2013-2014 **ANNUAL REPORT**

CAPITOL REEF FIELD STATION

UTAH VALLEY UNIVERSITY

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Developmental Mathematics

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At Capitol Reef Field Station (CRFS), we focus on the Colorado Plateau through engaged learning, research, and conservation. This year, in particular, has been a research renaissance. While continuing to emphasize engaged learning and environmental ethics, we've maintained our perennial research programs, fostered our fledgling projects, and added entirely new lines of scholarly activities including UVU Earth Science Assistant Professor Dr. Suzanne Walther and SRI International. In fact, Dr. Walther did a project mapping channel change and sediment transport in nearby Pleasant Creek with UVU students Brandon Davis and Devin Howard, two of our former CRFS summer interns! SRI International represents the first non-UVU group to use the station for research. SRI International found out about the incredibly dark sky above our station by interacting with UVU Physics Assistant Professor Dr. Kim Nielsen at a conference. In addition to these projects, this year we funded two research proposals written primarily by UVU students, Kasey Johnson and Jake Loveless, and another UVU student, Devin Howard, received a Summer Undergraduate Research Fellowship (SURF) grant to conduct research in Capitol Reef National Park. The Park is interested in these research opportunities and is very willing to review proposals and grant permits for carefully planned and relevant scholarly activities. In years to come, we look forward to more work being shared downstream from our mesa-top location in the form of publications, presentations, and other resume-building, engaged learning opportunities for UVU students and other station visitors.

Michael T. Stevens, Ph.D.
Director, CRFS

OUR MISSION

CRFS, 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 VISION

Our vision is for every Field Station guest to connect with Capitol Reef's landscapes, biological diversity, and rich cultural history. Through their investigation of the Capitol Reef area, we hope visitors will develop a "sense of place" that fosters lasting stewardship of the region and of the environment in general. To accomplish our vision, we provide opportunities for visitors to immerse themselves in the area through experiential learning, scholarly activities, and the practice of conservation.

OUR PARTNERSHIP

Vital to the success of our mission is the partnership between Utah Valley University (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 operates under the direction of UVU and the Park in accordance with our General Agreement, which we renewed this year. The Field Station is property of the National Park Service (NPS).

OUR PLACE

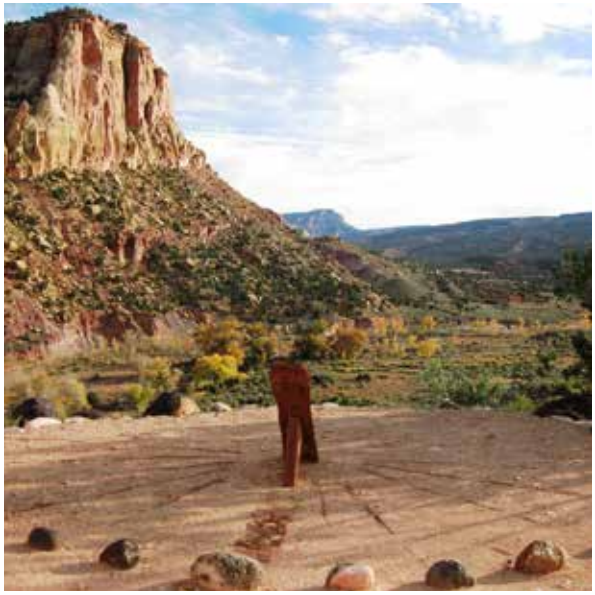
Our mesa-top location offers unobstructed views of picturesque scenery. Scanning east one sees the last mountain range in the continental United States to be mapped, the Henry Mountains; to the west lies Boulder Mountain that supported small glaciers during the last ice age. The calming sounds of Pleasant Creek, multi-colored sheer cliffs, and historic pastures characterize the immediate scene around the station. Located two-and-a-half miles past the end of the aptly named Scenic Drive in the heart of Capitol Reef National Park, our location provides an amazing opportunity for place-based learning. Only three-and-a-half hours from UVU and the Wasatch Front, CRFS welcomes students and faculty from institutions of higher learning seeking to experience the natural and cultural legacies of the Colorado Plateau.

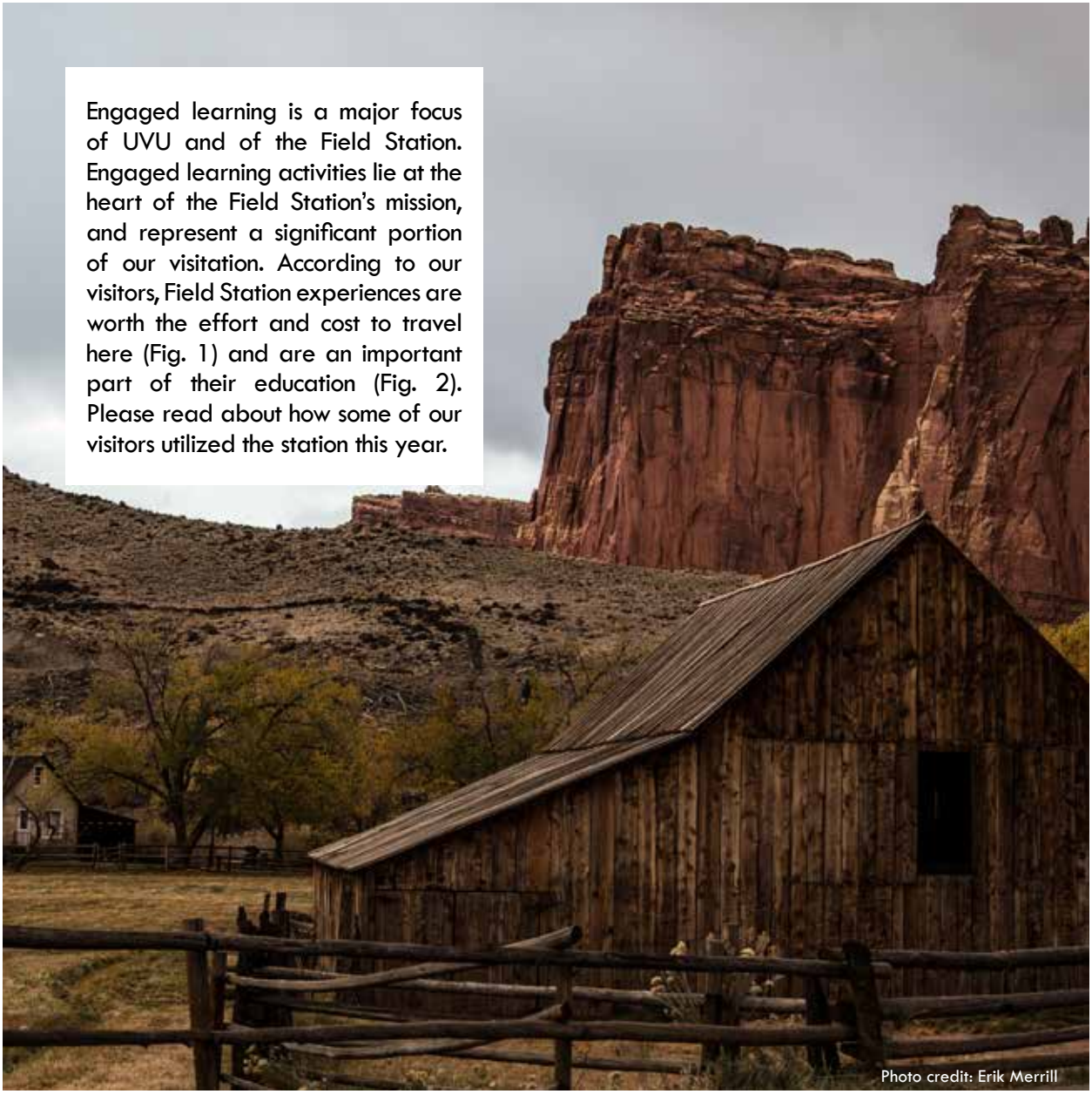
OUR HISTORY

Capitol Reef preserves hundreds of millions of years of Earth history. Stories of landscapes as varied as shallow seas, tidal flats, swamps, and sand dunes are in the rocks surrounding CRFS. In more recent time, Pleasant Creek has carved its way through the canyon walls creating an oasis that has attracted life for millennia including Paleo-Indian, Desert Archaic, Fremont, and Numic-speaking (Ute and Paiute) peoples.

