Collaboration—Connection—Innovation—Impact—Opportunity

iUTAH 2016 Annual Symposium and Summer All-Hands Meeting
University Guest House and Conference Center, 110 South Fort Douglas Boulevard,
University of Utah, Salt Lake City, UT 84113

Abstracts

Keynote Address:

Integrating Research with the Local Landscape

LAURA BRIEFER, *Director, Salt Lake City Department of Public Utilities, Salt Lake City, UT 84111, laura.briefer@slcgov.com*

Managing water resources, protecting our landscapes, and planning for future generations has become more complex in light of growing and more diverse populations and a changing climate. Vast amounts of global information and data have also become more readily available to practitioners to draw upon in the political, policy, and technical fields. However, many of the issues we are working to resolve have uniquely local characteristics, including climate, hydrology, geography, and demographics. These unique characteristics require research questions and both quantitative and qualitative data that have a distinctly local application. Two examples will be explored, including thoughts on incorporating a data-driven systems approach to negotiation and decision-making in the ongoing Mountain Accord process, as well as the creation of a multi-disciplinary team to plan for climate change impacts to Salt Lake City's water resources.

Invited Talks:

COLLABORATION: "COLLABORATIVE RESEARCH: CHALLENGES, REWARDS, AND OPPORTUNITIES"

The Painful Joy of Academic Collaboration

JANE LI, *Department of Environment & Society, Utah State University, Logan UT 84322, enjie.li@aggiemail.usu.edu*

Okay, let's be honest, we all dream of a collaboration in which no one arranges a 20-person conference call to do a status check. The reality is that collaboration is not always productive and joyful; occasionally, it can be quite frustrating and even a bit painful. But, it's important to remind ourselves why collaboration is key to the future of science and also to learn some new ways to get more out of collaboration. In this talk, I will share my own stories of collaboration, and lessons I've learned to make collaboration work. With a bit of humor, "collaboration is no longer painful—or precious" said Vince Clarke.

No Scientist Can Survive as an Island

COURTENAY STRONG, *Department of Atmospheric Sciences, University of Utah, Salt Lake City, UT 84112, court.strong@utah.edu*

Court Strong led high-resolution climate modeling for the CI-WATER (EPSCoR Track II) project. While this work has enabled several climate-focused papers and proposals, the associated skills and data sets became exponentially more impactful when connected to a broad network of interdisciplinary collaborators and stakeholders through iUTAH. The resulting collaborations have enabled research on key questions emerging at the interface of disciplines, and when executed effectively, have yielded enhanced quantity and quality with less effort.

"If You Build it They Will Come:" Building a Team Science Community of Practice in Utah

ANDREAS LEIDOLF, *iUTAH EPSCoR and Ecology Center, Utah State University, Logan, UT 84322, andreas.leidolf@usu.edu*

This presentation examines the iUTAH project in light of what we know about how teams assemble, evolve, and perform over time. I chart our progress in building a Team Science Community of Practice in the state of Utah, with particular emphasis on the administrative and managerial side of the complex "team science" equation; and place this in the context of EPSCoR's mission of building research capacity. I conclude by discussing opportunities that the emerging profession of the scientific community manager (aka. science community engagement professional) presents to serve our research community and facilitate the continued practice of integrated, multidisciplinary, cross-institutional Team Science in our state.

CONNECTION: "CONNECTING THE DOTS: PUIS, R1S, AND IUTAH'S CULTURE OF COLLABORATION"

Uncovering Attitudes Towards Water at Weber State University

CARLA KOONS TRENTELMAN, *Dept. of Sociology & Anthropology, Weber State University, Ogden, UT 84408, carlatrentelman@weber.edu*

Applying an iUTAH-type focus at the campus level, we examined the social science question of how Weber State University (WSU) shareholders think about water, water use and conservation, and how these perspectives and attitudes inform decision-making about water use and management at WSU. Our qualitative research found that attitudes, social structure, policy, built and physical environment all have a role in campus decision-making about water. We also discovered some interesting dynamics along the way – while some of them were not at all surprising, others were unexpected.

