative criteria to a numerical value for the purpose of regulating selenium discharges into the Lake.

This decision is both remarkable and timely and the Department of Environmental Quality deserves great praise for recognizing the importance of the Lake in this critical context. The decision was music to the ears of many who have worked tirelessly discussing the merits of numeric standards and the principles of comprehensive watershed management for the Great Salt Lake Ecosystem with the Division of Water Quality.
It is an auspicious beginning.

The opportunity for setting such a precedent came from a protracted and complex USEPA CERCLA (Comprehensive Environmental Response, Compensation and Liability Act) Program and a Natural Resources Damage (NRD) Proposal to the State Trustee, Dr. Dianne Nielson, Director of the Department of Environmental Quality.

At the heart of this regulatory and legal grandeur is the Groundwater Extraction and Treatment Remediation Project (Remediation Project) in the Southwest Jordan Valley. The Project is long term and involves Kennecott Utah Copper (KUCC) and the Jordan Valley Water Conservancy District (JVWCD).

In the Proposal to the Trustee, KUCC and JVWCD proposed to develop and construct a groundwater extraction and treatment project for two contaminated aquifers - Zone A and Zone B- with groundwater remedial functions that will provide treated municipal quality drinking water to the public in the Affected Area of the valley. Zone B included additional Lost Use Facilities to produce treated water from shallow wells along the Jordan River.

True to form in the development of such complicated environmental endeavors, the Proposal went through numerous iterations. And helping to drive these iterations were public hearings and comments on the Remediation Project.

In the summer of 2003 through the early part of 2004, two key events provided the impetus that helped initiate the numeric standard process. The first was the strong opposition by the public to the portion of the Remediation Project, providing for the discharge of concentrates from Zone B and the Lost Use Facilities to the Jordan River. And the second, was the decision by JVWCD to withdraw its discharge permit and adjust plans for the Lost Use Facilities because of this opposition. (Review FRIENDS Winter '06, Winter and Summer '04 newsletters for more background).

Once the Salt Lake Water Quality Steering Committee was formed, it identified the project goals, established the process and organizational structure, created accounting and reporting procedures to keep the public and stakeholders informed and engaged, and selected a Science Panel of selenium experts responsible for recommending the selenium standard.

On November 29 & 30, 2006, the Principal Investigators performing the scope of work for the selenium study, reported their findings to date to the Science Panel. Using a detailed conceptual model for selenium cycling in Great Salt Lake as a template for the specific research projects, general categories of the model include: selenium input, selenium in water and sediment, in the lower food chain, in the upper food chain, and selenium flux.

The research projects addressing these areas are : Project 1A- Birds (Shorebirds, Gulls and Over wintering Birds), Project 2- Food Chain (Brine Flies, Synoptic Survey), Project 3 - Selenium Loading and Project 4 - Selenium Flux.

It was determined by the Science Panel that additional work was needed in the kinetics and regulation of selenium in bring shrimp, and the volatilization of selenium into the atmosphere. The existing projects are in various states of data collection and analysis and could be finished as early as the summer of 2007.

When all of the new and old data is evaluated, the Science Panel will recommend a standard for selenium to the Steering Committee, who will evaluate it and forward a final recommendation to the Division of Water Quality. At this point, stakeholders will be engaged in a hearing and commenting process and the recommendation out of this process will be presented to the Water Quality Board. If approved by the Board, it will be forwarded to the EPA for final approval.

To date, more than a million dollars in funding and in-kind donations have come from The Nature Conservancy of Utah, the Jordan Valley Water Conservancy District, North Davis Sewer District, the US Geological Survey, Forestry, Fire and State Lands, Kennecott Utah Copper and the EPA. Without this strong endorsement and without this depth of funding required to cover the great costs involved in this study, it's anyone's guess where we would be today.

Remember – we all have a stake in this study and its outcome. Although selenium is a mineral essential for human health in trace amounts, at higher levels it can be deadly to fish and wildlife. Show ownership in the process. Come to the meetings and participate in the hearings and public commenting opportunities ahead. Take time to review the DEQ website for greater details www.deq.utah.gov/Issues/GSL_WQSC/

We owe it to ourselves and we owe it to Great Salt Lake.

In saline,

Lynn de Freitas

*"If we all give a little, it can really mean a lot. It's a small, small world, but it's the only one we got-small world"*

Huey Lewis and the News

# Friends Organizational Statement

Friends of Great Salt Lake was founded in 1994. The mission of Friends 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. The long-term vision of Friends is to achieve comprehensive watershed-based restoration and protection for the Great Salt Lake Ecosystem.

Friends has a very active Board of Directors and an Advisory Board consisting of professionals in the scientific, political, literary, education, and broadcast communities. The organization sponsors an array of programs, activities, and materials in pursuit of its mission.

Every two years, Friends hosts the Great Salt Lake Issues Forum to provide a focused discussion about the Lake for policy makers, researchers, planners, industry and other stakeholders. The goal of each 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.

The Friend of the Lake Award, given at each forum, acknowledges a citizen, business or organization working to promote GSL awareness in the community.

In 1997, Bruce Thompson was hired as Education Director to initiate a major regional education project designed to enhance both the knowledge about and care for the future of Great Salt Lake. Bruce wrote and produced a live-narrative slideshow program "The Lake Affect: Living Together Along the Shores of Something Great." The program is now available on DVD.

In 2000, Project SLICE, a 4th grade curriculum using Great Salt Lake as a system of study was initiated. It consists of 7 units of study, a Speakers Network, Teacher Training Workshop, and Lakeside Learning Field Trips. Currently work is being done to expand the curriculum into other grades.

In 2005, Friends hired Katie Pearce as Assistant Director, who is working to refine the Project SLICE curriculum and expand education outreach into the Great Salt Lake community.

In 2002, the Doyle W. Stephens Scholarship Award was established. The scholarship provides support to undergraduate and graduate students engaged in new or ongoing research that focuses on Great Salt Lake.

In 2006, Friends was the recipient of the Calvin K. Sudweeks Award by the Utah Water Quality Board for outstanding contributions in the water quality field.

