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ENGINEERING
UtahStateUniversity.



2019 ANNUAL REPORT

Utah Water Research Laboratory



David Tarboton
UWRL Director

The increasingly collaborative nature of research generally requires a team—a community—to gather information from the many disciplines needed to advance understanding and solve problems. This is as much the case for water research as it is for other fields of research. At the Utah Water Research

Laboratory (UWRL), researchers strive to generate the knowledge needed to solve water problems now and in the future, so the interdisciplinary nature of our research is increasingly important. UWRL Researchers span a diverse set of disciplines from environmental, to water resources, to hydraulics, to advanced sensing and information systems. This report touches on just a few of our over 200 ongoing projects.

Our feature project recognizes the twenty year legacy of the Utah On-Site Wastewater Treatment Training Program led by Judy Sims. Judy has tirelessly championed on-site wastewater treatment systems, training thousands with the expertise needed to properly construct these systems that are crucial to protecting environmental quality and human health.

Next is an overview of Hydroinformatics and water data management research at the UWRL. The increasing flood of sensor data presents both a challenge and an opportunity for water researchers. The projects described, each in their own way, contribute to better data management so that decisions can be based on data and research can be repeatable and trustworthy.

The third project featured is the Logan River Observatory (LRO), which builds on the infrastructure established as part of a prior National Science Foundation project and includes a program of comprehensive measurements to understand how climate and land changes impact water supply in mountainous snowmelt driven systems.

As an example of advanced sensing, the final featured project describes the use of AggieAir's unmanned aerial systems to measure the heat generated by controlled burns, to understand its ecological effects and identify hot spots at risk of flaring up again.

These projects collectively illustrate the diversity and multi-disciplinary capability that UWRL researchers continue to apply to Utah and the nation's water problems.

On a personal note, this is my first year as director of the UWRL. I am excited to take the reins and move the UWRL forward. Much of this annual report highlights work completed under the directorship of former director Mac McKee whose footsteps I now follow. I am immensely grateful to Mac for his 16 years of leadership of the UWRL. He has left it in good shape, and, on my watch as UWRL director, I am committed to continue to shepherd the good work of our faculty, staff, and students generating the knowledge needed to solve water problems now and in the future. I look forward to sharing with you other exciting research conducted at the UWRL in the years to come.

For more information, please visit our website at:

<http://uwrl.usu.edu/>



Measurement is the beginning of management

Contents

- Project Highlights..... 4-11**
 - A 20 Year Legacy: The Utah On-Site Wastewater Treatment Training Program 4
 - Judy Sims: Dedicated to Water Quality for 40 Years and Counting 7
 - Making a Difference: Better Water Data Management 8

- Focus on Utah10-15**
 - The Logan River Observatory: Local Data, Statewide Impact 10

 - AggieAir Fire Flights: Tracking Heat During Controlled Burns in Cache Valley, Utah 14

- Awards/Achievements 16-17**
 - Students Taking on Challenges: And Winning Three Awards 16

 - Awards & Achievements..... 17

- FY 18-19 Financial / Academic Summary 18-19**

A 20-Year Legacy: The Utah On-Site Wastewater Treatment Training Program



Brian Cowan demonstrating on-site treatment technologies at the Huntsman On-Site Wastewater Treatment Training and Demonstration Site, Logan, UT.

Ask the average person what they know about onsite wastewater systems (more commonly known as septic systems), and the answer will probably be, “not much,” if anything at all. While many people don't even think about their wastewater treatment systems, let alone how to appropriately install and maintain them, for UWRL and Biological Engineering faculty member Judy Sims and her colleagues at the Utah Onsite Wastewater Treatment Training Program (UOWTTP), teaching people to appropriately site, install, and maintain the various types of on-site treatment systems has occupied the last 20+ years.

Program Beginnings

The world of onsite wastewater treatment was a rough landscape in the 1990s, with little to no ongoing management and oversight of septic systems. In addition, the US Environmental Protection Agency was recognizing the need for more effective education and regulation regarding treatment options to protect the nation's groundwater resources, and Utah's leaders were responding to that environmental focus when they issued a request for proposals to establish a training program on a statewide level.

USU received that contract and Judy Sims and others began offering several training courses through the newly established UOWTTP each year between 1998 and 2001. Attendance was voluntary, but the trainings were well attended.

In 2001, the Utah State Legislature passed a law that requires “certification and recertification of individuals who design, inspect, and maintain underground wastewater disposal systems, or conduct soil evaluations or percolation tests for underground wastewater disposal systems.” USU was again awarded the contract and Judy and her colleagues have conducted these now mandatory trainings ever since.

For the past 20 years, the UOWTTP has provided formal classroom and field training to the region's regulators, consultants, contractors, and anyone who installs, maintains, or repairs on-site wastewater treatment systems in the State of Utah and other Rocky Mountain regions. The training programs also increase public awareness and education and help reduce misuses and failures of these on-site wastewater treatment systems.