Stakeholder response:

JENNIFER BODINE, *Energy & Sustainability Office, Weber State University, Ogden, UT 84408, jenniferbodine@weber.edu*

iUTAH Weber County Water Survey

GARY JOHNSON, *Department of Political Science & Philosophy, Weber State University, Ogden, UT 84408, garyjohnson@weber.edu*

This project is the result of work done by the students in Dr. Johnson's Urban Politics course. A survey written by members of iUTAH Research Focus Area 2 (Social and Engineered System) and administered by the students examined attitudes of Weber County residents about water use, quality, and pricing. Students gathered data from retail shoppers at a variety of locations around Weber County using iPads. The results presented indicate low levels of information about water pricing but high scores on citizen concerns about future water policy.

Stakeholder response:

THERESE GRIJALVA, *Office of Undergraduate Research, Weber State University, Ogden, UT 84408, tgrijalva@weber.edu*

INNOVATION: "INNOVATION WITHIN—INNOVATION WITHOUT—INNOVATION IN ACTION"

Getting Beyond Science: Creative Tools for Assessing the Human Dimensions of Water

COURTNEY FLINT, *Department of Sociology, Social Work & Anthropology, Utah State University, Logan, UT 84322, courtney.flint@usu.edu*

Understanding the human actors in the water system requires getting out beyond the science and into the everyday lives and perspectives of people who value, use, and manage water. iUTAH social scientists have

amassed a creative portfolio of tools and approaches for gathering and analyzing data from various vantage points in the human dimensions of Utah's water.

Piping GAMUT Observations from the Academy Well-head to the Public

MARTIN BUCHERT, *Global Change and Sustainability Center, University of Utah, Salt Lake City, UT 84112, martinpbuchert@gmail.com*

iUTAH has yielded a scientifically valuable environmental observatory in the form of the GAMUT network, but while GAMUT data are of broad social value and are published openly, they receive little public exposure. iUTAH has collaborated with NHMU to develop an interactive exhibit that presents these data to the general public in an audience-appropriate way. The exhibit is interactive and touch-driven. GAMUT feeds are interpreted and contextualized for non-specialists via photos, maps, a 3D physical model of the watershed, interpretive introduction material, and context in NHMU's Great Salt Lake gallery. NHMU's Becky Menlove will provide stakeholder perspective in the form of a recently completed formal study of visitor interactions with the exhibit, which is guiding revisions to the beta version of the exhibit.

The Red Butte Creek Revitalization Plan: Translating iUTAH Knowledge into Action

DIANE PATAKI, *Department of Biology, University of Utah, Salt Lake City, UT 84112, diane.pataki@utah.edu*

Due in major part to the prominence and success of iUTAH, the UU has commissioned a master plan to re-envision the segment of Red Butte Creek (RBC) that runs through campus. A team of iUTAH researchers collaborated with stakeholders on and off campus to develop a shared vision of RBC as a focal point of learning, research, and outreach about stream ecohydrology, human-environment interactions, and urban sustainability. The plan is currently in its first phase of implementation and aims to transform the campus RBC corridor from an under-utilized and degraded urban stream to a living laboratory for implementing and testing best practices in urban steam restoration, ecological design, and adaptive riparian management.

IMPACT: "MOVING THE NEEDLE IN RESEARCH AND TRAINING"

A Multifunctional Heat Pulse Probe for Soil Physical Property and Process Assessment

SCOTT JONES, *Department of Plants, Soils & Climate, Utah State University, Logan, UT 84322, scott.jones@usu.edu*

A multifunctional heat pulse probe (MFHPP) is being developed which provides enhanced scientific data leading to improved understanding of soil physical properties and processes. The iUTAH project has supported field-testing of the MFHPP at the T.W. Daniel Experimental Forest. A 2015 USTAR grant is funding efforts to commercialize the MFHPP in collaboration with Apogee-Instruments Inc., a local company.

DHS: Distributed Harvesting of Stormwater

RYAN DUPONT, *Department of Civil & Environmental Engineering and Utah Water Research Laboratory, Utah State University, Logan, UT 84322, ryan.dupont@usu.edu*

Changes in climate are resulting in significant changes in precipitation patterns in the Western US that will bring less snow and more rain-on-snow and rain events in the future. Reliance on snowpack for late spring and summer water supplies for the growing population in the region will result in growing demands on limited fresh water supplies. Distributed Harvesting of Stormwater, connected to Green Infrastructure development, is being evaluated in this EPA-funded project to assess opportunities and potential impacts and social constraints to the implementation of this stormwater management approach for increasing aquifer recharge to make available additional groundwater resources to meet the anticipated demand for new water supplies. An outline of the research approach and its application to the Salt Lake Valley watershed will be covered in this presentation.

