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, advocacy, and the arts.

www.fogsl.org
EXECUTIVE DIRECTOR’S MESSAGE

PINCH POINTS ON THE SYSTEM FROM RECORD LOW ELEVATIONS REQUIRE CRITICAL TIMING AND WATER TO ADDRESS IMPORTANT ECOSYSTEM SERVICES OF GREAT SALT LAKE

CURRENT GSL LAKE ELEVATION: GILBERT BAY/SOUTH ARM 4,192.29’ GUNNISON BAY/NORTH ARM 4,189’

“Thank you for taking the time to meet with me during my recent trip to Utah to discuss the profound environmental challenges facing the Great Salt Lake. It was a pleasure to tour the Great Salt Lake Shorelands Preserve, and I appreciated learning about the good work that FRIENDS is doing to protect Utah’s natural environment. As you well know, time is not our friend in the battle against climate change. My visit to Utah was very instructive, and I look forward to continuing to push for Congressional action on climate change when I return to Washington, D.C. Thank you for your tireless work to protect one of America’s special places.

Please stay in touch about your important work.”
- Senator Sheldon Whitehouse, Rhode Island

Whenever we talk about Great Salt Lake, it’s important to talk about trends and how over periods of time these trends tend to build or lose water in different parts of the system. In 1963, when Great Salt Lake experienced its last record low elevation of 4,191’, it took 20 years for the high water years of the 1980’s to accrue enough water in the system to get to the record high elevation of 4,212’. Since then, even without the compounding impacts from upstream diversions that exacerbate low Lake elevations, the water budget continues to be in the red because of a string of below average snowpack seasons and above average summer temperatures. All contribute to a trend of loss.

Because the railroad causeway bisects the Lake into two arms, it interferes with water flowing from the South Arm into the North Arm. The North Arm relies on springs, precipitation and inflows from the South Arm, which receives inflows from the Bear, Weber, and Jordan Rivers. The inflows from the rivers and the barrier of the causeway create about a 3’ “head” or differential of water between the two arms, which is why salinity in the North Arm where the deep brine layer originates is always higher. This differential affects bi-directional flows through the causeway which then influences salinity levels for brine shrimp (artemia) and their food sources, wildlife and their food sources, and mineral extraction.

Consider the findings of the white paper published in February 2016 by Dr. Wayne Wurtsbaugh, USU et al. Dry Lake City: Water Development and the Great Salt Lake. We now know that water development over the past 150 years has dropped the average Lake level by 11’. With this in mind, it’s sobering to think about the huge hit Great Salt Lake would take from the proposed Bear River Water Development project that would prevent 220,000 acre feet/year of its water from flowing into the system. Oy!

The summer of 2016 was the hottest on record for the past 137 years coupled with another less than stellar snowpack season. At the Great Salt Lake Marina on the south shore, boats that would otherwise be enjoying this lovely autumnal weather under sail are in dry dock and have been since the spring of 2015. The marina and channel leading out into Gilbert Bay (the South Arm) are waiting to be dredged because of low water and silt build up that prevents navigation. Search and Rescue support is holding its breath because of a growing inability to address any incident that may occur on the Lake. And although some mineral extraction industries like Compass Minerals have already taken the initiative to seal ponds to reduce leakage and improve yields, all industries are exercising existing easements to extend intake canals deeper into the open water to facilitate pumping brine into pond complexes just to maintain their existing operations.

Low water and temperatures influence, salinity, food sources and habitats for wildlife, the brine shrimp fishery, and the industry itself. Already limited by access points around the Lake, navigational hazards exist for brine shrimp boats getting product – cysts - on and off the Lake during the harvest that typically runs from October 1 through January 31. The current salinity range in the South Arm is well above the optimal range of 12-14% for artemia. This compromises artemia’s ability to expire salt and reproduce. Two of the last three years of the harvest have been below average. Microbialites - the coral reefs of Great Salt Lake - play a critical role in the food web for brine shrimp and the life cycle of brine flies, both of which are food sources for wildlife. But microbialites are drying out from exposure.

Great Salt Lake hosts over 250 avian species that use the system. When the Lake is low there’s a loss of critical wetland habitat, and less area for nesting birds like ducks, ibis, and gulls. Phragmites flourish under these conditions and can choke out limited nesting areas. This forces these bird populations to concentrate, increasing the incidence of
outbreaks of avian cholera or botulism. Forage is affected by the changes from fresher to more saline conditions creating pressures on nutritional sources for the birds.

At midnight on December 31st, the Standard Individual 404 permit issued by the U.S. Army Corps of Engineers to the Union Pacific Railroad (UPRR) will expire. The permit allows the railroad to make an opening in the berm of a newly constructed 180’ bridge on the existing causeway in order to facilitate bi-directional flows of water and brine between Gunnison Bay – the North Arm of the Lake, and Gilbert Bay – the South Arm as mitigation for closing two culverts in 2012 + 2013. The culverts were difficult to maintain and the railroad was concerned about the structural integrity of the causeway and its ability to handle freight crossing the Lake.

