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Federal Agency and Organization Element to Which Report is Submitted:	4900
Federal Grant or Other Identifying Number Assigned by Agency:	1208732
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Signature of Submitting Official (signature shall be submitted in accordance with agency specific instructions)	Michelle A Baker

Accomplishments

*** What are the major goals of the project?**

The overarching goals of the Utah RII EPSCoR were developed in light of our vision and mission:

Vision: The vision for iUTAH EPSCoR is to lead the nation in scientific, educational, and innovative solutions for water management and sustainability by conducting interdisciplinary research of the interactions among water, people, and ecosystems; and by developing a state-of-the-art hydroinformatics program that incorporates large data with interdisciplinary modeling and visualization.

Mission: The mission of iUTAH 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 the state's economic, educational, and research competitiveness.

Overarching Goals: The overarching goals of the Utah RII Track-1 are to create sustainable infrastructure improvements to benefit water-related science and technology throughout the state, increase national research and development competitiveness, and expand our workforce of researchers, educators, and practitioners to ensure a vital economy and sustainable future. Broad goals are presented below, and more specific goals, activities and timelines are provided in Table 1 in the supplemental documents.

1. Enhanced research capacity of the biophysical, social and engineered water environment. This will be accomplished by facilitating cross-campus and interdisciplinary research activities and by building and supporting state-of-the-art multi-user research facilities.

Research Focus Area 1 (RFA1) – Biophysical System Goals: Improve Utah's capacity to monitor and understand the ecologic/climatic/hydrologic (hereafter ecohydrologic) system of the Wasatch Range Metropolitan Area (WRMA). This will be achieved by improving watershed-scale measurement capacities via a networked environmental observatory, the Gradients along Mountain to Urban Transitions (GAMUT) Observatory. This instrumentation will support interdisciplinary teams and research projects aimed at gaining a better understanding of the biophysical processes that influence Utah's water resources.

Research Focus Area 2 (RFA2) – Social and Engineered System Goals: Improve the capacity of Utah's science community to gather and analyze social and engineering system data on coupled water systems. This will be accomplished by interdisciplinary research projects aimed at understanding the interactions between urban form, environmental change, built water infrastructure, and decision-making in terms of water use. A Green Infrastructure Research Facility (GIRF), re-envisioned as a broader "innovative Biogeochemistry of Urban Green Infrastructure" (iBUGI) will serve as a hub of research, education, and outreach activities related to how the built environment influences water quantity and quality outcomes.

Research Focus Area 3 (RFA3) – Coupled Human-Natural System Goals: Improve Utah's capacity to describe the water system as a whole by defining and including the linkages between biophysical and social dynamics; and by modeling the impact of alternative infrastructure designs and policy options on water use behaviors, the water cycle, water quality, and interconnected social and environmental systems. These goals will be achieved by synthesizing results from RFAs 1 and 2, and augmenting them with additional coupled data collection and coupled modeling. Researchers in this focus area will develop and use visualization tools to enhance communication, relevance, and understanding of the complexity of local water issues.

2. Build on Utah's existing strengths in hydrologic modeling and cyber-infrastructure from the CI-WATER and Cyberinfrastructure (CI) NSF EPSCoR awards. This will be accomplished by developing a hydroinformatics facility, the iUTAH Modeling and Data Federation (MDF); and by supporting interdisciplinary modeling approaches, linking currently disparate models, and developing and supporting data visualization tools.

The iUTAH CI team will develop hardware and software tools that increase capacity for data collection, organization, management, sharing, and synthesis to higher-level products; and increase capacity for integration of data with models.

3. Build programs to increase participation of underrepresented groups that include women, Hispanics and Native Americans. Training activities and sponsoring programs developed by the Diversity Enhancement (DE) team will accomplish this.

DE Goal: The goal of DE is to increase the individual, disciplinary, institutional, and geographic diversity of the STEM (Science, Technology, Engineering, and Mathematics) enterprise in Utah to address water sustainability issues facing Utah and the Mountain West.

4. Provide educational opportunities for a scientifically literate Utah workforce citizenry. This will be accomplished using a portfolio of activities developed by the Workforce Development (WFD) team.

WFD Goals: Enhance the STEM workforce in Utah by developing programs for a diverse range of learners that inspire students to choose STEM careers by promoting the retention of students in STEM degrees and enhancing the success of faculty in STEM disciplines. A strong STEM workforce is critical to building and sustaining research capacity and economic growth.

5. Provide societally relevant science and education regarding current and future water resources. iUTAH has a rigorous external engagement plan in place that will include state, regional, county, and local water management agencies and stakeholders. Our participatory modeling activities will provide first-hand knowledge of our enhanced sensor networks, data flows, and scenarios modeling capabilities. In turn, our research questions and modeling activities will be directly informed by the needs expressed by our water resource managers and other stakeholders.

External Engagement Goals: Design and implement programs to enhance the development of a diverse, well-prepared STEM workforce and a more scientifically literate public in the state of Utah. iUTAH will use data and results from the RFAs to engage the public in discussions about water sustainability issues throughout the western United States.

*** What was accomplished under these goals (you must provide information for at least one of the 4 categories below)?**

Major Activities: *1. Research Activities*

Year 3 of the iUTAH project was characterized by continued team building within, and significant integration of research among, all three RFAs. Participants engaged in cross-disciplinary and cross-institutional collaborations that substantially increased grant applications and manuscripts submitted, and generated stakeholder products. Facilitating the engagement of undergraduate and graduate students, as well as postdoctoral fellows, in iUTAH research was another focus of Year 3.

RFA1 – Biophysical System: Researchers and technicians in RFA1 completed instrumentation of the ecohydrologic observatory GAMUT. Three new urban water quality stations were added to GAMUT and two aquatic stations in each watershed were enhanced with nitrate sensors to evaluate nutrient loading and interpret water quality biometrics. All sensors are logging data, with real-time output available through MDF time-series analyst (Fig. 1). Regular meetings of GAMUT researchers and technicians from all watersheds via GoToMeeting™ (GTM) facilitated system maintenance, sensor calibration, and data quality control; and enhanced the application of GAMUT data to relevant research.

Team building in RFA1 included multiple joint data collections across watersheds: bi-weekly water quality sampling of chemical and biological characteristics to validate sensor data and create new links between existing data and variables not supported by current sensor technology; and synoptic snow collection to measure dissolved chemicals, heavy metals, dust, and microbes entering watersheds. RFA1 conducted monthly seminars via GTM to interpret findings, update status, and build collaborations.

RFA2 – Social and Engineered System: Social science researchers completed and began analysis of a survey of >2,400 households in 23 neighborhoods across the three watersheds. With the help of student volunteers, faculty from six Utah universities developed and implemented a general public survey using iPads that has received nearly 3,000 responses. Analysis of statewide news media coverage of water issues is ongoing. Two RFA2 social science Ph.D. students are defending their dissertations in spring of 2015 and many RFA2 graduate students have manuscripts under review.

Engineering faculty in RFA2 finalized installation of new urban instrumentation in selected stormwater drains, canals, and tributaries directly connected to GAMUT in all watersheds. Two new engineering Ph.D. students were hired and data collection continued at several urban green infrastructure sites. An integrated team of iUTAH engineers, biogeochemists, and geoscientists completed design and ordered instrumentation for GIRF re-envisioned as iBUGI (innovative Biogeochemistry of Urban Green Infrastructure). The revised budget supports a postdoctoral associate (hired in March 2015) and provides portable equipment for measurements at both the experimental facility and selected urban neighborhoods surrounding GAMUT locations along Red Butte Creek.

RFA3 – Coupled Human-Natural System: Year 3 activities in RFA3 focused on modeling coupled human/natural systems and data visualization, representing a pivot towards technical implementation of the concepts developed in Years 1 and 2. In addition to extensive modeling activities by team members, RFA3 invested substantial effort and made significant strides in creating an interdisciplinary team from RFAs 1 and 2; coordinating existing research work; and articulating a vision for a collaborative research agenda to attract new funding. Development of the iUTAH Visualization Lab (iVL) focused on innovative visualization of datasets to support research and enable stakeholder and public understanding of research is ongoing.

RFA3 partnered with the Natural History Museum of Utah (NHMU) to plan an interactive kiosk for the redesign of a climate exhibit. Planned data visualizations of near-real-time feeds include GAMUT camera imagery from Red Butte Creek to allow visitors to learn about stream hydrology and its relationship to land cover, climate, and human watershed management in an urban matrix. RFA3 also strengthened its collaboration with CI-WATER by identifying data and modeling frameworks that can be entrained into model coupling; and resources for stakeholder engagement; including a regional climate model and a detailed system-based model of the Salt Lake City public water supply system.

2. CI Activities

In Year 3, the CI team continued CI and data management support by maintaining the iUTAH CloudShare collaborative file sharing system, the MDF website, and other systems put in place during Years 1-3. CI also worked to increase virtualization server

capacity and storage infrastructure. Under leadership of CI, the iUTAH Data Policy Committee was formed to coordinate review of data collection plans and educate participants about the data publication process. To that end, CI team members produced a series of video tutorials accessible through the MDF website. Finally, the CI team again offered the graduate level course in Hydroinformatics in collaboration with CI-WATER. Year 3 participation in this groundbreaking endeavor was greatly expanded to 5 institutions.

In support of GAMUT, CI added new monitoring sites, including urban storm drains, to the overall data management and publication workflow; collaborated on revising the GAMUT quality assurance/quality control plan by adding specific protocols and standardizing data quality control procedures across all three watersheds; and revised software tools for sensor data management and quality control.

In collaboration with RFA1, CI automated publication of raw GAMUT data in text files using a standardized format in the iUTAH Data Repository; and further refined the Time Series Analyst web application; providing public, unrestricted, and timely access to and visualization of raw GAMUT data. CI also enabled discovery and access of GAMUT data via the Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI) Hydrologic Information System (HIS) HydroDesktop software. The CI team supported RFA2 research activities by updating the iUTAH Data Policy to reflect needs of social science datasets. They also advanced the iVL effort by developing a web-based visualization tool for social science survey data, with initial release anticipated in late Year 3 or early Year 4. CI worked with RFA3 researchers to develop and test new software for model coupling.

Most of the CI activities detailed above have resulted in submission of manuscripts to peer-reviewed scientific journals. Of these, two have either been published or are pending publication.

3. DE Activities

In Year 3, the Diversity Enhancement team focused on finalizing and refining such tools as the recruitment and retention plan and new surveys to assist iUTAH participants; broadening participation by diverse audiences in iUTAH activities; and supporting the engagement of diverse groups in STEM throughout the state.

4. WFD Activities

iUTAH continued facilitating and strengthening annual programs that contribute to a well-prepared STEM workforce in Utah, while connecting students with iUTAH research and concepts. The WFD team initiated a new iUTAH Traineeship program, and collaborated with three campus diversity programs at primarily undergraduate institutions (PUI) to strengthen and expand public-private partnerships.

5. Outreach Activities

iUTAH's outreach activities through Utah Water Watch (UWW) and Streamside Science continued in Year 3, engaging students and the public in all three watersheds. Additionally, iUTAH museum programming continued to integrate iUTAH research into K-12 classrooms. Outreach activities were expanded to include new partners in K-12 education, public radio, and museum programming. The iUTAH Communications team

also improved and expanded the iUTAH website and branding, and generated numerous new outreach materials.

Specific Objectives: Year 3 specific objectives closely tracked project milestones from the iUTAH Strategic Plan (Table 2). Tables 3 and 4 show the extent to which future activities and changes announced in the Year 2 Annual Report were addressed in Year 3.

1. Research Objectives

RFA1 – Biophysical System: Year 3 RFA1 research objectives centered on implementation and data collection for joint research initiatives with RFAs 2 and 3. Instrumentation of all sites was completed and is streaming data through MDF. Three new urban water quality stations were added to GAMUT. One of the mobile weather stations purchased in year 2 is currently deployed at Weber State University (WSU), a PUI; PUIs also have access to two mobile water quality/flow sensors. Additional mobile sensors are being constructed for installation at the end of Year 3 as part of urban instrumentation. Development and validation of flow rating curves is ongoing. Bi-weekly grab samples of surface water chemistry and snowpack chemistry sampling were continued.

Graduate students in *water quality* continued investigations of nutrient and contaminant relations, including stream organic matter dynamics, nutrient limitation/saturation, and *E. coli* sources and bacterial community dynamics along urbanization gradients; and measuring trace element and nutrient loads. In the *water balance research group*, research into transpiration of subalpine fir and aspen in Red Butte Creek, as well as the urban forest in the Middle Provo River; urban forest water sources in Salt Lake City; sources of in-stream flow and dust influencing snow melt; ground water gains and losses; and forest hydrology along disturbance gradients; continue to inform water yield climate models. Graduate students in *water demand or climate modeling* continued to manipulate climate models by examining how the Salt Lake City urban forest influences atmospheric transport processes and microclimate; estimating regional-scale water balance from historical climate models; studying the effects of land use/land change on climate at watershed and regional scales; and calculating energy balance and estimating evapotranspiration across GAMUT. An important Year 3 objective for RFA1 was the publication of research in peer-reviewed scientific journals. Eleven manuscripts were submitted, with four published and one accepted.

RFA2 – Social and Engineered System: A main Year 3 objective for RFA2 was sharing and review of results from the Household Survey with stakeholders, including neighborhood councils and municipal and state water managers. Survey report presentations and meetings are being held across all three GAMUT watersheds, and will serve as the basis for follow-up research and engagement activities. Another goal was the expansion of the Utah Water iPad Survey with the addition of Salt Lake Community College (SLCC), Southern Utah University (SUU), Utah Valley University (UVU), and WSU as collaborators. These projects were instrumental in revising the iUTAH Data Policy to address needs of research involving human subjects; and in developing methodologies for metadata submission, data publication, and archiving of social science data. With iBUGI still in installation phase, RFA2 refocused efforts on the green roof project at the University of Utah (UU) and SUU. Finally, Year 3 saw significant progress in linking RFA1 and 2 data and incorporating green infrastructure research and RFA2 preliminary results into coupled modeling activities by RFA3.

Collectively, pursuit of these goals has resulted in the submission of 17 manuscripts, of which four are published, with another three accepted.

RFA3 – Coupled Human-Natural System: A cross-cutting team of iUTAH researchers led by postdoctoral associate Rebecca Hale refined and published the Integrating Structure, Actors, and Water to Study Socio-Hydro-Ecological Systems (iSAW) conceptual model and documented its application in a pair of case studies. Research into model coupling methods has produced working software that continues to be tested. RFA3 has also begun modeling coupled human-natural systems, with regional climate model outputs serving as inputs for a rainfall run-off model; models of parcel-scale water use incorporated into a systems dynamics model of Salt Lake City Department of Public Utilities (SLCDPU) supply management and a regional urban growth model; and the integration of models of urban growth and stormwater flow in Cache Valley.

Year 3 saw the first in a series of workshops focused on integrating iUTAH research across all RFAs; and participation by critical stakeholders, who provided data, collaborated on modeling, or used decision support tools informed by RFA3 models and research. Representatives from Western Waters, the Utah Department of Natural Resources, and SLCDPU were instrumental in workshop planning and logistics. RFA3 research also resulted in six manuscripts submitted for publication in peer-reviewed scientific journals, three of which have been accepted.

During Year 3, RFA3 developed several products for stakeholders. A system dynamics model initially developed by CI-WATER was modified for use by SLCDPU for operational and strategic decision support. RFA3 also collaborated with NHMU to develop an interactive kiosk displaying data from GAMUT sensors in Red Butte Creek, including real-time video of stream conditions from the observation site. Lastly, RFA3 finalized the iVL concept.

2. CI Objectives

In Year 3, iUTAH CI continued support and integration of research across RFAs, and innovation in the emerging discipline of hydroinformatics. In support of GAMUT, faceted discovery and browsing of streamed data that is published to the Data Repository and updated daily was instituted; external data have been made discoverable and accessible through MDF. CI also fully implemented collaborative functionality for deposition of participant datasets for publication, archiving, and sharing. Finally, database support for urban instrumentation and RFA1 surface water chemistry sampling was expanded, and significant storage for virtualization infrastructure added. CI members and collaborators submitted five manuscripts to peer-reviewed scientific journals, with one published and one accepted.

3. DE Objectives

Diversity initiatives during Year 3 focused on increasing participation by diverse audiences inside and outside of iUTAH; by expanding iUTAH management and diversity teams; participating in six diversity-focused STEM events; soliciting new ideas through EOD Innovation Awards; continuing the Taking Learning Outdoors (TLO) and iFellows programs; and conducting diversity training for new participants.

4. WFD Objectives

Year 3 saw a continuation of successful iUTAH WFD programs: we awarded four Research Catalyst Grants (RCGs) to PUIs to encourage collaboration with research institutions; six EOD Innovation Awards, two of which represent new partnerships; recruited 18 iFellows, eight graduate students, and four postdoctoral associates; provided near-peer mentoring for the iFellows program; planned the third Summer Institute (SI) in the Middle Provo River watershed to involve middle/high school teachers, high school students, and undergraduates in integrated research; and developed a curriculum from Year 1 SI available on the iUTAH website. WFD team membership was increased by three.

5. Outreach Objectives

Activities during Year 3 included extensive outreach to K-12 through museum partnerships with NHMU and the Garth and Jerri Frehner Museum of Natural History at SUU, and through new programs funded via EOD Innovation Awards. Both students and the general public were engaged through citizen science programs, including UWW and Streamside Science. The External Engagement team was expanded by seven. The iUTAH Communications team was reorganized during Year 3, resulting in increased social media presence and following, broadening of the iUTAH newsletter audience, and refinement of iUTAH communication tools.

Significant Results:

1. Research Results

RFA1 – Biophysical System: RFA1 research generated novel and significant findings in all three research groups. The *water balance group* documented 87Sr/86Sr depletion in dust collected in the Logan watershed, suggesting that snowpack melt timing and rates in this watershed are influenced by dust deposits originating in Idaho's Snake River Plain, whereas dust in the other watersheds originates from desert sediments in western Utah based on NOAA HYSPLIT models (Fig. 2). The *water quality group* discovered that nutrient limitations of autotrophic versus heterotrophic constituents of stream biofilms differ along mountain-to-urban gradients, with the degree of urbanization determining the abruptness of shifts in nutrient relations. The *water demand or climate modeling group* completed high-fidelity numerical models explaining the transport of particles, radiation, heat, and moisture in highly heterogeneous vegetation and urban canopies, reducing the uncertainty surrounding these variables down to the sub-tree scale (Fig. 3).

Research Focus Area 2 – Social and Engineered System: RFA2 social scientists collected Household Survey data from over 2,400 households between May and September 2014, and have worked to process and make these data available for analysis. Major summary reports based on the Household Survey results at the neighborhood, community, watershed, and state-level have been completed, posted to the iUTAH website, and shared with respondents. RFA2 faculty and students also developed and implemented a major public survey on water issues with a sample of over 3,000 adults that is ongoing. Development of an urban typology has resulted in a manuscript submitted for publication at a peer-reviewed scientific journal (Figs. 4 and 5). Preliminary results of research linking urban form and water use were able to identify important, disproportionate drivers of water consumption at the neighborhood level. Neighborhood social science data is sufficiently dense now to inform RFA1 data collection activities during Year 4. Year 3 also saw the addition of several new faculty—including an environmental economist at USU, a land economist/planner and a

communication scientist at UU, a psychologist and sociologist at SUU, political scientists at WSU and UVU, and a sociologist at SLCC. During the third year of the project, the RFA2 faculty and students have presented papers and posters at 17 major national and international meetings and 8 local or regional seminars and conferences. They have collaborated on seven papers that are published or accepted for publication, with an additional ten manuscripts currently under review. RFA2 researchers also received two major collaborative grants – one to study urban green infrastructure and stormwater from the EPA STAR program, the other to bring an air quality dimension to the green infrastructure research program.

RFA3 – Coupled Human-Natural System: Year 3 saw a significant increase in inter-institutional contact and active collaboration among RFA3 team members. Regular meetings and the first of a planned series of three coupled modeling workshops have raised researchers' familiarity with their colleagues' work. The first coupled modeling workshop strengthened the esprit de corps among RFA3 team members, clarified the jointly-conceived direction for iUTAH coupled modeling research, and promoted cross-institution and inter-disciplinary research collaboration among participants. Leveraging iUTAH research to win additional funding was another significant outcome for RFA3 in Year 3. Progress on iUTAH's mission of building capacity for successful competition for external research funding includes a $750,000 award from the Environmental Protection Agency to, among others, RFA3 co-lead Sarah Null.

2. CI Results

The addition and integration of urban sensors into the GAMUT database represents a significant Year 3 achievement for CI, and has resulted in a manuscript on data management and publication workflow of large, heterogeneous sensor networks. CI also released new versions of software for quality control of GAMUT data, which resulted in a manuscript currently pending publication; updated the GAMUT quality assurance/quality control plan in collaboration with RFA1; revised the iUTAH Data Policy in collaboration with RFA2 to fully accommodate the unique requirements and considerations associated with the use of human research subjects; and created full functionality for data publication to the iUTAH Data Repository, allowing participants to submit datasets and metadata records directly and in a timely manner. Discovery and access to GAMUT data has been greatly increased, both through MDF and CUAHSI HIS. Finally, CI team members were able to significantly expand the reach of the graduate level course in Hydroinformatics with the addition of the Universities of Virginia (UVA) and Wyoming (UW) to the growing list of participating institutions.

3. DE Results

iUTAH funded 16 Native American students attending the American Indian Science and Engineering Society (AISES) Joint Regions 1 and 3 Conference at UU; of these, eleven were female, and one was from a tribal college. As part of an exciting new partnership with WSU, iUTAH provided financial support and STEM-focused academic content to the 2015 Multicultural Youth Conference, where iUTAH participants—including a Navajo UU graduate student and a 2014 iFellow—interacted with 180 high school students in three breakout sessions. In a continuation of the collaboration with WSU, iUTAH will support 20 underrepresented minority high school students attending the WSU Summit Leadership Institute at the end of Year 3. To increase diversity in its own recruiting for SI, iFellows, graduate students, and postdoctoral associates, iUTAH staffed booths and

provided financial sponsorship at three national conferences, and implemented Qualtrics surveys to gauge demographics of the applicant pool. Overall, iUTAH programs successfully engaged up to 25% women and underrepresented minorities in Year 3.

4. WFD Results

iUTAH WFD made great strides in the recruitment of women during Year 3: women made up 50% of the 18 iFellows, eight graduate students, and three postdoctoral associates hired. Women PUI faculty also accounted for 50% of the four RCGs awards given in Year 3. Another significant result was the establishment in collaboration with the iUTAH Project Office of a new Traineeship program geared towards providing undergraduate students marketable skills that are readily transferrable to a non-academic job environment.

5. Outreach Results

iUTAH continued its outreach to a large and diverse audience both via in-house programs and by leveraging existing productive partnerships with Utah museums, the Utah Education Network (UEN), and Utah Water Quality Extension (UWQE). The exhibit “Water” at The Leonardo museum, which continued through Year 3, featured installations exploring the physical and chemical properties of water, water sustainability best practices, as well as highlights of water research throughout the state; and has been seen by 143,825 visitors to date. In partnership with iUTAH, NHMU took TLO, a long-term teacher training program focused on better understanding of science, its processes, and applications, to Cache Valley in Year 3, reaching 1,285 High School students, and 15 teachers. During one of these events, iUTAH also unveiled an outreach sign (Fig. 6) developed by UWW with funds from a Year 2 EOD Innovation Award, with additional interpretive signs scheduled for Red Butte Creek and the Middle Provo River. iUTAH also partnered with UWQE programs to reach 919 K-12 students, teachers, and volunteers. In collaboration with UEN, iUTAH produced three videos for display on its website, with three additional videos slated to be completed by the end of Year 3.

