



CAPITOL  
REEF  
FIELD  
STATION



UTAH VALLEY UNIVERSITY



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## DIRECTOR'S INTRODUCTION

Capitol Reef Field Station (CRFS) is a center for education, research, and conservation located inside Capitol Reef National Park. UVU is one of only eight universities in the United States that operates a field station inside a national park. Through our unique partnership, we are able to facilitate a variety of academic activities linked to all five pillars of engaged learning. For example, we offer student internships with the National Park Service, community engagement with local K-12 teachers and students, intercultural connections with the region's current and past residents, a venue where an engaged curriculum can unfold for a variety of disciplines and programs, and opportunities for research, scholarly, and creative activities. Come visit us atop our mesa overlooking Pleasant Creek and surrounded by cliffs of Wingate sandstone. CRFS is an excellent home base for your academic explorations of the Colorado Plateau.

**Michael T. Stevens, Ph.D.**

Director, Capitol Reef Field Station



## Our Mission

Capitol Reef Field Station, in partnership with Capitol Reef National Park, promotes and supports engaged learning, research, scholarly, and creative activities, and environmental ethics through the exploration of the Colorado Plateau.

## Our Place

Beyond the paved roads, 2.5 miles past the end of the aptly named Scenic Drive, our buildings sit atop a mesa in the heart of Capitol Reef National Park. Surrounded by stunning views of canyon country, one can hear the calming sounds of Pleasant Creek running past historic pastures. The sun rises over the last mountain range in the continental United States to be mapped, the Henry Mountains, framed by towering sandstone cliffs. To the west lies Boulder Mountain, which was an active volcano tens of millions of years ago, and supported small glaciers during the last ice age. Looking up, casual stargazers and serious astronomers alike appreciate the amazing night sky, which recently received a Gold-Tier International Dark-Sky designation. Only 3.5 hours from UVU and the Wasatch Front, our incredible location provides an unparalleled opportunity for place-based learning. CRFS welcomes students and faculty from all institutions of higher learning who seek to experience the natural and cultural legacies of the Colorado Plateau.

## Our Vision

Our vision is that our visitors leave the field station having learned more than the content of their coursework. Far away from many of life's daily distractions, visitors are able to immerse themselves in educational experiences that focus on the natural world that surrounds them. Practicing conservation encourages all visitors to think about their role in the environment and deepen their understanding of environmental ethics. We hope that every visitor connects to the landscape and develops an appreciation for the area's rich biological diversity and cultural history.

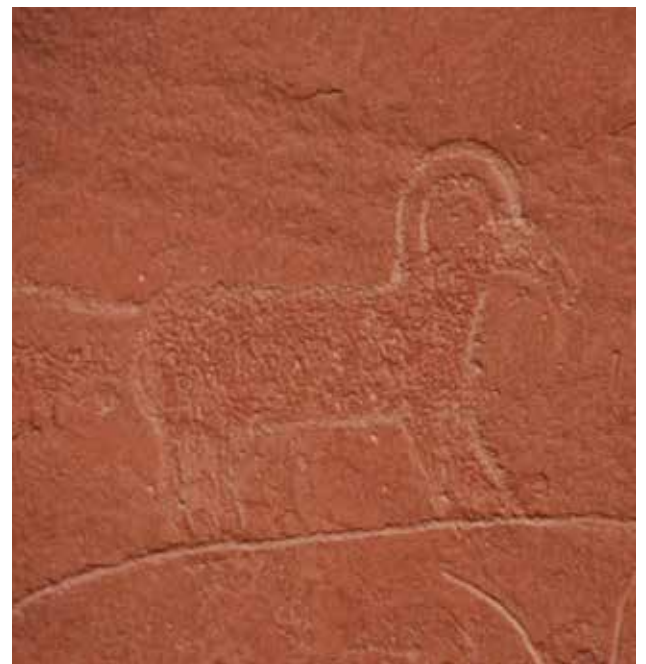
## Our History

From CRFS, visitors can see hundreds of millions of years into the past. The rocky landscapes tell stories of shallow seas, tidal flats, swamps, and sand deserts. More recently, Pleasant Creek has carved its way through the canyon walls to create the oasis that has attracted life for millennia including Paleo-Indian, Desert Archaic, Fremont, and Numic-speaking (Ute and Paiute) people.

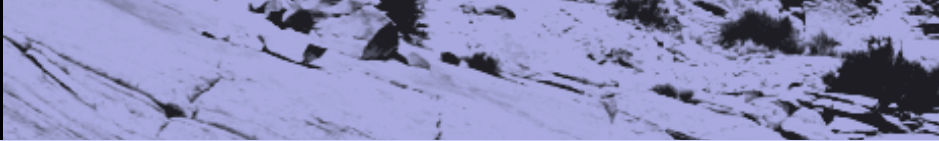
More recently, Mormon pioneers began to set the scene that we see today. In 1882, Ephraim Hanks established his ranch in Pleasant Creek Valley, building the first permanent home in what would become Capitol Reef National Park. This same ranch changed hands many times over the years, and had been converted into a tourist destination called Sleeping Rainbow Ranch when the national park was created in 1971. The ranch's owner, Lurt Knee, deeded the ranch to the national park in a transaction that included life tenancy. The land was handed over to the park in 1995. A few years passed before UVU approached the park with the idea of converting the unoccupied site into a field station. It was agreed that a field station would support the mission of each organization, and after years of close collaboration on the project, the idea became a reality. CRFS opened its doors in October 2008.

## Our Partnership

The success of our mission is made possible through the partnership between UVU and Capitol Reef National Park. This unique partnership allows CRFS to provide its visitors with educational experiences that are as remarkable as the landscape in which they occur. CRFS is property of the National Park Service and is operated under the direction of UVU and the park in accordance with our General Agreement.



# VISITATION SUMMARY



Visitation to CRFS has steadily increased since opening in 2008, and this year was no exception. User days, calculated by multiplying the number of visitors by the number of calendar days they spent at the station, totaled 2,348 (Fig. 1). This represents a 3% increase over the previous fiscal year. Our use has more than tripled since our first complete fiscal year with visitors (2009-10). We credit this substantial increase to our relevance to a variety of disciplines and our ongoing marketing efforts.

Nearly two-thirds of our user days were associated with UVU this year. The University of Kansas, Utah Science Teachers Association, and University of Utah were other substantial sources of visitation (Fig. 2).

Visitors from UVU represented a variety of colleges, programs, and schools (Fig. 3). Our top three sources of visitation were the University College, College of Humanities & Social Sciences, and College of Science & Health. Substantial user days also came from Professional & Continuing Education, the Honors Program, events hosted by CRFS, and the School of the Arts.

This is the first year that University College supplied the largest number of user days. The University College brought five groups from the English Language Learning Department. We're excited that our station supplies such an effective environment for language acquisition.

During the 2016-17 fiscal year, 654 people (including 485 undergraduates) visited CRFS in 42 groups. The average group size was 16 and the average stay per group was 4 days. Females and males comprised 51% and 49% of visitors, respectively.