Progress Toward a More Diverse Water Workforce

MARK BRUNSON, *iUTAH EPSCoR and Department of Environment & Society, Utah State University, Logan, UT 84322, mark.brunson@usu.edu*

It can be difficult to gauge the impact of EPSCoR education, outreach, and diversity programs because the benefits are necessarily delayed while students progress through their educations, and because careers are subject to post-program influences outside project control. At iUTAH we are especially interested in improving the diversity of Utah's environmental science workforce as well as enhancing female and minority participation in research. In our fourth year we believe we're beginning to "move the needle" in our efforts to build a more diverse STEM workforce for Utah's water future through increased diversity in our student programs and active participation in programs focused on under-represented groups. Female student participation has been enhanced especially but we are making progress with Native American students as well.

Stakeholder response:

ADRIENNE GILLESPIE ANDREWS, *Chief Diversity Officer, Weber State University, Ogden, UT 84408, adrienneandrews@weber.edu*

Undergraduate Student Posters:

** 2016 iFellow, # iUTAH Traineeship Program, & RCG Program, $ iUTAH Visualization Laboratory*

1. Fire Severity Increases Snow Accumulation in Subalpine Forests

KATELYN BOYER*, *Utah State University, katelyn.boyer@aggiemail.usu.edu*
Co-Authors: Sam St. Clair, Jordan Maxwell

Snowpack is an important resource for water supply but varies year-to-year depending on several different variables. One variable that is largely unknown is how much fire alters snowpack. In North America, snowpack varies from 57-72% due to changes in forest cover and composition (Varhola, Coops, Weiler, & Moore, 2010, p. 224). A forest composition that is modified by fire is increasing in frequency and causes a gradient of fire severity across landscapes. This study characterizes how peak snow accumulation is affected by varying degrees of fire severity in subalpine forests. Comparing the percent mortality, which relates to burn severity, with snow accumulation shows an increase in snow depth by 30% for 2015 and 2016. Overall we found that as burn severity increases, snow depth increases. Subalpine forests that experience severe fire damage result in low forest density. This allows more snow to accumulate with limited branches to block the snow. Even with a higher percent of snow accumulation, there is also more direct solar radiation that can cause ablation to happen at a faster rate. Further study is needed to gain a greater understanding of how snow ablation is affected by forest canopy.

2. Quantification of MeHg Fluctuations in the Provo River over a 24-hour Cycle

GRETA HAMILTON*, *Westminster College, hamilt4@gmail.com*

Anthropogenic emissions increase the natural mercury (Hg) levels in the Earth's biogeochemical cycle. In aquatic ecosystems, like the Provo River, Hg converts to the neurotoxin methylmercury (MeHg), which bioaccumulates through the food chain. Typical human exposure to MeHg occurs from the consumption of contaminated fish. A mercury advisory for Jordanelle Reservoir, located along the Provo River, created a need for the river analysis. The purpose of this study was to quantify the fluctuations of MeHg in the Upper Provo River over a 24-hour period. Results of the unfiltered MeHg in comparison to gage height show the highest MeHg levels (> 0.1 ng/L) coincided with the lowest gage heights (<94cm) during the hours of 1900 to 2200. These levels were within the range found in ambient waters of 0.078 and 0.55 ng/L for MeHg. The results of this study will aid in determining future collection times of river samples.

3. Identifying and Comparing Fecal Contamination Sources in Three Utah watersheds

REBECCA LEE*, *Brigham Young Un*iversity, *beccalee323@gmail.com*
Co-Authors: Natasha Griffin, Zachary Aanderud

As the population in Utah increases and more demands are placed on Utah's water sources, it is becoming even more essential to be able to identify and address water quality issues. Currently, tests can be run to determine if water is polluted or contaminated, but when it comes to determining the origin of the pollution, such as fecal contamination, there are not many fast and effective ways to find that source. This study looks at developing a basic microbial source tracking procedure, a technique that identifies fecal bacteria associated with specific host animals. This procedure will provide managers and residents of Utah with a way of identifying non-point sources of pollution so they can take steps to mitigate it and find a solution. We took samples from the Logan, Provo, and Red Butte Creek watersheds and analyzed them for fecal contamination using quantitative PCR. We were able to create qPCR standards by which we can compare water samples and quantify the level of bacteria from humans, dogs, cows, and other ruminants.