Key outcomes or Other achievements:

1. Enhancement of Research Capacity

iUTAH has strongly enhanced research collaborations across our state as evidenced by co-authored publications and research proposals during our first three years (Fig. 7). Prior to the EPSCoR track 1 award, there were few cross-disciplinary publications within institutions, and even fewer cross-institutional publications.

iUTAH researchers have submitted 116 research proposals since project inception that leverage iUTAH infrastructure and collaborations. Of these, 46 have been awarded, including proposals funded by the US Geological Survey, local non-profits, the NSF, and state agencies. Total funds requested by these awards exceed $16.5M, including one large ($11M) award to iUTAH’s urban water group from the USAID to enhance Pakistan’s higher education capacity for advances in applied research, innovation and commercialization, stakeholder engagement, and workforce development related to water sustainability.

iUTAH research products have advanced knowledge within and across disciplines as evidenced by 333 presentations (111 in year 3) and 35 publications (11 in year 3).

iUTAH's postdoctoral scholars Rebecca Hale and Steven Hall were offered and accepted faculty positions at Idaho State and Iowa State University, respectively. iUTAH PhD student Ann Armstrong also will be taking on a faculty position at Lafayette College. We anticipate that these new faculty members will continue their collaborations with iUTAH researchers in the near term as they embark on their academic careers.

2. Enhancing Utah's STEM workforce

iUTAH students follow on the heels of these new faculty members with enhancing Utah's STEM workforce. For example, Dylan Dastrup began his engagement as an undergraduate working with Dr. Steven Emerman (RCG awardee from year 1) at Utah Valley University, and went on to complete a MS with Dr. Greg Carling at BYU, and will continue his involvement with iUTAH as the GAMUT technician for the Provo watershed. He replaces Joe Crawford who left iUTAH this year for a permanent position with the U.S. Department of Interior's Central Utah Project. Stephanie Mitts was in iUTAH's first iFellow cohort (2013) and used this experience to gain an internship with the U.S. Department of Interior (2014) and Natural Capitalism Solutions to work on the Presidential Climate Action Plan (2015). After she graduates from WSU, Stephanie plans to work toward a MS in Environmental Engineering and pursue a career working to engineer and implement new sustainable technologies and policies to improve the quality of the natural resource industry in Utah and nationwide.

3. EOD Outcomes

iUTAH's recruitment efforts to reach a diverse population to its iFellow program resulted in close alignment with state demographics, with between 8% of applicants indicating Hispanic/Latino(a) ethnicity, 2% African American, 2% Native American, and 2% Native Hawaiian/Pacific Islander. Interestingly males dominated the applicant pool (61%), yet 50% of the applicants placed were females. 41% of the iFellow applications were received from 1st generation college students. Research teams at USU

Several iUTAH undergraduate researchers presented at the Utah Conference on Undergraduate Research (UCUR) as well as the National Conference on Undergraduate Research (NCUR). Grant Holyoak was chosen to represent the state of Utah at the National Posters on the Hill event in Washington, D.C. Simone Jackson, Don Long, and Coral Gardiner will present their research activities at the Annual Meeting of the Society for Freshwater Science in May 2015.

*** What opportunities for training and professional development has the project provided?**

This award continues to support the professional development of all iUTAH participants, including faculty, post-doctoral fellows, graduate students, and undergraduate students at research universities and PUIs; teachers and students at the secondary level; and citizens and stakeholders. Year 3 activities thus centered on (1) strengthening and refining research skills by mentoring students at all education levels; and (2) engaging teachers and students in research-based educational activities focused on STEM education, with particular attention to underrepresented minorities and women. Other sources of professional growth and development included the rigorous peer-review process involved in the publication, communication and presentation of research findings; writing and review of proposals; development of web sites and applications; building of databases and data sharing capacity; and the establishment and maintenance of cross-institutional and multi-disciplinary collaborations.

Research

RFA1 – Biophysical System: Dr. Steven Hall, RFA1's first postdoctoral fellow, continued his leadership of several research projects. Hall served as mentor to two women undergraduate students engaged in independent research for iUTAH. One of them, Simone Jackson, who is Native American, will present her research at the upcoming Society for Freshwater Science meeting in Milwaukee, WI. Hall has accepted an academic appointment for Fall of 2015, and will conclude his tenure with iUTAH at the end of Year 3. A new postdoctoral fellow, Dr. Eric Oerter, has been recruited and will begin work with iUTAH in June of 2015 under the mentorship of Dr. Gabriel Bowen.

Fifteen graduate researchers contributed to RFA1 research in Year 3. Of these, 60% were women and 40% we funded from leveraged funds. RFA1 also engaged undergraduates through several iUTAH EOD programs: three undergraduate iFellows, two of them women, were hosted in 2014. Two of these students represented iUTAH at the NCUR conference in Cheney, WA. RFA1 faculty and graduate students also developed a module for the 2014 SI; three new modules are planned for the 2015 SI in the Middle Provo River watershed.

RFA1 continued to employ three M.S.-level research technicians to oversee the installation and daily operations of GAMUT. Additionally, six undergraduate student GAMUT technicians, two per watershed, were hired in Year 3 under a traineeship program geared towards providing undergraduates with professional skills that are readily transferrable to a non-academic setting.

RFA2 – Social and Engineered System: In RFA2, the first postdoctoral fellow, Dasch Houdeshel, was able to obtain a position as a science teacher at a local, selective private high school and has since left the project. A new postdoctoral fellow, Dr. Melissa Haeffner, has been hired to work under the mentorship of Drs. Douglas Jackson-Smith and Courtney Flint at USU. In Year 3, RFA2 also supported seven doctoral students (three at UU and four at USU). Note that of these seven RFA2 doctoral students, 5 are female (including 2 of 3 engineers). In addition, a large cohort of undergraduate students has been actively engaged in RFA2 research: 15 students via the summer Household Survey, and over 30 students at six different institutions through the iPad survey project. One undergraduate student, Grant Holyoak, used Household Survey data to develop a poster and presentation that have been featured at both the UCUR and NCUR conferences and the national Posters on the Hill event in Washington, DC. RFA2 faculty and graduate students also mentored five undergraduate iFellows in 2014, and have committed to mentor seven new iFellows in 2015. Finally, RFA2 faculty are developing an engineering-themed module for the 2015 SI, after having previously provided two modules to the 2014 SI.

RFA3 – Coupled Human-Natural System: RFA3's first postdoctoral fellow, Dr. Rebecca Hale, successfully coordinated the joint development of a conceptual model of human/natural water systems, and led a panel of iUTAH co-authors in documenting this in a scholarly manuscript that has been published in the journal *Earth's Future* (Figs. 8-10). Hale has since accepted an academic appointment for Fall of 2015, and will conclude her tenure with iUTAH at the end of Year 3. A new postdoctoral fellow, Dr. Krishna Khatri, has been recruited and will begin work with iUTAH in July of 2015 under the mentorship of Dr. Courtenay Strong. During Year 3, RFA3 also mentored four doctoral students, as well as three undergraduate students participating in the 2014 iFellows program; an additional four undergraduate students will be hosted for the 2015 program.

CI

In year 3, the iUTAH CI team employed five undergraduate student computer programmers to work with professional programmers and analysts in the development of software and hardware cyberinfrastructure that supports MDF. These positions continue to provide opportunities for students to engage in cutting edge CI-related research, develop their programming skills while being mentored by professionals, and gain valuable experience and expertise. CI continues to work with GAMUT technicians and other RFA1 personnel in developing data management best practices and techniques. These are being captured in the GAMUT Quality Assurance and Quality Control plan and are also reflected in the iUTAH Data Policy. To better communicate these practices and policies to iUTAH participants, CI developed a series of data management video tutorials in Year 3; and provided in-person tutorials and guidance at iUTAH bi-annual meetings. Finally, iUTAH and CI-WATER collaborators Dr. Jeffery Horsburgh (USU) and Dr. Steven Burian (UU) teamed with Dr. Dan Ames (Brigham Young University, BYU), Dr. Fred Ogden (UW), and Dr. Jon Goodall (UVA) to offer a collaborative course on Hydroinformatics

(https://usu.instructure.com/courses/319801) for graduate students during Fall Semester 2014. The course, which uses an innovative multi-institution, team-teaching approach that provides new content and opportunities for interaction among students, was jointly taught and expanded from three to five universities. It was administered using the UEN Interactive Video Conferencing (IVC) system, combining synchronous video lectures with asynchronous student discussions, assignments, and grading using a new Learning Management System called Instructure Canvas. Students complete a semester project focused on Hydroinformatics concepts. Enrollment for the course was 45 students (Table 5).

*** How have the results been disseminated to communities of interest?**

In Year 3, iUTAH continued to engage with diverse audiences throughout the state, broadening the reach and impact of iUTAH concepts and research, and increasing interest in and engagement with STEM.

K-12 Students and Teachers

iUTAH TLO is a long-term teacher training program designed to influence K-12 educational practice by helping teachers develop a better understanding of science, its processes, and applications. In Year 3, TLO was based in Cache County, and incorporated RFA1 research and citizen science initiatives (Fig. 11). The program connected 15 local teachers and 399 students with NHMU educators and iUTAH scientists to develop a deeper knowledge of iUTAH research conducted in their community. Additionally, the program assisted participating teachers with the development and implementation of lesson plans that use outdoor and water related science as a context for learning, reaching a further 886 students indirectly via teacher training (Table 6).

Another cohort of middle and high school teachers, in addition to high school and undergraduate students, will engage with iUTAH research in the upcoming 2015 SI. This year's effort targets participants from the Provo area, and will focus on research conducted by RFA1. In addition to engaging students and teachers in iUTAH research, participants are encouraged to share their results and experience during the iUTAH Annual Symposium. Year 3 also saw the creation of curriculum based on the inaugural SI, which was presented as a resource to educators at the Utah Science Teachers Association 2015 conference. The resource is also available to the public at: http://learn.genetics.utah.edu/content/earth and, http://learn.genetics.utah.edu/content/earth/teacher. Subsequent years of the Summer Institute will be used to expand this curriculum on a yearly basis.

In Year 3, iUTAH provided funding to K-12 educators and students via two EOD Innovation Awards. The first is SLCC's Water Girls program. This field experience will engage 30 middle school girls and five to eight college-level mentors from SLCC. During the program, students will assess the health of streams and watersheds in their communities, benefit from near-peer mentoring, and will be encouraged to find creative ways of communicating their findings to audiences of their choosing. The second award supports the continued citizen science work of 4th grade Teacher Kris Kaly (a 2013 UWW Volunteer of the Year) and her class. Kris and her students collect stream health data for UWW's citizen science program, providing useful data on the Jordan River while engaging students in meaningful water research.

The RFA2 iPad project collaborated with teachers at Rowland Hall-St. Marks High School in Salt Lake City to train 8 students in an AP Environmental Studies course in the principles of social science research, then involved them in survey data collection at a local grocery store. With help from a teacher and students in their AP Statistics class, they analyzed and presented their data at their annual campus Earth Day celebration.

Community and Stakeholder Engagement

Community and stakeholder engagement continued to be a focus of iUTAH activities in Year 3. iUTAH hosted a booth at four Science Unwrapped events at USU this year. This event, which is organized by USU's College of Science as a yearly series developed around a central theme, aims to share science with Cache Valley families. At each monthly event, iUTAH's outreach staff shared fun and engaging water-related hands-on activities with attendees. The exhibit "Water" at The Leonardo museum, which challenges people of all backgrounds to explore one of nature's most fundamental resources, opened on July 3, 2014 and continued to be on display throughout Year 3 (Fig. 12). As of 31 March 2015, this innovative,

contemporary exhibit has been seen by 143,825 visitors, 18,435 of which are K-12 students, with 21% belonging to underrepresented minorities.

To enhance public understanding of iUTAH research, share opportunities with diverse audiences, and recruit new participants, iUTAH successfully hosted booths at a wide variety of events in Utah and across the region (Table 7). iUTAH also funded two radio programs that are bringing information to passive radio listeners who might otherwise not be aware of the science of water sustainability and the issues surrounding Utah's water future. Explore Utah Science's (EUS) "Follow the Flow" is a six-part series that showcased research efforts dedicated to maintaining and improving water sustainability in Utah. The series aired on KCPW, which reaches 40,000 weekly listeners in the Salt Lake Valley area, and featured interviews with nine iUTAH participants. In addition to this primary audience, episodes were accessed 8,035 times on EUS's website, and shared via the National Science Foundation's (NSF) Science360 Radio Facebook page, which has over 200,000 subscribers (http://iutahepscor.org/education/follow-flow.shtml). Utah Public Radio's program "The Source" follows scientists into lakes, streams, and snowfields that are a source of drinking water for Utah's citizens, serve as a critical resource for the agricultural industry, and provide stunning scenery and world-class recreation in the state. The program airs monthly to a projected audience of 40,000 daily listeners statewide.

iUTAH Communications

Much of Year 3 work conducted by the expanded and re-invigorated iUTAH Communications team has focused on executing a pivot from sharing process-based stories on iUTAH research to disseminating results and impacts. The iUTAH website now features monthly research highlights (http://iutahepscor.org/project_news.php, Fig. 13), connecting iUTAH research with the general public, and—through inclusion in the monthly newsletter—other iUTAH participants. The newsletter (http://iutahepscor.org/resources/newsletters.html), which has been redesigned and expanded in scope and length, was sent out every month during Year 3 to an audience of 257 subscribers, including iUTAH participants, EPSCoR State Committee members, university administrators, and other interested parties. In Year 3, iUTAH also greatly increased both its internet and social media presence and following: from August 2014-March 2015, the iUTAH website received 34,834 visits, with 49.1% first-time visitors. Over the same time period, the iUTAH Facebook page received 172 likes, while Twitter followers increased from 156 to 242.

Finally, the iUTAH Communications team has partnered with a Translational Ecology course at USU to develop a web page that will help the interested public find answers to questions they have about water sustainability in Utah. Much of this work will be ongoing through the early part of Year 4.

Traditional Academic Outlets

In Year 3, iUTAH researchers submitted 39 manuscripts for publication in scientific, peer-reviewed journals, of which 5 are accepted and pending publication, with 11 already published. In addition, our participants gave 111 oral or poster presentations at national, regional, and state scientific conferences.

*** What do you plan to do during the next reporting period to accomplish the goals?**

1. Future Research Plans

RFA1 – Biophysical System: Future plans for RFA1 include a further expansion of GAMUT into the urban environment and the measurement of the effects of built infrastructure on changes in water outcomes (i.e., water use, water timing, and location of flows). This will more clearly allow iUTAH to answer research questions about the relative contributions to flow caused by different urban forms and neighborhood configurations. This will be a joint research endeavor with RFA2, but the infrastructure data will be collected and managed by RFA1. Another focus in Year 4 will be the interpretation of real-time GAMUT data and their incorporation into coupled systems modeling efforts led by RFA3.

RFA2 – Social and Engineered System: With disproportionate drivers of water use related to urban form having been identified, future plans for RFA2 include making linkages between urban form and water and engaging in coupled modeling.

These activities will serve as a basis for developing new collaborative grant proposals to link urban typology with biophysical outcomes. In addition, we will inform RFA1 data collection with neighborhood-level social science data. Data from the green infrastructure experiments conducted at UU will also inform research at the new iBUGI facility during Year 4.

RFA3 – Coupled Human-Natural System: In Year 4, RFA3 plans to continue ongoing investigations on scaling and computational challenges in coupling models, including methods for overcoming spatial and temporal mismatches between coupled models. The RFA3 coupled modeling agenda for the coming 6-9 months will expand the capacity to represent and investigate agriculture as an element of the eco-socio-hydrological system, on multiple grounds. First, agriculture has been identified as a key missing element in current iUTAH models and research, especially given its size as a component of the human-mediated hydro-system in the study area. Second, explicitly considering agriculture will align ongoing research activities with the recently-announced NSF food/energy/water nexus and should strengthen iUTAH's capacity to contribute effectively to externally funded research in this arena. Stakeholder participation in upcoming workshops remains a main RFA3 objective.

2. Future CI Plans

With the iBUGI facility scheduled to become operational in early Year 4, CI will work to adapt database support for urban instrumentation and RFA1 surface water chemistry added in Year 3 for use by iBUGI in Year 4.

3. Future DE Plans

DE has been collaborating with university neighborhood partners (UU) to develop a conference that connects iUTAH scientists with diverse audiences; brings diverse institutions, leaders, and communities into iUTAH science and EOD; and discusses culturally appropriate teaching elements of effective diverse education related to water, watersheds, and ecosystems for iUTAH teams. DE hopes to reach underserved groups in the greater Salt Lake City area through this event. In addition, DE plans to finalize the Recruitment and Retention plan and oversee its integration into all iUTAH activities.

4. Future WFD Plans

In Year 4, WFD will update the SI curriculum with Year 3 research projects. With respect to RCG and EOD Innovation Awards, WFD plans to host several capacity building workshops prior to the call for proposals, to share iUTAH goals, milestones, and review criteria with interested communities.

5. Future Outreach Plans

After focusing on each of the three iUTAH experimental watersheds in Years 1-3, the Year 4 TLO program is scheduled to take place in southern Utah, reaching an entirely new, more rural audience.

Supporting Files

Filename	Description	Uploaded By	Uploaded On
PDF 1.pdf	Tables 1-4 and Figures 1-3	Michelle Baker	04/29/2015
PDF 2.pdf	Tables 5-7 and Figures 4-13	Michelle Baker	04/29/2015
PDF 3.pdf	Tables 8 and 9	Michelle Baker	05/01/2015

Products

Books

Book Chapters

Conference Papers and Presentations

Horsburgh, J.S., Spackman Jones, A., Reeder, S (2014). *Automating data management and sharing within a large-scale, heterogeneous sensor network*. Proceedings 7th International Congress on Environmental Modelling & Software. San Diego, CA. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Spackman Jones, A., Horsburgh, J.S., Reeder, S. (2014). *Cyberinfrastructure for Data Management and Sharing within a Large-Scale, Heterogeneous Sensor Network*. Mountain Observatories a Global Fair and Workshop. Reno, NV. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Spackman Jones, A., Horsburgh, J.S., Reeder, S. (2014). *Implementation of a workflow for streaming sensor data for a large-scale hydrologic monitoring network*. 2014 Utah State University Spring Runoff Conference,. Logan, UT. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Spackman Jones, A., Horsburgh, J.S., Ramirez, M., Caraballo, J. (2014). *Managing monitoring equipment: A sensor extension for the CUAHSI Observations Data Model*. National Water Quality Monitoring Council 9th National Monitoring Conference. Cincinnati, OH. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Horsburgh, J.S., Reeder, S., Patton, J., Spackman Jones, A. (2014). *ODM Tools Python: Open source software for managing hydrologic and water quality time series data*. National Water Quality Monitoring Council 9th National Monitoring Conference. Cincinnati, OH. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Jeff Horsburgh, Stephanie Reeder, Amber Jones (2015). *ODM Tools Python: Open Source Software for Managing Continuous Sensor Data*. HIC 2014 – 11th International Conference on Hydroinformatics. . Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Kshitij Parajuli (2015). *Spatial Analysis of Actual Evapotranspiration Estimates from the iUTAH Climate Station Network*. Proceedings of the 2015 EWRI World Environmental & Water Resources Congress. . Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Jeff Horsburgh (2014). *Toward Integrated Environmental Modeling Using Research Data Infrastructures*. Proceedings of the 7th International Congress on Environmental Modelling & Software. . Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Inventions

Journals

Amber Jones, Jeff Horsburgh, Stephanie Reeder, Mauriel Ramirez, Juan Caraballo (). A Data Management and Publication Workflow for a Large-Scale, Heterogeneous Sensor Network. *Environmental Monitoring and Assessment*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Beth Neilson (2013). Deducing the spatial variability of exchange within a longitudinal channel water balance. *Hydrological Processes*. . Status = PUBLISHED; Acknowledgment of Federal Support = No ; Peer Reviewed = Yes

Beth Neilson (2014). Development of minimalistic data collection strategy for QUAL2Kw. *Journal of Water Resources Management and Planning*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Beth Neilson (2015). Impacts of beaver dams on hydrologic and temperature regimes in a mountain stream. *Hydrology and Earth System Sciences*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Beth Neilson, David Rosenberg (2013). Simple Optimization Method to Determine Best Management Practices to Reduce Phosphorus Loading in Echo Reservoir, Utah.. *Journal of Water Resources Planning and Management*. . Status =

PUBLISHED; Acknowledgment of Federal Support = No ; Peer Reviewed = Yes

Beth Neilson (). Spatial considerations of stream hydraulics in reach scale temperature modeling. *Water Resources Research*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Bo Yang (2015). Assessing Residential Landscape Performance: Visual and Bioclimatic Analyses through In-Situ Data. *Landscape Architecture*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Bo Yang, Shujuan Li (). A Research Frontier in Landscape Architecture: Landscape Performance and Assessment of Social Benefits. *Landscape Research*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Bo Yang, Shujuan Li (). Design with Nature: Ian McHarg's ecological wisdom as actionable and practical knowledge. *Landscape and Urban Planning*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Bo Yang (). Ian McHarg's Ecological Planning in The Woodlands: Lessons Learned after Four Decades. *Landscape Research*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Brian Bailey, Rob Stoll, Eric Pardyjak (2014). A scalable plant-resolving radiative transfer model based on optimized GPU ray tracing. *Agricultural and Forest Meteorology*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Brian Bailey, Rob Stoll, Eric Pardyjak (2014). Effect of vegetative canopy architecture on vertical transport of massless particles. *Atmospheric Environment*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: http://dx.doi.org/10.1016/j.atmosenv.2014.06.058

Caleb Buahin, Jeff Horsburgh (). Evaluating OpenMI's Computational Performance using Different Model Decomposition Approaches: An Urban Stormwater Modeling Application. *Environmental Modelling & Software*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Carlos Licon (2014). Sustainability Assessment of Utah Counties. *The International Journal of Environmental, Cultural, Economic, and Social Sustainability*. . Status = PUBLISHED; Acknowledgment of Federal Support = No ; Peer Reviewed = Yes

Courtenay Strong (2014). A slab model of the Great Salt Lake for regional climate simulation. *Journal of Advances in Modeling Earth Systems*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Courtney Flint (). Vantage Points and Mountain Methods. *Mountain Research and Development*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Dasch Houdeshel (2013). Stormwater Green Infrastructure as no-irrigation landscaping alternative in a semi-arid climate. *Journal of Irrigation and Drainage*. . Status = PUBLISHED; Acknowledgment of Federal Support = No ; Peer Reviewed = Yes

Dave Epstein, Julia Kelso and Michelle Baker (). Beyond the urban stream syndrome: organic matter budgets for diagnostics and restoration of an impaired urban river. *Ecological Applications*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

David Rosenberg (2013). A decision tree model to estimate the value of information provided by a groundwater quality monitoring network. *Hydrology and Earth System Sciences*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: http://www.hydrol-earth-syst-sci.net/17/1797/2013/hess-17-1797-2013.html

David Rosenberg (2014). Heterogeneous Residential Water and Energy Linkages and Implications for Conservation and Management. *ASCE-Journal of Water Resources Planning and Management*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: http://ascelibrary.org/doi/abs/10.1061/%28ASCE%29WR.1943-5452.0000340

David Rosenberg (2014). Water Resources Systems Analysis: A Bright Past and Challenging but Promising Future. *ASCE-Journal of Water Resources Planning and Management*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: http://ascelibrary.org/doi/full/10.1061/%28ASCE%29WR.1943-5452.0000414

Douglas Jackson-Smith, Philip Stoker, Martin Buchert, Luke Bell, Zack Bjerregaard, Molly Cannon, Joanna Endter-Wada, Shujuan Li, Carlos Licon (). Differentiating Urban Forms: A neighborhood typology for understanding urban water systems. *Landscape and Urban Planning*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Enjie Li, Joanna Endter-Wada, Shujuan Li (2015). Linkages between Water Challenges and Land Use Planning in Megacities. *Water Resources IMPACT*. . Status = PUBLISHED; Acknowledgment of Federal Support = No ; Peer Reviewed = Yes

Greg Carling, Zachary Aanderud, Timothy Goodsell (). Evaluating natural and anthropogenic trace element inputs along a mountain to urban gradient in the Provo River, Utah, USA. *Applied Geochemistry*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Houdeshel, C.D., Hultine, K.R., Pomeroy, C.A. (2015). Evaluation of three vegetation treatments in bioretention gardens in a semi-arid climate.. *Landscape and Urban Planning*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Jeff Horsburgh, Amber Jones, Mauriel Ramirez, Juan Caraballo (). Time Series Analyst: Interactive Online Visualization of Environmental Time Series Data. *Environmental Modelling & Software*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Jeff Horsburgh, Stephanie Reeder, Amber Jones, Jacob Meline (2015). Open Source Software for Visualization and Quality Control of Continuous Hydrologic and Water Quality Sensor Data. *Environmental Modelling & Software*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: http://dx.doi.org/10.1016/j.envsoft.2015.04.002

