

FRIENDS of *Great Salt Lake*

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www.fogsl.org

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Lakeside, Utah by Charles Uibel ©2009

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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EXECUTIVE DIRECTOR'S MESSAGE

THE THING ABOUT GREAT SALT LAKE MATTERS IS THAT ONE THING ALWAYS LEADS TO ANOTHER

"We recommend the application be held in abeyance until environmental studies and/or a thorough analysis is completed. We recommend a conservation pool be established in the GSL to protect existing uses. Without these safeguards, this and future water diversions, if approved, could result in significant environmental consequences, including the need to list additional species as threatened or endangered."

- Larry Crist, Utah Field Supervisor, US Fish and Wildlife Service

Senator Orrin Hatch had it right when he said that Utah would be losing a great leader with the appointment of Governor Jon Huntsman, Jr. as the next U.S. ambassador to China. Most everyone I have talked with agrees, but especially my cohort of the Great Salt Lake Advisory Council.

It was a year ago this August when Huntsman created the Council to evaluate existing management practices of Great Salt Lake and recommend improvements. On April 28, 2009, our work culminated in a draft of Recommendations on the Establishment of a Great Salt Lake Commission. The mission of the Commission is to provide overall guidance on management of Great Salt Lake, its watershed, and its ecosystem. And 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. The draft of the concept must now run the gauntlet of the Utah Legislature, and with any luck, come out the other side in tact.

Unfortunately, I fear that with Huntsman's departure for Beijing there will be a complete loss of momentum for an extremely critical and long overdue focus on how we need to manage our lake. With more than 300 wild fires to fight in Utah this season, once again, the future of this hemispherically important ecosystem seems to be lost in the shuffle. One proposal after another focusing on the lake comes before the Division of Forestry, Fire and State Lands claiming to either make Utah's economy stronger or to provide "a more promising future" for Great Salt Lake.

Great Salt Lake needs a champion and it needs one now.

July 9th was the deadline for scoping comments to the

Army Corps of Engineers (Corps) on Public Notice SPK 2007-00121 - The Proposed 91,000 acre Expansion of Solar Evaporation Ponds on Great Salt Lake by Great Salt Lake Minerals Corporation (GSLM). The mining company revised its proposal from 33,000 acres to 91,000 acres to increase production of potassium sulfate – a fertilizer – in order to maintain its market share over the next 50 years. When added to the existing operation of 43,000 acres, you get a whopping 134,000 acres for one single operation. One single operation of six currently extracting minerals from the lake. And it is proposing to do this by expanding its extraction capacity at its Great Salt Lake facility.

The Corps is the lead federal agency on the project. The project will require a 404 permit under Section 404 of the Clean Water Act because of direct impacts to waters of the U.S, and the discharge of fill into a special aquatic site. It will also require 401 certification from the state for approval of water quality aspects of the project. An Environmental Impact Study (EIS) is required and must comply with NEPA (National Environmental Policy Act) by including least damaging practicable alternatives which could effectively avoid these impacts. Obtaining potassium chloride from other facilities within or outside the Great Salt Lake region should be included among those least damaging practicable alternatives.

Coupled with the revised expansion, GSLM filed a water right application with the State Engineer for an additional 353,000 acre ft. of lake water for consumptive use. If approved, it would be added to an existing water right of 150,000 acre ft. All this water for a single operation. This critical detail was missing from the Public Notice issued by the Corps and from information that was presented to the public during the scoping period.



According to comments submitted by the US Fish and Wildlife Service, the diversion of 353,000 acre ft. of water from Great Salt Lake could significantly reduce brine shrimp and brine fly numbers in Gilbert Bay and reduce available avian habitat. It would also significantly increase the vulnerability of the American white pelican colony on Gunnison Island and reduce migratory bird habitat in Bear River Bay. Bear River Bay has been designated by National Audubon as an Important Bird Area because of the numbers and species of birds that use it.

As a terminal lake, we know that Great Salt Lake's size is determined by average annual inflows from rivers, streams, groundwater, and precipitation. We also know that because the lake is very flat, relatively small changes in the lakebed have dramatic effects on the surface of the lake.

Models designed by the Utah Division of Water Resources, although untested, predict that for every 100,000 acre ft of water taken out of Great Salt Lake, the lake level drops by approximately .75 ft. Theoretically, 353,000 acre ft. could lower the lake level by almost 3 feet – significant impacts from one single operation.

The 2000 Great Salt Lake Comprehensive Management Plan indicates that there are currently 11 perfected water rights to divert directly from the lake totaling 362,306 acre ft. a year (consumptive use). In addition there are six approved applications (not yet "proved") totaling 444,562 acre ft. per year as well as PENDING applications (not approved, not rejected) totaling 657,565 (all also largely consumptive). That makes for a total of 806,868 acre ft. of approved water rights, as well as 1.5 million total pending and approved (which means these rights are "in line" before the newest application from GSLM). As a result, the 353,000 acre ft. proposal would bring the lake drawdown to 1.9 million acre ft. If the state engineer approves the newest application, there would be water rights totaling 1 million plus acre ft. of water that could then be taken out of the lake. At 4193' Gilbert and Gunnison Bays become two separate bodies of water which raises questions about how this will effect salinity levels in the rest of the lake.

In a separate action with the State RDCC and the Corps, GSLM also filed an application to amend an existing easement on the lakebed for an intake canal to its west side ponds. The request which was filed in December 2008 proposes to extend the canal by nearly

2 miles to the east (toward Gunnison Island) and deepen the canal to 4185'. Should the lake level drop to the record low of 4191', GSLM wants to make sure that they still get their water regardless of any potential damage to the lake's ecosystem.