In 2002, President Lynn de Freitas, was awarded the outstanding volunteer educator award by the Utah Society for Environmental Education.

In 1998, Friends was awarded the Conservation Achievement Award by the Utah Chapter of the Wildlife Society.

## On the Cover

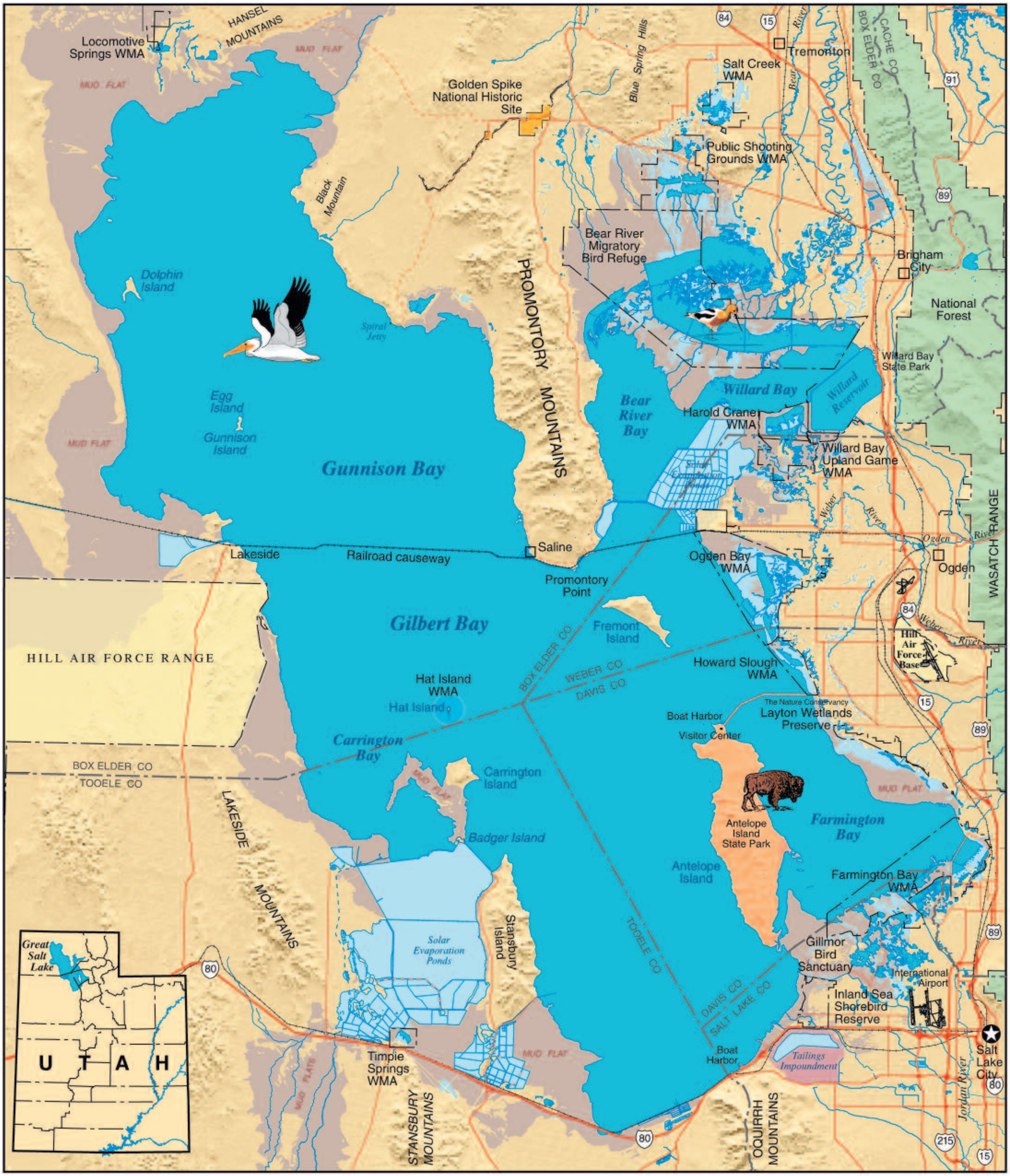
*Crane Reflections* by Gary Crandall, 2000

Usually found in open fields, meadows and open marshes, the sandhill crane (Grus canadensis) is a large, statuesque bird 41"- 46" in length, depending upon whether it is the Greater or Lesser Sandhill. Sexes look alike, but the male is slightly larger. The body is gray with a reddish hue and a red crown, white cheek and tufted feathers over the rump reminiscent of a bustle on a dress.

Sandhills are quite conspicuous, gregarious and make a loud, resonant wooden rattle sound similar to a percussion instrument. Small scattered breeding populations are found in northeastern Utah. Their diet includes roots, tubers, seeds, grain, berries, small vertebrates and invertebrates.

For more information about Gary Crandall's work, contact him at Dancing Crane Studio, 801-296-9393 or visit www.dancingcrane.com

# Great Salt Lake at a Glance




Courtesy of USGS

# Developing Bear River Water:

## Is it necessary and are there alternatives?

Imagine the Great Salt Lake without the Bear River. In other words, imagine it with 60% less contributing surface flow. Without the Bear River, the Great Salt Lake would be a fraction of its current size. Over time, acres of playa, wet meadow, and emergent marsh wetlands, in addition to some of the world's most specialized migratory bird habitat, would disappear.

**Dams and Diversions Proposed for the Bear**

Yet water suppliers propose to create massive diversions and send Bear River water south to address a projected water deficit that cannot justify the ensuing monetary and ecological costs. Bear River development would cost Utah taxpayers hundreds of millions of dollars and reduce the average annual outflow of the Bear by 18% in a low water year, and up to 70% in a high water year.

Where did this idea originate? Under the Bear River Development Act, the State directs the Division of Water Resources to develop 220,000 acre-feet of municipal water for distribution among the Jordan Valley Water Conservancy District, Weber Basin Water Conservancy District, Cache County and the Bear River Water Conservancy District. The State now proposes to construct a two-phase, $680 million project on the Bear. Yet the State's own numbers demonstrate that at the limits of their projections (2050), the predicted deficits are less than 20,000 acre-feet at the county level. The proposed solution is 11 times larger than the predicted problem

**Compelling Alternatives to Dams and Diversions**

Of the numerous methods other states and municipalities in the West have used to address water supply issues, there are two that have a history of success: water conservation and agricultural water transfers.

