

UTAH VALLEY UNIVERSITY

2014-2015 ANNUAL REPORT

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Advisory Board Members are Utah Valley University (UVU) faculty and staff who serve for ~3 years on a rotating schedule. Four hundred fifty undergraduates visited Capitol Reef Field Station (CRFS) this year in our busiest year ever. To put this number into context, this rate of visitation places us in the top 15% of field stations nationwide.¹ The majority of students who visit CRFS are from UVU. Because of our dual mission, UVU is in the uncommon position of having the field station resources of a comprehensive university while serving a high proportion of community-college-going students who are often underrepresented at field stations.¹ Further, CRFS is one of less than ten field stations run by a university and located in a national park. It's exciting to be part of such a unique, vibrant, and growing enterprise. In the context of our location in Capitol Reef National Park on the Colorado Plateau, we focus on engaged learning, research, and environmental ethics. Please read about our activities and accomplishments, and our goals for the future.

Archael

Michael T. Stevens, Ph.D. Director, Capitol Reef Field Station

¹Hodder J (2009) What are undergraduates doing at biological field stations and marine laboratories? BioScience 59:666-672.

DIRECTOR'S INTRODUCTION



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. Amidst unobstructed views of postcard-perfect scenery, one can hear the calming sounds of Pleasant Creek as they loft over 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 supported small glaciers during the last ice age. Looking up, casual stargazers and serious astronomers alike appreciate the amazing night

sky, for which Capitol Reef National Park recently received a Gold-Tier International Dark Sky designation. Our incredible location provides an unparalleled opportunity for placebased learning. Only 3.5 hours from UVU and the Wasatch Front, CRFS welcomes students and faculty from institutions of higher learning who seek to experience the natural and cultural legacies of the Colorado Plateau.

OUR VISION

Every visitor leaves 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 biological diversity and rich 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 Numicspeaking (Ute and Paiute) people.

More recently, the 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 to 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 of 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, which we renewed in May 2014.

ABOUT CRFS

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 2,108 (Fig. 1). This represents a 22% increase over the previous fiscal year. Our current use is three times greater than our first complete fiscal year with visitors (2009-10). We credit this substantial increase to our ongoing marketing efforts as well as our new approach to reviewing and scheduling reservation requests.

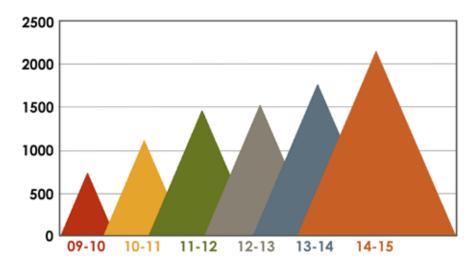


FIG. 1 User days at CRFS have steadily increased since our first complete year in operation (2009-10). Visitation for 2014-15 increased by 22% compared to the previous fiscal year.

- Utah Valley University
- University of Kansas
- Utah Science Teachers Association
- Mt. San Antonio College
- Snow College
- National Park Service
- Utah Art Education Association



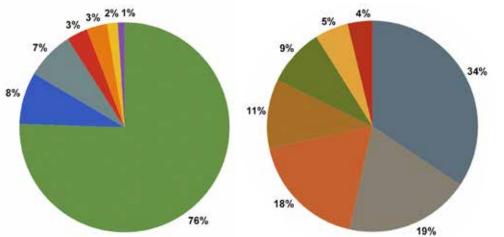


FIG. 2 Percentages of CRFS user days from various institutions and organizations.

FIG. 3 Percentages of CRFS user days from colleges, schools, or programs associated with UVU.

Seventy-six percent of visitors to CRFS were associated with UVU this year. The University of Kansas and the Utah Science Teachers Association were other major 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 College of Science & Health, Community & Continuing Education, and the School of the Arts. We remain committed to our interdisciplinary focus that includes University College, the College of Humanities & Social Sciences, the Honors program, and Multicultural Student Services.

During the 2014-15 fiscal year, 616 people (including 450 undergraduates) visited CRFS in 49 groups. The average group size was 13 and the average overnight stay per group was 2 nights. In terms of gender, 53% of our visitors were female and 47% were male.

VISITATION SUMMARY (continued)

DEPARTMENT	COURSE	TITLE
Art	ART 300R ART 371R, ART 300R	Photography Photography
Biology	BOT 3700/3705 BOT 4300	Plant Ecology Woody Plants of Utah
Communication	COMM 350R	Communicating Environments
Community & Public Health	HLTH 4140 HLTH 482R	Community Health Assessment and Program Development Community Health Internship
Earth Science	GEO 3500	Geomorphology
English & Literature	ENG 3050, 3460 ENG 3460 ENGL 201H	Creative Writing Wilderness Writing Learning Communities
English Language	ESL 2110, 2120, 2130, 2140	Fall ESL Program Level IV
Learning	ESL 2110, 2120, 2130, 2140	Spring ESL Program Level IV
Exercise Science & Outdoor Recreation	REC 4400	Natural Resource Management
Honors	HONR 100R	Honors Colloquium
Physics	PHYS 1800 PHYS 492R	Energy You and the Environment Space Plasma Physics