4. Evapotranspiration Estimates Using Soil Water Content Data

SHANAE TATE*, *Brigham Young University, r.shanae.tate@gmail.com*
Co-Authors: Kay Parajuli, Scott Jones

Evapotranspiration (ET) remains one of the more difficult variables to account for in the hydrologic cycle. There are several methods with which one can estimate ET, including the use of eddy covariance and vegetative indices. One of the simpler methods is a water balance equation using soil water content data. These data have significant implications for both agricultural and forest systems and are collected with sensors employing Time Domain-Transmissometry (TDT). These TDT measurements involve the time of travel of electromagnetic waves through different media, including soil, air, and water. As the travel time through water is significantly slower than that for soil solids and air, this gives an indication of the water content in the soil. The iUTAH GAMUT network contains an array of TDT sensors that are continuously collecting data in the Provo, Logan, and Red Butte Creek Watersheds. An analysis of these data and precipitation data give an indication of ET. Through this analysis, we find that ET varies along an elevation gradient. The loss of soil moisture to ET begins in later months for sites at higher elevations and the rate of ET is also lower at those sites. The difference in timing is related to the timing of snowmelt and the rate of ET is related to plant community as well as climatic factors. The soil water measurements are useful for water-budget ET calculations during dry periods, however may not be used at sites with high water tables that continually replenish the soil pores with water. In these cases the change in soil water content does not give a representation of ET. Each site in the iUTAH GAMUT has unique qualities and the soil water content in each help to understand the hydrology of the system.

5. iUTAH Summer Research Institute

IUTAH SUMMER RESEARCH INSTITUTE PARTICIPANTS
Co-Authors: Rachel Gabor

Research Question: How does the hydrology and water quality of Emigration Creek change from the canyon into town and does it match the changes observed in Red Butte Creek and the Logan River?

6. Microbes vs. Nutrients: Understanding Nutrient Pollution in Streams

SANDRA YOUNG*, *Utah State University, s.k.y@aggiemail.usu.edu*
Co-Authors: Beth Ogata, Michelle Baker

Microbial growth in stream systems can be limited by low nutrient concentrations. Nutrient loads to streams have increased with urbanization and agricultural land use. This has potential to cause stream eutrophication. This poster discusses the impact of specific nutrient loads that are of growing concern - nitrogen and phosphorus. I used two techniques to understand potential effects of elevated nutrients on microbial communities in the Provo River. Nutrient inputs did not significantly affect microbial biomass at the Provo River site. Continued research on which bacterial taxonomic units are using the nutrients is still in process. Examinations of bacterial preference for ammonium, nitrate, and organic nitrogen are being done using DNA stable isotope probing (DNA-SIP).This process uses a heavier stable isotope of a nutrient to analyze which bacterial taxonomic units are using the nutrient. The DNA-

SIP technique has never been used to analyze stream bacterial taxonomic units in this context, and a basic method is also explained.

7. The Effect of Plot Size on Nitrogen Availability and Water Sourcing of Urban Trees in Salt Lake City, UT

LILY WETTERLIN*, *University of Utah, lily.wetterlin@live.com*

Urban trees face severe limitation of plantable space, which effects both rooting depth and the amount of available soil. The limitation of plantable space ultimately influences water and nutrient supply. Determining a correlation between plot size and water and nitrogen sources and availability, respectively, is important for the future sustainability of urban landscapes. To address this, we collected stem and leaf samples from 2 species of trees (Tilia cordata and Fraxinus pennsylvanica) from 3 locations in Salt Lake City: Sugarhouse Park area, Liberty Park area, and the Avenues Cemetery area. Twenty trees (10 of each species) were sampled from each of the locations, 10 from the interior of each park and 10 from the streets surrounding each park. The plot sizes varied for the trees surrounding each park. In total, 60 trees from variable plot sizes were sampled. Water was extracted from the stems to determine oxygen (Î´18O) and hydrogen (Î´2H) stable isotope ratios. Stable isotopes ratios of water were analyzed by mass spectrometry, and used to assess water sourcing. Mass spectrometry was also used to find the isotopic composition and content of nitrogen in the leaf samples collected. I hypothesize that trees with the larger amount of plantable space will have a higher abundance of leaf nitrogen and rely on groundwater, and that trees with a smaller amount of plantable space will have less leaf nitrogen and rely more on irrigation systems.

