



FRIENDS of *Great Salt Lake*

P.O. Box 2655, Salt Lake City, Utah 84110-2655

801-583-5593

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Iceman by Gary Crandall ©2004

EXECUTIVE DIRECTOR'S MESSAGE

A Smart Growth Alternative to Building the Legacy Highway

"Despite the increasing prominence of roads across most landscapes, their impacts on aquatic biota are not well documented. Intuitively, effects on water quality (e.g., via toxic spills and runoff), habitat quality (via sediment loading and channel modification), and habitat connectivity (via barriers to movement) may often be severe."

Warren and Pardew 1998

Think back to September 16, 2002, and the unanimous decision by the U.S. 10th Circuit Court of Appeals to revoke the federal permits that were issued to build the proposed Legacy Highway. These permits were revoked because the court ruled that the Final Environmental Impact Statement (FEIS) was inadequate on a number of significant issues that included the following.

Sequencing - the original EIS failed to consider alternative sequencing of transportation investments other than building Legacy Highway first.

Integration - the EIS neglected to consider integration of road, transit investments and land use development.

Road Alignment and Configuration - the EIS improperly eliminated other practicable and less environmentally harmful road alignments and configuration.

Wildlife Impacts - the EIS ignored impacts to wildlife beyond 1000 feet from the highway.

Following that decision, the agencies responsible for the project - the Utah Department of Transportation, Federal Highway Administration and the US Army Corps of Engineers, hired transportation and environmental consultants to conduct the additional analysis required by the court ruling.

On December 3, 2004, the agencies issued the Draft Supplemental Environmental Impact Statement (DSEIS) for the project. The public has 90 days (after our request for an extension was granted) until March 4th to provide comment on what is included in the DSEIS (or based on the court ruling), what is missing. A public hearing is scheduled on Friday, January 7, 2005 at the Davis County Fairgrounds from 4-9PM.

In working to prepare comments on the DSEIS, it's important for all of us to be meticulous in our analysis of the work done by the agencies and their consultants. It's important to look for satisfactory answers to the following questions about the DSEIS.

Does it include thorough analysis of a Transit First approach? Does it evaluate ways to maximize the benefits of transit investments? Does it analyze upgrading and extending Redwood Road north in Davis County as an alternative vehicular route? and Does it disclose all of the damage to wetlands and wildlife that would result from the proposed Legacy Highway?

FRIENDS, Utahns for Better Transportation (UBET), the Utah Chapter of the Sierra Club and many other citizens have always proposed that the DSEIS should analyze the benefits of a Transit First approach to finding solutions to the transportation needs of the growing Wasatch Front. We do this because we realize that we cannot pave our way out of congestion.

We have stayed on message about fighting for more effective, more balanced, and more environmentally sustainable transportation solutions. These solutions must meet the travel needs in the area of the North Corridor, without promoting sprawl development. And these solutions must minimize impacts on critical wetlands of the Great Salt Lake Ecosystem.

Those principles are at the heart of our efforts to work toward maintaining our quality of life. That is why we have developed the Smart Growth Alternative, which is a viable alternative to building the Legacy Highway.

The Smart Growth Alternative is legal. It is based on a transit first investment strategy that reduces our auto - dependence by providing greater travel



options. It reduces air pollution. It provides an alternate vehicular route for Davis County drivers. It is less expensive than building a new highway, and it is environmentally responsible.

The Smart Growth Alternative represents a more effective long term solution to our future travel and air quality needs, and minimizing impacts to the Great Salt Lake Ecosystem.

When the decision from the 10th Circuit Court of Appeals was rendered, we also began working with consultants and experts to explore this alternative. With the help of world renowned transportation and urban planning expert Robert Cervero, from the University of California at Berkeley, and travel modeling expert Norm Marshall of Smart Mobility Inc. in Vermont, we see the Smart Growth Alternative as one that reflects 21st Century thinking and one that provides a win-win compromise solution to building Legacy Highway.

More information about this alternative is on page six of this newsletter. Additional updates can be found on the UBET website: www.utahnsforbetter-transportation.org.

Unfortunately, UDOT and the Federal Highway Administration have already dismissed our Smart Growth Alternative. So, when you provide your written comments on the DSEIS, urge the federal agencies to give full and fair consideration to the Smart Growth Alternative.

Part of my role as Executive Director is to promote advocacy in the best interest of the Great Salt Lake Ecosystem. In this case, the Smart Growth Alternative, combines what is in the best interest of the Lake, and for the people of Davis County. We can get to win-win. 🐾

In saline,

Lynn de Freitas

What You Can Do

Review the original Public Notice 200350493, summarizing the project proposal of the Legacy Highway, and the accompanying Draft Supplemental Environmental Impact Statement, describing impacts of the project and alternatives can be found at:

<http://www.spk.usace.army.mil/organizations/cespk-co/regulatory/PNs>

<http://www.spk.usace.army.mil/projects/regulatory/legacyparkway>

Urge the federal agencies to give the Smart Growth Alternative fair and equal consideration.