UVU RESEARCH GROUPS WHO VISITED CRFS

UVU CLASSES WHO VISITED CRFS

PROJECT	PRINCIPAL INVESTIGATOR	
Entomology	Jake Loveless	
Optics	Kim Nielsen	
Fluvial Geomorphology	Suzanne Walther	



UVU AFFILIATED GROUPS WHO VISITED CRFS

SPONSORING ORGANIZATION	GROUP
Capitol Reef Field Station	Open House
College of Science & Health	Botany Club Outdoor Recreation - Nature to the Classroom Science Association of Women Club
Community & Continuing Education	Natural History Night Photography Photography Plein Air Painting Watercolor Writing
Multicultural Student Services	Native American Initiative - Photography
Risk Management	Risk Assessment

CLASSES FROM OTHER UNIVERSITIES WHO VISIT

UNIVERSITY	DEPARTMENT	CLASS
Snow College	Geology	Natural Resources
	Geology & Physics	Honors Geology & Physics
University of Kansas	Geology	Introductory Field Geology
Mt. San Antonio College	Geology	Regional Geology

OTHER GROUPS WHO VISITED CRFS

HOST	EVENT
Utah Science Teachers Association	Astronomy Endorsement Course
	Geology Endorsement Course
Capitol Reef National Park	Wayne High School Visit
Utah Art Education Association	Board Meeting and Painting

ENGAGED LEARNING

ENGAGED LEARNING is a core theme of UVU, and it is central to the mission of the field station. Engaged learning is much more than interesting content. It provides students with hands-on experiences with what they're studying. It provides realworld context and applications for classroom knowledge. In short, engaged learning takes studying out of the textbook and brings it to life. Our visitors at the field station almost uniformly find CRFS to be an ideal location for engaged learning activities (Fig. 4) and report that CRFS provides unique experiences not available on campus (Fig. 5). Please read the following short summaries to learn more about some of our visitors this year.

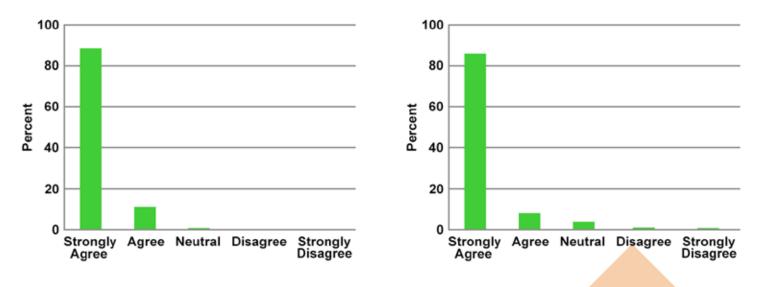
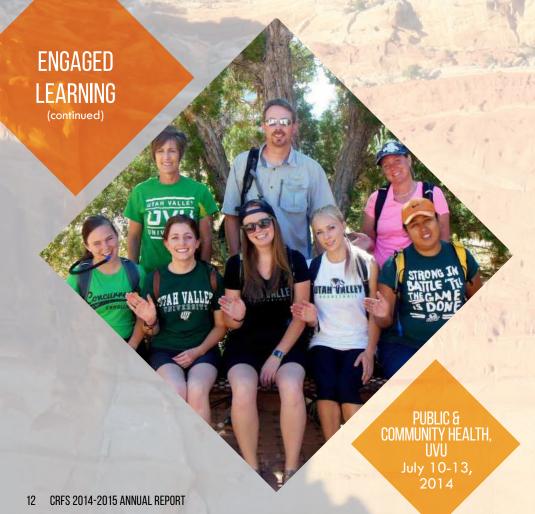


FIG.4 Ninety-nine percent of our visitors (n = 393) strongly agreed (88%) or agreed (11%) that their educational/learning experience was enhanced by their visit to the field station.

FIG. 5 Ninety-five percent of our visitors (n = 396) strongly agreed (87%) or agreed (8%) that the engaged learning activities and environment at the field station are difficult to replicate on campus.



Drs. James Bemel and Mary Brown visited the field station with six students to assess and discuss environmental health topics that could be found and illustrated in the surrounding area. Prior to their trip, Dr. Bemel submitted a proposal to our grant program and was awarded funding for their visit, which was a curricular innovation. In describing the trip, Dr. Bemel speaks about the needs-assessment the group did in the local towns. He explains,

"The assessment was designed to determine the availability of healthy foods in each town. The students were split into two teams with one faculty member accompanying each team. The towns were split into 'east' and 'west' groups based on their location compared to the Capitol Reef National Park Visitor Center. A large amount of data was collected by the students, providing them a real-world opportunity to apply what they had learned in HLTH 4140." Every fall semester, Dr. Michael Stevens takes his Plant Ecology students to the field station to study various plant communities. During the trip, students collect data to take home and analyze. Dr. Stevens explains,

"Our trip to the field station was a great opportunity to see a variety of plant communities. On the way, we saw communities dominated by sagebrush, pinyon-juniper, and aspen. We stopped by Fishlake National Forest to see the aspen clone named Pando, the largest organism in the world! At the field station, we hiked to Pleasant Creek discussing plant adaptations to the desert on our way. Along the creek, we set up a transect with quadrats to collect data on the frequency, density, and dominance of the trees and shrubs growing in the area. After returning home, students were able to compare their data from the Pleasant Creek riparian forest to data they collected previously from a montane forest near Sundance. For the two forests, they made assessments of species richness and diversity, productivity, and susceptibility to invasive species."

