



# FRIENDS of *Great Salt Lake*

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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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## Readings from *Visions of Antelope Island and Great Salt Lake*, a newly released book by Marlin Stum with photos by Dan Miller to be discussed at our next General Meeting

Marlin Stum will read from his newly released book *Visions of Antelope Island and Great Salt Lake* at the September 28 meeting of Friends of Great Salt Lake, beginning at 7 p.m. at the Sugarhouse Garden Center. Marlin's book expresses his affection for Antelope Island through poetic imagery, dramatic historical accounts, and insightful analyses of the changes and threats that affect the island. He covers the story of Antelope Island in detail, discussing geology and wildlife, archaeology and history, the dramatic impact of natural cycles of fire and flood, the importance of the island's free-roaming buffalo herd, and other topics. An excerpt from chapter two of the book is featured on pages 4 and 5.

## Summer 1999 Calender of Events

August 5, Thursday	Board Meeting 7 p.m.
August 14, Saturday	Layton Wetland Preserve Tour and Work Project
September 2, Thursday	Board Meeting 7 p.m.
September 11, Saturday	Lazy Fall Day Cruise from the South Shore Marina
September 25, Saturday	Bike the Bay at Farmington Waterfowl Management Area
September 28, Tuesday	Marlin Stum, author, reads from <i>Visions of Antelope Island and Great Salt Lake</i>

NOTE: General Meetings are held at the Sugarhouse Garden Center, located in the northeast corner of Sugarhouse Park, 2100 S. 1300 E. in Salt Lake City. Board meetings are held at the Salt Lake County complex on State Street and 2100 South in Salt Lake City, room S3009.

Cover: Avocet Displaying by Gary Crandall Photography, Dancing Crane Productions



## President's Message

### Passion and Process

We spotted the sign for the Jordan Valley Water Conservancy District and turned east onto 8215 South. The building was low slung, modern, and perched on a rise surrounded by a rolling landscape of Kentucky blue grass. Although we chuckled about this blatant irony, we were also sobered over the fact that we were to take on Goliath. We were there to defend the Bear River and to protest a budget line item of \$3.1 million for Bear River Aqueduct Right-of-Way Acquisition. On the evening of June 15th, the board room of the Jordan Valley Conservancy District (formerly the Salt Lake County WCD) was packed for a budget hearing.

Speakers included residents of Cache and Box Elder counties, the mayor of Elwood, residents from Amalga and Providence, representatives from the Utah Farmers' Organization, Audubon, Utah Rivers Council, and others. All expressed concern over continued rights-of-way property purchases by the Conservancy District for a pipeline corridor to Weber County. Nearly 25% of the estimated 40-mile corridor has already be acquired. With this year's budget approval, \$6 million of millions more will have been spent on this project. Simple logic would be to dictate that by continuing to make these purchases the momentum to justify building a dam on the Bear River gets stronger and stronger.

There was great passion in the voices of those who spoke. Some were concerned about the loss of prime agriculture land that provides 10% of Utah's agricultural products and a way of life for generations of Utah families. Some were concerned about the loss of precious riparian habitat. Others regretted the desecration of the ancestral graves of the Shoshoni Nation. Friends was there to speak on the continued diversion of inflow to the Bear River Migratory Bird Refuge. Already suffering from seasonal dry periods, continued water diversion from the Refuge would severely impact its ability to support the major bird populations reliant upon it for their survival. All of these impacts would come together to serve the gluttonous water needs of Salt Lake County in the future.

We lost. The Jordan Valley Water Conservation District board voted to keep spending money on rights-of-way. But there may be a glimmer of hope. The construction of the pipeline will require a NEPA process and environmental impact statement. And the process continues.

Speaking of passion; revel in the beauty of our cover photo. Many thanks to Gary Crandall, The Dancing Crane Studio, and the American avocet who was "caught in the act of displaying" for providing this splendid and graceful vision.

On behalf of our Great Salt Lake and its myriad occupants.

Lynn de Freitas



*The Board gathered in January at their annual Board retreat to discuss long and short term goals for the organization. This year it was held at the Great Salt Lake State Park Marina. We included a short field trip to the shore for inspiration. A rare photo documents the fact, at least of those that stood still long enough to get their picture taken. From left to right: Reda Herriott, Michele Davis, Lindsey Oswald, Spencer Martin, Ivan Weber, Kathlyn Collins, Lynn de Freitas, Rick Ford with Copper and Kiska in front.*

# “Of Schist and Salt”

## Excerpt from *Visions of Antelope Island and Great Salt Lake*\*

By Marlin Stum

About 350,000 years ago, the solar furnace reduced the vast lake that had formed in the Great Basin. The shrinking lake grew gradually more saline. This drought perhaps endured for 225,000 years, and, in all probability, desiccated the once huge mother lake and all her offspring ponds. Dust devils danced across the bottomlands.

Twentieth-century wells drilled near Saltair Resort on the southern shore of Great Salt Lake and others drilled in a gravel pit near Promontory Point produced cores indicating that three distinct lakes grew from dry lakebed over the past two million years. After our last glacial age ended, another warmer, rainy period commenced. Around 32,500 years ago, the most recent of these ancient inland seas--the one we call Lake Bonneville--came into existence. Born in an enclosed geologic basin and sensitive to climatic cycles, the lake's depth fluctuated throughout its 20,000-year life span.

This Pleistocene lake is named after a man who never saw Great Salt Lake, Benjamin Louis Eulalie de Bonneville. Captain Bonneville, ostensibly on leave from the U.S. Army, in 1832 headed west from Missouri greedily seeking fame and fortune in the fur trade. By then, the beaver were mostly trapped out, and some historians argue that Bonneville carried orders to spy on British and Mexican territories. Regardless of his true mission, Bear Lake on the Utah-Idaho border was as close to Great Salt Lake Valley as Bonneville ever got. Yet he was immortalized in a book that caused quite a stir, Washington Irving's *Adventures of Captain Bonneville in the Rocky Mountains and Far West* (1847). It included two maps and for the first time presented a wide audience with a glimpse of the Great Basin.

In the 1850s, the federal government sent another army captain, Howard Stansbury, west to examine routes to and from Great Salt Lake Valley, and to explore the lake itself. Stansbury was the first to recognize the extent of the ancestral lake. He encircled Great Salt Lake on land, executed a serious scientific examination of the lake environs, and published his conclusions. His work preceded that of Clarence King and Grove Karl Gilbert, who later provided their own important insights.

