

# iUTAH EPSCoR 2015



A Culture of Collaboration



Connecting the Pieces



Inspiring Future Generations of Scientists



Diversity Enhancement within iUTAH



Developing Tomorrow's Workforce



Science for  
Utah's Water Future

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**“We have built a culture of collaboration that extends to all aspects of our scientific enterprise.”**

Letter from the Director:

Enhancing research and training capacity is no small task, and requires investment in partnerships that lead to discovery and innovation. The National Science Foundation (NSF) developed the Experimental Program to Stimulate Competitive Research (EPSCoR) to improve the science and engineering infrastructure in states that have historically received less federal funding than other states. NSF’s investment in Utah EPSCoR’s iUTAH project has transformed the nature of scholarly collaboration across our state. Where once our researchers worked in silos, we have built a culture of collaboration that extends to all aspects of our scientific enterprise: the writing of research papers and grant proposals, teaching our classes, and training the next generation of scientists. Our core facilities, including analytical laboratories, environmental observatory, and cyberinfrastructure, provide a research and training platform to integrate these activities and have leveraged an additional \$16M in new awards to support research and education in subjects related to the environment and sustainability.

iUTAH is supporting STEM (science, technology, engineering, and math) initiatives in educational settings across Utah, reaching learners at all levels. In doing so, we have created a pipeline toward a diverse STEM workforce. Many of iUTAH’s first student participants are now graduating and launching the next phase of their careers in STEM fields.

Utah EPSCoR is also “graduating.” Because our state’s faculty have been submitting more research proposals that are being funded, Utah joins two other states (Iowa and Tennessee) that no longer qualify for the NSF EPSCoR program. Utah is proud to be recognized alongside these states as exemplars of success in NSF’s investment to improve research and human infrastructure.

I want extend a hearty thanks to all the iUTAH teams who have tirelessly worked to make this a successful year. I’ve enjoyed transitioning from a regular faculty researcher and educator to one who facilitates these activities across our many institutions.

Sincerely,

*Michelle A. Baker*

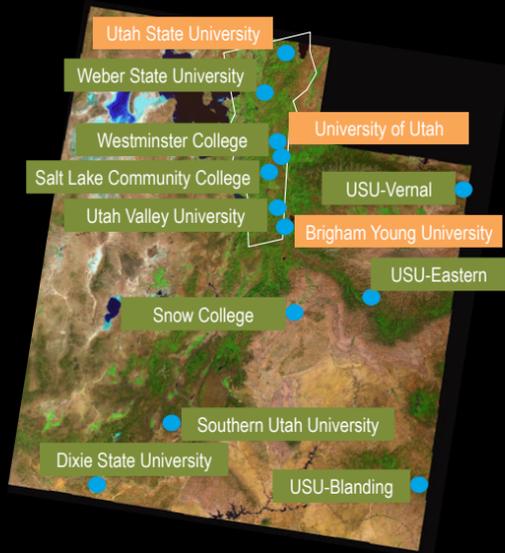
Michelle Baker, iUTAH EPSCoR Project Director

## iUTAH EPSCoR Mission

iUTAH EPSCoR’s mission is to enhance collaborative partnerships to better understand how to sustain Utah’s water resources by (1) developing novel approaches to integrated research and training, and (2) expanding and improving the state’s economic, educational, and research capacity and competitiveness.

# Scholarly Collaborations Statewide

Advancing Knowledge & Building Capacity



iUTAH EPSCoR enhances collaboration among institutions of higher education across the state of Utah.

Water systems are complicated. So are the problems Utah faces in sustaining our water resources. Solving those problems will require teams of researchers who bring together different backgrounds, ideas and perspectives to address the complex web of factors that created the problem. And because Utah's universities have different strengths and different missions, members of those teams likely will come from more than one institution.

*Continued on page 4*

## iUTAH Research Collaborations

**333** Total Presentations  
111 in Year 3

**35** Total Publications  
11 in Year 3

**116** Total Research Proposals  
46 Awarded By:

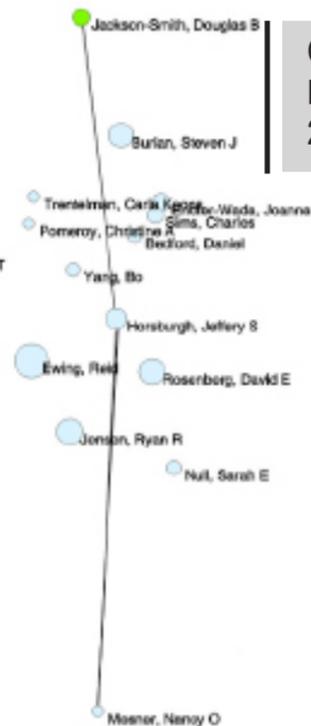
- US Geological Survey
- Local non-profits
- NSF
- State agencies

