Friends of Red Butte Creek
Research, Outreach, and Education Grants
PI: Brenda Bowen ($15,000 total)

The Friends of Red Butte Creek and the Global Change and Sustainability Center at the University of Utah partnered with the Salt Lake County Watershed Planning and Restoration Program to offer research, outreach and educational grants to University of Utah (UU) students and faculty to pursue action-oriented projects related to the sustainability and stewardship of Red Butte Creek (RBC). All University of Utah students (undergraduate + graduate), faculty, researchers and postdocs are eligible to apply for funds. Projects were required to be related to Red Butte Creek, particularly within the University segment most heavily impacted by the 2010 Chevron oil spill. A committee made up of interdisciplinary UU faculty, a UU sustainability-related administrators, a representative of the UU Riparian Corridor Steering Committee, and representatives of the Salt Lake County Watershed Planning and Restoration Program reviewed and ranked all submitted proposals. Bowen worked with the committee to award the following projects.

University FoRBC Student Outreach Activities
Rebecca Terry, *Mathematics PhD student* & Zacharia Levine, *City & Metropolitan Planning PhD student*-- $1,250

- ***This project will develop new RBC-related University outreach activities for UU students through creation of promotional materials, tabling, a Spring 2014 RBC "research showcase", and materials to build a new stream table to be used in educational outreach activities.***

  - **Summary:** After becoming an ASUU organization in Fall 2013, objectives of the Friends of Red Butte Creek (FoRBC) Outreach Activities throughout 2014 included increasing student awareness and involvement both at the undergraduate and graduate levels as well as providing opportunities for students and faculty to discuss research activities related to Red Butte Creek (RBC). To achieve these objectives, FoRBC participated in the Spring and Fall 2014 Activities Fairs (PlazaFest), tabled at the GCSC Research Symposium and on the Marriott Library Plaza during Earth Week (EarthFest), and held the second annual FoRBC year-end event and research showcase. With the support of the FoRBC mini-grant, we were able to print a cloth banner for tabling and informational pamphlets to disseminate at outreach events. We were also able to purchase 48 water bottles for promotional and fundraising purposes. We supplemented these water bottles with T-shirts purchased using ASUU funds. These promotional materials have been successful in increasing visibility and awareness of RBC across campus and within the larger community while helping to start a dialogue related to the Creek as interested parties ask, "What is FoRBC?" The second annual year-end event to be held at the end of Spring semester had to be postponed to June 30, 2014 due to inclement weather. The event was held at the Green Infrastructure Research Facility (GIRF) and showcased the work done by other FoRBC mini-grant recipients. While the change in the date and accessibility of the location may have diminished attendance, we were still able to engage both new and returning individuals in a dialogue related to RBC as well as showcase the work being done by individuals at GIRF and the projects of other FoRBC mini-grant recipients. To further enhance our educational outreach to students both on campus and in the greater community, we also purchased supplies for two new water tables. As a result of our outreach

activities this year, we increased our mailing list by more than 55 individuals. In the coming year, we hope to continue to grow our organization, fund student research projects and organize volunteer activities, coordinating our efforts with other University groups as well larger community organizations. Within this first organizational year, the executive committee has realized that one of the strengths of FoRBC may be it's ability to rally individuals around a campus resource, Red Butte Creek, while also connecting them to a greater community engaged in a dialogue related to such issues as sustainability, conservation, restoration, water quality, and global change.

How do Neighborhood Residents Use and Value Red Butte Creek?
Philip Stoker, *City & Metropolitan Planning PhD student*-- $3,000

- ***Residential attitudes, use, and values related to RBC will be assessed for households along the urban RBC corridor with an established social science questionnaire that builds from and links to state-wide iUTAH survey instruments.***

- **Summary**: Along its descent into the Salt Lake Valley, Red Butte Creek flows through several residential neighborhoods. The residents that live along Red Butte Creek are physically related to the creek: the creek is either part of their backyard, or there are trails that provide access to the creek itself. But do the residents that border the creek relate to the creek psychologically as well? Do they associate their natural resource consumption in relation to their proximity to the creek? Are their attitudes towards water different than residents who do not have constant direct physical access to urban creeks? How do these residents use and value Red Butte Creek? This proposed work will help answer these questions.