In tandem with the 404 permit, the Utah Division of Water Quality issued a 401 Certification requirement. The certification includes a 5-year monitoring plan to “detect and address any harmful effects to aquatic resources that may occur in order to ensure that the water quality of Great Salt Lake and its beneficial uses are protected.” The contractual agreement between the state and the railroad indicates that all construction and costs that include the initial breaching of the berm to regulate bi-directional flows, and subsequent adjustments to the berm to achieve monitoring goals over the 5 years will be covered by the railroad. After 5 years, all of this will fall into the lap of the Utah Division of Forestry, Fire and State Lands, the Agency that has jurisdictional responsibility for managing the Lake.

In 2011 when the railroad initiated its proposal to close the culverts and construct a bridge, Great Salt Lake was already exhibiting a significant downward trend in elevation due to cyclical declines in snowpack and precipitation. However, some degree of bi-directional flows still existed through the culverts. At that time, part of a maintenance agreement with the state was that the railroad was responsible for keeping the culverts open. Now, with the crumbling structures destined to be plugged, mitigation was required.

Union Pacific’s initial bridge design was fairly rudimentary in that it would only serve to maintain bi-directional flows under “worse case” scenarios, a condition which is extremely difficult to determine without the context of the ecosystem as a frame of reference. The design didn’t address the critical relationship that exists between the exchange of salts from the deep brine or water flowing into the North Arm (Gunnison Bay) from the south and how that translates into the ecological dynamics of the system, and important ecosystem services like mineral extraction, the brine shrimp industry, wildlife, and recreation, - all of which depend on those dynamics.

Without accounting for these critical Great Salt Lake values, cooperating state and federal agencies, industry, and other Lake stakeholders found the design untenable. And it soon became quite clear that in order to protect the system and its resources, a more intensive and collaborative working arrangement between the railroad and the state would be required to achieve a structural design that worked.

After painstaking negotiations that included the threat of a lawsuit by the railroad over right of way issues on easements across sovereign lands, everything is finally in place with a target opening date in early December. When this happens, it’s estimated that approximately 1.75 million acre feet – about 1.5’ of water will flow from Gilbert Bay north into Gunnison Bay creating a impressive torrent of water that will cut through the berm fairly quickly. It will take about one month to achieve equilibrium of bringing water to Gunnison Bay and increased salinity to Gilbert Bay. Under the current circumstances, there is no Greek ideal for the best time to breach the berm. However, when it comes to Great Salt Lake timing is everything.

Five million eared grebes are on their way to the Lake to rest and fuel up for the last leg of their migration. When they arrive, they’ll molt all of their feathers and double their body weight by consuming brine shrimp at a rate of 30,000 shrimp/bird/day. Fattened up and ready to go, the birds will leave sometime in December. The migrating population depends on this.

Juvenile brine shrimp that are responsible for contributing to the next generation of over wintering cysts that will populate the Lake next spring are extremely susceptible to salinity changes. A gush of increased salinity into Gilbert Bay could devastate part of the fishery as well as the eared grebe population. After careful analysis by the Great Salt Lake home team, it was agreed that a December target date was the most opportune for the Lake.

Near Antelope Island, I watched a flock of at least 300 American White Pelicans kettling up in the thermals to launch off for a fishing expedition at a local reservoir. I thought about resilience and fragility, community and our stewardship responsibility. And I thought about FRIENDS’ commitment to our Lake. It gave me hope.

In saline,

Lynn
**FRIENDS’ ORGANIZATIONAL STATEMENT**

FRIENDS of Great Salt Lake is a membership-based non-profit 501c3 organization 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, advocacy, and the arts. 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 Advisory Board consisting of professionals in the scientific, academic, planning, legal, arts, and education 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 was established in 2002 and is given at each GSL Issues Forum. It acknowledges a citizen, business or organization working to promote Great Salt Lake awareness in the community.

In 1998, the Utah Chapter of the Wildlife Society awarded FRIENDS the Conservation Achievement Award.

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

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

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

Janessa Edwards, hired in 2014 as Education & Outreach Director, is working to strengthen the Lakeside Learning Field Trip Program and FRIENDS community outreach.

In 2014, FRIENDS established the Annual Alfred Lambourne Prize to celebrate creative expressions inspired by the Lake in Utah.

In 2016 our Lakeside Learning Field Trip Program was recognized as the Environmental Education Program of the Year by the Utah Society for Environmental Education.

In 2016 FRIENDS hired Holly Simonsen as our new Membership Coordinator.

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**On the Cover**

*Birds of Great Salt Lake*, core sample relief print created by students during The Lake Affect summer camp partnership with Art Access, FRIENDS of Great Salt Lake, and Saltgrass Printmakers.