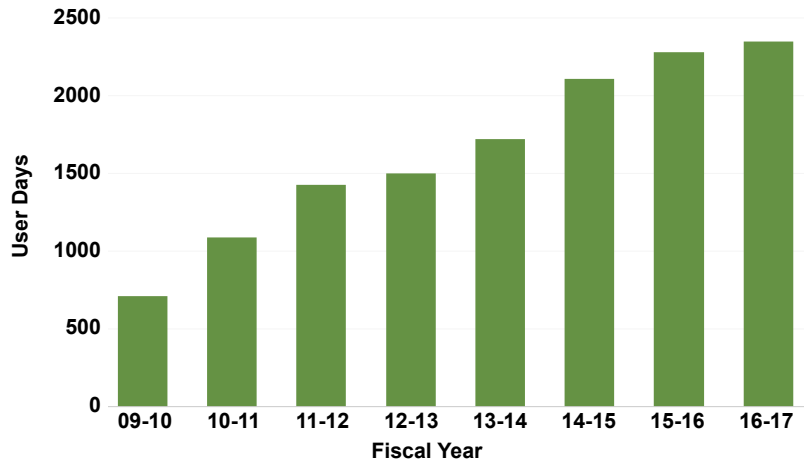


Fig. 1

User days at CRFS have steadily increased since our first complete year in operation (2009-10). Visitation for 2016-17 increased by 3% compared to the previous fiscal year.

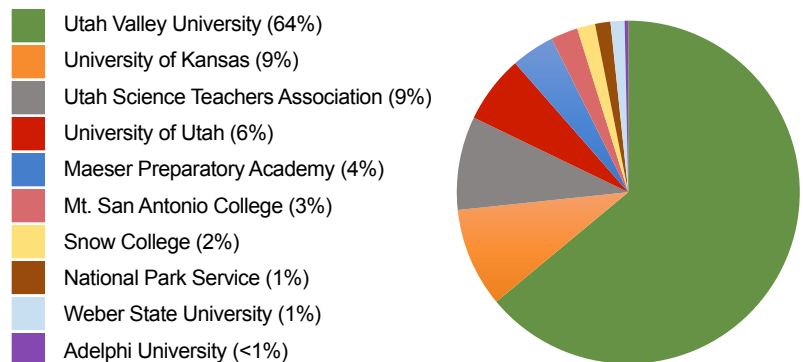


Fig. 2

Percentages of CRFS user days from various institutions and organizations.

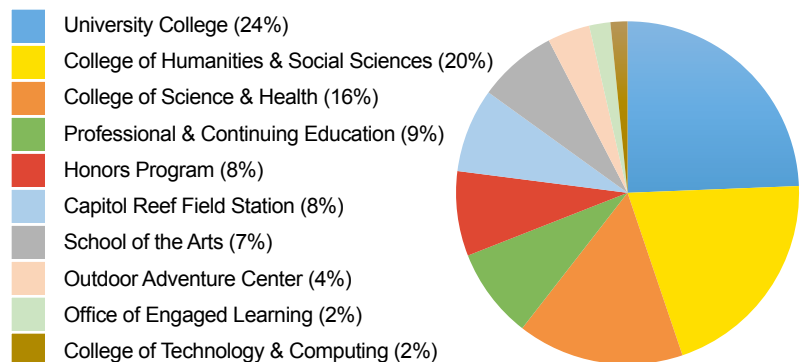


Fig. 3

Percentages of CRFS user days from colleges, schools, or programs associated with UVU.



## UVU CLASSES WHO VISITED CRFS

COLLEGE	COURSE	TITLE
College of Humanities & Social Sciences	COMM 350R	Environmental Communication
	ENGL 2010	Research Writing
	ENGL 2010/3020	Research Writing
	ENGL 3470	Environmental Writing
	SPAN 3030	Spanish Conversation & Composition
College of Science & Health	BOT 4050/4055	Plant Ecology
	GEO/GEOG 3500	Geomorphology
	PHYS 1800	Energy You and the Environment
	REC 4400	Outdoor Recreation
College of Technology & Computing	MGMT 4840	Consulting Group
Honors	HONR 100R	Honors Colloquium
	HONR 100R	Honors Colloquium
University College	ESL 1310, 1320, 1330, 1340	English Language Learning Level 5
	ESL 1310, 1320, 1330, 1340	English Language Learning Level 5
	ESL 2110, 2120, 2130, 2140	English Language Learning Level 6
	ESL 2120, 2130, 2140	English Language Learning Level 6

## UVU AFFILIATED GROUPS WHO VISITED CRFS

SPONSORING ORGANIZATION	GROUP
Capitol Reef Field Station	AJC Architects
	Park/Field Station Staff Social
	University-National Park Field Station Conference
College of Humanities & Social Sciences	Project Development
College of Science & Health	Nature to the Classroom
	High Altitude Research
Office of Engaged Learning	OEL Meeting
Outdoor Adventure Center	OAC Leadership Program
Professional & Continuing Education	PCE Photography
	Natural History of Utah
School of the Arts	Harvest Festival Photography
University College	English Language Learning Workshop

## CLASSES FROM OTHER UNIVERSITIES WHO VISITED CRFS

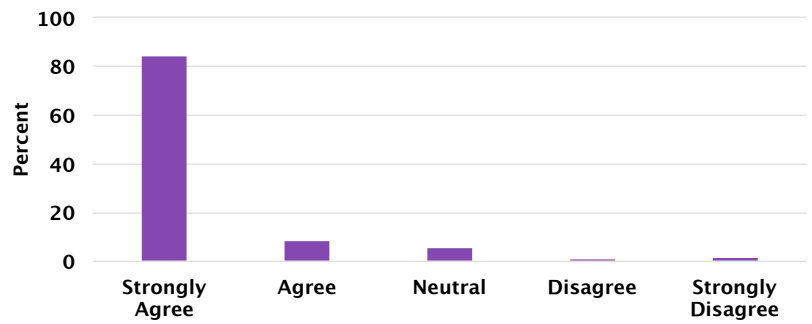
UNIVERSITY	CLASS
Adelphi University (Garden City, NY)	Field Paleontology
Mt. San Antonio College (Walnut, CA)	Field Geology
Snow College (Ephraim, UT)	Literature of the Outdoors
University of Kansas (Lawrence, KS)	Field Geology
University of Utah (Salt Lake City, UT)	Outdoor Recreation
Weber State University (Ogden, UT)	History

## OTHER GROUPS WHO VISITED CRFS

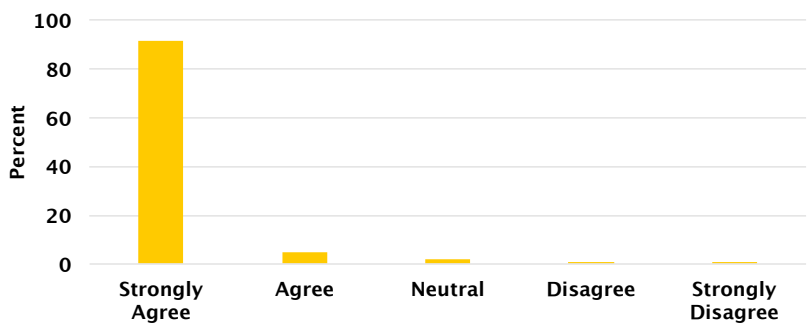
HOST	EVENT
Karl G. Maeser Preparatory Academy (Lindon, UT)	Discover Capitol Reef Winterim
National Park Service (Torrey, UT)	Wayne High School Outreach
Utah Science Teachers Association (Provo, UT)	Astronomy
	Astronomy
	Geology
Weber State University (Ogden, UT)	Curriculum Development