**67%** iUTAH Graduate Students  
Have cross-institutional committees

**16.5** Million \$ in Additional Funds  
Awarded to Participants  
Including one large (\$11M) award from USAID

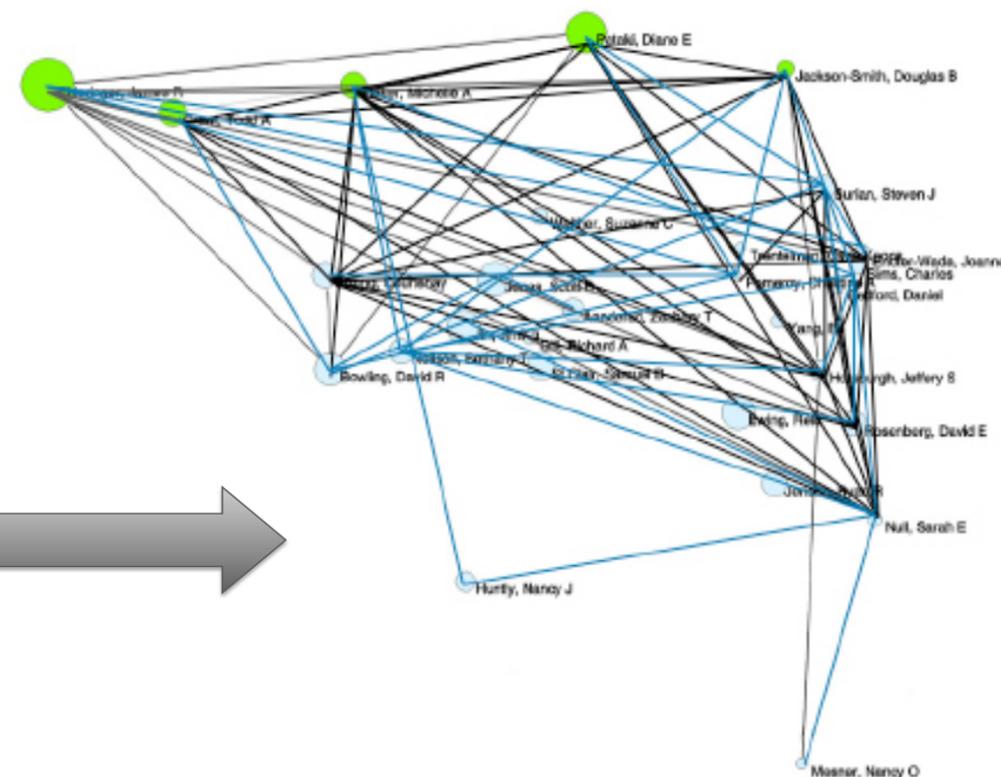
iUTAH has strongly enhanced research collaborations across Utah as evidenced by co-authored publications and research proposals during our first three years. Prior to the EPSCoR track 1 award, there were few cross-disciplinary publications within institutions, and even fewer cross-institutional publications.

iUTAH research products have advanced knowledge within and across disciplines over the last three years and the numbers are only getting larger.



Co-authoring among EPSCoR authors 2008-2012 (Baseline)

Collaborations from 2012-2015



Co-authoring among EPSCoR authors 2012-2015

Collaborative proposals among EPSCoR authors 2012-2015

Individual Authors

- Principal investigators
- Faculty members named in the original proposal as participants

\*size relates to the size of publication record

The iUTAH team has emphasized collaboration among researchers, and instilling the values of collaboration within our students. There will always be a place in science for studies by a single investigator, or by an advisor and her students. But increasingly research funders value multi-disciplinary science. When we launched iUTAH, one of our goals was to help Utah's environmental scientists work more closely with colleagues from other academic units across campus or across the state. To boost Utah's research and development capacity, and to increase our state's competitiveness for extramural funding, we needed to transform how our current and future scientists take part in the research process.

Have we been successful? Here are some numbers that help tell the story:

- Since iUTAH started in 2012, 11% of the peer-reviewed articles published with iUTAH support involved authors from more than one academic department or institution. Of the more recent papers, those that were submitted to journals and were still under review, 20% involved more than one department or institution – demonstrating how collaboration is increasingly a part of our research culture.

- iUTAH scientists have submitted 116 proposals for external funding since 2012; of those, 28% were cross-disciplinary and 11% cross-institutional.

- Of the 15 graduate students who have formed supervisory committees for their thesis or dissertation, 10 have at least one committee member who works at a different Utah institution.

- Two university courses have been developed involving multiple institutions. iUTAH scientists Jeffery Horsburgh (USU) and Steven Burian (U of U) teamed with professors at Brigham Young University, the University of Virginia, and the University of Washington to offer a course in Hydroinformatics that attracted 45 students in Fall 2014. In Fall 2015, iUTAH's Ryan Dupont (USU Civil & Environmental Engineering) and Sarah Hanners (U of U City & Metropolitan Planning) will co-teach a senior- to Master's-level course on Green Infrastructure.

How did we achieve this? One key factor is that iUTAH's team-oriented structure and culture encourages our scientists to learn what their colleagues are doing, and might be able to do in the future. We frequently meet via videoconference with iUTAH colleagues across campus and across the state, sharing ideas that not only advance our current research, but also lead inevitably to new collaborations and new knowledge.

It's an old cliché that many hands make light work. In Utah, we are bringing together many minds to make lighter the difficult task of safeguarding our water future.



# All-Hands Catchment Sampling

A watershed is much more than water. The characteristics of a stream depend not only on what's happening in the water itself, but on the conditions and processes of the land that it drains. That's why iUTAH researchers launched a new initiative in 2015 that will provide a comprehensive snapshot of the hydrologic, biogeochemical, ecological and meteorological state of our three study watersheds: Logan, Red Butte, and Provo.

Through an activity called "synoptic sampling" – bringing together scientists from different areas of expertise to measure many aspects of a location in a short period of time – iUTAH researchers will learn more about how different components of our watersheds are linked together. Students, post-doctoral scholars, and faculty researchers have joined forces to collect data on plants, weather, microbes, insects, and soils that can be superimposed on our hydrological and chemical observations of the streams themselves.

By carefully choosing where and how to sample, the effort is designed to help scientists understand how measurements may vary depending on the size of a "catchment" (a term for a watershed of any size). Rather than treating high-elevation forests, farming areas, and urban areas as separate environments, the "nested catchment" approach employed by iUTAH's synoptic sampling campaign allows scientists to better understand how these land uses interact to affect the whole watershed. The resulting data sets, analyses, and models will help us understand how both surface and ground water resources respond to climate and land use across the Wasatch Front, and ultimately yield insights that can help decision makers address the looming challenges in water resource management in Utah and throughout the semi-arid west.



# Connecting All the Pieces

iUTAH's goal is to understand how urbanization and climate change will affect water supply and demand in Utah. At first, the problem may seem simple – if there's enough snow or rain, there will be enough water; if not, we must get by with less. But of course it's not that simple. It's crucial to understand when and how water travels from snowfields to household faucets, who needs water where and why, and what this means for our natural and built environments. The closer we look at the problem, the more complex it appears.

That's why much effort in the early phase of the iUTAH project was devoted to creating a conceptual model of Utah's water system – a framework that helps us think about all the different ways that infrastructure, environment, and people intersect to shape how water is managed now, and could be managed in the future, to ensure a sustainable supply for a growing population and economy in our state.