  I gathered social science data along the Red Butte Creek urban residential corridor using a questionnaire. The data collection effort will paralleled efforts undertaken by iUTAH (an intercampus, interdisciplinary federally funded research program). This research tailored a portion of the iUTAH questionnaires to be administered along the Red Butte Creek residential corridor. The survey will be distributed to households directly adjacent to Red Butte Creek using a drop-off/pick-up approach. Myself and student research assistants dropped off the questionnaires at all houses that border the stream (from 800 South and 2000 East to 1100 East and 900 South), as well as a random sample of nearby houses in the Yalecrest neighborhood.

  We obtained a response rate of 67%. The survey responses are currently being entered and cleaned. Analysis of the data will occur this fall. I coded each of the surveys, and it was clear that almost all residents in both the Yalecrest neighborhood are aware of Red Butte Creek and think that it is a positive influence on their neighborhood. The chief complaints of residents along the creek were the repeated oil spills, and the removal of trees in Miller Park.

  Once completed, this analysis will serve as baseline data collection on residential attitudes, values, and uses of Red Butte Creek to complement our understanding of student perceptions of Red Butte Creek (previously determined with the GCSC class survey). Second, this data can

also represent the first data collection for a potential longitudinal study. Third, this data will help expand the iUTAH data collection efforts. Fourth, the data collected from this project can be compared to respondents across the Wasatch Front to determine if residents who live directly next to Red Butte Creek have different attitudes, values, and perceptions related to urban water sources.

Elementary Science Club Student Field Trips to RBC to Learn About Conducting a Scientific Research Project, Urban Streams, and Water Issues in an Urban Environment
Olivia Miller & Brittany Dame, *Geology & Geophysics PhD students*-- $850

- ***Local elementary (grades 5 and 6) Science Club students will conduct field and lab based projects focused on RBC in connection with relationships established through the Think Globally Learn Locally (TGLL) program.***


Photos: (L) Students learning about water quality and the riparian zone along Red Butte Creek. (R) Students measure water quality indicators such as temperature, pH, and dissolved oxygen in Red Butte Creek.

- **Summary:** The purpose of this field trip series was to teach students in the Rose Park Elementary School Science Club about conducting scientific research, urban streams, and water issues in an urban environment, using Red Butte Creek as our study site. To accomplish these goals, we focused on two areas of concern for urban streams: water quality, and riparian zone health. We taught one in-class lesson covering the location of Red Butte Creek, and background on the indicators of water quality and riparian zone health that we would measure on our field trips. We then used three after-school field trips to visit various locations along Red Butte Creek where students collected data on stream pH, dissolved oxygen, temperature, canopy cover, ground cover, and riparian zone width. This was the first time many of the students had been to Red Butte Creek. Following the field trips, students used the data they collected to draw graphs of how each indicator changed along the stream, and made research posters that they then presented to the entire class. Students learned to develop research questions and hypothesis, collect and interpret data, draw conclusions, and present their findings.

Exploring Traditional Ecological Knowledge for Red Butte Creek held by Utah Native American Tribes
Gavin Noyes, *Political Science PhD student*-- $1,400

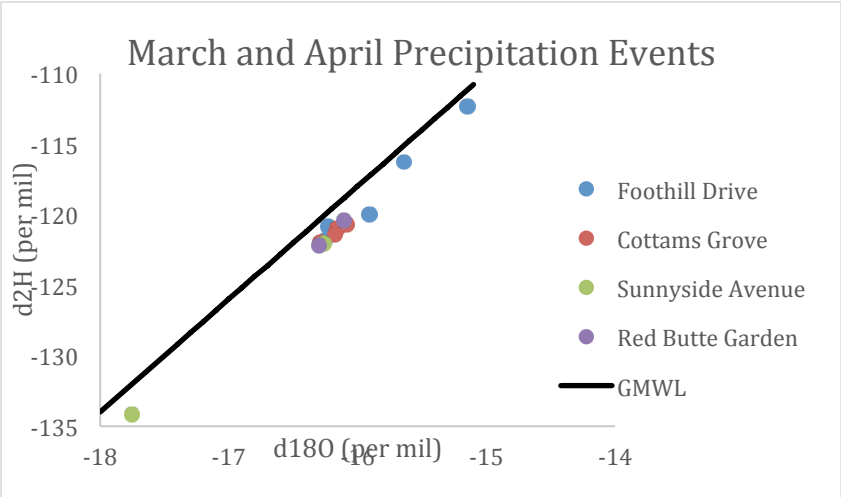
- ***This project will explore ties between Native Americans and the Red Butte watershed through 1) interviews with elders from Utah's Native American Tribes, 2) consultation with archaeologists, and 3) conversations with organizations interested in advancing education and outreach around Red Butte Creek and Utah's Native American cultures.***