8. A Microfluidic Device for Oxygen Quantitation in Anoxic Environments

LOHRA M. MILLER&, *Southern Utah University, lohramickelle@hotmail.com*
Co-Authors: Samantha Mckay, Aubriel Koehler, Christopher F. Monson

Anoxic waters, or water containing very low levels of oxygen (<1% of oxygen saturation), are important and relatively common, occurring in both natural waters (such as ocean basins and deeper waters in lakes such as the Great Salt Lake) and managed waters (such as waste lagoons). We have created a microfluidic device to measure low oxygen levels that will be less expensive and more sensitive than current STOX techniques. Measuring the amount of oxygen present in anoxic water is both challenging and important. Oxygen levels can help determine what types of biochemical processes can occur. Currently, the method for measuring low oxygen concentration is to use an STOX electrode, which is expensive and relies on a diffusion-limited current to measure dissolved oxygen. We have created a microfluidic device loosely based on the STOX electrode, but employing active (magnetohydrodynamic) transport. Our device has been calibrated and shown to be sensitive to well below 0.01 ppm oxygen concentrations (0.1% oxygen saturation). We will soon be ready to make field measurements.

9. Flow rates in Heber City canals: assessing impact of urbanization and agricultural runoff on stream hydrology

ANDREW BENTZ#, *Brigham Young University, abentz27@gmail.com*
Co-Authors: Jared Brabazon, Greg Carling

Urbanization and agricultural land use have great impacts on urban stream hydrology. Heber City is one of Utah's fastest growing municipalities with ongoing development from both agricultural and urban land use. Rapid urbanization results in greater impervious coverage allowing for increased runoff. Rapid agricultural spread affects runoff through diverting and flooding. To assess hydrological impacts from land use change, flow monitoring stations were installed in Sage and Spring canals in Heber City. These sensors observe flow conditions of the storm-canals in fifteen minute increments, thus allowing for an extensive dataset. These data enable the visualization and delineation of inputs such as urban and agricultural runoff from baseflow. Initial results indicate great variability in flow. A majority of changes in flow seem to correlate with precipitation. However, smaller variations in flow may be correlated to irrigation. Initial data show suspicious values and many time gaps indicating sensor malfunction. Further data, especially during storm and irrigation seasons, will allow a greater understanding of urban and agricultural impacts on urban stream hydrology.

10. iUTAH Summer Research Institute

iUTAH Summer Research Institute Participants
Co-Authors: Erik Oerter

Research Question: Can we use water isotopes as "fingerprints" to determine where food comes from?

11. Measuring Flow Rates in Small Urban Stormwater Systems

Mitchell Steele*, *Utah State University, mcsteele8@gmail.com*

Urban stormwater runoff from streets, parking lots, lawns and roofs is one of the largest impairments to our shared water systems. Untreated stormwater can contaminate surface water, making it unfit for use and/or habitat. In an effort to reduce stormwater runoff, the City of Logan installed street-side bio-retention bays along 300 E in town. This project will attempt to determine the hydraulic efficiency of the retention basins during storm events as well as the water quality as it drains through the basins. The results of this study can be used to decided whether or not to revise the designs or implement more.

12. Bioretention Effectiveness in a Semi-arid Climate

Darcie Christensen*, *Utah State University, darc.c@aggiemail.usu.edu*
Co-Authors: Pratibha Sapkota, Christine Pomeroy

With significant changes happening in watersheds due to rapid urbanization, bioretention is becoming a more common method to slow high velocity runoff and remove contaminants. Though a lot of research has been done on bioretention in wetland type systems, not much has been done in a semi-arid climate with native species that do not require additional irrigation. The focus for this study was on the analysis of nitrogen removal by vegetation and determining associated microbial roles in nitrogen cycling. Isotope ratio mass spectrometry was used to quantify total nitrogen (TN) in various wetland and upland plant species throughout various seasons. Real-Time Polymerase Chain Reaction (qPCR) was used to amplify and quantify bacterial DNA to determine diversity within the soils. The results will show the effectiveness of native plants in removing nitrogen from stormwater influent.

