exploring the layers of

CAPITOL REEF FIELD STATION

2019/2020
ANNUAL REPORT

UVU

layers of the report

page#

DIRECTOR'S INTRODUCTION

"One positive side effect of COVID-19 is that more and more people are getting outside and exploring nature since many of our typical indoor environments such as offices, schools, restaurants, and gyms are closed due to public health concerns. One drawback of more people enjoying the great outdoors, however, is that not everyone new to natural areas, such as Rock Canyon or the Bonneville Shoreline Trail, has the environmental ethics of a seasoned hiker. For example, in these areas I've recently noticed more graffiti, cairn-building, and motorized vehicles on trails where motors aren't allowed.

This is where the benefits of a field-station experience come in. Capitol Reef Field Station (CRFS) goes beyond just getting people outside. Each of our visitors learns about the wonders of Capitol Reef National Park in the context of their academic discipline, be it art, science, math, history, or English. This academic context forges deep connections between people and the land and sets the stage for the careful cultivation of environmental ethics in our visitors that may not occur when people simply go outside. I'm so looking forward to the day when the station can re-open and re-engage our visitors in outdoor experiences with academic contexts and infused with training in environmental ethics."

DIRECTOR'S INTRO

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

ABOUT CRFS

OUR MISSION

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

OUR PLACE

Beyond the paved roads, our buildings sit atop a mesa in Pleasant Creek Valley in the heart of Capitol Reef National Park. The field station is surrounded by stunning views of canyon country. The sun rises over the last mountain range in the continental United States to be mapped, the Henry Mountains, and sets over Boulder Mountain, which was an

ABOUT CRFS

OUR VISION

Our vision is that our visitors leave the field station having learned more than the content of their coursework. Far away from many of life's daily distractions, visitors are able to immerse themselves in educational experiences that are enriched by 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 natural and cultural legacies of the Colorado Plateau.

ABOUT CRFS

OUR PARTNERSHIP

The success of CRFS is made possible through the partnership between UVU and Capitol Reef National Park. There are only ten other university-operated field stations located inside U.S. national parks. Our uncommon 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 by UVU in accordance with our 10-year general agreement with Capitol Reef National Park.

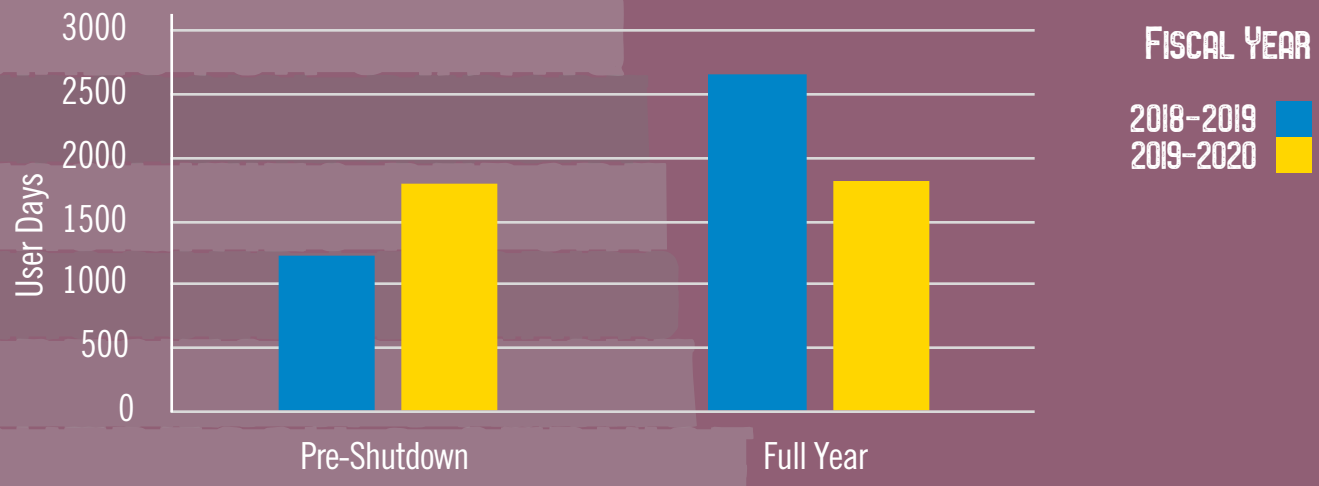
active volcano tens of millions of years ago and supported glaciers during the last ice age. At night, casual stargazers and serious astronomers alike can see the Milky Way and abundant constellations against a sky so dark that it's recognized by the International Dark-Sky Association. Only 3.5 hours from Utah Valley University (UVU) and the Wasatch Front, our incredible location provides an unparalleled opportunity for place-based learning.

VISITATION SUMMARY

As of March 13, 2020, visitation to CRFS was up 46% compared to the same time period in the previous fiscal year and we were on target for our busiest year ever. However, due to the public health concerns associated with COVID-19, CRFS had to close during some of our busiest months. As a result, our user days, calculated by multiplying the number of visitors by the number of calendar days they spent at the station, totaled 1,807. This represents a 32% decrease over the previous fiscal year and is the first time in the station's history that visitation has not increased from year to year (Fig. 1). We look forward to the day when we can again welcome visitors to CRFS!

Ninety-five percent of our user days were associated with UVU. Summit High School, Utah State University, and the National Park Service were other sources of visitors (Fig. 2). Visitors from UVU represented six of UVU's eight colleges and schools. We also welcomed visitors from other UVU programs, including: Professional and Continuing Education, the Outdoor Adventure Center, Institutional Advancement, CRFS, Honors, and the Office of Sponsored Programs (Fig. 3).

During the 2019-20 fiscal year, 572 people (including 246 undergraduates) visited CRFS in 31 groups. The average group size was 19 and the average stay per group was 3 days. Females and males comprised 55% and 45% of visitors, respectively.



VISITATION SUMMARY

Fig. 1

Visitation to CRFS in fiscal year 2019-20 was up 46% compared to the same time period (July 1-March 13) in the previous fiscal year and we were on target for our busiest year ever. However, due to the public health concerns associated with COVID-19, CRFS had to close its doors to visitors on March 13, 2020. As a result, our user days, calculated by multiplying the number of visitors by the number of calendar days they spent at the station, totaled 1,807 during 2019-20. This represents a 32% decrease over the previous fiscal year.