- **Summary:** This report asks the question of what evidence and oral histories exist on the Native American use and occupation of Red Butte Creek? Was it used, and if so, when and by whom? Finally, how can we utilize our understanding of the Native American history of the Salt Lake Valley to inform planning efforts like that underway on Red Butte Creek? During the research phase of this project, I spoke with one Ute leader whose grandmother was born in City Creek Canyon, and to a Goshute elder who described the traditional Goshute name for the Salt Lake valley as "Soonkahne" or "many homes." Other individuals and historic records point to the importance of the Wasatch warm springs (near the mouth of City Creek canyon), the use of Millcreek Canyon as an "antelope drive," describe an ornate pictograph of a feathered Chief on horseback near Ensign Peak, and finally, a Navajo elder able to draw the specific trails his people once used to obtain the critical resource of salt from the Great Salt Lake. Oral histories and archaeological evidence that point to occupation of Red Butte Creek by Native American people are scarce, however these pinpoints of information allow us to paint a picture that adds depth and dimension to the story that Indians did not live here in 1847 when Mormon pioneers first arrived. In fact, Native people have lived here for approximately 12,000 years and utilized this valley and its resources extensively. This report titled "Exploring traditional ecological knowledge for RBC held by Utah Native American Tribes" aims to fill in some of this information and pose questions for future researchers to help us understand the history of Tribes in the Salt Lake Valley and their historic use of canyons such as Red Butte.

Examining the Role of Storm Runoff as a Source of Pollutants to RBC
Crystal Tulley-Cordova & Yusuf Jameel, *Geology & Geophysics PhD students*-- $3,000

- ***The impact of urbanization on RBC water quality will be examined in collaboration with iUTAH via measurement of nitrogen and ammonium concentration and evaluation of nitrogen isotope variations in water and particulate organic matter during 2014 precipitation events.***

- **Summary:** With support from Salt Lake County and Friends of Red Butte Creek, we have measured stream water isotopes in Red Butte Creek, and added further evaluation of water quality examining urbanization impacts on Red Butte Creek during precipitation events. We collected samples for examination of δ15N and concentration of nitrate and ammonium, δ15N and concentration of nitrogen in particulate organic matter. Our nutrient samples have not been analyzed (nutrients analyses of our samples will be on Tuesday, September 16th). Our sample collection started March 10, 2014 and recently ended on September 9, 2014. We have analyzed our water stable isotopes samples. Once we have our results for our nutrient work, we plan on comparing our stable isotopic results to our nutrients analyses. Our data for March



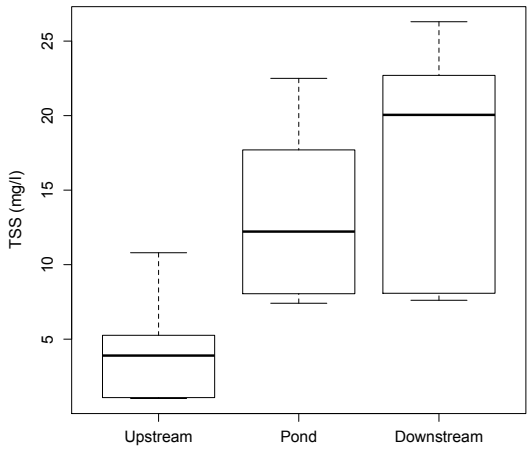
and April show more variation at the Foothill Drive location; the Red Butte Garden and Cottams Grove sites shows little variation (Figure). This could be due to the decreased amount of impervious surfaces further upstream at Red Butte Garden and Cottams Grove. In addition to our water stable isotopes and nutrients results we plan on comparing our results with the innovative Urban Transitions and Aridregion Hydro-sustainability (iUTAH) project. Their collection consists of monthly baseline water quality samples from Red Butte Creek including the parameters we are interested in and conducting real-time flow and conductivity measurements. Coupling our research with the iUTAH project allows us to provide short-term variability data related to precipitation events to their iUTAH's long-term baseline record. After September 16th, we will have more conclusive results regarding our project. We predict there will be a noticeable seasonal trend in water stable isotopes in Red Butte Creek, as well as the nutrients within the system.