**Water Conservation in Utah:**

By the year 2050, the State of Utah aims to reduce water usage on a per capita level by 25 percent, or from 321 gpcd in 1995 to 241 gpcd in 2050. Already between 1995 and 2003, Utah achieved a 17 percent reduction in water use. In contrast, Albuquerque, New Mexico achieved a 34% reduction in water use from 1995-2005, decreasing usage from 250 gpcd to 174 gpcd. It furthermore set a new goal for itself to achieve an additional 40% reduction by the year 2014. Clearly, the state of Utah can do more.

**Agricultural Water Transfers in Utah:**

As the population along the Wasatch Front grows, lands currently used for agricultural purposes will convert to residential uses. Consequently, agricultural water rights will be available for conversion to municipal and industrial uses. The State estimates that across the project area, approximately 209,000 acre-feet of agricultural water will be available for conversion by the year 2050.

**Alternatives exist at a cost significantly less than Dams and Diversions:**

The Council compared the cost of two alternatives, water conservation and agricultural water transfers, to that of Bear River dams and diversions. We determined that alternatives clearly trump development in cost-effectiveness. Dams and diversions on the Bear will cost $420 million, in 2006 dollars, to deliver the first 75,000 acre-feet of water to the Wasatch Front. This translates to approximately $5,600 per acre-foot. In comparison, by utilizing water conservation and available agricultural water transfers, the State can cut costs to $1,600/ acre-foot developed … a cost savings of $4,000 per acre-foot!

**The Council's recommendation:**

There is a solution to the predicted water deficit that does not require dams and diversions on the Bear at an unprecedented cost to Utah's taxpayers. In its analysis, the Council reviewed several scenarios and recommended the following:

- Both the Jordan Valley Water Conservancy District and the Weber Basin Water Conservancy District should increase their water conservation goal to 35 % by 2050, a 10% increase from the existing goal;

- The Jordan Valley Water Conservancy District should also utilize 20 percent of the agricultural water transfers available in 2050.

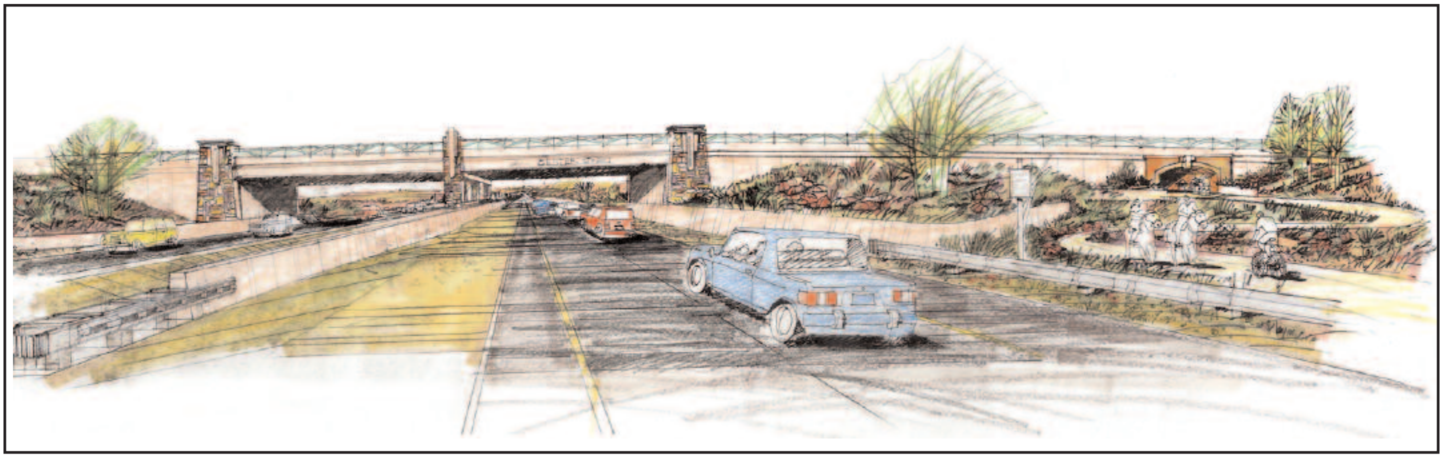
These alternatives are achievable. In fact, under the Council's recommended increase in conservation, per capita use in 2050 would be equal to the per capita water use today in several western cities.

Evaluate the data and the Council's analysis in more depth at www.utahrivers.org. If you are compelled to act, contact us at 801-486-4776. We can help direct your efforts where they will make the most difference.

*Bear River Idaho* by Dayle Record

# Legacy Parkway and Preserve

## Part II - Defining the Real Parkway Legacy



*Artist's rendering of southern gateway* courtesy UDOT

**What is a parkway?**
This simple question has been asked frequently during the past two years as the Utah Department of Transportation has worked to understand what a roadway might look like along the shores of the Great Salt Lake.

In trying to answer that question we looked to examples of parkways that already exist, including the George Washington Memorial Parkway, the Merritt Parkway, the Blue Ridge Parkway and other parkways in the eastern United States. We soon learned of the wide variety of features possible in the building of parkways. There are limited industry standards or design guidelines qualifying the designation of a parkway. However, the various parkways worldwide share one common theme: an emphasis on the natural environment that provides a unique driving experience. This was our starting point.

**Defining the Legacy Parkway**
In early June of 2005 several Legacy Parkway team members were invited to discuss parkway possibilities during a meeting arranged by the FRIENDS of Great Salt Lake and other civic groups. A consultant with smart growth expertise led the dialogue. The meeting served as a catalyst for the Legacy team to begin a series of meetings utilizing the expertise of a wide variety of professionals.

The Legacy team quickly formed a group of individuals tasked with defining a contemporary parkway. Architects, planners, artists, landscape architects, a visual scribe, engineers and environmental graphic artists shared ideas and began to define a Utah parkway. A significant amount of effort was spent learning about the context of the Great Salt Lake, the mountains and the communities through which Legacy Parkway would pass. After a series of workshops and hundreds of hours of meetings, the form of a parkway started to take shape.