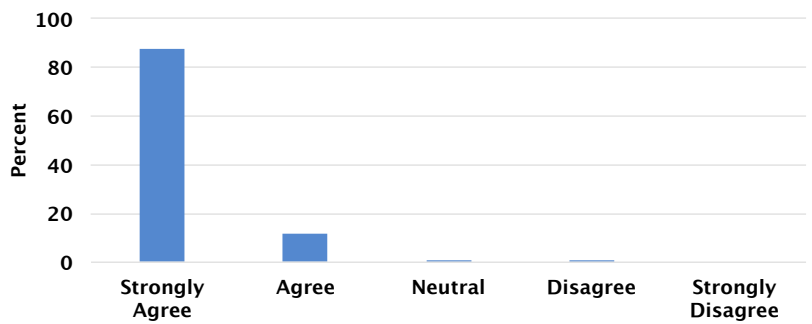
Every UVU student can expect numerous engaged learning experiences while enrolled at UVU. Similarly, engaged learning is central to the field station's mission. We provide countless opportunities for students to actively engage with the natural environment in a way that is challenging to achieve anywhere else. In fact, 93% of our visitors strongly agreed (84%) or agreed (9%) that the engaged learning activities and environment of the field station are difficult to replicate on campus (Fig. 4). Additionally, 97% of our visitors strongly agreed (92%) or agreed (5%) that their experience at the field station was worth the effort and cost to travel there (Fig. 5), and 99% of our visitors strongly agreed (88%) or agreed (11%) that their learning experience was enhanced by the field station visit (Fig. 6).



**Fig. 4** Ninety-three percent of our visitors strongly agreed (84%) or agreed (9%) that “the engaged learning activities and environment at the field station are difficult to replicate on campus” (n = 395).



**Fig. 5** Ninety-seven percent of our visitors strongly agreed (92%) or agreed (5%) that their “experience at the field station was worth the effort and cost to travel” there (n = 392).



**Fig. 6** Ninety-nine percent of our visitors strongly agreed (88%) or agreed (11%) that their “educational/learning experience was enhanced by the field station visit” (n = 392).

We had numerous engaged learning groups visit us this year. Please read the following summaries of some of those visits.

## UVU, English Language Learning

OCTOBER 24 - 28, 2016

The English Language Learning Department (ELL) at UVU is a regular visitor to the field station. They bring their students to the field station for an immersive English experience focused on the Colorado Plateau. They brought several groups to the field station this year with each trip built around the language abilities of that particular group of students.

While at the field station, one of the groups was even interviewed live, on-air, for the Access Utah program on Utah Public Radio. Currently, an archive of the interview can be found at [upr.org/post/earth-day-thursdays-access-utah](http://upr.org/post/earth-day-thursdays-access-utah). In addition, author Stephen Trimble plans to include writing from UVU's ELL students in an upcoming anthology called *The Capitol Reef Reader* that he is compiling.

The ELL Level VI group visited twice, and trip leader Brian MacKay from the October visit summarized the trip as follows:

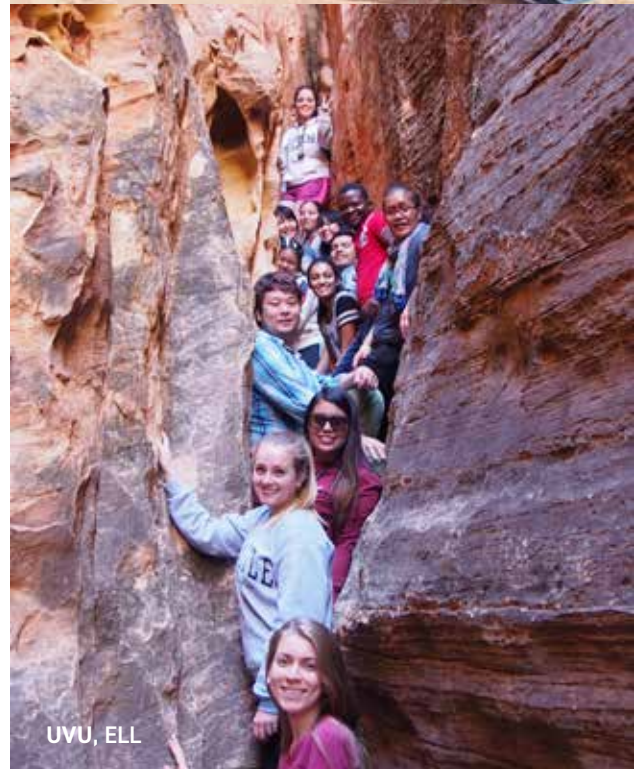
*"During our trip to the Capitol Reef Field Station (CRFS), we used the language-learning approaches known as Content-based Instruction (CBI) and Project-based Learning (PBL) in order to more accurately reflect the kinds of assignments as well as the types of language that the students will need to be successful in their studies after ESL (English as a Second Language). This is to say that academic content available to us in the park and at CRFS was used to teach English for Academic Purposes (EAP).*

*"We worked through August and September in preparation for our October trip to the CRFS, guiding students through readings and activities to learn more about the Colorado Plateau before we visited. We also explored our lives in the Great Basin and ideas surrounding nature and how different world-views play out in conservation and development. Students worked on topics of their selection that demonstrated an economic and environmental impact for substantive projects that were enhanced by our experience visiting the CRFS.*

*"We were able to have a hands on experience with elements of geology such as sedimentary rock, interact with plants and animals that demonstrate elements of desert adaptations, and see firsthand evidence of ancient peoples and how they adapted to their environment. In short, the Level VI English Language Learning students immersed themselves in learning academic English contextualized in the unique setting of the field station."*



UVU, ELL



UVU, ELL



UVU, ELL

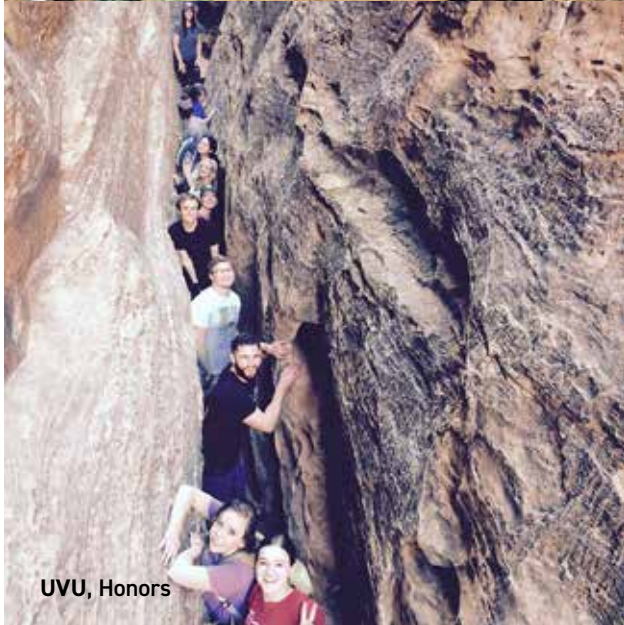


UVU, ELL





UVU, Honors



UVU, Honors



UVU, Spanish



UVU, Spanish

## UVU, Honors Colloquium

OCTOBER 28 - 30, 2016

Allen Hill from UVU's Honors Program brought a group of students to the field station. He was accompanied by several faculty who instructed students in geology, environmental ethics, history of the West, and astronomy. He described their trip:

*"Overall, I believe that the excursion was an extraordinary success. The faculty all seemed to get along with the students in a meaningful way and the students all seemed to get along with each other. Gina Gilson, the site manager, was also a gracious host and contributed in the students' awareness of their own consumption, leave-no-trace ethics, and the history of the park itself. We all cooked and ate together, explored the park on numerous hikes, and peppered the weekend with academic learning sessions and fun, discussion-based settings where the students could learn more about their professors and each other. It was a great time and I'm looking forward to the next opportunity."*