Scoping comments were sent to the Army Corps and to the State Engineer protesting the water right application and requesting a hearing. They were prepared by Western Resource Advocates on behalf of FRIENDS and a growing coalition of organizations. The coalition includes –National Audubon, Wasatch Audubon, Great Salt Lake Audubon, Utah Airboat Association, Utah Waterfowl Association, Utah Rivers Council, League of Women Voters of Salt Lake, the League of Women Voters of Utah, the Utah Chapter of the Sierra Club, Western Wildlife Conservancy and Physicians for a Healthy Environment.

You can read our detailed comments, along with comments from other organizations, agencies and interests on our website: www.fogsl.org <<http://www.fogsl.org>> .

GSLM is looking 50 years ahead to secure the future of its operations. We must do the same for Great Salt Lake. 🇺🇸

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

Lakeside, Utah by Charles Uibel

Lakeside is exactly 100 miles from Salt Lake City, giving you enough drive-time to shed your thoughts along the way. At Lakeside, you think in long distances. Your outlook becomes tuned to lengthy expanses in time. Your lines of sight, extending across the flat, salty sand and water to Nevada, Idaho, and the Wasatch Front are interrupted by a few free-standing mountain ranges and islands. How compressed people's attention seems back home. Like stepping on a salty crust, Lakeside is the point from which fractures of industrialization have been sent out across the Great Basin. Rocks quarried here fill the railroad beds which extend across Great Salt Lake and to Nevada. The lake continues to be divided up between competing interests. Caught between an ancient geologic world and the coming modernization, at Lakeside you can walk for miles upon eternal sand, yet feel you are in-between the slow ticks of a machine of change.

www.greatsaltlakephotos.com





Antelope Island Ridge Line by Charles Uibel



OIL DRILLING AND PERMITTING IN THE GREAT SALT LAKE

BRAD HILL, OIL & GAS PERMITTING MANAGER, UTAH DIVISION OF OIL, GAS AND MINING

The intention of this article is to give a brief synopsis of oil well drilling and permitting practices in the Great Salt Lake. It is a proven fact that oil exists under the lake and over the years the interest in possible commercial production has waxed and waned many times. It has now been over 20 years since the last exploratory well was drilled in the lake, however the interest remains. There are no current applications to drill but the future will surely bring new proposals.

The presence of oil near the Great Salt Lake has been known for many years. Surface oil seeps were observed in the area of Rozel Point by the Stansbury Expedition in 1852. These seeps may have been known and used by indigenous people for many years prior to the Stansbury discovery. Early settlers are known to have made use of the natural seeps and the first drilling activity is recorded as early as 1897. Commercial production dates to around 1904 and it is estimated that 10,000 barrels (42 gallons/barrel) of oil have been produced from the Rozel Point reservoir. Between 1978 and 1980 AMOCO drilled a total of 15 exploratory wells in the Great Salt Lake resulting in the discovery of the West Rozel Field. The West Rozel Field is comprised of 3 wells located approximately 5 miles south and west of Rozel Point. Nearly 30,000 barrels of oil were produced from these wells, however AMOCO plugged the wells and abandoned the field due to the high volume of water produced (a byproduct of the oil production) and the high cost of operating an offshore field. It has been estimated that the West Rozel reservoir has up to 100,000,000 barrels of oil in place with the amount which is actually recoverable, using current technology, being around 10%. In the years since the AMOCO wells were plugged there have been numerous proposals to drill for oil near Rozel Point and the West Rozel Field. So far none have gone past the proposal stage.

There are many risks associated with drilling in the Great Salt Lake, with the major risks being technological, economic and environmental in nature. The technological and environmental issues can be solved but the economic risk may be the main deterrent to companies drilling in the lake in that almost every aspect of such an endeavor boils down to cost vs. profit. The technological aspects and the mitigation of environmental issues when drilling, producing and transporting oil in an offshore location come at a much higher cost than drilling a conventional onshore well. Add to that the fact that the oil found in this area has unique properties that complicates its handling as well as making it more difficult to find a market

for the oil once it is recovered. Any company with a desire to drill in the lake must weigh the costs against the possibility of recovering enough oil to achieve an acceptable return on their investment.

The recent proposal by Pearl Montana to drill for oil under the Great Salt Lake has kindled a great amount of public interest. Some see this activity as a positive use of a natural resource while others see it as a threat to a beautiful and fragile ecosystem. The Division of Oil, Gas and Mining (DOGM, the Division) rules and policies dictate what must be submitted with an "Application for Permit to Drill" (APD), how and where a well can be drilled, how a well should be operated and produced, as well as waste handling and disposal. These rules and policies are intended to protect the rights of mineral and royalty owners, promote safe drilling practices, and to protect surface and ground waters and the environment. The mission of the Division, as stated on their website, is as follows: "The mission of the Utah Division of Oil, Gas and Mining is to regulate the exploration and development of coal, oil and gas, and other minerals in a manner which 1) encourages responsible reclamation and development; 2) protects correlative rights; 3) prevents waste; and 4) protects human health and safety, the environment, and the interests of the state and its citizens."

