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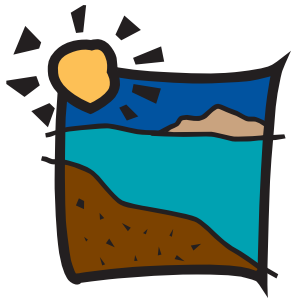
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Promontory Mountains from the Bear River Refuge in October by Sean Toomey



FRIENDS of *Great Salt Lake*

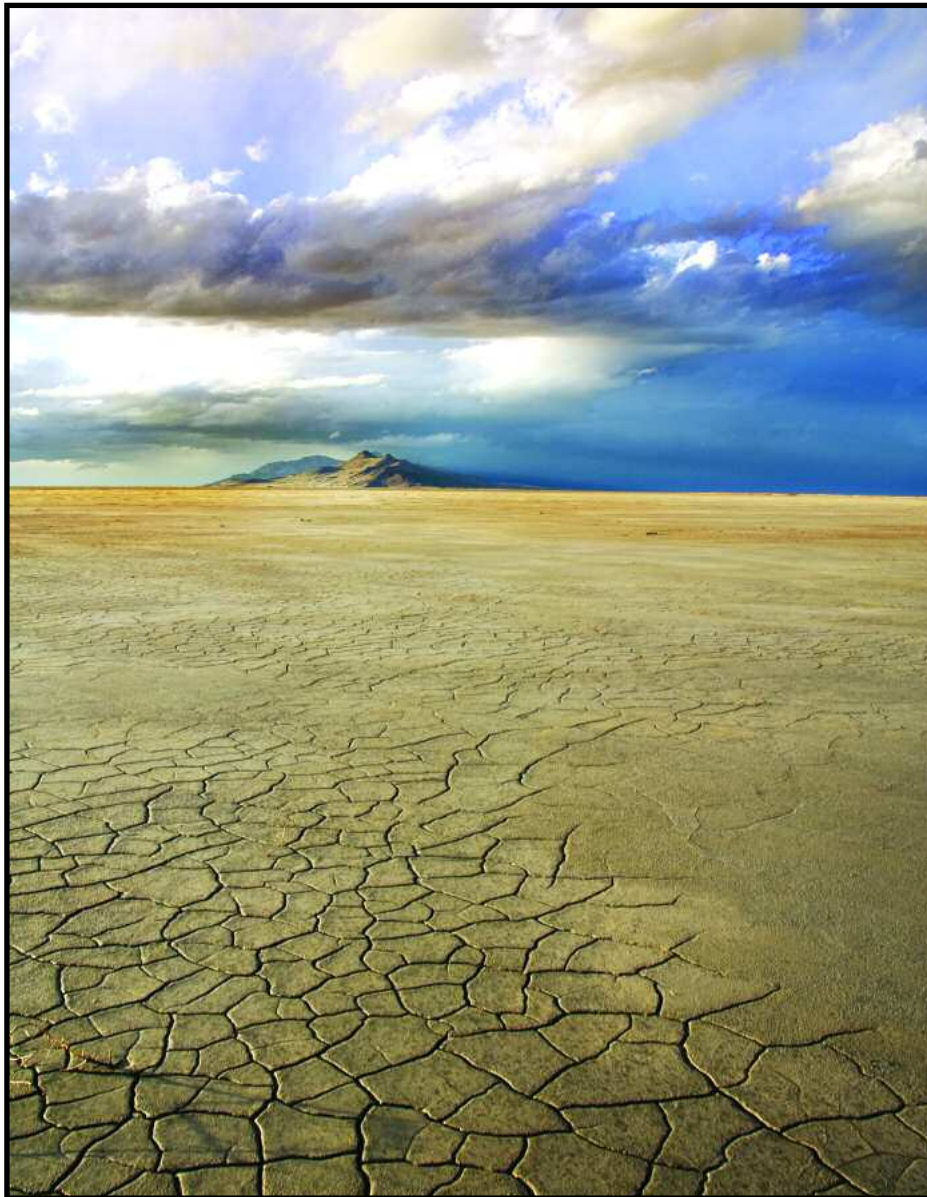
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Uninterrupted by Charles Uibel

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

MOUNTING PRESSURES ON THE SYSTEM REQUIRE A NEW APPROACH TO LAKE MANAGEMENT - SHIFT THE FOCUS FROM RESOURCE USE TO SUSTAINABILITY OF THE SYSTEM

"The issue is as much about the process as the heritage."

- Dr. Genevieve Atwood, geologist and educator

In late September, the Division of Forestry, Fire & State Lands posted a Request for Proposals for environmental planning consultants to review and update both the 2000 Great Salt Lake Comprehensive Management Plan (CMP) and the 1996 Great Salt Lake Mineral Leasing Plan (MPL). The purpose of the review and update is "to identify issues and concerns relative to the sovereign lands and resources at Great Salt Lake and apply comprehensive studies and new information that has accumulated over the last 10 years."