> PLANT ECOLOGY, UVU October 24-25, 2014

ENGAGED LEARNING (continued)

ENGLISH A A SECOND LANGUAGE PROGRAM LEVEL IV, UVU March 16-19, 2015 Kevin Eyraud, along with other faculty from the Department of English Language Learning, leads students from their English as a Second Language courses on trips to the field station each Fall and Spring semesters.

> K e v i n shares the experiences from the most recent trip,

"CRFS was ideal for the learning goals for our group in that we had 'handson' opportunities to engage with the target language for the topics selected for the semester. There was also an affective element to the activity where students were able to engage with English in extended and real-world contexts, both with their professors and with each other.

We had class meetings in the main building at the CRFS as well as class activities during hikes. This trip represented the 14th iteration of the English as a Second Language Program, Wilderness Writing Workshop, conducted while students hiked the Cohab Canyon Trail. We also hiked the Hickman Bridge trail and the Cassidy Arch trail. Our very special guests, Chip and Linda Ward, also visited us. As former inhabitants of Sleeping Rainbow Ranch and author of Canaries on the Rim, our students' experience was greatly enhanced by their presence and discussion. In other words, the Level IV English as a Second Language program students thoroughly engaged with the target concepts and language surrounding these topics while at the CRFS."

GEOLOGY, MT. SAN ANTONIO COLLEGE June 25-28, 2015

This was the first year a class from Mt. San Antonio College, located in Walnut, California, utilized the field station. This course traveled to many areas the Colorado across Plateau, learning more about the geography of the area. Rebecca Walker illustrates,

"Proximity to our mapping area, cooking and lodging facilities, workspace for lectures and presentations, and remote location of the facility made CRFS the ideal home base for our field activities in the park. We are particularly appreciative of the astronomy instruction that Gina provided and the infusion of environmental conservation/ sustainability into our stay at the field station. We hope to be invited back to the field station in the future and would like to stay longer the next time that the course is offered to allow time for additional mapping projects, enrichment activities on the biological and archeological resources in the area, and service learning.

The skills and content knowledge acquired during our time in Capitol Reef are far beyond those in a typical introductory-level geoscience course, further strengthening the assertion that fieldwork is essential in the recruitment and retention of geoscience majors. With respect to course curriculum, our cognitive, behavioral, and affective instructional objectives were exceeded. Thank you very much for the important role that CRFS played in the implementation of this course."

The majority of research at CRFS involves UVU students mentored by UVU faculty. CRFS encourages a variety of research, scholarly, and creative activities linked to the Colorado Plateau by helping to fund relevant projects. Please consider submitting your proposals to our competitive grant program funded by our endowment, the Bill J. and Margaret M. Pope Colorado Plateau Field Institute Fund.

This has been a very productive year for researchers at CRFS. Ten UVU students were lead authors or coauthors on six presentations shared at scholarly venues in Utah, Washington, and British Columbia. In addition, Dr. Emily Holt of UVU's Biology Department published a lichen field guide produced with students in her Lichens and Bryophytes class. Read on to learn about some of the research projects happening at CRFS.



This has been a busy year for Dr. Kim Nielsen of UVU's Physics Department. He led multiple trips to the field station involving both research and class groups. He relates,

"This year presented several exciting and new activities for the high altitude research group as well as the Department of Physics involving the field station. In terms of scholarly activities, the major activities focused on testing existing and new **OPTICS** instruments, while the RESEARCH instruments played key roles in curriculum through field visits to the site. The existing system hosted in the research trailer is a Keo Sentry airglow imaging system. While this system is designed for continuous data acquisition, software control and sporadic network have limited the use of the instrument in terms of transformative research. Instead, its main use was during two observation campaigns in PHYS 492R (Basic Space

Plasma), where the class visited the field station over two weekends in Fall 2014. Both times the students set up the instrument with a variety of filters for specific observation goals and presented their findings by the end of the trip. The last trip also included final project presentations. At the beginning of the spring semester, Professor Nielsen was fortunate to be offered a state-of-the-art new airglow imaging system for testing during the year by Keo Scientific. The system was installed in early February and equipped with a hydroxyl (OH) narrowband filter to monitor the brightest airglow emission. During visits to the field station, the instrument acquired data to evaluate its capabilities and compare with existing systems. In early April, PHYS 1800 (Energy You and the Environment) engaged in an exciting field trip to the station where they learned about solar-powered systems, sustainable housing designs, and

worked on course projects. The research highlight of the year was testing of a new low-cost airglow imaging system built by Professor Nielsen and four students in the research group. The system was brought down to the station in mid-April and the initial testing produced exciting data. This data set was presented at a world-leading conference in upperatmospheric research. All the activities had participation of students, and for the courses, the visits to the field station were listed as 'best college experiences.'"