Because of the unique nature of drilling for and producing oil within the boundaries of the Great Salt Lake, specific rules (R649-3-33) were written to address this special situation. There are several restrictions placed on where a well is allowed to be drilled. A partial list of these restrictions are as follows: a well is not allowed to be located within a mile of state or federal parks, wildlife refuges, or water fowl management areas; a well may not be drilled within 3 miles of Gunnison Island during the Pelican nesting season nor within a mile of the island at any other time; a well may not be drilled within a mile of the waters edge at the 4,193.3' lake elevation level. The operator is also required to submit an oil spill contingency plan for approval by the Division. In order to protect the waters and environment of the lake as well as to provide for adequate well control, rules were included which specify parameters for drilling, casing, and cementing of well bores. In addition to the broad statement that "the operator shall prevent pollution of the waters of the Great Salt Lake", there are a number of specific pollution prevention rules. In the absence of specific rules, the broad pollution statement gives the



Division the ability to address and regulate possible pollutants beyond those directly addressed by rule.

When an APD is received it is checked by the Division's office staff to confirm that the application is substantially complete before it is given to the technical staff for review. The initial review includes a spacing and siting evaluation to determine if the well is proposed at a legal location. If a proposed well is not in a spaced area, a unit, an established field or within one mile of an established field a notice is sent to the Resource Development Coordinating Committee. The RDCC operates under the Governors Office of Planning and Budget. From the RDCC webpage: "The RDCC includes representatives from the state agencies that are generally involved or impacted by public lands management. The RDCC coordinates the review of technical and policy actions that may affect the physical resources of the state and facilitates the exchange of information on those actions among federal, state, and local government agencies." Comments from the public and other agencies are forwarded to DOGM where issues are addressed within the confines of its jurisdictional boundaries. Other agencies may choose to require additional permits or apply restrictions under their own specific rules. DOGM works closely with these agencies to be sure that they are supplied with adequate information and that their needs are met. It was through the RDCC that thousands of public comments were received on the most recent proposal to drill in the Great Salt Lake and a great deal of time was spent in an attempt to address the stated concerns. Once these initial steps are completed the APD is sent to the technical staff for further review. The technical review includes an onsite evaluation, geologic review, and engineering review.

An onsite evaluation is performed by the Division on all wells in the state which are located on surface rights which are owned by the State of Utah or private entities. The Bureau of Land Management reviews surface matters for wells located on federal or indian lands. Environmental Scientists, employed by the Division, are responsible for setting up and conducting the onsite evaluation. Interested parties such as the operator, surface owners and other state agencies are invited to attend. During the onsite review, the proposed surface disturbance and environmental issues associated with the surface disturbance are evaluated and discussed. From this evaluation, DOGM determines relevant conditions of approval for the APD.

On any proposed well which has mineral rights owned by the State or is privately owned, a DOGM geologist evaluates the proposed surface casing for ground water protection purposes. The surface casing is a string of pipe which is cemented in place and should extend to a depth sufficient

to isolate the wellbore from usable ground water. It is the intent of the Division to prevent any fluids from the wellbore from contaminating any aquifers as well as preventing poor quality waters from deeper horizons from mixing with fresher waters at shallow depths. This is done through an investigation of near-surface geology and known or projected aquifers in the area. This often results in additional conditions of approval regarding the approved depth of surface casing in a new well.

On all wells for which a geologic evaluation is performed a DOGM petroleum engineer also performs an engineering evaluation of the proposed drilling program. The intention of this evaluation is to assure that sound drilling practices and materials are used in the drilling of the well. A strong emphasis is placed on safety, that the well can be drilled and produced without a loss of well control, the prevention of spills and the prevention of pollution. At the end of a wells usable life, the petroleum engineer is also responsible for the proper plugging and abandonment of a well. The engineer determines or approves a plugging program which will prevent leaks and fluid movement in the abandoned well. A plugging bond is required to be placed with the Division on all wells prior to APD approval. This bond is held for the life of the well and only returned to the operator once the well is properly plugged and abandoned. If a company "walks away from" a well without properly plugging it the Division can use funds from the bond to plug the well.

DOGM employs a staff of Environmental Scientists which carry out inspections on each well starting with the drilling phase and continuing on through the production phase and plugging of a well. The wells are inspected for compliance with the approved permit, operational procedures, public safety and environmental protection. The inspection staff responds readily to public concerns and makes every effort to ensure that all operations are run in a proper manner.

There is a known and currently untapped oil resource under and around the Great Salt Lake. Specific issues related to drilling in the lake can be solved but future activity will be dependant on the economic situation, as seen by the oil and gas operators. This resource is bound to be of future interest to those in the oil and gas industry and we will undoubtedly see applications to drill new wells.

Many details were omitted from this brief overview but an attempt was made to give a good representation of the available resource and well permitting procedures. Anyone seeking additional information should visit the DOGM website at www.ogm.utah.gov or contact Brad Hill at (801)538-5315 or bradhill@utah.gov.

2009 DOYLE STEPHENS SCHOLARSHIP RECIPIENT

GREG CARLING



Greg Carling

I am a 2nd year PhD student in the Department of Geology and Geophysics at the University of Utah. My advisor is Dr. Bill Johnson and we are working closely with Dr. Dave Naftz of the US Geological Survey. I grew up in Sandy and graduated from Alta High School. I then attended Adams State College in Alamosa, Colorado where I played basketball and ran track. I transferred to BYU for my final year of undergraduate work and received a bachelors degree in geology. I remained at BYU for a couple more years to earn a masters degree in geology with an emphasis on hydrology. While at BYU I also met my wife Mallary and we've been married for two years. Mallary and I like to spend our free time kayaking, fly fishing, backpacking, mountain biking, skiing, or doing anything else outdoors.