A new language evolved, introducing many of us to new words, concepts and ideas: gateways, landforms, trailheads, berms, xeriscaping, community integration, monuments, visual screening, responsibility of materials, independent alignments, among many other terms. This new language had artists and engineers discussing concepts that stretched imaginations and questioned standard practices. This synergy continued and by late 2005, the team had a workable definition of what the Legacy Parkway would become.

**Parkway Features**
"Pastoral driving experience" was a key concept used to develop many Legacy Parkway features. To evoke the pastoral driving experience, viewscapes were analyzed and the roadway was designed to take advantage of certain perspectives. This was accomplished by meandering the northbound and southbound roadways and through the use of berms and landscaping to enhance certain views and limit less desirable views.

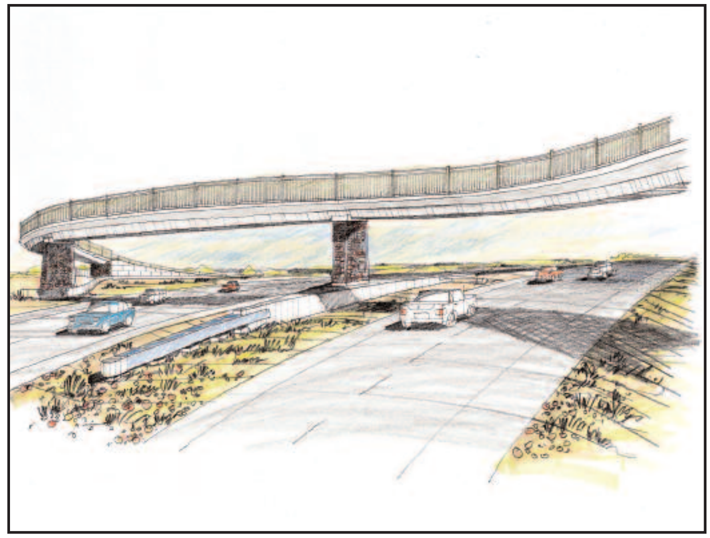
Landscaping is consistent with the natural environment and includes upland plantings, wetlands and riparian zones. Architecture of the bridges utilizes rock features in the monuments and elements of grass blades in the design of the railings. The prehistoric Lake Bonneville shoreline shelf above the valley floor was also incorporated into design of the bridges.

Gateways were developed where drivers will transition from the freeway to a parkway experience. Architectural, landscaping and other visual components were designed into the bridge of the Parkway's southern gateway at North Salt Lake's Center Street. The northern gateway near Glovers Lane welcomes drivers entering the parkway from the north..

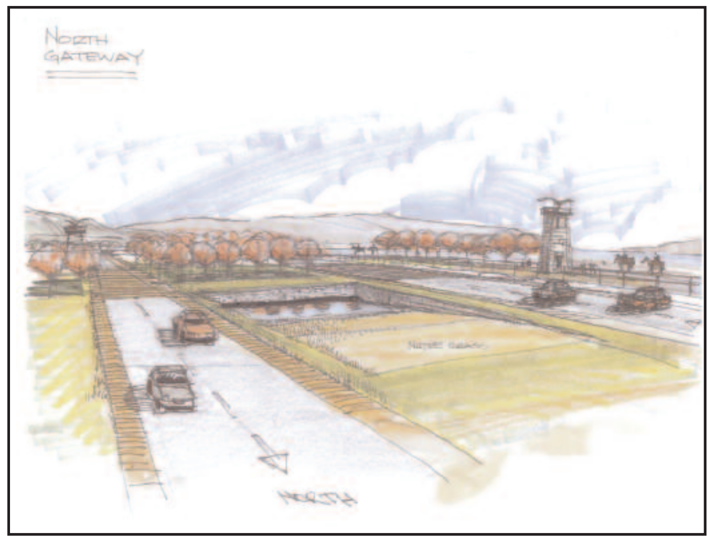
There is a trail system throughout the corridor. There is an 18-foot wide trail (10 feet paved, with four-foot soft shoulders on each side) running the entire 14-mile length of the Parkway. There is a six-foot wide gravel nature trail that runs about four miles along the Legacy Nature Preserve just west of the Parkway. More than three miles of the abandoned Denver & Rio Grande rail line will be paved for trail users. A pedestrian overpass takes trail users from a trailhead over the Parkway and down to the nature trail. Along the trail, there are trailheads that include parking spaces, kiosks, benches and drinking fountains. There are five underpasses and one overpass allowing users to access either side of the parkway.

Environmental responsibility is also a key factor in the Parkway design. The total right of way for the Parkway is approximately 850 acres. The Army Corp of Engineers' 404 Permit allows the Parkway to impact about 100 acres. Thoughtful design of the Parkway has resulted in the avoidance of about 25 acres of existing wetlands, bringing the total impact of the Parkway to about 75 acres. Also, 25 acres of new wetlands will be created as part of the facilities' landscaping.

The Parkway was designed to optimize community integration. Working with the five corridor communities on land use alternatives and designing the trail systems to encourage connectivity, a unique opportunity has evolved. Communities are working with developers to change their plans that called for them to put their backs to the Parkway. Developments are now being designed that will actually face – and embrace – the Legacy Parkway. This has resulted in a blurred boundary between the trail system and developments. Developers are designing open space features along the Parkway so that community trails connect to the Parkways trails. Recently the five corridor communities joined together to determine a cohesive development plan for the entire corridor, striving to maintain a consistent development style along the Parkway.



*Artist's rendering of pedestrian bridge* courtesy UDOT




*Artist's rendering of north gateway* courtesy UDOT

The collaboration and creativity that has gone into the design of the Legacy Parkway highlights the beautiful natural environment, ensuring that users will have a unique driving experience once the project is completed. The design of a modern, contemporary parkway in the context of the Great Salt Lake shorelands has been the result of input and insight from hundreds of people, including Lynn de Freitas and FRIENDS of Great Salt Lake, all working to carefully balance many objectives.