The UOWTTP

With her team, Judy developed the three certification levels available for the State of Utah:

- ▶ **Level 1: Site Evaluation and Percolation Testing**, a 3-day class held at various locations around the state, including a field session;
- ▶ **Level 2: Design, Operation, Maintenance and Inspection of Conventional On-Site Wastewater Treatment Systems**, a 2 ½ day

workshop held in Logan, including a field trip; and

- ▶ **Level 3: Design, Operation, Maintenance and Inspection of Alternative On-Site Wastewater Treatment Systems**, a 4-day workshop held in Logan, including a field trip.

The Huntsman On-Site Wastewater Treatment Training and Demonstration Site was developed in 2001 on the USU campus in Logan, Utah with financial assistance from the USU Huntsman Environmental Research Center, the Utah Department of Environmental Quality, and Kennecott Utah Copper. The site enhances classroom lectures with hands-on training, featuring field models and demonstrations that give participants direct experience dealing with on-site systems.

Each workshop is provided at least twice each year, and recertification is required for each level every three years.

The Program's instructors all have extensive experience in on-site wastewater treatment, including:

- ▶ **Judy Sims** (program coordinator and USU biological engineering faculty),
- ▶ **Peg Cashell** (soil scientist),
- ▶ **Brian Cowan** (licensed environmental health scientist), and
- ▶ **Richard Jex** (professional engineer and licensed environmental health scientist).

The team has developed detailed training manuals and workbooks for those attending, as well as homeowner materials for residents maintaining on-site wastewater systems at their homes. Meanwhile, Ivonne Harris has served as the administrative assistant for the program since it began and is an effective liaison to program participants.

Each year, Judy also teaches engineering classes full of future civil and environmental engineers and public health professionals the basics of septic systems and tries to emphasize what they need to know if they choose to buy a property with one in the future.

Twenty Years of Impact

Approximately 3,500 new septic systems are added annually to the existing 105,000+ systems operating in Utah. As Utah's population growth continues,

the need for these onsite wastewater systems will only increase, as will the need for training and certification.

As of 2020, the Utah Wastewater Treatment Training program has taught over 1,350 participants, with around 150 to 200 people attending the original certification and renewal of certification class each year. Judy and her team are also recognized regional trainers and have taught in Idaho, Wyoming, Montana, and Colorado helping to create and promote similar programs in the region.

Robert Beers, the Onsite Program Manager for Utah's Division of Water Quality (UDWQ) commented on the success of the program, saying, "The Program's efforts have made an indelible mark on Utah's on-site professional community by increasing knowledge and expertise amongst on-site professionals. This has encouraged better partnership between

state agencies, local regulators, on-site system designers, contractors, property owners, and community officials toward improving water quality throughout Utah."

As Utah's Wastewater Training Program continues to expand, plans are underway for development of an additional demonstration site at the Ash Creek Special Services District in Hurricane, improving access for even more Utahns to this vital training program. ■

2018 marked the Program's 20th anniversary—evidence of its effectiveness and benefit to the on-site professional community.

(Robert Beers, UDWQ)



Peg Cashell teaching class participants to evaluate a soil for use in treatment and dispersal of septic system wastewater

A Few of Judy's Achievements:



Judy Sims and Richard Jex discussing on-site technologies at the Huntsman On-Site Wastewater Treatment Training and Demonstration Site, Logan, UT.

Judy Sims: Dedicated to Water Quality for 40 Years and Counting

Just how does one become an expert in onsite wastewater (septic) systems? For UWRL faculty member Judy Sims, the inspiration was the first Earth Day held in 1970. That early inspiration led her toward an education in environmental biology and, more particularly, the interaction of wastes and soils.

After her early experience as a soil scientist, Judy came to USU in 1982 as a Research Biologist, and she has been involved in on-site wastewater treatment and disposal ever since. When Utah leaders recognized the need for a wastewater training program, Judy was an integral part of the team that developed the Utah On-Site Wastewater Treatment Training Program from a rough concept and a desire to increase awareness and provide training for septic system designers, engineers, and

installers, to the statewide professional training program that it is today. Judy has served as the Program's coordinator for more than 20 years.

Judy is particularly proud of her role in the formation of the Utah Onsite Wastewater Association (UOWA) in 1998. Judy and her colleague Peg Cashell took the lead in organizing its annual conference until 2014. Judy has also served as the organization's president. The UOWA continues to actively sponsor a conference each year.

Judy currently serves as a Research Associate Professor in Biological Engineering and at the UWRL, a position she has held since 2003.