13. Determining the Quantity and Quality of Rainwater Drainage from Various Rooftops

Joydino Beyale*, *Utah State University Eastern—Blanding, joydinobeyale@gmail.com*

Rainwater is an important natural resource for sustaining life; it is also essential to the environment. Due to high demand for water in urban areas and its contamination by human activities, implementing stormwater harvesting for groundwater recharge may be an option for increasing water supplies. This project is focused on collecting stromwater from commercial and industrial rooftops including: flat roofs layered with specific membranes, pitched metal roofs, roofs with solar panels, and a green roof. This roof runoff generated in the first flush and for the full rainfall events will be collected and analyzed for water quality indicators. Tipping Bucket Flow Gauges will be placed in roof drain manholes to measure the quantity of runoff draining from these roofs. An Isco Autosampler will be connected to the effluent of the Tipping Bucket Flow Gauge to collect samples for laboratory analyses. Standard lab procedures will be used to determine metals, nutrients, and organics in the runoff water as a function of the type of roof being sampled. These data will help determine if roof drainage is of sufficient quantity and high quality to be safe to use as a substitute water resource for humans and the environment to help manage the future water needs in the state of Utah. Harvesting and proper management of both rainwater and stormwater resources is urgently required to ensure a safe and adequate supply of water for future needs of the growing population in the Intermountain West.

14. Utilizing Hydroponic Systems to Optimize Food Production in Salt Lake City, Utah

Georgie Corkery*, *University of Utah, georgie.corkery@gmail.com*
Co-Authors: Sarah Mitchell, Daniel White, Steven Burian

Urban agriculture is increasingly popular and important in Salt Lake City, Utah. However, Salt Lake has limited water and land availability, a semi arid climate, and cold, snowy winters that make traditional agriculture difficult. Utilizing hydroponic systems may be a solution because they requires less area and water than traditional agricultural practices, and can produce food year round with the use of grow lights. However, additional energy and nutrient

input is required to run hydroponic systems. We are comparing the water, nutrient, and energy input of plants grown in hydroponic systems versus traditional container gardening in three different environments; indoors with grow lights, in a greenhouse, and outdoors. The objective of this study is to sustainably optimize food production in Salt Lake. So far the data shows that the greenhouse environment requires the least amount of water, energy, and nutrient input, and produces the greatest amount of yield.

15. Spatial Impacts on Local Perceptions of the Jordan River

CYNTHIA ELLIOTT*, *Weber State University, cynthiaelliott@mail.weber.edu*
Co-Authors: Mark Brunson, Taya Carothers

The Jordan River, which flows through the west side of Salt Lake City, is a natural amenity that can improve the quality of life in the community. Efforts have been made to turn the stream into a recreation area. It is not known the extent to which local residents benefit from those efforts. Our study explores how proximity to the Jordan River may affect local concerns and perceptions about certain aspects of the Jordan River. We distributed a questionnaire using iPads through public intercept methods. To be able to spatially analyze different questions on the survey, it asks respondents their proximity to the Jordan River. With this information, we were able to see whether or not proximity affects perceptions people have about the river. We found no evidence that proximity affects the perceived quality of life in the area, nor evidence that it affects concerns people have about flooding or river water quality. There is some evidence that proximity shares a relationship with how concerned people are about litter and trash along the Jordan River, and there is strong evidence that proximity correlates with how frequently people visit the Jordan River and surround parks.

16. Utah Water Institutions and Policy Boundaries

STACY HENDERSON*, *Salt Lake Community College, shendersonutah@gmail.com*
Co-Authors: Joanna Endter-Wada, Enjie Li

This project aims to geographically display different Utah water institutions' policy boundaries in relation to counties. I utilized ArcMap and data from Utah AGRC and USGS to create a series that includes the following maps: watersheds and elevation; Utah Division of Water Rights policy areas; Utah Division of Water Quality assessment units; Utah Water Conservation Districts; and Utah water conservancy districts and metropolitan water districts. I found that different water institutions have varying geographic areas within which their decisions are implemented, and those boundaries generally do not coincide with other water institutions' boundaries or with county boundaries. The visual display of these varying alignments of institutional boundaries illustrates the need for these institutions to have boundary-spanning lines of communication and forums for interaction to ensure that Utah's water is being used effectively and in a way that conserves it for future generations.