My interest in geology has taken me around the world. I have worked on volcanoes in Hawaii and Italy, looked at glaciers in Alaska and Switzerland, and studied coral reefs in Florida and the Bahamas. However, my current research interests are focused right here in our own backyard. For my dissertation, I am trying to understand mercury cycling in the Great Salt Lake and its watershed. Recent studies have shown elevated levels of mercury in the open water of the Great Salt Lake, in the brine shrimp, and in a number of duck species which utilize the lake. While all forms of mercury are harmful, the most toxic and bioaccumulative form is called methyl mercury. The Great Salt Lake has unusually high levels of methyl mercury. Our research is dedicated to understanding why there is so much methyl mercury in the lake and identifying the sources of the toxic pollutant. Once we understand the mechanisms driving mercury methylation in the lake and are able to quantify the loading of mercury to the watershed, we hope to be able to suggest methods for mitigating the problem.

I am very excited to spend the next couple of years working in this fascinating and complicated ecosystem, and I appreciate the support from FRIENDS of Great Salt Lake in receiving the 2009 Doyle Stephens Scholarship.

Thank you,
Greg

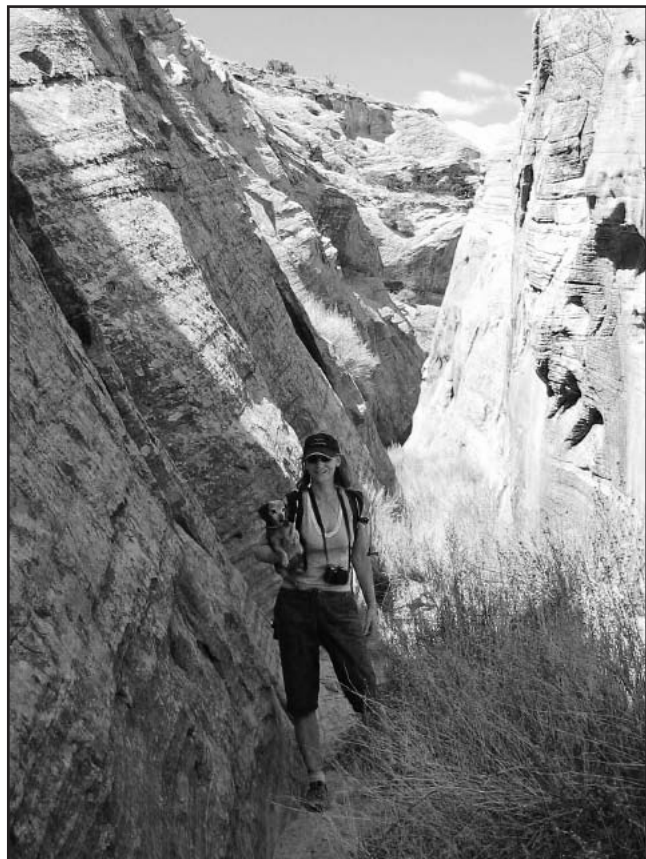


Glassy Water by D.J. Williams



MEMBERSHIP & DEVELOPMENT DIRECTOR

TAMARA ROWE



Grotto Canyon courtesy Tamara Rowe

It is truly an honor to become the new Membership and Development Director for the FRIENDS of Great Salt Lake. I look forward to the challenge and opportunity of furthering the mission of FoGSL. After living in Salt Lake City for most of the past 20 years, I remain in awe of and concern for our amazing natural landscape and ecosystem.

Moving from Port Townsend, Washington, in 1989 to attend the University of Utah, I studied biology and photography. Over 50 photography trips to Southern Utah ignited my passion for the desert. I changed my major to geology to better understand the awesome landscape of this state. The summer of 1992, I attended a field school course put together by the University of Utah's Museum of Natural History and the Moab BLM to document the rock art of Mill Creek Canyon just outside of Moab. I was in charge of photographing every panel. It was imperative to document as much of the art work as possible as the petroglyphs and pictographs were being both over-loved and vandalized due to their popularity/proximity to a rapidly growing Moab. People had tried to chip out some of the panels and shot at or carved over others.

I moved to Logan in 1993 and continued my education at Utah State University in anthropology. After graduating in 1995, I took a graduate field work course located in the La Sal Mountain range excavating the North Beaver Mesa

Cave site. I then worked as an archaeologist surveying and photographing sites in southern Idaho. A proud moment came that summer when we shut down a freeway project after discovering artifacts at the construction site!

In 1996, I began researching graduate schools to continue my education in archaeology. I also began writing and taking courses in writing. I had always been an avid reader and loved Barry Lopez, Edward Abbey, Wallace Stegner, and Terry Tempest Williams's works as they all wrote about place and sustaining our fragile ecosystems; I ended up going to graduate school to study English and writing at Northern Arizona University in Flagstaff.

During graduate school, as the Technical Writing Consultant for the School of Forestry, I worked with forestry graduate students who were writing their theses. I learned about more of the sustainability issues facing the Southwest (i.e. bark beetles, controlled burning of forests, damming rivers, endangered flora and fauna etc.). Since graduate school, I have taken many writing workshops, including one with Terry Tempest Williams in my home town of Port Townsend. I continue to write creatively and have published poetry and stories.

Over the past 10 years, I have volunteered and worked at several local nonprofits and owned/ran my own catering business. I sold the business in 2007 to go back writing and working in the non-profit field doing advocate work.

GSL AS A MULTI-DISCIPLINARY STUDY

GETTING OUT OF THE CLASSROOM AND INTO THE GREAT SALT LAKE



Bus to the Lake by D. Bedford

There was a jarring “crunch” and a mutter from the back of the van: “That didn’t sound good.” Time to quit while I’m (more or less) ahead, I thought. The dirt road to the Spiral Jetty had been deteriorating for the last 20 minutes; here’s where we stop driving and start walking.