Forty years after Captain Bonneville reached Utah, Gilbert--a geologist with the George Wheeler government survey--became one of the first scientists to write about the prehistoric lake. He described various shorelines, carved by an immense, vanished lake, along the Wasatch Mountains and other ridges in the Great Basin. Gilbert named the extinct lake Bonneville when the Wheeler survey report was published in 1875. He provided the classical description of the lake and named its major levels.

Modern geologists identify at least seventeen significant levels of Lake Bonneville. At its peak, some 16,800 to 18,000 years ago,<sup>1</sup> its many branches and bays sprawled over 20,000 square miles from southern Idaho and northeastern Nevada to southern Utah. Lake Bonneville submerged the White Valley of Idaho, along with the Cache, Tooele, Rush, and Salt Lake Valleys of northern Utah. Large portions of Box Elder, Weber, and Davis counties were inundated, as was the vast Great Salt Desert. The Sevier Desert and Escalante Valley were flooded. Area topography probably was not much different than it is today, except that only fish and other aquatic life viewed it. Fed by raging mountain rivers from a drainage basin encompassing more than 53,000 square miles, this immense inland sea reached a maximum depth of 1,050 feet.

In the habitable niche between glaciated mountains and the 325-mile long lake, lived abundant flora and fauna suggestive of a science fiction movie. Given that millions of migrating birds have used Great Salt Lake as a critical component of an international flyway, one can barely imagine the prolific avian flocks of Pleistocene times. Lush forests rimmed Lake Bonneville. Numerous recovered bones from larger prehistoric mammals indicate diversity and plenitude.

An enormous shaggy body helped *Bison latifrons* resist the icy climate 30 millennia ago. With a pelvis tall

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<sup>1</sup>Dates presented for various levels of Lake Bonneville in this chapter are approximate and are based on currently available data; they may change as more information comes to light. See J. Wallace Gwynn, "Commonly Asked Questions About Utah's Great Salt Lake and Ancient Lake Bonneville," p. 2.



as a human and eyes as far apart as a teenager's shoulders, it grew twice the size of our modern bison. It grazed in small herds around the lake. Woolly Mammoths (*Mammuthus columbi*) were also adept at surviving cold. Tusks dated from 13,000 to 15,000 years ago were found in 1976 near the mouth of City Creek, a tributary of the Jordan River. Mammoths, in fact, were widespread in Utah during the ice age, sharing the landscape with musk oxen, *Symbos cavifrons*. Fossils from both species were discovered in Davis County. One of the most common large animals inhabiting the shores of Lake Bonneville was *Ovis canadensis*, the bighorn sheep. Various construction workers around the valley have unearthed its remains, including skull and horn fragments of a 14,000-year-old bighorn dug from a gravel pit east of Bountiful. Giant beaver (*Castoroides ohioensis*), as large as German shepherds, worked the mountain watercourses. In 1994, during cleanup activities near Kennecott's copper mine in the Oquirrh Mountains, parts of prehistoric horses, rodents and the less common camel (*Camelops*) were found.

Bountiful vegetation sustained these plant-eaters, and they in turn fed large carnivores. Magnificent deer fed in the forest glades, their massive racks glistening in morning sunlight as keen ears scanned the meadows for sound of predators. The giant ground sloth, *Glossotherium harlani*, rose nine feet tall when it stood on its hind legs to reach tender leaves and fruits growing in trees. This slow-moving herbivore had small plates of bones embedded in its skin to ward off meat eaters. As recently as 10,000 years ago, the dire wolf, *Canis dirus*, prowled the lake shores in search of such prey. Its sturdy, inch-long teeth and a fast, powerful body made it a formidable foe. Many mammals also feared the largest bear that ever lived, *Arctodus simus*, weighing 1,500 pounds. A skeleton of one of these giants on display at the Utah Museum of Natural History in Salt Lake City was unearthed in a Kearns gravel pit only a few miles south of Great Salt Lake.

The most awesome flesh eater of Lake Bonneville was the saber-tooth cat, *Smilodon fatalis*. Its enormous upper canines--teeth as long as a spike deer's antlers--were curved and shaped like knives; they could rip and cut the thick hides of the largest herbivores. Its deep chest housed a robust set of lungs that hurled a leonine growl and propelled its lightening-quick attack. Preserved bones of these beasts show mighty forelegs and a massive scapula that make dire wolf, by comparison, look like a house pet.

Marlin Stum, journalist and nature writer, grew up east of Antelope Island. He has spent much of his life exploring it and Great Salt Lake both on site and through library research, and he currently works as a volunteer on the island.

\**Visions of Antelope Island and Great Salt Lake* by Marlin Stum, photographs by Dan Miller (Logan: Utah State University Press, 1999). Reprinted courtesy of the author.

## *Visions of Antelope Island* Available for Purchase

*Visions of Antelope Island and Great Salt Lake* is now available in bookstores or by ordering through Utah State University Press at 1-800-239-9974.

## Great Salt Lake Calendar Available August 1

FOGSL will be offering a year 2000 calendar. Entitled "Legacy of an Inland Sea, Birds of the Great Salt Lake," this beautiful 12-month wall calendar combines stunning images from wildlife photographer Gary Crandall with selected writings by Terry Tempest Williams to create a unique celebration of the richness and diversity of bird life within the Great Salt Lake ecosystem. Designed by Trent Alvey Design, this full-color calendar is a must for those who appreciate the beauty of the lake and its inhabitants. The calendar measures 10 1/2 x 13 1/2 folded (21 x 13 1/2 when hanging), and is available through FOGSL. Your purchase of this calendar directly benefits FOGSL. For more information, call our Friends information line: 801-583-5593.



# 1999 Great Salt Lake 'Spection Report

By Kevin Landis

We've had a wet spring this year, even worse than last year's El Nino. Under cloudy skies and with forecasts calling for more rain, we gathered in Brigham City to begin our weekend adventure. Eight vehicles show up, carrying eighteen adults, two teenagers, a baby, and two dogs. We'll have two more vehicles and five more people join us during the day.