These two planning documents essentially steer the Division's management direction on the use of the lake's resources and where development of these resources can occur. But the Division's management obligation does not stop there. By law, the Division is required to execute its authority as a trustee of the Public Trust of the sovereign lands of Great Salt Lake. In that capacity, it is charged with managing these trust resources in perpetuity for the people of Utah. As such, it must ensure that any use of Great Salt Lake does not interfere with navigation, fish and wildlife habitat, aquatic beauty, public recreation, and water quality on or in the lake. The protection of these "public trust values" trumps any other use on sovereign lands—including development.

Given that both planning documents are well beyond their sell by date, the announcement came as welcome news to FRIENDS and other Great Salt Lake stakeholders. We continue to express concerns about the planning documents being out of sync with more recent scientific findings. We acknowledge that past and current management practices have resulted in the radically altered natural lake system that we have today. And we continue to see the Division support proposals that increase the industrialization of the lake. Most recently is the proposed expansion of Great Salt Lake Minerals. The Division appears to be doing this without the knowledge of what the cumulative impacts on the ecological health of the system will be.

Despite this initial measure of good news, after reviewing the detailed scope of work in the RFP, it was discouraging to read that although some attention will be given to issues and concerns relative to Great Salt Lake, the document will still be mired in predictable management tendencies. It appears that the Division will continue to abide by its piecemeal approach by restricting the scope of its decisions for this hemispherically important ecosystem to competing uses - commercially weighted scenarios vs environmentally weighted ones vs something in between.

That's why FRIENDS and members of the conservation community believe that it's time to shift the focus from resource use to protection and sustainability of the system. The current approach continues to move lake management further away from lake protection. Instead of pitting Great Salt Lake against development and discharge proposals, the ecological health of the system should be the foundation from which all other uses are allowed to occur. In light of the mounting pressures on the system from population growth, water quality concerns, limited water resources, climate change and an emphasis on industrialization, we believe this is the most prudent way to proceed.

After 10 months of deliberation on existing lake management and ways to improve it, this is the same conclusion that the Great Salt Lake Advisory Council came to with its recommendation that a permanent Great Salt Lake Commission be established. The objective of the Commission is to design and help implement strategies for the sustainable use and protection of Great Salt Lake and its ecosystem. Working with a Science Advisory Panel, among the many tasks the Commission would assume is the establishment of indicators of ecological health for the lake and measureable goals for each indicator. The Commission would act in an advisory capacity to inform regulatory agencies such as the Division of Forestry, Fire & State Lands about these goals. Had the Commission been in place by now, it would be involved



in the revision of these planning documents and the public process ahead. Unfortunately, plans to move forward with the formation of the Commission have been stalled.

Nevertheless, sometime in 2010 a series of public open houses will be scheduled in the 5 counties surrounding the lake. This will be an opportunity for all of us to express our concerns and provide input for the next iteration of the two plans. To prepare for these meetings, now would be a good time to review the existing planning documents and identify critical factors that must be addressed to protect and sustain the lake's ecosystem. Links to these documents are available on our website: www.fogsl.org

For starters, during the revision of the CMP in 1999, a Scientific Review Committee was established to verify and validate the scientific underpinnings presented in the "Statement of Current Conditions and Trends" section. The goal of the review process was to "offer an unbiased assessment of the technical information base utilized by the Department of Natural Resources to make decisions and tradeoffs concerning Great Salt Lake. " The committee's work culminated in a report titled Evaluation of the Scientific Underpinnings of the May 1, 1999 Great Salt Lake Planning Document. Among the many insightful points that were raised in that report are the following:

- Knowledge of the relationship between lake hydrology and global climatic processes should be important to DNR managers, yet there is virtually no mention of climate in the CMP.
- The CMP does not discuss drought as a serious concern.
- Natural lake level fluctuation is an important component of the GSL Ecosystem and should be recognized as such by the State of Utah.
- The CMP implies that a change in upstream depletions of 100,000 acre-feet per year will affect lake elevation by about one foot. It is not clear whether the one-foot differential would be the cumulative result over time or that for a given year. Further the document offers no detailed analysis of the net change in lake inflows that will result from anticipated or planned upstream diversions and water imports. More information regarding future water development in the watershed of GSL is available within DNR and should be used to address concerns about changes in magnitude and direction of lake levels due to human intervention.

- The natural variability of GSL is not adequately addressed in the CMP. Pre-causeway salinity conditions have not been adequately discussed.

Another insight to consider is located on p. 41 of the Mineral Leasing Plan/Issues & Opportunities Related to Monitoring and Revision of Mineral Leasing Plans. It reads: "Volumes of research are available on various aspects of the lake's ecosystem and human impacts on the system. However, the long term trends on many aspects of the lake are not adequately understood or easy to predict. Significant changes take place on the lake on an annual basis with regard to water inflows and level; salinity in various areas of the lake; location, numbers and concentrations of biological resources to name the most prominent resources. Mineral operations can have significant impacts (some adverse, some neutral, some possibly enhancing the lake's ecosystem) on these variables through diking projects, pollution, depletion of salts in the lake, disturbances of bird populations, and other activities. The impact of mineral operations is not systematically documented nor are parameters or indicators set up which would signal if and when and to what degree a change in leasing and regulator policies or direction might be necessary."