Julia Kelso, Michelle Baker (). Filtering with a drill pump: an efficient method to collect suspended sediment and filtrate. *Journal of the American Water Resources Association*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Kimberly Smith, Courtenay Strong (). Connectivity between historical Great Basin precipitation and Pacific Ocean variability: A CMIP5 model evaluation. *Journal of Climate*. . Status = ACCEPTED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Licón, C. V. (2014). La Integración de Indicadores de Sustentabilidad a Través de un Modelo Gráfico de Evaluación. Cuadernos de Arquitectura y Nuevo Urbanismo. [Integrating sustainability indicators through a graphic assessment model. *Journal of Architecture and New Urbanism (2014)*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Melina Santos Vanderlinder, Christopher M. U. Neale, David E. Rosenberg, and Karin M. Kettenring (2014). Use Of Remote Sensing to Assess Changes in Wetland Plant Communities over an 18-Year Period: A Case Study from the Bear River Migratory Bird Refuge, Great Salt Lake, Utah. *Western North American Naturalist*. . Status = PUBLISHED; Acknowledgment of Federal Support = No ; Peer Reviewed = Yes

Philip Stoker, Robin Rothfeder, Kenneth Dudley, Philip Dennison, Martin Buchert (). Comparing the Utility of LiDAR data vs. Multi-spectral imagery for household-level water demand modeling.. *Urban Water Journal*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Philip Stoker (). Land Cover, Urban Form, and Water Use in Salt Lake City. *Land Use Policy*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Rebecca Hale, Andrea Armstrong, Michelle Baker, Sean Bedingfield, Caleb Buahin, Martin Buchert, Todd Crowl, R Ryan Dupont, Jim Ehleringer, Joanna Endter-Wada, Courtney Flint, Jacqualine Grant, Sarah Hinners, Jeff Horsburgh, Douglas Jackson-Smith, Amber Jones, Carlos Licon, Sarah Null, Augustina Odame, Diane Pataki, David Rosenberg, Madlyn Runburg, Philip Stoker, Courtenay Strong (2015). iSAW: Integrating Structure, Actors, and Water to Study Socio-Hydro-Ecological Systems. *Earth's Future*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Rebecca Hale (). Effects of climate on the expression of the urban stream syndrome. *Freshwater Science*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Rebecca Hale (). Principles for urban stormwater management to protect stream ecosystems. *Freshwater Science*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Sarah Null (2014). Optimizing selective withdrawal from reservoirs to manage downstream temperatures with climate warming. *Journal of Water Resources Planning and Management*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Sarah Null (2014). Optimizing the dammed: Water supply losses and fish habitat gains from dam removal systems analysis in California. *Journal of Environmental Management*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Sarah Null and Wayne Wurtsbaugh (2014). Approaches for studying fish production: Do river and lake researchers have different perspectives?. *Canadian Journal of Fisheries and Aquatic Sciences*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Sarah Null, David Tarboton (2014). More than meets the eye - managing salinity in Great Salt Lake, Utah. *LakeLine Magazine*. 34 (3), 25. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = No

Sarah Null, David Tarboton (). How do changes to the railroad causeway in Utah’s Great Salt Lake affect water and salt flow?. *PLoS One*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Sarah Null (). Specializing rivers by water use. *Environmental Research Letters*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Scott Jones (2014). Measured and Modeled Soil Moisture Compared with Cosmic-Ray Neutron Probe Estimates in a Mixed Forest. *Vadose Zone Journal*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: https://www.soils.org/publications/vzj/pdfs/13/12/vzj2014.06.0077

Shujuan Li, Bo Yang (2015). Introducing a new method for assessing spatially explicit processes of landscape fragmentation. *Ecological Indicators*. 56 111. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Shujuan Li, Bo Yang (). Quantifying forest fragmentation patterns and processes during rapid urbanization.. *Landscape Ecology*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Steve Burian, Thomas Walsh (). Ecosystem services from rainwater harvesting in India. *Urban Water*. . Status =

ACCEPTED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Steve Burian (). Improving Evapotranspiration Mechanisms in the U.S. Environmental Protection Agency's Storm Water Management Model. *Environmental Modeling and Software*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Steve Burian (). Local-to-regional landscape drivers of extreme weather and climate: Implications for water infrastructure resilience. *Journal of Hydrologic Engineering*. . Status = ACCEPTED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Steven Hall, Gregory Maurer, Sebastian W Hoch, Raili Taylor, David R Bowling (2014). Urban atmospheric pollution increases deposition of major ions to the "Greatest Snow on Earth". *Atmospheric Environment*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Steven Hall, Rebecca Hale, Michelle Baker, David Bowling, Jim Ehleringer (). Riparian plant isotopes reflect anthropogenic nitrogen perturbations: Robust patterns across land use gradients. *Ecological Applications*. . Status = SUBMITTED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Stoker, P. & Rothfeder, R. (2014). "Drivers of Urban Water Use.". *Journal of Sustainable Cities and Society (2014)*. (2014). http://dx.d. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Thomas Walsh, Christine Pomeroy, Steve Burian (2014). Hydrologic Analysis of a Watershed-Scale Rainwater Harvesting Program. *Journal of Hydrology*. . Status = PUBLISHED; Acknowledgment of Federal Support = No ; Peer Reviewed = Yes

Yang, B. & R.R. Dupont. (2014). "Form-based variables for stormwater quality performance: comparing three BMP types in five U.S. states.". *Urban Planning and Design Research (2014)*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Youcan Feng, Steve Burian, Eric Pardyjak (2015). Green roof evapotranspiration observation and modeling in Salt Lake City, Utah. *Journal of Hydrology*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Youcan Feng, Steve Burian, Eric Pardyjak (). Green Roof Evapotranspiration Observation and Estimation in Salt Lake City, Utah. *Ecohydrology*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Licenses

Other Products

Audio or Video Products.

Radio program "Desert Dust Events Could Trigger Early Wasatch Snowmelt" produced by Explore Utah Science and aired on public radio, and NSF's Science360.

Audio or Video Products.

Radio series "The Source" about water issues in Utah, hosted by Jennifer Pemberton and her reporter team, and aired on Utah Public Radio. Episodes range from short clips to longer in-depth explorations. http://upr.org/programs/source

Episodes produced to date include

"Every Tree in the West has a Climate Secret" (aired Feb 17, 2015)

"When Trees Talk Researchers Listen" (aired Feb 27, 2015)

"Closed Causeway Causes Curious Changes to Great Salt Lake" (aired Mar 17, 2015)

"The Source: Get to Know the Great Salt Lake" (aired Mar 27, 2015)

"Former Federal Dam Manager Tells Utah It's Time to Tear Down Deadbeat Dams" (aired Apr 14, 2015)

"The Source: For Rivers and Streams Messiness Matters" (aired Apr 24, 2015)

Other Publications
Omar Reyes-Perez, Samuel Rivera and Todd Crowl (2014). *Physical and Chemical Properties of Water: A Curriculum for K-12 students*. This is a manual of hands-on practices to be used by The Leonardo Museum to promote rational use of water among K-12 students. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Patents

Technologies or Techniques

Thesis/Dissertations

Websites
iUTAH: innovative Urban Transistions and Arid Region Hydrosustainablity
http://iutahepscor.org

Project website for participants and external engagement

Participants/Organizations

What individuals have worked on the project?

Name	Most Senior Project Role	Nearest Person Month Worked
Baker, Michelle	PD/PI	6
Aanderud, Zachary	Co PD/PI	2
Ehleringer, James	Co PD/PI	1
Jackson-Smith, Douglas	Co PD/PI	2
Strong, Courtenay	Co PD/PI	2
Alessandro, Zanazzi	Faculty	1
Balling, Rick	Faculty	1
Bancroft, Betsy	Faculty	1

Bates, Scott	Faculty	1
Bedford, Daniel	Faculty	1
Bowen, Gabriel	Faculty	1
Bowen, Brenda	Faculty	1
Bowling, Dave	Faculty	2
Brooks, Paul	Faculty	2
Brunson, Mark	Faculty	3
Buchert, Martin	Faculty	3
Bunds, Michael	Faculty	1
Burian, Steve	Faculty	1
Carling, Greg	Faculty	2
Castronova, Tony	Faculty	5
Corbato, Steve	Faculty	0
DeSart, Jay	Faculty	1
Dupont, Ryan	Faculty	1
Edwards, Eric	Faculty	2
Emerman, Steve	Faculty	1
Endres, Carla	Faculty	0
Endter-Wada, Joanna	Faculty	1
Ewing, Reid	Faculty	1
Flint, Courtney	Faculty	2
Fred, Govedich	Faculty	1

Ganning, Joanna	Faculty	2
Gill, Richard	Faculty	2
Gordillo, Luis	Faculty	0
Grant, Jacqualine	Faculty	1
Hinners, Sarah	Faculty	2
Homs, Daniel	Faculty	0
Horsburgh, Jeff	Faculty	3
Howe, Peter	Faculty	0
Hunter, Laura	Faculty	0
Huntly, Nancy	Faculty	1
Jensen, Ryan	Faculty	1
Jin, Jiming	Faculty	1
Johnson, Gary	Faculty	1
Jones, Norm	Faculty	1
Jones, Scott	Faculty	2
Li, Shujuan	Faculty	2
Licon, Carlos	Faculty	1
Mace, Britt	Faculty	1
Malone, Molly	Faculty	1
Matty, David	Faculty	0
McDowell, William	Faculty	0
Mesner, Nancy	Faculty	1
Michener, William	Faculty	0

Moore, Jeffrey	Faculty	1
Moyer-Horner, Lucas	Faculty	1
Neilson, Bethany	Faculty	1
Null, Sarah	Faculty	2
O'Neill, Bill	Faculty	1
Pardyjak, Eric	Faculty	1
Pomeroy, Christine	Faculty	2
Power, Mitchell	Faculty	1
Rosenberg, David	Faculty	2
Simon, Alexander	Faculty	1
St. Clair, Sam	Faculty	1
Stark, Louisa	Faculty	1
Stoll, Rob	Faculty	1
Tarboton, David	Faculty	0
Toke, Nathan	Faculty	1
Trentelman, Carla	Faculty	1
Van Alstyne, Andrew	Faculty	1
Van Houten, Judy	Faculty	0
Wairepo, Anne	Faculty	0
Walther, Suzanne	Faculty	2
Wang, Simon	Faculty	1
Weeg, Matthew	Faculty	1

Yang, Bo	Faculty	2
Yeo, Sara	Faculty	1
Hahnenberger, Maura	Community College Faculty	1
Howe-Taylor, Marian	Community College Faculty	0
Keleher, Mary Jane	Community College Faculty	1
Poole, Daniel	Community College Faculty	1
Kaly, Kristina	K-12 Teacher	1
O'Brien, Ken	K-12 Teacher	1
Gabor, Rachel	Postdoctoral (scholar, fellow or other postdoctoral position)	5
Haeffner, Melissa	Postdoctoral (scholar, fellow or other postdoctoral position)	2
Hale, Rebecca	Postdoctoral (scholar, fellow or other postdoctoral position)	12
Hall, Steven	Postdoctoral (scholar, fellow or other postdoctoral position)	12
Khatri, Krishna	Postdoctoral (scholar, fellow or other postdoctoral position)	1
Oerter, Erik	Postdoctoral (scholar, fellow or other postdoctoral position)	1
Andrews, Adrienne	Other Professional	1
Bardsley, Tim	Other Professional	1
Bo Flood, Nancy	Other Professional	1
Bringhurst, Kerry	Other Professional	1
Burns, Ellen	Other Professional	12
Dash, Pabitra	Other Professional	1

Dintelman, Sue	Other Professional	0
DuRoss, Erika	Other Professional	1
Huff, Terra	Other Professional	6
Keleher, Chris	Other Professional	0
Kiefer, Julie	Other Professional	1
Leidolf, Andreas	Other Professional	9
Lewis, Caitlyn	Other Professional	9
Manuelito-Kerkvliet, Cassandra	Other Professional	0
McEntire, Anna	Other Professional	1
Menlove, Rebecca	Other Professional	1
Nelson, Adelbert	Other Professional	0
Pemberton, Jennifer	Other Professional	1
Pendleton, Jackie	Other Professional	1
Petty, Lauren	Other Professional	2
Ramsey, Robert	Other Professional	1
Rivera, Samuel	Other Professional	4
Runburg, Madlyn	Other Professional	2
Schuske, Kim	Other Professional	1
Seppi, Jessica	Other Professional	2
Smith, Katie	Other Professional	1
Wang, Weihong	Other Professional	1
Young, Sarah	Other Professional	0

Anderson, Jessica	Technician	2
Carlisle, Jobie	Technician	1
Cox, Chris	Technician	12
Crawford, Joe	Technician	9
Eiriksson, Dave	Technician	12
Greene, Brian	Technician	6
Jones, Amber	Technician	12
Keele, Rusty	Technician	1
Lorimer, Matt	Technician	1
Reeder, Stephanie	Technician	3
Grove, Morgan	Staff Scientist (doctoral level)	0
Miller, Matt	Staff Scientist (doctoral level)	0
Amstrong, Andrea	Graduate Student (research assistant)	6
Bailey, Brian	Graduate Student (research assistant)	6
Betts, Dave	Graduate Student (research assistant)	6
Buahin, Caleb	Graduate Student (research assistant)	6
Bunnell, Michael	Graduate Student (research assistant)	6
Chan, Allison	Graduate Student (research assistant)	6
Elliott, Chris	Graduate Student (research assistant)	2
Feng, Youcan	Graduate Student (research assistant)	6
Goodsell, Tim	Graduate Student (research assistant)	6
Jones, Erin	Graduate Student (research assistant)	6

Kelso, Julia	Graduate Student (research assistant)	6
Levine, Zacharia	Graduate Student (research assistant)	6
Li, Enjie	Graduate Student (research assistant)	6
Ogata, Elizabeth	Graduate Student (research assistant)	6
Perez-Reyes, Omar	Graduate Student (research assistant)	2
Smith, Kimi	Graduate Student (research assistant)	6
Stoker, Philip	Graduate Student (research assistant)	6
Albert, Allison	Undergraduate Student	2
Beach, Tim	Undergraduate Student	2
Brotherton, Tobias	Undergraduate Student	2
Butterfield, Andrew	Undergraduate Student	2
Campbell, Hayden	Undergraduate Student	3
Caraballo, Juan	Undergraduate Student	3
Coral, Gardiner	Undergraduate Student	2
Donald, Long	Undergraduate Student	2
Gentry, Kenyon	Undergraduate Student	2
Henrie, Adam	Undergraduate Student	2
Hicks, Katlyn	Undergraduate Student	2
Holzwarth, Alexis	Undergraduate Student	2
Josephson, Jeffrey	Undergraduate Student	2
Kelley, Lauren	Undergraduate Student	4
Matos, Mario	Undergraduate Student	3

Meline, Jacob	Undergraduate Student	3
O'Donnell, Claire	Undergraduate Student	2
Patton, James	Undergraduate Student	3
Ramirez, Maurier	Undergraduate Student	3
Stout, Samuel	Undergraduate Student	2
Thomas, Anne	Undergraduate Student	2
Williams, Michelle	Undergraduate Student	2
Ewing-Taylor, Jacqueline	Consultant	2

Full details of individuals who have worked on the project:

Michelle A Baker
Email: michelle.baker@usu.edu
Most Senior Project Role: PD/PI
Nearest Person Month Worked: 6

Contribution to the Project: PD/PI

Funding Support: NSF

International Collaboration: No
International Travel: No

Zachary T Aanderud
Email: zachary_aanderud@byu.edu
Most Senior Project Role: Co PD/PI
Nearest Person Month Worked: 2

Contribution to the Project: co PD/PI and co-lead of RFA1

Funding Support: BYU

International Collaboration: No
International Travel: No

James R Ehleringer
Email: jim.ehleringer@utah.edu
Most Senior Project Role: Co PD/PI
Nearest Person Month Worked: 1

Contribution to the Project: co-PD/PI

Funding Support: 1 month match

International Collaboration: No
International Travel: No

Douglas Jackson-Smith
Email: doug.jackson-smith@usu.edu
Most Senior Project Role: Co PD/PI
Nearest Person Month Worked: 2

Contribution to the Project: co PD/PI; RFA2 co-lead

Funding Support: USU

International Collaboration: No
International Travel: No

Courtenay Strong
Email: court.strong@utah.edu
Most Senior Project Role: Co PD/PI
Nearest Person Month Worked: 2

Contribution to the Project: co-PI, co-lead RFA3

Funding Support: UU

International Collaboration: No
International Travel: No

Zanazzi Alessandro
Email: alessandro.zanazzi@uvu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: RCG award

Funding Support: UVU

International Collaboration: No
International Travel: No

Rick Balling
Email: balling@byu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: RFA2

Funding Support: BYU

International Collaboration: No
International Travel: No

Betsy Bancroft
Email: betsybancroft@suu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: iUTAH grant recipient from SUU

Funding Support: SUU

International Collaboration: No
International Travel: No

Scott Bates
Email: scott.bates@usu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at USU participating in research at iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Daniel Bedford
Email: dbedford@weber.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at Weber St. participating in research at iUTAH

Funding Support: Weber State

International Collaboration: No
International Travel: No

Gabriel Bowen
Email: gabe.bowen@utah.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at UU participating in research at iUTAH

Funding Support: UU

International Collaboration: No
International Travel: No

Brenda Bowen
Email: brenda.bowen@utah.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Professional at iUTAH

Funding Support: UU

International Collaboration: No
International Travel: No

Dave Bowling
Email: david.bowling@utah.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 2

Contribution to the Project: RFA1 co-lead

Funding Support: UU

International Collaboration: No
International Travel: No

Paul Brooks
Email: paul.brooks@utah.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 2

Contribution to the Project: iBUGI co-lead and RFA1

Funding Support: UU

International Collaboration: No
International Travel: No

Mark Brunson
Email: mark.brunson@usu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 3

Contribution to the Project: EOD Director and RFA3

Funding Support: USU and USTAR

International Collaboration: No
International Travel: No

Martin Buchert
Email: martin.buchert@utah.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 3

Contribution to the Project: Faculty at UU participating in research at iUTAH

Funding Support: UU

International Collaboration: No
International Travel: No

Michael Bunds
Email: michael.bunds@uvu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: RFA1

Funding Support: UVU

International Collaboration: No
International Travel: No

Steve Burian
Email: burian@eng.utah.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at UU participating in research at iUTAH

Funding Support: UU

International Collaboration: No
International Travel: No

Greg Carling
Email: greg.carling@byu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 2

Contribution to the Project: Faculty at BYU participating in research at iUTAH

Funding Support: BYU

International Collaboration: No
International Travel: No

Tony Castronova
Email: tony.castronova@usu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 5

Contribution to the Project: Faculty at USU Water Lab participating in research at iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Steve Corbato
Email: steve.corbato@utah.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Faculty at UU participating in research at iUTAH

Funding Support: UU

International Collaboration: No
International Travel: No

Jay DeSart
Email: jdesart@uvu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: RCG award

Funding Support: UVU

International Collaboration: No
International Travel: No

Ryan Dupont
Email: ryan.dupont@usu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at USU participating in research at iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Eric Edwards
Email: eric.charles.edwards@gmail.com
Most Senior Project Role: Faculty
Nearest Person Month Worked: 2

Contribution to the Project: RFA2

Funding Support: USU

International Collaboration: No
International Travel: No

Steve Emerman
Email: stevenE@uvu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: RFA1

Funding Support: UVU

International Collaboration: No
International Travel: No

Carla Endres
Email: carla.endres@usu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Faculty at USU participating in research at iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Joanna Endter-Wada
Email: joanna.endter-wada@usu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at USU participating in research at iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Reid Ewing
Email: ewing@arch.utah.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at UU participating in research at iUTAH

Funding Support: UU

International Collaboration: No
International Travel: No

Courtney Flint
Email: Courtney.Flint@usu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 2

Contribution to the Project: Faculty at USU participating in research at iUTAH

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Govedich Fred
Email: govedich@suu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: RCG award

Funding Support: SUU

International Collaboration: No
International Travel: No

Joanna Ganning
Email: joanna.ganning@utah.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 2

Contribution to the Project: RFA2 and RFA3

Funding Support: UU

International Collaboration: No
International Travel: No

Richard Gill
Email: rgill@byu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 2

Contribution to the Project: Faculty at BYU participating in research at iUTAH

Funding Support: BYU

International Collaboration: No
International Travel: No

Luis Gordillo
Email: luis.gordillo@snow.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Faculty at Snow College participating in research at iUTAH

Funding Support: Snow College

International Collaboration: No
International Travel: No

Jacqualine Grant
Email: jacqualinegrant@suu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at SUU participating in research at iUTAH

Funding Support: SUU

International Collaboration: No
International Travel: No

Sarah Hinners
Email: sarah.hinners@utah.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 2

Contribution to the Project: Faculty at UU participating in research at iUTAH

Funding Support: UU

International Collaboration: No
International Travel: No

Daniel Homs
Email: hornsda@uvu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Faculty at UVU participating in research at iUTAH

Funding Support: UVU

International Collaboration: No
International Travel: No

Jeff Horsburgh
Email: jeff.horsburgh@usu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 3

Contribution to the Project: USU Faculty

Funding Support: USU

International Collaboration: No
International Travel: No

Peter Howe
Email: peter.howe@usu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Faculty at USU participating in research at iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Laura Hunter
Email: lhunter@uen.org
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Faculty at UEN participating in research at iUTAH

Funding Support: UEN

International Collaboration: No
International Travel: No

Nancy Huntly
Email: nancy.huntly@usu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at USU participating in research at iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Ryan Jensen
Email: ryan.jensen@byu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at BYU participating in research at iUTAH

Funding Support: BYU

International Collaboration: No
International Travel: No

Jiming Jin
Email: jiming.jin@usu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at USU participating in research at iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Gary Johnson
Email: garyjohnson@weber.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: RFA2

Funding Support: Weber St.

International Collaboration: No
International Travel: No

Norm Jones
Email: njones@byu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at BYU participating in research at iUTAH

Funding Support: BYU

International Collaboration: No
International Travel: No

Scott Jones
Email: scott.jones@usu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 2

Contribution to the Project: Faculty at USU participating in research at iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Shujuan Li
Email: shujuan.li@usu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 2

Contribution to the Project: Faculty at USU participating in research at iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Carlos Licon
Email: carlos.licon@usu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at USU participating in research at iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Britt Mace
Email: mace@suu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: RCG award

Funding Support: SUU

International Collaboration: No
International Travel: No

Molly Malone
Email: molly.malone@utah.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at UU participating in research at iUTAH

Funding Support: UU

International Collaboration: No
International Travel: No

David Matty
Email: dmatty@weber.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Faculty at Weber St. participating in research at iUTAH

Funding Support: Weber St.