The modern record of settlement begins with the inscription, "J.L. Ivie 1876," on a nearby canyon wall. Over the next few years, various pioneers, prospectors, and surveyors left their mark just below the mesa that houses CRFS. In 1882, the first ranch was established by Ephraim Hanks, a Mormon pioneer. Hanks diverted water from Pleasant Creek to irrigate pastures and fruit orchards. The ranch changed hands several times over the years. By 1940, the last owners, Lurt and Margaret Knee purchased the property and converted it to Sleeping Rainbow Ranch, a tourist destination. In 1978, Lurt and his second wife, Alice, deeded the ranch to Capitol Reef National Park in a transaction that included life tenancy. In 1995, Lurt passed away and Alice relinquished her remaining property rights.

The site of Sleeping Rainbow Ranch remained unoccupied for several years before UVU approached the Park with the idea of a field station. It was decided that a field station supported the missions of both organizations and after years of close collaboration on the project, the idea became a reality. CRFS opened for operation in 2008.





Engaged learning is a major focus of UVU and of the Field Station. Engaged learning activities lie at the heart of the Field Station's mission, and represent a significant portion of our visitation. According to our visitors, Field Station experiences are worth the effort and cost to travel here (Fig. 1) and are an important part of their education (Fig. 2). Please read about how some of our visitors utilized the station this year.

Photo credit: Erik Merrill

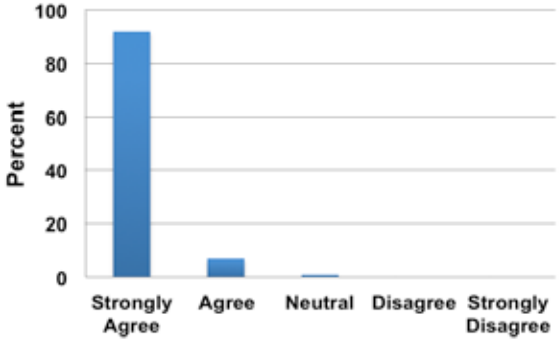


Fig. 1 The vast majority (92%) of CRFS visitors strongly agreed that their experience at the Field Station was worth the effort and cost to travel here (n = 291).

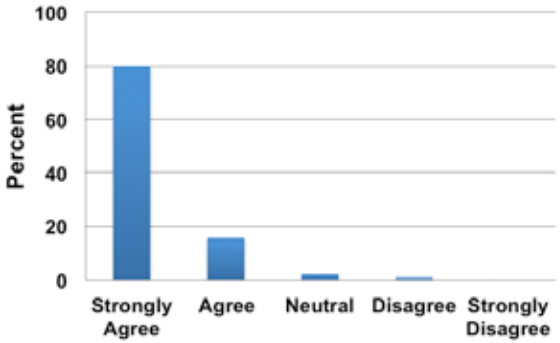


Fig. 2 The majority of CRFS visitors strongly agreed (80%) or agreed (16%) that their Field Station visit was an important and valuable part of their education (n = 267).

GEOLOGY FIELD STUDIES, SNOW COLLEGE
(September 26-29, 2013)

Renée Faatz from Snow College brought her Geology Field Studies class to the Field Station for a four-day trip in the fall to focus on the geology of Capitol Reef National Park. Renée shares,

"The students have learned a great deal about the geology and geologic history of the Capitol Reef area. They have also learned to identify numerous sedimentary structures, how to interpret the environment of deposition of a rock, how to measure strike and dip of both joint sets and dipping beds. In addition to the geology of Capitol Reef, they took away some great lessons about conservation and sustainable practices from the Field Station. The amenities of the Field Station made our trip much more comfortable and allowed us much more field time than would have been possible if we were camping. Thanks CRFS."

SCIENCE ASSOCIATION OF WOMEN, BOTANY, AND WILDLIFE CLUBS, UVU
(March 7-9, 2014)

Three UVU clubs joined together for learning and interaction at CFRS: the Science Association of Women club, the Botany club, and the Wildlife club. Science Association of Women President Julie Nance shares,

"We stayed just two nights and squished as much as we could into that time. Our orientation by Jason that first night was a great lesson in conservation, an overview of the Park and its geology, and in having a 'community' mentality that stuck with us the whole weekend and beyond. Utilizing the awesome telescope, we were able to enjoy the great Capitol Reef darkness to look at the surface of the moon and find Jupiter with its four (visible) moons. Despite our visiting astronomy professor being unable to make it due to jury duty, we learned a lot and enjoyed the evening with the collective knowledge of Jason and all the science nerds in our group. Saturday we were able to enjoy some of what the Park has to offer by hiking Cassidy Arch and visiting Capitol Gorge. We later talked more about the geology and botany of this area.

One of our advisors, Ally Searle, gave us a presentation on botany in Capitol Reef that night, which included some geology as well. She was able to point out things that we had seen earlier that day. The other advisor, Melissa Monk-Cavan, took a bunch of us outside in the dark with ultraviolet lights to look for scorpions, but sadly it's too cold at this time of year so we didn't find anything. On the last day we cleaned up and checked out of the station, and got to talk about more conservation and sustainability."

DEVELOPMENTAL MATHEMATICS, UVU (April 11-12, 2014)

Each spring, Keith White takes a group of students to the Field Station to demonstrate that math is applicable to the real world. In this venture to the Field Station, students are able to engage in nature and see that math is, in fact, all around them. Keith explains,

"The trip to Capitol Reef was one of the highlights of the semester for my Math 1010 students. The facility is amazing, but even more than that, it provides the students with engaged learning opportunities that are not possible anywhere else. The Colorado Plateau presents students with numerous opportunities to explore the applications of mathematics. On this trip we considered numerous aspects of math applied to Capitol Reef. For instance, we studied water usage at the Field Station giving students insight into the precious value of water in the desert ecosystem, used logarithms to better understand dating of ancient artifacts, and used desert hiking to explore uniform motion problems. When the students started joking about disabling our vehicle so we couldn't return home, I knew that in addition to learning a great deal, they were also having a great time."

COMMUNICATIONS, UVU
(May 7-10, 2014)

In a communications class led by Dr. Maria Blevins, students were able to explore new ways to communicate and connect with each other and with the environment. Maria writes,

"Cooking meals, creating activities, and living communally provided a terrific opportunity to participate in small group experiential activities. By living and working in small groups, students were able to explore the theories and practice of small group communication. Interviewing Park Service staff about working and living together was an opportunity to learn about work and lifestyle outside of the traditional American workplace. By completing a service project, students were able to plan and execute a group task.

By removing themselves from the distractions of everyday life, students were able to quickly create a community of support, creativity, work, and fun. These students united and accomplished tasks ranging from cooking, hiking, discussion, experiential activities, and entertainment with enthusiasm and ingenuity not often witnessed in the classroom. The connection they fashioned in just a few days was remarkable to witness. Additionally, it is rare in communication that we get to study human stillness. By spending time in the quiet of the Field Station, students were able to communicate with the natural environment in a new way."