Fluvial geomorphology researchers take full advantage of the field station's close proximity to Pleasant Creek. Dr. Suzanne Walther of UVU's Earth Science Department writes,

"This past year, monitoring of the geomorphology and flood impacts on Pleasant Creek continued in both student research projects (Alison Stallings and Bret Huffaker) and with the earth science Spring 2015 Geomorphology (GEOG 3500) course led by Drs. Nathan Toké and Suzanne Walther. The projects include measurements of channel change and erosion and deposition following a flash flood using traditional and new techniques, and a new project investigating longer-term change through seismic surveying and stereo-imagery. We plan to continue long-term monitoring of the creek in the future to quantify changes due to climate change and human activities."

FLUVIAL Geomorphology Research Research at CRFS led by Dr. Emily Holt of UVU's Biology Department has resulted in a published field guide entitled Macrolichens of Capitol Reef National Park and a presentation on lichens at the Entrada Institute. She shares,

"As part of a research-based field class, Dr. Emily Holt and 13 UVU students inventoried four sites within Capitol Reef National Park in September 2013 to



search for macrolichens. They identified 234 collections representing 42 unique species. In a collaborative effort, they authored a professional-quality field guide of the lichens of the park. Using regional floras and the scientific literature, students: (a) wrote an introductory background about the different types of lichens and their uses; (b) created a taxonomic key to aid in identification of the lichen taxa we encountered: (c) wrote detailed species descriptions, including morphological and chemical characteristics and interesting facts about each species; (d) illustrated photographed every and/or species; and (e) prepared a complete glossary of relevant lichen terminology. Dr. Holt compiled all this work and hard copies of the guide were printed through UVU Printing Services (remaining copies available through eholt@uvu.edu).

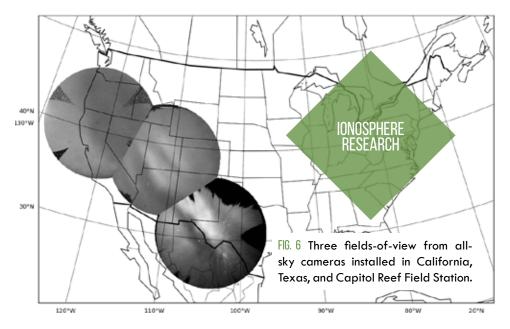
On 30 May 2015, Dr. Holt was invited to give a presentation on her work for the Entrada Institute in Torrey, Utah. She provided a brief history of lichens and their uses and shared some of her students' work on the field guide. She also gave an update on a current project stemming from the field work in September of 2013. Dr. Holt and three of the students from her 2013 Lichens and Bryophytes class have tentatively identified one of their collections as a rock-dwelling cyanolichen, Lichinella intermedia. The specimen was sent to a taxonomic expert in this group from Germany. If confirmed, this collection from Capitol Reef will represent the northern-most extent of this species and a state record. In addition, they are reviewing materials from this genus, the Rock Licorice Lichen, from several neighboring herbaria that was found in the Colorado Plateau/Great Basin region, to identify the general distribution of its circa ten species. They hope to prepare a manuscript on this work to be submitted to a peerreviewed scientific journal."

SRI International is an independent, non-profit research institute from Menlo Park, California. They are studying ionospheric waves using an all-sky camera they installed at CRFS. Dr. Asti Bhatt of SRI International writes,

"An all-sky camera imaging ionospheric airglow in the 630nm wavelength was installed at Capitol Reef Field Station in March, 2014 by a team from SRI International. This camera is part of a three camera network covering the U.S. west coast. The other two cameras are located at Hat Creek, California (operated by SRI) and at McDonald Observatory, Texas (operated by Boston University). The purpose of this network was to image large-scale processes in the earth's ionosphere.

lonospheric disturbances imaged by the airglow imagers can have origins in lower atmospheric sources (such as thunderstorms) or in magnetospheric sources (such as auroral storms). These disturbances often travel large distances that may cause problems in communication/navigation systems. Understanding the coupling of energy and momentum between various atmospheric regions is an active area of research. By creating a large fieldof-view to observe the ionospheric processes, we plan to observe the generation, propagation and dissipation of these waves and thereby gain an understanding of the source mechanism behind the disturbances. This will help us eventually calculate the energy transfer between the atmospheric regions.

In the time that the Capitol Reef camera has been operational, we have



observed wave activity spanning all three camera fields-of-view (Fig. 6). We see northeast to southwest propagating waves related to an electrodynamic instability in the ionosphere known widely as 'Perkins instability.'

There was intense thunderstorm activity on July 31, August 17, and August 18, 2014 over northern Mexico extending up to Texas and other southern states in the United States. We observed waves propagating towards the northeast in the Capitol Reef imager field-of-view, and later connecting to phase fronts in the California imager field-of-view. We are currently working to publish these results as these are the first observations of ionospheric waves at 250 kilometers from thunderstorm origin." Erickson R*, Hatch B*, Ogden TH (2015) Species list of insects in Capitol Reef National Park. Utah Conference on Undergraduate Research, St. George, UT.

Holt EA, et al. (2014) Macrolichens of Capitol Reef National Park. UVU Printing Services, Orem, UT.