All written comments are due by March 4, 2005.

Send your written comments on the DSEIS to:

Gregory Punske, Program Manager
FHWA-Utah Division 2520 West 4700 South Ste. 9A
Salt Lake City, Utah 84118-1847

Send written comments regarding the probable impact of the project on the aquatic environment to:

Nancy Kang, Regulatory Officer, U.S. Army Corps of Engineers
Utah Regulatory Office 533 West 2600 South, Suite 150
Bountiful, Utah 84010-7744 or email Nancy.Kang@usace.army.mil

FRIENDS ORGANIZATIONAL STATEMENT

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.

FRIENDS has a very active Board of Directors and an Advisory Board consisting of professionals in the scientific, political, literary, education, and broadcast communities. Founded in 1994, we have organized and sponsored an array of programs, activities, and materials in pursuit of our mission.

Since 1996, we have sponsored a biennial Great Salt Lake Issues Forum that provides a gathering for policy makers, researchers, planners, industry and other stakeholders who are involved in and concerned about the Great Salt Lake.

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.

In 1997, we hired Bruce Thompson as our Education Director and initiated a major regional education project designed to enhance both the knowledge

about and care for the future of Great Salt Lake. Bruce wrote and produced a live-narrative slideshow program "The Lake Affect: Living Together Along the Shores of Something Great." Over 11,000 people in the five counties surrounding Great Salt Lake have seen the program.

We hope that the video version of The Lake Affect, and Project SLICE, a 4th grade curriculum using Great Salt Lake as a system of study, will achieve a positive, long-lasting impact on the future of the Great Salt Lake and those who dwell upon its shores.

In 2003, FRIENDS awarded the first Doyle W. Stephens research scholarship. Until his death in May 2000, Stephens served as a research hydrologist for the U.S. Geological Survey. He is particularly remembered for his work toward increasing public awareness of the Great Salt Lake Ecosystem.

FRIENDS was awarded the Conservation Achievement Award by the Utah Chapter of the Wildlife Society in 1998. 🦋

On the Cover

Iceman, Gary Crandall ©2004

Great Blue Heron shivering in 11 degrees below zero at Farmington Bay, Utah.

Photographing wildlife is a true passion for me, but it's also one of the most challenging endeavors I've ever undertaken.

First, there's finding the wildlife, then there's finding the fairly clean backdrop, and finally, the most important photographic element, finding the right light-which is essential to the photograph.

Sometimes I get lucky and find all three of these elements together, and when I do, it is very rewarding. Hopefully, that is evident to the viewer of the photograph.

It's my hope that in viewing these images, there will be instilled in us who share this continent with the wild creatures, the need to preserve enough space for all of us to continue to live together.

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



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THE WIN-WIN SOLUTION

A SMART GROWTH ALTERNATIVE TO THE LEGACY HIGHWAY

The Smart Growth Alternative consists of five integral parts.