And perhaps this cooperative effort will be the true and lasting legacy of the Parkway.

John Thomas,
Project Director, Legacy Parkway Team, UDOT

# Place Attachment

## Among Neighbors of Great Salt Lake and Its Environs

It's an exciting time for research on all kinds of different aspects of Great Salt Lake (GSL). Between the studies of microbiology, mercury and selenium, nest productivity, and climate effects related to GSL, as well as the larger ecosystem study and other research we have read about in this newsletter and other places, we are finally being able to consider aspects of the lake and its environs we have previously known little about. However, one area that lags behind these others is the social sciences. My research is an attempt to begin filling some of the gaps in examining the human part of the ecosystem, beginning with the people who live closest to the lake. Not much is known regarding their beliefs and attitudes about the lake, and their attachments to it, and considering their proximity to the lake, this could be valuable information for resource managers, local government officials, and others of us who are interested in GSL.

For my research, funded by the Doyle Stephens Scholarship, I conducted two focus groups to explore how residents who live close to the lake in Weber and Davis Counties feel about the lake, specifically how connected or attached they feel to GSL. The discussion included how focus group members feel about living close to the lake and why they chose to live there (including whether the lake played a role in the decision), and what they see as the positive and negative aspects of living close to GSL. The focus groups were part of a qualitative study of these issues, which also included interviews with a number of other residents who live within one mile of the lake and its environs, county commissioners in Davis, Weber and Box Elder counties, and a number of resource managers and rangers from the refuges, preserves and state parks that are part of the lake system. This report includes findings from this broader qualitative study. The findings here cannot be taken as representing those who live closest to the lake in general, but do provide a glimpse of how some of these lake neighbors feel about Great Salt Lake.

**Positive and negative aspects of living near the lake.**
Residents brought up a number of positive aspects of living close to Great Salt Lake. For example, when asked for the first word that came to mind when thinking about living near GSL, a number of focus group participants said "sunsets." Sunsets over the lake were brought up by most people who were interviewed about the lake as well. A number of people mentioned dark night skies over the lake—being able to see the stars and the reflection of the moon off the lake, as well as the view of the lake in general (although often not from their property, many of the closest residents cannot see the lake from their homes or land).

Being close to wildlife was frequently raised as a benefit of living near GSL. This included many avian references, including shorebirds, geese, ducks, swans, pelicans, cranes, and others, as well as fond mentions of the large number of bald eagles in the winter. Residents also spoke of bighorn sheep, buffalo, deer, elk, coyotes, turtles, foxes, and others, found on the shores, in the basins where the rivers meet the lake, and on the islands. Some close to the Weber County shoreline talked about moderate weather and a lack of snow as a benefit of living close to GSL, because of the protection the lake provides to this area much of the time. Other positive aspects of living near the lake were also mentioned.

Residents also talked about the negative aspects of living close to Great Salt Lake. Many brought up issues with "bugs," including mosquitoes, gnats, horseflies, midges and brine flies. Other residents stated they were not bothered by the bugs, particularly since they were what brought the birds to the area to feed. Some lake neighbors indicated they were used to it, but talked about visitors frequently being irritated by the sheer numbers of insects.

Everyone brought up the smell, including a number who said it was not problematic for them. It seemed the issue of smell was so connected to the lake that people felt they had to comment on it, even if it was to say it was not a problem for them. However, many did see it as problematic. In fact, when asked for the first word that came to mind when thinking about living near GSL, half of the focus group participants said "the smell." Other negatives raised included the ever-changing lake elevation, high ground water, and winter fog.

**Why do people choose to live close to the lake?**
A good number of residents were drawn to the area close to Great Salt Lake by the rural setting. Several of these people became attached to the lake once they arrived, and for a number of people, the lake and the ruralness of the place go hand in hand. Some people choose to buy land as far west as can be developed, or right next to protected wetlands, because they know the land next to them will remain open with unobstructed views and at least some sense of living in a rural area.

Several people reported that many folks in the area live there because they had inherited property, much of which had been in the family for generations. Often, the family connection had been there since the earliest European settlement, typically the Mormon settlement. Several focus group members were the third generation in their family to live on their property.

Other residents reported they had chosen to purchase land in the area because it was affordable, another indication of the land closest to GSL not being typical lakefront property. Still others indicated they had moved to the area because it was a "good place to raise the kids." Some of these parents talked primarily about the benefits of children living in a rural area, but a number spoke particularly about being able to rear their children so close to the lake or the bays. And finally, some residents were specifically attracted by the lake and the bays, especially by the idea of being close to the wildlife there.

So there are many reasons people choose to live close to Great Salt Lake. Some of them are directly related to the lake, as indicated above, others are indirectly related, sometimes in ways the resident may not even realize. For example, one preserve manager speculated that many of the people who live there because it is a rural place do not realize that the lake, its affiliated wetlands, and the dynamics of the lake's changing elevation are the main reasons why the area remains rural, despite rapid development to the east.

**Feelings of attachment and connection to the lake.**

There are a number of aspects of GSL that appear to impair attachment for even those who live closest to the lake. These include the changing elevation—some longtime residents report having felt more attached when the lake was "right there," in higher water years than have been experienced recently. The lack of access to the lake for most residents, particularly in Weber and Box Elder counties, is another limit to residents feeling attached to GSL.

Despite these things that serve as limiting factors, there is a good deal of attachment to the lake among the residents in my study. When asked how they feel about living close to GSL, some residents expressed a great deal of connection to the lake. Some of the strongest feelings can be seen in folks who grew up near the lake and got to explore in the marshes, hunt, or just wander and play around close to the lake. Several people also talked about the attachment they have because of family and heritage ties to the lake and its surrounding area, and because of ties they have had to the lake through their communities.