VISITATION SUMMARY

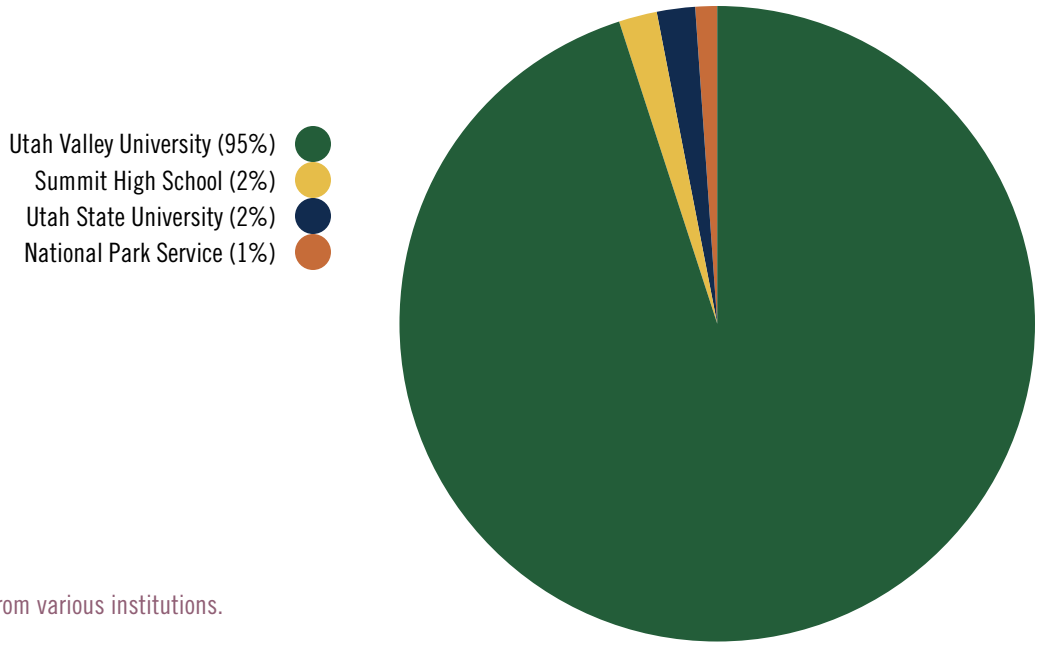


FIG. 2

Percentages of CRFS user days from various institutions.

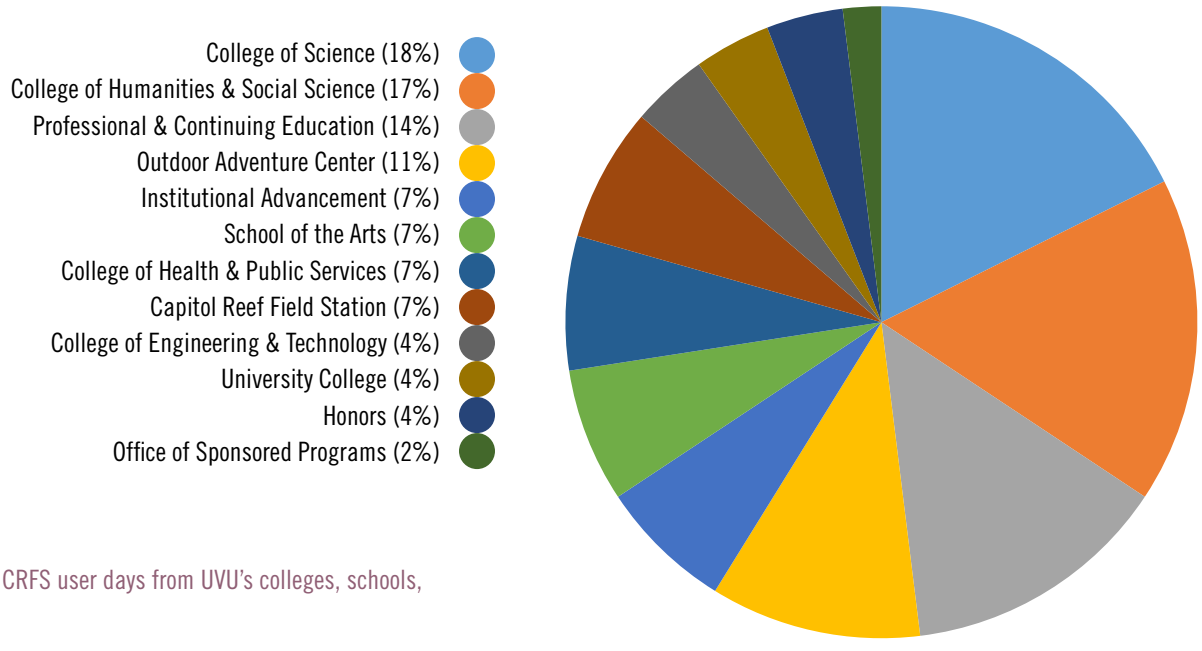


FIG. 3

Percentages of CRFS user days from UVU's colleges, schools, or programs.

VISITATION SUMMARY

GROUPS FROM OTHER UNIVERSITIES WHO VISITED CRFS

UNIVERSITY	GROUP
Utah State University (Logan, UT)	Utah Conservation Corps

RESEARCH GROUPS WHO VISITED CRFS

SPONSOR	PRINCIPAL INVESTIGATOR
National Park Service	Vanessa Shoenecker

OTHER GROUPS WHO VISITED CRFS

ORGANIZATION	EVENT
National Park Service	NPS Orientation
	NPS Orientation
	NPS Orientation
Summit High School	Alpine Summit Program

UVU AFFILIATED GROUPS WHO VISITED CRFS

SPONSORING ORGANIZATION	GROUP
Capitol Reef Field Station	CRFS Advisory Board Annual Meeting
	Star Party
College of Engineering & Technology	Digital Media China Workshop
College of Health & Public Services	Community Health Outreach Clinics
College of Humanities & Social Sciences	Philosophy of Art
College of Science	American Association of Physics
Institutional Advancement	Foundation Board Annual Planning Meeting
Office of Sponsored Programs	Grants Development Workshop
Outdoor Adventure Center	Mindfulness Workshop
	Trip Leader Training
	Wilderness First Aid
Professional & Continuing Education	Photography Workshop
	Plein Air Watercolor Workshop
	Writers' Workshop
	Writers' Workshop

UVU CLASSES WHO VISITED CRFS

COLLEGE	COURSE	TITLE
College of Humanities & Social Sciences	ENGL 1010 & 3020	Introduction to Academic Writing
	ENGL 1010 & 3020	& Modern English Grammars
	ENGL 2250	Creative Process & Imaginative Writing
	POLS 3030	Futurescapes Workshop
College of Science	BOT 4050/4055	Plant Ecology
	PHYS 1800	Energy, You, & the Environment
	REC 4400	Park Management
Honors	HONR 100R	Honors Colloquium
School of the Arts	ART 443R	Graphic Design
University College	ELL 2110-2140	English Language Learning