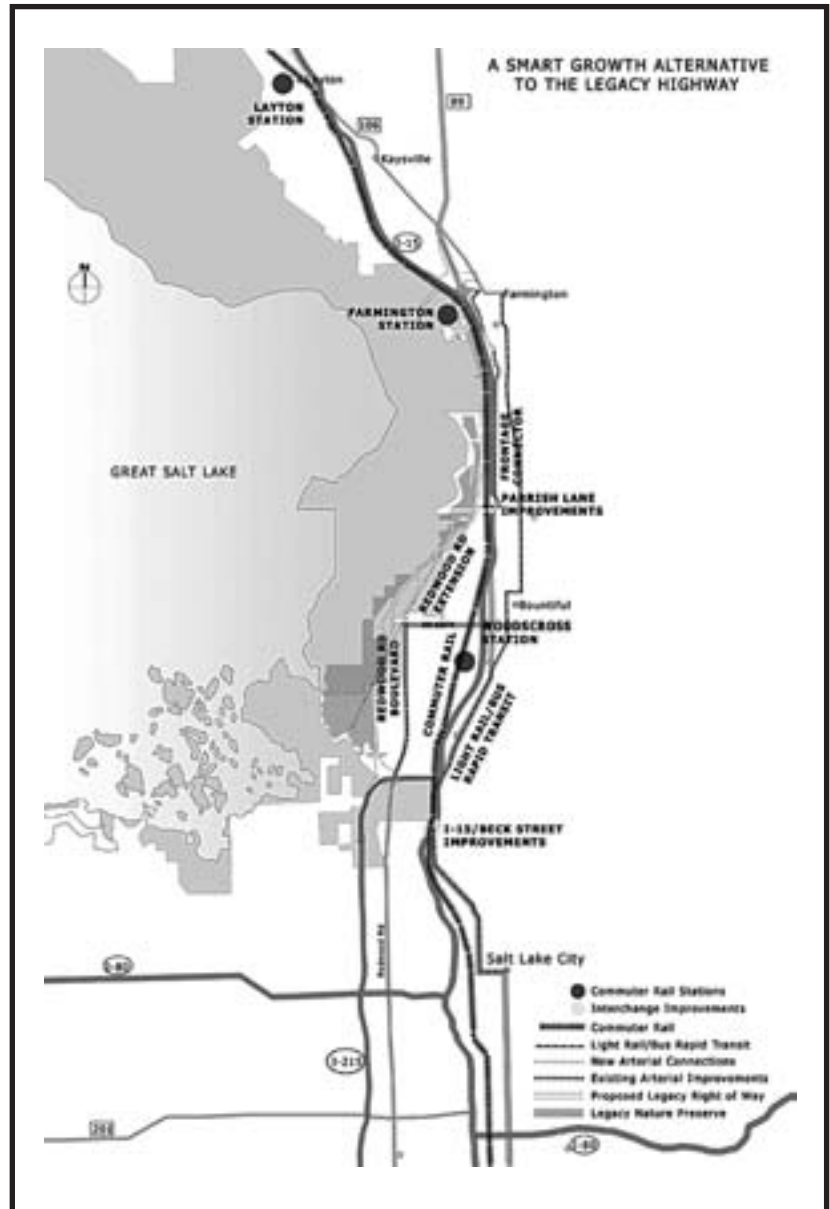
- 1) Commuter Rail to Ogden
- 2) Light Rail or Bus Rapid Transit to Farmington
- 3) Improvements to I-15 (widening and reconstruction of Beck Street and Parrish Lane interchanges.
- 4) Revitalizing Redwood Road, creating a low impact extension to Parrish Lane, and improving a frontage connector to Highway 89 in Farmington
- 5) Retain the Legacy Nature Preserve

The Smart Growth Alternative is an overall better transportation/growth vision because it will:

- Maximize transit and slow sprawl growth
- Save an estimated \$270 million in state funds over the Legacy shared solution
- Create a non-freeway alternative transportation route through Davis County.
- Protect hemispherically significant wetlands of the Great Salt Lake

The Smart Growth Alternative deserves full and fair consideration because it will:

- Meet future travel needs. (The federal agencies have greatly underestimated transit rider ship projections).
- Promote a better quality of life with more transit friendly development patterns, better long-term air quality, and open space preservation.
- Greatly reduce the loss of valuable wetlands compared to the Legacy Highway alternative.



The Smart Growth Alternative

Comments can be addressed to
Gregory Punske, Program Manager
FHWA - Utah Division
2520 West 4700 South, Suite 9A
Salt Lake City, UT 84118

The Public Hearing on the DSEIS was held on Friday Jan. 7, 2005 from 4 - 9pm at the Davis County Fairgrounds, 151 South 100 West, Farmington. Contact Marc at (801) 467-9294 for more information.

FRIENDS NEW ASSISTANT DIRECTOR

Katie D. Pearce



I am very pleased to accept the Executive Assistant position at FRIENDS of Great Salt Lake and am excited by the opportunity to extend my environmental advocacy and activism out of my armchair and into the community of service.

The Great Salt Lake holds a special place in my heart and history. I have hiked, camped, driven and biked along its shores numerous times. The most memorable occasions usually involved getting stuck in the legendary muck that develops after a good rain. Perhaps the best payoff for frequenting the lake was a few years ago when my then two-year-old insisted on going to the bird refuge before he would try out his new red binoculars.

My background is in US history. I am currently working on a Ph.D. at the University of Utah where I instructed writing workshops, served as a teaching assistant, and grader. This experience gave me the opportunity to teach a diverse population and develop my teaching philosophy. I look forward to putting my skills and experience to work for FRIENDS.

I am committed to preserving, conserving and protecting the Great Salt Lake, its shores, islands and wetlands, so everyone can have the opportunity to experience the lake as I have. I am looking forward to the future partnership with FRIENDS and am excited to serve as an educator and advocate in furthering the mission of this outstanding organization. 🌿

CREWING ON GREAT SALT LAKE

by Dory Trimble



Hot Wake Stephen Trimble ©2004

“Push off from dock in two. One...two.” Our coxswain makes the call and we all shove off, the boat sliding out into the water as we begin to row. We follow his calls and shiver a little as we maneuver out of the marina, past rows of sailboats dark and still in the windless night air. The boat makes rhythmic noises as we row out, the thud of oars in oarlocks, creaks of pressure on fiberglass foot stretchers, and the squeak of sliding seats. The boat passes into the strait at the mouth of the harbor, and our coxswain turns us out towards open water. We enter the lake.