Some of the attachment that occurs is a sort of attachment with utilitarian hopes. Some residents, while expressing a great deal of sentiment about GSL, also express a sense that the lake should be improved on, along the lines of "it's great now, but think how much better could be…" or "it's so cool, we need to develop it more so more people will come experience it." This seemingly double message was heard in one of the focus groups, where on the one hand several people commented that the lake was a thing of stability it their lives, referring to it as "our constant." Yet a small number of these same individuals also talked about improving the lake by developing the islands, creating fresh water bays within the lake system, or building a road from Promontory Point to the islands, to Salt Lake City, so the road does not take up valuable land. These comments were made by people who indicated strong attachment to GSL. It should be noted that there were larger numbers who raised concerns about increasing development on the lake, and whether these types of developments would harm the lake and its ecosystem.

It should be noted that not all residents in this study had positive things to say about living close to Great Salt Lake. However a sizable majority of those in my focus groups and those I interviewed did express a tremendous amount of attachment to the lake, despite having to deal with the nuisances of living close to the lake that were raised by every person I spoke with. This cannot be taken as representative of how most residents in the area feel, but it is an indication that there are at least some folks who enjoy living close to Great Salt Lake. In fact, they enjoy it so much that when asked how they feel about living near the lake, they say things like:"…wonder and appreciation, I think."--A ranger who lives on-site at a lake-related state park "It's a privilege, it's a tremendous privilege."--Davis County resident "I can't imagine being without it… I can't visualize living out here and not having this beauty." --Weber County resident

This research is part of a larger project focusing on the beliefs and attitudes about the GSL ecosystem held by the closest neighbors of the lake. My next step will be to conduct a survey in the study area in Weber and Davis counties, to attempt to get a more representative picture of how these closest residents feel about the lake.

Carla Koons Trentelman
Doctoral Student in Sociology, Utah State University
Report on Research Funded by the Doyle Stephens Scholarship for 2005

# Great Salt Lake Education

## Looking Forward and Looking Back

Over the last year we have made a conscious effort to re-evaluate FRIENDS educational programming and look for ways to improve and expand it. Last spring we sent out a survey to many of the teachers who worked closely with Bruce Thompson during the field-testing phase of our SLICE curriculum & Lakeside Learning field trips. Their responses were very positive and helpful.

*Lakeside Learning Field Trip*

We used some of their suggestions to help guide us in new directions to serve other k-6 and middle school classrooms. Our extremely dedicated and talented Education Committee will hammer out some new programs in January to field test next spring. We are really looking forward to seeing some positive results by providing the opportunity for more school-aged children to get out to Great Salt Lake, put their toes in the oolitic sand, dip their cups in the water and learn more about the world-class icon that is right in their own back yards.

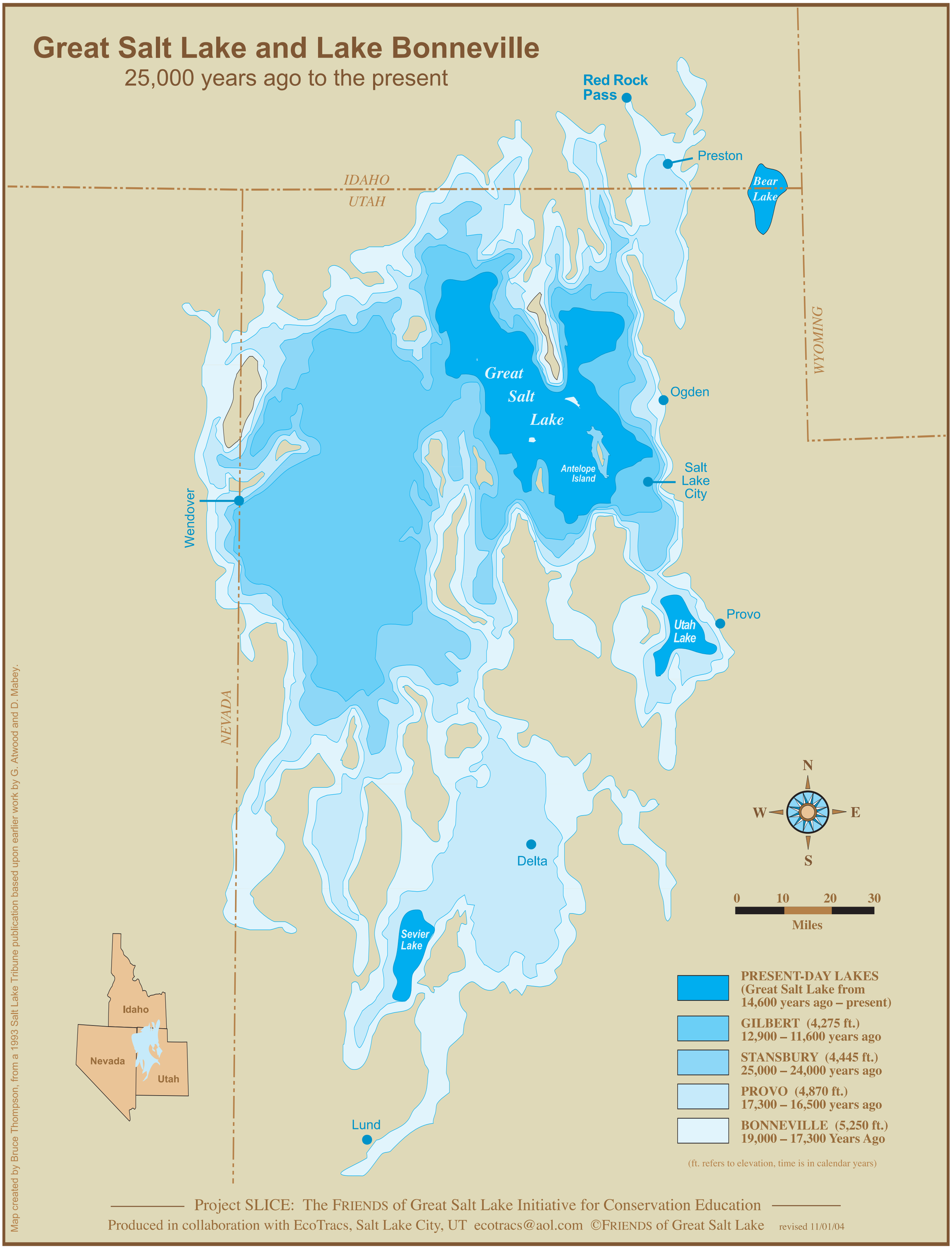
I have also been out and about participating in the local environmental education workshops and conferences where I have had several opportunities to learn about other local programs and the myriad of educational resources. One of my favorite new authors is David Sobel, co-director of the Center for Environmental Education at Antioch New England Graduate School. He has written several books on new ways to create environmental literacy in elementary aged children. In Beyond Ecophobia: Reclaiming the Heart in Nature Education, Sobel puts forth a fantastic argument in favor of place-based educational approaches like our own Great Salt Lake Education programs.