ENGAGED LEARNING

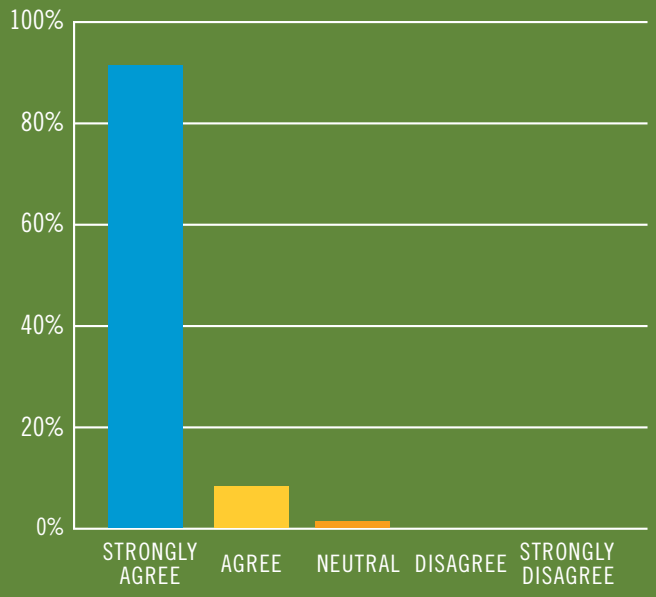


FIG. 4

Ninety-nine percent of our visitors strongly agreed (91%) or agreed (8%) that their educational experience was enhanced by their visit to the field station (n = 292).

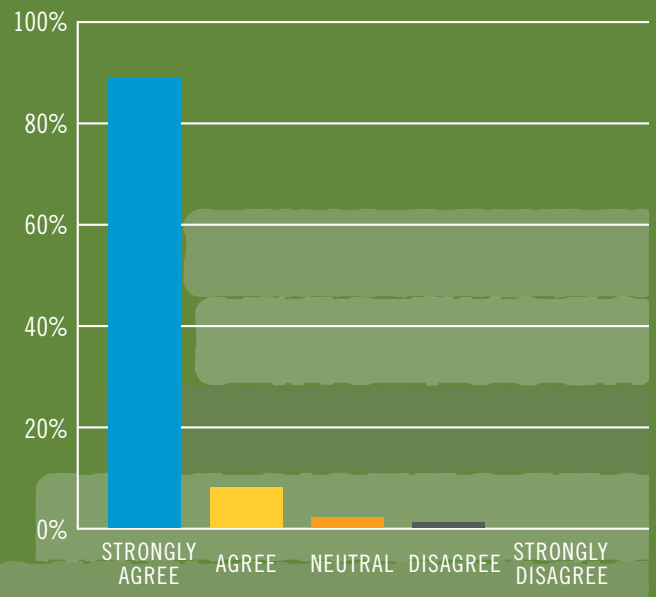


FIG. 5

Ninety-seven percent of our visitors strongly agreed (89%) or agreed (8%) that the environment at the field station is difficult to replicate on campus (n = 285).

ENGAGED LEARNING

At CRFS engaged learning is in our DNA. It is foundational to our mission and operations. Our visitors experience engaged learning in the heart of the Colorado Plateau in ways that cannot be duplicated anywhere else. The natural world is our classroom, and it profoundly impacts students.

In fact, 99% of our visitors (n = 292) strongly agreed (91%) or agreed (8%) that their educational experience was enhanced by their visit to the field station (Fig. 4). Similarly, 96% of our visitors (n = 290) considered the field station an important, valuable part of their education. In addition, 97% (n = 285) strongly agreed (89%) or agreed (8%) that the environment at the field station is difficult to replicate on campus (Fig. 5).

ENGAGED LEARNING

UVU

Design Studio (ART 443R)

July 28-August 3, 2019

UVU faculty Brandon Truscott and Ben Evjen took students to the field station as part of a Design Studio course, which addresses new topics, issues, and technology relevant to graphic design. As part of this course, the students and faculty collaborated on the first issue of the Phase 3 Mag, an annual project for graphic design students and faculty. That first issue, "Sleeping Rainbow Ranch," is built on the student work accomplished during their CRFS trip (https://brandontruscott.com/phase-3-mag). It was one of the winning entries in the 2020 American Institute of Graphic Arts 100 Show, Salt Lake City's most prestigious juried competition, that showcases the year's best design! Brandon describes a typical day for the group:

"We began each day at the Capitol Reef Field Station with an hour-long group discussion in the classroom building with a different focus on a specific aspect of graphic design history, theory, and practice. The students were given readings the night before to inform the discussions. After the discussion, we also gave the students specific information about Capitol Reef and a design prompt to go with it. We wanted students to make work around a theme that responded to the Capitol Reef environment. The design prompts were delivered as contrasting concepts open to interpretation as follows: Layers/Flat, Native/Invasive, Contaminated/Pure, Boundary/Open, Prickly/Smooth. The students would go to work independently or as groups during the day making art and design work related to the prompts. As faculty, we worked alongside the students making our own work and checking in on the progress of the students. At the end of each day, the students presented their work one-by-one for a group critique after dinner, again in the classroom building. The discussions were lively and informative, lasting as long as three hours."

ENGAGED LEARNING

UVU

Creative Process and Imaginative Writing (ENGL 2250)

August 3-5, 2019

UVU faculty member Amber Smith-Johnson brought her students to the field station for a multi-day writing exercise focused on creative non-fiction. They used the sights and sounds of Capitol Reef, specifically petroglyphs, Sulphur Creek, and the impressively dark sky as inspiration to create evocative, moving prose. For example, one of her students, Daniel Little, penned the piece, "Encountering Light."

When asked what they would change about their trip, students overwhelmingly wished it had been longer! Please read some of their comments about the trip:

Encountering Light by Daniel Little

"The creek, cliffs, and clouds are all cloistered together by the light. From Payne's-grey clouds it diffuses as if sneaking into a full lecture hall, so subtle that if not intentionally looked for, she would be missed. Yet, it is her kisses that cause the stoic canyon sentinels to blush in their shades of alizarin crimson, cadmium orange, and raw sienna. It is the movement of her fingers that fills the creek with watery diamonds as it flows through her hands. She glows; she thrums; she conceives; she bears. The earth springs from her womb, crevice and outcropping, insect and flower, wind gust and tree; all imbued with a part of her. Gazing intently at each I can almost see them pulsating with every touch of light. I long to capture her with photo, brush, or word, but from each she breaks free, leaving only her shadow.

The day breeze blows just as relentless as the engorged sun. He is always in a hurry, desperately trying to apply his cooling touch to each place the sun has scorched. But, when the sun puts the earth to bed and tucks itself behind the mountains, the breeze stops to catch his breath. He pulls up a chair beside mine. He is quiet for a time, but before long his fingers are gliding through my hair and behind my ears. He traces patterns across my neck and tumbles down my spine, his hands catching on my elbow, the crook of my knee, and my ankles just above black socks."