International Collaboration: No
International Travel: No

William McDowell
Email: bill.mcdowell@unh.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: External Advisory Board

Funding Support: UNH

International Collaboration: No
International Travel: No

Nancy Mesner
Email: nancy.mesner@usu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at USU participating in research at iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

William Michener
Email: wmichene@unm.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: External Advisory Board

Funding Support: UNM

International Collaboration: No
International Travel: No

Jeffrey Moore
Email: jeff.moore@utah.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: RCG award

Funding Support: UU

International Collaboration: No
International Travel: No

Lucas Moyer-Horner
Email: lucas.m.horner@utah.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: co-lead iFellows

Funding Support: UU

International Collaboration: No
International Travel: No

Bethany Neilson
Email: bethany.neilson@usu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at USU Water Lab participating in research at iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Sarah Null
Email: sarah.null@usu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 2

Contribution to the Project: Faculty at USU participating in research at iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Bill O'Neill
Email: oneillb@dixie.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at Dixie participating in research at iUTAH

Funding Support: Dixie

International Collaboration: No
International Travel: No

Eric Pardyjak
Email: pardyjak@gmail.com
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at UU participating in research at iUTAH

Funding Support: UU

International Collaboration: No
International Travel: No

Christine Pomeroy
Email: christine.pomeroy@utah.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 2

Contribution to the Project: Faculty at UU participating in research at iUTAH

Funding Support: UU

International Collaboration: No
International Travel: No

Mitchell Power
Email: mitchell.power@geog.utah.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: RCG award

Funding Support: UU

International Collaboration: No
International Travel: No

David Rosenberg
Email: david.rosenberg@usu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 2

Contribution to the Project: Faculty at USU participating in research at iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Alexander Simon
Email: alex.simon@uvu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: RCG award

Funding Support: UVU

International Collaboration: No
International Travel: No

Sam St. Clair
Email: stclair@byu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at BYU participating in research at iUTAH

Funding Support: BYU

International Collaboration: No
International Travel: No

Louisa Stark
Email: louisa.stark@utah.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at UU participating in research at iUTAH. Director of iUTAH's Summer Institute

Funding Support: UU

International Collaboration: No
International Travel: No

Rob Stoll
Email: rstoll@eng.utah.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at UU participating in research at iUTAH

Funding Support: UU

International Collaboration: No
International Travel: No

David Tarboton
Email: david.tarboton@usu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Faculty at USU participating in research at iUTAH

Funding Support: USU

International Collaboration: No

International Travel: No

Nathan Toke
Email: nathan.toke@uvu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: RCG award

Funding Support: UVU

International Collaboration: No
International Travel: No

Carla Trentelman
Email: carlatrentelman@weber.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at Weber St. participating in research at iUTAH

Funding Support: Weber St.

International Collaboration: No
International Travel: No

Andrew Van Alstyne
Email: andrewvanalstyne@suu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: RCG award

Funding Support: SUU

International Collaboration: No
International Travel: No

Judy Van Houten
Email: Judith.Vanhouten@uvm.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Member of External Advisory Board

Funding Support: U Vermont

International Collaboration: No
International Travel: No

Anne Wairepo
Email: annew@uvu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Faculty at UVU participating in research at iUTAH

Funding Support: UVU

International Collaboration: No
International Travel: No

Suzanne Walther
Email: SWalther@uvu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 2

Contribution to the Project: Faculty at UVU participating in research at iUTAH

Funding Support: UVU

International Collaboration: No
International Travel: No

Simon Wang
Email: simon.wang@usu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: RFA1 and RFA3

Funding Support: USU

International Collaboration: No
International Travel: No

Matthew Weeg
Email: matthewweeg@suu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: RCG award

Funding Support: SUU

International Collaboration: No
International Travel: No

Bo Yang
Email: bo.yang@usu.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 2

Contribution to the Project: Faculty at USU participating in research at iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Sara Yeo
Email: sara.yeo@utah.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: RFA2

Funding Support: UU

International Collaboration: No
International Travel: No

Maura Hahnenberger
Email: mhahnenb@bruinmail.slcc.edu
Most Senior Project Role: Community College Faculty
Nearest Person Month Worked: 1

Contribution to the Project: External Engagement/Outreach, EOD innovation award

Funding Support: SLCC

International Collaboration: No
International Travel: No

Marian Howe-Taylor
Email: marian.howe-taylor@slcc.edu
Most Senior Project Role: Community College Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Faculty at SLCC participating in research at iUTAH

Funding Support: SLCC

International Collaboration: No
International Travel: No

Mary Jane Keleher
Email: maryjane.keleher@slcc.edu
Most Senior Project Role: Community College Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Faculty at SLCC participating in research at iUTAH

Funding Support: SLCC

International Collaboration: No
International Travel: No

Daniel Poole
Email: daniel.poole@slcc.edu
Most Senior Project Role: Community College Faculty
Nearest Person Month Worked: 1

Contribution to the Project: RFA2

Funding Support: SLCC

International Collaboration: No
International Travel: No

Kristina Kaly
Email: kristina.kaly@slcschools.org
Most Senior Project Role: K-12 Teacher
Nearest Person Month Worked: 1

Contribution to the Project: External Engagement/Outreach, EOD innovation award

Funding Support: Rose Park Elementary

International Collaboration: No
International Travel: No

Ken O'Brien
Email: Ken.Obrien@slcschools.org
Most Senior Project Role: K-12 Teacher
Nearest Person Month Worked: 1

Contribution to the Project: External Engagement/Outreach, EOD innovation award

Funding Support: Rose Park Elementary

International Collaboration: No
International Travel: No

Rachel Gabor
Email: rachel.gabor@utah.edu
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 5

Contribution to the Project: RFA1 and RFA2

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Melissa Haeffner
Email: melissahaeffner@gmail.com
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 2

Contribution to the Project: RFA2

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Rebecca Hale
Email: rebecca.hale@utah.edu
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 12

Contribution to the Project: UU PosDoc by iUTAH

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Steven Hall
Email: steven.j.hall@utah.edu
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 12

Contribution to the Project: UU PosDoc by iUTAH

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Krishna Khatri
Email: krishna.khatri@gmail.com
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 1

Contribution to the Project: RFA3

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Erik Oerter
Email: erik.oerter@berkeley.edu
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 1

Contribution to the Project: RFA1

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Adrienne Andrews
Email: adrienneandrews@weber.edu
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 1

Contribution to the Project: Diversity specialist at Weber St

Funding Support: Weber St

International Collaboration: No
International Travel: No

Tim Bardsley
Email: wwa.bardsley@gmail.com
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 1

Contribution to the Project: Western Water Assessment team

Funding Support: Western Water Assessment

International Collaboration: No
International Travel: No

Nancy Bo Flood
Email: wflood@hotmail.com
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 1

Contribution to the Project: Navajo Nation representative, diversity specialist

Funding Support: Navajo Nation

International Collaboration: No
International Travel: No

Kerry Bringhurst
Email: kerry.bringhurst@usu.edu
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 1

Contribution to the Project: External Engagement/Outreach, EOD innovation award

Funding Support: UPR

International Collaboration: No
International Travel: No

Ellen Burns
Email: ellen.burns@usu.edu
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 12

Contribution to the Project: iUTAH EOD coordinator

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Pabitra Dash
Email: pabitra.dash@usu.edu
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 1

Contribution to the Project: Programmer at USU Water Lab participating in research at iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Sue Dintelman

Email: sue@pleiades-software.com
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 0

Contribution to the Project: Pleiades Software, Inc. - private enterprise representative

Funding Support: Pleiades Software, Inc.

International Collaboration: No
International Travel: No

Erika DuRoss
Email: EDuRoss@theleonardo.org
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 1

Contribution to the Project: Education specialist from The Leonardo

Funding Support: The Leonardo

International Collaboration: No
International Travel: No

Terra Huff
Email: terra.huff@usu.edu
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 6

Contribution to the Project: Financial Oficer of IUTAH at USU

Funding Support: USU

International Collaboration: No
International Travel: No

Chris Keleher
Email: ChristopherKeleher@utah.gov
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 0

Contribution to the Project: Member of iUTAH management team

Funding Support: State of Utah

International Collaboration: No
International Travel: No

Julie Kiefer

Email: exploreutahscience@gmail.com
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 1

Contribution to the Project: Member of EUS

Funding Support: EUS

International Collaboration: No
International Travel: No

Andreas Leidolf
Email: andreas.leidolf@usu.edu
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 9

Contribution to the Project: Assistant Director/Project Administrator

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Caitlyn Lewis
Email: caitlyn.lewis@usu.edu
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 9

Contribution to the Project: Outreach Assistant

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Cassandra Manuelito-Kerkvliet
Email: manuelitokerkvliet@hotmail.com
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 0

Contribution to the Project: External Advisory Board

Funding Support: CMK Consultancy part of the EAB

International Collaboration: No
International Travel: No

Anna McEntire
Email: anna.mcentire@usu.edu

Most Senior Project Role: Other Professional
Nearest Person Month Worked: 1

Contribution to the Project: USU

Funding Support: USU

International Collaboration: No
International Travel: No

Rebecca Menlove
Email: bmenlove@nhmu.utah.edu
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 1

Contribution to the Project: NHMU, educational specialist

Funding Support: NHMU

International Collaboration: No
International Travel: No

Adelbert Nelson
Email: mansel.nelson@nau.edu
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 0

Contribution to the Project: Diversity specilist of Northern Arizona U

Funding Support: Northern Arizona U

International Collaboration: No
International Travel: No

Jennifer Pemberton
Email: jennifercpemberton@gmail.com
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 1

Contribution to the Project: External Engagement/Outreach, EOD innovation award

Funding Support: UPR

International Collaboration: No
International Travel: No

Jackie Pendleton
Email: outreach@thelivingplanet.com
Most Senior Project Role: Other Professional

Nearest Person Month Worked: 1

Contribution to the Project: EOD supplement from The Living Plant Aquarium

Funding Support: The Living Plant Aquarium

International Collaboration: No
International Travel: No

Lauren Petty
Email: lauren.petty@usu.edu
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 2

Contribution to the Project: iUTAH Communications/Logistics Administrator at USU

Funding Support: USU

International Collaboration: No
International Travel: No

Robert Ramsey
Email: bob.ramsey@crsengineers.com
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 1

Contribution to the Project: Consultant at Canyon Concepts LLC

Funding Support: Canyon Concepts LLC

International Collaboration: No
International Travel: No

Samuel Rivera
Email: samuel.rivera@aggiemail.usu.edu
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 4

Contribution to the Project: Science Coordinator of IUTAH at USU

Funding Support: USU

International Collaboration: No
International Travel: No

Madlyn Runburg
Email: mrunburg@nhmu.utah.edu
Most Senior Project Role: Other Professional

Nearest Person Month Worked: 2

Contribution to the Project: NHMU, educational specialist

Funding Support: NHMU

International Collaboration: No
International Travel: No

Kim Schuske
Email: exploreutahscience@gmail.com(2)
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 1

Contribution to the Project: Member of EUS EOD supplement

Funding Support: EUS

International Collaboration: No
International Travel: No

Jessica Seppi
Email: jseppi@nhmu.utah.edu
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 2

Contribution to the Project: NHMU, educational specialist

Funding Support: NHMU

International Collaboration: No
International Travel: No

Katie Smith
Email: ksmith@theleonardo.org
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 1

Contribution to the Project: Education specialist from The Leonardo

Funding Support: The Leonardo

International Collaboration: No
International Travel: No

Weihong Wang
Email: weihong.wang@uvu.edu
Most Senior Project Role: Other Professional

Nearest Person Month Worked: 1

Contribution to the Project: UVU recipient of RCG grants

Funding Support: UVU

International Collaboration: No
International Travel: No

Sarah Young
Email: sarah.young@schools.utah.gov
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 0

Contribution to the Project: State of Utah

Funding Support: State of Utah

International Collaboration: No
International Travel: No

Jessica Anderson
Email: janderson@uen.org
Most Senior Project Role: Technician
Nearest Person Month Worked: 2

Contribution to the Project: Technician from UEN

Funding Support: UEN

International Collaboration: No
International Travel: No

Jobie Carlisle
Email: jobie@usu.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 1

Contribution to the Project: Technician at USU

Funding Support: USU

International Collaboration: No
International Travel: No

Chris Cox
Email: chrisrycx@gmail.com
Most Senior Project Role: Technician

Nearest Person Month Worked: 12

Contribution to the Project: Technician at USU

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Joe Crawford
Email: joe_crawford@byu.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 9

Contribution to the Project: BYU technician sponsored by iUTAH

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Dave Eiriksson
Email: dave.eiriksson@utah.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 12

Contribution to the Project: UU technician sponsored by iUTAH

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Brian Greene
Email: brian.greene@usu.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 6

Contribution to the Project: USU Technician sponsored by iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Amber Jones
Email: amber.jones@usu.edu
Most Senior Project Role: Technician

Nearest Person Month Worked: 12

Contribution to the Project: USU Water Lab Tech sponsored by iUTAH

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Rusty Keele
Email: rkeele@uen.org
Most Senior Project Role: Technician
Nearest Person Month Worked: 1

Contribution to the Project: Technician from UEN

Funding Support: UEN

International Collaboration: No
International Travel: No

Matt Lorimer
Email: matt.lorimer@usu.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 1

Contribution to the Project: CI, systems administrator

Funding Support: USU

International Collaboration: No
International Travel: No

Stephanie Reeder
Email: stephanie.reeder@usu.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 3

Contribution to the Project: Technician-Programmer at USU Water Lab

Funding Support: USU

International Collaboration: No
International Travel: No

Morgan Grove
Email: mgrove@fs.fed.us
Most Senior Project Role: Staff Scientist (doctoral level)

Nearest Person Month Worked: 0

Contribution to the Project: External Advisory Board

Funding Support: USFS

International Collaboration: No
International Travel: No

Matt Miller
Email: mamiller@usgs.gov
Most Senior Project Role: Staff Scientist (doctoral level)
Nearest Person Month Worked: 0

Contribution to the Project: USGS official, water data and advise provider

Funding Support: USGS

International Collaboration: No
International Travel: No

Andrea Amstrong
Email: armstrong.usu@gmail.com
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: USU graduate student sponsored by iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Brian Bailey
Email: bri.bailey@utah.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: UU graduate student sponsored by iUTAH

Funding Support: UU

International Collaboration: No
International Travel: No

Dave Betts
Email: davebetts@gmail.com
Most Senior Project Role: Graduate Student (research assistant)

Nearest Person Month Worked: 6

Contribution to the Project: USU graduate student sponsored by iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Caleb Buahin
Email: caleb.buahin@aggiemail.usu.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: USU Water Lab graduate student sponsored by iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Michael Bunnell
Email: michaelcbunnell@gmail.com
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: BYU graduate student sponsored by iUTAH

Funding Support: BYU

International Collaboration: No
International Travel: No

Allison Chan
Email: amchan118@gmail.com
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: UU graduate student sponsored by iUTAH

Funding Support: UU

International Collaboration: No
International Travel: No

Chris Elliott
Email: chris.elliott@usu.edu
Most Senior Project Role: Graduate Student (research assistant)

Nearest Person Month Worked: 2

Contribution to the Project: Adminstrative Assistant

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Youcan Feng
Email: youcan.feng@utah.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: UU graduate student sponsored by iUTAH

Funding Support: UU

International Collaboration: No
International Travel: No

Tim Goodsell
Email: timothy.goodsell@gmail.com
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: BYU graduate student sponsored by iUTAH supervised by Greg Carling

Funding Support: BYU

International Collaboration: No
International Travel: No

Erin Jones
Email: erinfjones3@gmail.com
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: BYU graduate student sponsored by iUTAH

Funding Support: BYU

International Collaboration: No
International Travel: No

Julia Kelso
Email: julia.kelso@gmail.com
Most Senior Project Role: Graduate Student (research assistant)

Nearest Person Month Worked: 6

Contribution to the Project: USU graduate student sponsored by iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Zacharia Levine
Email: z.levine@utah.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: UU graduate student sponsored by iUTAH

Funding Support: UU

International Collaboration: No
International Travel: No

Enjie Li
Email: enjie.li@aggiemail.usu.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: USU graduate student sponsored by iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Elizabeth Ogata
Email: bethogata@gmail.com
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: Graduate researcher working on iUTAH

Funding Support: USU Presidential Doctoral Research Fellowship

International Collaboration: No
International Travel: No

Omar Perez-Reyes
Email: macrobrachium@gmail.com
Most Senior Project Role: Graduate Student (research assistant)

Nearest Person Month Worked: 2

Contribution to the Project: USU graduate student sponsored by iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Kimi Smith
Email: kimi.smith@utah.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: UU graduate student sponsored by iUTAH

Funding Support: UU

International Collaboration: No
International Travel: No

Philip Stoker
Email: philip.a.stoker@gmail.com
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: UU graduate student sponsored by iUTAH

Funding Support: UU

International Collaboration: No
International Travel: No

Allison Albert
Email: allisongalbert@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: 2014 iFellow

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Tim Beach
Email: timbeach17@gmail.com
Most Senior Project Role: Undergraduate Student

Nearest Person Month Worked: 2

Contribution to the Project: 2014 iFellow

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Tobias Brotherton
Email: tab0531@westminstercollege.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: 2014 iFellow

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Andrew Butterfield
Email: ajb0302@westminstercollege.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: 2014 iFellow

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Hayden Campbell
Email: alexandria.hayden.campbell@aggiemail.usu.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 3

Contribution to the Project: USU undergraduate student sponsored by iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Juan Caraballo
Email: juan.caraballo17@gmail.com
Most Senior Project Role: Undergraduate Student

Nearest Person Month Worked: 3

Contribution to the Project: USU Water Lab undergraduate student sponsored by iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Gardiner Coral
Email: 21coralreef@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: RCG undergrad

Funding Support: SUU

International Collaboration: No
International Travel: No

Long Donald
Email: Donaldo82@yahoo.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: RCG undergrad

Funding Support: SUU

International Collaboration: No
International Travel: No

Kenyon Gentry
Email: kkg0325@westminstercollege.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: 2014 iFellow

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Adam Henrie
Email: adamhenry1@mail.weber.edu
Most Senior Project Role: Undergraduate Student

Nearest Person Month Worked: 2

Contribution to the Project: 2014 iFellow

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Katlyn Hicks
Email: latlynnhicks@mail.weber.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: 2014 iFellow

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Alexis Holzwarth
Email: alexis.holzwarth@hotmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: 2014 iFellow

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Jeffrey Josephson
Email: jeffreyjosephson@mail.weber.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: 2014 iFellow

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Lauren Kelley
Email: lauren.kelley@usu.edu
Most Senior Project Role: Undergraduate Student

Nearest Person Month Worked: 4

Contribution to the Project: Administrative Assistant

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Mario Matos
Email: mario.matos@usu.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 3

Contribution to the Project: Undergrad student at USU Water Lab participating in research at iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Jacob Meline
Email: jacob.meline@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 3

Contribution to the Project: Undergrad student at USU Water Lab participating in research at iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Claire O'Donnell
Email: u0491817@utah.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: 2014 iFellow

Funding Support: iUTAH

International Collaboration: No
International Travel: No

James Patton
Email: j.patton@aggiemail.usu.edu
Most Senior Project Role: Undergraduate Student

Nearest Person Month Worked: 3

Contribution to the Project: USU undergraduate student sponsored by iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Maurier Ramirez
Email: mauriel.ramirez@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 3

Contribution to the Project: Undergrad student at USU Water Lab participating in research at iUTAH

Funding Support: USU

International Collaboration: No
International Travel: No

Samuel Stout
Email: samuelstout1@mail.weber.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: 2014 iFellow

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Anne Thomas
Email: aet_artist@sbcglobal.net
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: 2014 iFellow

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Michelle Williams
Email: michelle.will879@gmail.com
Most Senior Project Role: Undergraduate Student

Nearest Person Month Worked: 2

Contribution to the Project: 2014 iFellow

Funding Support: iUTAH

International Collaboration: No
International Travel: No

Jacqueline Ewing-Taylor
Email: jacque@unr.edu
Most Senior Project Role: Consultant
Nearest Person Month Worked: 2

Contribution to the Project: U Nevada Reno

Funding Support: U Nevada Reno

International Collaboration: No
International Travel: No

What other organizations have been involved as partners?

Name	Type of Partner Organization	Location
Brigham Young University	Academic Institution	Provo, Utah
Campbell Scientific, Inc.	Industrial or Commercial Firms	Logan, Utah
Judge Memorial High school (Judge)	Academic Institution	Salt Lake City, Utah
Logan City	State or Local Government	Logan, Utah
Logan Northwest Field Irrigation Company	Industrial or Commercial Firms	Logan, Utah
Logan, Hyde Park and Smithfield Canal Company	Industrial or Commercial Firms	Logan, Utah
Montana State University Billings	Academic Institution	Billings, Montana
Natural History Museum of Utah	Other Nonprofits	Salt Lake City, Utah
Northern Arizona University (NAU)	Academic Institution	Northern Arizona
Providence Blacksmith Fork Irrigation Co.	Industrial or Commercial Firms	Providence, Utah
Purdue University	Academic Institution	Indiana

Renaissance Computing Institute (RENCI)	Academic Institution	North Carolina
Christina River Critical Zone Observatory	Other Nonprofits	Delaware, Pennsylvania and Maryland
STEM Evaluation Associates	Other Nonprofits	Western US
Salt Lake City	State or Local Government	Salt Lake City, Utah
Salt Lake Community College	Academic Institution	Salt Lake City, Utah
Salt Lake County	State or Local Government	Salt Lake City, Utah
Salt Lake Department of Public Utilities	State or Local Government	Salt Lake City, Utah
Southern Utah University	Academic Institution	Cedar city, Utah
Stroud Water Research Center	Other Nonprofits	Avondale, PA
The Leonardo	Other Nonprofits	Salt Lake City, Utah
Triangle Coalition for STEM Education (Triangle)	Other Nonprofits	Washington D.C.
Tufts University	Academic Institution	Massachusetts
Consortium of Universities for the Advancement of Hydrologic	Academic Institution	National
US Forest Service Rocky Moutain Research Station (RMRS)	Other Organizations (foreign or domestic)	Logan, Utah
United States Bureau of Reclamation (BLM)	Other Organizations (foreign or domestic)	Salt Lake City, Utah
United States Geological Survey	Other Organizations (foreign or domestic)	Salt Lake City, Utah
University of Alaska Anchorage	Academic Institution	Anchorage, Alaska
University of Hawaii	Academic Institution	Hawaii
University of Idaho	Academic Institution	Moscow, Idaho
University of Illinois at Urbana-Champaign (UIUC)	Academic Institution	Illinois

University of Life Sciences & Natural Resources (BOKU)	Academic Institution	Vienna, Austria
University of New Hampshire	Academic Institution	New Hampshire
University of New Mexico	Academic Institution	Las Cruces, New Mexico
Dixie State University (DSU)	Academic Institution	Southern Utah
University of North Carolina Chapel Hill	Academic Institution	North Carolina
University of South Carolina	Academic Institution	South Carolina
University of Texas at Austin	Academic Institution	Texas
University of Toledo	Academic Institution	Toledo, Ohio
University of Utah	Academic Institution	Salt Lake City, Utah
University of Wyoming	Academic Institution	Wyoming
Utah Automated Geographic Resource Center	State or Local Government	Salt Lake City, Utah
Utah Department of Agriculture (UDA)	State or Local Government	Salt Lake City, Utah
Utah Education Network	Academic Institution	Salt Lake City, Utah
Utah State University - Eastern	Academic Institution	Eastern Utah
Envision Utah	Other Nonprofits	Utah
Utah State University - Eastern	Academic Institution	Logan, Utah
Utah Stormwater Advisory Committee (USWAC)	State or Local Government	Utah
Utah Valley University	Academic Institution	Orem, Utah
Utah Water Research Laboratory (UWRL)	Academic Institution	Logan, Utah
Washington State University (WaSU)	Academic Institution	Washington state
Western Water Asssessment (WWA)	Other Nonprofits	Colorado, Western US
Westminster College	Academic Institution	Salt Lake City, Utah

Explore Utah Science (Explore)	Other Nonprofits	Utah
Four Corners School	Academic Institution	Monticello, Utah
HydroShare	Academic Institution	National
JUB Engineering	Industrial or Commercial Firms	Utah

Full details of organizations that have been involved as partners:

Brigham Young University

Organization Type: Academic Institution
Organization Location: Provo, Utah

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution:

Campbell Scientific, Inc.

Organization Type: Industrial or Commercial Firms
Organization Location: Logan, Utah

Partner's Contribution to the Project:
Collaborative Research
Personnel Exchanges

More Detail on Partner and Contribution: Campbell Sci. as been the host of iUTAH students in internships.
http://www.campbellsci.com

Christina River Critical Zone Observatory

Organization Type: Other Nonprofits
Organization Location: Delaware, Pennsylvania and Maryland

Partner's Contribution to the Project:
Collaborative Research
Personnel Exchanges

More Detail on Partner and Contribution: Whole watershed integration. We integrate knowledge of water, mineral and carbon cycles to quantify human impact on Critical Zone Carbon sequestration - from soils to sea.