That yearlong effort bore fruit in March 2015 with the publication of a conceptual framework for studying human-water system sustainability that can be applied not only to water management in Utah but to any situation where changing circumstances are likely to affect the supply of a critical natural resource to humans. iUTAH post-doctoral scholar Rebecca Hale led the 25-person team whose article, "iSAW: Integrating structure, actors, and water to study socio-hydro-ecological systems," appeared in the journal *Earth's Future*. The article can be downloaded free of charge from the journal's website.

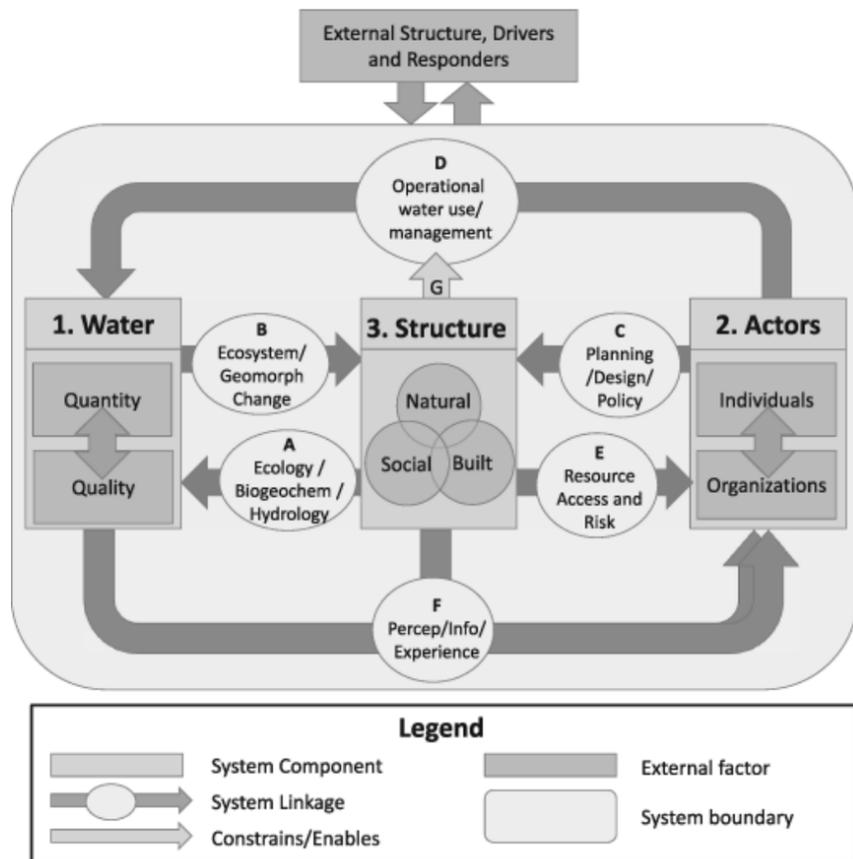
Hale's team wanted to produce a framework for water resources research that would draw upon ideas from multiple academic

disciplines from hydrology to ecology to sociology; could address management challenges from local to regional scales; and could be applied not just to water but to any human-environment system.

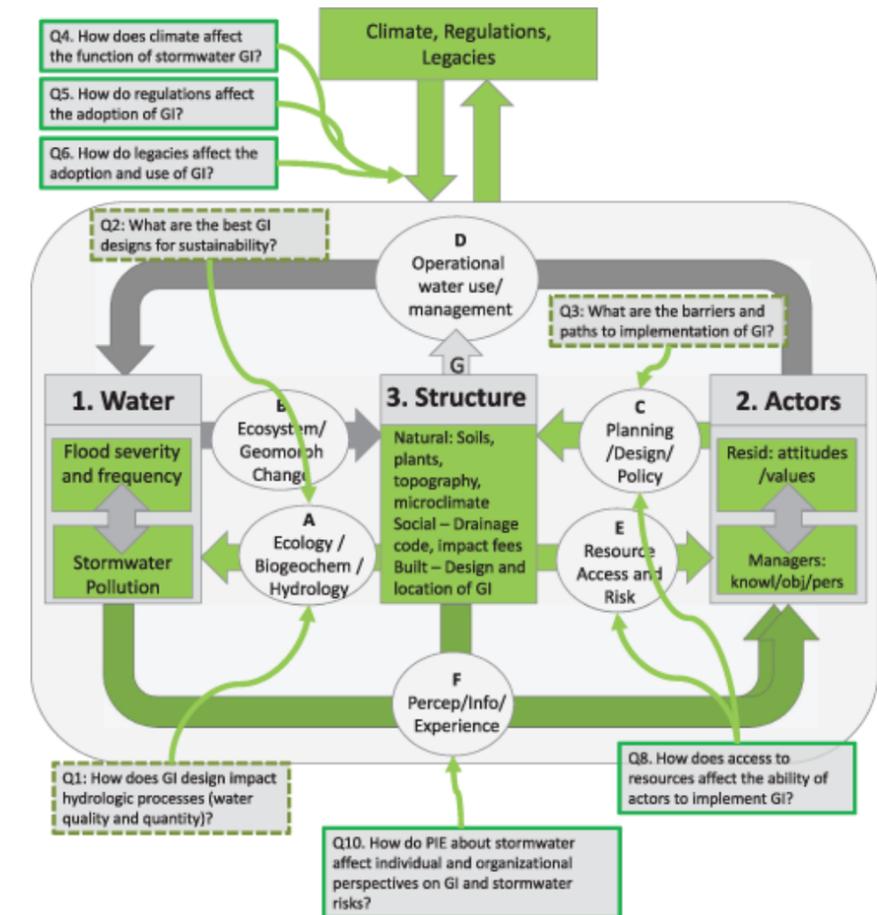
The model (Fig. 1) suggests that to understand a water system, one must be able to characterize three major components: water, in terms of both quality and quantity; actors, i.e., the individuals and organizations within a system's boundaries that make water-related decisions; and structure, the natural, built, and social features of the system that shape how water moves and water quality changes throughout the system. Also critical is to learn how those components are linked together through environmental and societal processes.