He states, "what is important is that children have an opportunity to bond with the natural world, to learn to love it, before being asked to heal its wounds." (pg. 9) Instead of focusing on threatened habitats like rainforests, or global deforestation in distant and far-off places, we should ground our children's environmental awareness within their very local surroundings. We must try to capture children's natural instincts to explore and understand the nearby flora and fauna and use every opportunity to get them outside to explore the natural world around them.

This is precisely what our Lakeside Learning field trips and SLICE curriculum do. They provide an opportunity for kids to get out and explore the Great Salt Lake Ecosystem and understand its relationship to both big and little pictures. We are helping build a sense of their place within the larger community and plant the seeds to create a commitment to environmental ideals.

*"Authentic environmental commitment emerges out of firsthand experiences with real places on a small, manageable scale."* - David Sobel

Katie Pierce
FRIENDS Assistant Director


Great Salt Lake and Lake Bonneville
25,000 years ago to the present
Red Rock Pass
Preston
Bear Lake
IDAHO
UTAH
WYOMING
NEVADA
Great Salt Lake
Antelope Island
Ogden
Salt Lake City
Wendover
Provo
Utah Lake
Delta
Sevier Lake
Lund
N
W
E
S
0 10 20 30
Miles
Idaho
Nevada
Utah
PRESENT-DAY LAKES (Great Salt Lake from 14,600 years ago – present)
GILBERT (4,275 ft.) 12,900 – 11,600 years ago
STANSBURY (4,445 ft.) 25,000 – 24,000 years ago
PROVO (4,870 ft.) 17,300 – 16,500 years ago
BONNEVILLE (5,250 ft.) 19,000 – 17,300 Years Ago
(ft. refers to elevation, time is in calendar years)
Map created by Bruce Thompson, from a 1993 Salt Lake Tribune publication based upon earlier work by G. Atwood and D. Mabey.
Project SLICE: The FRIENDS of Great Salt Lake Initiative for Conservation Education
Produced in collaboration with EcoTracs, Salt Lake City, UT ecotracs@aol.com ©FRIENDS of Great Salt Lake revised 11/01/04

# Dr. Ephydra - We Welcome Your Questions Via Email or Phone

**E•phy'•dra, a noun; a genus of two species of brine flies that live on the bottom of the Great Salt Lake as larvae and pupae, and along the shores of the Lake as adults.**

Brought to you by the Science Committee to help explain the science surrounding Great Salt Lake. We welcome your questions via email or phone. Contact Lynn de Freitas at ldefreitas@earthlink.net

*Brine shrimp* by John P. George

## How Is The Brine Shrimp Artemia Able To Survive In The Hypersaline Waters Of The Great Salt Lake?

The brine shrimp Artemia is perhaps the most characteristic inhabitant of the Great Salt Lake. These small shrimp-like crustaceans are found in saline lakes on all continents and so are truly cosmopolitan. In the United States, Artemia is found principally in the Great Salt Lake, parts of San Francisco Bay, and saline lakes in Nevada and California, including Mono Lake.

Like other organisms that live in hypersaline aquatic environments, Artemia is considered to be an extremophil – organisms which can live in environments which would kill most other organisms because of extremes of salinity, temperature, and other environmental factors. The major factor that Artemia must contend with is the high salt content of the GSL water. Ocean water is 3.5% salt. Great Salt Lake water is much higher.

The protoplasm of GSL organisms has a much lower salt content and consequently a much higher water content than the external environment. The "law" of diffusion states that small particles (water molecules, sodium and chloride ions, etc.) move from an area of higher concentration to an area of lower concentration until concentrations are equal. If a cell membrane is involved, the process is called osmosis.

The regulation of the flow of these small particles by the organism is called osmoregulation. Obeying the law of diffusion, salts tend to diffuse into the tissues and cells of Artemia from the surrounding hypersaline environment and water tends to diffuse out of the tissues, thus resulting in cell dehydration and excessively high salt content in the cells and tissues.

A unit volume of Great Salt Lake water has a lower content of pure water than does a unit volume of Artemia protoplasm because of the space taken up by the high concentration of salts. As a result, pure water tends to diffuse out of Artemia following a concentration gradient, from higher concentration to lower concentration, into the surrounding medium. Salts would tend to flow into Artemia along a concentration gradient. Without protective mechanisms, Artemia would die.

Artemia has gotten around these osmotic problems by evolving some extraordinary osmoregulatory mechanisms. First, Artemia has a relatively impermeable body covering consisting of the exoskeleton with its cuticle. Outward diffusion of water from the tissues is greatly reduced and inward diffusion of salts is restricted by the cuticle.

Artemia needs to continually replace the water lost from its tissues, so it "drinks" Great Salt Lake water, both orally and anally. Artemia may drink the equivalent of 3% of its body weight/hour. Water is absorbed from the gut, along with salts, and passes into the bloodstream. The unwanted excess salts are carried by the blood to the ten pairs of branchiae or gills. Stacks of small organelles called mitochondria occur in the gills and they seem to constitute a mitochondrial pump which excretes the excess sodium and chloride ions to the external medium. Since this excretion of salt is against a concentration gradient (from lower to higher concentration of salt in the surrounding medium), this doesn't involve simple diffusion but more likely is an active transport mechanism.

Thus, Artemia, by using various osmoregulatory mechanisms, is able to maintain its internal composition fairly constant even though it's surrounded by a medium that has a high salt content and a lower water concentration. Great Salt Lake water can vary from 6-8% salinity up to around 25% salinity, yet Artemia can survive through this whole range.