Recently, the Department of Natural Resources approved an administrative rule change that says if a comprehensive management plan is in effect, no site-specific planning is required. The old rule says that both could be appropriate in a given situation. In the current MLP, areas of the lake are designated as OPEN for oil/gas and mineral extraction. This designation precludes the need to conduct site specific analysis with each proposal that comes forward for consideration. We're not so sure that streamlining the process works in the best interest of protecting the resource especially if, as indicated in the excerpt above, there are no parameters or indicators set up to act as red flags in changing course.

The bottom line here is that this is our lake and it's our responsibility to advocate for its sustainability. The issues are big and the threats imminent. As we engage in the public scoping meetings ahead, let's do everything we can to shape the two planning documents to accurately reflect not only the complexity of the lake, but identify sustainable limits for all lake uses so that we can keep our lake Great. 🌊

In saline,
Lynn de Freitas

What you can do – Visit www.fogsl.org - to find out.

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

Uninterrupted by Charles Uibel

What's between this spot and Antelope Island in the distance? Back home, where people accumulate, there's not a cubic foot that isn't filled by things built or bought. Out here, you have to struggle to remember any of it. Great Salt Lake keeps itself very clean. Most foreign objects, including people, are expelled or digested by the mud. Deadlines bind you to your keyboard, responsibilities keep you traveling. All these tethers, like last year's cob webs, are blown away by the gentle and sometimes strong winds at Great Salt Lake. It's necessary for a person to be alone, away, to be off of the permitted trail, to take in a long view. Thoughts simplify, a sense of wonder returns. Being at Great Salt Lake is a very cleansing experience, in many ways because it is so uninterrupted.

www.greatsaltlakephotos.com





Pre-History by Charles Uibel

2010 GREAT SALT LAKE ISSUES FORUM

UNIVERSITY OF UTAH, SALT LAKE CITY,
APRIL 28, 29, 30TH

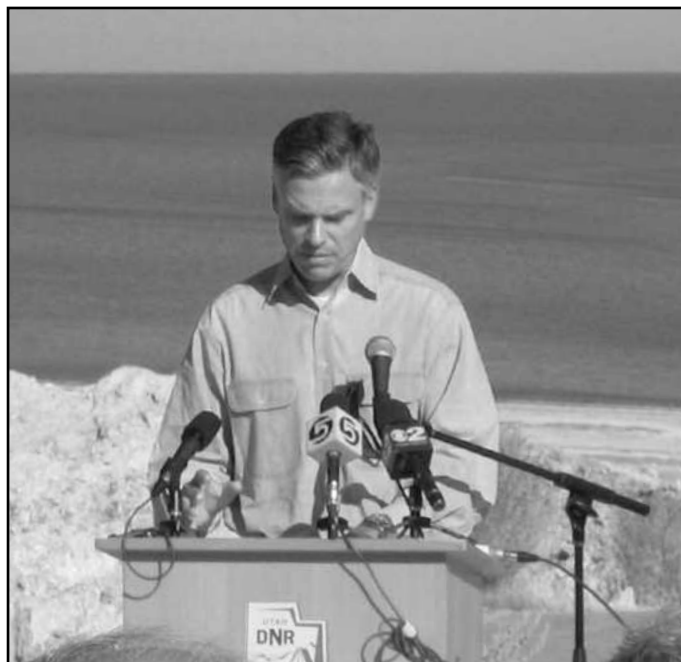
Focus of the Forum - A Water Appropriation for Great Salt Lake

“The future of many saline lakes will be decided over the next several decades as the direct economic value of fresh water inflows are weighed against the less easily measured ecosystem goods and services provided by these unique ecosystems.” - Bob Jellison, International Society for Salt Lake Research

More details will be coming soon at www.fogsl.org

INACTION IS NOT ACCEPTABLE

WE NEED TO ACT TODAY AND ESTABLISH A GREAT SALT LAKE COMMISSION



Huntsman creates GSL Advisory Council by L. de Freitas

When Lynn de Freitas asked me to prepare an update on the status of the Great Salt Lake Advisory Council (GSLAC), I thought she must be suffering from an insufficient number of articles for the newsletter.

You got to understand that I am a sewer kind of person. I eat, sleep and breathe sewer. For recreational reading I find articles on biosolids (sludge to the non-sewer people) and wastewater treatment processes most appealing. As the manager of a wastewater district, I have been accused of polluting the Great Salt Lake and stinking up the neighborhood. Apparently some people don't realize the water was polluted and stunk when we got it.

The wastewater industry considers itself true environmentalists since our entire function is to reduce pollutants from the environment. I have to admit, some nutrients remain in the water, but we exceed all current requirements.