During this unique program, students investigated our Great Salt Lake environment and learned about the ecosystem by drawing from observation, discovering the diverse textures and surfaces of Antelope Island and Great Salt Lake marina. Students kept a ‘field notebook/sketchbook’ to record amazing scientific discoveries and collect drawings of encountered plants, minerals and animals. Then, back at the Art Access studio, we translated our knowledge and experiences though drawing, memory mapping and carving a ‘core sample’ relief print. You can learn more about Art Access and their programs at www.artaccess.org. See the amazing work happening at Saltgrass Printmaker by visiting their website at www.saltgrassprintmakers.org.
CREATIVE EXPRESSION INSPIRED BY OUR INLAND SEA

Jules Jimreivat and Syd Sattler, directors of the Great Salt Lake Podcast discuss important environmental topics on the salty beach of Great Salt Lake. Their mission is to educate and inspire with stories of Great Salt Lake. The first three pilot episodes of the podcast can be found on their website, greatsaltlakepodcast.com.

Photo by Jeri Gravlin

2016 Alfred Lambourne Prize- Winner in the Sound Category
Bear River—The Long Trajectory

“We forget that the water cycle and the life cycle are one.” —Jacques Cousteau

I owe my life to the Bear River. Every one of my ancestors relied on its waters for survival. The Gosiutes and Shoshone also relied on the Bear. The long-term residents of what the Mormon settlers came to call Logan and Brigham City taught the fair-skinned Richardson and the Christensens and the McMasters how to keep from starving there. So my gratitude for the Bear River goes back over a thousand years and extends to all the generations of people, bobcats, coyotes, deer, seagulls, cranes, gophers, lizards, sagebrush and sego lilies that kept the Bear River region strong and healthy.

As strong and healthy as it now stands.

We have to pass the river on intact.

I am not only grateful to the Bear, I am in awe of its vigor. This three-state, wandering waterway is the Great Salt Lake’s largest tributary, and North America’s largest river that does not reach the sea. Though tapped for agriculture, the Bear River still has free-flowing sections and the river’s course moves with a river’s own intelligence. Just look at it on a map. The Bear flows 350 miles—a bit like the trajectory of an arrow shot skyward—from the Uintas in central Utah up through a corner of Wyoming to Idaho’s Soda Springs, then courses back south to Utah with its curves and oxbows and meanders slowing erosion and creating the soil of the living valleys that we plant, enjoy and cherish. As a sideline, rivers create dirt, no charge. The Bear River’s waters end their trip at the wild marshes that embrace the eastern shores of the Great Salt Lake, near Brigham City, home to a national flyway for more birds than anyone can count. Of course people do try. They’ve tallied tundra swans, cinnamon teals, black-necked stilts, snowy plovers, avocets, marbled godwits, curlews, phalaropes, to name a few, and an array of wheeling gulls.

Want to see the beauty of a river’s intelligence firsthand? Go to the Bear River Migratory Bird Refuge. Go and be deliciously small in the grand, wide world. Drive its 13 miles of gravel roads and marvel at vast beauty while the curve-billed ibises whomp past and a crew of white pelicans floats together like parked VW bugs in the distance. Laugh. Be with god—it is a godly place, so filled with life and in so many forms you’d swear the light was holy, light made just to warm the Wasatch peaks and draw the flocks and drape the fields in green and tawny gold.

We need to pass the river on intact.

Enter the proposal to damn the Bear River. To provide water for a flood of human inhabitants who haven’t arrived yet.

This short-sighted, well-meaning proposal tries to make the best use of Utah’s limited water by damming the Bear with reservoirs for future agricultural and home use. But the plan ignores the long-term realities of a river system that already gives and supports life generously in our arid land. We live in a desert. A mountaintop desert that has strict limits. Ranchers know this. Farmers know this. Wise desert dwellers learn to live within the desert’s water limits, or they don’t last long.

For 170 years, Utah’s new inhabitants, my ancestors among them, have thought of the Great Salt Lake, if they thought of it at all, as a waste place. A salty anomaly. A dead sea where civilization ends. But the Great Salt Lake is not dead thanks largely to the end-waters of the Bear River which contributes 65% of the fresh water entering its shores. And the Salt Lake Valley is livable thanks to this. An old river keeping an ancient trust.

Damming the Bear River is as smart as putting a tourniquet around Utah’s neck. Two million people and the animals, plants, and insects who are their neighbors in Utah’s most populous region, will suffer if the Bear no longer pours into the lake. And the lake dries up. And the dirt, dust, salt and heavy metals held deep in the lake’s body become the newest arrivals. The new settlers. And settle they will. Over the Salt Lake Valley in the layers of a new Dust Bowl. With four million people wondering how it all went wrong.

No. That is only one possible future.

We can and will pass this river on intact.

The Bear River’s health and strength still shine and feed and build and sustain along its 350 mile course, but especially where it empties into the Great Salt Lake. There, it welcomes avian and human visitors from across the continent, erasing the need for the infringements of technology, balancing the salinity of the lake with fresh water, moistening the desert with its well-travelled breath.

Strong and healthy, even after such a long trajectory.
Thank you, Bear River. I cannot imagine northern Utah without your gifts. I question the logic that allows twice the number of people to settle here in this desert. After all, this is the place. The place and the time for farmers, ranchers, birdwatchers and waterfowlers, families in subdivisions, and lone campers out in the Utah wilds to pass this river on intact so that it can scatter into marshes, empty all its riches, and demonstrate the power of letting go at journey’s end.