Red Butte Creek Sediment Transport Model

Zachary Magdol, *Civil & Environmental Engineering MS student*-- $1,500

- ***This project will support evaluation of the impact of land management practices on bank stabilization and sediment transport along the urban stretch of RBC.***

- **Summary:** This study investigated sediment concentrations in and around Red Butte Garden and was part of a larger project assessing Red Butte Garden's impacts on Red Butte Creek. Stream water column samples were collected bi-weekly September through December 2013 upstream of, downstream of, and within Red Butte Garden. Samples were analyzed for total suspended solids (TSS) as well as nutrients. Upstream, pond and downstream average TSS concentrations are 4.33, 13.35, and 17.47 mg/l respectively. The mean TSS concentration downstream of the Garden was significantly higher than upstream (p=0.002). The concentration in the pond within the Garden was also significantly higher than mean upstream concentration (p=0.02). Results are summarized in the box plot below (Figure).



In 2005, there was an accidental release at the Central Utah Water Conservancy Distrcit (CUWCD) dam, approximately 2 km upstream of Red Butte

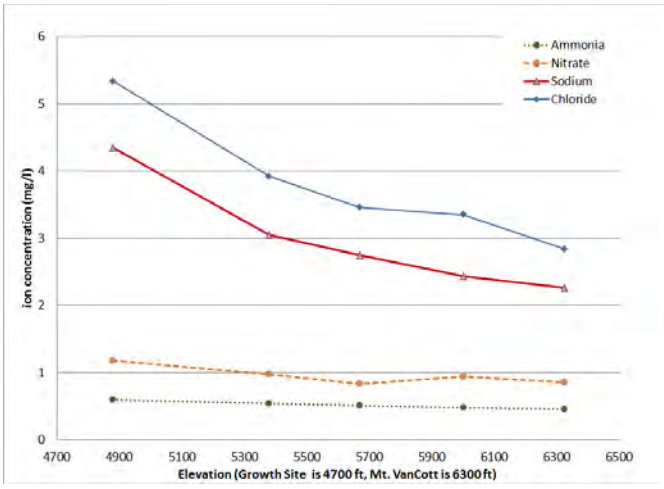
Garden. A large amount of fine sediments (<2mm) accumulated in the upper portion of the Garden pond as a result of this incident. The accumulation altered the hydraulics of the Creek by widening and decreasing velocities. A non-native variety of Phragmites invaded this upper pond area further compounding the hydraulic alterations. The results of this study suggest that the sediment accumulated in the upper pond is gradually being transported to downstream reaches. However, preliminary hydraulic model results suggest that the sediment transport capacity for fine sediment (0.5 - 2.0 mm) within the pond is approximately 80% smaller than upstream and downstream capacity. This is due to shallow channel grades and large channel width in the pond. Therefore it would take a very long time for the Creek to return to pre-2005 conditions. Figure: Box plot of Red Butte Creek TSS concentrations by location. Upstream and downstream of Red Butte Garden and the pond within the Garden.

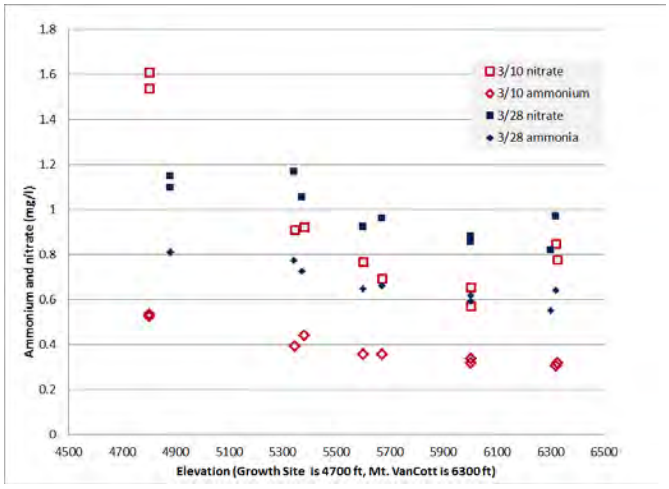
Nitrogen in Stormwater Runoff

Dasch Houdeshel, *Civil & Environmental Engineering Postdoc*-- $1,000

- ***This project will evaluate whether nitrogen inputs from stormwater runoff to RBC are deposited via precipitation or by entrainment as stormwater is conveyed across engineered flow paths.***