Even after all these years, Judy continues to be a champion of onsite wastewater treatment training and innovation in Utah. And what has she valued most over the years? All of the talented and dedicated colleagues. Judy adds, "without their skills, experiences, and work ethic, the training program would not be what it is today." The same could be said about Judy! ■

2019 Sudweeks Award:

Professor Judy Sims was recently honored to receive the Calvin K. Sudweeks Award from the Utah Division of Water Quality for her contributions to Water Quality Research. The award is given annually to a person who has shown leadership and achievement in the field of water pollution control and/or water quality improvements in the State of Utah and exhibits the qualities of professionalism, personal integrity and dedication to the goals and principles of improved water quality in the State of Utah.

Keynote Speaker at the Annual Conference of the Arizona Wastewater Associations in Flagstaff, Arizona—2013

Board of Directors: Elected as National On-Site Wastewater Recycling Association (NOWRA) board member—2008

Lynn Thatcher Award for significant contributions to the field of environmental health, Utah Environmental Health Association—2004

Non-Point Source (NPS) Water Quality Award, NPS Water Quality Task Force, Utah Department of Environmental Quality—2003

Making a Difference:

Hydroinformatics

Hydroinformatics research at the UWRL combines a wide range of digital data gathering, handling, analysis, and management technologies in support of finding solutions to challenging current and future water management problems. This type of research:

- Is enabled by innovative data collection and sensing technologies.
- Integrates data from different sources and models to support decision management.
- Encourages a focus on technology within a social context.

CIWS

The Cyberinfrastructure for Intelligent Water Supply (CIWS) project led by UWRL faculty member Jeff Horsburgh, aims to advance the data collection, management, and analysis cyberinfrastructure available for smart water metering. Smart meters generate large volumes of water use data that can be used to better characterize and quantify residential water use behavior and for building the scientific data and knowledge base needed to sustainably manage urban water supplies.

Without supporting cyberinfrastructure, however, the data generated by smart meters can be overwhelming. This project is answering questions about:

- water use behavior across socio-demographic groups and neighborhood types,
- The timing of water demand in homes and how this information can be used by water providers to ensure water availability and efficiency, plan for related energy demand, and improve customer satisfaction,
- How water consumers change their behavior when given detailed information about their water use.

The answers to these questions are critical to identifying water conservation opportunities, forecasting demand, and determining how water use patterns may change over time in response to population growth, demographic shifts, and technology improvements.

HydroShare

HydroShare is a web-based data and model sharing platform developed by hydroinformatics experts from USU, U. of Virginia, U. of Illinois, U. of Washington, Tufts, U. of North Carolina and Brigham Young U. who came together as part of an NSF-funded collaboration. Led by UWRL Director David Tarboton, the HydroShare team is developing cyberinfrastructure for sharing and publishing data and models in a variety of flexible formats, making this information available in a citable, shareable, and discoverable manner.

The Consortium of Universities for the Advancement of Hydrologic Science Inc. (CUAHSI) operates this system, which includes a repository for data and models, and tools (web

apps) for visualization and analysis, and a gateway to high performance computing and computing in the cloud. HydroShare allows users to:

- Share data and models with colleagues and manage access to the content shared.
- Share, access, visualize and manipulate hydrologic data and models and make research results more reproducible.
- Publish data and models to meet the requirements of a data management plan.
- Discover and access data and models published by others.
- Use web apps to visualize, analyze, and run models on data in HydroShare.

See more at: www.HydroShare.org

◀ HydroShare Impact

4000+ users at
140+ US universities and
100+ international
organizations, with
9000+ resources (data or
models) shared among the
water science community.

Example of urban flooding: Logan River at 6th West, closed during June 2011 flooding requiring rerouting of traffic (photo Aaron Byrd) ▶

Better Water Data Management



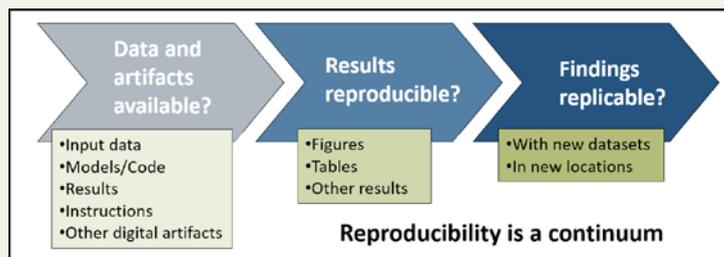
Photo courtesy / Jeff Horsburgh

UWRL graduate students Camilo Bastidas and Nour Attallah install a smart metering device on a residential water meter in Logan Utah

Data/Model Reproducibility

In science and engineering, results must be reproducible to be accepted as valid. Unfortunately, as Dr. David Rosenberg (UWRL) and Dr. Stagge (former UWRL post-doc 2016–2018) found when examining the reproducibility of past research data from peer reviewed journal articles, very few provide enough

information to truly reproduce the results. The team has suggested ways data producers can coordinate efforts to make their data and models reproducible so researchers can more quickly understand and apply past efforts toward current and future work to advance the field.