"The value of Capitol Reef is the ability to connect to nature and like-minded writers in ways that aren't possible in everyday life. The trip was honestly invaluable. I think every English major needs to go down there. I am honestly a better writer and person for having gone down." – Paris Simonsen

ENGAGED LEARNING

"My writing was heavily influenced by the environment and the scenery. I could notice things about myself and the world that were only possible due to the isolation and overall stress-free quietness that came with the field station. Offering this trip was a life-changing event for me. I've been to Capitol Reef plenty of times but none of them were as enlightening of an experience as this specific trip was. Between the writing prompts and the hiking, my writing took a step above where I thought I was capable of taking it." – Marston Kelly

"I will never have a better experience in school again. The trip is something so unique, you won't get an educational experience like this doing something else. I grew so much in just two-and-a-half days." – Mikayla Morganson

ENGAGED LEARNING

UVU
Honors Colloquium (HONR 100R)
September 6-7, 2019

Honors Program Director Dr. Kate McPherson brought a group of UVU Honors students for a program focused on listening. The CRFS trip was an important part of the Honors Colloquium experience and helped students meet the course objectives.

Kate depicts their listening activities as follows:

"While at CRFS, our students had reflective experiences listening to the sounds of the creek, wind, and wildlife around the field station. These reflective activities happened at different times of the day and night, which provided different ambient environmental sounds. We also had a reflective activity in the new classroom building focused on listening to recordings of experimental music. One of the unadvertised resources of CRFS is the genuine silence there. Yes, there are occasional airlines that cross overhead. But mostly, the environment around CRFS is free of the white noises that flood our campus and home communities. For any educational activity focused on listening (free from other distractions), CRFS is the most ideal location available to UVU students."

UVU
Energy, You, and the Environment (PHYS 1800)
February 21-23, 2020

Dr. Kim Nielsen from the UVU Physics Department took his students to the field station to learn more about sustainable design. His class focuses on energy production and consumption, and culminates in a semester-long project in which students design a home with a focus on sustainability.

Kim explains how the trip to CRFS supplements and extends the curriculum:

"CRFS, with its sustainable design elements, is an ideal location for the students to experience some of the topics learned in class in-person. Specifically, we spent time at the field station exploring the Trombe wall, the cooling towers, design location of windows, and how they are designed to be utilized as part of a passive cooling system in the summer. Of course, the students also got an opportunity to learn about the natural sciences of the park and local environment as well as exploring it through a hike."

ENVIRONMENTAL ETHICS

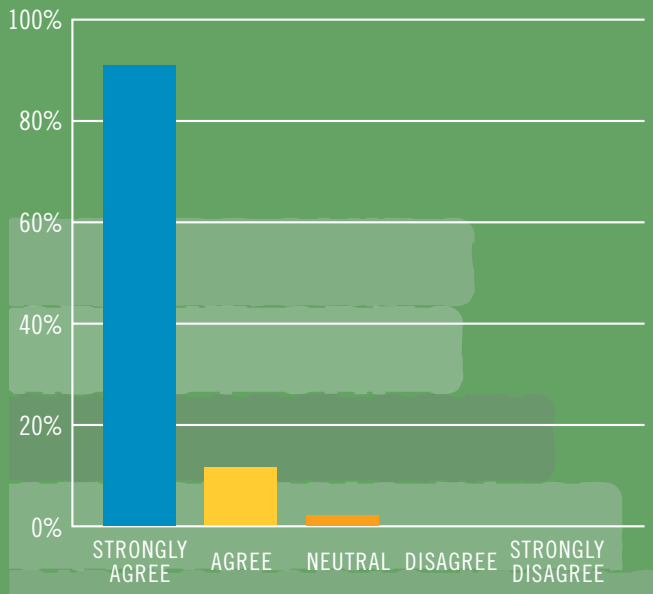


FIG. 6

Ninety-eight percent of our visitors strongly agreed (86%) or agreed (12%) that their stay at the field station made them more aware of their impact on the environment (n = 293).

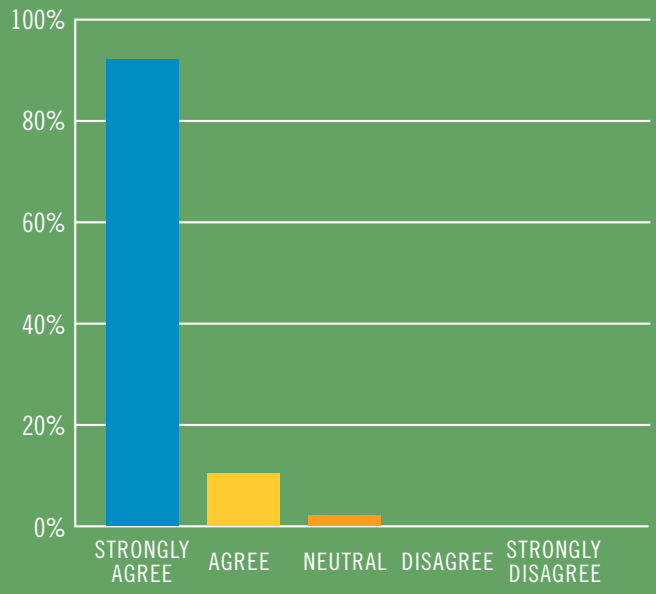


FIG. 7

Ninety-eight percent of our visitors strongly agreed (87%) or agreed (11%) that they place more value on public lands such as Capitol Reef National Park as a result of their stay at the field station (n = 293).

Environmental ethics and conservation are central to the mission of CRFS. As a self-contained facility operating in a fragile, desert ecosystem, we strive to minimize our impact on the environment. At the same time, we strive to maximize our impact on our visitors, teaching and modeling for them sustainable behaviors and practices they can use at the field station and also take home. Every group learns about sustainability both directly and indirectly. It is a critical part of each group's orientation, and visitors remain environmentally-aware during their stay as water usage and trash production are carefully monitored. Groups are able to see how they are doing and compare themselves to previous groups.

This year, 91% of our visitors (n = 281) reported learning new methods they can use in their day-to-day activities to reduce their personal environmental impact. Similarly, 98% of our visitors (n = 293) strongly agreed (86%) or agreed (12%) that their stay made them more aware of their impact on the environment (Fig. 6). In addition, 98% (n = 293) strongly agreed (87%) or agreed (11%) that they place more value on public lands such as Capitol Reef National Park as a result of their stay at the field station (Fig. 7).

ENVIRONMENTAL ETHICS

FINANCIAL REPORT

This year, the operating funds at CRFS came from three sources: 1) institutional support from UVU ($217,538.88), 2) funds generated by user fees and product sales ($15,649.76), and 3) private donations ($4,200.00) (Fig. 8). This funding supported the salaries and benefits of the staff ($162,776.88), operations and maintenance ($28,164.75), student internships ($13,629.20), marketing and outreach ($6,378.85), and research ($4,256.68) (Fig. 9). While UVU generously supports the station, CRFS relies on private donations to pay for new building projects and important programs such as student internships and research. This year, we are seeking donations to remodel the existing site manager's quarters to allow for an artist-in-residence or scientist-in-residence to stay at the field station long term.