17. Cross Cutting Relationships Among Community Concerns and Green Urban Infrastructure in the Jordan River Corridor

LUIS VIDAL*, *University of Utah, luisguillermo.vidal@gmail.com*

A public intercept model survey was conducted in the Jordan River corridor of Salt Lake City, Utah. The survey's questionnaire asked residents on their perceptions and opinions of the Jordan River, the surrounding parks and areas, and a proposed new green infrastructure. The results of the questionnaire will explore the relationships between residents and their green urban infrastructure in the river corridor. Analysis of the data was conducted after reaching 401 respondents and analyzed through SPSS. Specific terms related to parks and green spaces that are asked in scalar questions in the questionnaire show that supports for parks is always present regardless of which term is posed. A Frequency of visits to parks and how parks impact quality life also found no correlation between the two variables.

18. A Comparative Analysis of Attitudes Toward Drinking Water Between Utah and the Nation

ADAM WHALEN*, *University of Utah, adam.whalen@utah.edu*
Co-Authors: Sara Yeo, Meaghan McKasy

Issues surrounding water have become increasingly prevalent in the arid regions of the western United States. Existing public opinion research in Utah gauges attitudes toward water issues among the citizenry; however, there is little to no understanding about where these attitudes compare to the rest of the nation. This study reviews extensive secondary data and analyzes national and state level surveys with water related questions. This data was then

compared to similar water surveys completed in Utah and comparable questions were identified. The study ultimately selected perceived drinking water quality as the dependent variable for analysis. Specific demographic factors such as age, sex, educational attainment, and region of residence represent the independent variables. Linear regression analyses were calculated, and demonstrate a very slight but significant correlation between several of the variables. The resulting comparisons highlight the similarities and contrasts between Utah, the nation, and several demographic groups. The implications and nuances of these findings are discussed.

19. iUTAH Summer Research Institute

iUTAH Summer Research Institute Participants
Co-Authors: Mark Brunson, Taya Carothers

Research Question: How do residents' use and appreciation of urban streams vary across Salt Lake City neighborhoods?

20. Mosaicking and Georeferencing Thermal Infrared Imagery of Swaner Preserve, Park City, Utah

Heather Bottelberghe*, *Salt Lake Community College, heather.bottelberghe@gmail.com*
Co-Authors: Sarah Null, Maggi Kraft, Andrew Hackett

Remote sensing using airborne devices such as an infrared camera attached to a drone are instrumental in monitoring the spatial patterns of stream temperatures. As such, the imagery collected using forward looking infrared (FLIR) systems must be processed to visually represent the values of a stream'sradiant temperature patterns. This project processed thermal infrared imagery captured at Swaner Preserve, Park City, Utah to create a georeferenced mosaic that delineates the location of water on a section of Swaner Preserve and visually represents the variance in radiant temperature of the stream's water.

21. Channel Width Movements, Flow Error Analysis, and the Impact of Change on the Lower Bear River, UT

Todd Brown*, *Utah State University, toddkay.94@gmail.com*
Co-Authors: David Rosenberg, Ayman Alafifi

How much water do we use and where do we use it to benefit both humans and the environment? Managing any river system requires an understanding of its ecology and hydrology. The Watershed Area of Suitable Habitat (WASH) system model is created to understand both. This WASH model functions to recommend environmental flows for riverine, floodplains, and wetland. It also recommends sites for restoration. This is going to help benefit the environment by allocating water for environmental users and also determining the quantity and the times of water needed for restoration purposes at different locations along the Bear River. In 2012, 2013, and 2015 the Bear River Fellows conducted multi-day river trips on the Bear River to collect data. During these trips we collected water surface level, stream flow, pressure data, river bank bed topology, and riparian zones using the Acoustic Doppler Current Profiler (ADCP), Garmin GPS, and HOBO pressure transducers. We collected these hydrologic and ecological data at 3 different sites; the Cub River site, the confluence of the Cub and Bear River, and the Morton site. Using the data collected from these river trips I was able to organize and compare the data for river width and comparing stage and flow from year to year taking into account the human and the data collection instrument errors. I was able to determine the change in the total river width comparing 2013 to 2015 and also determine the stage and flow relationship of the river at different times. The relationship is a linear relationship showing the higher the stage, the more flow. I also took into consideration the possible error; helping make the model more precise. This research is helping protect the environment by considering riverine suitability, floodplain suitability, and wetland suitability throughout the year.