This was the fourth and last field trip of an experimental course I taught in fall 2008 for the Weber State University Honors program, titled simply “The Great Salt Lake”. I was teaching the course as part of a fellowship program which encourages faculty to develop and teach new courses for Honors in their area of research interest, incentivized with a teaching reduction to allow prep time. A course on the Great Salt Lake seemed like a perfect fit with the multi-disciplinary Honors ethos, and a good way to bolster students’ appreciation for the salty gem in our back yard. We could study the lake’s hydrology, chemistry, ecology, economics, politics and

art, and do so by getting our hands dirty on field trips—with Antelope Island just a 45-minute drive from the Weber State campus, how could we not?—and, although I’m a relative newcomer to GSL research, I could tap into the expertise of colleagues with guest lectures. With the optimism of the foolhardy, I thought it would be a piece of cake. In fact, the class was a lot of very hard work—but was incredibly rewarding to teach (and, I hope, to take).

The class was a small (and therefore manageable) mix of seven WSU students and two community members. Some were ardent birders, but most knew little about the lake despite living near its shores all their lives. On the first day of class, we tried the classic FoGSL exercise of completing the sentence “The Great Salt Lake is...” and found that big, salty, stinky and buggy (or more polysyllabic variants) were popular descriptors, although



they were at least supplemented with more interesting ones, like “symbolic”. By semester’s end, though, we were able to come up with a string of far more evocative words, like “mysterious” and “fragile”. Evidently, there had been a shift in thinking. The field trips that were the core of the class had a lot to do with this.

From the outset, I decided to make the field trips more experiential than empirical. With a group of primarily non-science majors (some historians, a fine artist, and a business major, among others), I felt there would be more to be gained from simply allowing students to see, touch and smell the lake than from conducting measurements. Although we would study the hard data in the classroom, the field trips would be for translating the rational into the personal. Our first field trip was a hike up nearby Malan’s Peak, to gain a broad overview of the lake’s geographical context and identify key features such as rivers, islands, industrial facilities, and the railroad causeway. On returning to the classroom, the students voiced a refrain that would become an informal class motto: it’s one thing to see these places on a map, or read about them in a book, but when you get outside and experience them, they become real. The melding of the academic and the practical came to be a powerful defining feature of the class.

Field trips two and three were to Antelope Island and GSL Minerals respectively. At Antelope Island, we built on classroom time spent discussing salinity and density properties of GSL water by taking kayaks out in the marina. Paddling through syrupy, 15%-salt water brought home the physical reality of GSL density in a way that classroom work alone never could. Wading a hundred yards out into Bridger Bay accomplished the same thing for the concepts of lake shallowness, gently-sloping shores, and surface area-lake level changes. At GSL Minerals, several students were introduced for the first time to the idea that large-scale industrial operations are at work on the lake. A full tour of the facilities by incredibly helpful GSL Minerals staff was followed, back in the classroom, by a debate about the wisdom of allowing the company to expand its evaporation ponds (along with probing questions from the more cynical students about whether the company’s information had been sugar-coated). Finally, our fourth field trip took us to Spiral Jetty and an examination of “earth art”, Robert Smithson’s obsession with seemingly “shattered” landscapes, and the issue of potential nearby oil and gas

exploration. We also learned a powerful lesson about the remoteness of parts of the lake, and how thoroughly screwed we would be if anything happened to our vehicle (see the “jarring crunch” mentioned earlier). The next time I teach the class, I will fill an obvious gap by adding a fifth field trip, to Bear River Migratory Bird Refuge.

The powerful combination of classroom and field trips was supplemented by excellent guest lectures from WSU faculty and adjuncts: Michele Zwolinski (microbial life), Nicole Okazaki (brine shrimp ecology), Brad Marden (the brine shrimp industry) and Carla Trentelman (how people relate to the GSL). Rosalie Winard, in town for her exhibition of wild bird photographs at the Utah Museum of Natural History, graced us with a wonderful slide show and commentary about birds, photography, and being out in nature. Next time, I hope to tap into the broader research community beyond the WSU campus.

By semester’s end, the students seemed to have undergone a transformation. They seemed energized and empowered to talk about lake preservation issues, and the multiple ways the GSL touches the lives of northern Utahns. They had produced exceptional end-of-semester projects, ranging from academic term papers to paintings maps and a hand-made, hand-dyed Great Salt Lake quilt (several of these works are now on display in WSU’s Stewart Library). One student has recently published a GSL article in *Ergo*, the WSU journal of undergraduate research. All had come away with a fundamentally different understanding of the lake, which they will communicate to their families and friends. As with all outreach and education work, the last day of class was really just the beginning of the process.

Acknowledgements: This class would not have been possible without the generous support of an Honors Eccles Fellowship, and the tremendous administrative, financial and personal support of the Honors Program Director Judy Elsley and her team (Marilyn Diamond and Leanna Riddle). 🐼

Daniel Bedford is an associate professor in the Geography Department at Weber State University.

EDUCATION AND OUTREACH DIRECTOR

EMILY GAINES



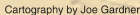
Emily Gaines by a secret admirer

Within a week of relocating to Utah in 2006, I visited Antelope Island for the first time. I had spent the previous five years conducting research in coastal salt marshes from North Carolina to northern Massachusetts, and because of my love of wetlands and salty waters, I was eager to experience the Great Salt Lake. The beauty and value of the Lake and surrounding land was striking to me, and I have felt a strong connection to the area ever since. I am very excited to promote awareness and appreciation of this very special ecosystem through my position as Education and Outreach Director for FRIENDS of Great Salt Lake.