Dr. Rosenberg and Dr. Stagge have created a reproducibility tool to help authors, journals, funders, and institutions self-assess the reproducibility of their manuscripts.

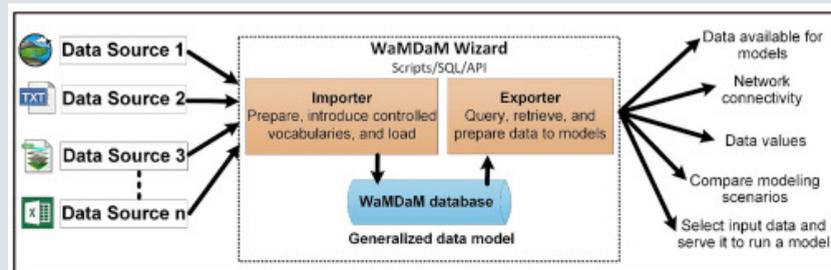
UFOKN

UWRL hydroinformatics researchers David Tarboton and Jeff Horsburgh are part of a team from around the nation developing the Urban Flooding Open Knowledge Network (UFOKN) to address the impact of flooding on the urban multiplex. This is the combination of electrical, transportation, water, sewer and other systems that make our cities work, and which can be involved in a cascade of failures if there is flooding. This team is part of a National Science Foundation supported convergence accelerator project that brings together diverse expertise in each of the systems involved with information and computer scientists to develop a system to aid in planning for and managing flooding in urban systems.

WaMDaM

The Water Management Data Model (WaMDaM) and supporting software developed by UWRL PhD student Adel Abdallah, helps water managers, scientists, and engineers to decrease the time spent gathering and interpreting data and to more efficiently model, analyze, and manage their water systems by organizing and integrating diverse water resources data. The tools allow managers and engineering to:

- Visualize models/data online and compare data from different scenarios.



- Edit model input data online and serve data to run a model.
- Store input data with metadata in HydroShare for others to discover.

This NSF-funded project is advancing the cyberinfrastructure needed to better understand the interconnectivity of natural and human water resources systems.

Focus on

UTAH:

The Logan River Observatory:

Local Data, Statewide Impact

Water is the lifeblood of our state, and we depend on a safe and adequate water supply, not only for drinking water, but for other municipal, agricultural, industrial, and recreational uses. Much of Utah's water supply comes from reservoirs or streams that are fed by snowmelt. However, historical data may not be predictive of future water supply as climate changes occur, which raises a host of questions. For example:

- ▶ As weather patterns change to more rain and less snow, what will be the effect on summer flows?
- ▶ What pressures will population increase put on an already limited water supply?
- ▶ Under these and other unprecedented circumstances, how do we develop ways to increase drought resilience?

Reliable data are essential to answering questions like these, and monitoring Utah watersheds is necessary to making informed water management decisions. That is precisely what the Logan River Observatory (LRO) is doing to help meet the challenges and fill in the knowledge gaps.

Story photos by Brittanie Carter

Inspection visit at the Franklin Basin Climate Station

Beginnings

The Logan River Observatory began as part of the iUTAH project funded by the National Science Foundation (NSF) and implemented by universities across the state. This NSF project provided funds for infrastructure and initial data collection to increase research competitiveness; however, it did not provide ongoing funds to maintain that infrastructure and continue data collection.

Building on the infrastructure installed during the 5-year iUTAH project, the LRO now has 21 river flow stations, 8 real-time water quality stations, and 6 weather stations installed in Logan River watershed, making it one of the most highly instrumented watersheds in the western U.S. This infrastructure and the associated data provide an opportunity for Utah to lead the country in water-related research and develop innovative water management approaches in water-scarce regions. But maintaining such a large network requires ongoing support.

Connections

With over \$1 million invested in infrastructure, installation, and data collection to date and \$100s of thousands in data management infrastructure to archive and provide these data to the public, team members Drs. Bethany Neilson (LRO director, UWRL), Jeff Horsburgh (UWRL), and Michelle Baker (Biology) were committed to finding a way to maintain and expand the partnerships forged in the iUTAH project and to ensure that this wealth of data continues to benefit the water

managers in Utah who rely on it. The LRO is the result of that commitment. In addition to partnerships with Utah State University, the City of Logan, and the Cache Water District, the LRO was recently granted ongoing state appropriation funding through the Division of Water Resources to facilitate the operation and maintenance of this hydrologic observatory.

Research

LRO data provides critical information to guide northern Utah's water resources planning and management decisions, but it also offers foundational information to support water-related research, which is a primary focus for researchers at the Utah Water Research Laboratory and many other USU departments.

The findings from just a few research projects using LRO data are good examples of the possibilities ahead:

- ▶ **A hydraulic routing and river temperature model of the Logan River.** This model of a large section of the lower Logan River developed by UWRL researcher Caleb Buahin in 2019 accounts for all river inflows and outflows to determine gains and losses to the system. Their analyses resulted in a much better understanding of the dynamic inflows and outflows to the river system, and was only possible with the type of high-resolution data collection and modeling employed within the LRO. Current research efforts are developing new data-driven approaches for predicting complex urban inflows to river systems.