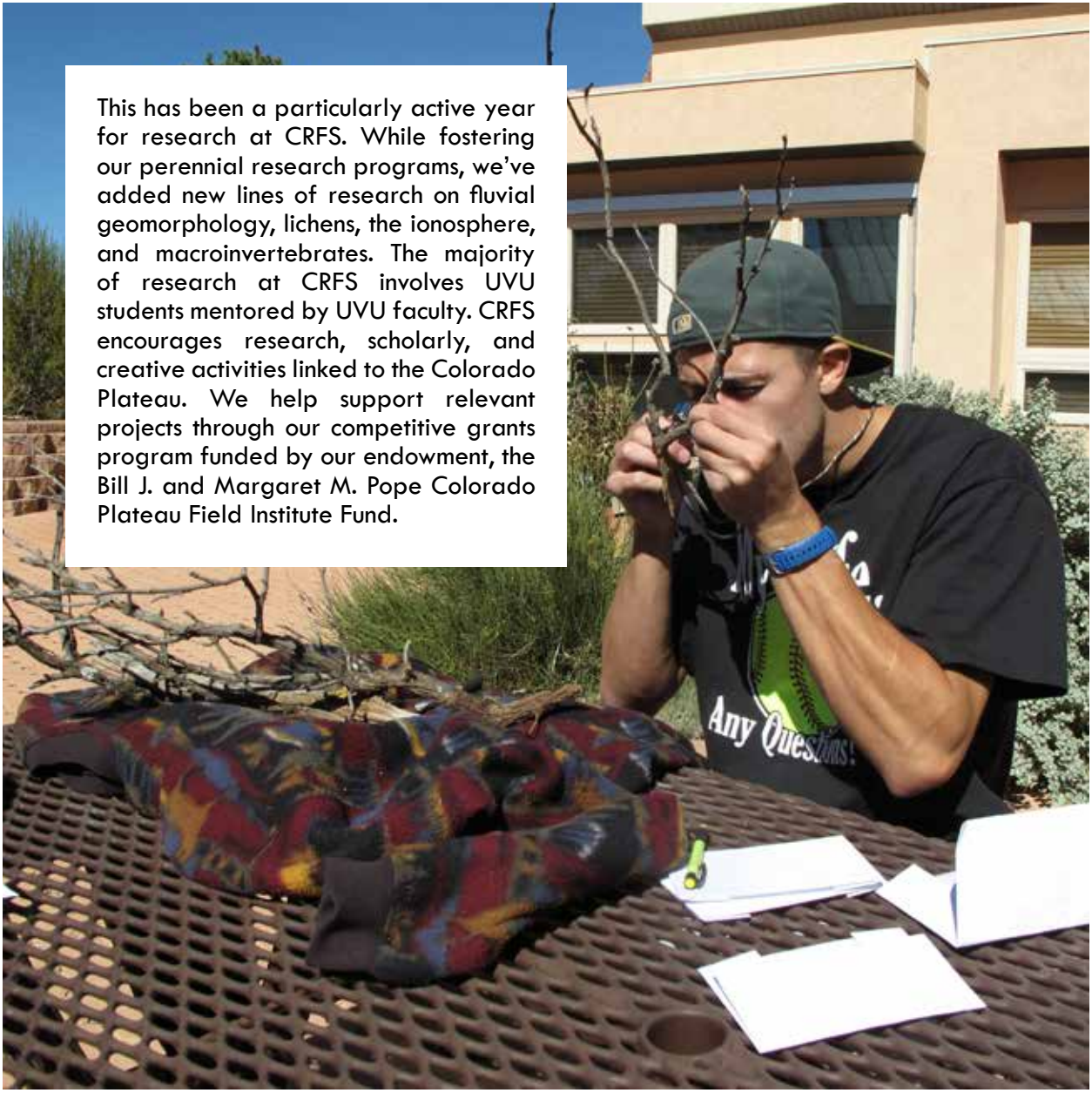
INTRODUCTORY FIELD GEOLOGY, UNIVERSITY OF KANSAS (May 20-27, 2014)

Dr. Diane Kamola from the University of Kansas has strong ties to Capitol Reef National Park after spending three summers at the Sleeping Rainbow Ranch, where the station is now located, for her doctoral research. She discusses her geology class taught at the Field Station,

"Our objectives in Geology 560, Introductory Field Geology, were to study the principles of field geology and the application of field methods to solving geological problems. We started by selecting map areas with well-exposed geologic structures, and used topographic maps and aerial photographs to geologically map the selected field areas. We chose Capitol Reef National Park because of the excellent exposures and accessibility of geologic structures. The Field Station in Capitol Reef National Park allowed us to spend our time focusing on the geology in the Park, as opposed to the logistics of camping. Evenings were spent in the commons area discussing each day's events, and finalizing and coloring completed maps as well as preparing geologic cross sections through the map areas.

The mapping experience at Capitol Reef National Park provided a solid introduction to geologic mapping that gave the students the skills to map more complicated areas and to map in areas with more vegetative cover. It was a wonderful learning experience for them. The opportunity to stay at the Field Station enhanced this experience. Students were immersed in geology each day, and were not distracted in the evenings when returning from their daily assignments. Students could work late into the evening in an environment that fostered learning. Thank you for this great opportunity!"

Photo credit: Diane Silver



This has been a particularly active year for research at CRFS. While fostering our perennial research programs, we've added new lines of research on fluvial geomorphology, lichens, the ionosphere, and macroinvertebrates. The majority of research at CRFS involves UVU students mentored by UVU faculty. CRFS encourages research, scholarly, and creative activities linked to the Colorado Plateau. We help support relevant projects through our competitive grants program funded by our endowment, the Bill J. and Margaret M. Pope Colorado Plateau Field Institute Fund.

FLUVIAL GEOMORPHOLOGY RESEARCH

Two of our former CRFS summer student interns, Brandon Davis and Devin Howard, returned to the station to conduct research with UVU's Dr. Suzanne Walther. Devin shares,

"During the spring 2013 semester I applied for and was awarded a $1,500 SURF grant from UVU for researching Pleasant Creek in Capitol Reef National Park. The goal of this ongoing research is to find out more about how stream channel dimensions influence sediment transport and distribution. To do this we compared channel dimensions, stream depth, stream flow, and streambed characteristics (sediment size and distribution). We took GPS measurements and sediment samples at four different sites on the stream, located upstream and downstream of the road crossing the stream relatively near the Field Station. We also took high-resolution photographs and video of the creek.

The close proximity of CRFS to Pleasant Creek gave us a significant advantage for gathering the data we needed in a short amount of time and using minimum manpower. Setting up the survey-grade GPS system was important to our research and is very time consuming because it involves several parts of heavy equipment. The position of the Field Station overlooking Pleasant Creek made it possible for us to set up the equipment only once per day and not have to pack it in to our research sites on fragile terrain. This saved us valuable time."

During the spring 2014 semester, a UVU geomorphology class visited CRFS to continue the fluvial geomorphologic surveys on the same sites. Dr. Walther explains,

"The goal of this field trip was to have the students learn more about fluvial geomorphology methods and to contribute another year of data to the existing project. The overall project objective is to map channel change and sediment distribution to model stream flow. Additionally, we are using novel techniques of creating digital elevation models from imagery and using digital elevation models of differencing or geomorphic change detection to quantify the geomorphic work of the last flash flood season."

LICHEN RESEARCH

Dr. Emily Holt and her Lichens and Bryophytes students visited CRFS in September 2013. Emily explains,

"The group visited four sites in Capitol Reef National Park on Friday, September 27, and two sites on Saturday, September 28. Friday we visited the Fremont River Trail, Cohab Canyon Trail, Capitol Gorge Trailhead, and the Pleasant Creek road crossing. Saturday we visited another site along Pleasant Creek and the Chimney Rock Trailhead. At the first site, the class was briefed on the standard Forest Health Monitoring protocol of lichen surveys, to establish consistent abundance estimates. Then each site was thoroughly surveyed by the class and opportunistic collections of lichens were made by students. On an individual basis, Dr. Holt helped students identify unique or lichen-rich sites and identify morphospecies or genera in the field. On Friday evening, the collections were organized and stored for transport back to UVU. Although identifications of all our collections are still underway, we made 228 collections representing 11 unique genera and 25 unique species."

IONOSPHERE RESEARCH

Our facility has attracted the attention of SRI International, an independent, non-profit research institute from Menlo Park, California. SRI International is using all-sky imagers to study the ionosphere above the Colorado Plateau. They are particularly interested in disturbances in the ionosphere caused by geomagnetic storms or thunderstorms that can disrupt satellite communications. SRI International is researching ways to forecast such disruptions and improve space weather models. Dr. Asti Bhatt and Dr. Elizabeth Kendall from SRI International visited the Field Station to install a camera system used to study terrestrial space weather. They describe,

"CRFS provides a crucial location that helps complete the western U.S. network of all-sky imagers. The other two imagers in this network are located at Hat Creek, California, and McDonald Observatory, Texas. Combining the field-of-view from the three imagers covers the ionosphere from Oregon to Texas extending into central Mexico. Such a field-of-view is unprecedented. While the data retrieval from CRFS can take some time, from whatever data we have been able to retrieve, we have already seen wave strictures extending in more than one field-of-view and propagating from one imager to another. This arrangement will inevitably lead to good science."

ENTOMOLOGY RESEARCH

Dr. Heath Ogden has involved UVU undergraduates in research at CRFS over multiple years. Heath reports,

"The Ogden lab continues its multi-year insect research collecting efforts at Capitol Reef National Park. We are documenting the diversity of insects in order to produce species lists and a reference collection. This year we initiated research on the macroinvertebrates of two different stream systems within the Park, capturing diversity before and after flooding events. The Field Station serves as a "home base" for our research and the riparian habitat of Pleasant Creek has been extensively sampled. These projects are excellent examples of engaged and serious learning for students. The final goals consist of students presenting their research at scientific conferences and preparing manuscripts for publication."

MACROINVERTEBRATE RESEARCH

Jake Loveless, a biology major at UVU, conducted an independent research project in Capitol Reef National Park under the direction of Dr. Heath Ogden. Jake shares,

"This past summer I conducted a survey on the macroinvertebrate assemblages of both Pleasant Creek and Sulphur Creek. The purpose of the study was to compare the populations of the two streams to see if the macroinvertebrate functional feeding groups differed between the two sites, and to assess relative water qualities using literature on pollution tolerance by taxa. Samples were taken on five separate collection trips using kick nets, and early data analysis has shown a significant difference in the populations of the two streams, but very similar water qualities.