Consortium of Universities for the Advancement of Hydrologic

Organization Type: Academic Institution
Organization Location: National

Partner's Contribution to the Project:
Facilities
Collaborative Research
Personnel Exchanges

More Detail on Partner and Contribution:

Dixie State University (DSU)

Organization Type: Academic Institution
Organization Location: Southern Utah

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Dixie State is a four-year regional university in southern Utah that primarily serves Utah state residents, southern Nevada, and southern California. It is an open-enrollment school and has a large population of non-traditional students. As of spring 2013: We offer 67 degree programs, emphasis areas and certificates. 87% of students are on financial aid. 215 full-time faculty (23:1 student to faculty ratio). http://new.dixie.edu/

Envision Utah

Organization Type: Other Nonprofits
Organization Location: Utah

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Exchange ideas, projects

Explore Utah Science (Explore)

Organization Type: Other Nonprofits
Organization Location: Utah

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Original reporting and multimedia broadcasting of Utah-centric science news and information. http://www.exploreutahscience.org

Four Corners School

Organization Type: Academic Institution
Organization Location: Monticello, Utah

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Four Corners School of Outdoor Education is a nonprofit organization founded in 1984. Based in Monticello, Utah, Four Corners School provides place-based outdoor education on and about the Colorado Plateau (Northern Arizona, Southwestern Colorado, Northwestern New Mexico, Southern Utah). The mission of Four Corners School of Outdoor Education is to create lifelong learning experiences about the Colorado Plateau bioregion for people of all ages and backgrounds through education, service, adventure, and conservation programs. The vision of Four Corners School of Outdoor Education is to build a diverse community of people who are committed to conserving the natural and cultural treasures of the Colorado Plateau.

HydroShare

Organization Type: Academic Institution
Organization Location: National

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: HydroShare is a collaborative website being developed by a collaborative team for better access to data and models in the hydrologic sciences. HydroShare is aimed at providing the sustainable technology infrastructure needed to address critical issues related to water quantity, quality, accessibility, and management. http://www.cuahsi.org/HydroShare.aspx

JUB Engineering

Organization Type: Industrial or Commercial Firms
Organization Location: Utah

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Non-participating Institution

Judge Memorial High school (Judge)

Organization Type: Academic Institution
Organization Location: Salt Lake City, Utah

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Judge Memorial is a diverse, co-educational, college preparatory school centrally located in Salt Lake City, Utah http://www.judgememorial.com/

Logan City

Organization Type: State or Local Government
Organization Location: Logan, Utah

Partner's Contribution to the Project:
Facilities
Collaborative Research

More Detail on Partner and Contribution: Public work at Logan city, UT.

Logan Northwest Field Irrigation Company

Organization Type: Industrial or Commercial Firms
Organization Location: Logan, Utah

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Water users

Logan, Hyde Park and Smithfield Canal Company

Organization Type: Industrial or Commercial Firms
Organization Location: Logan, Utah

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Canal company in Cache Valley

Montana State University Billings

Organization Type: Academic Institution
Organization Location: Billings, Montana

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: DRUPAL collaboration

Natural History Museum of Utah

Organization Type: Other Nonprofits
Organization Location: Salt Lake City, Utah

Partner's Contribution to the Project:
Facilities
Collaborative Research

More Detail on Partner and Contribution:

Northern Arizona University (NAU)

Organization Type: Academic Institution
Organization Location: Northern Arizona

Partner's Contribution to the Project:
Collaborative Research
Personnel Exchanges

More Detail on Partner and Contribution: Northern Arizona University's main campus is located in Flagstaff, AZ. There are 34 additional campuses, many which are located in underrepresented communities. http://nau.edu

Providence Blacksmith Fork Irrigation Co.

Organization Type: Industrial or Commercial Firms
Organization Location: Providence, Utah

Partner's Contribution to the Project:
Collaborative Research
Personnel Exchanges

More Detail on Partner and Contribution: Water users

Purdue University

Organization Type: Academic Institution
Organization Location: Indiana

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: http://www.purdue.edu/

Renaissance Computing Institute (RENCI)

Organization Type: Academic Institution
Organization Location: North Carolina

Partner's Contribution to the Project:
In-Kind Support

More Detail on Partner and Contribution: RENCI (Renaissance Computing Institute) develops and deploys advanced technologies to enable research discoveries and practical innovations. RENCI partners with researchers, policy makers, and technology leaders to engage and solve the challenging problems that affect North Carolina, our nation and the world. An institute of the University of North Carolina at Chapel Hill, RENCI was launched in 2004 as a collaborative effort involving UNC Chapel Hill, Duke University and North Carolina State University. http://www.renci.org/

STEM Evaluation Associates

Organization Type: Other Nonprofits

Organization Location: Western US

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: We provide external evaluations for STEM projects to universities and school districts across the west.

Salt Lake City

Organization Type: State or Local Government
Organization Location: Salt Lake City, Utah

Partner's Contribution to the Project:
Facilities
Personnel Exchanges

More Detail on Partner and Contribution: Salt Lake City govermnent

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Salt Lake Community College

Organization Type: Academic Institution
Organization Location: Salt Lake City, Utah

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution:

Salt Lake County

Organization Type: State or Local Government
Organization Location: Salt Lake City, Utah

Partner's Contribution to the Project:
Collaborative Research
Personnel Exchanges

More Detail on Partner and Contribution: Salt Lake County government

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Salt Lake Department of Public Utilities

Organization Type: State or Local Government
Organization Location: Salt Lake City, Utah

Partner's Contribution to the Project:
Facilities

More Detail on Partner and Contribution: Salt Lake City Department of Public Utilities is committed to serving our

customers and protecting our environment by delivering high-quality drinking water, managing flood control and storm water, and collecting and treating wastewater to standards that exceed EPA regulations. We actively protect our source waters and promote its efficient use. Established in 1876, the Utility is the oldest retail water provider in the West, and as a municipal agency is funded by water sales and new connection fees, not taxes. http://www.slcgov.com/utilities

Southern Utah University

Organization Type: Academic Institution
Organization Location: Cedar city, Utah

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution:

Stroud Water Research Center

Organization Type: Other Nonprofits
Organization Location: Avondale, PA

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: http://www.stroudcenter.org

The Leonardo

Organization Type: Other Nonprofits
Organization Location: Salt Lake City, Utah

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Museum. educational purposes

Triangle Coalition for STEM Education (Triangle)

Organization Type: Other Nonprofits
Organization Location: Washington D.C.

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Agency responsible for administering the Albert Einstein Distinguished Educator Fellowship Program.

Tufts University

Organization Type: Academic Institution
Organization Location: Massachusetts

Partner's Contribution to the Project:
Collaborative Research
Personnel Exchanges

More Detail on Partner and Contribution: http://www.tufts.edu/

US Forest Service Rocky Moutain Research Station (RMRS)

Organization Type: Other Organizations (foreign or domestic)
Organization Location: Logan, Utah

Partner's Contribution to the Project:
Collaborative Research
Personnel Exchanges

More Detail on Partner and Contribution: Research unit of the US Forest Service

United States Bureau of Reclamation (BLM)

Organization Type: Other Organizations (foreign or domestic)
Organization Location: Salt Lake City, Utah

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: The BLM is a United States Department of the Interior.

United States Geological Survey

Organization Type: Other Organizations (foreign or domestic)
Organization Location: Salt Lake City, Utah

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution:

University of Alaska Anchorage

Organization Type: Academic Institution
Organization Location: Anchorage, Alaska

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: This is part of DRUPAL collaboration

University of Hawaii

Organization Type: Academic Institution
Organization Location: Hawaii

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: This is part of DRUPAL collaboration

University of Idaho

Organization Type: Academic Institution
Organization Location: Moscow, Idaho

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution:

University of Illinois at Urbana-Champaign (UIUC)

Organization Type: Academic Institution
Organization Location: Illinois

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Collaborative research

University of Life Sciences & Natural Resources (BOKU)

Organization Type: Academic Institution
Organization Location: Vienna, Austria

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: The Institute of Landscape Development, Recreation and Conservation Planning (ILEN) at BOKU conducts research for sustainable landscape development with expertise across many disciplines.

University of New Hampshire

Organization Type: Academic Institution
Organization Location: New Hampshire

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: This is part of DRUPAL collaboration

University of New Mexico

Organization Type: Academic Institution
Organization Location: Las Cruces, New Mexico

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Part of DRUPAL collaboration

University of North Carolina Chapel Hill

Organization Type: Academic Institution
Organization Location: North Carolina

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: RENCI (Renaissance Computing Institute) develops and deploys advanced technologies to enable research discoveries and practical innovations. RENCI partners with researchers, policy makers, and technology leaders to engage and solve the challenging problems that affect North Carolina, our nation and the world. An institute of the University of North Carolina at Chapel Hill, RENCI was launched in 2004 as a collaborative effort involving UNC Chapel Hill, Duke University and North Carolina State University. http://unc.edu/

University of South Carolina

Organization Type: Academic Institution
Organization Location: South Carolina

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: http://www.sc.edu/

University of Texas at Austin

Organization Type: Academic Institution
Organization Location: Texas

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: https://www.utexas.edu/

University of Toledo

Organization Type: Academic Institution
Organization Location: Toledo, Ohio

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution:

University of Utah

Organization Type: Academic Institution
Organization Location: Salt Lake City, Utah

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: University of Utah - Salt Lake City Campus

University of Wyoming

Organization Type: Academic Institution
Organization Location: Wyoming

Partner's Contribution to the Project:
Collaborative Research
Personnel Exchanges

More Detail on Partner and Contribution: EPSCoR collaboration

Utah Automated Geographic Resource Center

Organization Type: State or Local Government
Organization Location: Salt Lake City, Utah

Partner's Contribution to the Project:
Facilities
Collaborative Research
Personnel Exchanges

More Detail on Partner and Contribution: The Utah AGRC maintains a central clearinghouse for spatial data and digital mapping services in the state of Utah.

Utah Department of Agriculture (UDA)

Organization Type: State or Local Government
Organization Location: Salt Lake City, Utah

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution:

Utah Education Network

Organization Type: Academic Institution
Organization Location: Salt Lake City, Utah

Partner's Contribution to the Project:
Collaborative Research
Personnel Exchanges

More Detail on Partner and Contribution: DRUPAL collaboration & web support

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Utah State University - Eastern

Organization Type: Academic Institution
Organization Location: Eastern Utah

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Utah State University is an academic research institution serving the needs of students throughout Utah.

Utah State University - Eastern

Organization Type: Academic Institution
Organization Location: Logan, Utah

Partner's Contribution to the Project:
Financial support
Facilities
Collaborative Research
Personnel Exchanges

More Detail on Partner and Contribution: Utah State - Logan campus.

Utah Stormwater Advisory Committee (USWAC)

Organization Type: State or Local Government
Organization Location: Utah

Partner's Contribution to the Project:

Personnel Exchanges

More Detail on Partner and Contribution: The Utah Storm Water Advisory Committee (USWAC) will coordinate efforts to reduce storm water pollution and provide adequate flood control. The committee will jointly review governing regulations, disseminate information to enhance compliance with those regulated, promote effective storm water management training, and assist local municipalities and other interested parties to implement best management practices, consistent with their individual needs and resources. This committee will also review any proposed storm water regulations to assess potential impacts on the regulated community. http://www.uswac.utah.gov

Utah Valley University

Organization Type: Academic Institution
Organization Location: Orem, Utah

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution:

Utah Water Research Laboratory (UWRL)

Organization Type: Academic Institution
Organization Location: Logan, Utah

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: The Utah Water Research Laboratory (UWRL) is part of Utah State University. The Utah Water Research Laboratory (UWRL) is a stand-alone facility located at Utah State University (USU) on the Logan River, Logan, Utah. The UWRL operates within an academic environment and collaborates with government and private sectors to address technical and societal aspects of water-related issues, including quality, quantity, distribution, and conjunctive use. This is accomplished through providing more than 100,000 square feet of state-of-the-art laboratory, computer, and office space. http://uwrl.usu.edu

Washington State University (WaSU)

Organization Type: Academic Institution
Organization Location: Washington state

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: The School of Communications at Washington State University has expertise in risk and environmental communication.

Western Water Asssessment (WWA)

Organization Type: Other Nonprofits
Organization Location: Colorado, Western US

Partner's Contribution to the Project:
Personnel Exchanges

More Detail on Partner and Contribution: On of the NOAA funded Regionally Integrated Sciences and Assessments http://wwa.colorado.edu/

Westminster College

Organization Type: Academic Institution
Organization Location: Salt Lake City, Utah

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution:

What other collaborators or contacts have been involved?
Nothing to report

Impacts

What is the impact on the development of the principal discipline(s) of the project?

iUTAH research activity has had impact on many disciplines. A notable accomplishment was the publication in March 2015 of the conceptual framework underlying much of our work (Hale et al. 2015. iSAW: Integrating Structure, Actors, and Water to Study Socio-Hydro-Ecological Systems. Earth's Future DOI: 10.1002/2014EF000295). Although the publication is too new to predict the paper's long-term impact, in only one month, it already has a social media score of 14 and has been downloaded from ResearchGate 38 times. Several publications relating to the "urban stream syndrome" have been submitted based on iUTAH research. These papers explore how urban streams express impacts from human activity in our semi-arid environment. The neighborhood typology conducted by the social sciences team identified and described a unique form: "suburbanity" in a recent manuscript. Research by our cyberinfrastructure team has made important contributions to the growing field of hydroinformatics. This group published seven conference papers, and submitted five manuscripts (one recently was published). These works describe the software they developed to manage the workflow of sensors, automate data management, and share/visualize live data streams. The green infrastructure team also produced several publications that evaluate efficacy of engineered bioretention systems in our semi-arid environment. Such systems are widely used throughout the US but less well studied in our region. Houdeschel et al. (2015) identified an important trade-off between nitrogen retention and water cost to irrigate. The coupled modeling group produced a systems dynamics model of water supply and distribution that is being used by Salt Lake City's Department of Public Utilities to inform their decision making.

The most significant contribution of iUTAH continues to be the enhancement of human capacity to engage in interdisciplinary research. iUTAH has continued to develop research groups that span across multiple campuses and disciplines. These are close-working teams capable of working within and across disciplines to identify knowledge gaps and gather needed data about our study areas in a collaborative way. The productivity of these teams is strong as evidenced by the growing number of jointly authored conference presentations, research proposals, and publications (Fig. 7).

What is the impact on other disciplines?

The broader impacts of this project on other disciplines span aquatic ecology, atmospheric science, biogeochemistry, urban ecology, sociology, engineering, and urban planning. We have built close-working relationships with colleagues within and outside of iUTAH who represent other disciplines and have participated in cross-disciplinary collaborative meetings to plan the full research infrastructure for iUTAH. In year 3 we expanded our collaboration network to include new specialists in environmental communication, water markets, economic development planning, climate predictions/extremes, and watershed hydrology. These new collaborators have strengthened our ongoing and productive dialogue across disciplines in iUTAH. We have expanded our partnerships with local water system managers in each GAMUT watershed. We are currently negotiating a memorandum of understanding with Logan City to expand GAMUT monitoring to support the city's needs to understand stormwater dynamics.

What is the impact on the development of human resources?

For this reporting year, iUTAH has had a direct impact on the development of human resources at the undergraduate student, graduate student, postdoc and technician levels.

In RFA 1, we trained 14 graduate students (6 female, 8 male) across 3 campuses (note 4 of these students are not paid by iUTAH but are leveraging other resources). Two of these student are graduating this year. We will retain one of them (Dylan Dastrup) as a technician with the Provo GAMUT. He replaces Joe Crawford, who was recruited to a permanent position with the U.S. Department of Interior. We engaged 2 undergraduates as iFellows (50% female), and extended their research into the academic year. Our postdoctoral fellow, Steven Hall, has accepted a faculty position at Iowa State University.

In RFA 2, we trained 7 graduate students (5 female, 2 male) and mentored 6 undergraduate iFellows (50% female). We also trained and employed a team of undergraduates in our household survey efforts. Two of our PhD students will graduate this year. Of these, Ann Armstrong has accepted a faculty position at Lafayette College. We recruited two female postdocs, Rachel Gabor and Melissa Haeffner, to work with the iBUGI and social sciences teams, respectively.

In RFA 3, we trained three graduate students (all male) and mentored 4 iFellows (50% female). A female postdoctoral fellow was hired and she began in August 2013. Our postdoctoral fellow, Rebecca Hale, has accepted a faculty position at Idaho State University. We are recruiting programmers and designers for the iVL, and are building an interactive museum kiosk to visualize live data from the GAMUT.

The CI group continues to employ several undergraduates in their programming team (including 4 Hispanics). We expanded our Hydroinformatics course, in which there was participation by 45 graduate students across 5 universities.

What is the impact on physical resources that form infrastructure?

The original physical research infrastructure of the GAMUT observatory is 100% operational, and constitutes the first climate-hydrologic observatory across mountain-to-urban gradients in three watersheds. Based on input from RFA2, the GAMUT has expanded by 3 full water quality monitoring stations which are currently being installed. We also installed several stormwater and canal monitoring stations in each watershed. iUTAH contributed to the purchase of a scintillometer which is being used to estimate evapotranspiration in urban areas. iBUGI instrumentation expands the capacity to measure environmental variables in our region, and provides a common platform for environmental chemistry measurements at the three research campuses.

What is the impact on institutional resources that form infrastructure?

iUTAH strengthens and improves the institutional resources of all participating institutions. As a result, 39 journal articles have been submitted, 111 presentations have been made, and most importantly, 39 proposals were submitted, with new awards exceeding $15M. We built ties with 70 collaborating institutions.

The GAMUT and iBUGI facilities will provide important place-based infrastructure for research and education for the foreseeable future. These efforts will be extended to local stakeholders by work done at the iVL facility.

What is the impact on information resources that form infrastructure?

The CI team implemented the hardware and software systems to support management of the data collected under the iUTAH project, and facilitate a greater degree of collaboration among iUTAH students and scientists. One major impact of the iUTAH CI is the recognition among iUTAH researchers that it is no longer sufficient to work and collect data independently within disciplines or subgroups. The iUTAH CI is seen as an integral component of the overall project and necessary to promote data and model sharing and collaboration among the iUTAH research teams.

The server hardware that we have deployed provides us with a flexible platform to implement the systems needed by iUTAH researchers. For example, we have deployed a data sharing web application at http://cloudshare.iutahepscor.org and support a website at http://data.iutahepscor.org, where we host online data and model inventories to assist iUTAH researchers in cataloging and prioritizing existing datasets and models. We implemented submission of data collection plans and publication of metadata and data sets by iUTAH researchers. iUTAH researchers can discover available datasets and identify ongoing data collection efforts to facilitate cross-campus and cross-disciplinary interactions.

What is the impact on technology transfer?

During the course of this award, four software packages have been made available to the public as a part of the technology transfer objectives of this year's activities.

1. A web-based graphical user interface has been developed for the iUTAH GAMUT sensor data management database.
2. A software program for managing and performing quality control of streaming sensor data was developed and released.
3. Existing tools from the CUAHSI Hydrologic Information System (databases, web services, etc.) have been refined and expanded for managing the streaming sensor data from GAMUT.
4. An extension to the existing CUAHSI HIS Observations Data Model (ODM) has been developed to assist RFA1 researchers in managing the sensor and data collection infrastructure across the GAMUT site.

What is the impact on society beyond science and technology?

This award has two broader impacts that reach beyond science and technology:

• The workforce development and enhancement of graduate and undergraduate training in Science, Technology, Engineering, and Mathematics (STEM)

• A growing collaboration with local water resource managers (cities, county, irrigation/canal companies).

Workforce development and the expansion of the STEM opportunities are critically important to sustain the growth of the state of Utah's high technology sector. Guiding principles for iUTAH's workforce development plan have included integrating research and education, providing near-peer mentoring, encouraging diversity, and creating public-private partnerships. Research and education activities engage the STEM pipeline: K-6 students, middle school and high school students and teachers, undergraduates at community colleges, Primarily Undergraduate Institutions (PUIs), and the major research universities, graduate students, postdoctoral fellows, and early career faculty and established faculty. These experiences are directly related to iUTAH's research questions, so the focus will be on the watershed observatories and modeling activities in the three RFAs.

Collaborations with local water resource managers and the public include outreach, communication, and dissemination activities to translate iUTAH efforts to diverse audiences in order to engage key stakeholders. These partnerships are bringing together researchers, educators, students, stakeholders, and policy makers to design and develop decision-making exercises. Mixed models of social and hard sciences are being used for both collaboration and evaluation as a novelty in the

iUTAH process. Workforce Development and Diversity Enhancement goals are also incorporated into this work.

Relationships with state, municipal and local irrigation company partners have raised the profile of iUTAH research and should allow our work to directly influence water management decisions. Already, this effort has resulted in further planned expansion of the GAMUT observatory in Logan City.

Changes/Problems

Changes in approach and reason for change

iUTAH originally had planned to design and construct a Green Infrastructure Research Facility (GIRF) to be located at the University of Utah in year 2. Plans for this facility have been finalized, and the facility has been re-envisioned as the "BUGI" (Biogeochemistry of Urban Green Infrastructure), which includes the ability to experiment with stormwater green infrastructure and expand biophysical measurements out into the GAMUT watersheds with mobile equipment and measurement campaigns. iUTAH has enlisted Paul Brooks, a new faculty member at the University of Utah, and former principle investigator of the SAHRA Science and Technology Center, to lead this effort. This plan was described in an interim report which we submitted in December 2014, and which was subsequently approved by NSF. The iBUGI equipment has been purchased and is being set up in various locations on the University of Utah campus. Plans have been made to conduct an extensive synoptic sampling/measurement campaign in May to launch iBUGI activities. iBUGI activities also engage (7) researchers not previously affiliated with iUTAH to capitalize on place-based work that is ongoing in the Red Butte Creek watershed. Given the redirection of the green infrastructure facility, the RFA2 team has revised the milestones outlined in the iUTAH Strategic Plan (Table 8). RFA2 social scientists also have added some milestones that build on original milestones (Table 8).

The original iUTAH proposal included a decision theater as a facility to promote participatory modeling, to be implemented in year 3. iUTAH opted not to move forward with a decision theater based on advice from our External Advisory Board, as well as input from the AAAS external assessment team. The coupled modeling team has instead begun to implement a facility called innovative Visualization Lab (iVL). At the same time the team revisited their strategic goals and milestones to ensure the iVL is consistent with building Utah's research and stakeholder engagement capacity (Table 9). The iVL aims to focus and amplify the modeling, visualization, and stakeholder engagement efforts of iUTAH research during years 3-5 of the grant and will become part of the state's research infrastructure. Rather than investments in large amounts of equipment, the funds will be used to staff the lab, as well as more modest computer equipment and software investments to be used in support of modeling and visualization, including an interactive touchscreen and web cameras to make a museum display that visualizes GAMUT data for a general audience. The team is recruiting for additional visualization programmers and designers and has made equipment purchases and begun to construct a museum kiosk with interactive touchscreen. Already the iVL has developed a web-based visualization for RFA2's household survey data. This software is in beta-testing with anticipated release in July or August 2015.

Actual or Anticipated problems or delays and actions or plans to resolve them

Our interim report described a Diversity Conference planned for May 2015. This has been postponed until Winter 2015, after the DET realized that this activity was a year 4 milestone. The DET and WFD teams have instead focused on activities that connect to diverse audiences, including the Summit Leadership Institute at WSU, which brings 40 Ogden-area high school students to WSU for a 4-day on-campus experience; the Multicultural Youth Conference, also at WSU, where iUTAH offered a STEM track as part of an event that drew more than 600 underrepresented students from area high schools; and a Native American Internship program at USU which brings 21 students from the USU-Blanding campus (a 2-year college) for a 4 week research immersion experience.

There has been a delay in completing RCGs by faculty from UVU because one of the PIs was seriously injured and unable to

complete field work during summer 2014. Fieldwork was therefore postponed until summer 2015.

Changes that have a significant impact on expenditures
Nothing to report.

Significant changes in use or care of human subjects
Nothing to report.

Significant changes in use or care of vertebrate animals
Nothing to report.

Significant changes in use or care of biohazards
Nothing to report.