- ▶ **Finding the temperature of inflows.** Buahin's team of researchers were also able to calibrate the temperature model so that the simulations matched observed data well and then determine the temperature of the inflows, which can indicate whether they originate from colder groundwater or warmer urban/agricultural runoff. Current research is focused on quantifying inflows and identifying flow sources in the urban and agricultural sections of the Logan River using natural tracers.



Patrick Strong, LRO technician, taking flow measurements on Temple Fork Sawmill Creek



USU 2019 Surface Water Quality Modeling class measuring river flow during a field trip on the Logan River

- ▶ **Precipitation changes in snowmelt dominated watersheds with karst geology.** Dr. Bethany Neilson and her team of researchers found that significant amounts of river water were repeatedly exchanged between the river and the local aquifer and that the majority of the groundwater entering the river moves quickly through the system via karst aquifer conduits (a local geologic formation). These findings suggest that river flow each summer is highly dependent on recent aquifer recharge from snow accumulation during the prior winter. Future research is focusing on quantifying how climate changes that affect snowpack will subsequently influence the amount of summer streamflow.

- ▶ Serving as an outdoor laboratory and classroom for training the next generation of engineers and scientists to address water issues in the state.
- ▶ Supporting the research that will generate a better understanding of the limitations of and potential challenges related to our water supplies.
- ▶ Providing opportunities to advance STEM education in local schools through K-12 outreach such as USU's GearUP summer program.
- ▶ Increasing public awareness of the connection between the landscape, humans, and water.

Statewide Benefits

The ongoing operation and maintenance of these stations and the data that they provide are critical to water supply and water quality monitoring in the northern part of the State of Utah. The Logan River watershed spans

wilderness areas, Forest Service land, urban areas, and agricultural areas, so the lessons learned, as well as the methods developed for integrating efforts by government, citizen-led organizations, and management entities, can be applicable to watersheds spanning pristine to rural to urban areas throughout Utah and the western US. LRO information on water quantity and quality can inform water resources decision-making locally and throughout Utah. Some current uses serve as examples:

- ▶ **Utah Division of Water Resources and Cache Water Conservancy District** plan to use the flow and water quality data collected by these stations for water management and potential development of water projects within the Logan River basin. These data are also critical for quantifying the water entering the Bear River and eventually the Great Salt Lake.
- ▶ **Cache Water Conservancy District** is also using LRO data to assess drinking

Education

In addition to its value as a data source for research, the LRO also supports education by:

About the Logan River Observatory

NETWORK RESOURCES

Throughout a watershed that spans pristine mountainous area through urban and agricultural areas, the network has expanded to include:

- ▶ 21 streamflow stations
- ▶ 8 water quality stations
- ▶ 6 weather stations

FUNDING PARTNERS

- **Public and Private**
 - ▶ State of Utah (through the Division of Water Resources)
 - ▶ Logan City
 - ▶ Cache Water District
 - ▶ National Science Foundation
- **Utah State University**
 - ▶ Vice President of Research Office
 - ▶ College of Natural Resources
 - ▶ College of Engineering
 - ▶ Utah Water Research Laboratory
 - ▶ Ecology Center

COLLABORATORS

- ▶ Logan Northwest Field Irrigation Company
- ▶ Logan River Task Force

<https://LRO.usu.edu>

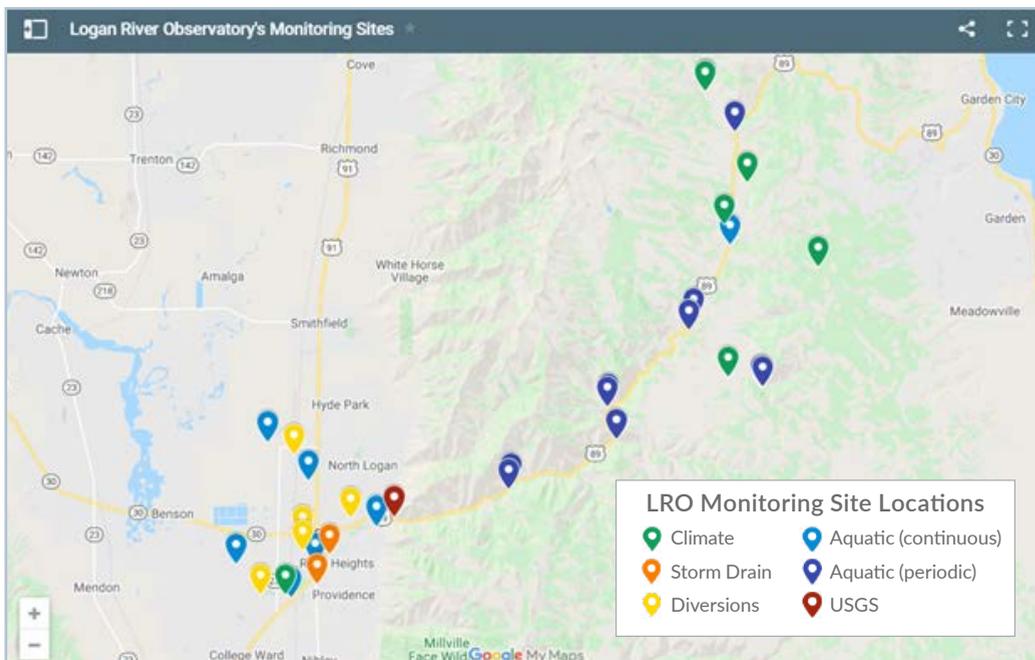
water source status and to meet their mission of protecting and managing water resources in Cache County.