The bow cuts seamlessly through the water, leaving a rippled wake dappled by strokes, oars dipping into the water at precisely the same moment, leaving behind rows of swirling circles. It feels as though we are rowing through night itself, cutting through the darkness with our oar blades and powering ourselves on towards the Big Dipper looming at our backs like a giant oar hanging on the wall of the city. We move as one, all eight rowers sliding up to the catch, exploding off our foot stretchers, pulling our oars back towards our chests and snapping them out of the water, cruising over an expanse of liquid darkness.

We row as one animal, swish-thunk-swishing our way across

the night, completely alone. It is easy to forget we are moving, to get lost in the sensation of the stroke and the feel of the darkness, unable to comprehend that it is water we are rowing on and not an extension of the sky above us. Just the dark and the stars and the boat, all of it gliding swiftly out to sea.

Slowly the sound of our breathing starts to hang on the edges of the night, small noises of effort as we pull back the strokes and send ourselves forward. The coxswain's yelling overcomes the darkness, and now it is not peaceful at all. We are fighting the water and the clock and the other boats, we are fighting the roar of the launch's engine and the stillness of the night. We are racing as hard as we can because we refuse to lose.

We row harder, our strokes quick and powerful, but never frantic—they are measured with a sort of controlled fury. Our thighs burn with lactic acid, arms aching every time we snap the oars from the water and move forward for another greedy stroke. But we don't stop. We keep going, every stroke the same as the next, every rower moving in synchrony, and we enter a space even more amazing than the one we felt before. Our speed creates an even sweeter harmony, one that we all feel and that blots out our exhaustion. There is





Crew Watching by Stephen Trimble ©2004

a hint of light over the mountains, and we are escaping it. It feels as though if we keep going, we can outrun the dawn and disappear, back into that globe of darkness that we have learned to love more than anything else in the world.

It feels like if we go fast enough, if we can just keep this up, we will never have to leave. We will be able to stay here, in this oddly harmonious place of intense passion and speed, forever. We will never grow old, never leave our friends behind or make mistakes, never have to face those things we fear the most or make choices we hate. It is a sort of Never Never Land, this place we've found, where we never grow up and we will always be safe.

But dawn comes, just as it always does. The sun starts to rise over the mountains, tinting the clouds pink and the sky golden, and we head back to the dock. We reenter the marina subdued, the reality of our lives slowly coming back to us. We carry the boats up, flinching as the cold salt water sloshes from the boat and drenches us. Already late for school, we exchange a few words with the coaches and return to our

cars, popping the trunks and changing our clothes in the parking lot.

We drive back past Saltair, now illuminated by the morning light and looking just as out of place as ever, a concrete palace on the shores of an endless sea. We get on the freeway, conversation picking up as we relive the morning's row. The car is full of excitement, we can barely contain ourselves. We are all talking too loud, gesturing wildly, laughing.

I can feel salt water seeping from my underwear into my jeans. And somehow, I don't care. I am taken away by the joy of our row, the beauty of the morning. All over the valley, our friends and families are just waking up, just rolling out of bed. But here we are, in a car full of our friends, salty and wet and ecstatic. And it is already a beautiful day. 🐻

Dory Trimble is currently a junior at West High School and one of the Varsity Captains of the Utah Junior Crew.

WILDLIFE POLITICS 101: PART II

An Overview for Concerned Citizens and Conservation Organizations



Bison by Gary Crandall ©2002



(The second article in a series that began in the previous newsletter issue.)

In last quarter's newsletter, we introduced the concept that interested citizens and conservation organizations can work with staff at the Utah Division of Wildlife Resources (DWR) on projects of mutual interest. Citizen involvement can include field work such as habitat improvement, scientific work such as participating in Audubon's Christmas Bird Count, or providing input on policies and programs through both formal and informal channels.

Today's article will present an introduction to the state's legislative process, in preparation for the opening of the 2005 General Session on January 17. Here are ten basic facts about the Utah State Legislature that can help you monitor, understand and participate in the process.

1) There are 29 senators and 75 representatives in the Utah State Legislature. If you don't know who yours are, see item 2.

2) The Utah Legislature home page web address is www.le.utah.gov. This website has volumes of information such as contact information for legislators, daily calendars of meetings, and the full listing and text of bills for current and past sessions. The best way to learn about it is to log on and spend some time reading and learning. During the session, this website even allows you to listen to floor debate live from your computer.

3) The General Session usually begins on the Monday in January that coincides with the Martin Luther King Jr. Holiday, and runs for 45 days. During the rest of the year, Interim Committees and Task Forces typically meet 2 days per month. These meetings are announced in advance on the same website described above.