Barbara Richardson is an author and the recipient of the 2013 Utah Book Award for her novel *Tributary*. Her most recent novel set at the Intermountain Indian School is in the works.

www.barbarakrichardson.com
www.dirtalovestory.com

*Pelican Sunset* by Gary Crandall
What’s that tang in the air you can sometime taste while driving on I-80 near the Grantsville exit about 30 miles west of Tooele? It’s the taste of success and industry, and more specifically chlorine, emitted by US Magnesium; the primary producer of magnesium in North America and the sole producer in the NATO alliance.

Magnesium is an integral part of our everyday life as an alloy to strengthen aluminum that constitutes a multitude of products ranging from aircraft to pop cans. By-products from the magnesium extraction process including ferric chloride, hydrochloric acid, and chlorine are also sold whenever possible, and are used in applications from swimming pools to hydraulic-fracking. Additional undesired by-products of the process include dioxins, polychlorinated biphenyls and hexachlorobenzene, which persist in waste disposed on site, and which have largely driven this site’s placement on the National Priority List (NPL), commonly referred to as “Superfund” sites.

This Superfund site is unique in that it is currently operational, and so it is subject to environmental regulations concerning both newly-generated waste (Resource Conservation & Recovery Act, RCRA) as well as previously improperly disposed wastes (Comprehensive Environmental Response, Compensation, and Liability Act, CERCLA and Superfund Act Reauthorization Amendment, SARA).

Three of us, two graduate students and one professor from the University of Utah were granted a golden ticket to tour US Magnesium in late May of 2016. The tour came about from an EPA grant awarded to FRIENDS of Great Salt Lake to hire a Technical Advisor via the Superfund process. Throughout the US Magnesium guided tour, we were accompanied by two EPA employees (Mr. Ken Wangerud and Ms. Jennifer Chergo), a member of the Utah Department of Environmental Quality (Mr. Michael Storck), and a representative from Environmental Resources Management (the contractor hired by US Magnesium to oversee remediation efforts on site) (Mr. Kevin Lundmark).

The smokestack of US Magnesium is the first thing you notice when approaching the site from Interstate 80. Its puffy discharge of white against the blue sky is cloud-like, except for its lime-green core, an eerie reminder of the 3,300 annual tons of chlorine gas that are emitted under the Title V Operating Permit. Stepping out of the car in US Magnesium’s parking lot, one’s nose hairs (as reported by the professor) tickle and shrink from exposure to the ground-level vapor.

The friendly plant environmental manager, David Gibby, notes that chlorine affects people differently; a seasoned US Mag. worker hardly notices the odor. We are given emergency respirators in the event that chlorine levels rise above safe levels, and hard hats for no clear purpose, but possibly as a meager defense against corroded structures that are continually exposed to the caustic air. We don our decade-old prescription eye glasses, since contacts are prohibited, quite understandably, due to risk of plastic lenses melting onto one’s cornea in the event of unsafe chlorine gas exposure. After a brief history of US Mag. and the magnesium extraction process, we load into the commuter van that shuttles facility workers every day from their homes in Grantsville and Tooele, and begin our tour.

The site is otherworldly, since all areas north and east of the active industrial area are stained dark red. These active disposal “ponds” and waste piles are designated by EPA as Preliminary Remedial Investigation areas (PRIs). The red reflects precipitation of iron that is used in the electrolysis process. PRI 9, colloquially-called “smut” pile, looks like it could have come from the Moon, and is made of solid waste (unwanted salts and metal-oxides) scooped out of the electrolytic cell. As the smut ages after disposal, the material equilibrates with temperatures at Earth’s surface, and changes color from auburn to grey, and texture from blocky to powdery. The smut’s high lithium content (~25%) could potentially be valuable if lithium prices increase into the future. Channeled through the orange earth of the smut pile are ditches that convey ochre liquid waste to the vast active waste pond.
Historically US Magnesium disposed of waste effluent in an 800-acre waste pond constructed in the Great Salt Lake embayment that extends south toward Skull Valley. In the mid-1980s the lake level overtook the old waste pond, so the active waste pond was moved toward the facility (away from the lake). This newer 500-acre active waste pond is defined by unlined earthen berms on its south, east and north sides, and on its west side by the delta of the mineral waste smut pile. The sight of this active waste pond is impressive, not just because of its expanse and orange color, but also because its boundaries are constantly changing due to erosion and slumping. This gigantic waste pond was clearly a hurried response to the mid-1980 floods, but despite the passage of several decades of environmental improvements at industrial sites across the nation, containment at this site appears to be tenuous.