After agreeing on the model, the team tested it on two key topics: the effects of a changing climate on water supply and demand, and the expanding use of "green infrastructure" – using plants, soils, and natural processes to manage water. For example, the green infrastructure model (Fig. 2) includes system components such as flood severity and storm water pollution (water); residential attitudes and managers' knowledge (actors); topography, street layout, drainage regulations (structure); all linked by processes as varied as climate, urban planning, and water chemistry. After agreeing on what the model should include, the team created a set of research questions whose answers can assist water decision-makers in using green infrastructure most effectively.

Hale, R. L., Armstrong, A., Baker, M. A., Bedingfield, S., Betts, D., Buahin, C., Buchert, M., Crowl, T., Dupont, R. R., Ehleringer, J. R., Endter-Wada, J., Flint, C., Grant, J., Hinners, S., Horsburgh, J. S., Jackson-Smith, D., Jones, A. S., Licon, C., Null, S. E., Odame, A., Pataki, D. E., Rosenberg, D., Runburg, M., Stoker, P. and Strong, C. (2015), iSAW: Integrating Structure, Actors, and Water to study socio-hydro-ecological systems. *Earth's Future*, 3: 110–132. doi:10.1002/2014EF000295



**Figure 1:** The iSAW conceptual framework is organized around three main structure, actor, and water components (gray boxes), seven key linkages (arrows), and a system boundary (light grey shaded box) that separates internal and external (box with dark shading) components.



**Figure 2:** Research questions for storm water green infrastructure (GI). Questions in boxes with dashed borders are the original project research questions developed before the framework, whereas questions in boxes with solid borders were generated using the framework.



students from multiple universities. As of late spring, the teams already had gathered data from more than 1,200 people from Logan to Cedar City. Jackson-Smith expects that by summer's end they will have contacted more than 3,000 Utah residents at grocery and department stores and other public locations.

"It's really different from anything else I've done," said Reva Laurella, a Weber State senior in Political Science who has been working alongside USU student Jordan Risley and two members of the iFellows summer undergraduate research program, Matt Johnson (Weber State) and Viviane Baji (USU). "It's more data-based than I'm used to, and it's really nice to work with someone who's not in my major, so I can see how their experiences differ from my own."

Not content simply to connect iUTAH's workforce development and research through the project, Jackson-Smith and Flint also are working with Amber Jones and Jeff Horsburgh from our Cyberinfrastructure team and iUTAH Visualization lab (iVL) to create a web-based survey data viewing platform, to be launched in the summer of 2015. The Utah Water Survey website allows viewers to ask their own queries about the data – for example, a municipal water manager might want to know if homeowners think differently about water cost and infrastructure than renters, while a curious citizen might compare the concerns of residents in his or her zipcode about water quality to those of residents from elsewhere in the state. The data viewer is accessible through iUTAH's website ([www.data.iutahepsc.org/surveys/](http://www.data.iutahepsc.org/surveys/)).

"Water projects like this are really important," said Caroline Alsterberg, a team member from SLCC who hopes ultimately to earn a Master's degree in Public Health. "Coming from California, I've seen what can happen to our water. I'm really glad to help work on something like this."

An inventive new initiative by iUTAH scientists links research to teaching and stakeholder engagement by involving high school and college students in data collection, then enhancing the value of the science via an interactive web tool for use by water decision-makers and the public.

The Utah Water Survey project originated in July 2014 when Utah State University (USU) sociologists Doug Jackson-Smith and Courtney Flint were asked to devise a social science exercise that could be part of iUTAH's Summer Institute, a program that stimulates interest in science careers. Summer Institute teams up undergraduate students with high school students and teachers who join in various data-gathering activities over an intense week.

For their exercise, Flint and Jackson-Smith asked the teams to survey shoppers at Logan-area grocery stores, using iPads to gather data about people's perceptions of water supply and quality, and their concerns about water and other environmental issues. The brief survey questions were based on a more extensive household survey being conducted that summer in 12 cities within iUTAH's study watersheds.

Spending a few hours in the field, the Summer Institute teams gathered information from several hundred shoppers and analyzed the data the same day. A poster based on the results was shared at the 2014 iUTAH Summer Symposium by the students and teachers.

The success led Jackson-Smith to wonder what might happen if the iPad survey were expanded to a wider range of public venues statewide, using

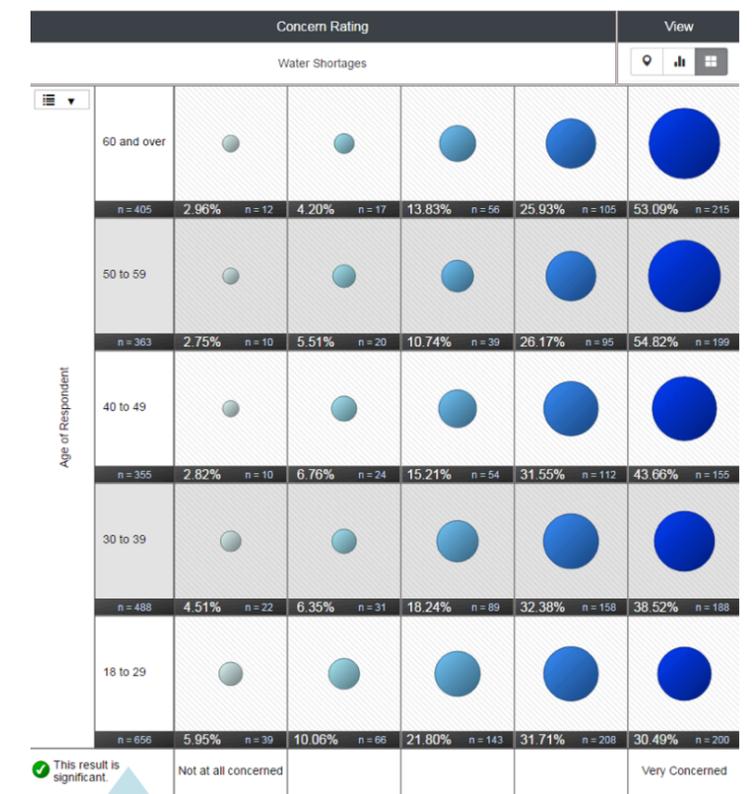
a rigorous research design that would allow iUTAH social scientists to use the data to better understand patterns of behavior and attitudes around the state and across demographic groups.