I suppose being the acting chair of the GSLAC might have been the reason for the request. The recommendation of the GSLAC has been discussed earlier in the newsletter, but basically we recommended an independent, balanced commission with funding

necessary to generate lake research and provide advocacy for lake health.

As a sewer kind of guy, you may think this would not be a priority for me, but nothing could be further from the truth. As a wastewater environmentalist, we need to understand what level of treatment is needed to fully support lake health. Nothing less is acceptable. Our citizens expect us to provide the most economical treatment that meets the goal of lake health. Lake health requires us to understand the effects of our actions. If nutrients need to be reduced we should do it. If nutrients are needed by the ecosystem, then we should continue to discharge them.

The Great Salt Lake is a state treasure and resource. It should be protected. Current state organizations do a good job within their statutory responsibilities but each agency has specific areas of expertise. An independent commission can bring a unifying balance to the current process.

Sufficient funds to understand water balance, pollutant limits, and commercial viability of the lake can not wait any longer. Each day of delay means we may move further away from achieving and maintaining lake health.

The GSLAC has recommended that we act today. Hopefully this recommendation can be implemented in some effective form. We appreciate the difficulty a new organization presents, but we also know inaction is not acceptable. All of us need to encourage those in power to consider this recommendation. We sewer people are behind the need for a Great Salt Lake commission. We welcome regulations founded on a solid scientific understanding of lake health. We may be myopic in our work but we see the big picture for the lake.. 🦋

Leland Myers
Central Davis Sewer District



FRIENDS OF GREAT SALT LAKE AWARD

VISITING GREAT SALT LAKE EXCEEDED MY EXPECTATIONS

Hannah Finch is a 9th grader from Timpview High School. Last spring, she won “The FRIENDS of Great Salt Lake Award” at the Central Utah Science and Engineering Fair held at BYU. Her award was an airboat ride at Farmington Bay. Her thoughts about that experience follow.

I must admit, the ride was not quite what I had expected. Counting down the minutes until the day arrived, I had only been expecting a cool, fun, boat ride around a lake I heard was somewhat void of life and purpose. But thanks to FRIENDS my eyes have been opened to the amazing wilderness that thrives in and around the Great Salt Lake, and to the life and beauty of Farmington Bay.

While boating around the bay, I was fascinated by the many species of birds and plants I had never seen before. I was thrilled when a small flock of birds flew beside our boat for a moment as if to say, “Welcome to my home!” Everything seemed happy, unified, peaceful, and I was a part of all of that.

Further along I noticed fewer nests and birds, and instead of a variety of plants, a specific kind of plant seemed to be taking over. There was a terrible smell and a lot of garbage – including several plastic balls and even a tennis shoe. I wondered how the litter might affect the wildlife.

The water was becoming very shallow and clear. I could see curious patterns in the sand below the boat. I didn’t believe it was a problem at first but I learned that the lake is losing water dramatically. There was a land bridge leading to Antelope Island. Farmers and industry have contributed to this loss, but so has the drought cycle. Parts of the bay where airboats could usually go were impassable. Elizabeth Jarrell from FRIENDS talked with me about water loss to the lake, non-native invasive plant species, and what impacts these have on wildlife habitat. My concerns began to grow.

On the way back to the shore, I was relieved to see more wildlife again. I learned that all of Farmington Bay used to be covered by many different species of birds. So many in fact that they could have been compared to sand at the beach. Hearing this made me realize how sad



Hannah Finch by her mother

it would be to lose such a beautiful part of Utah. I hoped then and still do hope that Farmington Bay and the Great Salt Lake can be a refuge to many different species of both animals and plants, as well as a refuge to the weary soul. Let biodiversity rule the bay!

Thank you to FRIENDS of Great Salt Lake for letting me ride with you and for the knowledge I was given on that day in May. I wish everyone could have the same experience I had. I hope together we can make a difference. And I hope that together we can be worthy stewards of this great gift before we lose it. Thanks FRIENDS for exceeding my expectations. 🐼

Hannah Finch

SCOUTING UP THE MAGIC

ABOUT GREAT SALT LAKE AND ITS WETLANDS



Pelican spotting at Farmington Bay by S. Coleman

"I have lived here my whole life and never knew this was here."

In my years as a Volunteer Naturalist at the Great Salt Lake Nature Center at Farmington Bay, I can't tell you how many times I've heard that sentence. My name is Steve Coleman. I have worked with hundreds of Cub Scouts and Boy Scouts in the years I've been at the lake. I've found that most of the groups who came out knew very little about the Great Salt Lake or wetlands generally. In fact, most of them had negative feelings about both. As I developed my presentations, I tried to center them around the Lake so that people could gain a better knowledge and appreciation for the importance of the lake and the wetlands.