The challenge of containing this waste is driven by two primary forces; one being the huge increase in production (52,000 ton/year in 2010 to 76,500 ton/year currently) (http://minerals.usgs.gov/minerals/pubs/commodity/magnesium/mcs-2010-mgmet.pdf). The other force comes from geology. The acidic waste dissolves oolitic lime sands underlying the site. Throughout our tour, we observed gas bubbles rising through the waste liquid at all locations in the active waste disposal pond, signifying the dissolution of underlying sediment. This dissolution can lead to slumping within the pond and its bounding levees. Dissolution-driven sink holes are also observed outside the levee boundaries demonstrating that acidic waste is moving underneath these boundaries to dissolve sediment outside the disposal waste pond perimeter. A 10-acre brackish pool called the “Angel Wing” is present on Bureau of Land Management (BLM) land and is being monitored for decreases in pH which could signal waste inflow. Between the ever-increased level of acidic waste driven by increased production and the dissolution of the floor below this waste, US Magnesium has a massive containment problem. To make matters worse, US Magnesium has had recent breaches of the levee and release of waste from the active waste pond into the old waste pond, with a major breach in 2012.

The silver lining is that the majority of the length of the containment levee for the active waste pond is adjacent to the old waste pond. Any breach in the eastern levee will release waste into the old waste pond (as was the case for the 2012 breach). Due to the persistence of the contamination and the current low lake level, this release does not likely constitute a major change in risk to the environment. However, a breach through the levee at its north or south ends may entail larger concerns. To the north lies Bureau of Land Management land, to the south lies a diversion canal that conveys runoff to Great Salt Lake from Skull Valley to avoid its mixing with solar evaporation ponds used by US Magnesium to concentrate the salts. The barrier between the active waste pond and the diversion canal on the south levee is only an earthen barrier of 15 or so feet width with a five foot or so (eyeballed) elevation drop from the waste liquid level and the diversion canal. The potential for transport to the Great Salt Lake is obvious should this levee breach.

A second silver lining observed in our visit is that, during our tour at least, birds and other wildlife were absent from the active and old waste ponds, waste piles and mineral slurry deltas. Just beyond these impacts, birds were plentiful (avocets and gulls) where emergent aquatic plants exist. It seems that the lack of habitat in impacted areas limits exposure of wildlife to toxic materials, and this should continue in the absence of catastrophic release of waste materials.
The Superfund process is thorough, but not speedy. Although the site has been listed on the NPL since 2009, it is still in the characterization stage. This first phase of the Superfund process concerns characterizing contamination and potential threats to ecosystem health. Two components of this first phase (Phase 1A & Phase 1AB) were recently completed in which a conceptual model of site geology, climate and hydrology were developed from historical data, and existing and expected ambient concentrations of contaminants of potential concern (COPC) were determined. The next phase (Phase 2) will assess potential impacts to the ecosystem via a baseline risk assessment. Following these phases, a plan for remediation will be developed and eventually executed.

Clearly the witches’ brew present at the US Magnesium Corporation of America Superfund site presents a major operational and remediation challenge; one for which the cry “out out damn spot!” can be expected to persist for at least another decade prior to its delisting. The simultaneous operation and clean-up of this site is a challenge worthy of our attention, one that one day may well become required reading of budding environmental engineers and possibly even thespians.

Logan Frederick, TAG team member
Anna Farnsworth, TAG team member
William Paul Johnson, Professor, Geology and Geophysics University of Utah
Westminster College provides students with unique learning opportunities during an intensive month-long block each May. May Term courses are designed for experiential learning opportunities that students often do not have access to in the traditional classroom. This past May, in just a few weeks, we offered sixteen students the experience of Exploring Great Salt Lake.

Our areas of teaching expertise, art history and ecopoetry, find common ground in our Lake—both of us have spent countless hours along the Lake’s shores and on the Lake. For over ten years Holly has been working in ecopoetic collaboration with Great Salt Lake. Her working thesis is that ecologically disrupted areas offer access points for the human body to experience language. In this way, Great Salt Lake isn’t merely an inspirational site, rather an active collaborator. Hikmet’s art historical approach finds ways for students to both learn of past artists’ representations of and actions on the Lake, and to experience the Lake through sensory and phenomenological foci resulting in their own artistic expressions.

Because our class was cross-listed for credit in the Art, English, Environmental Studies, and Honors programs, we were able to accommodate a diverse range of students. The class included a wide variety of majors including public health, biology, and dance. While students needed to come with basic understanding of literature and art, few had any experiences at Great Salt Lake. In fact, many harbored the Great Salt Lake stereotypes we work to refine (the Lake is a stinky wasteland).

There are many rewards to teaching, and through May Term, the rewards are compounded by spending large blocks of time on site. Each week, we loaded students into large 18 passenger vans after ensuring they had sunscreen, proper shoes, and granola bars. We created a Field Guide to assist students in moving from one area of the lake to the next, filled with carefully planned readings from art and ecopoetry to move students through complex ideas tied to “place.” Once we arrived at the site, we reminded students of our expectations and set them loose to explore and experience.

One of the most fascinating aspects of teaching is seeing what resonates with students. How will they respond to the material? Will our months of planning course content make a difference in how they see or experience the lake?