4) The Office of Legislative Research and General Counsel, located in the capitol building, sells a very helpful publication known as the Utah Legislative Directory. It costs around five dollars, and has pictures and brief biographies of each legislator. It also shows seating charts for both houses, lists a calendar of important dates, lists the membership of all committees, and provides names and photographs of legislative staff. If you plan to visit the legislature in person, this book is a survival tool.

5) There are two parallel processes occurring at the General Session. One is the introduction, debate, and passage of new legislation. The other is the development and passage of the state's budget for the upcoming fiscal year. Wildlife

conservation and other environmental issues can therefore be affected by direct legislation, or by the appropriation of funding for those state agencies that oversee and implement such programs.

6) Legislators develop bills based on ideas from varied sources including constituents, government agencies, special interest groups, lobbyists, municipalities, and the Governor. Bills are drafted by the Office of Legislative Research and General Counsel based on a bill request from the Legislator. The drafting attorney reviews existing laws and prepares the bill in proper technical form. The bill is assigned a number, and reviewed for fiscal, statutory, and constitutional concerns, which are attached in the form of a note.

7) When a bill is introduced to the Legislature, it is referred to the Rules Committee for the House or Senate, depending on the sponsor. If the bill passes Rules Committee review and voting, it is forwarded to the appropriate Standing Committee. Wildlife and habitat related bills are most often referred to the House or Senate Natural Resources Committee (the full committee name is Natural Resources, Agriculture, and Environment.)

8) The standing committee reviews the bill in a public meeting where it receives public testimony. The committee may amend, hold, table, substitute, or make a favorable recommendation on the bill. If the bill is reported out favorably (with or without amendments), it is returned to the full house for floor debate, where it can be amended, substituted, held, or passed. Thirty eight votes are required to pass a bill in the House, fifteen in the Senate.

9) If passed, the bill then proceeds to the other house for committee review and so on. If the bill passes both houses, it is signed by the Speaker of the House and the President of the Senate, and then sent back to Legislative Research and General Counsel to be "enrolled", which involves final formatting and forwarding to the Governor.

10) The enrolled bill is sent to the Governor, who can sign, veto, or allow the bill to become law without his/her signature. Bills usually become effective 60 days following adjournment, unless a different date is specified. 🐾

By Debbie Goodman, Utah Audubon Council

Debbie Goodman also wrote the first article in this series in the Fall issue. Our apologies for omitting her name with that one.



WHAT ABOUT THIS GREAT SALT LAKE?

LAKE SCENTS: THINGS SCIENCE KNOWS YOUR NOSE MIGHT NOT

THAT UNPLEASANT ODOR that periodically visits us from Great Salt Lake can be attributed to hydrogen sulfide, also referred to as “rotten egg gas.” Specialized species of bacteria living in lakebed sediments respire anoxically—without oxygen. They acquire the minimal amounts of oxygen they need from various compounds in the mud, notably those containing sulfur. From this respiration, sulfate is reduced to hydrogen sulfide. This gas then finds its way into the air, particularly when wind-driven waves mix sediment and water layers. Under certain circumstances, storms bring this smell to communities quite far from the lake.

AS IF TO OFFSET THIS OFFENSE, these anaerobic bacteria also break down surplus nitrates, returning nitrogen gas to our atmosphere, which is itself approximately 78% nitrogen. This provides us all with an essential ecological service by helping to close the loop for the global nitrogen cycle—a cycle that begins when other players in the bacterial world transform atmospheric nitrogen into nitrogenous compounds required by plants as nature’s “fertilizer.”

THAT'S NOT REALLY THE LAKE WE SMELL. Boaters and researchers who spend a great deal of time out on the lake report that the most notable scent is that of salt, as carried by a pleasant sea breeze. Offensive odors tend to be confined to shallow bays or mudflats where the aforementioned chemical transformations are taking place.

FARMINGTON BAY IS THE BIG OFFENDER, thanks in large part to human influences. Water flowing into this bay, located close to human settlement in southeastern Great Salt Lake, has become laden with excessive nutrients from agriculture, industry and sewage treatment. These nutrients promote an extraordinary and often explosive growth of algae. Algae at Great Salt Lake is beneficial to the lake’s aquatic and avian life, but too much algae is not. As the ever-abundant algae in Farmington Bay dies and drifts down onto the submerged lakebed, ongoing decomposition creates the anoxic conditions ideal for those bacteria that produce hydrogen sulfide. To make matters worse, Farmington Bay has become virtually separated from the main body of the lake by the causeway built to Antelope Island. This causeway, combined with a gravel roadbed at the south end of Farmington Bay conspire with periods of low lake levels to prevent most of the bay’s nutrient-rich water from mixing with the main body of the lake.