When I was young my father and I would visit Farmington Bay because I loved watching the birds. When I grew up I spent many hours out at Farmington Bay watching ducks and shorebirds and compiling my life list. One Sunday afternoon as I was driving through and watching for new birds, there was a man with his spotting scope looking at ducks on the big Unit One

pond. He looked at me like he wanted me to stop, so I did. He showed me many different species and I added a few new ones to my list. He told me that Phil Douglass was trying to recruit some volunteers to help out with the growing number of school kids and scout groups wanting to come out for field trips to the bird refuge. I was working in the Boy Scouts as a Scoutmaster at the time so I signed up. After the new volunteer orientation training we were treated to my first behind the gates tour of Farmington Bay by the well known and respected Don Paul.

For the past eight years I, along with other volunteer naturalists, have conducted a half day workshop for kids during the Great Salt Lake Bird Festival at the Nature Center entitled "Those Wild Wetlands." The workshop has sold out every year. For the last 3 years during the Great Salt Lake Bird Festival we have also organized a Dutch oven Dinner and Birding for Families workshop together with a bird tour of the Nature Center Wetlands.

My motivation for volunteering is to help the many





Brimming with GSL Enthusiasm by S. Coleman

local people who have not experienced the Lake or the wetlands understand just how important they are to each of us. I consider it a great privilege to be able to work with Division of Wildlife to do these workshops. One of the big disappointments to me, however, is that over the years I have had very few Girl Scout or other youth groups for girls come out. Happily, the few that have come out are some of the best and most interested kids that I have had the opportunity to share this great resource with.

Several years ago when I was the Cub Master for the Cub Scout Group in my neighborhood we did a display for the Scout O'Rama at the State Fair Park. Our display was on Wetlands. I brought two large tubs with pond water and hundreds of macro-invertebrates. I brought several magnifying glasses so the kids could look at the macro-invertebrates and learn about the life in the ponds that most people never see. Our booth was a great success and it was then that I learned how interested girls can be about wetlands, bugs and birds as families came through and the sisters of the cubs were just as excited about looking at these tiny animals as their

brothers were. Another time I was guiding a tour of high school biology students out at Farmington Bay and picked up several owl pellets, it was several of the girls who were first to dig in and start dissecting the pellets.

I still have ten years before I can retire from my paying job and be able spend most of my time volunteering at the Nature Center, in the mean time I will continue to work with scouts and conduct my workshops at the Great Salt Lake Bird Festival.

To set up a Scout or other youth workshop contact me at 801-298-1536 or e-mail me at colehouse1@juno.com. I can help meet their requirements for the World Conservation Award, Belt Loop and Pin, the Webelos Naturalist Award, and the Bird Study Merit Badge. I would also love to have people visit my Birding Blog and leave a comment at stevesbirdnblog.blogspot.com

Steve Coleman
Volunteer Naturalist
Great Salt Lake Nature Center at Farmington Bay

LEGACY PRESERVE AND PARKWAY UPDATE

ONGOING EFFORTS AT THE LEGACY NATURE PRESERVE



LNP Sign courtesy UDOT

Water Act (Section 404 permit) to successfully establish the 2,100-acre Preserve. Although UDOT began to purchase Preserve lands back in 2001, UDOT's Preserve Team is still working hard as we strive to help the Preserve achieve its mission:

"The Legacy Nature Preserve provides in perpetuity quality wildlife habitats for the purpose of mitigating impacts to wetlands and wildlife associated with the Legacy Parkway."

Since much of the Preserve landscape and hydrology was heavily altered over the last century by agricultural and industrial activity, habitat conditions were largely degraded. To begin Preserve planning we asked, "What is the ecological potential of the Preserve?". It is located near the southeast shore of Great Salt Lake and is contiguous with other protected areas such as Farmington Bay Waterfowl Management Area. It functions as a buffer against further westward development and can help provide refugium when Great Salt Lake levels are high. Even in a degraded condition well over 100 avian species were documented on the Preserve.

Establishment of the Preserve entails three phases: 1) Implementation, 2) Adaptive Management and Monitoring, and 3) Long-term Management. The Implementation phase included measures such as land acquisition, removal of large piles of concrete and other debris, and construction of water delivery system to

restore hydrology to a portion of the historic Jordan River floodplain. The Adaptive Management and Monitoring phase was initiated in 2005 and will continue until 2011 or beyond, depending on when permit success criteria are satisfied. This phase began by forming the Collaborative Design Team (CDT), a planning team that included resource and regulatory agencies, UDOT and its Preserve staff consultants, and advocacy groups including FRIENDS.

Through a two-year collaborative planning effort, the CDT developed an Adaptive Management Plan followed by accompanying resource management plans: Habitat Management Plan, Comprehensive Water Management Plan, and Access and Education Management Plan. These plans correspond with and expand upon 404 permit requirements for the Adaptive Management and Monitoring phase. The Adaptive Management Plan is a guidance-level document that provides the Preserve's mission, guiding principles, and broad management objectives. The resource management plans provide detailed information on Preserve habitat and hydrology characteristics, specific management goals, and multiple site management strategies that can be selected as determined appropriate.