If you value our mission, please make a donation at: www.uvu.edu/crfs/support.html.

FINANCIAL REPORT

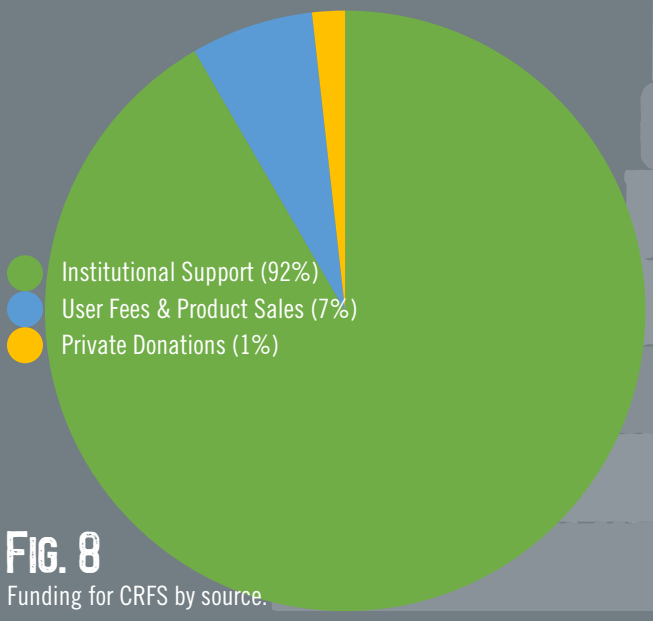


FIG. 8
Funding for CRFS by source.

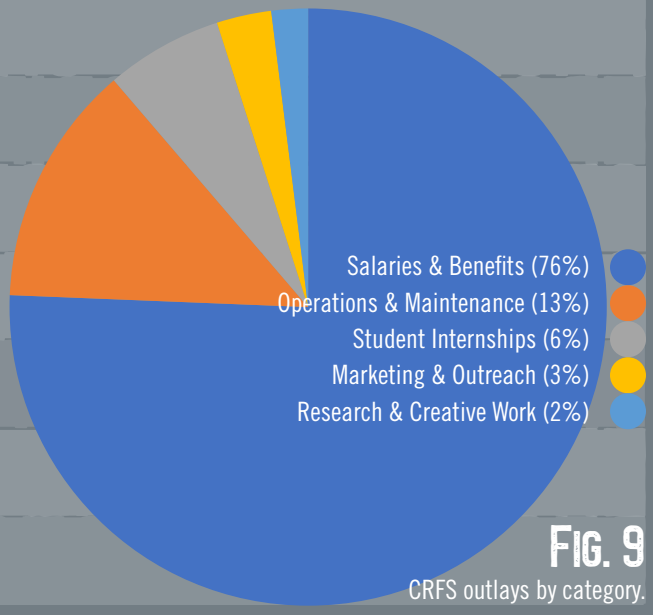


FIG. 9
CRFS outlays by category.

DRAGONFLY MERCURY PROJECT

Carolyn Livensperger, Capitol Reef National Park ecologist, and Joe Ceradini, CRFS site manager, received a CRFS grant to continue work on a nationwide National Park Service program examining the patterns and processes of mercury transport in ecosystems. Carolyn explains the project:

"Mercury is a contaminant that can originate naturally or be deposited in the environment through anthropogenic sources such as coal-fired power plants, causing harm to humans and wildlife. The Dragonfly Mercury Project (DMP) utilizes dragonflies as bioindicators of mercury pollution in order to understand mercury contamination throughout the National Park Service (https://www.nps.gov/articles/dragonfly-mercury-project.htm). Dragonflies are well-suited as bioindicators of mercury contamination because they can accumulate mercury for up to 5 years while in the larval stage, are an important food source for fish, and are relatively easy to collect. The DMP has collected data from over 100 national park units across the country, resulting in a dataset that will help elucidate large-scale patterns and processes of mercury transport. This would not be possible without a survey effort coordinated between national park units across the country. Capitol Reef is contributing to this effort by collecting dragonfly larvae at different sites in the park, which are then analyzed for mercury content.

In July 2019, field technicians, including UVU intern Justus Thomas, surveyed areas in Pleasant Creek with slow-moving or stagnant water ('backwaters') for dragonfly larvae. A sufficient number of larvae were collected to send for mercury analysis, making it the third consecutive year that Pleasant Creek was successfully surveyed. Additionally, thanks to the CRFS grant, DMP agreed to provide matching funds for an additional site in Capitol Reef. We were not able to survey another site in 2019, but the DMP match can be used for a 2020 survey."

RESEARCH & CREATIVE WORK

RESEARCH & CREATIVE WORK

ACOUSTIC MONITORING OF MEXICAN SPOTTED OWLS

Sandy Borthwick, Capitol Reef National Park biologist, and CRFS Site Manager Joe Ceradini, received a CRFS grant to evaluate the efficacy of detecting Mexican spotted owls (*Strix occidentalis lucida*) using acoustic monitoring equipment. Sandy writes about the pilot study:

"Mexican spotted owls (MSO) are listed as threatened under the U.S. Endangered Species Act and are a management priority species for Capitol Reef National Park. An essential component of MSO management is knowing where they breed and nest, which can trigger specific management actions. However, surveying for MSO is challenging because they breed in the rough terrain of canyon country and most of the 'call and response' surveys to locate the owls occur at night, which requires hiking after dark in canyon country. It is therefore difficult to survey for MSO across large areas as well as to conduct repeat surveys, both of which are important for understanding MSO distribution and breeding behavior.

Acoustic monitoring units have the advantage of passively monitoring a potential breeding territory continuously for several weeks. It is also a non-intrusive survey method and is safer than hiking over rough terrain at night to conduct nocturnal surveys. If the acoustic units are found to be effective, the park intends to expand their use to help inform a backcountry management plan to be developed in the next few years. Visitation within Capitol Reef National Park has nearly doubled since 2013 with more visitors venturing into the backcountry where their activities frequently intersect with MSO territories. Canyoneering has become an increasingly popular activity, with many of the same narrow, steep-walled canyons occupied by MSO also being used by canyoneers.

The acoustic monitors have been deployed in several drainages in the park and MSO have already been detected! In one instance, traditional 'call and response' surveys did not detect a MSO while the acoustic monitor did, highlighting the potential value of this survey approach."