Huffaker B* (2015) Analysis of the geomorphic impact of a flood season on Pleasant Creek, Capitol Reef National Park. UVU Engaged Learning Week, Orem, UT.

Huffaker B*, Walther SC, Toké NA (2014) Analysis of the geomorphic impact of a flood season on Pleasant Creek, Capitol Reef National Park, Utah. Geological Society of America Annual Meeting, Vancouver, BC, Canada. Huffaker B*, Walther SC, Toké NA (2015). Remote sensing analysis of flash flooding in Capitol Reef National Park, Utah. Utah Geographic Information Council Maps on the Hill, Salt Lake City, UT.

Johnson S^{*}, Childs J^{*}, Pugh J^{*}, Patchett B^{*}, Nielsen K (2015) Low-cost airalow imager: Integration of CEDAR science into the undergraduate PUBLICATION AND research and PRESENTATION OF course curriculum. **CRFS RESEARCH** National Science Foundation CEDAR Workshop, Seattle, WA.

> Stallings A* (2015) Postflooding channel change detection of Pleasant Creek in Capitol Reef National Park. UVU Engaged Learning Week, Orem, UT.

*denotes an undergraduate researcher from UVU

Not only does the field station serve as an important destination for university undergraduates and faculty, we also hosted UVU/National Park Service-affiliated groups from the broader community. Please read the summaries of some of these visits.

CRAWNING AND MANAGER MINES



NATIVE AMERICAN INITIATIVE, UVU November 21-23, 2014

UVU's Native American Initiative and the Photography Department joined together on a project called UVU photoVoice involving Ute Mountain Ute students and their advisors from the Towaoc, Colorado, and White Mesa, Utah, reservations. Ken Sekaquiptewa, UVU's Native American Initiative Director, explains,

"This was part of a 10-month photo project called UVU photoVoice during which the Indian high school students used digital cameras, with guidance from photography faculty and UVU photography students, to capture elements of reservation and family life through the lens of their cameras. ... The Ute students and advisors were impressed with the uniqueness of the UVU campus within [the park] and with the opportunity to explore new sites and expand their knowledge of the area along with increasing their photography skills. ... The culmination of the project after the field station experience was the 'Hidden Voices: Native Peoples' photography exhibit of their work at the UVU Woodbury Art Museum at the University Mall in Orem, which took place in January 2015. The opening night gala reception was attended by the students and their parents and a total of 1,398 people attended the two-month run of the exhibit."

WAYNE HIGH SCHOOL, CAPITOL REEF NATIONAL PARK May 4, 2015

Capitol Reef National Park invited students from Wayne High School to the field station for the day. After a successful trip, another trip was planned for the fall for high school seniors to stay overnight and learn more about college and various career paths. Ranger Cindy Micheli describes,

"Capitol Reef National Park Superintendent Leah McGinnis initiated an introductory visit to the field station for Wayne High School students. With the support of school Principal Mary Bray, planning began in early 2015. Sustainability, Leave-No-Trace, and the peoples of Capitol Reef were chosen for the topics for field trip presentations, as students were drawn from biology and world civilization classes.

Students were quizzed in conversation about their experience at the field station, and responded very positively and enthusiastically when asked if they'd enjoy an overnight field trip to the station during their senior year to learn about resource careers and astronomy!"



ASTRONOMY AND GEOLOGY ENDORSEMENT COURSES, UTAH SCIENCE TEACHERS ASSOCIATION June 14-18, 2015

The Utah Science Teachers Association provides endorsement courses to licensed science teachers in the entire state of Utah to fulfill requirements to teach. Two of these courses, astronomy and geology, were held at the field station.

Dr. Duane Merrill describes the astronomy course:

"We had the most spectacular Wednesday night in the history of night skies. The teachers waited until 1:00 am to start the night viewing and then went to bed as the sun came up that Thursday morning. By the end of the evening all teachers were passing the constellation tests and the highlight for many of them was that they could use the telescopes and the constellations to find deep sky nebula, galaxies, and clusters. The tag team of teachers, daytime learning, and evening viewing was so enhanced by the field station. The ability to just walk out the door and be in the night sky was amazing."

Dr. Merrill also explains the geology course:

"The highlight of the trip may have been the trip to Glass Mountain. A close second was the Waterpocket Fold and the Burr Trail ascent and descent. Day trips to geologic areas, classroom instruction, and great people made this week memorable. The ability to apply geology ideas in the field was valuable. Slope, strike, and terms that used to be 'just terms' now have meaning. The facilities from instruction to food were very first class. The field station host was more than kind and it was our pleasure to visit with her."



Promoting conservation and excellent environmental ethics is a central priority for the field station. Conservation touches everything we do at the field station including the design of the buildings, the way we evaluate reservation requests, our visitor orientation, and all other aspects of operation. We carefully monitor water usage and trash production and keep our visitors informed of their impact on the environment. We recycle, compost, and re-use whenever possible.

ENVIRONMENTAL ETHICS

We seek to have a lasting impact on all our visitors. Not only do we want them to leave with a greater appreciation of the wonderful Colorado Plateau and Capitol Reef National Park, we also want them to practice conservation once they return home, and we brainstorm with them about ways they might accomplish that. In fact, 77% of our visitors (n = 354) reported learning new ways they can reduce their impact on the environment once they return home. Further, we were able to substantially increase our visitors' overall environmental awareness (Fig. 7). We also had a positive impact on visitors' perception of the value of protected, public lands (Fig. 8).