## UVU, Spanish

NOVEMBER 18 - 19, 2016

Jason Wilber led a Spanish 3030 class to the field station in November for an immersive language experience in the Colorado Plateau. They were able to hike, have a night sky program, explore around the field station, and speak a great deal of Spanish. Even Jason was able to learn some new vocabulary. After the trip, the students turned in persuasive essays and some of them reported in their essays that the trip had taught them about conservation and helped them see how important it is. Jason shared:

*"Overall it was a wonderful experience, and the students thanked me greatly for giving them the chance to experience what they did. Thank you for the opportunity."*

## Karl G. Maeser Preparatory Academy, Discover Capitol Reef Winterim

JANUARY 19 - 22, 2017

UVU alumnus, Mark Ensign, remembers going on trips to the field station during courses he took while attending UVU. Now as a teacher at Karl G. Maeser Preparatory Academy, he took his own students back to the field station. Students were asked to think about the following questions: 1) How does life survive in an environment with little or no water?, 2) What can we learn from what our ancestors have left behind?, 3) Can humans realistically live a zero-footprint life?, and 4) What are ways that I can reduce my ecological impact? During their stay, they explored the historical, ecological, and geological aspects of the area.



## UVU, Geomorphology

MARCH 31 – APRIL 2, 2017

Dr. Nathan Toké from UVU led a group of students to the field station as part of a Spring 2017 Geomorphology course (GEO/ GEOG 3500). They came to observe the fluvial geomorphology and river terraces of Pleasant Creek, which runs near the field station. They were able to achieve all of the objectives for their trip, and Dr. Toké reported:

*"After returning to UVU, three of the field trip students used the data from the trip to complete a term project about the geomorphology of Pleasant Creek. Clearly, this visit to the field station added a lot of value to their geomorphic education and some of the data collected may be utilized in the future as a part of a scientific paper on the geomorphology of Pleasant Creek!"*

## University of Utah, Parks, Recreation, & Tourism

APRIL 10 – 14, 2017

The field station hosted visitors from the University of Utah's Parks, Recreation, and Tourism department for the first time. Trip organizer Chris Zajchowski summarized their trip:

*"University of Utah students and faculty from Parks, Recreation, and Tourism (PRT) program were thrilled to visit the Capitol Reef Field Station from April 10th – 14th. From the initial orientation and hike in Pleasant Creek, all the way through star gazing and the final recycling activity, we were challenged by Field Station staff, Gina Gilson, to deeply engage with place and interact sustainably with this unique resource. At the culmination of our five-day experience, twenty-eight undergraduate students shared that this was the highlight of their entire semester. Once back in Salt Lake City, students continued to echo this sentiment, and shared they simply couldn't imagine this semester without a visit to the Capitol Reef National Park and the Utah Valley University Field Station."*



UVU, Geomorphology



UVU, Geomorphology



University of Utah, PRT



University of Utah, PRT





Weber State University, History



Weber State University, History



Weber State University, History

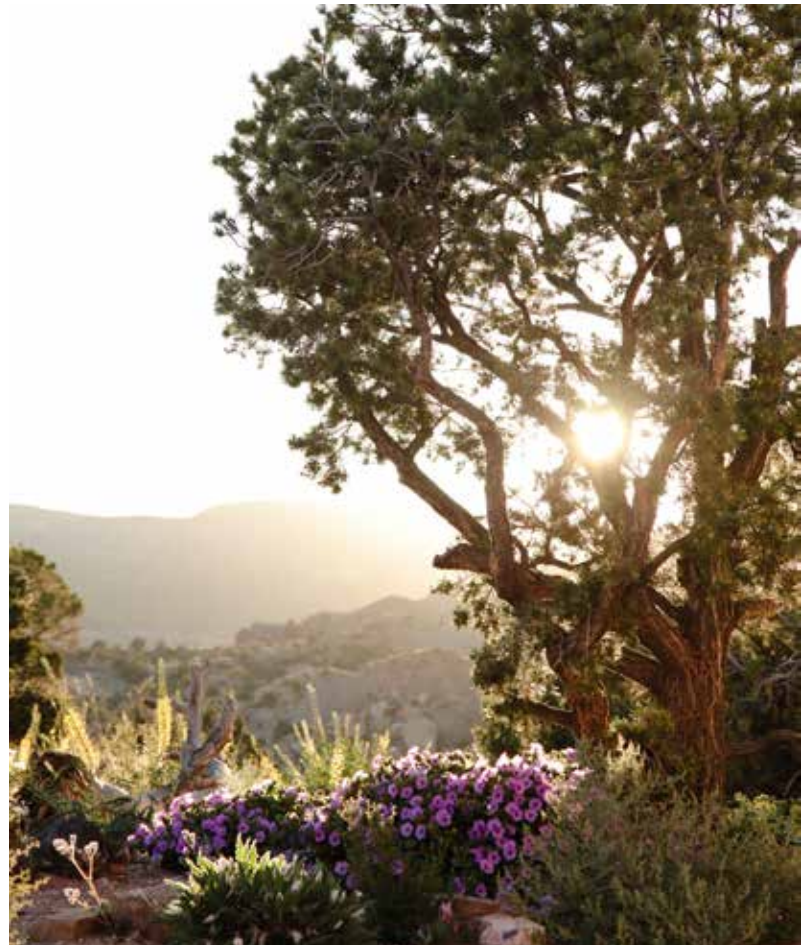
## Weber State University, History

MAY 15 - 18, 2017

Kathryn MacKay from the Weber State University History Department brought a group of students to the field station as part of an experimental history class studying the American West. They came to better understand human occupation in the region prior to 1300, and to better understand national parks and their impacts. Kathryn reported:

*"I had a vague notion that the field station would also be a prime location for participants to consider issues of sustainability and scarcity in the American West. The stay at the station went beyond my expectations in developing consciousness about water and resources. I find myself deliberately using less water and trying to create less trash! I know from talking to participants – many are doing the same."*

*"The field station – its setting, its physical space, its staff – proved a stunning way for participants to be more mindful of many of the issues in the American West. It was a way to get beyond the textbooks and classroom discussions and to be physically engaged in big questions about people and place."*





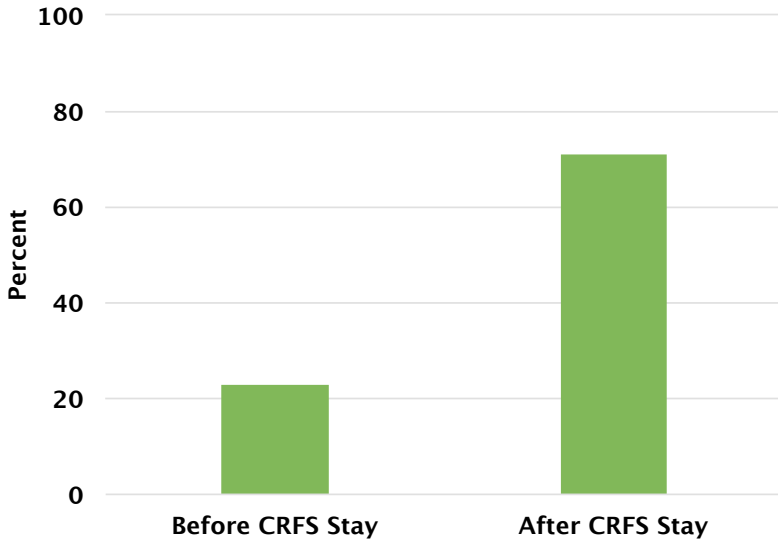


Fig. 7

After staying at CRFS, the percentage of our visitors who rated themselves as “very aware” of their personal environmental impact jumped from 23% (n = 353) to 71% (n = 352).