RESEARCH & CREATIVE WORK

PLEASANT CREEK WATERSHED PROJECT

CRFS Site Manager Joe Ceradini is blending science education and adventure on his watershed project:

"I plan to hike the entire length of Pleasant Creek, from the headwaters high on Boulder Mountain, to the confluence with the Fremont River east of the park, highlighting different aspects of the landscape along the journey while using the landscape to illustrate scientific concepts. I want to connect the public to the Colorado Plateau, Capitol Reef National Park, and CRFS by creating unique content to use for distance learning and public outreach. This is especially timely because of current travel restrictions and challenges due to COVID-19. The journey itself will be a part of the story, providing an informal and beautiful context for learning about scientific topics, such as ecology, hydrology, geology, and land management. Additionally, I'm conducting field interviews with local experts, such as a hydrologist, water manager, forester, and rangeland manager, to understand the landscape from multiple perspectives and to help convey scientific concepts.

Salt print of Pleasant Creek by UVU photography student Kevin Wellman

Pleasant Creek flows down an impressive elevation gradient in a relatively short distance, starting at close to 11,000 ft on top of Boulder Mountain and ending at nearly 5,000 ft where it joins the Fremont River—a 6,000 ft elevation change in fewer than 35 miles. Many interconnected aspects of the landscape change along with elevation, such as climate, plant and animal communities, watershed dynamics, land ownership, and land uses. For example, Pleasant Creek starts high in Dixie National Forest, briefly runs through state land at mid-elevation, then flows through the Capitol Reef National Park uplift, and finally onward to Bureau of Land Management and private land. The Pleasant Creek watershed is also important to the human dimensions of the landscape, since it is a perennial creek that supplies water to the field station, private lands in Notom, and, through a diversion, Lower Bowns Reservoir and Sandy Ranch. Pleasant Creek therefore connects many interrelated facets of the landscape, ultimately telling a broader story of watershed dynamics in the Intermountain West."

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*denotes a UVU undergraduate

OUTREACH & SERVICE

The presence of the field station in Wayne County facilitates the connection between UVU students, the local community, and the National Park Service. CRFS serves as an important destination not only for university faculty, staff, and students, but also for visitors from the region, including high school students. Additionally, seven different groups this year engaged in service projects such as small mammal research, graffiti removal, native seed collection, and invasive species removal, for a total of over 79 service hours.

OUTREACH & SERVICE

UVU Foundation Board

August 23-34, 2019

The UVU Foundation Board supports UVU through a variety of fundraising and promotional programs and activities. The Foundation Board held their annual meeting at CRFS in 2019 – our new classroom was the perfect venue! The annual meeting was well-attended, including President Dr. Astrid Tuminez, Provost Dr. Wayne Vaught, Scott Cooksey (Vice President of Institutional Advancement and Foundation CEO), and James Clarke (former Foundation Chair). Many UVU students attended as well and provided essential help throughout the meeting while also gaining valuable experience and connecting with board members. When the Foundation wasn't working on board business, board members and their families had the opportunity to learn about and explore the park, such as through a guided desert hike to a nearby petroglyph panel. Attendees also enjoyed the stunning night sky of Capitol Reef with the help of Dr. Karl Haisch, a UVU astronomy professor, who provided a night sky program that included CRFS telescopes – as always, Saturn was a hit! It was the first trip to CRFS for many board members and they were amazed with the top-notch, off-grid facilities and inspiring location. In addition to meeting the needs of the Foundation Board, we are always excited to share CRFS with more of UVU and hope we can continue to create connections with events like this.

OUTREACH & SERVICE

UVU Outdoor Adventure Center

Mindfulness Workshop

September 26-29, 2019

UVU's Outdoor Adventure Center (OAC), along with the Student Life and Wellness Center, hosted a mindfulness weekend at the field station. Participants were treated to a yoga class atop Cassidy Arch, led by OAC Director Kim Reynolds. In addition to yoga and meditation, the weekend also included classes on intuitive eating and creating a more sustainable lifestyle. CRFS Site Manager Joe Ceradini took the group on an interpretive hike in Pleasant Creek Valley, and gave them a tour of the field-station facility, explaining its unique off-grid design.

Kerri Scott, assistant wellness coordinator, explains why the field station was the ideal location, *"CRFS's sustainable model fell in-line with the group's overall theme of mindfulness. Rather than just sitting and being silent, we can teach students how to live mindfully."*

Natalie Melander, a UVU student majoring in illustration, summed up the group's experience, *"We were very present and awake to our senses the whole time. It was just bliss."*

OUTREACH & SERVICE

Summit High School
Environmental Stewardship
October 29-31, 2019

Summit High School serves at-risk Utah students, more than 80% of whom are in state custody. Summit teaches the importance of education and lifelong learning, and cultivates a commitment to personal growth in all areas of life. The trip to CRFS helped teach about environmental stewardship and helped students, many of whom had never been outside of Wasatch Front cities, develop a connection to the land. As trip leader Russ McKell told us, *"Conservation is only sustainable if we have future stewards of the land."* Russ further relates how lessons learned from nature can provide powerful metaphors to people working to understand the human condition and improve their lives:

"The students who attended this trip have been able to provide unique perspectives for their fellow-students in these sorts of discussions. Joe Ceradini (perhaps unknowingly) helped set the tone for this trip on our first hike to the petroglyph panel. During the hike, Joe stopped us at a juniper tree and taught the students how some plants in the desert shed branches in order to survive. With our students, these are the sorts of conversations we have with them: 'What do we have to give up (assumptions, behaviors, social circles, etc.) in our lives in order to survive?' 'What do we need to shed in our lives to live better lives?' 'What things in our lives are dragging us down and making our long-term survival and success more difficult (even if they feel necessary right now)?' Even though Summit teachers have conversations like this all the time with our students, the teachers who went on this trip now frequently draw on observations like the ones Joe shared with us (and other insights from our trip) when having these conversations."

OUTREACH & SERVICE

UVU & Capitol Reef National Park
CRFS Advisory Board/ Park Leadership Meeting
November 22-24, 2019

In an effort to further the partnership between Capitol Reef National Park and UVU, park employees Sue Fritzke (Superintendent), Dr. Jim Roche (Chief of Resource Management and Science), Sally Sprouse (Chief of Visitor and Resource Protection), Sandy Borthwick (Biologist), and Thann Baker (Archeologist), and CRFS advisory board members attended a meeting at the field station to discuss how they can support each other's missions. Two exciting collaborations were conceived that weekend. First, a more deliberate strategy for bringing students to do service work at Capitol Reef National Park was developed. Second, a social science research team that will support the park in gathering and analyzing data about park visitors and their activities was solidified. After the meeting, members of the board, along with their friends and families, spent the weekend sharing meals, singing songs, and exploring the area around the field station, including an interpretive hike to the petroglyph panel. CRFS Advisory Board Member Dr. Maria Blevins shares her experience:

"In addition to productive conversations about future cooperative efforts … fun was had. The field station worked its magic in providing the perfect backdrop for hikes, stargazing, sing-alongs, sunrise yoga, philosophical conversations, and enjoying meals together. The weekend served as a reminder of the important work done at CRFS and how it embodies engaged learning."