We began implementing the management plans in 2007. The Preserve's adaptive management approach is an iterative process of selecting management strategies, monitoring results, then evaluating and adjusting management strategies in an ongoing effort to achieve management goals. Vegetation management strategies include targeted herbicide applications, grazing with goats, and reseeding, all intended to reduce weed cover and other undesirable plants, while increasing desirable vegetation cover. Water management is structured around habitat goals to provide appropriate depth and duration of water that is suitable for a diversity of shorebirds and other wildlife. Vegetation, water quantity and quality, and avian activity are actively monitored. All of these efforts are led on a day-to-day basis by the Preserve site manager, Eric McCulley, who is assisted by several part-time staff and volunteers. On an annual basis, the Preserve team cycles through the adaptive process by determining management strategies for the year, implementing strategies, monitoring, and preparing an annual report to document activities and





Legacy Nature Preserve by Charles Uibel

evaluate monitoring results. Several members of the CDT continue to support the Preserve in an advisory role by providing input and review to this dynamic process.

Since 2007, the landscape across much of the Preserve has changed dramatically. Some areas once dominated by thick and decadent noxious weeds have become lush, open habitats with shallow wet areas that are ideal for many shorebirds. Our monitoring results for 2009 indicate continued improvement across most of the Preserve. Over 1000 acres have been classified as wetland habitats, which is more than a 200-acre increase from the original classification. The percent cover of undesirable vegetation across the entire Preserve has been reduced to approximately 15%. Bird surveys indicate seasonal variability in species abundance, richness and diversity, and an increase in shorebird abundance. For example, a single flock of over 4,000 long-billed dowitchers were observed utilizing Preserve habitats. We still need to continue adapting to help the Preserve progress towards fulfilling its mission. The relative cover

of Common reed (*Phragmites australis*) was approximately 37% within Preserve freshwater marshes in 2009. Further efforts to reduce this undesirable species will be implemented in 2010.

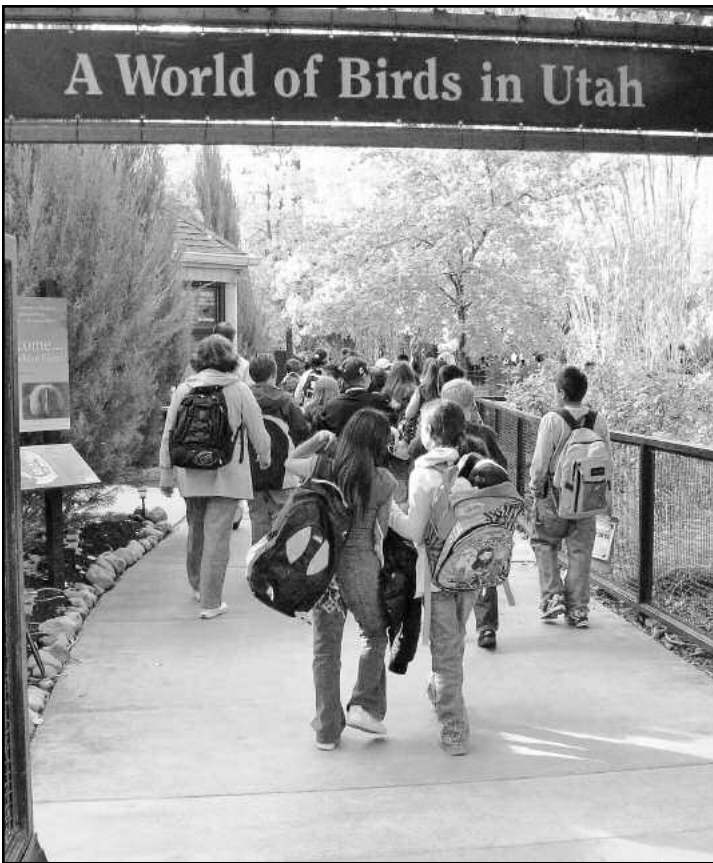
As we continue adaptive management on the Preserve, we are also planning for the future. When the Adaptive Management and Monitoring phase is successfully completed, the Long-term phase will begin. At that time, UDOT's preference is to have an appropriate land management entity take over long-term management of the Preserve. I invite you to learn more about the Preserve by visiting its website (www.legacypreserve.utah.gov), where you can explore an interactive map, download the management plans, and submit inquiries such as questions about volunteer opportunities. 🐾

Mike Perkins, HDR, Inc.
Biology & Environmental Compliance Practice Group



GREAT SALT LAKE EDUCATION

EDUCATION SOLUTIONS AT TRACY AVIARY IS FOR THE BIRDS



Entrance to Tracy Aviary by B. Thompson

This program, dubbed the AVES Project—Avian Ecology in Schools—is now in its third year, during which it has provided 580 classroom visits and 205 field trips to over 3,300 students, 143 teachers and over 400 parents. Each AVES student works with our staff 8 times throughout the school year, with 40% of the curriculum taught by Aviary personnel and 60% by AVES teachers.