Conservation and environmental ethics are a key part of the field station’s mission. For example, Utah is one of the driest states in the nation; yet Utah’s per capita water usage is among the very highest. All visitors are taught the importance of conservation of natural resources and stewardship of the environment. Additionally, the field station works hard to “walk the walk” in terms of conservation in our own operations, and all visitors are made aware of their water usage and garbage production during their stay. Our first goal is to affect visitor behavior while at the field station. Our second goal is to affect visitor behavior long after they leave.

Prior to their stay at the station, only 23% of our visitors rated themselves as “very aware” of their personal environmental impact. After their stay, that percentage jumped to 71% (Fig. 7). In addition, 91% (n = 349) of our visitors learned new methods to reduce their environmental impact in their day-to-day activities.

We also strive to help visitors gain appreciation for protected public lands such as national parks. Prior to their stay at the station, 59% placed a “very high” value on protected public lands. After their visit, that percentage increased to 86% (Fig. 8).

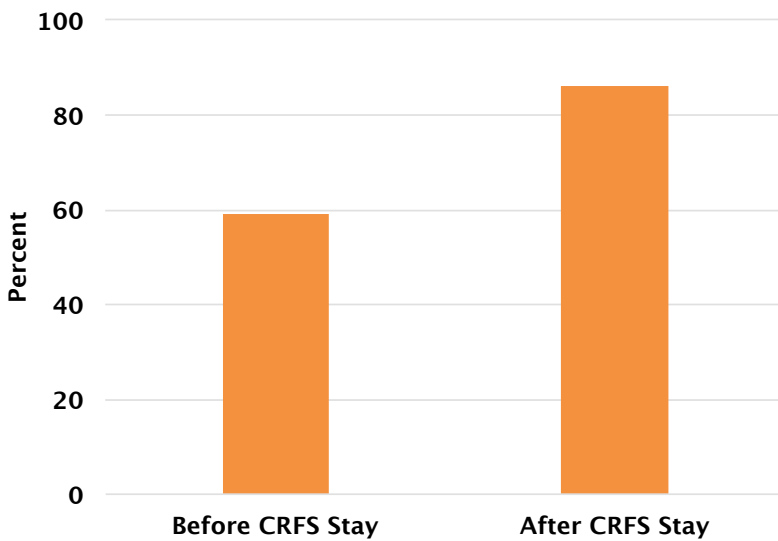


Fig. 8

After staying at CRFS, the percentage of our visitors who placed a “very high” value on protected public lands such as national parks increased from 59% (n = 350) to 86% (n = 351).



The research, scholarly, and creative activities that occur at the field station are as varied as the Colorado Plateau itself. This year we highlight scholarly activities on atmospheric dynamics, geomagnetic storms, art & design, and the study of field stations themselves.

## Atmospheric Dynamics

Dr. Kim Nielsen writes about his work at the field station with students, including acquisition of data and the development of professional writing skills.

*"This trip was partly sponsored by the CRFS as part of a program to study atmospheric dynamics generated by the Colorado Plateau. The student team deployed an advanced airglow imaging system to the field station in the early part of the summer and evaluated the system performance during this week-long trip. The system performance was determined to be excellent and it was prepared for a longer-term operational mode (until November). Unfortunately, the motherboard on the computer malfunctioned during this later period, and we only recently recovered the data but have yet to evaluate how much damage was done to the data and the hardware.*

*"The second objective of the project and trip to CRFS was to promote writing skills for peer-review publication. The team split into two groups: one investigating atmospheric wave propagation over Antarctica utilizing an existing dataset, while the second team investigated thermal inversion layers in the atmosphere and how they impact wave propagation. Both teams produced draft articles that required small additions before being ready to submit for publication. The first paper has now been submitted and received very positive reviews; only requiring minor edits to be accepted for publication in the leading journal of upper atmospheric physics. The second paper is near completion for submission."*

## Geomagnetic Storms

Dr. Asti Bhatt from SRI International shares information about her study of geomagnetic storms.

*"Solar and geomagnetic storms affect earth in many different ways. Most impact is seen at high latitudes in the form of northern lights. The storm impact at high latitude often dumps enough energy that the impact is seen in the form of large traveling disturbances at mid- and low-latitudes. This coupling between high- and mid-latitudes is an active research topic. The MANGO (Mid-latitude All-sky-imager Network of Geospace Observations) network is ideally situated to observe the impact of these large-scale traveling ionospheric disturbances resulting from auroral input at high latitudes.*

*"An all-sky camera imaging ionospheric airglow in 630nm wavelength was installed at Capitol Reef Field Station in March 2014 by a team from SRI International. This camera is part of a continental U.S.-wide camera network of nine cameras. Installations include SRI operated cameras at Hat Creek, CA; Bridger, MT; Eastern Iowa Observatory in Ely, IA; Madison, KS; French Camp, MS; Pisgah, NC; and cameras at McDonald Observatory, TX and Millstone Hill, MA operated by Boston University. The purpose of this network is to image large-scale processes in the earth's ionosphere including medium- and large-scale traveling ionospheric disturbances and low-latitude aurora. The CRFS imager is one of the earliest imagers in the MANGO network with the largest number of clear observing nights due to low humidity levels."*

## Art & Design

Travis Lovell from UVU's Department of Art & Design brought a special topics art class (ART 300R) to the field station as part of a larger project celebrating national parks. Some of the students' work was featured in an award-winning book. Travis details the project and their trip:





*“During 2016, the Art & Design Department worked on a collaborative project to celebrate the centennial of the National Park Service by visiting and creating artwork in all 13 of the parks and monuments managed by the National Park Service in the state of Utah. With Capitol Reef National Park being one of the Big Five, students were brought down to the park several times during the course of the year—including the ART 300R special topics class that worked exclusively on the project. Members of this class spent a full week in the park photographing, painting, and carving as they were inspired by the wonders of the park. During the fall semester, graphic design students created a fine art coffee table book to celebrate Utah’s wondrous public lands compiled with the other students’ work from all the parks. This book was recently awarded a gold medal at the Independent Publishers Book Awards for the best non-fiction book in the West-Mountain region. This book and the recognitions it has received are a wonderful example of engaged learning for our students and also a tribute to the wonderful educational work that can be accomplished at the Capitol Reef Field Station.”*

## Field-Station Studies

Dr. Michael Stevens discusses his study of university-operated field stations located in U.S. national parks.

*“As part of our strategic planning grant from the National Science Foundation’s Field Stations and Marine Laboratories program, Gina Gilson and I hosted a University-National Park Field Station Partnership Conference at CRFS in July 2016. We invited representatives from the eight universities in the United States who operate field stations located in national parks to discuss the opportunities and challenges of such a partnership. The conference was very well attended and valuable to all participants. All eight universities sent representatives to the conference and three national parks did as well. At the conference, each station was introduced and we discussed our recent BioScience paper on field station partnerships. We focused on topics such as: strategic plan development, encouraging research, raising funds, fostering education and outreach, field station management, and building a network of university-national park field stations to continue to work together in the future. It was a great opportunity to learn from each other and to showcase CRFS for a national audience. Each of the attendees served an important consulting role and we have visited many of them at their respective field stations over the course of the year.”*

## PUBLICATION AND PRESENTATION OF CRFS SCHOLARLY ACTIVITIES

Bhatt A, Kendall E (2016) Mid-latitude response to geomagnetic storms. Coupling Energetics and Dynamics of Atmospheric Regions (CEDAR) Annual Meeting, Santa Fe, NM.