Jackson-Smith reached out to other Utah colleges and universities, ultimately connecting with colleagues at Salt Lake Community College, Southern Utah University, the University of Utah, Utah Valley University, and Weber State University, as well as Rowland Hall-St. Marks, a private high school in Salt Lake City. Funding for the project came from iUTAH's social science research budget as well as our Research Catalyst Grant program, which supports student research at our primarily undergraduate-serving partner institutions.

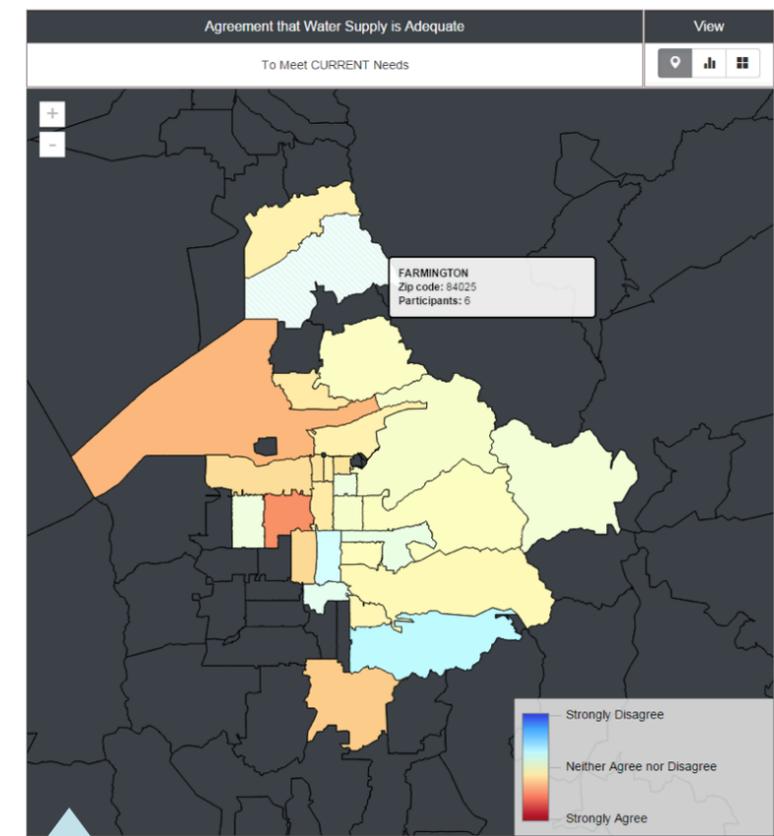
Surveying began during the school year and is continuing this summer, involving teams of



iUTAH undergraduates Joydino Beyale, Viviane Baji, Jordan Risley, and Matt Johnson conduct the Utah Water Survey in front of a Logan-area store in May, of 2015.



Screenshot of survey data web-viewer showing a crosstabulation of respondent age against concern about water shortages. People over 50 appear to be more concerned than young adults.



Zipcode maps available on the survey data web-viewer (see above) allow people to explore geographic patterns in responses to different questions. Agreement that the current water supply is adequate varies across the Salt Lake Valley.

# Education, Outreach & Diversity

## *Making Connections*

iUTAH's Education, Outreach and Diversity programs engage students and stakeholders throughout Utah in water research and education. We work with our many partners to share the latest information about water and the sustainability of Utah's water systems, and we seek out opportunities to enhance Science, Technology, Engineering and Math (STEM) education in Utah, with special attention to groups that are under-represented in science. Through these efforts we are committed to helping build an inclusive and knowledgeable STEM workforce of tomorrow.



# Our New & Ongoing 2015 Partnerships

## Education, Outreach & Diversity Innovation Awards

With Education, Outreach and Diversity (EOD) Innovation Awards, iUTAH engages new partners or programs that enhance the outreach goals of iUTAH EOD. During year 3, iUTAH provided awards to seven partners.



### **The Leonardo - Leo On Wheels Science Outreach Carts About Water**

Developing water-focused outreach carts for middle school students that provide opportunities for current iUTAH research to be shared with students state-wide

*Learn more on page 15*



### **Rose Park Elementary School, Salt Lake City School District - Jordan River Water Watch**

Exposing 4th grade students to innovative interdisciplinary research and systems-level knowledge of the interactions among water, demand, and climate with a novel approach to integrated research and training



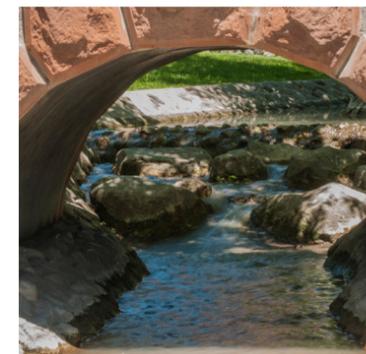
### **Garth and Jerry Frehner Museum of Natural History, Southern Utah University - Green Roof Agriculture Exhibit and Outreach**

Creating green roof infrastructure to assist with research and educational activities, in partnership with the iUTAH Research Catalyst Grant program



### **The Natural History Museum of Utah - "The Whole Gamut," A Digital Interactive at NHMU**

Collaborating with iUTAH scientists and the iUTAH Visualization Lab, NHMU is designing and building an exhibit kiosk to visualize iUTAH GAMUT site outcomes



### **Global Change and Sustainability Center, University of Utah - Student Field Trips to Red Butte Creek**

Elementary student field trips to Red Butte Creek focusing on water issues in the urban environment



### **Salt Lake Community College - iUTAH Water Girls Program**

Place-based STEM learning for middle school girls

*Learn more on page 14*



### **Utah Public Radio- "The Source"**

A monthly 60-minute radio program sharing stories about water in Utah as it relates to research, the environment, recreation, and the economy

*"This project has been extremely beneficial to the SUU campus and Cedar City community, and it would not have been possible without iUTAH EOD funding, and we are very thankful." - Dr. Jacqueline Grant, SUU*

*"At Utah Public Radio we have an engaged and curious audience that wants to learn everything there is to know about what's going in the state. The award from iUTAH has given us the opportunity to highlight water issues and research that matter to our listeners. The resulting program, called The Source, has already become a listener favorite. It's exactly the kind of content they expect from public radio and we're really happy to be able to deliver it each month."*

**- Jennifer Pemberton, UPR**

# iUTAH WaterGirls Field Experience Program



How do we engage middle school students in science? It's easy, DO science with them! iUTAH WaterGirls was developed as a collaboration between Salt Lake Community College, Salt Lake City School District, and iUTAH to get middle school girls out into nature exploring their local outdoor environment and learning for themselves about water in Utah's canyons.