CRFS was an invaluable tool throughout the course of my research. CRFS provides excellent research opportunities, not only in facilities, but in funding, as my study was completely funded through a CRFS undergraduate research grant."

OPTICS RESEARCH

Dr. Kim Nielsen visited the station with UVU students in August 2013 and March 2014. He relates,

"The optics research group led by Dr. Kim Nielsen is steadily progressing towards routine observations of mesospheric airglow from CRFS. This past year, a trailer was positioned at the Field Station and interior modifications of the trailer are in process to facilitate the use of instruments and acquisition computers. Several test observations have been performed utilizing four different imaging systems. At this point, a state-of-the-art airglow imaging system has shown excellent data from the Field Station and is being deployed for continuous operations starting Fall 2014. Furthermore, two meteor detection units have been tested and shown capable of detecting the meteor entries above the Park. These cameras are also being deployed in Fall 2014. At this point, the trailer facility is operational for testing purposes, while the 2014 summer months will make it ready for continuous operations."

PUBLICATION AND PRESENTATION OF CRFS RESEARCH

Erickson R*, Ogden TH (2014) Pamphlet and survey of common insects of Capitol Reef National Park. Utah Conference on Undergraduate Research, Provo, UT.

Howard D*, Walther SC (2013) 3-D mapping of Pleasant Creek, Capitol Reef National Park. Geological Society of America annual meeting, Denver, CO.

Howard D*, Walther SC (2014) Sediment grain size and mobility analysis of Pleasant Creek, Capitol Reef National Park. Spring Run-off Conference, Logan, UT.

Howard D*, Walther SC, Davis B* (2014) Sediment grain size and mobility analysis of Pleasant Creek, Capitol Reef National Park. UVU Engagement Week, Orem, UT.

Ogden TH (2013) Biology buffet: bugs, evolution, and teaching. UVU Department of Biology Seminar, Orem, UT.

Ogden TH (2013) The common insects of Capitol Reef. Entrada Institute, Torrey, UT.

Ogden TH, et al. (2013) Common insects of Capitol Reef National Park. UVU Printing Services, Orem, UT.

Walther SC (2014) Modeling distribution and sediment transport in Pleasant Creek, Capitol Reef National Park. Association of American Geographers annual meeting, Tampa, FL.

*denotes an undergraduate researcher

Photo credit: Erik Merrill

Photo credit: McKell Haggard

Teaching our visitors environmental ethics is an important part of our mission. It's also important to our partner, the NPS, that visitors leave with an enhanced understanding of the environment and how to protect it. Proper care of the environment influences virtually everything that we do at the Field Station, from the design of the buildings to the operation of the facilities, and even the way classes are conducted.

Visitors are quickly introduced to key concepts in sustainability and conservation during their initial orientation. They are informed of their water usage during and at the end of their visit, helping them remain aware of this precious resource. Additionally, prior to departure, visitors are informed of their total garbage production, which allows for further discussion of sustainability with respect to waste reduction and recycling.

In particular, we seek to have a lasting impression on our visitors that will impact their lives well beyond the time they spend at CRFS. Together with our visitors, we brainstorm ways of reducing personal environmental impact, and 82% of our visitors reported learning new methods to reduce their impact in their day-to-day activities. After visiting the station, nearly three times as many of our visitors reported that they were "very aware" of their personal impact on the environment (Fig. 3). Additionally, our visitors were more likely to place a "very high" value on protected public lands (Fig. 4), such as Capitol Reef National Park, after staying at CRFS.

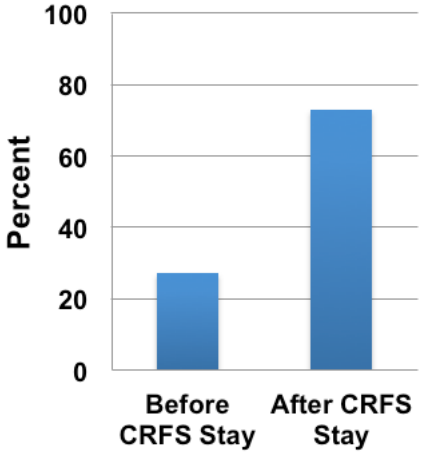


Fig. 3 After staying at CRFS, visitors were nearly three times as likely to report being "very aware" of their personal impact on the environment (n = 267).

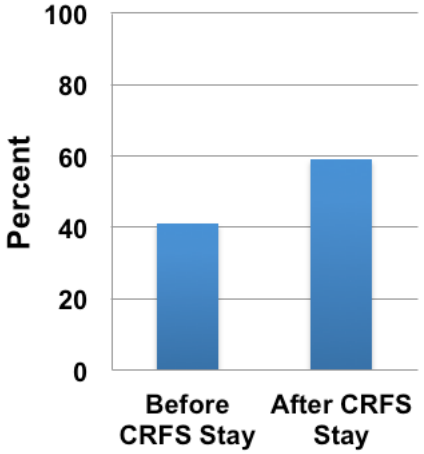
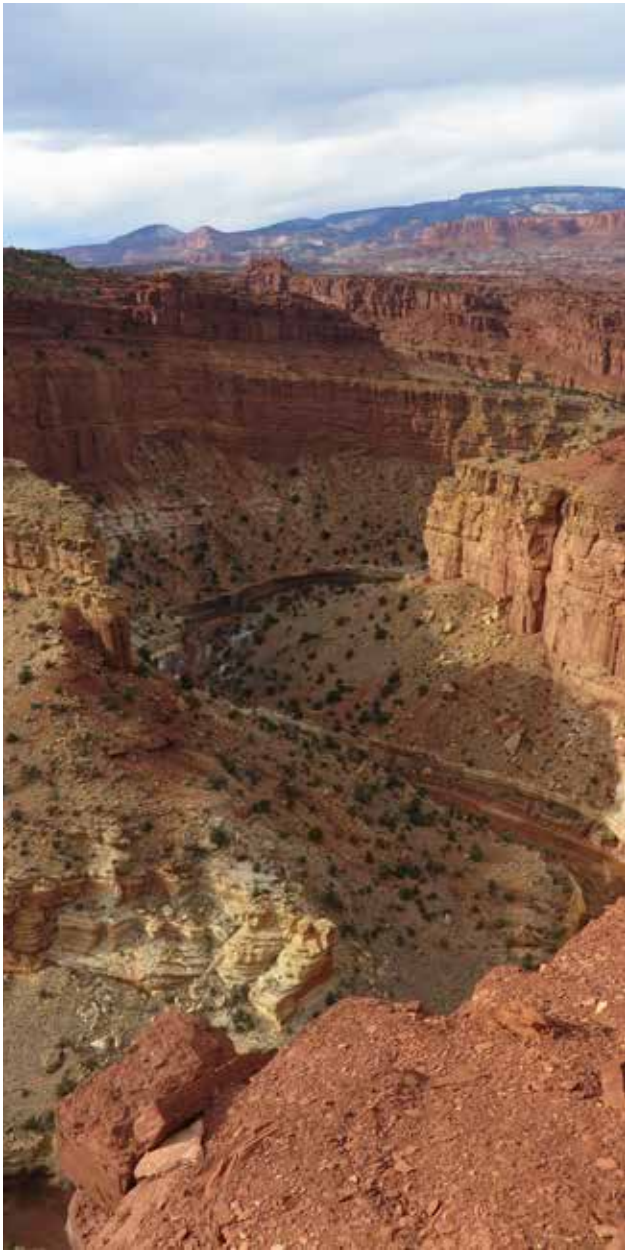
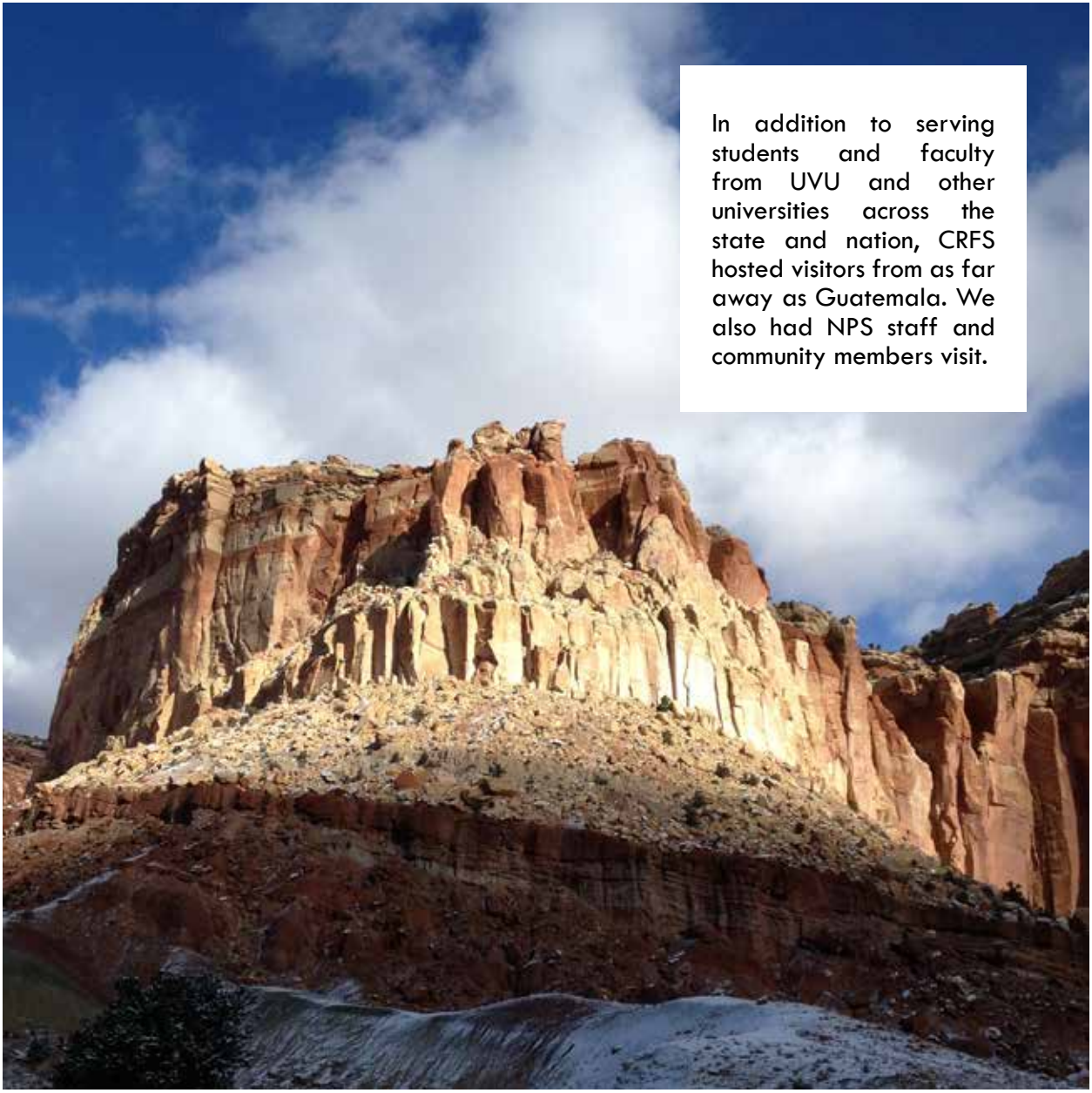