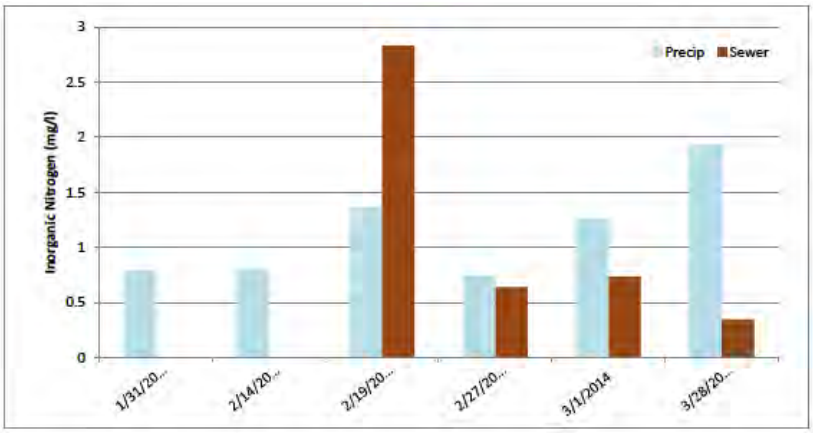
- **Summary:** It is widely held that stormwater becomes contaminated with nutrients as it is conveyed over urban infrastructure. However, wet deposition of N, or N contained in precipitation, has been modeled by the National Atmospheric Deposition Program to be as high along the Wasatch Front as anywhere else in the country. Further, the predicted deposition values are likely underestimated because local influences such as local topography, automobile traffic, and heavy industry can cause significant variability at local levels and these dynamics are not well represented in the NADP models. Therefore, the Wasatch Front likely receives high N loading rates directly from precipitation than suggested by the NADP models, with high spatial variability due to proximity of agricultural, industrial, and transportation centers and steep elevation gradients.





Are N inputs from stormwater runoff to Red Butte Creek dominated by wet deposition of N in precipitation or by N that is entrained as the stormwater is conveyed across engineered flow paths?

	Cl^-	NO_3^-	Mn^+	Ca^+	NH_4^+	PO_4^-
Precipitation	1.51	0.94	0.13	1.12	0.51	BDL
Roof additions	0.25	-0.01	0.05	2.53	-0.05	BDL
Street additions	80.89	0.01	0.88	8.77	-0.30	BDL
Parking lot additions	62.88	-0.20	1.15	15.63	-0.21	BDL
Storm sewer additions	20.95	-0.14	0.06	4.02	0.04	BDL
Outlet	74.6	0.90	1.21	14.80	0.23	BDL



Precipitation collectors (Figure 1) were deployed in pairs at 4800 ft, 5300 ft, 5600 ft, 6000 ft, and 6300 ft along a transect from the Growth Site (4800 ft) to the top of Mount VanCott (6300 ft) 12 hours before predicted precipitation and collected 12 hours after precipitation ended on Feb 19, March 10, and March 28. All samples were tested on a Metrohm IC in the Geology department. Storm water collectors were placed a long an engineered storm water flow path within the RBC drainage to measure the change in storm water chemistry as precipitation ran across roofs, roads, parking lots, and through storm sewers. Passive collectors were placed to sample runoff from the downspouts of the Sage Point dorms, at the inlet to the stormdrain to capture runoff from the parking lot adjacent to the Sage Point dorms, at the inlet to the stormdrain to capture runoff from Pollock Rd, and near the outlet that conveys stormwater from the Sage Point dorm complex to RBC. Samplers were positions so that high flow rates would be required to collect samples.

Average ion concentrations appear to decrease with elevation, however, this decrease appears to be non-linear. There appears to be greater differences between sampling points at lower elevations (Figure 2). However, while this pattern held true for both storms sampled, the variability between storms appears large (Figure 3). The ionic fluxes that were observed, as calculated by precipitation minus the runoff from a given surface, indicate that all urban surfaces acted as a source of Na+ and Cl-, but a sink for NO3- and NH4+ (Table 1). As seen with the elevation transect data, inter-storm variability was high such that inorganic nitrogen (NO3- + NH4+) concentrations in the precipitation and the relative contribution of inorganic nitrogen from the urban surface varied greatly for each storm (Figure 4). On February 19, the inorganic nitrogen concentration at the outfall was double that of the precipitation, yet on all subsequent storms, inorganic nitrogen concentration was much lower at the outfall than in the precipitation.