- ▶ **Utah Division of Water Quality** is using the data to assess compliance with state water quality standards, determine the need to help fund additional stream restoration projects, and identify and address water quality related problems.
- ▶ **Logan City** can use LRO data to gather information about drinking water source status and protection. Some of the data are being used in Logan City's stormwater management and river restoration efforts. Data can also provide tourism-related information (e.g., for fishermen, snowmobilers, skiers, and other recreational users).

- ▶ **Utah State University** installed and operates the stations and uses them for teaching, research, and K-12 outreach.
- ▶ **The general public** can access all Logan River Observatory data for free online via the LRO website and the HydroShare data repository.

Looking to the Future

Ongoing data collection and targeted research provide information needed for developing future adaptive management strategies needed to address the diverse water resource challenges that the Western US faces. The partnerships and collaborations established so far have set the LRO on a sustainable path toward both understanding and addressing many of Utah's water related challenges. ■



Focus on

AggieAir's near-real-time, detailed information on the location and number of 'hot spots' helped avoid the possibility of unattended hot spots flaring up again.

AggieAir Matrice DJI 600 Pro Dragonfly VTOL flying over a controlled burn in fall 2019.

UTAH:

AggieAir Fire Flights: Tracking Heat During Controlled Burns in Cache Valley, Utah

The UWRL's AggieAir Service Center deploys sUAS (small unmanned aerial systems) to collect extremely high-resolution scientific-grade remote sensing data, most often for water resources related applications. Recently, however, they used the same capabilities to track something entirely different—heat. AggieAir was granted access to air space over some recent prescribed burns in Logan canyon, Utah.

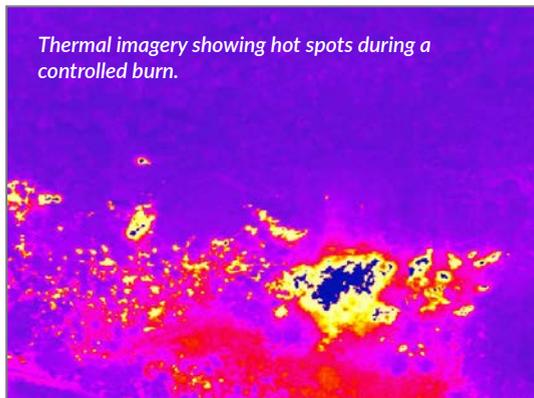
Prescribed burns can be an effective forest management tool to:

- ▶ enhance and restore habitat for wildlife,
- ▶ help prevent soil erosion,
- ▶ Protect water resources, and
- ▶ Reduce the quantity of volatile unhealthy, dead and down trees.

The AggieAir team flew a VTOL (vertical take-off and landing) Matrice DJI 600 Pro platform at an above ground elevation (AGL) of 400 ft. to acquire aerial imagery over these Forest Service controlled burns. The VTOL platform carried a 3-camera configuration payload that included two Lumenera scientific grade cameras and an ICI thermal sensor.

Because it doesn't need a runway, the Dragonfly VTOL can be launched even in rugged terrain such as in Logan Canyon. The team captured both visual and thermal aerial imagery over two separate burn locations. The Forest Service personnel were able to view the status of the fires in near-real-time.

As AggieAir Service Center director, Ian Gowing, explained, "The imagery provided by AggieAir, and especially the thermal imagery, is incredibly useful for tracking prescribed burns because it provides relatively time sensitive detailed information on the location and number of 'hot spots' that need to be monitored by 'boots on the ground' to avoid the possibility of unattended hot spots flaring up again." ■



Thermal imagery showing hot spots during a controlled burn.