Fig. 4 After staying at CRFS, visitors were 44% more likely to report placing a "very high" value on protected public lands (n = 267).





In addition to serving students and faculty from UVU and other universities across the state and nation, CRFS hosted visitors from as far away as Guatemala. We also had NPS staff and community members visit.

NPS (Capitol Reef National Park and Cedar Breaks National Monument)
(July 11-12, 2013, April 21-24, 2014, and June 9-11, 2014)

Scott Brown, Chief Ranger at Capitol Reef National Park, explains,

"Capitol Reef National Park is proud of the CRFS and appreciates the opportunity to use and offer the facility for official NPS functions. During the 2013-2014 year, the NPS held three different sessions at the Field Station. The Capitol Reef National Park management team held a two-day retreat where the team was able to establish goals and objectives for the Park's near future. The team also prioritized Park issues and analyzed its ability to address a variety of management challenges. The management team from Cedar Breaks National Monument also used the facility for four days for a similar meeting. The Cedar Breaks and Capitol Reef staff were able to hold a joint session as well to share information and discuss common issues. The Field Station provides a facility free of the distractions associated with the Park headquarters offices. CRFS certainly provides for an efficient work setting, but perhaps more importantly an inspiring and motivating setting. While using CRFS, the Park and UVU staff have the opportunity to discuss operations, challenges and successes on-site."

Community and Continuing Education, UVU (September 20-22, 2013, October 18-20, 2013, March 28-30, 2014, April 24-26, 2014, and May 1-3, 2014)

Every year the Community and Continuing Education Department at UVU offers many classes to those seeking exceptional learning experiences. This year they offered five classes at the Field Station: two photography workshops, two plein air painting classes, and an astronomy class.

CRFS enjoys hosting these classes as a way to reach out to the broader community. These groups continue their education by practicing and improving skills all while learning more about sustainability and experiencing what the Park has to offer.

After facilitating a Plein Air workshop, Sandy Plummer reported,

"Our Oil Painting: Plein Air Workshop at CRFS was a wonderful success. The weather was great! We had rain and thunder and lightning and beautiful rainbows! The group went down to the old ranch buildings on Saturday morning to gain inspiration from that vantage point. We couldn't ask for better scenery. All the participants loved it. They also loved the excellent accommodations at the Field Station. We even had a brief 'Star Party' on Friday evening before the full moon was in sight! It was a fabulous weekend."

Pre-med and Medical Student Exchange, UVU and Centro Universitario de Oriente
(November 22-23, 2013)

UVU Biology Professor Dr. Mark Bracken took the UVU/Centro Universitario de Oriente pre-med and medical student exchange students to CRFS to expose the medical students from Guatemala to a field station in a U.S. national park where conservation and preservation are primary objectives. He shares,

"These medical students come from a country where deforestation is rampant. Trees are cut for agriculture as well as for cooking fuels. This continues to go on unchecked today. The Guatemalan medical students participated in three activities during their visit to Capitol Reef National Park that were designed to entice them to consider the principles of conservation in their own country when they return to their homes in Guatemala.

Jason gave our Guatemalan guests instructions on the delicate balance of the environment and ecosystem in the Capitol Reef area. He emphasized our responsibility and stewardship to leave the area with zero impact on the delicate balance of nature that has evolved over thousands of years. This was reinforced by the weighing of the waste we generated at the end of our stay. (The Guatemalans were proud of how little waste our group generated during our short stay).

These students watched the film in the Visitor Center about the geological history of the Waterpocket Fold, its formation and uniqueness. The film also emphasized the human history of the area. Hopefully this instilled in the minds of our guests the reason why we as citizens of the United States value this area and have committed to preserve it throughout the ages for future generations to enjoy.

Thank you for the opportunity to visit the station and to enjoy the Capitol Reef Area. Although our guests saw more snow than the majesty of the formations, it was well worth the trip. Jason was a gracious and wonderful host."


RIPPLE ROCK
NATURE CENTER

Cinimin Kofford –
The Cordell Roy Intern

The Cordell Roy internship is funded in part by a generous private endowment from G. Kevin Jones who wished to honor the accomplishments of Cordell Roy, a long-time employee of the NPS. Kevin is an attorney in the Office of the Solicitor, United States Department of Interior, representing the Utah units of the NPS. Cordell Roy also contributed to the endowment.

Operating the Ripple Rock Nature Center gave Cinimin the opportunity to interact with children and families from around the world. Using skills she gained as an Outdoor Recreation major at UVU, Cinimin was able to educate others about Leave No Trace ethics and share with them the value of protecting special places like Capitol Reef. Cinimin also expanded her own understanding of natural resource protection and national park operations. She had this to say about her experience,

"This experience has been priceless. Ripple Rock Nature Center has become my cottage dwelling where families, children, and wildlife are drawn in. Can I just stay here forever?"