Special Requirements

Responses to any special reporting requirements specified in the award terms and conditions, as well as any award specific reporting requirements.

2014 External Advisory Board met with iUTAH July 10/11, 2014.

Supporting Files

Filename	Description	Uploaded By	Uploaded On
iUTAH_EAB_Symposium agenda_Jul2014_v6.pdf	2014 EAB documents	Michelle Baker	05/04/2015

Table 1. Goals, strategies, and timelines for the iUTAH project.

Goal	Strategy	Year
Create common research platform required to enhance interdisciplinary excellence in water and urban science	• Create integrated, instrumented watershed observatories across urbanization gradient	1-2
	• Create integrated, multi-institutional research teams	1-3
	• Engage existing, and target new, expertise in social sciences with an emphasis on maximizing interdisciplinary collaboration	2-4
	• Create an "innovative Biogeochemistry of Urban Green Infrastructure" (iBUGI) facility to understand urbanization's effect on water quality and quantity	3-5
Promote excellence and innovation in integrated modeling of coupled human-natural systems	• Create a highly integrated cyberinfrastructure data storage and modeling network in Utah, and in collaboration with Wyoming and New Mexico, that will provide state-of-the-art data storage and high throughput modeling capabilities	1-5
		1-5
Enhance Utah economy and workforce	• Partner with private industry through sensor system design, development, and deployment	1-4
	• Partner with private industry and government agencies through student internship and exchange programs	1-5
Grow a STEM-informed citizenry	• Engage women and underrepresented groups in STEM	2-5
	• Partner with statewide experts on recruitment and retention of diverse communities	2-5
Integrate research, education, and decision-making	• Create “iUTAH Visualization Lab (iVL)” for data visualization that will bring researchers, educators and, decision-makers together in a participatory modeling environment	3-5
	• Enhance STEM pipeline with an emphasis on female Hispanic, Native American and rural students	1-5

Figure 1. Screenshots from the iUTAH Modeling and Data Federation's Time Series Analyst, showing real-time GAMUT sensor output.

Table 2. Traffic Light Analysis (TLA) of Year 3 (1 August 2014-31 July 2015) iUTAH milestones as indicated in strategic plan or revised in Years 1-3.

Project Component	Milestone[a]	TLA[b]	Explanation
Project Management			
	Weekly EPSCoR staff meetings		31 of 37 (84%) scheduled weekly meetings held
	Biweekly Leadership team meetings		23 meetings held over 18 two-week periods (128%)
	Biannual all-hands meetings		Fall all-hands meeting: 21 November 2014, West Valley City, Utah. Spring all-hands meeting: none
	Annual EAB & EAT meeting		16 July 2015, Midway, Utah
	Annual symposium held		17 July 2015, Midway, Utah
	Broaden state and local government base		Numerous ongoing collaborations: UT DEQ/DWQ, Salt Lake City Parks and Public Lands Program, Salt Lake City Department of Public Utilities, City of Logan. Numerous oral, poster, or panel presentations to state and local government: Salt Lake County Watershed Symposium, Maps on the Hill, Utah Water Quality Task Force, Utah Congressional Delegation staff and leaders.
	Revise activities based on previous assessment; formative assessment of PM activities		(1) GIRF has been re-envisioned into iBUGI, a more comprehensive build-out of GAMUT that includes innovative monitoring of the urban footprint in the Red Butte Creek watershed. The result is a truly integrated platform that also serves as a UoU learning lab and has generated broad interest among researchers at UoU, BYU and Westminster. (2) A scaled-down version of the Decision Theater, iVL, is being built at UoU and USU. (3) EOD representation has been added to the Leadership Team. (4) We have increased gender and ethnic diversity of the Management team by engaging new participants: Adrienne Andrews, Betsy Bancroft, Frank Black. Women now make up 53% of Management team.
Research			
RFA1			
	Finish installing aquatic instrumentation in all watersheds		All instrumentation installed at 14 aquatic locations in three study watersheds Three new urban water quality stations being added
	Validate rating curves		Rating curves for flow developed and being validated for Red Butte Work is ongoing for Logan River
	Continue data collection		All sensors installed, logging, and transmitting data Surface water and snowpack chemistry data collection is ongoing.
	Have first papers published		3 manuscripts, 1 manuscript accepted/pending, 2 manuscripts submitted
	Finish installing terrestrial instrumentation in all watersheds		All instrumentation installed at 12 terrestrial locations in three study watersheds
	Have first papers published		1 manuscript published, 4 manuscripts submitted
	Modify and validate nutrient transport models		GRAs in water quality research group are continuing research into nutrient and contaminant relationships (Kelso, Ogata, Goodsell, Jones)
	Build and deploy 3 mobile sensor units		Two mobile weather stations purchased and available for use--one deployed at Weber State Two water quality sensors and flow meters purchased and available for use at PUIs Additional mobile sensors that will be part of the urban instrumentation in the process of being purchased

Table 2. Continued.

Project Component	Milestone[a]	TLA[b]	Explanation
	Incorporate iUTAH data into developed climate models		Climate models being informed by research conducted by Bailey, Smith, Walston, and Parajuli
	Modify water yield-climate models		GRAs in the water balance research group continuing research to modify water yield climate models (Chan, Navarro, Bunnell, Dastrup, Barnes, Maxwell)
RFA2			
	Coordinate with local neighborhood and municipal organizations to review household survey results		Meetings held in Heber Valley One meeting held in Logan, others planned
	Develop first analysis that links data collected by RFA1 and RFA2 teams		Maps of virtual watersheds being developed for Logan and Salt Lake City Planning underway to inform and target RFA1 data collection with neighborhood-level social science data
	Transfer initial findings from RFA2 work to RFA3 coupled systems modeling teams		Enjie Li and Caleb Buahin are integrating their respective models of urban growth and stormwater flows in Cache Valley; planned work to tie forms of development to understanding water demand.
	Publish first peer reviewed paper		Li, Enjie, Joanna Endter-Wada, and Shujuan Li. 2015. Linkages between water challenges and land use planning in megacities. Water Resources IMPACT 17: 9-12.
	Conduct key informant interviews in WRMA communities to assess interactional capacity and water programming		Media work ongoing Key informant interviews not yet conducted
	Expand Utah Water iPad Survey project with new collaborators		New collaborators: SLCC, SUU, UVU, Weber Challenges to identify venues for implementation
	Develop templates for social science data collection and management plans and metadata reporting		Substantial revisions to iUTAH Data Policy and Data Publication/Data Repository in collaboration with MDF in Year 3
	Review work with partners and stakeholders in study areas to ensure research addresses local questions and interests of diverse communities		Meetings with municipal and state water managers to review household survey results are ongoing Policy research by Joanna Endter-Wada
	Publish first paper		Urban typology paper submitted and successfully screened for review

Table 2. Continued.

Project Component	Milestone[a]	TLA[b]	Explanation
	Incorporate first results of urban form analysis into RFA3 coupled modeling exercises		Disproportionate drivers of water use related to urban form have been identified; linkages are being made, but no formal modeling exercises yet;
	Submit collaborative proposal to link urban typology to biophysical outcomes		Not yet--requires completion of previous milestone
	Finish installation of new urban instrumentation		Urban expansion of GAMUT is almost complete Storm drain sensors will be installed in Logan and SLC by end of Year 3 New mobile instrumentation ordered
	Analyze first data from GIRF experiment		Only 40 samples submitted for analysis to date
	Instrument 1 new green infrastructure (GI) project in collaboration with muncipalities and universities		cf. urban instrumentation Trixie Wolf's work expands urban instrumentation to green infrastructure Expansion of Green Roof work at UoU (Burian) and SUU (Grant)
	Publish first research paper		2 manuscripts submitted
	Develop improved model for simulating surface runoff in diverse built/urban contexts		Burian/Feng work is ongoing Focus of upcoming work under EPA STAR grant
	Incorporate results of GI research into urban hydrologic models		Burian/Feng work is ongoing Focus of upcoming work under EPA STAR grant
RFA3			
	Publish conceptual model and continue model development		Published manuscript "iSAW: Integrating Structure, Actors, and Water to Study Socio-Hydro-Ecological Systems," Earth's Future Continue model development: regional climate (Strong/Smith); unregulated rainfall runoff (Null/Betts); Wasatch Front urban growth (Ewing/Tian); Cache Valley urban growth (Li/Li); SLC water supply management (Burian/Goharian); SLC parcel-scale water consumption (Ewing/Stoker)
	Development and technical evaluation of methods for coupling models		Work by Castronova and Buahin not yet complete Investigation on computational and scaling challenges in model coupling ongoing Buahin: one submitted manuscript "Evaluating OpenMI's Computational Performance using Different Model Decomposition Approaches: An Urban Stormwater Modeling Application" Software development by Castronova in beta stage Technical evaluation just begun as model case studies are made available by other iUTAH participants

Table 2. Continued.

Project Component	Milestone[a]	TLA[b]	Explanation
	Continue model coupling		Substantial progress: regional climate/rainfall run-off (Strong/Null), parcel-scale water use/SLC water supply management (Stoker/Goharian), parcel-scale water use/regional urban growth (Stoker/Ewing and Tian), stormwater flow/urban growth (Buahin/Li)
	Integrate RFA1 and RFA2 through coordination of biophysical data collection with social and engineering science		Milestone needs re-evaluation RFA3 to continue to serve as point of integration of RFA1 and 2 research via model coupling Integration of RFA1 and 2 data collection and activities to occur organically
	Collaborative publication and dissemination of results		6 manuscripts: 3 submitted, 3 accepted for publication, none published in Year 3
	Entrain stakeholders into coupled modeling workshop series		Stakeholder involvement limited to planning stage (Bardsley, Keleher, Briefer) So far, no stakeholder involvement in actual workshops (mainly due to scheduling conflicts)
	Develop stakeholder responsive products (1 to 3 in Years 3-5)		SLC Department of Public Utilities using systems dynamics model of their supply and distribution system to support decision making Model stems from CI Water but informed by RFA3's parcel-scale water use model Ongoing research on regional urban growth promising for use by Salt Lake Metropolitan Planning Organization and Wasatch Front Regional Council
	Develop student, diversity, and outreach oriented products		Collaboration with NHMU to develop an interactive "dashboard" display for Red Butte Creek GAMUT sensor data in planning stage EOD products generated by iUTAH EOD with RFA3 team members
	Develop visualization capacity for project-wide apps, web applications, and interactive tools		iVL still in planning and conceptualization stage No staff hired Visualization capacity not operational
Cyberinfrastructure			
	Datasets from GAMUT discoverable and accessible through iUTAH MDF website		Raw GAMUT data published to Data Repository and updated daily Faceted discovery and browsing of datasets implemented GAMUT data published with CUAHSI HIS
	External datasets discoverable and accessible through iUTAH MDF website		USGS discharge data CUWCD flow/reservoir release data for Provo River and Red Butte Creek SNOTEL data not yet accessible
	Make initial release of collaborative functionality for depositing user datasets into the iUTAH MDF for publication, archival, and sharing		Functionality for deposition of user datasets fully implemented in the iUTAH Data Repository
	Make initial release of collaborative model sharing tool		Work ongoing (Castronova and undergraduate students) Working software produced Some challenges related to scaling remain
	Necessary databases and software to support GIRF data deployed		All urban stormwater sites incorporated into GAMUT databases and data management workflow Databases to support storage and management of chemical analyses of biweekly RFA1 sampling effort available and adaptable for use by iBUGI

Table 2. Continued.

Project Component	Milestone[a]	TLA[b]	Explanation
	Make initial deployment of DataONE Member Node		From a long-term sustainability perspective, making iUTAH a member node of DataONE may need re-evaluating. Other options being pursued include partnering with USU's library or partnering with HydroShare for longer term archival of iUTAH datasets.
	Additional storage is added to virtualization infrastructure		3 new virtualization host servers and 20 TB of new disk storage added to virtualization infrastructure
	Publish peer reviewed papers about iUTAH CI (2-3)		2 peer-reviewed papers published or pending publication (accepted) 3 papers submitted and under review
	New proposals for CI-related research developed		2 grant proposals submitted
Education, Outreach and Diversity			
Diversity Enhancement			
	Expand and diversify DET team by 1-2		New members Mark Brunson
	Increase diversity of iUTAH leadership by 1-2		Adrienne Andrews added to Management Team
	Conduct seminar & dialog program		Part of Year 3 iFellow cohort session
	Conduct diversity training workshop for new iUTAH participants		Part of Year 3 iFellow cohort cession
	Update best practices handbook		To be completed at end of Year 3
	Implement recruitment and retention plans for target populations		Recruitment and retention plan from Year 1 is being addressed in Year 3 Ellen Burns to work with DE at end of Year 3 to finalize
	Solicit new ideas for recruitment & retention programs		Occurring during monthly DE , communications, MT, EET, WFD meetings To be considered as part of Fall 2015 RFP for EOD Innovation Awards
	Design up to 2 museum programs for target populations		Taking Learning Outdoors
	Train near-peer mentors		First Year 3 iFellow program mentor training meeting in May
	Attend SACNAS		Collaborated with other EPSCoR jurisdictions to host booth and recruit students
Workforce Development			
	Expand and diversify WFD team		New members: Mark Brunson, Betsy Bancroft, Lucas Moyer-Horner
	Train near-peer mentors		Year 3 iFellow program mentor training
	Integrate SI curriculum materials into K12 classrooms		Curriculum presented at Utah Science Teacher Association annual conference Accessible on iUTAH website
	Implement SI #3 9 HS Teachers 9HS Students 9 UG students 6 Grad students		To be held in Heber City, Utah
	Create SI curriculum repository		Online

Table 2. Continued.

Project Component	Milestone[a]	TLA[b]	Explanation
	Recruit and hire undergraduate iFellows; up to 14 iFellows, 50% PUI, 25% URM or women		18 iFellows hired, 50% women, URM?, PUI 39%
	Recruit and hire up to 15 graduate research fellows		GRAs hired in Year 3: 8, 50% women, URM?
	Recruit and hire postdoctoral scholars		Postdoctoral fellows hired: 4 (50% female)
	Recruit and fund PUI faculty RCGs		Yes
	Recruit additional agency and private industry partners as internship sponsors		Program is being re-thought into traineeship program
	Recruit and hire up to 10 UG interns		Program is being re-thought into traineeship program
	Survey participants to assess iUTAH collaborations		Needs discussion with EAT/Jacque Ewing-Taylor
	Conduct year-end iUTAH Symposium		17 July 2015, Midway, Utah To include WFD-focused student track
	Revise activities based on previous assessment; formative assessment of WFD activities		SI and iFellow programs revised based on year-end assessment Formative assessment during SI to be issued during Year 3 iFellows program
External Engagement			
	Expand and diversify EE team		New members: Mark Brunson, Marci Demillion, Jennifer Pemberton, Kerry Bringhurst, Ken O'Brien, Kris Kally, Maura Hahnenberger
	Recruit and engage K12 cohorts for museum programs: 200 students; 30 teachers		TLO, The Leonardo Water Exhibit
	Conduct UWW K12 programs at iUTAH watersheds		Yes
	Fund new K12 engagement events.		EOD Innovation Awards--7 funded
	Develop K12 program at Green Infrastructure Facility (GIRF)		Recommend EOD is brought into RFA conversation in Year 4
	Develop citizen science program at Green Infrastructure Facility (GIRF)		Recommend EOD is brought into RFA conversation in Year 4
	Conduct UWW program at iUTAH watersheds		Yes
	Expand stakeholders engaged with iUTAH		UPR, Rose Park Elementary School

Table 2. Continued.

Project Component	Milestone[a]	TLA[b]	Explanation
	Fund new public engagement events		The Leonardo Water Exhibit continued into year 3 Booth outreach Year 3 EOD Innovation Awards
	Expand Communications team		Caitlyn Lewis, Mark Brunson, Andreas Leidolf
	Develop website as primary communications resource for participants; up to 1,000 unique visitors per month		iUTAH website traffic: 10,181 visits from 1 August-31 March 2015
	Revise and augment iUTAH website		New mega menu Updated content
	Expand and diversify social media following; up to 100 new followers		Social Media: Facebook (172 page likes), Twitter (242 followers), LinkedIn (100 connections/followers)
	Produce and expand audience for bi-monthly newsletter		Audience expanded to 257 subscribers 17 newsletters sent out 1 August-31 March 2015 Average open rate: 56%
	Evaluate and refine communication tools		Newsletter layout, website content and layout, and printed materials updated EPSCoR Champions workshop materials, developing press releases
	Revise activities based on previous assessment; Formative assessment of EE activities		During monthly meetings

[a]Milestones shown in *italics* represent revisions from the strategic plan.

[b]Green = milestone accomplished or on track to being accomplished by the end of Year 3; yellow = milestone not yet acomplished; ongoing work that may or may not be completed by the end of Year 3; red = milestone not addressed, in conceptualization or planning stage, may need to be revised.

Table 3. Traffic Light Analysis (TLA) of the implementation of planned activities from Year 2 Annual Report during Year 3.

Project Component	Planned Activity	TLA[a]	Explanation
Research			
General			
	Meet quarterly as a larger group to share results and feedback, identify research gaps, and build capacity between universities and stakeholders in Utah		
	Continue to support and mentor undergraduate students, graduate students, and postdoctoral fellows		
RFA1			
	Install a scintillometer and collect data of urban evapotranspiration in Salt Lake City		
	Finish downscaling snow accumulation model and parameters		
	Outline potential water balance scenarios for use by other RFAs		
RFA2			
	Install urban instrumentation and integrate with GAMUT		
RFA3			
	Complete manuscript about iUTAH coupled conceptual framework		
	Finalize data visualization plan in absence of centralized decision theater facility		
Cyberinfrastructure			
	Develop effective visualization and presentation techniques for social science datasets		
	Identify and develop new capabilities and data services to support coupled and integrated modeling activities		
	Fully deploy and support data publication system		
	Fully deploy and support advanced data visualization and access tool for GAMUT		

Table 3. Continued.

Project Component	Planned Activity	TLA[a]	Explanation
	Provide access to USGS data through MDF		
	Provide access to NRCS SNOTEL data through MDF		No demand for SNOTEL data by iUTAH participants
	Continue to offer Hyrdoinformatics course to USU, UU, and BYU		
	Provide support for green infrastructure data		
Education, Outreach and Diversity			
Workforce Development			
	Implementation of recruitment, selection, placement, and evaluation processes		
	Create K-12 curriculum materials from Summer Institute		
	Implement Year 3 Summer Institute based on feedback and recommendations from Year 2		
	Recruit more iFellows for undergraduate research program		
	Place students in iUTAH internships		iUTAH internship program is being re-envisioned as Traineeship program
External Engagement			
	Expand EE team statewide		
	Recruit and engage new EOD partners		
	Plan and implement Taking Learning Outdoors (TLO) program		
	Use TLO to engage rural audiences in Utah		TLO to be held in rural areas during Year 4
Diversity Enhancement			
	Increase diversity of iUTAH teams		
	Plan and implement second diversity-training workshop to connect with Hispanic populations in Utah		Diversity conference will be held in Year 4
	Continue to design engagement and museum programs		

[a]Green = milestone accomplished or on track to being accomplished by the end of Year 3; yellow = milestone not yet acomplished; ongoing work that may or may not be completed by the end of Year 3; red = milestone not addressed, in conceptualization or planning stage, may need to be revised.

Table 4. Traffic Light Analysis (TLA) of the implementation of changes proposed in the Year 2 Annual Report during Year 3.

Project Component	Proposed Change	TLA[a]	Explanation
Project Management			
	Recruiting for new Project Administrator Mark Brunson to assume role of State EPSCoR Director and engage with EOD		
Research			
RFA1			
	Purchase equipment to be re-locatable scintillometer Complete negotiations for siting of additional GAMUT stations on private land		
RFA2			
	Begin construction of GIRF facility		GIRF re-envisioned as iBUGI Equipment and instrumentation has been ordered
RFA3			
	Develop data visualization plan Formulate and implement new plan for data visualization and communication facility		

[a]Green = change implemented or on track to being implemented by the end of Year 3; yellow = change not yet implemented; ongoing work that may or may not be completed by the end of Year 3; red = change not implemented.

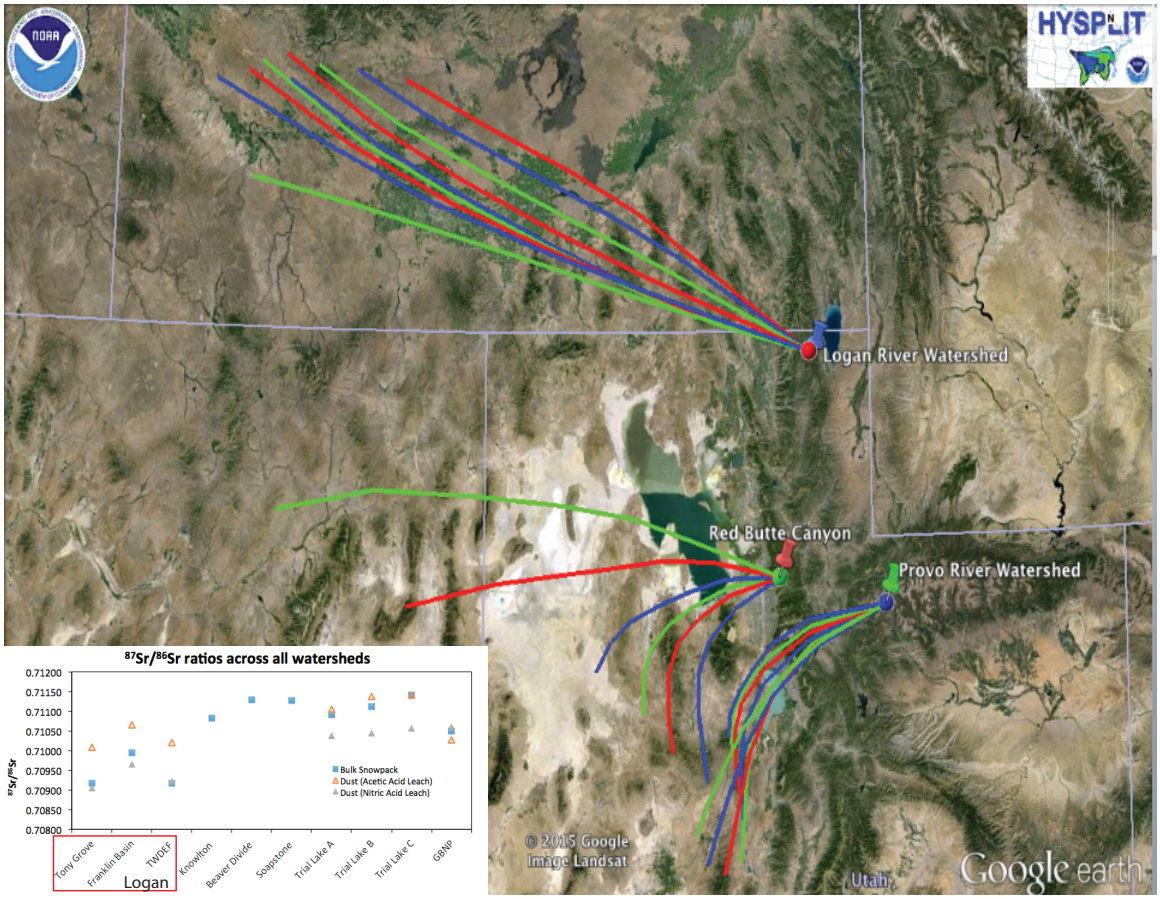

Figure 2. Dust from the Logan River watershed is isotopically depleted in $^{87}Sr/^{86}Sr$ as compared to dust from the other iUTAH watersheds. The HYSPLIT backward trajectory model suggest different dust sources for the March 17, 2014 dust storm event. The model used times when PM 2.5 was at its highest in each watershed.