And do we incorporate Great Salt Lake ecology in AVES? Does a brine shrimp have lips?

The foundation of our AVES curriculum is big IDEAS—metaconcepts—characterizing our natural world as interdependent, diverse, everchanging, adaptive and systematic. Our lessons package these ideas with birds as stars of the show, and with habitat, adaptation, biodiversity and interrelationships as story line. To tell such stories without key figures such as Great Salt Lake and its myriad feathered, finned, furred and carapaced occupants would be like Thanksgiving without... well, it wouldn't be complete, would it?

By the end of a year's three-unit, fifteen-lesson AVES immersion, and the staff-teacher-student relationships that have been forged during that time, we take lake-sized pleasure in the belief that we have stirred a significant number of our local citizens into that Great Salt Lake "solution."

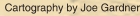
Bruce Thompson, Director of Education, Tracy Aviary

Lots of things dissolve at Great Salt Lake: the lake's horizon into sky, minerals into solution, urban stress into tranquility. And for myself and an ever-expanding number of educators, Great Salt Lake is a teaching "solution:" where birds, place-based education and conservation convene. Add inquisitive learners. Stir.

I had the good fortune of first connecting with FRIENDS of Great Salt Lake, and thereby the teacher that is the Lake, in 1996. I was hired as consultant to build an audio-visual story aimed to transform the paradigm of "big, buggy, salty, stinky" into a more truthful "massive, invertebrate-rich, hypersaline repository of life." This soon fledged into the literally and figuratively immersive Lakeside Learning field trip program. With that program, as is so often the case whenever nature is summoned to teach, we just needed to generate the opportunity for a meaningful experience and then get out of the way. Water, algae, fly larvae, brine shrimp and the rest do most of the teaching.

In 2006, following a decade of my own lakeside learning, I was asked to become Director of Education for Tracy Aviary. First order of business was to develop a depth-over-breadth formal education program that weaves birds through the tapestry of experiential science, guided by the Utah State Core Standards for Science.





Courtesy of USGS



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

Of Brine Shrimp, Heavy Metals, and Tapeworms



Brine Shrimp Constellation by John P. George

I started studying brine shrimp almost thirty years ago, when I chose this crustacean as the subject of my Ph.D. research. I was living in California and working with brine shrimp from San Francisco Bay. When I was hired at Weber State University (WSU), the obvious subject of my research had to be the Great Salt Lake (GSL) brine shrimp.

These shrimp are abundant in the GSL from mid-spring to mid-fall. They feed on algae and are a main source of food for many local and migratory bird species. They reproduce by spawning a brood of larvae or by releasing encysted eggs. These cysts are a source of revenue for the local brine shrimp industry. The larvae, hatched from the cysts, are indispensable as food for prawns, crab and fish in aquaculture operations around the world.

The shrimp and their cysts are impacted by the slow but steady accumulation of various substances in the Great Salt Lake. Working with undergraduate students, we studied the effects of various toxic compounds on the brine shrimp. Dustin Ingraham helped with measuring the effect of mercury on the shrimp, Christian Larsen and Jeff Jepperson focused on selenium, and Kendall Asper with benzene. In each case, we looked at the effects of these chemicals on the shrimp survival, growth and reproduction, as well as the shrimp metabolic response to the exposure.

During a casual conversation in a meeting, the subject drifted to the presence of tapeworm larvae (cysticercoids) found in the European brine shrimp. Wondering if our shrimp had cysticercoids too, I sent a sample to Dr.



Francisco Amat's team, in Spain, who had been working on this subject for several years. They did find that the shrimp were heavily infested and sent a Ph.D. student, Stella Redon Cavillo, an expert on this matter, to study the problem here.

At WSU, Cavillo spent four months this past summer examining thousands of GSL brine shrimp. She confirmed the infestation and found two different species of parasites. Interestingly, the presence of cysticeroid in the shrimp turns them redder in color and changes their behavior. They also swim closer to the water surface, which makes them easier to be picked up by the birds.

The tapeworm larvae develop into an adult tapeworm in the bird gut, producing a large number of eggs that are eliminated in the bird feces. The eggs that end up in the water are filtered and eaten by the shrimp where they can develop into the next stage -the cysticeroid. The circle is then complete.

However, two questions remain: since there are at least two cysticeroid types, which cysticeroid develops into which adult worm?

Nearly all birds present around the lake - avocets, grebes, phalaropes and gulls have tapeworms. So, one has to wonder which bird harbors which tapeworm species?

In order to answer these questions, adult tapeworms will be collected from bird guts, and will be identified and classified by the Spanish team. The matching between cysticeroids and adult tapeworms will be done through DNA profiling by Dr. Avery from Westminster College.

By now, you might be asking yourself two questions - Do the tapeworms affect us, the human species? And besides color and behavior changes, are the tapeworms harmful to the brine shrimp and to the brine shrimp industry?