Studies show that the middle school years are a critical time when female students begin to lose interest in a STEM career. An effective method to retain female students' interest in science and desire for a career in STEM is laboratory and field experiences. Exposure to field research helps students experience the true nature of science and research, while nurturing a sense of curiosity about the world around them.



During WaterGirls, students visited field sites in Little and Big Cottonwood Canyons. On each field day students were tasked with collecting water quality data, including pH, temperature, electrical conductivity, total dissolved solids, and dissolved oxygen. They also collected and identified macro-invertebrates found living in the streams. Weather observations were completed, using hand-held instruments to record temperature, wind, and humidity, as well as cloud and precipitation data. Students discussed and analyzed their data to determine how these values change at different sites and in different canyons, what the data tell them, and what that data tell them about the health of these streams and watersheds. Scientists and volunteers from Salt Lake Community College, Salt Lake City School District, University of Utah, and the Colorado Basin River Forecast Center, all taught the students and shared their expertises.

Following the field experience, students attended a wrap-up and reflection session to communicate their findings to audiences of their choosing. This could include their fellow students, their families, the general community, or others. The goal of this step is to help students improve communication skills and demonstrate their interest in science to others. By communicating the impact of water systems to their home place, students begin to create ownership of both their environment and their interest in STEM fields.

*"WaterGirls is an important project for me since I was inspired to become a scientist by similar experiences when I was growing up. Many students aren't exposed to female scientists and it is hard to imagine a career path when you don't know it exists. I believe the two things that make WaterGirls effective are that it offers students one on one interactions with scientists and it gets students out into the field actually doing science instead of just learning about it."*

- Maura Hahnenberger,  
WaterGirls Coordinator

# Expanding the Reach of "Water" at the Leonardo

In 2014, iUTAH partnered with Salt Lake City's downtown science museum, The Leonardo, to develop an interactive exhibit engaging people of all backgrounds and ages in the exploration of water. Debuting to the public on July 3, 2014, the exhibit "Water" featured installations exploring the physical and chemical properties of water, issues related to the availability and access to clean water, actions and best practices related to water sustainability, highlights of on-going research throughout the State of Utah, and a hands-on water lab.

"Water" was originally envisioned as a temporary two-month prototype exhibit to engage a few thousand visitors. After a successful first few months, the exhibit has remained open far past the original timeline, reaching over 120,000 individuals, and 18,000 students in 11 months. The exhibit is now slated to remain open through the end of 2015.

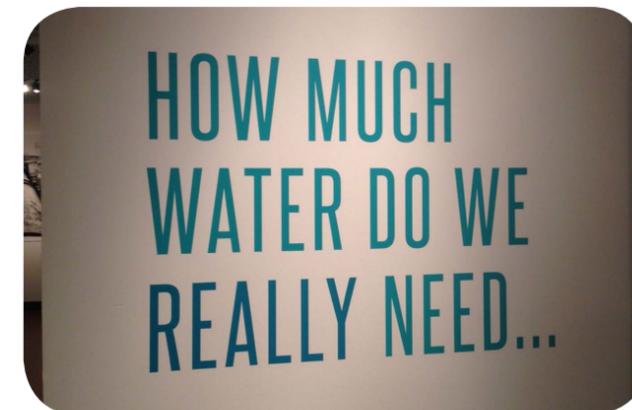
The Leonardo has also developed supplemental pre- and post-visit lessons for educators bringing students to the exhibit. Through these lessons, and direct interaction with the exhibit by the general public and K-12 students, The Leonardo has seen a greater understanding and sense of wonder around the complexity of the water molecule, a deeper appreciation for water as a non-renewable resource, and an interest by



students and visitors in the current and future use of water in our community.

Water is a topic that The Leonardo will continue to interpret on an on-going basis. The "Water" exhibit curriculum and activities, along with the content, can be repurposed in a variety of other approaches including hands-on science carts, downloadable curricula, and citizen science projects. "Water" has spurred the continued interpretation of water as a topic at The Leonardo. "Water", the exhibit, is the first example of The Leonardo's commitment to interpreting this topic for the general public for years to come, both at the museum and through their outreach initiatives.

To further support this endeavor, iUTAH awarded the museum an EOD Innovation Award in 2015 to develop water programs for The Leonardo's mobile science outreach program, Leo On Wheels. This water-based program will travel to middle schools across Utah, engaging students with concepts of water sampling and water quality, water transportation, and snow. The museum plans to incorporate concepts of iUTAH research and results into the curriculum. These water carts will be ready for inclusion in the Leo on Wheels program for the 2015-2016 academic year, and will be included in the program indefinitely.





# Commitment to Diversity

Utah's demographics are changing, just as they are across the United States. The minority share of the state population has risen from just over 2% in 1960 to 20% today, and it's predicted to reach 30% by 2050. Already in Salt Lake City more than half of children under the age of 15 identify as minority group members. This means the Utah workforce of tomorrow also will be more diverse than ever before.

Yet women and minorities' participation in science, technology, engineering and math (STEM) careers remains disproportionately low. If Utah is to remain competitive in STEM fields, we must improve recruitment and retention from within these under-represented groups. That's why iUTAH increased our diversity enhancement efforts with several new initiatives in 2015.

Through a developing partnership with the Education Access and Outreach program at Weber State University, we provided financial support and STEM-focused presentations to 180 high school students attending the 2015 Multicultural Youth Conference at Weber State in January. This summer iUTAH has been planning a STEM track at Weber State's Summer Summit Leadership Institute, a four-day residential program for under-represented high school seniors in the Weber, Ogden, and Davis school districts.