UVU & Capitol Reef National Park
Public Star Party
January 24-25, 2020

UVU, CRFS, and Capitol Reef National Park collaborated on a public outreach event focused on astronomy at the field station. UVU astronomy professors, Dr. Joe Jensen and Dr. Karl Haisch, led the event, teaching the public about star formation, the challenges of measuring the vast distances of our universe, and answering all the space questions visitors could think of. Unfortunately, the park was immersed in a rare temperature inversion during the star party, filling the park with low-hanging clouds. Despite the adverse conditions, 60 people attended the event, making it the best-attended public star party to-date at the field station! CRFS Site Manager Joe Ceradini and Capitol Reef National Park Rangers Shauna Cotrell and Dean Butterworth helped coordinate the event. Joe Ceradini says:

"Although not our typical star party due to the persistent clouds, the public had an opportunity to visit and learn about the field station, stay overnight in the park for free, and discuss the science and mysteries of our universe with professional astronomers! Next year we'll definitely see at least one star."

SPECIES SPOTLIGHT

The Mexican spotted owl (MSO; *Strix occidentalis lucida*), one of three spotted owl subspecies, is a nocturnal raptor that occupies forested mountains and canyonlands throughout the southwestern U.S. and Mexico. The owl is partially a habitat specialist (restricted to specific habitat types) but, interestingly, different populations of the subspecies prefer different habitats. The majority of owls are found in forested mountain ranges, which have received much of the management and conservation focus; however, where the habitat is available on the Colorado Plateau, MSO are only found in rugged canyons, including within Capitol Reef National Park. It is not clear if the differences in habitat preference are simply a result of habitat availability; in other words, would all MSO prefer canyon country if that habitat were available throughout their range? Or, are there other factors that vary throughout their range, such as prey density or climate, which influence habitat preference?

SPECIES SPOTLIGHT

MSO were designated as a threatened species under the Endangered Species Act in 1993. Since the owl occupies distinctly different habitats in different portions of its range, the threats to MSO vary depending on location. There are two primary threats to their habitat in forested mountains: 1) logging practices that promote even-aged, homogenous forests, and 2) high-intensity wildfires resulting primarily from decades of fire suppression. Fortunately, land management strives to be guided by science, and in recent years, as research has demonstrated the many downsides of homogenous forests and fire suppression, management practices have started to change. Managers now often promote more diverse forests and landscapes, and use low-intensity fire as a management tool. Both practices benefit many aspects of the landscape, including MSO habitat.

SPECIES SPOTLIGHT

The challenges are different in canyon country. Recreation, for example from hiking, rock climbing, and canyoneering, has increased dramatically in the last few decades. Visitation to Capitol Reef National Park nearly doubled in the last ten years, with 1,226,519 people visiting the park in 2019. There are more people on trails, more people in the remote backcountry, and the busy season is longer, all of which increase the likelihood of MSO being disturbed by the presence of people. One tool that managers have to protect MSO is closure of sensitive areas during the breeding season (April to August) when the consequences of disturbing an owl are greatest. Managers, and certainly tourists, do not want all trails and canyons closed from the beginning of April to the end of August, so it is essential to base seasonal closures on the best available science. To determine where MSO may be breeding in Capitol Reef, biologists survey for owls by listening for their calls at night and also by recording sound for several weeks in remote canyons with sensitive acoustic equipment (check out the Research & Creative Work section for more details). The results of these surveys help guide where and when temporary closures should occur.

NPS photo

In addition to recreation, livestock grazing and invasive plants may affect MSO in canyon country. While food webs are often a complex mix of interactions between multiple species and environmental factors, understanding the basic connections between plants, plant-eaters (like herbivores and granivores), and carnivores is important for good land management. In canyon country, MSO primarily eat herbivorous and granivorous small mammals, especially woodrats (a.k.a., packrats). So, factors that affect small mammals can also impact MSO. Through their alteration of plant communities, livestock grazing and invasive plants have been shown to influence small mammals like woodrats, in some cases reducing small mammal diversity and abundance, which in turn could influence MSO. More research is needed to better understand these relationships (current CRFS research focuses on these questions), which will result in better-informed management, and ultimately, healthier ecosystems and happier owls.

NATURAL RESOURCES INTERN
Alisa Baadsgaard

Alisa Baadsgaard, a Botany major at UVU, worked with the Resource Management and Science Division of Capitol Reef National Park during her internship. She worked throughout the park on a wide variety of fieldwork projects, including those focused on plants, animals, insects, and air quality. The field season began with five weeks of intensive cactus surveys focused on two endemic species, *Pediocactus winkleri* and *Sclerocactus wrightiae*, which are both listed under the Endangered Species Act. Surveys involve locating individual cacti and collecting data on demographics (such as life stage and phenology) and impacts from disturbance (such as from cattle trailing). Cactus monitoring has occurred annually for the last seven years, often with the help of UVU interns. This cactus monitoring helps land managers better understand population trends for these species, facilitating data-driven management decisions. Alisa also helped maintain game cameras and acoustic monitors used throughout the park to document elusive species such as mountain lions and owls. She participated in a variety of other fieldwork, including air-quality monitoring, invasive plant removal, native seed collection, fish surveys, dragonfly surveys, small mammal live-trapping, and riparian ecosystem assessment. She also helped with data entry and management, which are essential parts of management and science.

Reflecting on her internship, Alisa said, *"This internship has given me countless valuable experiences that have helped shape my future plans for graduate school and my career. I'm very grateful for the knowledge I have gained, the friends I've made, and the experiences I've had as the UVU CRFS natural resources intern."*

INTERNSHIPS

INTERPRETATION INTERN

Heather Moon

Heather Moon, also a Botany major at UVU, worked with the Interpretation Division of Capitol Reef National Park during her internship. Heather worked at the park visitor center more than any previous UVU interns. This gave her the opportunity to learn from park staff and to interact with and assist park visitors. Heather helped to engage and educate park visitors with weekly public presentations on the fascinating geology of Capitol Reef. She also gave history talks from the historic Fruita Schoolhouse, which gives visitors a glimpse into what life in historic Fruita was like and is only open if a park representative is present. Heather also had the opportunity to work with other park divisions, giving her a diverse internship experience. She helped the Resource Management and Science Division with native seed collection for restoration projects and with game-camera monitoring. Additionally, she received basic search-and-rescue training from the Visitor and Resource Protection Division and was able to assist on rescues throughout the summer, which is a unique and rewarding experience.