A sample of the readings provided gives one a broad sense of where we were headed in this course. The first class, title Germination, included a chapter from David Abram’s book The Spell of the Sensuous, and a chapter from Lucy Lippard’s book The Lure of the Local. Additional readings (for the class titled Directionality/Materiality) paired readings from Alfred Lambourne’s book Our Inland Sea with Julia Spahr’s “Poem Written After September 11/2001” from her book This Connection of Everyone With Lungs. Additional readings rounded out what we hoped would be a new way to understand not only Great Salt Lake, but the broader environment that surrounds us.

Our class visited the lake three times, moving progressively along the south shore. During each visit the students were asked to respond to the previous day’s readings, connecting information and experience. Students were asked to observe and explore the site through the lens of their reading assignments. They were encouraged (according to our course syllabus) to take “academic risks in the hope of expanding conceptualization and creativity.” Exploration and response could be written, drawn, created in three-dimensions. During the first class, when we were asked for the minimum number of words each assignment needed “to pass,” we discussed the authentic expression we were seeking in their responses, which had nothing to do with word count.

On the first visit we took the students walking the border between the Inland Sea Shorebird Reserve and the Lee Creek Audubon Preserve. The students experimented with boundaries, both as physical barriers and metaphorical borders. Students were most struck by the remains of a pronghorn antelope that had caught its front leg between two strands of barbed wire. The carcass showed obvious signs of...
struggle—hair had been rubbed from bone, the hoof of the animal now pointed straight toward the sky, the carcass was emaciated. It was determined that the antelope had starved. While it’s easy to see singular tragedy here, our students responded clear-eyed and solution-oriented. They immediately questioned and discussed the complexities of the situation, which are microcosms of the complexities of Great Salt Lake, and the complexities of the larger ecosystem.

Next, the class moved west to a point that allowed access to the lake’s waters. Our discussions—along with the emphasis on art and ecopoetry—included heavy doses of our lake’s current reality of diminished lake levels and the ensuing problems resulting from our current drought. It took almost an hour to walk to the point where water met land, giving students the opportunity to tie durational time with the time seen around them through remnants of the Bonneville Shoreline. The water offered brine shrimp, flies, and plenty of romping before heading back to the campus vans.

The final visit to the lake took place at Black Rock, site of the former pioneer-era Kimball home, now an area that sees the intersection of highway, railroad, graded road, and Black Rock painted in neon colors. Students were encouraged to consider contemporary issues of sustainability and diversity within the environment and use this trip to formulate their final course project.

The culmination of the course came too quickly: we sensed our student’s deep engagement with the lake and materials presented to them. But, after this brief emersion in the lake, the final class found us responding to individual and group projects. To our delight, these projects were as diverse as our students. Each group represented their new-found understanding of Great Salt Lake in a different way. As example, one group made a satirical video called “Dude, Where’s The Water,” wherein they played surfers looking to catch a wave on the “so called inland sea.” Through the silly acting and pun-laden jokes, emerged a deeper understanding of the western watershed as it relates to Great Salt Lake. In the film, the students finally did make it to the water line. They immersed themselves (quite literally) in their new understanding of our inland sea—in the final scene, they are all standing in line outside their dormitory shower waiting their turn to wash the salt from out of their ears. It truly was an experiential course and we cannot wait to teach another section.

Holly Simonsen, English Professor at Westminster College
Hikmet Sidney Loe, Art History Professor at Westminster College
The Importance of Collaboration, Predictability and Follow-through on Great Salt Lake

Compass Minerals, formerly Great Salt Lake Minerals Inc., has been operating a mineral production facility on the shores of the Great Salt Lake in southern Bear River Bay since 1970, and in Clyman Bay since 1991. Our operation includes 50,000 acres of solar evaporation ponds, and a production facility west of Ogden where we produce sulfate of potash (SOP), magnesium chloride and salt. Compass Minerals is the only domestic producer of SOP, including certified organic SOP, which is a specialty potassium for high-value crops that have sensitivity to chloride-based fertilizer, including tree nuts, citrus, grapes, potatoes and turfgrass. The salt we produce keeps people safe in the winter, while magnesium chloride has a variety of uses, including reducing dust on dirt roads.

Our products are produced by concentrating Lake brine in our ponds. The minerals are harvested at the east pond complex and further processed in the production facility, where we employ over 300 full time workers, many of whom have been with the company for decades.

In 2012, Compass Minerals invested over $40 million to improve the functionality and sustainability of our east pond complex. The improvements enhanced the efficiency of the pond complex by reducing the leakage of valuable concentrated brine. While improved pond efficiency has economic benefits to the company, it also results in significant environmental benefits by materially reducing the volume of brine consumed from the Lake annually. By preserving the concentrated brine, there is no need to replace leaked volumes with new lake brine. Preservation of concentrated brine also reduces energy consumption and results in fewer emissions.