THE ODOR IS NOT NEW to this or other lake systems. Parts of Great Salt Lake have probably been producing olfactory evidence of its biotic processes since before Lake Bonneville evaporated away nearly 15,000 years ago. Historically, some of the first reports of smells attributed to Great Salt Lake were made by early explorers, John C. Fremont and Howard Stansbury. Upon approaching the lake through Bear River Bay in 1843, Fremont wrote: “Getting overboard, [we] commenced dragging the boat—making by this operation a very curious trail and a very disagreeable smell in stirring up the mud as we sank above the knee at every step.” Out on the main body of the lake seven years later, Stansbury recorded: “A belt of soft, black mud, more than knee-deep lay between the water and the hard, rocky beach, and seems to be impregnated with all the villainous smells which nature’s laboratory was capable of producing.” Burgeoning human population near the lake has quite likely resulted in even greater smells than were noted by Fremont and Stansbury, particularly in Farmington Bay.

WHY GREAT SALT LAKE has shown itself to be such a champion odor producer, as compared with other lakes, is explained by several factors. First is the lake’s high sulfate concentration, which affords a correspondingly generous bacterial production of hydrogen sulfide. Sulfates and many other salts and minerals are able to accumulate here because Great Salt Lake is a “terminal lake,” with no outlet. Second, our lake is a shallow one, with more places for wind and currents to stir mud and gases into the air. Third, our lake fluctuates in elevation from spring to fall and from year to year, causing different portions of the lakebed to become exposed to wind and waves. In addition, a shallow lake warms significantly during summer, which promotes bacterial incubation and proliferation. Many of these conditions exist in lakes and wetlands all over the world, but generally not to the extent of Great Salt Lake. In many lakes the production of hydrogen sulfide in the sediment layers may only become apparent during the spring when upper and lower water layers mix.

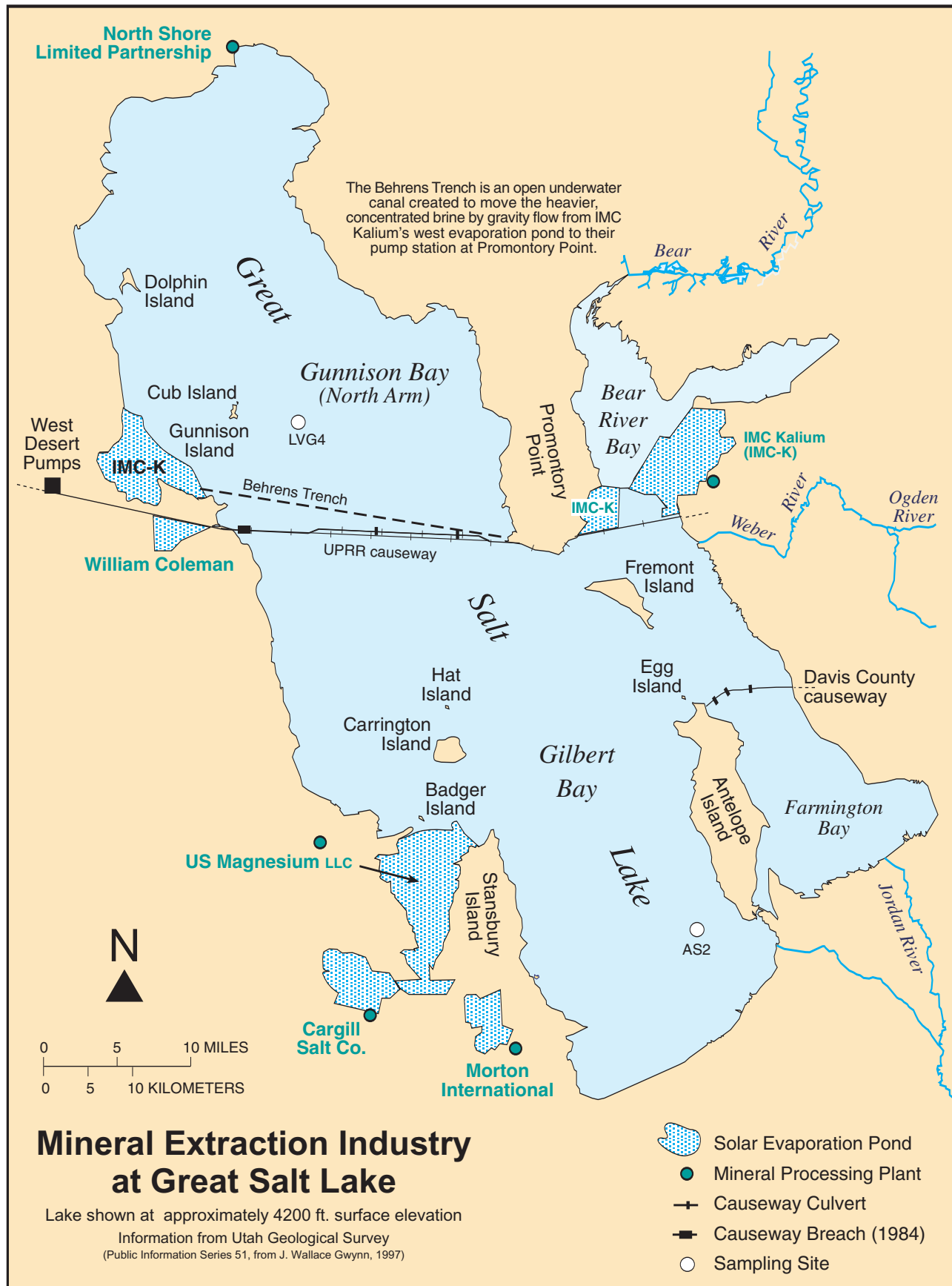
Now, if only we could help Great Salt Lake generate as much attention to its globally important living assets as it has to its chemical achievements...