The results from the FoRBC study support my initial hypothesis by indicating that atmospheric wet deposition is the primary contributor to stormwater inorganic nitrogen. The values reported (0.5 to 2.0 mg/l inorganic nitrogen) are in line with a wide body of ecosystem-focused nitrogen deposition literature but the concept that atmospheric wet deposition is the primary source of urban stormwater inorganic nitrogen is contrary to the current dogma of urban stormwater philosophy. The methods that are employed here fail to capture any “first flush” phenomenon that may be occurring, and so it is difficult to determine if the samples that

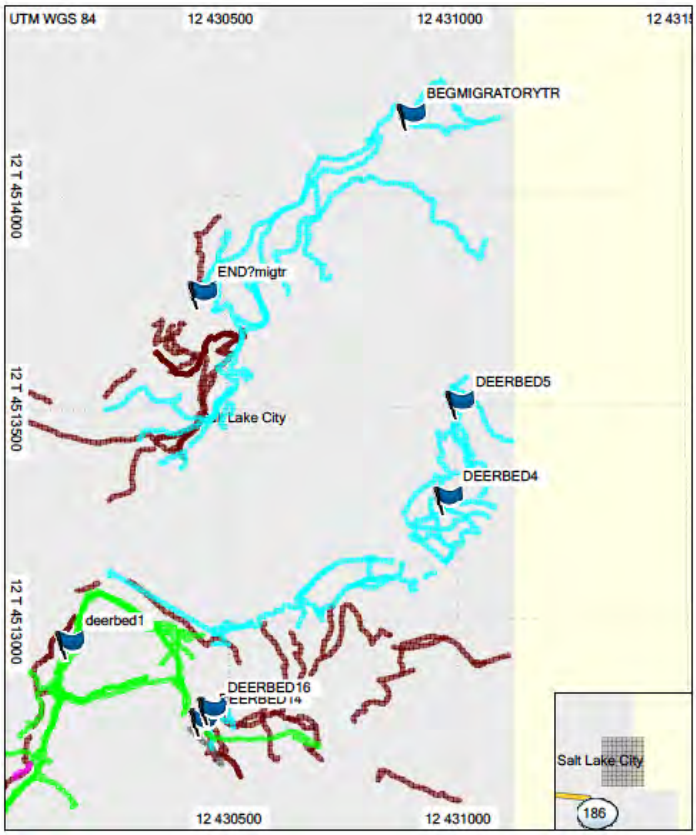
were measured are representative of an event mean concentration. Auto samplers must be utilized to capture sufficient samples to fully characterize an event mean concentration, or event total mass. Because of the contradiction between these results and the current paradigm that inorganic nitrogen is entrained in stormwater as it flows across urban surfaces, every effort must be made to insure that the reported samples are indisputably representative of event mean concentrations that capture the variation of inorganic nitrogen in stormwater throughout an event. Work is in progress to secure resources to expand this study to utilize auto samplers.

Enhancing Habitat Quality for Seasonal Mule Deer Movement Within the Red Butte Riparian Corridor

William Newmark & Eric Rickart, *Natural History Museum of Utah faculty*-- $1,000

- ***This project will identify landscape features that promote or hinder mule deer movement along the RBC riparian corridor by mapping snow trail networks during the winter of 2014.***

- **Summary:** Eric Rickart, Mark Gibson and I mapped mule trail networks along Red Butte Creek during the winter of 2013/ 2014 on six separate occasions, 12 – 24 hours following a snow storm (Figure). Several interesting patterns were observed:
  (1) Migratory mule deer movement during the winter 2013/14 along Red Butte Creek varied over time with higher levels of mule deer movement at lower elevations during the early winter (December 2013) and lower levels of mule deer movement at lower elevations during the late winter (Feburary 2014).
  (2) During the winter 2013/14, mule deer below Red Butte Canyon Research Natural Area (RBCRNA) moved largely parallel to the creek rather than perpendicular as been documented previously in the winter in RBCRNA. We suspect mule deer are moving parallel to the creek below RBCRNA because the creek provides important cover - both thermal and from potential predators (humans and dogs) while mule deer are moving perpendicular to the creek in RBCRNA to reduce predation risk from mountain lions, the principal predators in RBCRNA.
  (3) Foothill Boulevard and the fencing along eastern edge of the Sunnyside Student Complex and the VA hospital are a nearly impermeable barrier to mule deer winter movement along Red Butte Creek. Nearly all of the mule deer fatalities, which we observed during the winter of 2013/14 along Red Butte Creek, were due to vehicle collisions along Foothill Boulevard.