AggieAir Joins National Drone Traffic Efforts

With more than a decade of rigorous development, research, and service under its belt, the AggieAir program is being recognized as a national leader in remote sensing for scientific applications. In addition to the various water- and fire-related projects conducted over the past year, AggieAir was selected to participate in two national airspace studies sponsored by the Federal Aviation Administration (FAA) and NASA:

FAA & NASA: A critical national airspace operation led by NASA specifically testing beyond-line-of-sight capabilities of unmanned aerial vehicles in a large urban setting, which is a first step to safely using drones for package delivery, newsgathering, and other services. AggieAir was the only research group to fly every day during the 30-day program (Reno, Nevada).

FAA: AggieAir joined other industry experts to develop UAV enterprise service cloud infrastructure in the hopes that it will support the sharing of information between organizations that promotes cooperative separation and situation awareness. This FAA program will provide practical data that will allow stakeholders to see and understand the level of investment needed for safe UAS traffic management. (Las Vegas, Nevada).

More information at:

<http://aggieair.usu.edu>

Students Taking on Challenges: And Winning Three Competitions

EPA Campus Rain Works

A multidisciplinary team of USU students advised by Jake Powell (Landscape Architecture and Environmental Planning) and mentored by UWRL faculty member R. Ryan Dupont (Civil and Environmental Engineering) won 3rd place in the EPA-sponsored Campus RainWorks Challenge, a green infrastructure design competition that engages future environmental professionals to find innovative and visionary ways to use green infrastructure to manage stormwater pollution.

Their project titled "A New Heart" proposed a concept for converting Aggie Boulevard into a permeable plaza that would reduce current stormwater flows, recharge groundwater with treated

runoff, reduce impermeable surfaces, introduce native landscaping to eliminate the need for supplemental irrigation, and create a new cultural center for the campus using green infrastructure.

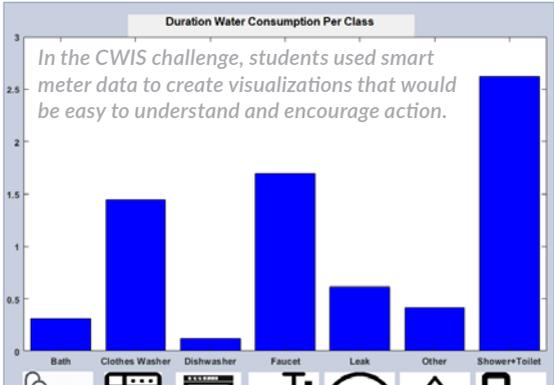
WEFTEC Wastewater Design

A team of civil and environmental engineering undergraduates took 3rd place at the 2019 Wastewater Design Competition sponsored by the Water Environment Federation (WEFTEC). The students, led by faculty advisor R. Ryan Dupont, are all members of the student chapter of the Water Environment Association of Utah. They competed against teams from 13 other schools. The team's project focused on improving wastewater treatment operations at Utah's North Davis Sewer

District by reducing levels of phosphorus and nitrogen discharged into the Great Salt Lake, which could reduce algal blooms and protect aquatic life. This is the fourth time USU students have placed in this national competition.

CWIS Data Visualization

UWRL faculty member Dr. Jeff Horsburgh and his Cyberinfrastructure for Intelligent Water Supply (CWIS) team issued a data visualization challenge to give students an opportunity to develop innovative ways to visualize the high-resolution water use data collected as part of their research. Three USU students rose to the challenge and won cash prizes for the top three designs: Mahyar Aboutalebi, Esther Davis, and Ahmed Gharib.



& Achievements

Below are a few significant achievements at the UWRL in FY 2019:

USU SPONSORS NATIONAL

CONFERENCE: Dr. David Stevens served as Conference Chair, and several UWRL faculty delegates served on the conference planning committee for the UCOWR/NIWR Annual Water Resources Conference at Snowbird, UT, on June 11-13, 2019. USU students and faculty participated with presentations and posters over the course of the four-day conference.

UCWRR 5-YEAR REVIEW RESULTS:

The Utah Center for Water Resources Research within the UWRL recently received the results of their latest USGS review. The review panel commended the Center for demonstrating a positive impact on addressing state and regional water problems, maintaining an outstanding information transfer program, and showing a commitment to development of students and early career faculty.

UWRL HOMECOMING EVENT: Over 200 alumni and current affiliates participated in this UWRL event in October 2018.

FACULTY APPOINTMENTS:

- ▶ **New UWRL Director:** Dr. David Tarboton assumed the role of UWRL Director on July 1, 2019, following the retirement of previous director, Mac McKee.
- ▶ **VP for Research:** UWRL researcher and former Associate Director Dr. Blake Tullis was appointed Interim Associate Vice President for Research starting July 1, 2019.
- ▶ **Utah Drinking Water Board:** Dr. Tullis was appointed by Utah's governor to serve a 4-year term on the Utah Drinking Water Board.