Patrick Kane –
Backcountry Patrol, Interpretation, & CRFS Intern

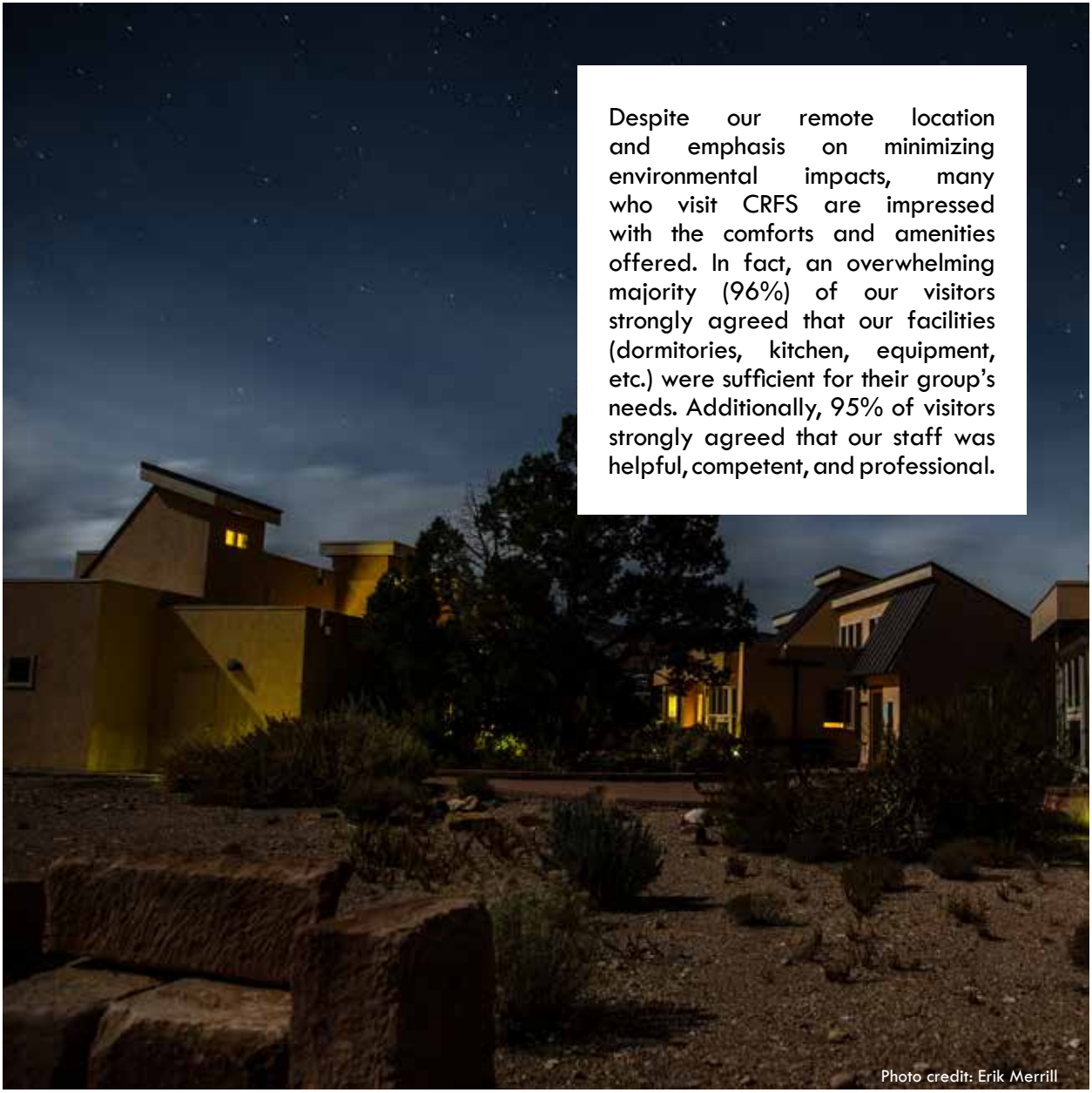
Patrick's internship created a unique professional experience that split his time between CRFS and the Park's divisions of Visitor Protection and Interpretation. Aside from assisting at the Ripple Rock Nature Center by conducting programs on geology and nature, he interacted with visitors during patrols and assisted in protecting Park resources in the backcountry. Patrick's interpretative programs were well received; one visitor had this to say, "I learned more in that class than all year in science." Additionally, Patrick's independent project at the Field Station will lead to the creation of an informative Leave No Trace poster specific to Field Station guests. Patrick states,

"*This UVU internship has given me the chance to gain on-the-job training and skills necessary to give me a head start to begin a career with the National Park Service.*"

Ben Stutz –
Plant Survey and Orchard Data Intern

This year was the first time UVU sponsored a Plant Survey and Orchard Data position. Under the direction of Park staff, Ben assisted researchers studying an endangered cactus species, Wright's fishhook (*Sclerocactus wrightiae*), and a threatened cactus species, Winkler's pincushion (*Pediocactus winkleri*). Ben used line transects, study plots, and cataloged GPS locations to determine the effect of invasive plant species, wildlife, and livestock on the two cactus species. In addition to working with cacti, Ben was involved with the Park's historic orchards. He studied methods to improve irrigation and pest control and was a member of a team that conducted health assessments on each of the 2,800+ fruit trees in the Park. Ben's work in the orchards will be used to develop effective management strategies for the future. Ben describes,

"*It has been an exciting experience during this internship to apply the knowledge and skills that I've developed in my classes at UVU to real field work and research.*"



Despite our remote location and emphasis on minimizing environmental impacts, many who visit CRFS are impressed with the comforts and amenities offered. In fact, an overwhelming majority (96%) of our visitors strongly agreed that our facilities (dormitories, kitchen, equipment, etc.) were sufficient for their group's needs. Additionally, 95% of visitors strongly agreed that our staff was helpful, competent, and professional.

Photo credit: Erik Merrill

PASSIVE HEATING & COOLING

The building design at CRFS makes use of simple physics to help warm and cool the buildings. To assist with winter heating, we employ trombe walls. Trombe walls are south-facing walls that have been painted black and sealed with a pane of glass 4-6 inches in front of them to capture the sun's radiant energy. Heat is captured throughout the day and slowly conducts inward through the wall, even into the night. For the summer months, trombe walls are covered during the day with a solar shade to prevent heat absorption and uncovered at night to promote cooling. To further promote cooling during the summer months, the building design also includes solar chimneys, or "cooling towers." Utilizing the principle of convection, solar chimneys allow warmer, more buoyant air to move up and out of the tower as cooler, less buoyant air filters in, creating a natural current. Surprisingly, without the aid of air conditioning, building temperatures remain relatively comfortable throughout the summer. Proper insulation, quality seals around door and windows, and a white roof that reflects sunlight also help in maintaining 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 lighting throughout the day while conserving energy. Once the sun is down, we continue to save energy by using energy-efficient light bulbs.

OFF-GRID POWER

Often people turn on a light or take a shower and never consider the origin of the resource or the process involved in getting it to them. At CRFS, we know exactly where our power and water come from. To power the facility we utilize solar technology. Our solar array is composed of seventy-two 200-watt panels that generate up to 14.4 kilowatts of power. The solar array also provides covered parking, a luxury in our desert climate. The harnessed power of the sun is then stored in a bank of 48 batteries. To transform the energy into a useable form, four inverters convert the electricity from DC to AC. In the event we lose solar capability, CRFS has a propane-powered backup generator.

MINIMIZATION OF LIGHT POLLUTION & THE DARK-SKY RESOURCE

The Field Station boasts a location in the Colorado Plateau with some of the darkest skies in the lower 48 states. To protect the dark-sky resource and the nocturnal species that live here, we strive to minimize light pollution. We do this by having low-wattage exterior lights that point downward. Further, all windows are equipped with blinds that are closed at night to minimize artificial lighting. Additionally, we have a 12-inch telescope that gives visitors an excellent opportunity to experience celestial objects and gain a greater appreciation of the precious, dark-sky resource.

ON-SITE WATER TREATMENT

Water consumed at the Field Station is drawn from a well near Pleasant Creek, a perennial source that flows through the valley below. A solar-powered pump brings water to our on-site water treatment facility. To purify our water, CRFS uses a membrane filtration technique that uses several filters, including two nano-filters, to ensure a quality product. The Field Station's water treatment system is state licensed and operated by trained staff. Water is tested daily and meets or exceeds many operations found elsewhere in the state. A 10,000-gallon tank stores treated water for later use.

WATER CONSERVATION

At CRFS we save water with reduced-flow showerheads. The flow rate of these showerheads is 1.5 gal/min vs. 2.5 gal/min for a typical showerhead. Additionally, these showerheads have a button valve so you can switch off the water flow when applying shampoo, conditioner, or soap, or taking time to shave. To increase visitor awareness of water use, all faucets, toilets, and showerheads at CRFS have a label listing the flow rate in gallons-per-minute. This simple technique is often noted as one of our most effective and popular conservation strategies. In the kitchen, we conserve water while washing dishes by using three separate bins for washing, rinsing, and sanitizing. This allows washing to be done without constantly running the water.

PERMEABLE PAVEMENT

Interlocking permeable pavers have been placed around the buildings allowing precipitation to percolate into the soil. Permeable pavers allow for natural ground water recharge and discourage erosion. Also useful in urban situations, the pavers allow the topsoil to capture contaminants before the water returns to the environment.