After a few introductory comments from our leader (Kevin Landis), we load up and head towards Bear River Migratory Bird Refuge. We won't be stopping at the Refuge this year because their Bird Festival is being held today. Instead, we cross the bank-full Bear River and head into Corinne, "The Gentile City." Established in 1869, this was a railroad freight transfer point for supplies heading to Idaho and Montana by wagon, and a port for steam ships hauling ore and passengers from Lakepoint at the south end of the Lake. This frontier town once had 1500 permanent residents, twenty-eight saloons, sixteen liquor stores, huge freight warehouses, several banks, meat packing plants, Epsom salt factory, five newspapers, two theaters, opera house, sawmill, brickyard, cigar factory, flour mill, ore smelter, and several hotels. Residents of Corinne made several attempts, until 1877, to break Mormon political control in Utah.

We drive on through light rain past Little Mountain with its distinct lakeshore benches, past the Thiokol facility, then up over the pass through the Promontory Mountains and down the west side to Golden Spike National Historical Site. Along the way we see several owls, willets, curlews, egrets, avocets, gulls, and a golden eagle. The park and museum commemorate the joining of the Union Pacific and Central Pacific railroads here on 10 May 1869, forming the nation's first transcontinental railroad. Today we're more interested in their indoor flush toilets, the last we'll see until Sunday evening. After a short break, we leave the paved road and head west on the old railroad grade. It's still raining, but the gravel roads are in good condition. The low clouds obscure the panoramic views of the Lake, Rozel Hills, Strong Knob, Lakeside Mountains, Newfoundland Mountains, Hogup Mountains, and Pilot Peak that we usually enjoy. Even our favorite sego lily patch has been plowed up as part of some new ranching activity here. A little further on we start to see a few sego lilies and bright yellow salsify blooms among the sage brush and rabbit brush. We stop for a short walk to get a closer look. The wet grass soon soaks our shoes, socks, and pant legs. Wet shoes are a common part of nature study, but we never suspected that our feet would remain wet the entire trip. The rain, although bad for our shoes, seemed to bring out a lot of antelope, curlew, and wildflowers.

We stop at Lone Rock, at Monument Point, for lunch. We eat in our cars since it's still raining. The rain soon lets up and we take the chance to walk out to the rock and watch the waves from Gunnison Bay crash on the shore. This is the highest water level we've seen in the four years we've been doing the 'Spection tour. We push on toward Kelton. Mud puddles are scattered along the road and spread out onto the flats on both sides of the old railroad grade.

We stop to explore the ghost town of Kelton, originally called Indian Creek. Kelton was once a bustling town of 100-200 people with a railroad depot, turntable, maintenance facilities, stagecoach line, post office, two hotels, several saloons, stores, and homes. Freight wagons served the mines north of here in Idaho and Montana. The town was severely damaged by an earthquake in 1934 and was completely abandoned when the rails were removed in 1942 for scrap steel. Almost everything else has since been removed or destroyed by scavengers, relic hunters, target shooters, dirt bikers, and vandals.

As we turn south toward the Hogup Mountains, a stone arch near the road attracts everyone out for a short walk. The hillside here is dotted with orange clusters of globe mallow, delicate white blooms of evening primrose, and yellow tootsie-pop stalks of sulfur flower. Pea-pods of astragalus are found under some of the greasewood bushes.

We proceed up over Hogup Bar, then down past a rocky outcrop where big horn sheep were seen earlier this year. They are not out today, so we head on up into the Hogup Mountains. The road is lined with beautiful blue phlox, daisy fleabane, sulfur flower, evening primrose, and Indian paintbrush. The rain finally stops just as we arrive at our campsite on the Lake Bonneville shoreline. The bench is soon dotted with tents, camp chairs, camera tripods, cook stoves, barbecue grills, and Dutch ovens. The damp air carries smells of sagebrush smoke, charcoal briquettes, steaks, and chicken pot pie. The evening ends with a campfire discussion of Great Salt Lake issues and Dutch oven blueberry cobbler.

It rained most of the night once we were safely tucked inside our tents. But we rose in the morning to clear skies and the quarter moon high overhead. Our campsite offered a great view of Gunnison Bay with Dolphin Island and Gunnison Island in the distance. We packed up early and headed down the western slope of the Hogup Mountains just as the rain began again. Bright yellow spikes of freshly rinsed desert plume were seen along the way. But the Raft River Mountains, Silver Island Mountains, and Pilot Peak remained shrouded with rain clouds.



A large golden eagle, perched on a basalt boulder, carefully watched our arrival at the spring below Hogup Cave. All of our vehicles made it up the steep rocky drive to the parking area below the cave despite the persistent rain. There was soon a long line of red, yellow, orange, blue, and olive ponchos and rain jackets trekking up to the cave. Hogup Cave is considered one of the most important archaeological sites in the Great Basin. The cave was occupied intermittently for 8000 years by Desert Archaic, Fremont, and early Shoshoni peoples.

We pushed on through the mud to a small petroglyph site at the south end of the Hogup Mountains. We enjoyed a lively discussion of the origin and meaning of each carving led by Ken Sasson.

After a little more driving and a lot more mud, we arrived at the west desert pump station. The pump station was constructed at a cost of \$60 million to help protect developments along the shores of Great Salt Lake from the rising water level. The station includes three pumps with 10 ft. diameter impellers to lift water fifteen feet at a rate of 1.6 million gallons per minute. Each pump is powered by

a 16-cylinder, 3500-horsepower natural gas engine. The pumps operated from April 1987 to June 1989. Once again, we ate lunch sheltered from the rain in our cars. Extra fuel was distributed to those who needed it, and we all headed for home. Ken and Tim headed out first, hoping to take the road over Big Pass before the mud got too bad.

We turned north, passed Broom Mountain, and ascended back into the Hogup Mountains. Tall stalks of blue penstemons led us up into Big Pass canyon, where we met Ken and Tim coming back the other way. The road ahead was impassible due to the deep mud. We were all forced to turn around and take a different route across the lowlands of Clyman Bay to the Fingerpoint. With just a little trouble on one really slick slope, we all got through and had a nice drive north to Kelton and on to Snowville.

Everyone stopped for fuel at Snowville and loaded up with snacks and drinks for the road. We headed east into more rain for the last leg of our journey as a flock of pelicans headed south to their home on Gunnison Island.