Summarizing her internship, Heather said, *"I had a unique and memorable time here at Capitol Reef as an intern. I learned so much about the park and gained valuable skills that I'll use for the rest of my life."*

FACILITES REPORT

NEW CLASSROOM BUILDING

Our new classroom building was completed spring 2019 and has greatly enhanced the field-station experience. Our visitors enjoy top-notch educational facilities while surrounded by the beauty of a remote valley in Capitol Reef National Park. The field station combines the endless place-based learning opportunities of the park with more structured classroom teaching, effectively providing the best of both worlds. The flexible classroom space has already facilitated many diverse educational activities, such as historic photographic processes, watercolor painting, mindfulness meditation and yoga, and wilderness first aid training. The classroom is also ideal for meetings and public outreach events. For example, the classroom was used for the annual UVU Foundation Board meeting in August, and to conduct the lecture portion of a public star party in January. We look forward to many more years of unique educational experiences in Capitol Reef!

FACILITIES REPORT

FACILITIES REPORT

DARK-SKY RESOURCE

Of all the awe-inspiring views at the field station, one of the most spectacular is the clear night sky. Capitol Reef National Park and CRFS take special measures to ensure the preservation of this resource, helping to retain the park's designation as an International Dark-Sky Park. 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. Additionally, all visitors learn about the importance of preserving dark skies and the small but effective steps they can take to reduce light pollution at the field station and at home. Our powerful telescopes give visitors the opportunity to see Saturn's rings, the Andromeda Galaxy, and countless other celestial objects, inspiring a deeper appreciation of the natural dark-night sky as a resource worth protecting.

OFF-GRID POWER

At CRFS, visitors have the unique experience of knowing where all their electricity comes from. We take advantage of the abundant sunlight and capture solar energy with seventy-two 200-watt panels, which produce up to 14.4 kilowatts of power and also provide shaded parking. Solar energy is stored in a cutting-edge lithium-ion (lithium-ferrous phosphate) battery bank. The batteries are more than 95% efficient and 99% of the energy stored in the batteries is available for use ("depth-of-discharge"). Finally, our batteries contain a more environmentally-friendly iron (ferrous) cathode than the commonly-used, environmentally-hazardous cobalt cathode. Four inverters convert the electricity from DC to AC so it can power our facilities. In the event we lose solar capability, CRFS has a propane-powered backup generator.

FACILITIES REPORT

WATER CONSERVATION

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

HEATING & COOLING

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

ON-SITE WATER TREATMENT

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

FACILITIES REPORT

RECYCLING & COMPOST

At the field station, visitors are challenged to think about their waste and where it goes. Often, what we consider to be “waste” isn’t waste at all! We recycle plastic, metal, paper, and glass. We also have composters to convert kitchen scraps, such as from fruits and vegetables, into nutrient-rich soil that is used for gardening. These two methods allow visitors to repurpose what would otherwise be trash, reducing their environmental impact and significantly decreasing the amount of trash produced.

NATURAL LIGHTING

The buildings at the field station were constructed with south-facing windows situated high on the walls. During the day, these windows supply ample natural light, in many cases eliminating the need to use regular lights. Once the sun is down, we continue to save energy by using energy-efficient bulbs.

EROSION CONTROL

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

STRATEGIC PLAN

CRFS staff utilize strategic planning to guide our operations. We have five objectives that direct our decision-making.

STRATEGIC PLAN

Salt print of Boulder Mtn. by UVU photography student Kevin Wellman

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

Our visitors represented a wide array of disciplines—from 75% of UVU's colleges and schools. Interest in utilizing the field station as a venue for engaged learning has grown at UVU over the years and this year we had the highest percentage of UVU user days ever (95%). Go Wolverines!

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

At the field station, we teach our visitors about environmental ethics and many report how they continue to conserve water and reduce waste—and even teach their friends and family to do the same—after they return home. This year, the environmental ethics we teach at the station were shared even more broadly to the UVU community and beyond. At UVU, Dr. Maria Blevins, Scott Williams, Joe Ceradini, Dr. Hilary Hungerford, and Kevin Eyraud gave a presentation about the field station at the David R. Keller Environmental Ethics Symposium. For the wider community, Kevin Eyraud published a book chapter and his doctoral dissertation on place-based eco-pedagogy using research done at CRFS.

STRATEGIC PLAN

3. Foster research and creative work that utilize CRFS as a venue from which to explore the Colorado Plateau.

Ongoing research and creative work involving the field station this year has resulted in seven publications and four presentations—our most productive year ever! Drs. Asti Bhatt and Elizabeth Kendall (SRI International) and their colleagues, using data collected at CRFS, shared their work on the ionosphere in four venues. UVU research and creative work included: 1) a report on our 2019 BioBlitz written by CRFS Site Manager Joe Ceradini and biologists and ecologists from UVU and the park, 2) a graphic design magazine that was produced by Ben Evjen, Brandon Truscott, and 15 UVU undergraduate co-authors, 3) a presentation highlighting a community-health excursion to CRFS given by three UVU students at UVU's Showcase of Undergraduate Scholarly and Creative Works event, and 4) a publication in the International Journal of Wilderness by CRFS Director Dr. Michael Stevens on the perspectives of National Park Service employees on university-national park field-station partnerships.

4. Continue to collaborate with our National Park Service field-station partners and build relationships with other relevant organizations.

One of the takeaways from the CRFS advisory board/park leadership meeting held at the field station in November 2019 was the need to connect UVU social scientists with the park to determine how increased park visitation affects the visitor experience and the natural resources of Capitol Reef National Park. Dr. Maria Blevins organized a team of UVU faculty from the fields of communication, outdoor recreation, biology, and earth science to address this park research objective. The team is currently working to obtain funding and the necessary permits to begin their research.

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

In terms of facilities, our new classroom building is enhanced with audio-visual equipment and wireless internet installed by UVU's Office of Information Technology. With regard to staffing and services, we are proud to report that 100% of our visitors (n = 293) strongly agreed or agreed that "the field station staff was helpful, competent and professional" and that 100% of our visitors (n = 291) strongly agreed or agreed that "the orientation was informative and helped [them] feel comfortable at the field station."

Capitol Reef Field Station makes a difference. So can you!

SUPPORT CRFS

Because of the support of our donors, we have completed the construction of our new classroom building that is fully operational for teachers and learners with audio-visual equipment, wireless internet, and a massive whiteboard! Our future plans include building an observatory that will allow us to capitalize on the internationally-recognized dark sky above the park. Additionally, we plan to construct a residence facility for our site manager and remodel the existing site manager's quarters to serve as housing for an artist-in-residence or scientist-in-residence. These facility expansions and modifications will enhance the field-station experience for all visitors and increase the field station's ability to fulfill its mission of engaged learning, environmental ethics, and research and creative work in the context of the Colorado Plateau.

Please visit uvu.edu/crfs/support.html to contribute.
Donations are tax-deductible to the extent allowed by law and we will honor your contribution by listing your name in our annual report.

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CAPITOL REEF FIELD STATION

2019/2020
ANNUAL REPORT

Thank you to Paul Fenske (UVU Printing Services) for layout and design.
Photographs are provided by CRFS staff or trip leaders unless otherwise noted.

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