Lake Fact:

What two popular historic artifacts are located on Fremont Island?

See page 19 for answer.

A SLICE OF SLICE



DOYLE W. STEPHENS RESEARCH SCHOLARSHIP

A Call for Applications

The Doyle W. Stephens Research Scholarship, sponsored by the FRIENDS of Great Salt Lake (FoGSL), celebrates Doyle's scientific contributions towards understanding the Great Salt Lake Ecosystem. This scholarship provides support to undergraduate and graduate students engaged in new or on-going research that focuses on the Great Salt Lake and its surrounding ecosystems. The scholarship award may be used to support any aspect of research including field, laboratory or literature research, attendance at professional meetings, or other activities that further the understanding or protection of the Great Salt Lake Ecosystem. Research located anywhere in the Great Salt Lake watershed can qualify for this award.

Qualifications:

Applicants must be undergraduate or graduate students currently enrolled in an accredited college or university. Specific application details are available at <http://www.fogsl.org/research/doylestephens.html>.

Selection of Award Recipients:

For the year 2005 one award of \$500.00 will be given. Applications will be judged on the following criteria: 1) Probability of successful completion of the proposed research (based on transcripts, letter of support, and feasibility of project), and 2) Potential contribution of the proposed research to the protection, preservation or understanding of Great Salt Lake Ecosystem.

Scholarship Recipient Requirements:

We request that the recipient present their research findings to the FoGSL membership. This can occur as a presentation at a general membership meeting and/or as an article in our quarterly newsletter. Additionally, we encourage recipients to participate in our biennial Issues Forum, which will be held in April 2006.

Application Deadline:

March 11, 2005 - AWARD RECIPIENT WILL BE ANNOUNCED IN APRIL 2005.

Send Applications to:

FoGSL P.O. Box 2655, Salt Lake City, Utah 84110-2655 attn: Scholarship
or emailed to amym@cc.usu.edu

For Applications and More Information:

Visit www.fogsl.org or contact the following:
Amy Marcarelli at amym@cc.usu.edu or 435.797.2517
or the FRIENDS of Great Salt Lake information line at 801.583.5593



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 Amy Marcarelli at amym@cc.usu.edu

The Phragmitization of the Great Salt Lake

Just as animal species profit from our presence on the landscape many plants aggressively spread after deliberate or inadvertent introduction. The potential for cattails (*Typha* spp.), reed canary grass (*Phalaris arundinacea*) and common reed (*Phragmites australis*), among others, to alter biotic community structure, reduce wetland function, and impede restoration is significant in the Great Salt Lake ecosystem. What makes these plants especially invasive is their tendency to be more vigorous and productive than in their native distribution.

Hypotheses that explain increased competitiveness include: 1) chemical or physical conditions at the new site that facilitate growth, 2) an absence of herbivores allowing allocation of resources away from defense to reproduction, and 3) hybridization. In the case of *Typha* spp., *Phalaris arundinacea*, and *Phragmites australis* hybridization is a likely explanation as all are historically found in the Great Salt Lake Basin but did not dominate plant communities until more recently.

It is suggested that *Typha latifolia*, a freshwater cattail species, has crossed with *T. angustifolia*, a more salt tolerant species first recorded in Utah in the 1920's. *Phalaris arundinacea* has been an important cultivated forage grass in temperate areas for over two hundred

years. Most likely, varieties bred for different soil conditions and increased yield have propagated with wild strains.