Singleleaf Ash (*Fraxinus anomala*)

Most species that migrate to the arid landscapes of the desert Southwest immediately become challenged by the harsh conditions and the ensuing struggle to survive. It is truly a situation of adapt or perish. As the species name suggests, *Fraxinus anomala* is an anomaly because it is the only ash with small simple leaves; most ashes have larger compound leaves with more surface area. Less surface area means less moisture loss through transpiration. This anomaly is an excellent adaptation to an environment characterized by high temperatures and little rain. Singleleaf ash may be referred to as a shrub or small tree generally growing up to 13 feet (4 meters tall) at elevations between 2,950-8,600 feet (900-2,625 meters). A member of the olive family (Oleaceae), singleleaf ash is found throughout Capitol Reef in pinyon-juniper woodlands, mixed scrublands, washes, and riparian areas. Its hardiness to arid conditions and drought make it a good choice for water-wise landscaping. The hard wood of the tree can be used for making tools and utensils. A deciduous species, singleleaf ash is green in the summer, brilliant yellow in the fall, and easily recognized in the winter because of its vertical branch structure and dark bark.

CRFS is supported financially by three main sources:

1. institutional support from UVU
2. funds generated by user fees and product sales, and
3. private donations (Fig. 5).

This funding supports the salaries and benefits of the staff, student internships, marketing and outreach, operating and maintenance costs, and research (Fig. 6). While UVU generously supports the station, CRFS relies on private donations to fund important programs such as student internships and research. Please consider becoming a Friend of the Capitol Reef Field Station by making a donation at: **www.donate.supportuvu.org/crfs**

CRFS is actively seeking funding for additional support staff to keep up with the growing demand for our facility. We are seeking funding for a part-time Assistant Site Manager ($8,600) and funding for increased hours for our Administrative Assistant ($12,883). Additionally, we are seeking funding ($4,000) to improve internet and telephone connectivity at the station. Better internet connectivity is important for many engaged learning and research activities at the station.

Photo credit: Brooke Morrill

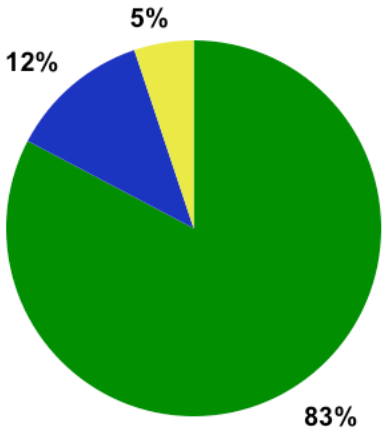


Fig. 5 Funding for CRFS by source.

REVENUE:

Category	Amount	Percent
Institutional Support	$140,738.05	83%
User Fees & Product Sales	$20,702.18	12%
Private Donations	$8,707.08	5%
TOTAL	$170,147.31	

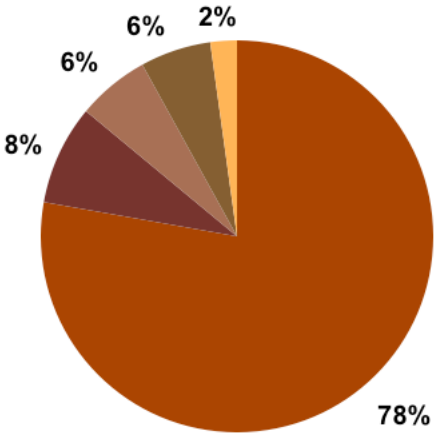


Fig. 6 CRFS outlays by category.

EXPENSES:

Category	Expenditure	Percent
Salaries & Benefits	$137,549.09	78%
Internships	$14,551.74	8%
Marketing & Outreach	$10,536.54	6%
Operations & Maintenance	$10,303.59	6%
Research Support	$3,867.01	2%
TOTAL	$176,807.97	

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 days they spent at the station, totaled 1,724 (Fig. 7). This represents a 15% increase over the previous fiscal year. We credit our new approach to reviewing and scheduling reservation requests as well as our ongoing marketing efforts for this substantial increase in visitation.

Nearly three-quarters of visitors to CRFS were associated with UVU this year. The University of Kansas and the Utah State Office of Education were other major sources of visitation (Fig. 8). Visitors from UVU courses represented a variety of colleges, programs, and schools. Our top three sources of visitation were the College of Science & Health, the School of the Arts, and Community & Continuing Education. These organizations supplied us with roughly equal proportions of user days (Fig. 9). We are proud of our interdisciplinary focus that includes the College of Humanities & Social Sciences and University College as well.

During the 2013-14 fiscal year, 477 people visited CRFS in 41 groups. The average group size was 12 and the average overnight stay per group was 3 nights. In terms of gender, 52% of our visitors were male and 48% were female.

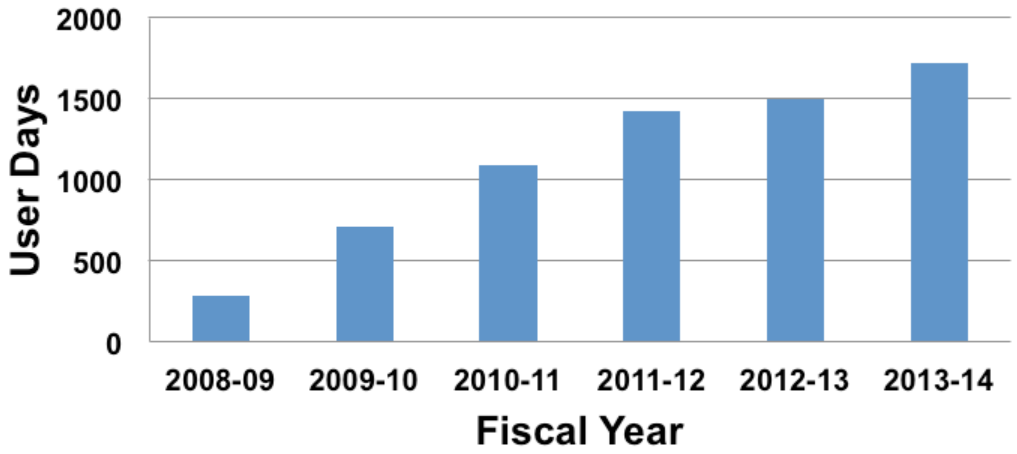


Fig. 7 User days at CRFS have steadily increased since it opened in 2008. Visitation for 2013-14 increased by 15% compared to the previous fiscal year.

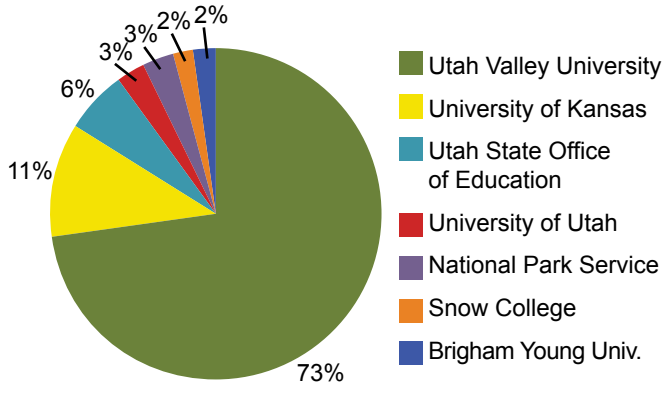


Fig. 8 Percentages of CRFS user days from various institutions and organizations.

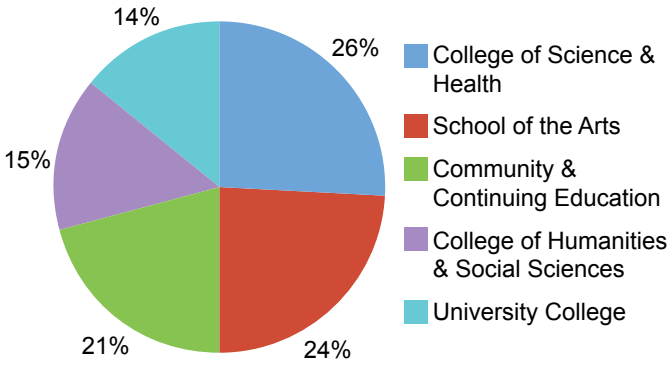


Fig. 9 Percentages of CRFS user days from colleges, schools, or programs associated with UVU.