(4) The Red Butte Creek "migratory corridor" is currently and almost certainly an ecological trap or sink for mule deer. Mule deer that use the Red Butte Creek migratory corridor face a high risk of being killed by vehicles and/or frightened and stressed by hikers, joggers, and dogs using the Bonneville Shore Line Trail and the Red Butte Creek Road below the western boundary of RBCRNA. In the area immediately to the west of western boundary of RBCRNA, there is an inverse relationship both in time and space between numbers of dog tracks and mule deer tracks.

Recommendations:

1. Dogs are currently required to be on lease all times along the Bonneville Shoreline Trail and to the west of RBCRNA. However this ordinance is not enforced and thus the city should be requested to enforce this ordinance.
2. There are a number of piles of razor wire which have been dumped between Red Butte Creek and the southern fenced boundary of Fort Douglas which should be removed because the razor wire poses a serious risk of injury to people and mule deer moving along the creek.

Estimating Density of Large Mammals in Red Butte Canyon

Blake Hethmon, *Biology undergraduate*-- $1,000

- ***Faunal populations occupying the Red Butte riparian corridor will be surveyed using non-invasive camera traps during the spring of 2014.***

- **Summary:** We are happy to report results from our camera trap survey in the Red Butte Creek riparian corridor that runs through the University of Utah Campus. During the Spring semester 2014, we placed a total of five cameras at different points along the Red Butte Creek urban section, each placed approximately 500 meters apart while trying to keep them hidden from easy sight of an animal or a passerby. We monitored cameras every 2-4 weeks, once the data collection was complete, we categorized the photo data and compared it to a ongoing camera trap survey that the Sekercioglu Lab has been conducting up in Red Butte Canyon Research Natural Area (RNA). Our results suggest a notable difference in mammal species presence and abundance between the two study areas. Despite the urban section survey lasting only 198 camera days compared to the 1137 camera days in the RNA, there were almost twice as many photo captures of mule deer in urban section, and while there were many pictures of elk from the canyon, there was not a single photo

capture of an elk in the urban section. Other animals that were photographed in the urban section were raccoons, skunks, magpies, ducks, rats, squirrels, domestic dogs and domestic cats. Animals photographed in the RNA include moose, elk, bobcat, cougar, and wild turkey. These two areas are adjacent to each other; species lists vary significantly while species richness of the two areas is similar. Our current survey in the urban section is complete, but the cameras that were purchased with the Friends of Red Butte Creek research grant are currently monitoring Red Butte Canyon RNA as a part of a larger project. We plan to redeploy cameras in the urban section during the fall semester. We thank Friends of Red Butte Creek once again for their generous support, and hope they continue to support research of the wonderful local wildlife area that we have on campus!

Integrating science, environmental education, public outreach, conservation, and capacity-building through hands-on bird ecology research in the Red Butte Creek riparian corridor
Evan Buechley, *Biology PhD student*-- $1,000

- ***This project will investigate the community ecology of understory birds with the RBC riparian corridor.***

- **Summary:** The Friends of Red Butte Creek mini-grant supported our ongoing bird banding operations in Red Butte Canyon Research Natural Area in 2013-2014. This support enabled us to update our aging equipment, specifically mist nets for capturing birds and pliers for banding birds. With this new equipment and hundreds of volunteer hours we have continued to sample the bird community in Red Butte Canyon, enabling us to gather important data on the composition and demographics of bird populations breeding and migrating through the canyon. During the study period, 322 birds were caught of 44 species (Table 1). Furthermore, this banding station has continued to serve as an important educational outreach tool, helping to foster interest in birds, biology, and conservation. In the past year our banding station has been visited by many groups, including undergraduate biology classes from the University of Utah, staff from Tracy Aviary, and the Great Salt Lake chapter of the Audubon Society, underscoring the value of this hands-on research project. Photo: Evan Buechley demonstrating bird banding to a visiting group from Great Salt Lake chapter of the Audubon Society in August, 2014.