## The Great Salt Lake Bird Festival a Great Success



*The Great Salt Lake Bird Festival at the Davis County Fair Park in early May was a great success. Attendance was high and our booth did a brisk business of giving information on Great Salt Lake to visitors and letting them know who we are as an organization. In the photo Robin Hooten is on the left and Kathlyn Collins is seated on the right. Photo by Lynn de Freitas.*

# A Slice of SLICE

## Bruce Thompson and the FOGSL Education Project

By Ivan Weber, Board Member FOGSL

Bruce Thompson, by any other name, would still be a genius were he to conceive the Friends of Great Salt Lake Institute for Conservation Education (SLICE). Some of us can be intuitive and creative some of the time; some of us can be meticulous some of the time; some of us are equipped with the technical education to conceptualize and execute important plans --some of the time; and some of us have developed the sense of urgency about human impacts on the environment to do something about it, again some of the time. But Bruce is the only person we know who is intuitively creative, meticulous, technically sound and driven to act *all of the time*. Through his consulting business, EcoTracs, Bruce performs an astonishing variety of ecological and natural history education services to schools, groups and communities.

An ideal friend of *Friends*, Bruce has launched the first phase of a multi-year plan to create, test, perfect and disseminate the "Great Salt Lake Curriculum" as a major educational project. The Board of FOGSL was easily convinced that public education, especially education of youth in our region, is the single most important and most approachable program FOGSL could undertake constructively. Bruce Thompson had been *Friends'* Education Director for some time, producing *The Lake Affect*, the popular and effective slide presentation on the Great Salt Lake, before introducing the idea of a cooperative program to assist schools in presentation of this enormous and enormously complex living system.

Characteristically, Bruce took the ball and ran with it. Choosing to home in on one of the grades in which environment is a core curriculum element--the fourth grade--SLICE was conceptualized, as Bruce puts it, to "serve as focal points for both the selection and future development of lessons and activities for Great Salt Lake education." Leveraging the strengths of Core Curriculum Standards, created by the Utah State Board of Education in the 1990s, Project SLICE guidelines "are divided into four principal categories:  
Essential Questioning and Analysis Skills  
Great Salt Lake as a Physical System  
The Living Environment of Great Salt Lake  
Human Connections to Great Salt Lake.

"A Great Salt Lake Curriculum should build from a core of key principles that inform its approach to education," Bruce contends. He lists as "essential

underpinnings":

Systems – "understand a whole through knowledge about parts and their relationships."

Interdependence – "we are part of nature and not outside of it; we and the systems we create impact our total environment."

Place – "begin close to home to acquire a knowledge and skill base to move out into larger systems."

Integration and infusion – "connections from natural sciences to social sciences to humanities," bringing "science more meaning when explored and applied in a larger context."

Real world experience – "direct experiences with our environment, environmental issues and society . . . are essential activities and are most effective when relevant to the real world."

Lifelong learning – "emphasis on skills in critical and creative thinking, decision making, communication and collaborative learning" may foster lifelong curiosity, joy and commitment to learning about the Great Salt Lake in the world around us.

Bruce and the FOGSL Board Education Committee have been consistently resolved to make the curriculum applicable not only to a single grade, but to all K-12 grades--and to instruction beyond "just" science. "Math, social studies and language arts curriculums, as well," can use the Project SLICE methods and materials, once completed. What some see to be a lack of linkages, themes and unity in the Core documents is a major concern in SLICE. "We seek greater flow and cohesion for a Great Salt Lake Curriculum," Bruce points out.

Drawing both on the Utah Core Curriculum Standards and the Guidelines for Learning of the North American Association for Environmental Education (NAAEE, 1999), SLICE strives "to be a coherent and integrated framework that can serve to unify Great Salt Lake education throughout various grades and between numerous disciplines." Well on his way to completion of the pilot version for testing, Bruce Thompson is taking Project SLICE to the next level, fast.

Friends of Great Salt Lake wishes to thank those who have contributed generously to the support of Project SLICE. Future issues will allow us a chance to update Friends of the project's progress. And thank you, especially, Bruce. Keep up the great work!



## Layton Wetland Preserve Birding Trip and Volunteer Project Saturday, August 14, 8 a.m.- noon

Saturday, August 14, beginning at 8 a.m., Joel Peterson, manager of The Nature Conservancy's Layton Wetland Preserve will lead us on a birding trip through the Preserve. Then, from 11 a.m. until noon, we will help Joel with some trash pick-up in the Preserve. The Layton Wetland Preserve stretches 11 miles along the northeastern shore of Farmington Bay. It consists of undeveloped natural lake shoreline wetland habitat supporting many waterbirds, raptors, and other wildlife. We will be wading through the marshlands to see the birds so wear knee high rubber boots or wear shoes that can get wet. Joel recommends that you cover up to avoid the bugs and sunburn. Bring binoculars, field guides, water, lunch, bug repellent, and work gloves. Meet at the main entrance to the Preserve on Gentile Street. DIRECTIONS: Take the Layton Exit #332 off of Interstate 15. Turn west which puts you onto Main Street. Turn left at the 1st light onto Gentile Street, continue west. After approximately 4 miles, at the intersection with Bluff Road, Gentile turns into a dirt road. Continue directly west on the dirt road. In approximately two miles (after the third radio tower on the left) the large, metal Preserve entrance gate is on the left. Watch for the Preserve sign on the gate. We will meet at the gate. For more information call the FOGSL activities hotline at 583-5593 and leave a message for Kathlyn.

## Scenes from the Spring Inland Sea Shorebird Reserve Field Trip



The field trip to the Inland Sea Shorebird Reserve in April was a great success thanks to Ann Neville, Reserve manager, who conducted an organized and informative tour. Twenty-six people enjoyed the brisk clear day to view 21 species of birds including Pink Floyd. The many short eared owls were the highlight of the day. The Reserve is managed by Kennecott as wetland mitigation for the tailings pond expansion. *Photos by Kathlyn Collins.*



# Citizens Against Chlorine Contamination Update

By Howard Gross

*June 16, 1999 - As CACC enters its fourth year of pressuring state and federal regulatory agencies to increase their scrutiny of the Magnesium Corporation of America (MagCorp), our efforts have begun to bear fruit. Dioxin testing at MagCorp which began last year has yielded data that state and federal agencies can not ignore and are using to leverage MagCorp into cleaning up their facility. In addition, the U.S. Environmental Protection Agency (EPA) is currently taking major steps to resolve some important regulatory issues regarding MagCorp, and in doing so, will shed light on MagCorp's waste-handling practices and environmental contamination that the facility may be causing. However, CACC's watchdog efforts to convince government agencies to take more decisive and expeditious actions are still needed.*

## EPA Investigation of MagCorp Gears Up

In response to a March 1999 request from the Utah Division of Solid and Hazardous Waste (UDSHW), the EPA has assumed the lead role in resolving issues regarding MagCorp's compliance with federal laws regulating their wastes under the federal Resource Conservation and Recovery Act (RCRA). CACC is encouraged thus far by the actions EPA appears to be taking to resolve these issues.