Promoting female participation in STEM careers was the goal of iUTAH WaterGirls, a water-focused field experience program for middle school girls headed up by Maura Hahnenberger, an assistant professor of geosciences at Salt Lake Community College.

iUTAH also supported travel for 16 Native American students who attended a joint regional conference of the American Indian Science and Engineering Society (AISES) March 5-7 at the University of Utah. And in May, 21 Native American students from Utah State University's regional campus in Blanding arrived in Logan to spend four weeks working alongside USU researchers. All participated in a tour of iUTAH and water research facilities, and two students spent their internships rotating through iUTAH labs. (For more about this program see the story on new EOD initiatives, p. 19).

Finally we supported the production of a new book on water by Native American author/educator Nancy Bo Flood, who has published several books written from a Navajo perspective. *Water Runs Through this Book* weaves science and poetry, illustrated by Jan Sonnenmair's photographs, to stimulate awareness of and a conservation ethic toward water among readers of all ages.



Multicultural Youth Conference at Weber State University



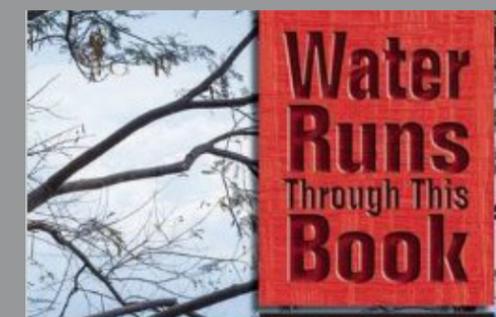
iUTAH WaterGirls



AISES Regional Conference



USU Blanding Native American students



Nancy Bo Flood's book about water- ISBN: 9781936218134



# iUTAH Initiatives



## Strengthening Utah's STEM Workforce



iUTAH's Education, Outreach & Diversity (EOD) teams operate a variety of programs that promote development of a more robust science, technology, engineering, and math (STEM) workforce in Utah, enhance gender and ethnic diversity within STEM fields, and communicate scientific findings about water and sustainability to the general public.

In 2014-15, we continued iUTAH's successful programs from previous years, including our summer-long iFellows research experience for undergraduates; the one-week Summer Institute geared towards high school teachers and students, as well as beginning college students; and our Research Catalyst Grant program, which supports faculty research with substantial undergraduate student involvement at primarily undergraduate institutions in Utah.

We also added two new workforce development programs to broaden our reach into our state's student communities. In May, we launched a new partnership with Utah State University and its USU-Eastern campus in Blanding, which serves a student population that is over 60% Native American. As part of this collaboration, iUTAH participated in a new four-week internship experience that brought 21 Native American students from Blanding to Logan to immerse themselves in the daily activities of a major research university. During orientation week, iUTAH hosted a half-day session, beginning with an introduction to critical Utah water issues, followed by an opportunity to ask questions and discuss the material presented, and ending with a guided tour of water science and engineering facilities on campus.

Two of the interns, Joydino Beyale and Logan Harvey, both engineering majors, then spent the next three weeks in iUTAH labs learning about the breadth of water-focused science. One week was spent with Doug Jackson-

Smith's Utah Water Survey crew (see story, pp. 6-7). The next week they joined Ryan Dupont's civil engineering lab group on a project to study how vegetation might be used to remove pollutants from storm water runoff. The final week was spent in Michelle Baker's aquatic ecology lab, where they helped prepare and then implement an experiment to study how pharmaceuticals affect microbial biofilms in Red Butte Creek above Salt Lake City. During their stay, Logan and Joydino worked and learned alongside participants in our iFellows program.

The second new workforce development initiative begun during 2014-2015 is the iUTAH Traineeship Program, which allows students to work alongside faculty, staff, and graduate student researchers at our three research universities (University of Utah, Brigham Young University, Utah State University) throughout the year. In conceiving of this program, it was iUTAH's main goal to provide students an opportunity to develop technical proficiency and acquire marketable skills that can be transferred to a professional, non-academic work environment in a STEM field.

Six of iUTAH's fifteen trainees – Brett Boyer, Simone Jackson, Scott Collins, Jordan Smith, Dane Broghy, and Ben Rider – work with the highly skilled technicians who maintain iUTAH's GAMUT water and climate observatory sites in the Logan River, Red Butte Creek, and Middle Provo River watersheds. They are learning how to maintain and trouble-shoot sophisticated electronic monitoring equipment – skills that will surely be in demand in the private sector after graduation. Other trainees are gaining professional skills in data management, urban agriculture, environmental consulting, ecological and genetic informatics, and storm water management in labs at USU, U of U and BYU.

# Training the Next Generation of Scientists One Step at a Time

iUTAH's Workforce Development programs are designed to inspire students to choose careers in science, technology, engineering and math (STEM), and to prepare for success. Undergraduate students have the opportunity to develop their research skills while working alongside graduate students and faculty. We also employ post-doctoral fellows who work within a research team, gaining valuable experience and co-mentoring that an interdisciplinary program offers. Three years after the start of the iUTAH program, our students are beginning to make their way into their new careers. We'd like to introduce you to just a few of these iUTAH "graduates" and to celebrate their accomplishments:



**Grant Holyoak**  
**Undergraduate Researcher**  
*May 2014 - May 2015*

Grant is an undergraduate student at Utah State University majoring in both Sociology and Economics with a minor in Statistics. He was an iUTAH survey supervisor and administrator during the summer of 2014, where he managed a field team of undergrads who distributed a household survey entitled "Utah's Water Future." Once the survey data was available, he conducted an analysis of the data. During the spring of 2015, Grant presented these findings at multiple undergraduate research conferences including The Council on Undergraduate Research's "Posters on the Hill" event in Washington, DC, where he got to present his findings directly to all the members of Utah's congressional delegation.

Grant is currently employed as an intern at the U.S. Department of State's Foreign Service Institute in Arlington, Virginia and looks forward to pursuing his research interests back at USU in the Fall.