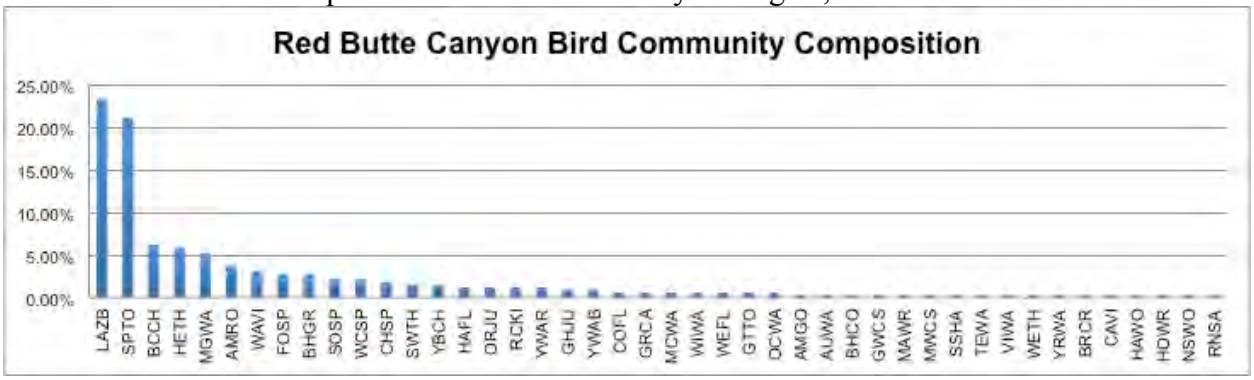


Figure 1. Summary of all bird species captured in the study period. The x-axis represents the proportion of all captures each species represents. The y-axis contains bird species codes (key in Table 1).

Table 1. Bird Species Banded in Red Butte Canyon Research Natural Area.

Sharp-shinned Hawk	*Accipiter striatus*	SSHA
Northern Saw-whet Owl	*Aegolius acadicus*	NSWO
Black-chinned Hummingbird	*Archilochus alexandri*	BCHU
Broad-tailed Hummingbird	*Selasphorus platycercus*	BTLH
Calliope Hummingbird	*Selasphorus calliope*	CAHU
Rufous Hummingbird	*Selasphorus rufus*	RUHU
Red-naped Sapsucker	*Sphyrapicus nuchalis*	RNSA
Cordilleran Flycatcher	*Empidonax occidentais*	COFL
Hammond's Flycatcher	*Empidonax hammondii*	HAFL
Western Flycatcher	*Empidonax difficilis/occid.*	WEFL
Cassin's Vireo	*Vireo cassinii*	CAVI
Warbling Vireo	*Vireo gilvus*	WAVI
Hairy Woodpecker	*Picoides villosus*	HAWO
Black-billed Magpie	*Pica hudsonia*	BBMA
Black-capped Chickadees	*Poecile atricapillus*	BCCH
Brown Creeper	*Certhia amricana*	BRCR
House Wren	*Troglodytes aedon*	HOWR
Marsh Wren	*Cistothorus palustris*	MAWR
Ruby-crowned Kinglet	*Regulus calendula*	RCKI
American Robin	*Turdus migratorius*	AMRO
Hermit Thrush	*Catharus guttatus*	HETH
Swainson's Thrush	*Catharus ustulatus*	SWTH
Gray Catbird	*Dumetella carolinensis*	GRCA
Yellow-breasted Chat	*Icteria virens*	YBCH
Audubon's Warbler	*Setophaga coronata auduboni*	AUWA
MacGillivrays Warbler	*Geothlypis tolmiei*	MGWA
Orange-crowned Warbler	*Oreothlypis celata*	OCWA
Tennessee Warbler	*Oreothlypis peregrine*	TEWA
Virginia's Warbler	*Oreothlypis virginiae*	VIWA
Wilson's Warbler	*Cardellina pusilla*	WIWA
Yellow-rumped Warbler	*Oreothlypis pusilla*	YRWA
Yellow-Warbler	*Setophaga petechia*	YEWA
Chipping Sparrow	*Spizella passerine*	CHSP
White Crowned Sparrow	*Zonotrichia leucophrys*	WCSP
Song Sparrow	*Melospiza melodia*	SOSP
Fox Sparrow	*Passerella iliaca*	FOSP
Gray-headed Junco	*Junco h. caniceps*	GHJU
Oregon Junco	*Junco h. oregonus*	ORJU
Green-tailed Towhee	*Pipilo chlorurus*	GTTO
Spotted Towhee	*Pipilo maculates*	SPTO
Black-headed Grosbeak	*Pheucticus melanocephalus*	BHGR
Lazuli Bunting	*Passerina amonea*	LABU
Brown-headed Cowbird	*Molothrus ater*	BHCO
American Goldfinch	*Spinus tristis*	AMGO