22. What Factors Affect the Way People Think About Xeriscaping

Gabriela Martinez*, *Salt Lake Community College, martinez.gabriela@utah.edu*
Co-Authors: Pratiti Tagore, Sarah Hinners

Xeriscaping is a widely accepted water saving alternative to the more traditional lawn style of landscaping typically seen in single-family homes. It requires the use of smart landscaping choices, such as: drought-tolerant plants, mulch, and rocks. We hypothesize that people's beliefs and their cultural background, water availability perception and the neighborhood they live in influence attitudes toward xeriscaping.

23. Mapping Curbside Delivery of Secondary Water in Urban Areas of Cache Valley, Utah

ANDREW HACKETT*, *Weber State University, andrewhackett@mail.weber.edu*
Co-Authors: Heather Bottelberghe, Sarah Null

When Cache Valley, Utah was initially settled, canals were constructed to convey irrigation water from local rivers to developing communities for irrigation. As urban neighborhoods grew, water was conveyed through the city from canals to individual properties using city street gutters. These are secondary water rights and are organized through a complex system of water rights and management districts. Today, many neighborhoods in the historic sections of these early settlements continue to flood their property and retain their secondary water rights. The purpose of this study is to map Cache Valley urban where city streets convey secondary water used for flood irrigation.

24. Development of a Mobile Water Quality Monitoring Platform

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Water quality monitoring efforts typically involve the measurement of variables at fixed locations. With in situ sensors, high temporal resolution can be achieved, but spatial resolution is not captured. A mobile monitoring platform has the potential to observe fine scale spatial variability of water quality in streams or lakes to identify spatial hot spots and constituent sources, and to inform fixed monitoring efforts. In order to capture spatial variability, a mobile monitoring platform consisting of a small, tethered boat was created and outfitted with in situ water quality sensors (YSI EXO Sonde, FTS Turbidity Sensor, Turner Designs fluorometer). An on-board global positioning system (GPS) tracks the route of the boat and reports to a datalogger so that the data are temporally and spatially referenced. The platform can be guided, floated, or pulled down a stream to capture a longitudinal gradient or on a lake to capture spatial variability of surface water quality. The platform was tested along a stretch of a canal system in an urban area of Logan City and at First Dam, a reservoir on the Logan River at the mouth of Logan Canyon. Challenges encountered included maintaining control of the boat, portaging around bridges, and preventing interference of ambient conditions by operators (e.g., mobilization of sediment). A second prototype of the platform was created to help address some of these challenges.

25. Visualizing Water Use Variability Within the SLC Public Utility Service Footprint

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Understanding the spatial variability in Utah's urban water use will help shed light on future plans when it comes to overcoming the challenges we face with growing population and competition for water. This video visualization will give viewers of all backgrounds a sharpened understanding of spatial and temporal patterns in Salt Lake City Public Utility (SLCPU) customer water use over a 4-year annual cycle. Our data came from an anonymized database of monthly customer water use that includes no financial or other personally identifying information aside from parcel ID. Each individual record was classified by SLCPU as one of 13 different service types (e.g. single family residential, commercial, civic). The water use data has been aggregated from parcels (n= ~75K) to 2010 Census Blocks (CBs; n=3845), tracking each service type individually, in order to maintain customer anonymity. The aggregated monthly water use data was then shown visually by extruding CB polygons proportionately with the total water use by service type from the CB. We then combined static images into a time-lapse animation to portray water usage for each service type. The video reveals patterns in water use variability between the different types of users over a 4 year complete annual cycle across the SLCPU service footprint, which includes all of Salt Lake City and portions of Millcreek, Holladay, Murray, and Cottonwood Heights UT.