**Andrea Armstrong**  
**Graduate Researcher**  
*August 2012 - July 2015*

Andrea Armstrong has been a graduate research assistant with iUTAH since the Fall of 2012, and will complete her doctorate in Sociology at Utah State University. Her dissertation research examines how local water organizations, such as irrigation groups and municipalities, manage water resources in northern Utah. As a researcher with iUTAH, she partnered with the Utah Stormwater Advisory Committee to implement a statewide survey of stormwater managers and conducted over 50 interviews of local water managers.

In the fall of 2015, Andrea is taking the position of Assistant Professor of Environmental Studies at Lafayette College in Easton, Pennsylvania. There, she will continue to work with undergraduate students on research surrounding water and land use policy.



**Steven Hall**  
**Post-doctoral Researcher**  
*August 2013 - August 2015*

Steven Hall worked with iUTAH as a postdoctoral researcher over the past two years. Hall just accepted a position as an assistant professor in the Department of Ecology, Evolution, and Organismal Biology at Iowa State University, where he will continue his work on carbon and nutrient cycling at the interface between terrestrial and aquatic ecosystems. He says that iUTAH was a great opportunity to collaborate with a wide range of colleagues across disciplines, and he valued the ability he had to expand his scientific perspective. Hall particularly enjoyed the opportunity to interact with faculty and students across the various campuses and valued the chance to pick up some new analytical skills at the University of Utah SIRFER facility.

He hopes to stay involved with iUTAH in the future, especially given the momentum that the project has achieved. He also hopes that the datasets he has collected will spur future collaborations as the modeling activities of the program begin to spin up.



**Rebecca Hale**  
**Post-doctoral Researcher**  
*August 2013 - July 2015*

Rebecca Hale was a postdoctoral fellow with iUTAH over the past two years, during which she led the development of the iUTAH conceptual framework, iSAW, and conducted research on the history of flood and stormwater management across the iUTAH study area. Trained as an ecosystem ecologist, iUTAH was a great opportunity for Hale to develop skills in the social sciences, through her own research as well as through participating in the household survey. She particularly appreciated the opportunities, through the conceptual framework and the household survey, to collaborate with faculty and students with diverse perspectives about and skills for studying water and human-environment interactions.

In the summer of 2015, Hale will be moving up the road to start a position as a research assistant professor at Idaho State University, where she will work on social-ecological systems and ecosystem services as part of Idaho's EPSCoR project MILES. She's excited to continue working in urban dryland systems and hopes to continue collaborations with iUTAH researchers.

# Synergy in Action

## Engaging the EPSCoR Network

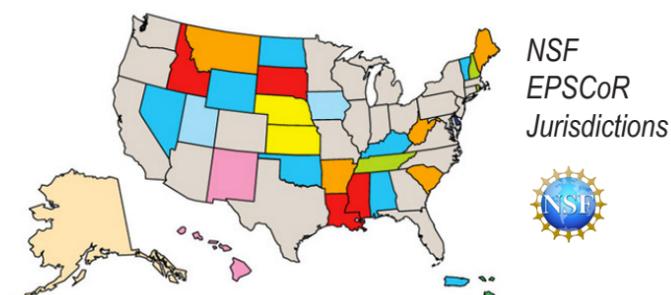
Capacity building does not end at Utah's borders. In pursuing our mission of innovative research and education to benefit the citizens of our state, iUTAH is not alone. Rather, we are part of a larger network of 31 EPSCoR jurisdictions across the country. By joining forces with other states in pursuit of common approaches to diverse problems, we are able to expand the reach of our activities while at the same time leveraging resources and expertise from a geographically diverse group of stakeholders, turning co-actors into collaborators. It's the iUTAH culture of collaboration writ large.

In Year 3, iUTAH joined with four other EPSCoR jurisdictions to expand outreach to traditionally underrepresented minorities in science, technology, engineering, and math (STEM) by co-hosting a booth at the 2015 Society for Advancement of Chicanos and Native Americans in Science (SACNAS) National Conference in Los Angeles. EPSCoR staff and students from Maine, Nevada, New Mexico, Rhode Island, and Utah spent four days introducing minority students from across the United States to EPSCoR opportunities. This successful example of cross-jurisdictional synergy is slated to continue throughout the remainder of the iUTAH project. iUTAH again teamed up with New Mexico EPSCoR to showcase our programs at the Joint Region 1 and 3 Conference of the American Indian Science and Engineering Society (AISES). Here, we also provided travel support for 16 Native American students to allow them to make the journey to Salt Lake City to interact with their peers and network with a large number of professionals from STEM disciplines.

Ongoing involvements with other EPSCoR jurisdictions include iUTAH's continued leveraging of resources and expertise of the joint Utah-Wyoming EPSCoR CI Water project, whose personnel include many active iUTAH participants. Our Education, Outreach and Diversity (EOD) Coordinator, Ellen Eiriksson, was re-elected to a second year of

service on the EOD Advisory Council, a consultative body that serves as an important voice for the EPSCoR-wide EOD community and liaison to the Project Directors' (PD) and Project Administrators' (PA) Councils. iUTAH Assistant Director and Project Administrator Andy Leidolf began his first term as a Member of the PA Council in May at the conclusion of the Spring PD/PA Meeting in Arlington, Virginia. Both of these individuals, by serving the larger EPSCoR community, are playing an important role in fostering synergy and collaboration among their peers.

Throughout the year, iUTAH staff and participants have also attended a number of national conferences aimed at bringing together scholars and researchers from across the globe to promote and facilitate the effective conduct of integrative, transdisciplinary research for the betterment of society. The National Alliance for Broader Impacts (NABI) 2015 Summit in Madison, Wisconsin drew a sizeable iUTAH contingent composed of researchers, EOD and administrative staff, and institutional representatives, who joined their colleagues from many other EPSCoR jurisdictions for three days of workshops and meetings on the meaning and implementation of NSF's Broader Impact criterion. The Science of Team Science (SciTS) 2015 Conference held at the National Institutes of Health in Bethesda, Maryland, was another important event with participation by iUTAH staff. As we prepare to move into year 4 of our project, iUTAH will continue to actively engage with other EPSCoR jurisdictions to advance our mission and generate results for the citizens of our state.



# iUTAH Participants



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*Geography*
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*Geology and Geophysics*
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*Geology and Geophysics*
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