Bhatt A, Kendall E (2016) Mid-latitude response to geomagnetic storms observed in 630nm airglow over continental United States. American Geophysical Union Annual Fall Meeting, San Francisco, CA.

Bhatt A, Kendall E, Baumgardner J (2016). F-region airglow imaging at midlatitudes. ICON-GOLD-COSMIC Workshop, Boulder, CO.

Bhatt A, Kendall E, Baumgardner J (2017) Mid-latitude All-sky-imager Network for Geospace Observations (MANGO). International Space Weather Meridian Workshop, Qingdao, Shandong, China.

Bhatt A, Kendall E, Reimer A, Varney R, Zhang S, Kilcommons L (2017) Memorial Day weekend storm 2017. Coupling Energetics and Dynamics of Atmospheric Regions (CEDAR) Annual Meeting, Keystone, CO.

Brooks E (2017) A poetics of infrastructure: toward a community-engaged, interdisciplinary environmental humanities. Utah Campus Compact Biennial Engaged Faculty Retreat, Moab, UT.

Davis E\*, Nielsen K, Negale M\* (2017) Reverse ray tracing of wintertime mesospheric gravity waves over interior Alaska. Japan Geoscience Union Annual Meeting, Tokyo, Japan.

Department of Art & Design (2016) Uncommon Ground: The National Park Service, 100 Years in Utah. Utah Valley University, Orem, UT.

Shelton L (2017) Undergraduate research in freshman English. College English Association Conference, Hilton Head Island, SC.

Stevens MT, Gilson GG (2016) University-National Park Field Station Partnership Conference, Capitol Reef Field Station, UT.

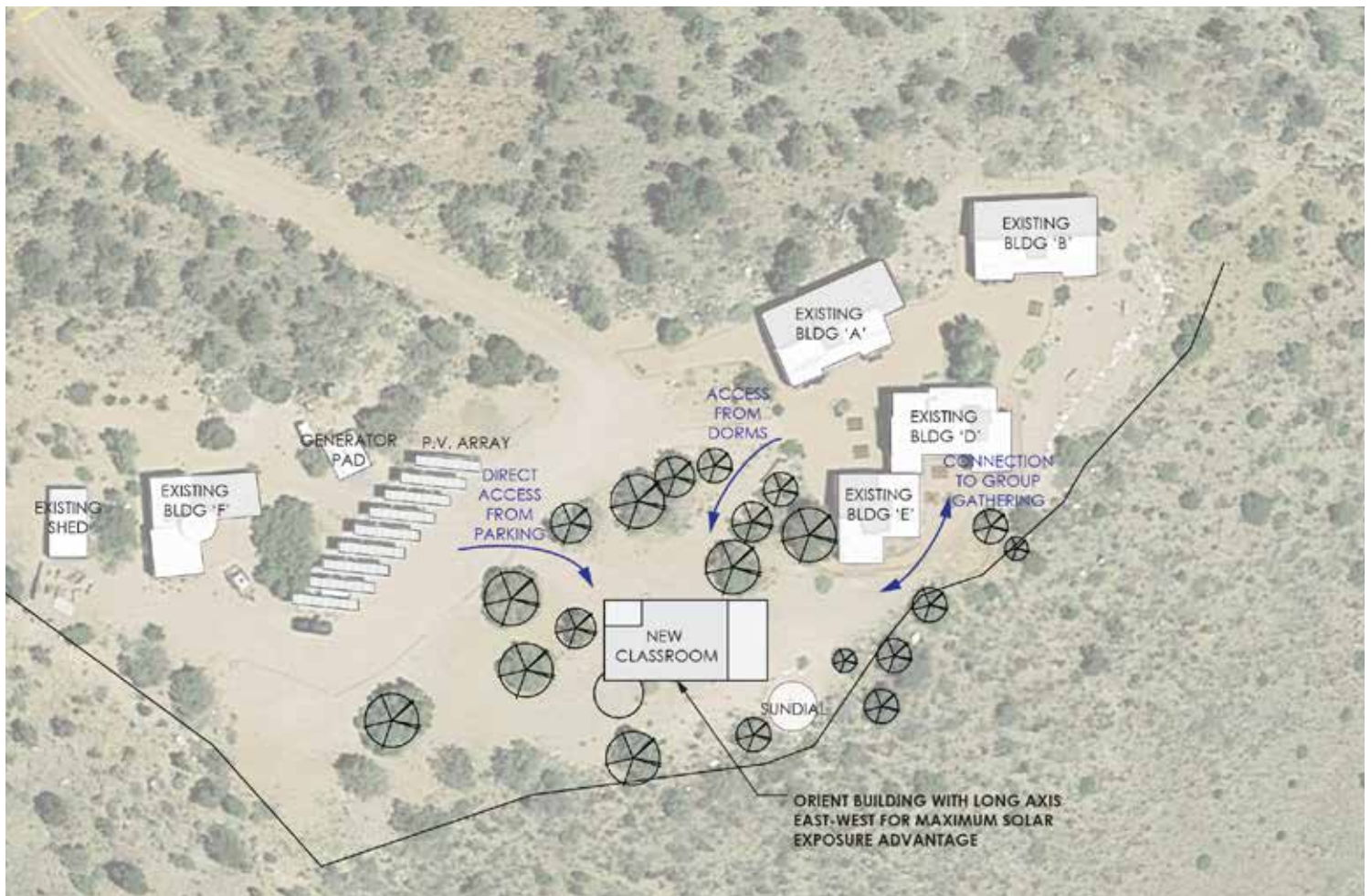
Williams B\*, Davis E\*, Nielsen K, Taylor M (2017) Reverse ray tracing of mesospheric gravity waves over the Antarctic Peninsula. Japan Geoscience Union Annual Meeting, Tokyo, Japan.

\*denotes a UVU student or alumna/alumnus

As user days have increased and user groups have continued to diversify, it has become obvious that our single, multi-purpose room has serious limitations. It has been difficult for groups to share one room for classroom space, eating space, and social space. We are excited to announce that a new classroom building is in the works, which will feature a dedicated space for teaching and learning. With this new building, visiting geology groups won't have to put their maps away to make room for the salad dressing, and students who want to focus on their reading assignments can be physically separate from the students who are discussing their group project.

## New Classroom Building

Designed by AJC Architects, the new 1,400 ft<sup>2</sup> building will be situated on the south side of the mesa top between the solar panels and the existing CRFS campus with an east-west orientation (Fig. 9). It will be a wood-framed structure over concrete slab-on-grade with a low-maintenance exterior finish (Fig. 10 and Fig. 11). The new building will include a classroom with digital projection, whiteboards, sinks, cabinets, and ample work surfaces. The classroom will open out onto a covered patio that will offer additional teaching space outside with shade and spectacular views of the Henry Mountains. The building will also feature a telescope storage room with an adjacent observation platform, a space for research instruments, and two restrooms accessible from the outside (Fig. 12). The new classroom building will enhance the field station experience for all visitors and increase the field station's ability to support the missions of both Capitol Reef National Park and UVU.