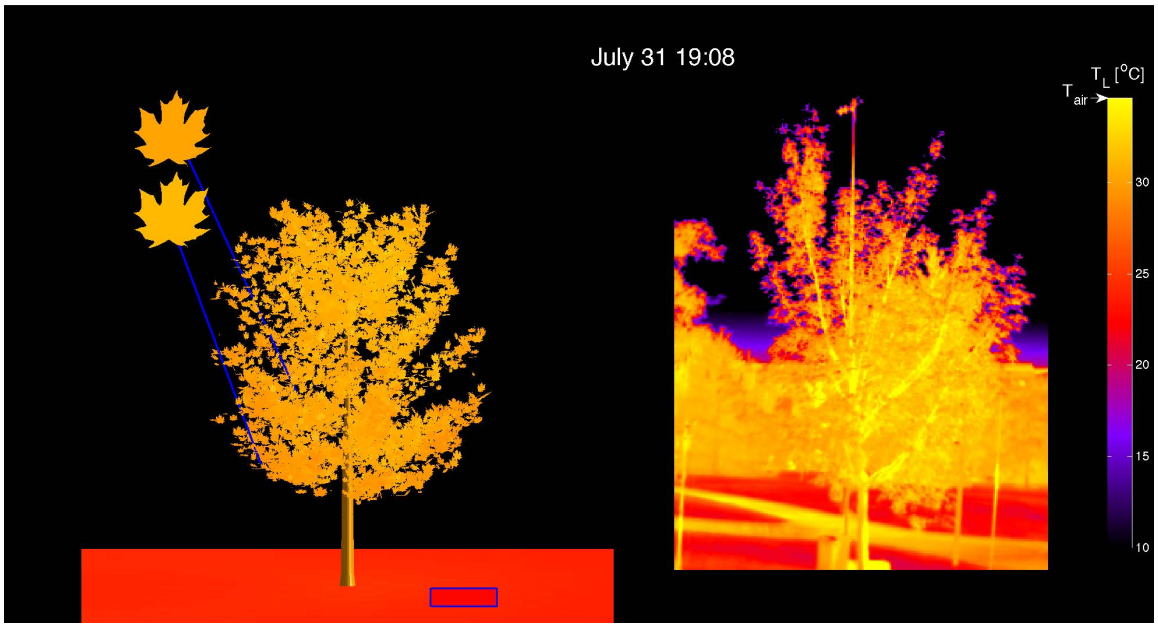

Figure 3. Simulated 3D temperature distribution in and around an isolated tree. (Left) Measured 3D temperature distribution using a thermographic camera. (Right) Oversized leaves and the blue box denote point measurements of temperature.

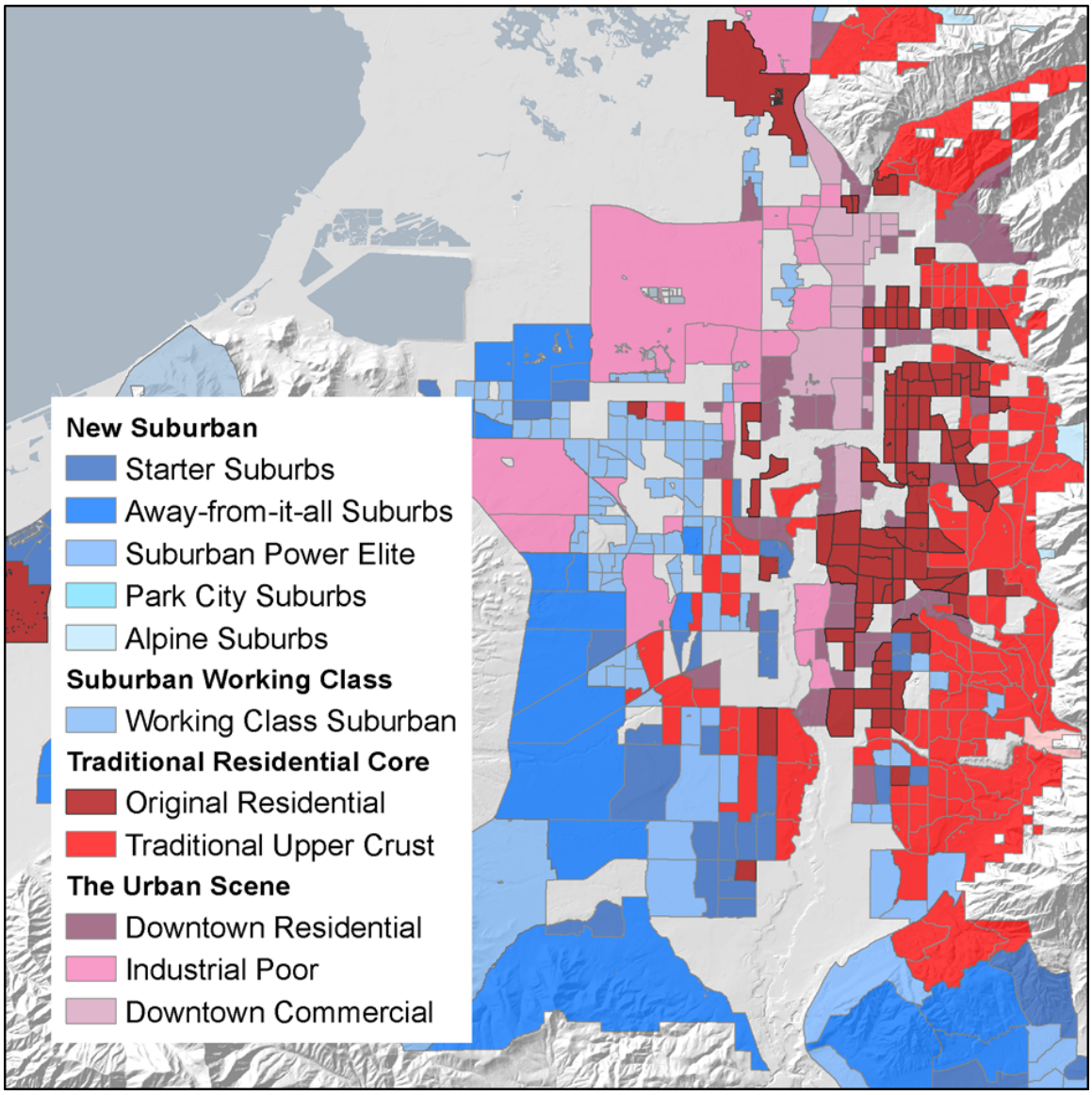

Figure 4. RFA2 developed a typology of urban neighborhoods using a multivariate classification approach that included key factors such as land use, land cover, housing type, lot size, elevation, climate, socioeconomic status, and demographic characteristics. This map of Salt Lake City illustrates the spatial arrangement of the 'core' neighborhood types that emerged from the analysis – which reflect clustering of traditional older residential neighborhoods in the eastern side of the valley, downtown commercial/industrial neighborhoods along highway corridors, and diverse types of suburban developments in the west and south.

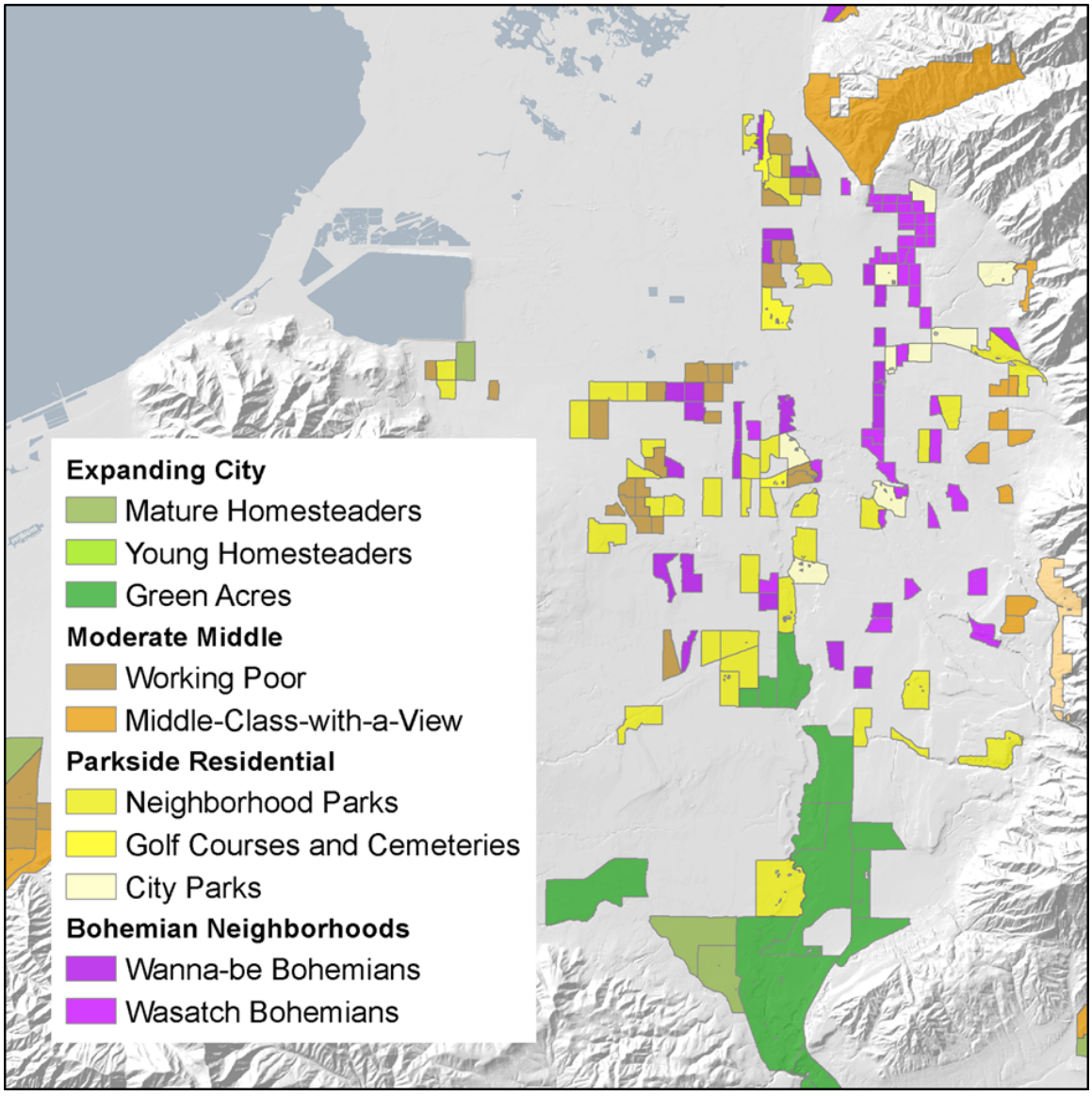

Figure 5. This map of Heber Valley illustrates the locations of 'specialized' neighborhood types that are interspersed among the core neighborhoods. These reflect urban mixed-use residential areas (Bohemian neighborhoods), neighborhoods with parks, golf courses and urban open space, and neighborhoods at the urban-rural fringe where some of the most rapid new residential growth is occurring.

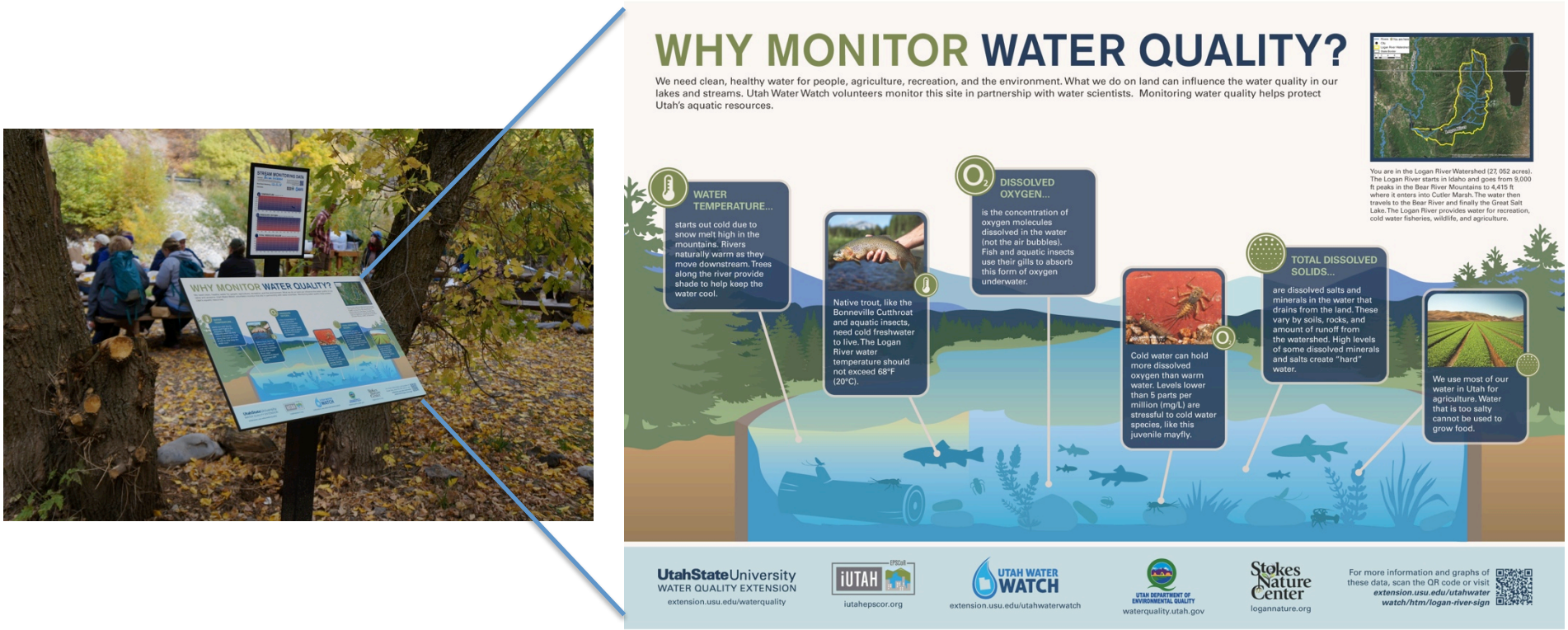

Figure 6. Outreach sign developed by Utah Water Watch with funds from Year 2 iUTAH EOD Innovation Award.

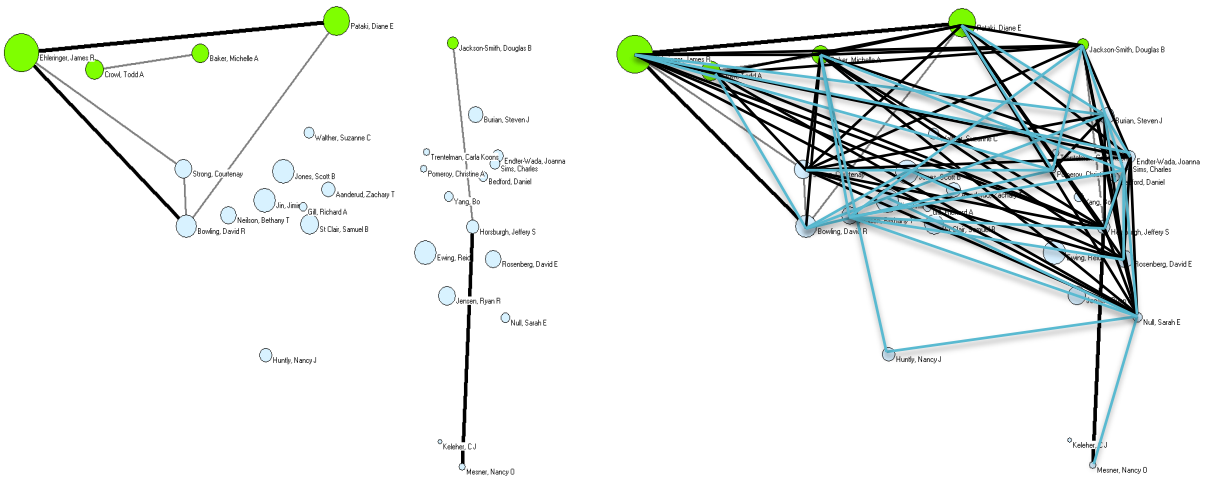

Figure 7. Collaboration network before iUTAH (2012) shows limited co-authoring of academic publications among initial iUTAH participants (left). Collaboration network after 3 years shows increased co-authoring of publications (black lines) and collaborative proposals (blue lines).

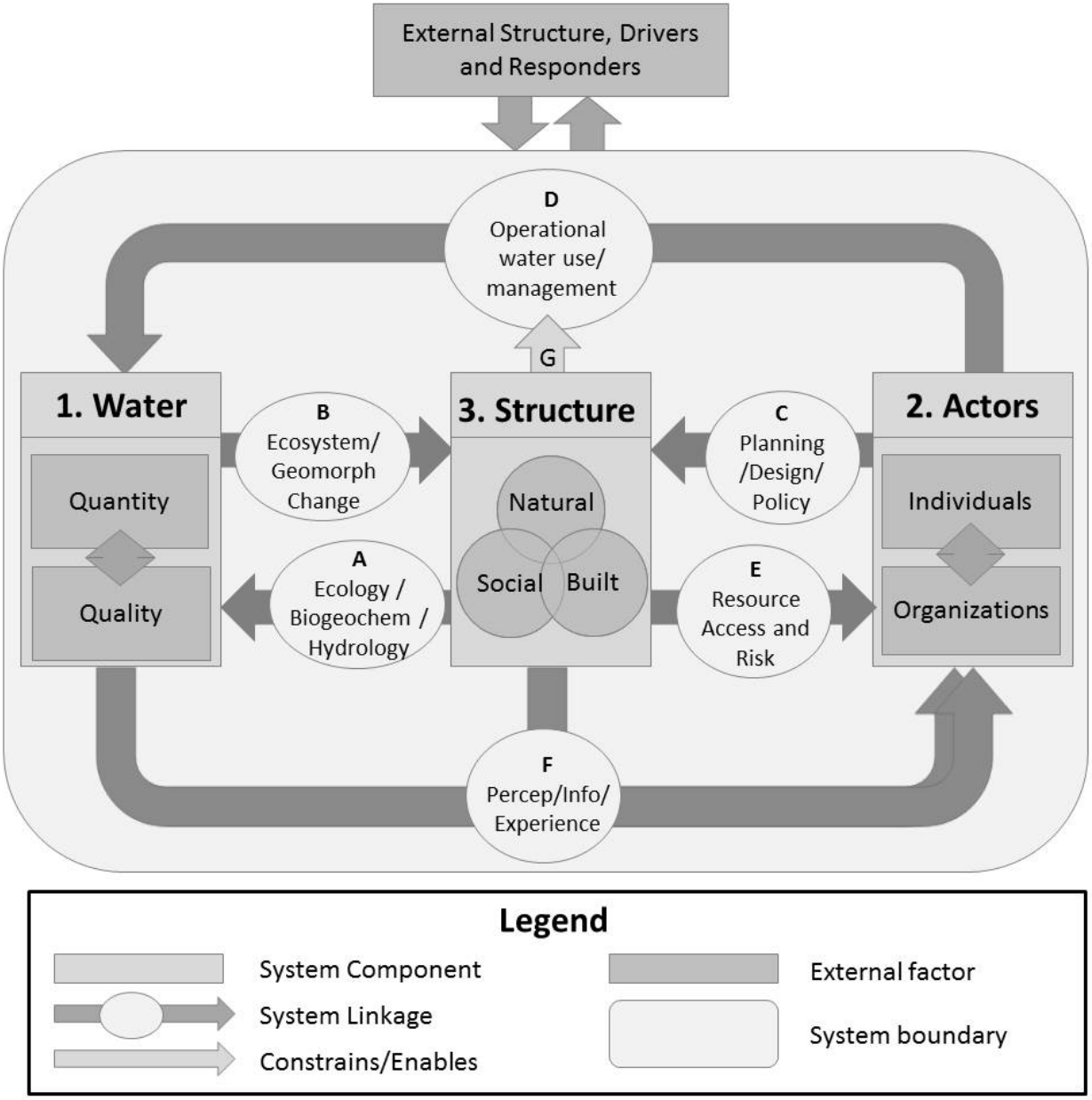

Figure 8. The iSAW conceptual framework is organized around three main structure, actor, and water components (gray boxes), seven key linkages (arrows), and a system boundary (light grey shaded box) that separates internal and external (box with dark shading) components (Hale et al. 2015).

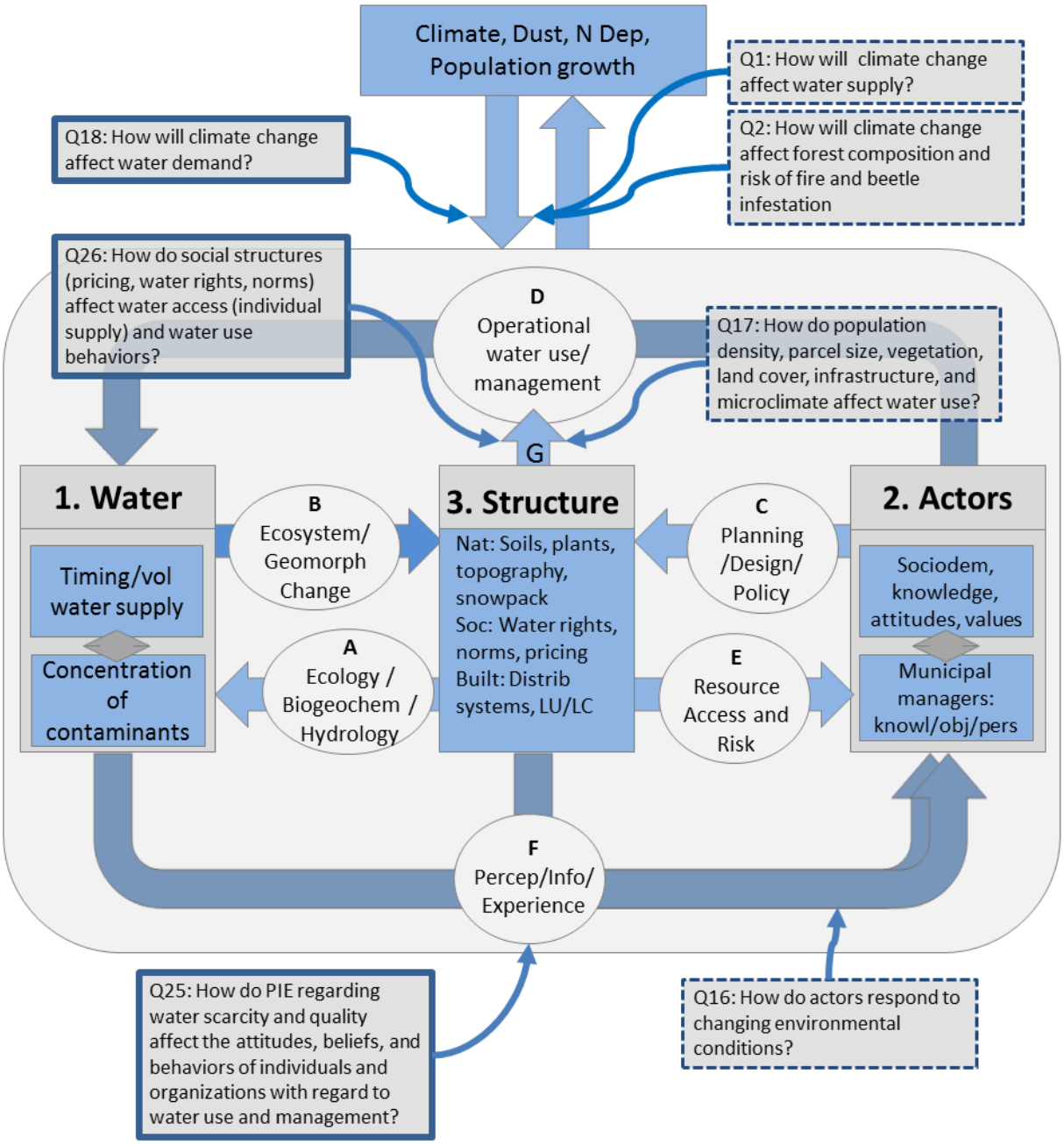

Figure 9. Research questions for water supply and demand overlaid on the iSAW framework. Questions in boxes with dashed borders are the original project research questions developed before the framework, whereas questions in boxes with solid borders were generated using the framework (Hale et al. 2015).