Aside from the economic and natural resource benefits, the east pond improvements created another wonderful opportunity to engage with other lake stakeholders. The project was the first time a mineral company on the Lake sought growth in production through improvements in process efficiency, instead of developing additional pond acreage. Moreover, the improved engagement and collaboration between Compass Minerals and conservation stakeholder groups enabled the collaboration on other efforts to help keep our Lake healthy. These include:

- Development and finalization of the Great Salt Lake Comprehensive Management Plan
- The Union Pacific Railroad (UPRR) culvert closure request and mitigation plan
- Development of projects to advocate and materially preserve inflows to the Lake

During 2012 and 2014 the Lake was clearly benefitting from improved stakeholder collaboration through the many meetings associated with these processes. Through this collaboration, much creative thought was shared about how to plan for and keep our Great Salt Lake healthy. The various engaged groups participated and embraced the opportunity to be involved in discussions around modelling, planning, negotiating, compromising and moving forward. As the horizon cleared, and these processes came to a well-thought-out conclusion, Compass Minerals began to plan accordingly. Leveraging our successes in our east ponds, we decided to pursue the same at our west pond complex. In designing these improvements we realized we were able to withdraw unused minerals to the Great Salt Lake.

The West Pond Sustainability project accomplishes two things operationally:
1. Provides incremental pond area that will enable Compass Minerals to establish a pond rotation to enable us to return unused minerals to the Great Salt Lake.
2. Reduces pond leakage, yielding an approximately 20% reduction in our overall brine consumption.

In addition to the operational benefits, the project also integrated improvements to the pond reclamation plan. Developed in collaboration with FOGLS and Division of Wildlife, we will convert rip-rap armoring along the shores of the pond complex to isolated islands that are preferred habitat for shorebirds and will protect against predator access. The reclamation plan is secured through financial surety, and is the right thing to do towards keeping the Great Salt Lake ‘great’!

We are fortunate to have aligned with so many groups on this project and are pleased to have initiated construction in
November 2015. We are also very proud to have received the Utah Division of Oil, Gas, and Mining Earth Day Award and Best of the Best Award for 2016. We are also honored to have received the Environmental Leadership Award at the 2016 Governor’s Energy Summit.

Notwithstanding the many successes and the incredible level of engagement we enjoy with other lake stakeholders, lake managers and regulators, businesses such as ours rely on the well-vetted and final decisions, so we can make long-term plans. A great example of this was the UPRR culvert closure project and mitigation. While we were concerned about the lost flow to the North Arm of the Great Salt Lake when the culverts were closed, we were assured that the flow lost by virtue of the culvert closings would be replaced with a new conveyance to be developed in a mitigation plan. The process to identify the exact specifications of the new conveyance was long. It was not unreasonable however – we appreciate that it is important to get the design right! As the design and regulatory process pointed toward an ultimate solution, it became clear that the design would not only replace the flow conveyance and bi-directional flow that existed with the culverts, but would actually enhance north to south flows of salinity. The enhanced flow could result in a slight freshening of the hypersaline North Arm. While many stakeholders assumed Compass Minerals would have concerns with this ultimate design, they were surprised that we were supportive. Our East and West Pond Sustainability projects reduce our sensitivity to minor perturbations in salinity. Further, the region has been impacted by an ongoing drought. With the North Arm effectively cutoff from any inflow since 2014, and with the North Arm having receded 7 feet (compared with ~ 4 feet in the South Arm), we were very much looking forward to the promised mitigation that would reconnect the two arms of Great Salt Lake in accordance with the UPRR State and Federal permits.

In the intervening four years since the first culvert was closed, we have implemented four canal extensions to ‘chase’ the artificially suppressed lake levels in the North Arm at significant expense. The agencies that oversee the Lake were incredible to work with and highly responsive to our needs. Their collective efforts were appreciated, but we were looking forward to the predictability that would return with completion the new UPRR bridge and causeway opening.

We now find ourselves in an unforeseen chapter of this process. The embankment behind the bridge has not yet been ‘cut,’ and now there are questions as to whether the causeway opening should be delayed beyond 2016. Several stakeholders in the South Arm are concerned about the loss in elevation that will occur when the embankment is cut, and there are concerns the resulting salinity of the South Arm will pressure the upper end of suitable brine shrimp habitat. Without judging the unproven technical merits of these concerns, our worry is that these concerns, which were not articulated or vetted in the multi-year public process to determine the design of the mitigation, could now derail a well-vetted project on which key lake stakeholders are relying.

We believe any delay beyond 2016 is an unspoken move towards development of lake level and salinity management strategy, which is well outside of the original objective of the project to replace flows lost between the South and North Arms via culvert closures. A decision to delay the causeway opening is a decision to change the context of the original permitting process, which was approved through an exhaustive, collaborative public process.

Compass Minerals is committed to the health of the Great Salt Lake and our concern goes beyond our ponds to the impacts on other stakeholder groups and resources. The artificially low lake elevations have resulted in a land bridge to Gunnison Island, home to a pelican colony. Further suppression of the lake levels could dry the ring of soft, slushy lake-bed sediments around the island, making it accessible to predators, and potentially impacting the colony. Also, the lakebed contour in the North Arm is generally very shallow and a loss in lake elevation generally exposes more lakebed at an accelerated rate, than if the contour were steeper, as it is in the South Arm. With the loss of the surface area, comes a reduction in wetted surface area that generally seeds northwest winds with moisture. That moisture ultimately enhances snowpack in the Wasatch, and we should make every effort to protect the resource that provides life and vitality to northern Utah.