UVU CLASSES WHO VISITED CRFS

DEPARTMENT	COURSE	TITLE
Art	ART 300R	Water Media Plein Air Intensive
	ART 300R/ART 371R	Special Topics in Photography/ Historic Processes
Biology	BIOL 490R	Lichens and Bryophytes
	BOT 3700/3705	Plant Ecology
	ZOOL 3430	Entomology
Communication	COMM 2010	Small Group Communication
Developmental Mathematics	MAT 1010	Intermediate Algebra
Earth Science	GEO 3500	Geomorphology
English & Literature	ENG 2010/3020	Research-based Writing
English as a Second language	ESL 2110, 2120, 2130, 2140	ESL Program Level IV
	ESL 2110, 2120, 2130, 2141	ESL Program
Exercise Science & Outdoor Recreation	REC 4400	Natural Resource Management

UVU RESEARCH GROUPS WHO VISITED CRFS

PROJECT	PRINCIPAL INVESTIGATOR
Fluvial Geomorphology	Devin Howard
Fluvial Geomorphology	Suzanne Walther
Entomology	Heath Ogden
Macroinvertebrates	Jake Loveless
Optics	Kim Nielsen

UVU AFFILIATED GROUPS WHO VISITED CRFS

SPONSORING ORGANIZATION	GROUP
Community & Continuing Education	Astronomy Photography Plein Air Painting
English & Literature	Student Journal Publication Staff & Faculty Advisors
Office of Engaged Learning	Office of Engaged Learning Directors
Pre-med Association	Pre-med Association with Centro Universitario de Oriente Medical Students from Guatemala
Science Association of Women, Botany, and Wildlife Clubs	Science Association of Women, Botany, and Wildlife Clubs

CLASSES FROM OTHER UNIVERSITIES WHO VISITED CRFS

UNIVERSITY	DEPARTMENT	CLASS
Brigham Young University	Recreation Management	Leave No Trace Outdoor Recreation
Snow College	Geology	Geology Field Studies
University of Kansas	Geology	Introductory Field Geology
University of Utah	Writing and Rhetoric	Environmental Writing

OTHER GROUPS WHO VISITED CRFS

HOST	EVENT
Capitol Reef National Park	Management Team Building
Cedar Breaks National Monument	Management Planning
SRI International	SRI Imager Team
Utah State Office of Education	Astronomy

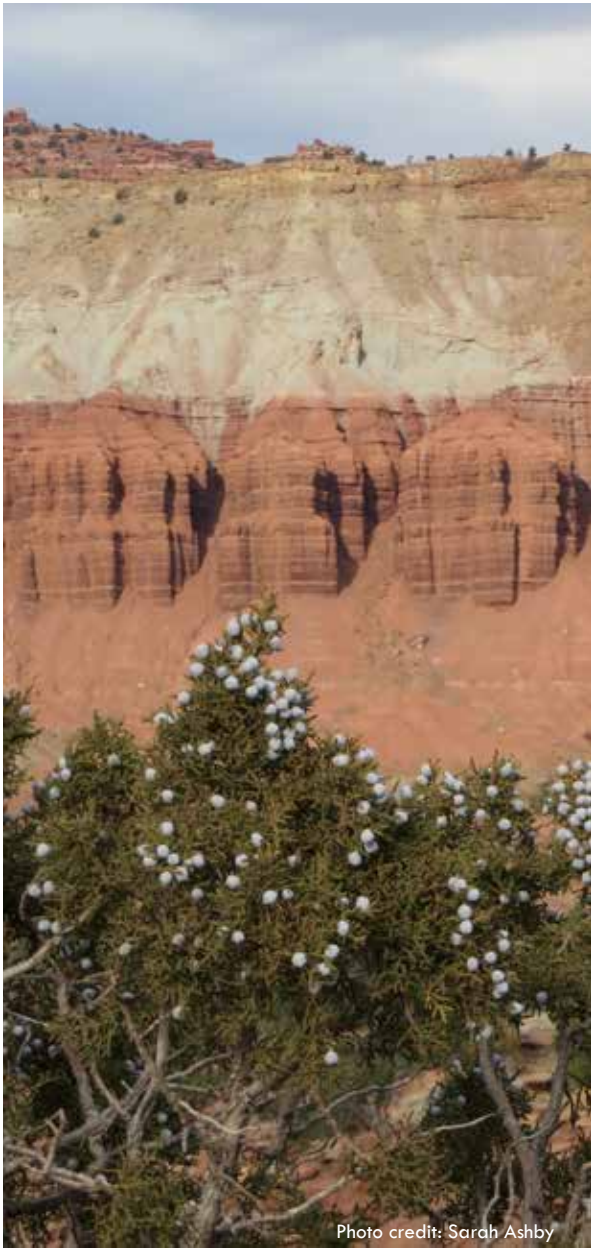


Photo credit: Sarah Ashby

Last year we accomplished a lot! We had five major goals including 1) the renewal of our 5-year agreement with the Park, 2) increased awareness and marketing, 3) revised scheduling policies, 4) increased staff funding, and 5) facilities improvements. We worked closely with the Park to renew our 5-year lease agreement. We greatly appreciate the leadership and vision of Capitol Reef National Park's Superintendent Leah McGinnis during this process. The new agreement begins a new chapter for CRFS—one that will potentially include more K-12 outreach and research, in addition to a closer working relationship between the Park and UVU. To increase awareness of the Field Station, we held an on-site open house in the fall and a virtual open house at UVU in the spring. We also gave two presentations about the Field Station to a group of nearly 400 high school girls who came to UVU to participate in the She Tech Challenge that involved designing a field station suitable for the Colorado Plateau environment. We got some great ideas from these girls! We revised and implemented new scheduling policies to give preference to visitors whose trip objectives most closely match our mission. With the help of then Associate Vice President Brian Birch, we secured one-time funding for our Assistant Site Manager position held by Darrell Mensel. On top of that, our ADA ramp was completely updated and revised under the direction of UVU Facilities. For 2014-15, we plan to focus on the following objectives:

GRANT FUNDING

We plan to seek external funding to augment support for CRFS programs from at least two agencies: 1) We will support Capitol Reef National Park personnel as they submit proposals designed to help engage local Wayne High School students in relevant, experiential activities in the Park and at the Field Station to fuel critical thinking skills, encourage stewardship, and develop an appreciation of the natural resources of the Colorado Plateau. 2) The National Science Foundation has a program that funds strategic planning for research and education that occurs at field stations across the United States. To help develop our long-term strategic plan, we are particularly interested in seeking funding to enable us to visit and learn from personnel who run field stations similar to ours (i.e., located in U.S. national parks and run through university partnerships).

INCREASED VISITATION

Although we're intensively utilized from March through October, we plan to encourage additional use, especially during the winter. Our goal is to make the Field Station a destination for more students and faculty from UVU, and across the state and nation. We plan to connect with additional potential visitors through a redesigned website, social media, two open houses a year, and outreach visits to area universities who have not yet visited CRFS.

STAFF FUNDING

We will seek funding from UVU for our Assistant Site Manager and increased hours for our Administrative Assistant. Our Assistant Site Manager Darrell Mensel is invaluable, especially during our busy season. Our Administrative Assistant Annette Harrington is funded by UVU to work for 12 hours/week. This was sufficient in 2008, but in 2014 we have six times as many visitors. Additional time (to get to a total of 28 hours/week) is needed to effectively administer our growing program.

CONSERVATION

We will continue to improve monitoring and data collection related to water, propane, electricity, and trash in order to model sustainable living practices that have minimal impact on the surrounding environment. We seek to encourage conservation by our visitors while they are at the station and also after they return home.

ENHANCED TECHNOLOGY AND COMMUNICATION INFRASTRUCTURE

We are actively working with UVU and the Park to improve our internet and telephone connectivity. Our goal is to provide high-speed internet for our visitors and to have an on-site UVU telephone for CRFS staff. Better internet connectivity is particularly important as we pursue new research opportunities and funding for an observatory at CRFS that could be utilized remotely by students and faculty at UVU.

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

CRFS could not succeed without donor support. Donor contributions were instrumental in affording visitors the chance to explore the scientific, historic, and cultural significance of the Capitol Reef region, to engage in research and interdisciplinary learning, to acquire job skills, to learn sustainable living practices, and to appreciate and enjoy the unique beauty of the desert.

We would like to acknowledge the generosity of our supporters.

Major Donors

Bill J. and Margaret M. Pope, whose vision and generosity made the idea of a field station in Capitol Reef become a reality. Their endowment, the Bill J. and Margaret M. Pope Colorado Plateau Field Institute Fund, is the primary private funding source for CRFS.

Additional Donors

Anonymous
G. Kevin Jones
Cordell Roy

Your financial support is needed. Please visit ***www.donate.supportuvu.org/crfs*** to contribute.

Photographs are provided by CRFS staff or trip leaders unless otherwise noted.

Special thanks to Paul Fenske (UVU Printing Services) for layout and design.

CAPITOL REEF FIELD STATION

UTAH VALLEY UNIVERSITY

CAPITOL REEF FIELD STATION '13-'14