After receiving a B.S. in Biology from the University of Virginia in 2003, I worked as a research assistant for the Marine Biological Laboratory in Woods Hole, Massachusetts. Our research focused on nutrient cycling in coastal ecosystems with the intent of better understanding how human impacts and sea level rise would affect these delicate systems. Despite the tremendous value of this research, I was eventually drawn to the education and outreach field. I find it extremely rewarding to work with the public and promote understanding of environmental issues and conservation needs. To better equip myself for this career shift, I returned to school and received a Master's degree from the University of Utah's Master of Science and Technology program in 2009. The degree program joined environmental science with communication and business administration, a combination which I hope will prove useful to FoGSL.

I come to FoGSL with direct experience teaching about the Great Salt Lake ecosystem. As a W.E.S.T. (Water, the Environment, Science, and Teaching) Graduate Teaching Fellow at the University of Utah, I co-led numerous field trips to Antelope Island and the Great Salt Lake State Marina for elementary and middle school students. I am eager to continue working in a similar capacity and not only enhancing FoGSL's education and outreach programs, but also building partnerships with other organizations involved with the Lake. As pressures on the Great Salt Lake ecosystem continue to build, FoGSL's education and outreach efforts are as important as ever. I greatly appreciate the opportunity to work with FoGSL and look forward to dedicating my time and energy to such a meaningful cause.





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

Biostromes and Their Communities in the Great Salt Lake



Biostromes courtesy GSL Ecosystem Program

together forming a continuous plate that extends hundreds of feet across the bottom of the lake. In other cases they form columns 3-4 feet tall. The cyanobacteria must have sunlight for photosynthesis and growth, so the biostromes in the Great Salt Lake are limited to shallow areas. We do not know for sure the extent of the biostromes in the lake but based on an undocumented map by A.J. Eardley in 1938, biostromes cover over 90 square miles of the bottom of Gilbert Bay.

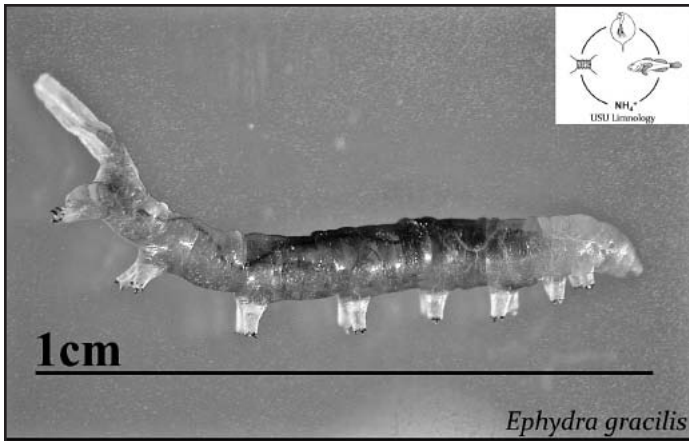
With so much area covered by biostromes, we might expect them to be important in the ecology of the lake, and they are. Preliminary estimates indicate that the cyanobacteria in the biostromes have nearly as much photosynthetic chlorophyll in them as do the microscopic phytoplankton inhabiting the water column of the entire lake. The biostromes may consequently produce organic matter roughly equivalent to the algae in the water above them, and this growth of plant material feeds another very important organism in the lake — the brine fly.

The majority of brine flies in the lake are the species *Ephydra gracilis*. Adult brine flies lay their eggs on the surface, and the eggs sink to the bottom and hatch. Once the developing larvae find a biostrome they have a good home,

Biostromes, bioherms and stromatolites—three names for very similar structures that occur in salt waters around the world, and that are a critical, but little-known part, of the Great Salt Lake ecosystem. Biostromes are “sedimentary deposits of organic origin built by organisms.” Coral reefs are one type of biostrome. In the Great Salt Lake the organisms that build the biostromes are not corals, but colonies of single-celled cyanobacteria, previously known as blue-green algae. When the cyanobacteria photosynthesize they change the chemistry of the water layer around them causing tiny amounts of limestone rock to deposit. With time the “living rock” deposits layer after layer to create a soft limestone rock with cyanobacteria embedded in its surface. Biostromes once covered large portions of the Earth’s ancient, shallow seas. The greatest claim to fame for stromatolites is that fossilized remains of them from Australia represent the oldest documented form of life on earth at 3.5 billion years!

The ages of biostromes in the Great Salt Lake are not known, but they probably did not begin to grow until Lake Bonneville declined and the water became salty. Many of the biostromes in the Great Salt Lake are a foot or more thick and 3-4 feet in diameter. Often these grow





Brine fly larvae courtesy W. Wurtsbaugh

as the limestone rock provides a solid footing, and the growing cyanobacteria provide an abundant food source. Several thousand brine fly larvae live on each biostrome. If we multiply their densities by the area of biostromes in the lake we estimate that there are 2 - 5 trillion larvae in the lake during the summer. We sometimes see brine flies in the water column of the lake, but they are not feeding there. Most likely they are using currents to disperse to other areas, much like insect larvae in streams drift downstream in search of better habitat.