Postponing the planned breach of the Great Salt Lake railroad causeway could have major economic, community and even environmental consequences. It is our hope that state regulators will stay true to the agreed upon, approved schedule to reconnect the South and North Arms of the Great Salt Lake and take into account the impact to all those who depend on it. Compass Minerals is a collaborator. We have worked closely with lake users and stakeholders to preserve and enhance the health of the Great Salt Lake, and we will continue to collaborate and support a sustainable Lake for all the groups who participate in these important conversations. However, as a valued employer and responsible contributor to Utah’s economy and environment, it is our duty to impart the many detrimental consequences of delaying the causeway breach beyond 2016.

Joe Havasi, Natural Resource Manager, Compass Minerals
Thanks to Cargill, fourth graders in Tooele County School District can now participate in our Lakeside Learning Field Trips. Cargill has teamed with FRIENDS to create the South Shores Lakeside Learning Field Trip Program. This is the first time that a corporation has partnered with FRIENDS to ensure future generations have the opportunity for hands-on learning education about the Great Salt Lake.

From its start in 1865, Cargill has grown to be a world leader in the food and agriculture sectors. It now employs 150,000 employees in 70 countries. Starting with grain shipping in the Midwest, Cargill quickly added other lines of business, including salt. In 1997, Cargill purchased the Diamond Crystal brand which included the solar salt facility on the south western shores of the Great Salt Lake. Today that solar facility has 100 employees and the capacity to produce 1 million tons of salt from the Great Salt Lake.

Cargill’s Great Salt Lake production facility uses the sun and wind to evaporate water from the lake brine. This concentrates the brine so it develops salt crystals. Many other salt production processes use energy from sources like natural gas and coal to heat brine that has been pumped up from salt layers underground.

Salt harvest at Cargill operations. Image courtesy of Cargill.

Cargill and FRIENDS began working together in 2014 to identify an opportunity for an environmental project which would benefit and fit the needs of both groups. Cargill’s Global Partnership Fund helps local Cargill locations provide contributions to focus areas of food security and nutrition, education, and environmental stewardship. Janessa Edwards, FRIENDS Education and Outreach Director, and the local Cargill Cares Committee in Grantsville worked together to develop a grant through the Cargill Global Partnership Fund. This grant was to develop a pilot program so that the 4th graders from Tooele schools could experience Great Salt Lake first hand. Success of the pilot program led to the South Shore Lakeside Learning Field Trip Program.

When students arrive at Great Salt Lake State Park and Marina they are met with the sights, sounds and smells of Great Salt Lake. Gulls fly overhead and brine flies swarm along the shoreline. Binoculars are distributed as students learn about the birds that inhabit the system and their role in the food chain. Plant adaptations are explored during the next activity as students munch on pickleweed and learn how it grows in the salty soil. Finally, it’s beach time! Shoes and socks come off and all participants can’t help but to dig their toes into the soft oolitic sand. The natural basin landscape sets the stage for the next phase of the field trip experience. Engineering and art merge as students use organic materials found on the beach to create a watershed model. Digging a Great Salt Lake, scouting for just the right rocks to build mountains around the terminal basin, and using their creativity to represent the three major rivers that flow into the Lake.

At the waters edge FRIENDS education staff introduce the Lake’s two main aquatic specimens, brine shrimp and brine
flies. Collection cups are distributed as students wade into Great Salt Lake – many of them for the first time ever. The first cup to contain a live brine shrimp is usually partnered with an exuberant yell from the lucky student, “I got one!”

As they board the bus to head back to school, students take a final look back down towards the setting that was our outdoor classroom for the day. The experiences connecting the students to their local landscapes will serve as a catalyst for a new generation of environmentally engaged learners. It is our hope that this approach gives students a comprehensive sense of place and helps to increase student understanding of the complex relationships between home, community, the Great Salt Lake ecosystem, and real world connections.

FRIENDS of Great Salt Lake and Cargill look forward to continuing this effective and beneficial partnership to provide this program for the Tooele School District.

Matt Potter, Maintenance Superintendent, Cargill
Douglas Fraser, Sr. EHS Professional, Cargill
Janessa Edwards, FRIENDS Education and Outreach Director

Images courtesy of FRIENDS of Great Salt Lake

Students and Cargill volunteers examine brine shrimp

After a day of Lake observations its time to load the bus

Students from Settlement Canyon Elementary
HOW TO REACH US
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Submission Deadlines:
Sept. 16 (Fall)
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Submit articles and
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*Sometimes The Lake Feels Like It Was Made For Me* by Justin Wheatley
Submitted for the 2016 Third Annual Alfred Lambourne Prize