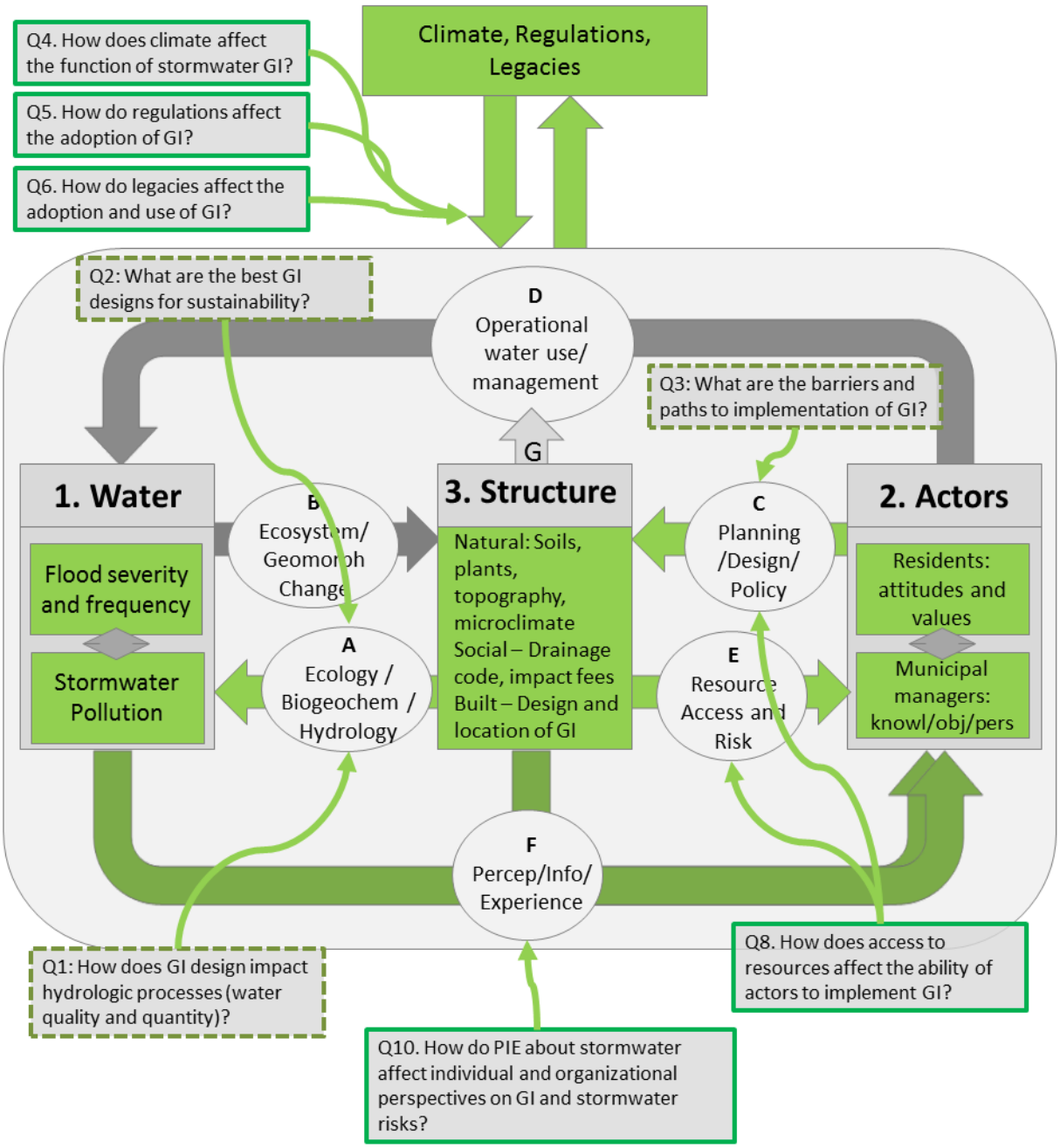

Figure 10. Research questions for stormwater green infrastructure (GI). Questions in boxes with dashed borders are the original project research questions developed before the framework, whereas questions in boxes with solid borders were generated using the framework (Hale et al. 2015).

Table 5. Student enrollment in collaboratively taught Hydroinformatics course, Fall 2014.

Institution	Number of Students		
	Male	Female	Total
Brigham Young University	-[a]	-	9
University of Utah	-	-	8
University of Virginia	-	-	13
University of Wyoming	-	-	8
Utah State University	-	-	7
Total	34	11	45

[a] Breakdown by gender not available.

Figure 11. Flyer advertising the Taking Learning Outdoors program in Cache Valley during Year 3 of the iUTAH project.

Table 6. Demographics of participants in Year 3 Taking Learning Outdoors program.

Category	Faculty				Students				Total			
	Male	Female	Total	URM[a]	Male	Female	Total	URM	Male	Female	Total	URM
Academic Research Institutions	1	1	2	0	0	1	1	0	1	2	3	0
K-12 Institutions	13	2	15	0	203	196	399	93	216	198	414	93
via Teacher Training	-	-	-	7	459	427	886	193	459	427	886	193
Total	14	3	17	0	662	624	1286	286	676	627	1303	286

[a] Underrepresented minorities.

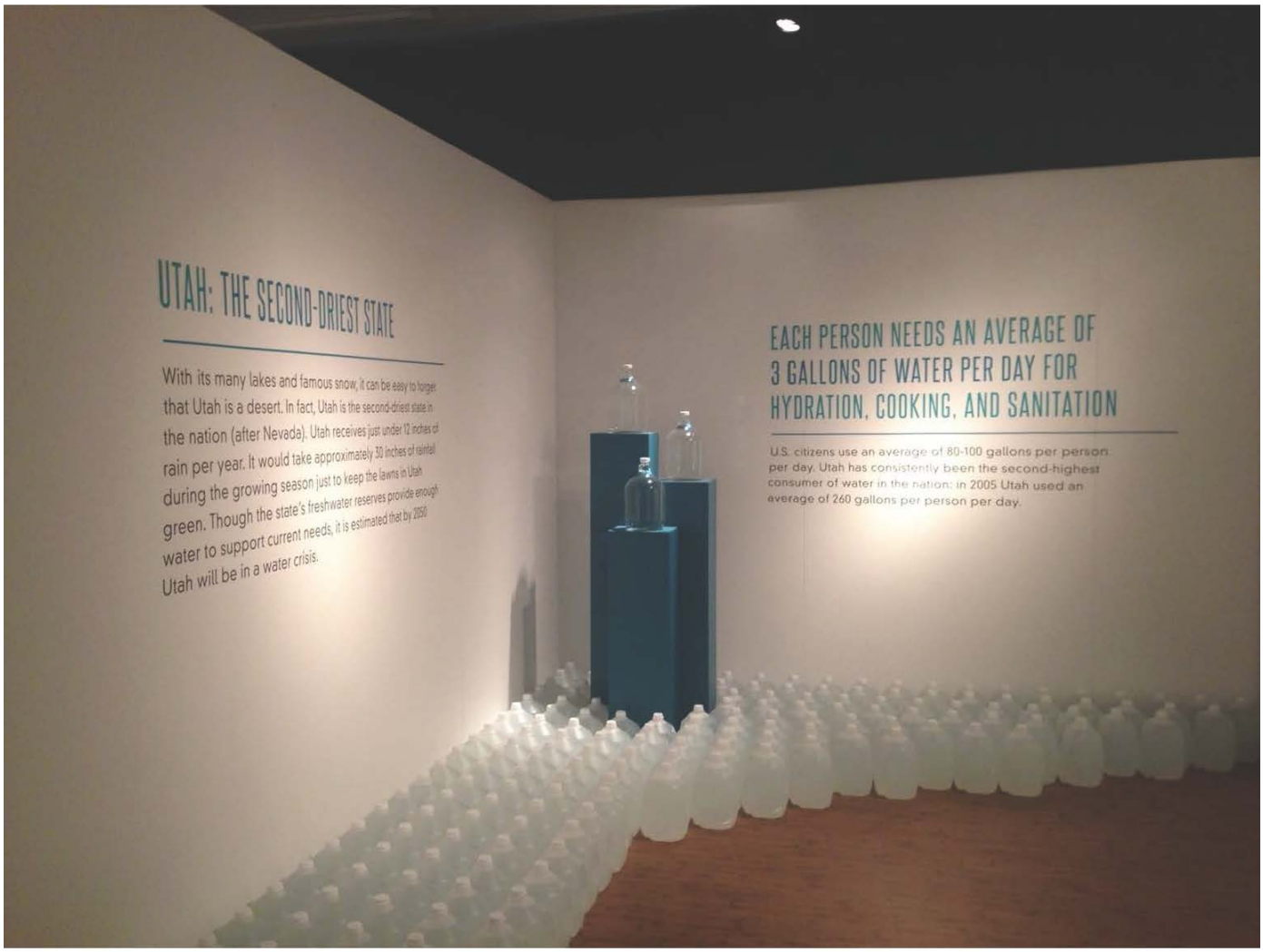

Figure 12. The iUTAH-sponsored exhibit "Water" at The Leonardo museum in Salt Lake City, Utah.

Table 7. iUTAH participation in national, regional, and local water-related conferences.

Event	Location	Date	Event Sponsorship	Booth	iUTAH Travel Support for Student Attendees
Society for Advancement of Chicanos and Native Americans in Science	Los Angeles	10/15/14-10/18/14	-	X	-
Salt Lake County Watershed Symposium	West Valley City	11/19/14-11/21/14	X	X	X
American Geophysical Union	San Francisco	12/15/14-12/19/14	-	X	X
Utah Conference on Undergraduate Research	St. George (DSU)	2/27/15	-	-	X
Spring Runoff	Logan (USU)	3/31/15-4/1/15	X	X	free to students
American Indian Science and Engineering Society	Salt Lake City (UU)	3/5/15-3/7/15	-	X	X
Intermountain Sustainability Summit	Ogden (WSU)	3/6/15-3/7/15	X	X	X
National Conference on Undergraduate Research	Cheney, WA	4/16/15-4/18/15	-	-	X
Annual Meeting of the Society for Freshwater Science	Milwaukee, WI	5/17/15-5/22/15	-	-	X
Consortium of Universities for the Advancement of Hydrologic Science, Inc.	Las Vegas	6/15/15-6/18/15	X	X	-

iUTAH Research Highlights

Breakthroughs in Aquatic Microbiology Advance iUTAH's Research

Streams are teeming with many different kinds of bacteria, but until recently the technology has not existed to let scientists understand how the species composition of microbial communities is linked to water quality. Researcher Zachary Aanderud and his PhD student, Erin Jones, are studying the importance of bacteria in stream environments and their role in water quality for iUTAH. Breakthroughs in DNA sequencing techniques allow iUTAH to be part of a new wave of aquatic ecology studies now taking place. Previously, scientists could describe stream bacterial activity only in terms of total carbon – basically measuring the amount of bacteria, but not which kinds are present. Identifying the species present is useful because different types of bacteria are able to create different biochemical compounds, including ones that are considered pollutants. We now are able to analyze a stream's capacity to produce any number of pollutants, based on molecular activity represented in bacterial genomes.

Their first study involved collecting water samples from high elevation-pristine sites to low elevation-urbanized sites in the Logan, Red Butte, and Provo watersheds. In the past, their lab had measured levels of a single bacterium, E. coli, at these sites, and recorded a definite increase in this species from high elevation to low elevation. The more urbanized sites showed a decrease in bacterial diversity – there were fewer species, and certain species tended to grow more dominant as they looked further downstream. Upon closer examination, the shift in bacterial community happened ABOVE heavy urbanization in all three watersheds. Instead, the shift corresponded to sites immediately downstream of dams (First Dam in Logan, Red Butte Reservoir in Red Butte, and Jordanelle Reservoir in Provo). This change occurred before there were significant changes in E. coli levels.

These data, paired with water chemistry data collected by iUTAH researchers, will give huge insights into how bacteria communities interact with other water quality variables. By collecting samples during different seasons of the year iUTAH can see if these trends are consistent across different weather and flow patterns.

Erin Jones sampling Utah Lake

UTAH EPSCoR NSF iUTAH

iUTAH Research Highlights

Los Avances en la Investigación de la Microbiología Acuática

Los arroyos están llenas de muchos tipos diferentes de bacterias, pero hasta hace poco no existía la tecnología para que los científicos comprendieran cómo se vinculaba la composición de especies de las comunidades microbianas a la calidad del agua. El Investigador Zachary Aanderud y su estudiante de doctorado, Erin Jones, están estudiando la importancia de las bacterias en entornos de flujo y su papel en la calidad del agua para iUTAH. Los avances en las técnicas de secuenciación de ADN permiten al programa de iUTAH ser parte de una nueva ola de estudios de ecología acuática

Anteriormente, los científicos podrían describir la actividad bacteriana corriente sólo en términos de carbono total - básicamente la medición de la cantidad de bacterias, pero no qué tipo estaban presentes. La identificación de las especies presentes es útil porque los diferentes tipos de bacterias son capaces de crear diferentes compuestos bioquímicos, incluyendo las que se consideran contaminantes. Ahora estamos en condiciones de analizar la capacidad de una corriente para producir cualquier cantidad de contaminantes, sobre la base de la actividad molecular representada en los genomas bacterianos.

En el primer estudio se recolectaron muestras de agua en sitios pristinos de alta elevacion y sitios urbanos de baja elevacion. Los sitios urbanizados son de las cuencas de los rios Logan, Red Butte, y Provo. En el pasado, había medido los niveles de bacterias individuales como E. coli en estos sitios y se habian hecho estimaciones de los niveles de bacteria en los sitios de alta y baja altitud. Los sitios más urbanizadas mostraron una disminución en la diversidad bacteriana - hubo menos especies, y ciertas especies tendieron a crecer más dominantes, ya que parecían más aguas abajo. Tras un examen más, el cambio en la comunidad bacteriana ocurrió ARRIBA urbanización en las tres cuencas. En cambio, el cambio correspondían a sitios inmediatamente aguas abajo de las presas (primera presa en Logan, Red Butte embalse en Red Butte, y Jordanelle embalse en Provo) en los niveles de E. coli.

Estos datos, combinados con datos de la química del agua recogidos por investigadores de iUTAH, darán grandes ideas sobre cómo las comunidades de bacterias interactúan con otras variables de calidad del agua. Mediante la recopilación de muestras durante las diferentes estaciones del año iUTAH puede ver si estas tendencias son consistentes.

Erin Jones muestreo Lago Utah

UTAH EPSCoR NSF iUTAH

Figure 13. Example of an iUTAH research highlight in English (left) and Spanish (right). Research highlights feature current iUTAH research outcomes and are publicized through the iUTAH website, newsletter, and as stand-alone bilingual handouts at events attended by iUTAH.

Table 8. Revised Strategic Plan Milestones for Research Focus Area 2: Social and Engineered Systems

Goal: (a) To imporve the capacity of Utah's science community to gather and analyze social and engineering system data on coupled water systems; (b) understand the interactions between urban form, environmental change, built water infrastructure, and decision-making in terms of water use; and (c) model the impact of alternative infrastructure designs and policy options on water use behaviors, the water cycle, water quality, and interconnected social and environmental systems.									
Objectives	**Year 3 milestones**	**Revised year 3 milestones**	**Rationale**	**Year 4 milestones**	**Revised year 4 milestones**	**Rationale**	**Year 5 milestones**	**Revised year 5 milestones**	**Rationale**
1. Water & Land Use		Coordinate with local neighborhood and municipal orgs to review HH survey results	*This milestone was added because the HH survey presented an important opportunity for stakeholder engagement.*	Work with partners to identify ways to incorporate RFA2 research results into ongoing water system planning efforts	Work with partners to identify ways to incorporate RFA2 research results into ongoing water system planning efforts		Document impacts of RFA2 research on stakeholder decisions	Document impacts of RFA2 research on stakeholder decisions	
	Develop first analysis that links data collected by RFA1 and RFA2 teams	Develop first analysis that links data collected by RFA1 and RFA2 teams		Receive first major collaborative research grant award	~~Receive first major collaborative research grant award~~	*Proposals submitted to date have not been funded.*	Identify new research questions and data needs to address emergent scientific and policy goals	Identify new research questions and data needs to address emergent scientific and policy goals	
	Transfer initial findings from RFA2 workto RFA3 coupled systems modeling teams	Transfer initial findings from RFA2 workto RFA3 coupled systems modeling teams						Receive major collaborative grant	*Moved from Year 4 milestones.*
	Publish first peer reviewed paper	Publish first peer reviewed paper							
		Conduct key informant interviews in WRMA communities to assess interactional capacity and water programming	*Reflects efforts of EPSCoR faculty hire, Courtney Flint.*						
		Expand Utah Water iPad Survey project with new collaborators	*iPad surveys were implemented in 2014 Summer Institute and expanded across the state.*						
		Develop templates for social science data collection and management plans and metadata reporting	*RFA2 and CI recognized need for specific plans related to social science data collection and reporting.*						

Table 8 continued.

Objectives	Year 3 milestones	Revised year 3 milestones	Rationale	Year 4 milestones	Revised year 4 milestones	Rationale	Year 5 milestones	Revised year 5 milestones	Rationale
2. Urban Form	Review work with partners and stakeholders in study areas to ensure research addresses local questions and interests of diverse communities	Review work with partners and stakeholders in study areas to ensure research addresses local questions and interests of diverse communities		Work with RFA3 team to simulate impacts of alternative urban growth scenarios on water and ecological outcomes	Work with RFA3 team to simulate impacts of alternative urban growth scenarios on water and ecological outcomes		Document impact of improved knowledge on stakeholder decisionsabout urban design, growth, management and water sustainability	Document impact of improved knowledge on stakeholder decisionsabout urban design, growth, management and water sustainability	
	Publish first paper	Publish first paper						Receive first major collaborative grant.	
	Incorporate first results of urban form analysis into RFA3 couple systems modeling exercises	Incorporate first results of urban form analysis into RFA3 couple systems modeling exercises							
		Submit collaborative proposal to link urban typology to biophysical outcomes	*Urban typology results proved more interesting than initially anticipated, including defining "suburbanity." The team sees an excellent opportunity for proposal development in late year 3/ early year 4.*						
		Finish installation of new urban instrumentation	*RFA2 team is collaborating with RFA1 to install urban equipment.*						

Table 8 continued.

Objectives	Year 3 milestones	Revised year 3 milestones	Rationale	Year 4 milestones	Revised year 4 milestones	Rationale	Year 5 milestones	Revised year 5 milestones	Rationale
3. Built Systems				Receive first major collaborative grant	~~Receive first major collaborative grant~~	*Proposals submitted to date have not been funded.*	Document impact of GI research on stakeholder decisions about GI planning and implementation		
	Analyze first data from GIRF facility	Analyze first data from GIRF experiment	*GIRF reinvisioned to iBUGI, and the urban water team continues analysis of explerimental plots established by former postdoc Dasch Houdeshel.*	Develop improved models to simulate GI at neighborhood or landscape scale	Develop improved models to simulate GI at neighborhood or landscape scale		Establish 1 new GI research site in extended network	~~Establish 1 new GI research site in extended network~~	*GIRN not feasible. Extensive synpotic sampling of urban influence on water outcomes planned as part of iBUGI activities beginning summer 2015.*
	Implement extended GI research plan	~~Implement extended GI research plan;~~ Instrument 1 new GI project in collaboration with muncipalities and universities	*Extension of the GIRF into a broader network (GIRN) was not feasible. GI activites reorganized as part of iBUGI. Green roofs have been instrumented at UU and SUU, and mobile stormwater equipment will be used to assess various GI projects.*	Establish 1 new GI research site in extended network	~~Establish 1 new GI research site in extended network~~	*GIRN not feasible. Extensive synpotic sampling of urban influence on water outcomes planned as part of iBUGI activities beginning summer 2015.*		Receive first major collaborative grant	*Moved from Year 4 milestones.*
	Publish first research paper	Publish first research paper			Integrate considerations of GI options into RFA3 coupled models	*Added to reflect ongoing and planned activities*			
	Establish 1 new GI research site in extended network	~~Establish 1 new GI research site in extended network~~	*GIRN not feasible. Extensive synpotic sampling of urban influence on water outcomes planned as part of iBUGI activities beginning summer 2015.*						
		Develop improved model for simulating surface runoff in diverse built/urban contexts	*Reflects activities of graduate student Youcan Feng and advisor Steve Burian. This will also be focus of upcoming work under a new EPA award.*						
		Incorporate results of GI research into urban hydrologic models	*Reflects activities of graduate student Youcan Feng and advisor Steve Burian. This will also be focus of upcoming work under a new EPA award.*						

Table 9. Revised Strategic Plan Milestones for Research Focus Area 3: Coupled Human-Natural Systems

Goal: To advance coupled systems modeling and understanding of Utah's water systems. Use the results of RFAs 1 and 2 in order to describe the water system as a whole and facilitate interactions with stakeholders regarding an improved capacity to study the complexity of local water issues.									
Objectives	**Year 3 milestones**	**Revised year 3 milestones**	**Rationale**	**Year 4 milestones**	**Revised year 4 milestones**	**Rationale**	**Year 5 milestones**	**Revised year 5 milestones**	**Rationale**
1. Interdisciplinary Modeling	Publish conceptual and model development	Publish conceptual and model development		Populate models with GAMUT and other iUTAH collected data	Populate models with GAMUT and other iUTAH collected data		Desseminate results and model products	Desseminate results and model products	
	Continue ET+ development	~~Continue ET+ development~~	*Decision was made to replace the ET+ framework with a more portable open source platform as the hub for model coupling.*	Disseminate results	Disseminate results		Develop framework for iUTAH water model	~~Develop framework for iUTAH water model~~	*Removed milestone since the product was not clear, and RFA3 already published a coupled conceptual model in year 3, and coupled water modeling is ongoing.*
	Continue model coupling	Continue model coupling							
		Development and technical evaluation of methods for coupling models	*Added to explicity describe activities by new EPSCoR faculty hire, Tony Castranova*	Continue model coupling	Continue model coupling		Publish model coupling methods and results	Publish model coupling methods and results	
2. Coupling Research	Apply results to scenarios and interdisciplinary modeling	Integrate RFA1 and RFA2 through synthesis of biophysical data with social and engineering science.	*Milestone clarified to describe RFA3 coupled modeling as point of integration. Coupled data collection to occur organically, especially with iBUGI activities.*	Continue integration of RFAs 1 and 2	Continue integration of RFAs 1 and 2		Publication and dissemination of results	Publication and dissemination of results	
	Collaborative publication and dessemination of results	Collaborative publication and dessemination of results		Publication and dissemination of results	Publication and dissemination of results		Evaluate scenarios of change and adaptation/mitigation strategies	Evaluate scenarios of change and adaptation/mitigation strategies	
	Participatory data collection and modeling to test adaptation and mitigation strategies	Entrain stakeholders into our coupled modeling workshop series.	*Milestone postponed to Year 4 because iVL was in planning/ construction phase, and make explicit stakeholder engagement in coupled modeling.*	Hold a new round of stakeholder workshops	Participatory data collection and modeling to test adaptation and mitigation strategies	*Revised to more explicitly define the original milestone.*			

Table 9 continued.

Objectives	Year 3 milestones	Revised year 3 milestones	Rationale	Year 4 milestones	Revised year 4 milestones	Rationale	Year 5 milestones	Revised year 5 milestones	Rationale
3. Scenarios Modeling and Visualization	Develop stakeholder responsive products (1 to 3 in years 3-5)	Develop stakeholder responsive products (1 to 3 in years 3-5)		Disseminate products and tools	Disseminate products and tools		Publication and dissemination of results	Publication and dissemination of results	
	Develp student, diversity, and outreach oriented products	Develp student, diversity, and outreach oriented products		Hold a new round of stakeholder workshops	Hold a new round of stakeholder workshops		Develop framework for iUTAH water visualization facility	Introduce stakeholders to live web-based visualizations through classroom use and presentation to state agencies	*Milestone revised to reflect decision to not build decision theater and instead develop the iVL.*
	Develop apps, web applications, and interactive tools	Develop apps, web applications, and interactive tools		Continue development of apps, web applications, and interactive tools based on user feedback	Continue development of apps, web applications, and interactive tools based on user feedback			Assess useage of web-based visualizations through analytics	