STUDENT AWARDS:

- ▶ **American Society of Civil Engineers National Scholarship:** Civil engineering student Seth Thompson was the only student in Utah to receive the Samuel Fletcher Tapman ASCE Student Chapter

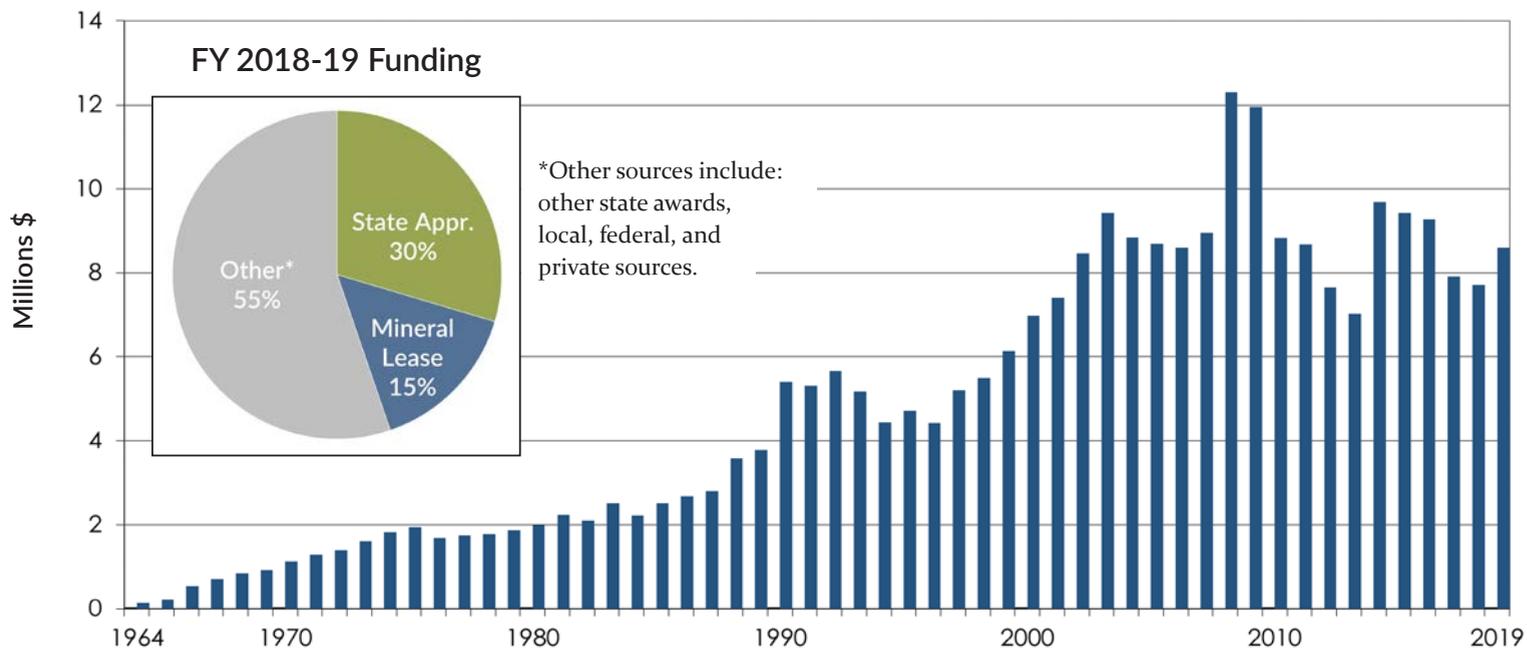
Scholarship and was one of only 18 people nationwide to receive a major scholarship from the American Society of Civil Engineers.

- ▶ **AWWA Scholarships:** UWRL graduate students Ayman Nassar and Karl Christensen received American Water Works Association (AWWA) Intermountain Section scholarships.
- ▶ **2019 SPIE Best Paper Award:** Graduate student Mahyar Aboutalebi received this award at the 2019 SPIE Conference, for his paper titled, "Autonomous Air and Ground Sensing for Agricultural Optimization and Phenotyping IV."

...along with many others.

FY18-19 Financial/Academic Summary

UWRL Funding History:



Research and Training Products:

239

Active projects

152

Scholarly presentations at professional conferences

86

Scholarly publications in peer reviewed journals

12

Short courses

Student Outcomes:

48

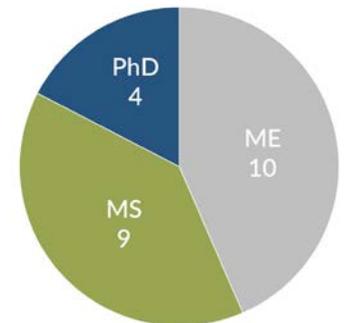
Graduate research assistantships funded

66

Undergraduate students supported

23

Graduate degrees granted



\$8,611,764

Total Annual Expenditures FY 18-19



8200 Old Main Hill, Logan, UT 84322-8200 • (435) 797-3155
uwrl.receptionist@usu.edu • <http://uwrl.usu.edu>

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