The brine fly larvae go through three “instars” or growth stages while inhabiting the biostromes. The final instar is about 1 cm long. Before they can emerge, the larvae must pupate, just as caterpillars must form a chrysalis before a butterfly can take wing. The pupae of brine flies attach themselves to the biostromes by a slender stalk. When they are ready, the pupae float to the surface, and multitudes of adult brine flies emerge and fly to the shore to breed. If you’ve walked along the shores of the lake in mid-summer, you can believe that there are trillions of these insects, and you’re also happy that the adult flies do not bite!

Although the swarming flies can be a nuisance, brine flies are very important for birds and other organisms that reside at the lake. Avocets, stilts, gulls and golden-eye ducks consume large numbers of brine fly larvae and adults. Eared grebes and many other birds may also feed on brine flies, but we do not yet have a good grasp on the diets of most of the birds that use the lake. Common orb weaver spiders and tiger beetles feast on flies and are themselves also utilized by birds and small mammals. The cyanobacteria and brine



Instar growth stage courtesy W. Wurtsbaugh

flies also take up selenium, mercury and other contaminants in the lake. The importance of this route of delivery of contaminants to birds is currently under study by scientists at Utah State University.

Although hidden beneath the surface of the lake, the biostromes, cyanobacteria and brine flies are thus crucial for driving the lake’s ecology. Although there have been extensive studies on phytoplankton and shrimp in the lake, few studies have been done on the biostromes and their biota, and much work is needed to fully understand their distribution and function in the Great Salt Lake.

Wayne Wurtsbaugh and Caleb Izdepski, Watershed Sciences Department and the Ecology Center, Utah State University.

DISCOVERING OUR LAKE

Legacy Parkway-Scenic Byway



Legacy Parkway by Charles Uibel

When the West Davis Highway was conceived some twenty years ago most Davis County leaders envisioned it as another I-15 type of highway cutting through Davis County along the eastern shoreline of the Great Salt Lake providing commuter relief for those stuck in I-15 traffic. In the ensuing years of litigation surrounding the location of the highway an interesting transformation occurred. The highway morphed into a Parkway with a 14 mile trail system along the entire length of the Parkway, including a second unpaved trail on the west side of the Parkway providing individuals a close up experience with the Lake's environs. During the environmental discussions it became clear to us in Davis County that we have a gem in the Great Salt Lake and the Legacy Parkway can serve not only as a protection against further encroachment on the Great Salt Lake ecosystem, but can also provide a great interface between the urban environment and the Lake's ecosystem.

In May 2002, six and a half years before the Legacy Parkway was opened to traffic, it was designated a State Scenic Byway. In December of 2008, three months after the opening of the Parkway in September an application was made to have the parkway designated as a National Scenic Byway. If designated such the Parkway will get more national exposure and will be eligible for federal grant monies.

To ensure the success of the Legacy Parkway as a scenic byway the Great Salt Lake Legacy Parkway Scenic Byway Committee was formally organized in the early part of 2009. Local governments, the Davis Chamber of Commerce, the Davis Convention and Visitors Bureau and private organizations such as FRIENDS are represented on the committee



On the Trail by Charles Uibel

serving a wide variety of interests. It is a goal of the Committee to showcase the Great Salt Lake to those travelling the Parkway. We want the users of the Parkway to realize they are travelling through a special place, and understand the importance and uniqueness of the area. For those who take time to travel the trails we want them to experience the natural setting of the Great Salt Lake. It is our goal to ensure that urban development on the east side of the parkway interfaces with the natural area on the west side of the parkway so as to not destroy the opportunity of those visiting to experience the natural setting of the lake.

I would encourage those travelling north on I-215 or South on I-15 to jump off onto the Legacy Parkway. Travelling south you will notice the openness to the west and the attendant water and vegetation associated with the Great Salt Lake environs. You cannot miss Antelope Island, the Stansbury Mountains, and the Oquirrh Mountains as the Parkway makes a southerly bend near the 5th South interchange. Travelling north the Wasatch Mountains stand out as the Parkway makes a northerly bend near the Parrish Lane Interchange. This is a much different ride than I-15. Travelling at 55 mph on very quiet pavement with no big trucks to dodge can certainly be more relaxing.

In the future, the Committee plans to place more interpretive material along the Parkway to tell the story of the Great Salt Lake to those traveling the Parkway and the trails. The Great Salt Lake has such a rich history we would like all who travel the Parkway to learn and appreciate the special place they are traveling through. 🌲