Phragmites australis possesses many characteristic traits of hybridized plants that include perenniality, asexual reproduction and rapid colonization of disturbed habitats. Propagules are found in ballast water from the Old World and it is possible that these plants contributed new genetic material to indigenous populations. However, additional research is needed to determine if the more invasive genotype we see in Utah developed after colonization or prior to introduction.

Limiting the expansion of invasives to new sites is paramount if we hope to keep healthy and diverse wetland plant communities. Management strategies such as fire, flooding, and drawdowns are unlikely to control them as all rapidly colonize wetlands subject to human or natural disturbance. As stewards, any observations we can contribute regarding the spread and distribution of these three species may provide useful information for managing and protecting our wetland resources. 🦋



Phragmites courtesy of Division of Wildlife Resources



LIFE AT THE EXTREME

Great Salt Lake Microorganisms



Student Sampling by Bonnie Baxter

The enchanting pink hues of the North arm of Great Salt Lake surround the eco-sculpture, Spiral Jetty. The color is attributed to the many microorganisms which inhabit an ecosystem that is one third salt. Life, thriving where life should not be. My work is dedicated to the discovery of these “extremophile” organisms and their biochemistry.

The North arm, isolated by a railroad causeway, is not as diverse biologically than the less saline South arm, which is closest to Salt Lake City. In fact the South arm boasts many algae species and far more species of bacteria. The brine shrimp and brine fly larva, which inhabit the waters around Antelope Island, for example, graze on this rich microbial soup. However, we have turned our studies to the more extreme North arm, where the food chain and the complexity occur at the microscopic level. The soup is too salty for brine fly larva, and brine shrimp tolerate the brine, but do not thrive.

What does thrive in the North arm is a diverse community of microorganisms that are somewhat elusive. In fact, we are unable to culture ninety percent of the cells seen by microscopy; they simply refuse to grow in captivity. This hypersaline ecosystem is rich in life of unusual shapes: Not only the typical microbe shapes of spheres and rods, but also triangles, squares, and curved rods. We have isolated dozens of organisms which my students are growing and characterizing. Others that we cannot grow must be analyzed by means that do not require cultivation.

Dr. Fred Post, who is retired from Utah State University, spent his career doing the first major study on Great Salt Lake microbes in the 1970's. With the advent of molecular technologies, a current group of scientists, including Drs. Shiladitya DasSarma and Kevin Sowers of University of Maryland, Dr. Carol Litchfield of George Mason University and myself at Westminster College, are approaching this population with different tools. If we cannot capture all of the organisms, then perhaps we can analyze their genes instead. In fact their genes tell a story of an unexplored

ecosystem: more than half of the genes sequenced thus far are new to the scientific community. What secrets does this great lake hold?

Another significant finding that we have made, in collaboration with Dr. Jack Griffith at University of North Carolina, is that there are a number of virus species in Great Salt Lake. As the “fleas upon fleas” analogy may illustrate this best, these viruses infect only the microbes of the Great Salt Lake North arm. Most likely they play an important role in limiting the bacterial populations, a sort of predator-prey relationship. So their presence may be significant in the balance of this ecosystem.

My students, including Ashlee Allred (this year’s recipient of the Doyle Stephens Scholarship Award), have also been pursuing the biochemistry of the Great Salt Lake microorganisms. In particular, they are researching the role of the colorful pigments of these bacteria, and just how they might defend the microbe from the intense UV radiation it receives in its environment. Our working hypothesis is that the pigments act as a sun-screen to protect the cells’ DNA from damage, but the mechanism is unclear.

Many of the readers of this newsletter are aware of the unique properties of Great Salt Lake: its rise and fall in elevation, its corresponding changes in salinity, and its dichotomy due to severing by the railroad causeway. Despite these extreme and dynamic conditions, Great Salt Lake microorganisms flourish in this ecosystem. Indeed, they are tailor-made for a life of saturated salt and dehydration cycles, evolution at its finest. Lesson learned here may indeed help us as we explore beyond planet earth. As opposed to little green men, Martians may have looked a little like salty microorganisms. The hypothesized dehydrated salt lake bed on Mars, for example, may have been home to bacteria such as those in Great Salt Lake. In fact, we know on earth that salt-tolerant extremophiles can lie dormant in salt crystals and be resurrected millions of years later. Perhaps there are salty microbes awaiting discovery as far away as Mars or further. Building an understanding of those in our Great Salt Lake becomes increasingly poignant. 🌍

by Bonnie K. Baxter, Ph.D.,
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North Arm Colonies by Bonnie Baxter

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receipt of e-mail or with any questions, suggestions, comments, or ideas.

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



Your FRIENDS Need You

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

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

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

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

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

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

Big Thanks!

PS. Does this sound like your mother?

Lake Fact Answer:

Kit Carson's Cross and the
burial marker of Judge and Mrs. Wenner

Thank You to Our New and Renewed Members for Your Support

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