These issues date back to 1992. UDSHW has conducted inspections over the years at MagCorp, documenting waste management activities that UDSHW felt were inconsistent with RCRA. Despite clear regulatory guidance from the EPA, UDSHW has not resolved these issues with MagCorp, in part due to MagCorp's constant challenge to UDSHW's regulatory efforts. CACC has urged UDSHW to resolve these issues in a more timely manner. This past March, the UDSHW turned over enforcement authority on these issues to EPA. UDSHW believes that the EPA, possessing national expertise and access to greater resources, is in the best position to resolve these issues.

The focus of the dispute is MagCorp's interpretation of the Bevill Exemption, which exempts the certain wastes resulting from their beneficiation and processing of magnesium from regulation under RCRA. The assumption underlying the Bevill Exemption is that certain mining wastes are of high volume and low toxicity and can be exempt from the stringent regulations of RCRA. However, MagCorp has interpreted this exemption as allowing them to combine all of their wastes with their Bevill-exempt wastes, which are disposed to a waste pond on the Great Salt Lake

shoreline that CACC feels is an ecological hazard. CACC has learned that this pond has been the disposal site for a wide variety of MagCorp waste streams, including the following: washdown water from facility cleaning operations, lab drains, used antifreeze, floor drains in all buildings (including vehicle maintenance areas), lubrication oils, gypsum slurry, discharge from cooling towers and the demineralization water plant, and cell salts. The EPA's position is mixing RCRA wastes with Bevill-exempt wastes does not qualify them for the Bevill-exemption. The EPA feels such mixing is unacceptable because the non-exempt wastes are subject to numerous regulations under RCRA and other laws governing their treatment, storage, and disposal.

The EPA has taken swift action since these issues were referred to them by UDSHW. The EPA performed a compliance evaluation inspection at MagCorp from April 19 through April 23, 1999, and a case development inspection on April 28, 1999. In addition, in May 1999, the EPA cited their RCRA and Clean Water Act authority in requesting additional information from MagCorp to help the EPA resolve these issues. By its citing of the Clean Water Act, CACC ascertains that the EPA may be pursuing other regulatory issues besides the RCRA issues. In addition, the EPA has assured CACC that they will assess the risk to human health and the environment posed by MagCorp.

CACC is very encouraged by the EPA's actions. The EPA's May 1999 information request to MagCorp contained 50 detailed requests about plant operations, regulatory compliance, waste management and disposal, dioxin testing, and ecological hazard assessments. MagCorp was given 20 days to respond to the request. CACC noted that many of the EPA's requests were those that either (a) CACC raised in a letter sent to the EPA in March 1999 detailing our concerns about regulation of MagCorp's operations, or (b) CACC made in previous correspondences to the EPA and state agencies. Hopefully, the EPA's efforts will reduce the threat to humans and the Great Salt Lake ecosystem posed by the way MagCorp handles and disposes of their wastes.

## Dioxin Testing Update

In April 1999, MagCorp announced results of testing conducted in December 1998 to evaluate the extent of dioxin contamination in and around their Rowley, Utah facility, located on the southwest shore of



Great Salt Lake. The results showed on-site sediment dioxin concentrations in the ditch leading to their waste pond as high as 130 parts per billion, over four times higher than previously reported and vastly exceeding the Center for Disease Control clean-up action level of 1 part per billion. Testing conducted just outside MagCorp's perimeter found lower dioxin concentrations, which MagCorp claims is similar to those found elsewhere along the Wasatch Front. Curiously, MagCorp did not collect any samples from their current waste pond of the shore of Great Salt Lake to which they discharge dioxin-laden waste water.

In addition, MagCorp claims to have identified where in their production process dioxins are being formed. CACC is encouraged that MagCorp is addressing public concerns about dioxin contamination. However, more thorough testing needs to occur with all data released to the public, which MagCorp refuses to do. In addition, CACC is concerned that MagCorp and the Utah Department of Environmental Quality (UDEQ) are not addressing several important questions about dioxin production at MagCorp.

One of CACC's biggest concerns is MagCorp's discharge of dioxin-laden water to their waste ponds on Great Salt Lake's shoreline. Prior to MagCorp's ownership of the Rowley facility, older waste ponds were damaged extensively during the high lake episode of the 1980s, resulting in the mixing of dioxin-laden sediment and other wastes with Great Salt Lake waters. A new waste pond was constructed at a higher elevation and is currently used by MagCorp, but this pond is still within Great Salt Lake's floodplain.

MagCorp's December 1998 testing of the "old" waste pond found dioxin levels of 0.15 parts per billion. This is an order of magnitude higher than levels found along the Wasatch Front, but lower than the levels found in MagCorp's waste ditch. CACC asserts that the reason higher dioxin concentrations were not found in the old waste pond is because most of these wastes were mixed into Great Salt Lake during the 1980's lake flooding.