**Fig. 9** Site plan for CRFS showing the placement and orientation for the new classroom building.

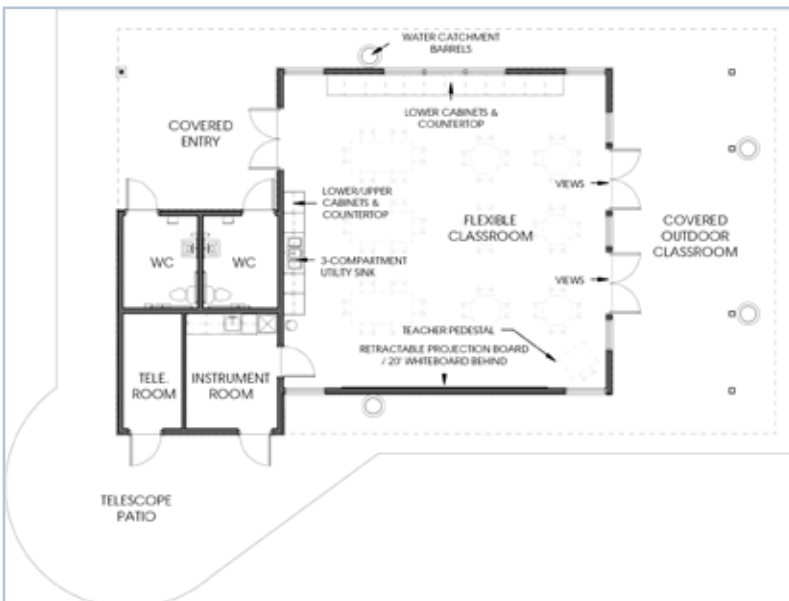




**Fig. 10** Architectural rendering of the front (north side) of the new classroom building.



**Fig. 11** Architectural rendering of the back (south side) of the new classroom building.



**Fig. 12** Floor plan of the new classroom building.

## Off-Grid Power

At CRFS, visitors have the unique experience of knowing where all of their electricity comes from. We take advantage of the abundant sunlight and capture solar energy with seventy-two 200-watt panels, which also provide shaded parking. Up to 14.4 kilowatts of power can be generated; excess energy is stored in a bank of 48 batteries. Four inverters convert the electricity from DC to AC so it can power our facilities. In the event we lose solar capability, CRFS has a propane-powered backup generator.

## Heating & Cooling

In the United States, nearly half of the energy used in our homes goes to heating and cooling. Using passive systems can dramatically reduce energy needs. At CRFS, our buildings have been designed to take advantage of natural processes. In the winter, trombe walls are used to help warm the buildings. These south-facing walls have been painted black and sealed with a pane of glass 4-6 inches from the wall. The sun's radiant energy is captured during the day and slowly conducts inward through the wall, even into the night. For the summer months, these trombe walls can be covered during the day with a solar shade to prevent heat absorption. To further promote cooling, the building design includes solar chimneys, or "cooling towers." Utilizing the principle of convection, these towers allow warmer air to move up and out of the tower as cooler air filters in, creating a natural current. Without the aid of air conditioning, building temperatures remain surprisingly comfortable throughout the summer. Proper insulation, quality seals around doors and windows, and white roofs that reflect sunlight also help in maintaining moderate interior temperatures.

## Natural Lighting

The buildings at the field station were constructed with south-facing windows situated high on the walls. These windows supply ample pleasant light throughout the day while conserving energy. Once the sun is down, we continue to save energy by using energy-efficient bulbs.

## Recycling & Compost

At the field station, visitors are challenged to think about their waste and where it goes. Often, what we consider to be “waste” isn’t waste at all! Thanks to the system set up within the park, we are able to recycle plastic, tin, aluminum, paper, and glass. We also have a composter to convert fruit and vegetable scraps into nutrient-rich soil for our raised-bed garden. These two methods allow visitors to reduce their environmental impact and significantly decrease the volume of trash they produce.

## Raised Garden Beds

Two raised garden beds at the field station, installed by intern Sarah Heelis in 2015, help demonstrate the practical applications of composting. Waste from the kitchen is converted into soil and used to grow food on-site, further demonstrating ways to live sustainably.

## Erosion Control

Permeable pavement reduces the amount of runoff and subsequent erosion caused by the existence of field station buildings. The interlocking pavers allow precipitation to slowly disperse into the soil, allowing natural ground-water recharge. Permeable pavers also allow topsoil to capture contaminants before runoff re-enters the groundwater.



## Dark-Sky Resource

Of all the awe-inspiring views at the field station, one of the most spectacular is the clear night sky. Capitol Reef National Park and CRFS take special measures to ensure the preservation of this resource. To minimize our impact on the nocturnal environment, the field station uses low-wattage external lighting that points downward. All windows are equipped with blinds that are closed at night. Our powerful telescopes give visitors the opportunity to see the rings on Saturn or the Andromeda Galaxy, for example, inspiring a deeper appreciation of the natural, dark night sky as a resource worth protecting.

## On-Site Water Treatment

Water at the field station is pumped from a well adjacent to Pleasant Creek, a perennial stream that has supported life in the area for hundreds of years. A solar-powered pump brings water to the on-site treatment facility, where it is purified using a membrane-filter system. Treated water is stored in a 10,000-gallon tank for later use. The water treatment system is state-licensed and operated by trained staff. Water is tested regularly and meets or exceeds standards within the state.

## Water Conservation

Visitors have the opportunity to see our on-site water treatment facility, giving them a deeper understanding of where their water comes from. When groups visit our remote desert location, we encourage them to think critically about how they are using water and teach water conservation strategies. All faucets have their flow rate displayed in gallons per minute. Reduced-flow shower heads cut back on the amount of water used, with a flow rate of 1.5 gal/min instead of 2.5 gal/min for a typical shower head. Buttons on the shower heads allow the user to stop the water from flowing while taking time to shampoo, condition, soap up, or shave. In the kitchen, three separate tubs are used to wash, rinse, and sanitize, which allows guests to clean dishes without constantly running the water. Dual-flush kits on toilets allow a partial flush (1 gallon) for liquid waste, and a full-powered flush (2.25 gallons) when it’s really needed. Rainwater catchment basins are used to collect precipitation that runs off our roof, which we can use for our raised garden beds.



## Ripple Rock Nature Center Intern

Jessica Lewis

We were happy to welcome Jessica Lewis (formerly Jessica Harris) back this year as the Ripple Rock Nature Center Intern. Jessica, majoring in Outdoor Recreation Management and minoring in Native American History, was designated as the Ripple Rock Nature Center Intern in 2015-2016 and again in 2016-2017. She was also the recipient of the Cordell Roy Scholarship during both years. The scholarship honors Cordell Roy, a long-time employee of the National Park Service. It is funded in part by a generous private endowment from G. Kevin Jones, who is an attorney in the Office of the Solicitor, United States Department of Interior, representing the Utah units of the National Park Service. Cordell Roy also contributed to the endowment.