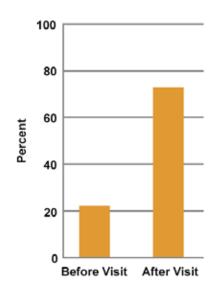


FIG. 7 Prior to arriving at CRFS, only 22% of our visitors (n = 371) rated themselves as "very aware" of their impact on the environment. That jumped to 73% of our visitors (n = 372) after their visit. In other words, during the relatively short period of time that most visitors stay at the station, the number who consider themselves "very aware" of their environmental impact more than tripled.

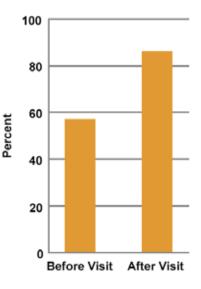


FIG. 8 Prior to their stay, 57% of our visitors (n = 374) placed a "very high" value on protected public lands like Capitol Reef National Park. After their stay, that increased to 86% of our visitors (n = 366), a more than 50% increase.



CORDELL ROY INTERN-**CINIMIN KOFFORD**

Cinimin Kofford was selected and welcomed back to the park for her second year as the Cordell Roy intern. She operated the Ripple Rock Nature Center, combining knowledge from her Outdoor Recreation major with hands-on experience from her previous summer to effectively educate visitors about environmental ethics and the value of protecting special places like Capitol Reef. This year, she also worked as the park's ligison for Arts and the Park, collaborating with BadDog Arts and the Utah Watercolor Society to hold events for people of all ages. Cinimin shares, "It's been wonderful seeing children's curiosity and

creativity as they learn about Capitol Reef history, geology, and wildlife. I am happy to know that these future conservationists will spread the word of preservation and protection of our wild areas among their friends."

ART INTERN-SAMI PRESTWICH

In honor of the upcoming celebration of the 100th anniversary of the National Park Service, CRFS teamed up with the park to The Cordell hire an art intern. Sami Roy internship Prestwich was chosen to honors a long-time help the park with their employee of the National re-branding project, Park Service. It is funded in part by which is being a generous private endowment from G. completed Kevin Jones, who is an attorney in the Office honor of the of the Solicitor, United States Department centennial. of Interior, representing the Utah units Sami is a UVU of the National Park Service. student working Cordell Roy himself also double towards a contributed to the major in Design and endowment. Photography with a minor

in

in Business Marketing. She has had other internships in the past, but says that nothing has been this hands-on.

Instead of working with a piece of the puzzle, she is responsible for all aspects of the project, which is unique for an undergraduate internship. She is able to create a complete feeling by putting text together with the photos. However, it's been more than graphic design: she's gained management experience through collaborating professors with from UVU and students in UVU's Photographic Illustration course. She remarked, "Collaborating with stuff like this allows you to see other views and receive input from people you can trust."

Working extensively with park staff has allowed her to gain a more intimate understanding of the park. She's enjoyed hearing romanticized stories of historic Fruita and is eager to convey its special meaning in her project.

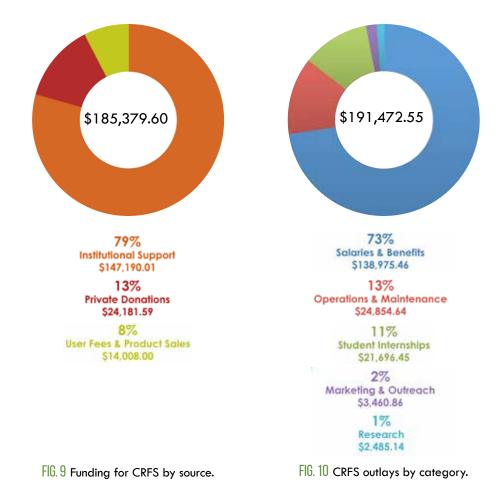
NATURAL RESOURCES INTERNS— Sarah Heelis and Matt Wang

This year, UVU sponsored two Natural Resources interns. Under the direction of the park biologist, Sarah Heelis and Matt Wang assisted with research on threatened plant species within the park: Wright's fishhook cactus (Sclerocactus wrightiae), Winkler's pincushion cactus (Pediocactus winkleri), and Last Chance Townsend daisy (Townsendia aprica). Sarah and Matt helped monitor the condition and numbers of these plants, re-visiting previously tagged individuals to observe their health and the health of their immediate surroundings. Capitol Reef is unique among national parks because cattle are still allowed to graze within park boundaries. To assess the volume of cattle traffic in a particular area, the interns ran frequency frame disturbance transects. Some days were spent in the office, working with computer programs such as ArcGIS, Microsoft Excel, and Microsoft Access. In addition to working with endangered plants, the interns spent time in the historic orchards with the park horticulturalist.

Matt noted, "It's great experience, and it's exactly the kind of work I want to do." Sarah agreed, noting that it was a valuable opportunity to have this experience "learning skills that apply to the career I want to have—conducting field research and working in a national park."