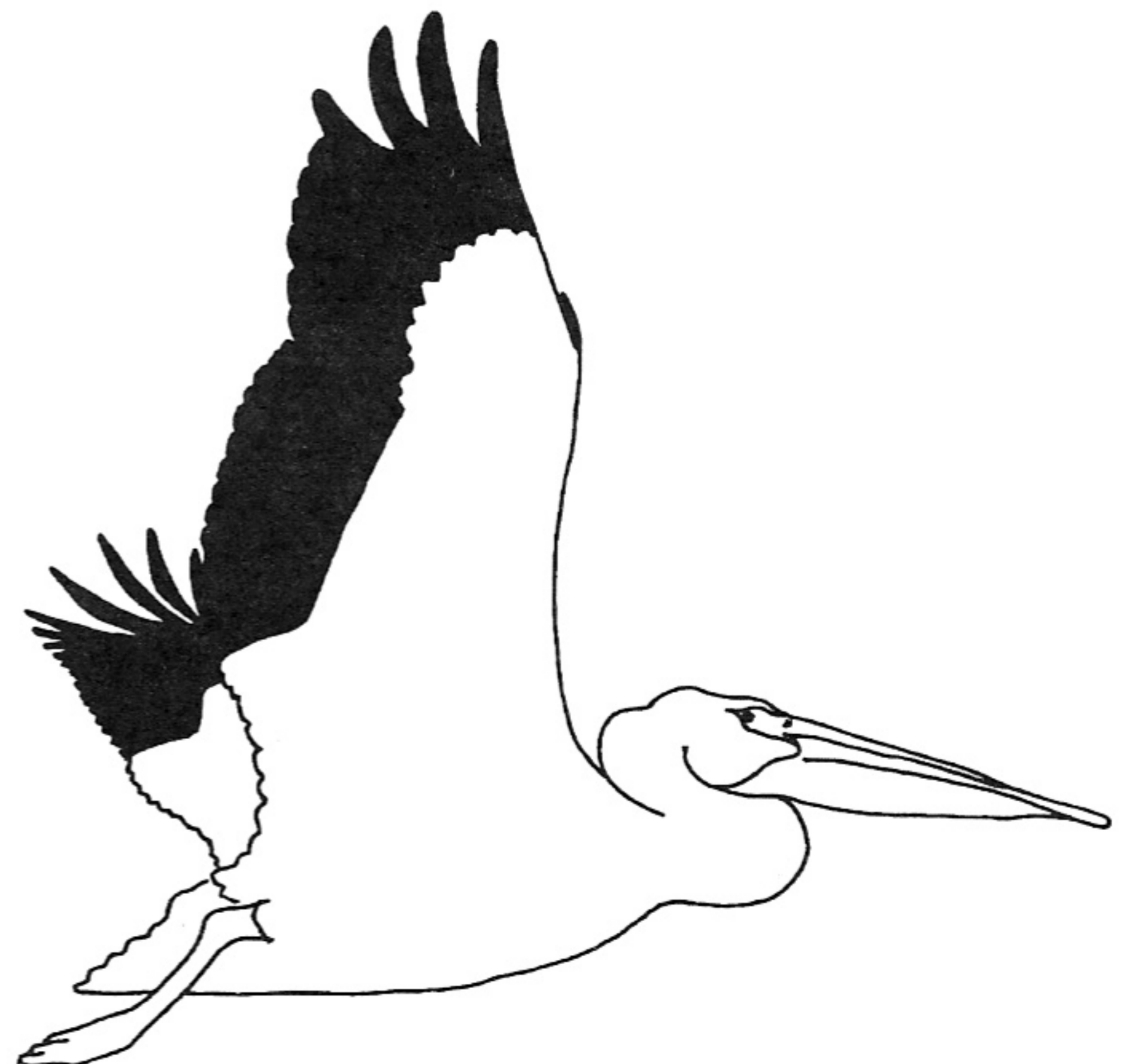
Sampling of the "new" waste pond was curiously absent from the December 1998 testing. Earlier testing conducted in 1998 by UDEQ found dioxin concentrations of 1 part per billion in its sediments. There is a very high probability that, at some point in the future, these sediments will be washed into Great Salt Lake during a high lake event, whether that happens in 20 years, 50 years, or 200 years. It is imperative that UDEQ and MagCorp conduct more testing of the new waste pond to determine the total quantity of dioxins it contains. Once this calculation is made, UDEQ and EPA can evaluate the threat of

contamination posed to Great Salt Lake by this pond and determine whether a clean-up of new pond is warranted.

CACC is feels that MagCorp's current dioxin releases to the environment should be quantified. Steve Packham, a UDEQ toxicologist working with MagCorp, opposes quantifying MagCorp's releases. Instead, Packham wants to focus efforts on reducing dioxin releases from MagCorp's operations. CACC understands that the UDEQ has limited resources and appreciates the effort that UDEQ has put forth to date regarding CACC's concerns. However, CACC feels that MagCorp could be one of Utah's largest dioxin sources. An accurate measurement of these emissions is necessary to assess the threat they pose to the environment.

MagCorp actually has conducted enough testing to estimate their annual dioxin emissions into the waste ditch. MagCorp offered to release this information to CACC, but only if CACC signed a confidentiality agreement saying that we would not public disclose the information! CACC feels that this information should be released to the public because the public has a right to evaluate the threats posed by industry to the environment.

If you'd like more information about CACC, please call Scott Endicott at 596-1325 or Howard Gross at 486-4565.





# What About This Great Salt Lake?

Another in a continuing series of Great Salt Lake information compiled by Bruce Thompson, Education Director for Friends of Great Salt Lake

## III. Biotic Features

**THE GREAT SALT LAKE ECOSYSTEM** consists of approximately 15,000 square miles of water environment, with numerous islands and remote shorelines offering wildlife sanctuary from predators and human disturbance. A gradation of saline environments and periodic fresh water flushing have over thousands of years conceived a dynamic yet stable system. The ecosystem responds to such variables as annual runoff, salinity, temperatures, water circulation, nutrient balances, cloud cover, and stream effluent in concert with biotic factors such as disease, predation and birth success. Great Salt Lake is tied to its neighboring Wasatch Mountains by ribbons of riparian (water-based) habitats, critical for neo-tropical migrant songbirds, raptors, and riverine mammals. Many of these riparian subsystems have been compromised by human activity, causing those remaining to become magnified in importance. Because Great Salt Lake is a terminal lake, minerals, effluent and chemical pollutants are collected and concentrated in the system.

**WETLANDS** are among the most biologically productive systems in the world. Those of the Great Salt Lake Ecosystem occupy approximately 400,000 acres, or nearly 3/4 of all wetlands in Utah, which in total comprise just over 1% of the state. Periodic flooding, while inconvenient to those who have chosen to develop close to the lake, provides the benefits of nutrient dispersal and plant revitalization. Wetland services include seasonal flood water storage and ground water recharge, water purification, wildlife habitat, and recreational opportunities. The marshes, playas, and upland vegetation zone serve as critical buffers to outside disturbances. About half (200,000 acres) of Great Salt Lake wetlands are currently protected to some degree.