Jessica was the face of the Nature Center, professionally and enthusiastically engaging large volumes of visitors—up to 200 per day and 60 per program. She continued to build on the knowledge and experience she gained last year, highlighting her passion for learning about nature and effectively sharing her knowledge with visitors. She worked to develop educational programs, and always strived to improve her interpretive presentations. Reflecting on her two summers at the Nature Center, she states, *“In a time plagued with constant electronic bombardment, it is a magical thing to know that you are educating future generations about the many wonders of the outdoor world.”*



Jessica Lewis

## Natural Resources Intern

Ranae Zauner

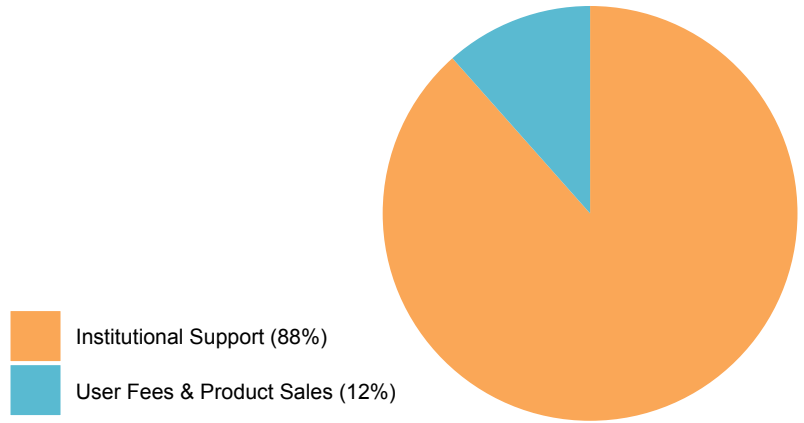
Ranae Zauner, a Botany major, gained valuable hands-on experience in ecology while working with the Resources Management and Science Division in the park. Ranae worked on a vegetation crew surveying threatened and endangered plant species, such as two federally listed, endemic cacti, *Pediocactus winkleri* and *Sclerocactus wrightiae*. These surveys will help the park manage threatened species by improving our understanding of the effects of native and non-native ungulates on cactus species. In addition to rare plant surveys, Ranae participated in a variety of surveys and trainings, including: breeding bird surveys, wildlife monitoring via game cameras, peregrine falcon monitoring, seed collection, vegetation restoration, riparian health assessments, air quality monitoring, and dark sky measurements. She also acquired first aid training and assisted with the management of CRFS. For her independent internship project, Ranae labeled and organized the herbarium specimens at CRFS, and collected specimens on Bureau of Land Management land outside the park, which were added to the CRFS herbarium. She says, *“I have enjoyed my time working in the park, and know that the surveying experience gathered here will be beneficial throughout my career.”*



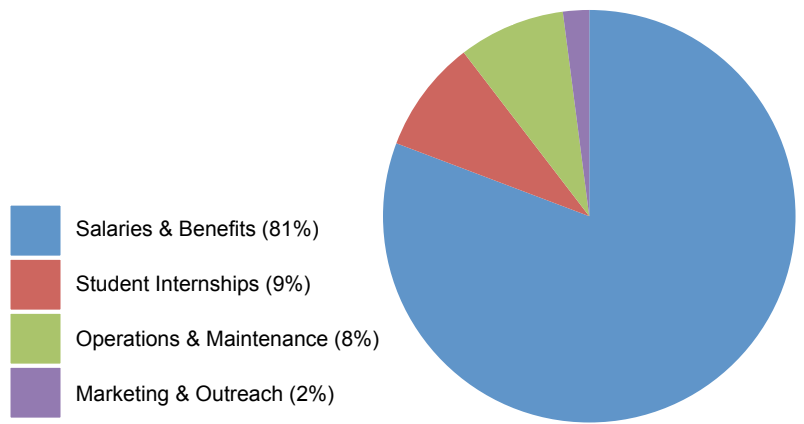
Ranae Zauner



This year, the operating funds of CRFS came from two sources: 1) institutional support from UVU (\$180,328.78) and 2) funds generated by user fees and product sales (\$23,543.37) (Fig. 13). This funding supported the salaries and benefits of the staff (\$150,157.16), student internships (\$16,425.53), operations and maintenance (\$15,546.45), and marketing and outreach (\$3,812.39) (Fig. 14). While UVU generously supports the station, in many years CRFS relies on private donations to fund important programs such as student internships and research. We are seeking donations to help fund our new classroom building. If you value our mission, please make a donation at: [www.donate.supportuvu.org/crfs](http://www.donate.supportuvu.org/crfs). Contact Jim Murphy at [jmurphy@uvu.edu](mailto:jmurphy@uvu.edu) or (801) 863-5511 with questions about making a donation.



**Fig. 13** Funding for CRFS by source.



**Fig. 14** CRFS outlays by category.





CRFS staff regularly review and update our strategic plan. We have five objectives that guide our planning and operations. A summary of our past and future activities related to these objectives follows:

## 1. Promote CRFS as a venue for engaged learning utilized by a variety of disciplines and multiple institutions.

We continue to promote CRFS through a variety of on and off-campus activities, including New Faculty Orientation, Faculty Convocation, and visits to other college campuses. For instance, this past year our site manager, Gina Gilson, visited Westminster College and had a productive meeting with their faculty and administration. Our visitation has grown steadily over the last several years, and is up this year as well.

## 2. Foster research, scholarly, and creative activities that utilize CRFS as a venue from which to explore the Colorado Plateau.

This will be a focus area for the upcoming year. We plan to release a new call for proposals to solicit additional research, scholarly, and creative activities at the field station. As part of our call, we will provide financial support in an effort to encourage new projects.

## 3. Develop environmental awareness and engage visitors in sustainable practices to be applied at home.

One of our goals for next year centers around this objective. While our visitors overwhelmingly report a greater sense of responsibility for the environment at the end of their stay, we don't know how permanent this effect is. Next year we will modify our exit survey to allow us to contact visitors after their visits in order to see how they have incorporated sustainable practices in their day-to-day lives.

## 4. Continue field station operations through our partnership with the National Park Service and build relationships with other relevant organizations.

We work diligently to maintain a strong relationship with our partners at Capitol Reef National Park. One of our goals this year was to participate with the park as they developed an artist-in-residence program.

In terms of building relationships with other relevant organizations, we set a goal to host a conference to discuss university-national park field station partnerships with our peer group of seven other university-operated field stations located in U.S. national parks. In July 2016, we hosted this conference where we gained valuable insights. Not only did this conference allow us to better understand the opportunities and challenges of working with a national park, we were also able to build relationships with the other field station personnel in our peer group.

## 5. Ensure that CRFS facilities, staffing, and services meet visitor needs.

This year, two of our goals were tied to this objective. We set a goal to begin construction of our new classroom building, and to raise funds and plan for a site manager's residence. We have not yet broken ground on our new building. However, we have been through the approval process with the park and UVU, and have obtained bids from general contractors. Because the bids came back higher than projected, we are revisiting the plans to look for areas where we can reduce costs. We are also redoubling our fundraising efforts and will focus on raising additional funds for the classroom building as well as for a site manager's residence.



## Capitol Reef Field Station makes a difference—so can you!

**Big changes are underway and you can be a part of them!** With your financial support we can build a new classroom building and enrich students' learning and research experiences. Large or small, all donations help build a bright future for CRFS.

Please visit [www.donate.supportuvu.org/crfs](http://www.donate.supportuvu.org/crfs) to contribute. Donations are tax-deductible to the extent allowed by law and we will honor your contribution by listing your name in our annual report. Contact Jim Murphy at [jmurphy@uvu.edu](mailto:jmurphy@uvu.edu) or (801) 863-5511 with questions about making a donation.

## A big thank-you to our donors!

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## CAPITOL REEF FIELD STATION 2016-17 ANNUAL REPORT