In response to the first question, these particular tapeworms have never been found in humans, so they are not likely to harm us. However, the tapeworms do affect the brine shrimp by sharply reducing their ability to reproduce. We have found that many female shrimp

have an empty or nearly empty ovisac (egg pouch).

The incidence of tapeworm infestation can be as high as 60%. This would make you wonder about the effect of the worm on the number of cysts produced. On the other hand, the brine shrimp population is limited by the amount of algae available for consumption and a single female shrimp can produce over one hundred larvae every five days. Therefore, the tapeworms might have an insignificant effect on the brine shrimp numbers and the cyst harvest.

The effect of tapeworms on birds is still unknown. Most birds carry the tapeworms and have not shown significant change in vigor or reproduction. However, we cannot forget about the effect of rising levels of mercury and other pollutants in Great Salt Lake. In high enough amounts, it is likely that they will have some affect on the brine shrimp and eventually the birds and human populations. 🐸

by Nicole Okazaki,
Asst. Professor of Biology
Weber State University

Lake Fact:

What is the present breach elevation in the railroad causeway?

Answer: 4193'

DISCOVERING OUR LAKE

New Walking Trail at the Great Salt Lake Nature Center at Farmington Bay



Classroom at GSL Nature Center courtesy DWR

A new 1.3 mile section of walking trail will take visitors into the heart of the Great Salt Lake Ecosystem at Farmington Bay. This new access will help to tell the story of this delicate and complex ecosystem, and its importance to wildlife, clean water, industry, and recreation.

The trail will meander around the 300 acre site of the Great Salt Lake Nature Center, located at the Farmington Bay Wildlife Management Area. It will immerse visitors into the uplands, wetlands, and seasonal playas with spectacular vistas of Great Salt Lake and the Wasatch Mountains. Not only will people enjoy a beautiful stroll, but they will come away with a better understanding of the importance of this unique setting.

The project is being led by Utah Wildlife In Need (UWIN), a Utah based non-profit organization with the mission to promote the appreciation for and conservation of the Great Salt Lake Ecosystem, and to ensure the future of Utah's native wildlife by supporting critically needed research, conservation and education projects.

Last year, over 10,000 visitors came to the Nature Center including over 4,000 Utah 4th grade students, who were there to study wetlands. Under the tutelage of Justina Parsons-Bernstein, the Director of the Nature Center, these students can look forward to more hands-on learning opportunities from the trail. Students can take samples of macro-invertebrates back to the Nature Center and view them under a microscope to learn about the rich protein source they provide for migratory birds. We know that getting students out of the classroom and into the field creates a greater



Building a Boardwalk by volunteer

understanding and appreciation of important ecosystems, like Great Salt Lake. So this is a perfect complement to the learning opportunities already here.

The Nature Center Trail will also connect to the Farmington City Trail system that has direct links to a network of other local, regional and national trails, including; the Bonneville Shoreline Trail, the Legacy Parkway Trail, Utah's Rail to Trails, and the Great Western Trail.

The trail will be ADA accessible with kiosks for the hearing and vision impaired with lots of comfortable benches for those contemplative interludes during the meander. Two observation blinds, located over the Nature Center's largest pond, will provide photographers and bird enthusiasts with a camouflaged view of the habitat so they can see a variety of species throughout the year that call the Great Salt Lake Nature Center home.

Many volunteers and many volunteer hours are responsible for helping out with trail construction. Local businesses, community councils, the Boy Scouts, an array of community groups, and the UWIN Board of Directors are working diligently over many weekends to add to the incremental progress of the project.

This is Phase II of a long term plan for the Nature Center. Phase I was completed in 2007 with the relocation and installation of two classroom buildings further to the west. Phase III will culminate in a State of the Art - 14,000 sq.ft. - visitor and education center located where the Nature Center is today. A capital campaign will be necessary to raise enough funds so that we can add another Great Salt Lake shoreline destination point for families, students and visitors from out of state to promote the appreciation and conservation of this hemispherically important ecosystem.

A ground breaking ceremony to dedicate the new trail is planned on Bald Eagle Day – February 13, 2009. For information about this event, ways to make contributions to the Nature Center Trail Campaign, or other efforts to help native Utah wildlife, visit the UWIN website at www.uwin.org. 🇺🇸

J.D. Davis, UWIN Development Director

HOW TO REACH US

FRIENDS of Great Salt Lake
P.O. Box 2655
Salt Lake City, UT 84110-2655
801-583-5593
email: mail@fogsl.org
website: www.fogsl.org

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Matt Crawley: Newsletter Layout
matt@celadonstudios.com

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Bison overlook by L. de Freitas

Submission Deadlines: Sept. 16 (Fall), Dec. 16 (Winter), Mar. 16 (Spring), and June 16 (Summer). Submit articles and images for consideration to Lynn de Freitas ldfreitas@earthlink.net or call 801-583-5593.



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