**PROTECTED WETLANDS** on Great Salt Lake are the 74,000 acre Bear River Migratory Bird Refuge managed by the US Fish & Wildlife Service, and several units managed by the Utah Division of Wildlife Resources, including the following: Farmington Bay Waterfowl Management Area (WMA), Harold Crane (Willard Bay) WMA, Locomotive Springs, Ogden Bay WMA, Public Shooting Grounds, Salt Creek, and Timpie Springs WMA. Wetlands protected by private organizations include the 1400 acre Gillmor Sanctuary (Audubon), the 1472 acre Layton Wetlands Preserve (Nature Conservancy), and those of various private duck clubs.

**LIFE IN THE GREAT SALT LAKE SYSTEM** includes species or subspecies of 8 amphibians, 19 reptiles, 64 mammals, 250 birds, and numerous species of plants, invertebrates and microorganisms. In addition to 23 species

of fish found in fresher water peripheries, the lake's aquatic lifeforms include dozens of species of algae, bacteria and protozoa, brine shrimp, and the egg-larva-pupa stages of two Ephydra fly species. These organisms are particularly critical to systemwide food webs.

**PAST LIFE OF GREAT SALT LAKE**, based on fossil evidence, included two types of musk oxen, the mammoth, a horse, a camel, mountain sheep, two types of bison, and a giant bear. All are now extinct. Archeological evidence suggests that the wetlands formed around the east, north, and south shores of Great Salt Lake provided significant resources for both Native American and European visitors and occupants during the past 12,000 years.

**PLANTS** of the Great Salt Lake system include flora typical of western riparian habitats and Great Basin environments, plus a number of halophytic (salt-adaptive) specialists. Plants found in the immediate lake vicinity withstand stresses such as alternate flood and drought, variations in water and soil salinity, extreme heat and evaporation during summer, and the extreme cold of winter. Some notable halophytes possessing varying levels of salt tolerance are Alkali Dropseed, Four-Winged Saltbush, Greasewood, Inkweed, Iodine Bush, Pickleweed, Salt Grass, and Shadscale. To cope with high salt concentrations, many of these plants control salt by excretion through leaf glands; by leaf saturation, disposal and regrowth; or by internal regulation and storage.

**BRINE FLIES** exist as two species at Great Salt Lake. These flies do not bite and seldom land on people. Beginning in spring, female flies each lay approximately 100 eggs on the lake's surface. These eggs hatch into half-inch tubelike larvae, which sink and attach themselves to the lake bottom to feed on algae. The larvae soon contract within their pupal shells, each creating an air bubble that floats it back to the surface where the adult fly emerges. During summer the lake shores testify to brine fly volume and productivity with masses of empty larval cases washed upon the shore. An estimated 5,000 billion brine flies hatch at Great Salt Lake each year. At their summer peak, there can be 110 billion flies at any moment along 335 miles of lake shoreline. Contrasting with this abundance, the brine fly life span is just 3-4 days. During their brief lives they eat great quantities of algae, bacteria, and organic waste from both brine shrimp and their own life processes. The water cleansing provided by brine flies has been said to be more efficient than a \$75 million sewage treatment plant operating at an annual cost of \$3 million. Brine flies remove about 120,000 tons of organic matter from the lake each year. Without the flies, it is believed algae would essentially take over the lake and Great Salt Lake as we know it would cease to exist. A noteworthy symbiotic relationship between



brine flies and brine shrimp relates to water clarity. After shrimp have grazed much of the lake's algae during summer, mid-lake waters become very clear. This allows more light to reach down to the lake bottom, which then stimulates the growth of blue-green algae—the food of the brine fly larvae.

**BRINE SHRIMP**, *Artemia franciscana*, fill a huge niche in the lake's food webs. Overwintering eggs (cysts) begin hatching with the spring "bloom" of green algae, the brine shrimps' favored food. The newly hatched females quickly mature to begin giving birth to live young, called "nauplii." With ideal conditions each female lives three months and continues to produce several generations of nauplii. Nauplii grow to the adult size of approximately 10 mm (.4") in two to four weeks. Salinity levels of 12% to 19% seem to be ideal for Great Salt Lake shrimp. Brine shrimp consumption of algae is largely responsible for the crystal clear water observed in central portions of the lake. By August or September, the females switch from bearing live young to again laying the hard-shelled eggs. The tiny eggs measure approximately 200 micrometers (2/10 millimeter), yet are so highly adapted to wait out stressful conditions that they may remain dormant but viable for many decades. With adequate food and temperatures, each female lays between 10 and 25 eggs. Nearly all brine shrimp perish by late fall, so the fate of the entire shrimp population rests on the overwintering eggs. Each spring, Great Salt Lake experiences another "instant shrimp population." What seems to limit brine shrimp are available foods plus water temperature and salinity. Reduced salinity also increases impacts from the less salt-tolerant coryxid, an invertebrate predator of brine shrimp. We currently possess very limited knowledge about other factors affecting brine shrimp, such as lake chemistry or pollution. It is also unknown how many eggs can be harvested from the lake without impairing shrimp population dynamics.

**THE BRINE SHRIMP INDUSTRY** began in the 1950s when adult shrimp were harvested for aquarium food. Since the 1970s, cyst (brine shrimp egg) harvesting has dominated. The cysts are collected, dried, and canned for sale as food to shrimp—or prawn—farms overseas. Most of the prawns consumed by people in the US come from those overseas farms, and over 90% of the world's brine shrimp eggs used to produce feed on these farms come from Great Salt Lake. Between 1980 and 1994 global prawn farm production rose from 108 million to 1.5 billion pounds annually. Today over 50,000 prawn farms cover 3,800 square miles worldwide, often resulting in losses to wetlands, tidal flats and mangrove forests.