Gary Uresk, Chair of Scenic Byway Committee



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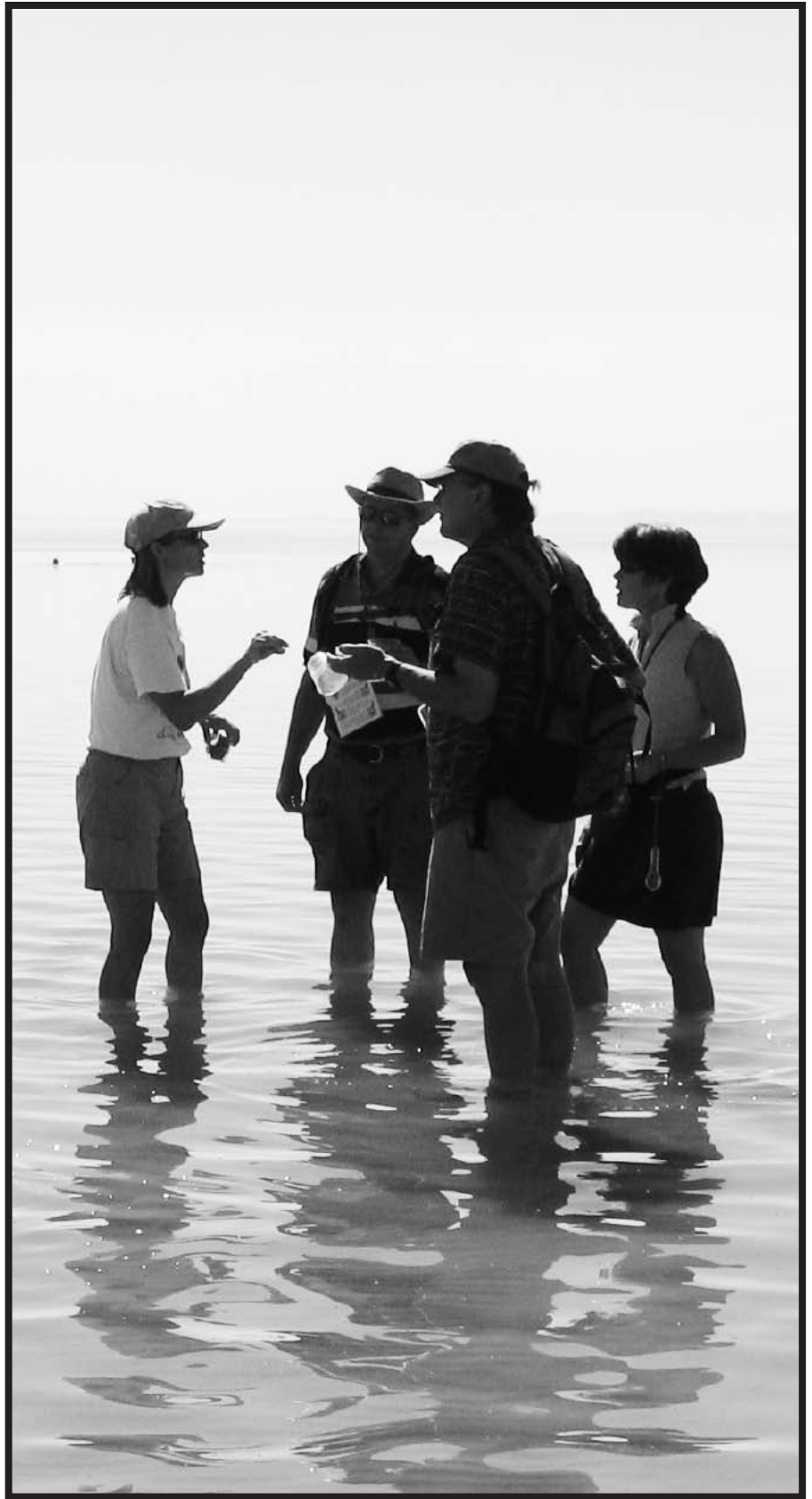
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Immersed in Understanding Great Salt Lake by P. Albion

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.

MAKING A DIFFERENCE

New FRIENDS and Old new and renewed members

William & Jeannine Adams
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Wayne Wurtsbaugh
Beth & Craig Young

GREAT SALT LAKE PEOPLE

Great News!!! In case you didn't know by now, the online edition of the Great Salt Lake Waterbird Survey Five-Year Report (1997-2001) is available at www.wildlife.utah.gov/gls/waterbirdsurvey. The survey was released by the Great Salt Lake Ecosystem Program and the Utah Division of Wildlife Resources. It provides a tremendous amount of information about the relationship of migratory waterbirds with the Great Salt Lake Ecosystem. The survey was the inspiration of Don Paul, an avian biologist who worked for more than 30 years with the Division of Wildlife Resources et al. A commitment of hundreds of volunteers and thousands of volunteer hours conducting bird surveys around the lake culminated in this extremely valuable data that helps us better understand bird use on and around Great Salt Lake. Take a moment to visit the website and we guarantee you will be stunned by the wealth of information available. You can also access the survey through a link provided on the FRIENDS website: www.fogsl.org under Birds of Great Salt Lake.

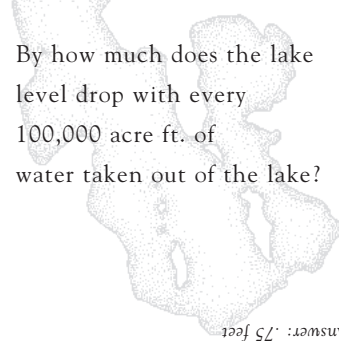
Happy trails to Crystal Carpenter, Park Naturalist at Antelope Island State Park who has moved to Dead Horse Point State Park. Crystal will be putting her magic to work at another one of our Utah jewels as she helps people understand the value of these special places for their unique habitats and the unique experiences they provide. Crystal was always there for FRIENDS and we will miss her.

We blew our briny farewell kisses to three extraordinary FRIENDS - Amy Price our treasurer, Becki Wright - Membership & Outreach Coordinator, and Elizabeth Jarrell - Assistant Director. We were extremely fortunate to have had the opportunity to work with these wonderful women. Amy kept a meticulous eye on our finances, Becki directed her energies at maintaining and building our membership endowment, and Elizabeth skillfully worked to refine and improve our education program and inspire those pesky 4th graders during our Lakeside Learning field trips. We wish them all the best.

Congratulations to Bill "Wild Bird Center" Fenimore, on his recent appointment to the Utah Wildlife Board. In that capacity, he will be working diligently to protect and conserve Utah's Wildlife. You go boy!

Lake Fact:

By how much does the lake level drop with every 100,000 acre ft. of water taken out of the lake?



Answer: .75 feet



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Great Salt Lake Girl by Charles Uibel