In addition to working with park staff, Sarah served as the CRFS intern. As such, she was tasked to complete a project that benefits the field station, and she chose to create raised beds that will be used to grow a small garden using the composted waste produced by the visitors. Sarah said, "I don't know how I'm going to go back to a regular classroom after this!"

INTERNSHIPS



CRFS is supported financially by three main sources: 1) institutional support from UVU, 2) private donations, and 3) funds generated by user fees and product sales (Fig. 9). This funding supports the salaries and benefits of the staff, operations and maintenance, student internships, marketing and outreach, and research (Fig. 10). While UVU generously supports the station, CRFS relies on private donations to fund important programs such as student internships and research. If you value our mission, please make a donation at:

<www.donate.supportuvu.org/crfs>.



FINANCIAL REPORT 31

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 (94%) of our visitors strongly agreed that our facilities (dormitories, kitchen, equipment, etc.) were sufficient for their group's needs. Additionally, 94% of visitors strongly agreed that our staff was helpful, competent, and professional.

FACILITIES REPORT

OFF-GRID POWER

Many first-time visitors leave their vehicles under the solar array without recognizing it as anything more than covered parking. Here at CRFS, visitors have the unique experience of knowing where all of their energy comes from. We take advantage of the abundant sunlight and capture solar energy with seventy-two 200-watt panels. Up to 14.4 kilowatts of power can be generated, which is stored in a bank of 48 batteries. Four inverters convert the electricity into a useable form, from DC to AC. In the event we lose solar capability, CRFS has a propanepowered backup generator.

HEATING AND COOLING

According to the U.S. Department of Energy, nearly half of the energy in a typical U.S. household goes towards 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 southfacing walls have been painted black and sealed with a pane of glass 4-6 inches in front of them. 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 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 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.

DARK-SKY RESOURCE

Of all the awe-inspiring views at the field station, one of the most spectacular is the clear night sky. The Colorado Plateau is home to some of the darkest skies in the lower 48 states. This year, Capitol Reef National Park received an international designation as a Gold-Tier Dark Sky, proving that this precious resource is truly noteworthy. 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. A 12-inch Dobsonian telescope gives visitors the opportunity to see the rings of Saturn or Jupiter's moons, among numerous other celestial objects, inspiring a deeper appreciation of the night sky as a precious resource.

WATER CONSERVATION

Guests have the unique opportunity to learn exactly how much water they use on a daily basis while at the field station. Because all water is treated on-site, visitors take care to use this resource wisely. Water consumption awareness is often noted as one of the most interesting conservation strategies that visitors learn while at the field station. Reduced-flow shower heads cut back on the amount of water used, with a flow rate of 1.5 gallons/ minute instead of 2.5 gallons/minute 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. To increase awareness of how much water is being used, all faucets have the flow rate displayed in gallons/minute. In the kitchen, three separate tubs are used to wash, rinse, and sanitize, which allows guests to clean dishes without constantly running the water. This year, new dual-flush kits were installed on all toilets, allowing

users to make a water-wise choice. A partial flush uses 1 gallon for liquid waste, reserving a full-powered 2.25 gallon flush for when it's really needed.

ON-SITE WATER TREATMENT

Water at the field station comes from Pleasant Creek, a perennial stream that has supported life in the area for millennia. A solar-powered well and pump bring water to the on-site treatment facility. To purify our water, CRFS uses a membrane-filter technique that uses a series of filters, including two nano-filters. 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 state standards.

EROSION CONTROL

Permeable payement limits the amount of erosion caused by the existence of field station buildings. The interlocking payers allow precipitation to slowly disperse into the soil below, allowing natural ground-water recharge. This useful technique allows topsoil to capture contaminants before the water is returned to the environment. Rain water from the buildings is collected in barrels and can be used to water plants.

RECYCLING AND COMPOSTING

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. This year, we have set up a composter to convert fruit and vegetable scraps into nutrient-rich soil for our new raised-bed aarden. These two methods allow visitors to lessen their environmental impact by decreasing the volume of trash they produce.

FACILITIES REPORT

On a hike from CRFS, visitors will be rewarded for being attentive to their surroundings. A diligent observer may see tracks, scat, or even meal leftovers from the field station's most elusive visitor. the bobcat. These stealthy felines are rarely seen by people as they are most active at night and spend their days sheltered by rocks. If seen, one can identify the bobcat by the tufts on its ears and its "bob" tail, for which it is named. They prefer broken woodlands with cliffs and rocky outcrops. They patiently wait for their prey to pass by and attack with a quick leap. Though they prefer rabbits, they will also eat rodents and small nesting birds. Bobcats remain solitary when not breeding, and they will attempt to cover their scat, but often make only a slight effort. They retract their claws when walking, which is a helpful way to identify their tracks.