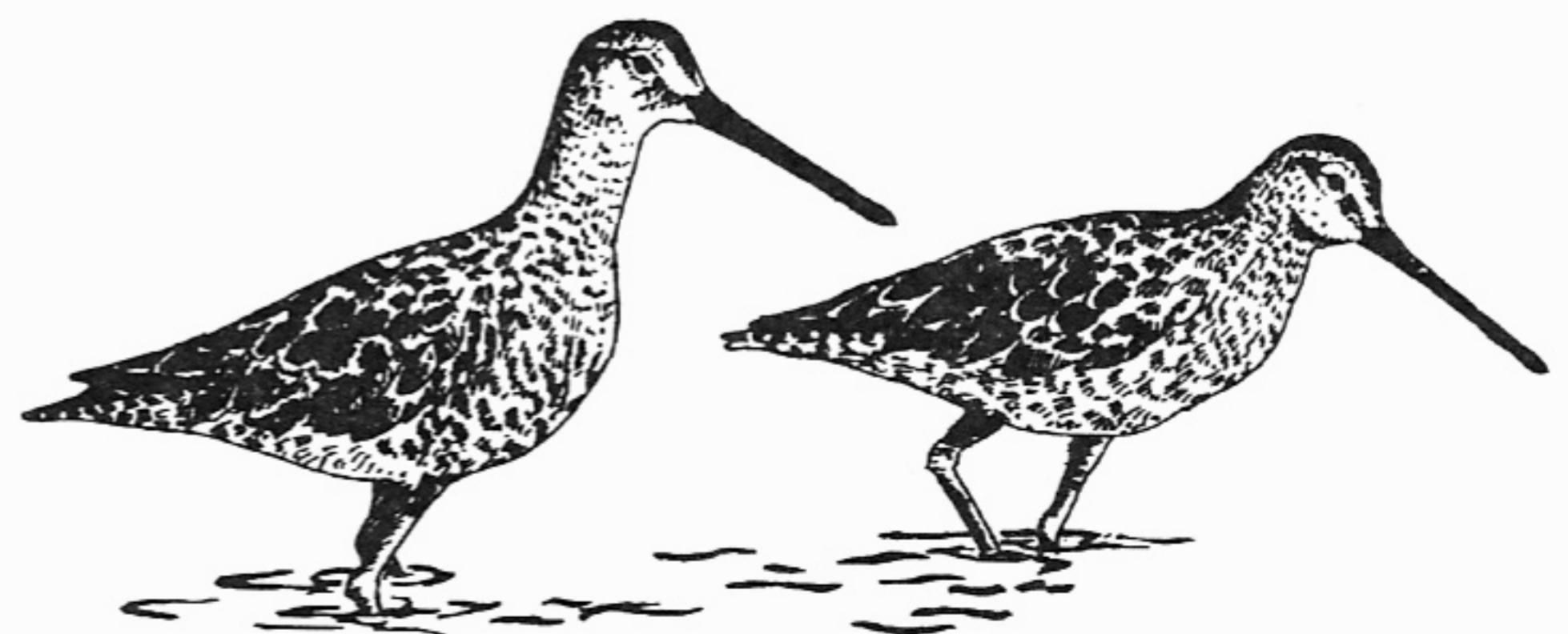
**BRINE SHRIMP CYST (EGG) HARVESTING** usually occurs October through January. 79 cyst-harvest permits are held by 32 companies on the lake. Permits cost \$10,000 each per year, plus a 3.5% state royalty tax. An average eleven million pounds (wet weight) of cysts are harvested annually. Dry, marketable cysts comprise approximately one-third of wet harvest weight. Utah State University estimates that in the 1994-95 season 40% of the lake's 1.65

trillion cysts were harvested at a rate as high as 300,000 lbs./day. In 1995-96, and again in '96-97, totals of over 14 million pounds of cysts were removed from Great Salt Lake. In both 1997 and 1998 the lake's adult shrimp population was at 25% of the previous year, resulting in many fewer eggs. Because of this shortage, fall harvests were halted at approximately 4-1/2 million pounds—less than one-third that of previous high-yield years. Causes for these low numbers are uncertain, but seem to be related to the year's lower lake salinity and effects that has on the green algae shrimp need to eat. There is now an ongoing study of brine shrimp ecology, funded in large part by fees paid by the harvesters. One of the study's goals is to determine what levels of harvest are sustainable for both human interests and for satisfying the lake's ecological needs, such as for that of migratory birds.

**BIRD LIFE** at Great Salt Lake is of global importance, earning the designation of "Western Hemisphere Shorebird Reserve." The location of Great Salt Lake and its 15,000 square miles of water environment, its remote islands and shoreline, and 400,000 acres of wetlands translates into what might best be described as a "bird magnet." Birds of regional, national, and international significance depend on Great Salt Lake for resident feeding and sanctuary, breeding, or for migratory stopover. There are 2-1/2 times more birds at Great Salt Lake through the year than there are people in the entire state of Utah! 5 million birds, 250 species, rely on the lake. The ecology of bird life at Great Salt Lake is one of the most extraordinary examples of the rich web of relationships here between land and water, food and survival. (See the Friends of Great Salt Lake companion document in this series, *What About This Great Salt Lake?: Bird Life* for more specific information.)

**MAMMALS** in the Great Salt Lake Ecosystem include the pronghorn antelope, badger, bison, black-tailed jackrabbit, cottontail rabbit, coyote, deer mouse, kangaroo rat, mink, mule deer, muskrat, porcupine, red fox, striped skunk, voles, and at least 45 other species.

**THE LAKE'S SMELL** is one of its lesser but more notorious features. The odor is not from the lake itself but from shoreline decomposition of organic debris, deposited through current and wave action as the waters recede from summer evaporation. All summer long, this decomposing material continues to provide smelly but nutritious food for lake life forms.



## HOW TO REACH US

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Please consider donating aluminum cans to Friends. Can donations will be accepted at 1176 2nd. Avenue Saturdays between 9 a.m. and 2 p.m. All proceeds will go to the FOGSL general fund. Cans must be contained in plastic garbage bags. If you have cans to donate, but can't transport them, please call Margie Nakowski and arrangements will be made for a pick-up. If you don't recycle aluminum, please consider starting!! This will greatly benefit Friends. Volunteers are needed for accepting aluminum cans in your neighborhood and/or taking cans to the recycling center.

Questions, please call Margie Nakowski at 355-7174.

## SUBMITTING MATERIAL FOR PUBLICATION

1. **What to Submit:** original articles (historical, geological, geographical, biographical, political, fiction, poetry, etc.) or art work (sketches, photographs, etc.) which pertain to Great Salt Lake.
2. **Submitting Material:** Mail or deliver to 1117 E. 600 S., Salt Lake City, UT, 84102. Or email to: ldefreitas@earthlink.net
3. **Please call (801)582-1496** to confirm receipt of email or with any other questions, suggestions, comments, or ideas.
4. **Deadlines:** The deadlines for submittals are Sept. 16 (Fall), Dec. 16 (Winter), Mar. 16 (Spring), and June 16 (Summer).

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