Their ability to survive in a hostile environment results in two distinct benefits for Artemia: (1) Little or no competition for food or space (except each other); (2) Virtual absence of predators. Thus, their excellent powers of osmoregulation have made them remarkably successful extremophils.

Dr. Barry Quinn
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*Brine shrimp* courtesy FOGSL

# Discovering Our Lake

## Spiral Jetty and the Romantic Landscape of Great Salt Lake

*Spiral Jetty Looking West* by Jen Mauro Hicks

Great Salt Lake offers untold riches and unfolding experiences on a constant and continually evolving basis. Spiral Jetty, a work of art located along the Lake's north shore at Rozel Point, offers these experiences and more. Seeking out and viewing Spiral Jetty offers us a new experience with the Lake – we are able to see Great Salt Lake as a romantic landscape, filled with all the awe and wonder that only great art is able to communicate.

Spiral Jetty is a work of earth art, built in 1970 at the beginning of the Earthworks movement, when artists left the sterile spaces of galleries and museums and ventured outside to lend their artistic visions in the West's open spaces. The artist, Robert Smithson, evolved his work through personal interests in geology, natural sciences, and evolutionary time. For Smithson, it was an easy leap to create art outside the gallery and work with the materials of the earth that he had studied since childhood.

Smithson came to Great Salt Lake in a quest to find a red body of land to build an earthwork. He heard about the north end of the Lake's red waters and quickly selected Rozel Point to build an earthwork. The end result, Spiral Jetty, is 1,500 feet long and 15 feet wide. Smithson hired a local construction company to move about 6,650 tons of earth and basalt rock from the shoreline to create his masterpiece. This word is not used lightly: in the history of art, Spiral Jetty is among the top five most illustrated works ever!

There are two experiences related to viewing Spiral Jetty: the constant and the continually evolving. The logistics of driving to Spiral Jetty haven't changed since 1970. From Golden Spike National Historic Site, you travel along graded roads towards the Lake, following signs the Division of Natural Resources has graciously placed along the way to guide travelers seeking art to their rightful destination. This first constant experience marks the beginning of the journey into the romantic landscape. The rolling hills and jagged peaks at the north end of the Lake offer quiet contemplation mixed with mounting anticipation before view-

*Spiral Jetty From Above* by Hikmet Loe

ing Spiral Jetty for the first time. For more detailed driving instructions, view Dia Art Foundation's site at www.diaart.org.

This fifteen mile drive leads to the continually evolving experience. Rounding the corner of Rozel Point, pushing further past the remains of the old oil jetty, one is never sure how much of Spiral Jetty will be visible within the continual rise and fall of the Lake. Smithson built Spiral Jetty in a body of water that is constantly in flux – no two days are the same on Great Salt Lake. This dynamic environment constantly changes the appearance of Spiral Jetty. Spiral Jetty was built when the Lake was at a low point, with the intent that the Lake would rise and fall around it, lending salt and crystals to a rounded work that blends with the rounded hill of Rozel Point.

No two experiences with Spiral Jetty are the same. This depends on the Lake and more importantly, on one's history and perceptions that are brought to the work. An artist sees the work differently than an art critic or historian. A saline biologist is interested in different factors than a Utah resident who reads about Spiral Jetty and is just curious. To be at the site is to have an experience with art, with the land, and ultimately with yourself.

Spiral Jetty is a destination that indicates life and action on Great Salt Lake. It has been incorporated into our lives and consciousness, especially after the years of drought that left Spiral Jetty high and dry for all to see over the span of several years. Making the journey to Spiral Jetty takes time (and a sturdy vehicle for rough roads) but the rewards will last a lifetime. For only at the north end of the Great Salt Lake will you be able to experience a truly monumental work of art, in our own backyard.

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## HOW TO REACH US

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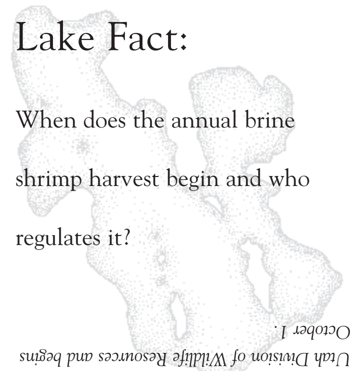

Lake Fact:

When does the annual brine shrimp harvest begin and who regulates it?

*Answer: The annual harvest is regulated by the Utah Division of Wildlife Resources and begins October 1.*

## GREAT SALT LAKE PEOPLE

**Congratulations to Dr. Theron Miller**, Dept. of Environmental Quality, Division of Water Quality, on receiving the 2006 Governor's Award for Science and Technology. Theron has been focusing his research efforts on nutrients in Farmington Bay and is co-chair of GSL Water Quality Work Group that is working to determine a numeric standard for selenium.

**Congratulations to Bill Fenimore**, (Wild Bird Center) who will serve on the USFWS National Refuge System Birding Initiative and Birders Team as a representative of the Intermountain West. The team will be developing means and methods to help birders appreciate the national wildlife refuges and the benefits derived by wildlife from a refuge. The project also aims to strengthen quality wildlife recreation on refuges.

**Dr. Maunsel Pearce** retired as President of the Utah Wetlands Foundation after serving 6 years in that position. Good job, Doctor.

**John Luft**, is the new Program Manager for the Great Salt Lake Ecosystem Project. Before moving into this position, John was the avian bioligist for the program. In that role, he managed the water bird count program and was a key player in the winter water bird research project with USU. Congratulations John!

**Lindsey Oswald**, former director and vice president of FRIENDS, has left her position as SUWA Director of Development for the past 8 years. Lindsey is now looking for new challenges in the world of conservation.

**Bruce Thompson,** former Education Director Extraordinaire for FRIENDS, is now the Education Director for the Tracy Aviary. Viva, Tracy Aviary!

**J. Louis Schricker, Jr. MD,** died on November 19, 2006. Dr. Schricker was a highly respected neurosurgeon at LDS Hospital. His great neurological skills saved hundreds of lives and is greatly respected in his field for his many accomplishments. He enjoyed Utah history and particularly loved spending time on Great Salt Lake. He will be missed.

**Donations on behalf of the late J. Louis Schricker, Jr. MD**

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*Near the Refuge* by L. de Freitas