SPECIES SPOTLIGHT

SPECIES SPOTLIGHT 35

Last year we had five major goals including: 1) obtaining grant funding, 2) increasing visitation, 3) providing additional funding for staff, 4) improving conservation efforts, and 5) enhancing technology and communication infrastructure. We made significant headway in all of these areas. Please read about our progress in each of the five areas below:

We submitted a proposal for a \$25,000 grant from the National Science Foundation's Improvements in Facilities, Communications, and **Biological** Field Equipment at Stations and Marine Laboratories (FSML) program to obtain funding to conduct comprehensive planning to better meet our mission of engaged learning, research, and conservation. The planning grant will allow us to take advantage of our unique setting within Capitol Reef National Park to offer a variety of faculty-mentored research and learning opportunities to a diverse group of UVU students. Additionally, we proposed to study and learn from other field stations, like ours, that are located in U.S. national parks and run through university partnerships.

This year was our busiest ever, with 2,108 user days, representing a 22% increase over last fiscal year. To achieve this, we held an on-site open house in the fall and a virtual open house at UVU in the spring. Additionally, we encouraged use during the winter and had our busiest November and December ever with a Natural Resources Management group, a Ute Youth group, a writing group, and a Space Plasma Physics group.

With the help of Associate Vice President Fred White and Senior Vice President Jeff Olson, we secured one-time funding for an Assistant Site Manager and additional hours for our Administrative Assistant, Annette Harrington. 4 With regard to conservation, we installed dual-flush toilet kits this year. The dual-flush kits give the option to choose a 1-gallon flush for liquid waste or a 2.25-gallon flush for solid waste. Our previous toilets flushed 2.25 gallons every time, so the dual-flush kits will substantially reduce our water use.

5 To our visitors, perhaps the most noticeable advancement this year was our high-speed internet service that allows for a telephone! We now have a UVU extension (5640). Give us a call! To aet broadband internet and voice communication to the field station effort required a cooperative between UVU, the National Park Service, the Utah Education Network,

and Beehive Telecommunications. We are now utilizing microwave paths from the field station to the solar-powered Miners Mountain communication site. From Miners Mountain, the Utah Education Network installed a microwave path to a Beehive Telecommunications tower, where UVU and the Utah Education Network connect to broadband via Beehive Telecommunications. Our staff can communicate more effectively and courses see fewer limitations when participants have access to broadband internet. Improved connectivity is particularly important as we pursue new research opportunities that could be enhanced by remote use of the facility by UVU faculty and staff.

In addition to these achievements, we rebuilt our website. This was a long process with a lot of input from our advisory board as well as web development. You can visit our new webpage at <uvu.edu/crfs>.

Finally, during the past year we also welcomed a new site manager, Gina Gilson, who immediately had a positive impact and is proving to be a wonderful addition to our staff. Before coming to CRFS, Gina was utilizing her background in environmental science while working at a field station in the tropical forests of Costa Rica. Though the landscape was radically different, her experiences there have equipped her with a unique perspective, and we look forward to her involvement as CRFS moves forward.

WHERE CRFS IS HEADED

WHERE CRFS IS HEADED (continued)

For 2015-16, we plan to focus on the following objectives:

STRATEGIC PLANNING FOR A NEW CLASSROOM/LABORATORY BUILDING

As part of our strategic planning efforts, we will seek input from station users and other interested parties on a new classroom/laboratory building at CRFS. After gathering ideas, we will commission architectural renderings of the new building and obtain bids from contractors.

INCREASING STAFF FUNDING

We will seek on-going base funding from UVU for increased hours for our Administrative Assistant. Our Administrative Assistant, Annette Harrington, is hard funded by UVU to work for 12 hours/week. This was sufficient in 2009, but in 2015 we have three times as many user days (Fig. 1). Additional time (16 more hours/week for a total of 28 hours/week) is needed to effectively administer our growing program. Further, we will seek on-aoina base funding for an Assistant Site Manager. Our agreement with the park stipulates that a Site Manager be present at the station whenever the facility is scheduled with visitors. This can be particularly demanding in the fall and spring, when use of CRFS is most intense. For example, we were once reserved for 60 days straight, which is an unreasonable amount of days for the Site Manager to work consecutively without any days off. As we seek to increase student participation in engaged learning activities, and our reputation grows, we will only get busier. An Assistant Site Manager could cover weekends during our busy seasons, give our Site Manager time off periodically, and allow our Site Manager to participate in meetings and attend to other field station business.

MARKETING THROUGH SOCIAL MEDIA

We plan to increase marketing efforts through social media by actively managing a Facebook page that highlights the activities of various groups at the field station. We also plan to pursue other options for social media, such as Instagram.

DEMONSTRATING SUSTAINABLE PRACTICES

In the coming fiscal year, we will demonstrate sustainable practices by composting our visitors' food waste and using the composted soil in raised garden beds constructed at the station. Further, we will water the raised beds using rainwater collected from our roof and stored in rain barrels. All of these sustainable practices can be incorporated into our visitors' lives when they return home. We hope to reduce the amount of trash produced per group by diverting a lot of heavy (and useful) waste into our composter and garden beds.

Big changes are underway and you can be a part of it! With your financial support we can build a new classroom/laboratory 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 to contribute. Donations are tax-deductible and we will honor your contribution by listing your name in our annual report.

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

Photographs are provided by CRFS staff, trip leaders, or station visitors.

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

A big thank-you to our perennial supporters!



CAPITOL REEF FIELD STATION 2014-2015 ANNUAL REPORT

