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Mountain Views Chronicle

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Informing the Mountain Research Community

Cover Art: *Early October in the Park Range.* Painting for Candace Galen has been a passion, long backstage to her ecological research. Since 1978, she's spent summers probing the ecological relationships of flowering plants and pollinators above the trees. After retiring in 2021, she's been returning to the central Colorado Rockies with easel and paints to capture the spectacular setting of her research career. Artist: Candace Galen, Professor Emerita, Division of Biological Sciences, University of Missouri.

Mountain Views Chronicle Editorial Team

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From the Editors

Jan. 31, 2024

Earth science does not occur in a vacuum. We may treasure the fleeting, sublime moments alone with the mountains – finding an alpine lake all to oneself for sampling (or lounging) or seeing moon shadows cast on a field of fresh snow after a cold day in the field. But it's the community – today's and yesterdays' – that got us to that place. In addition to the ecological communities in which we work, Earth science is also a human endeavor, supported by an entire community not only of those with "scientist" as their title, but also those with the title of student, technician, community-observer, local-expert, outdoor safety professional, conservationist, or no particular title at all. Inspired by these myriad experiences that all build our community, comes our 2024 Mountain Views Chronicle theme—an exploration of **science in community**.

We find this theme a fitting dedication to the community of individuals without whom there would be no CIRMOUNT, no Mountain Views Chronicle, and 'gasp' no biennial MtnClim Conference to build and maintain the mountain science community!

Communities emerge and are sustained by many interacting relationships. This issue's *Feature Article,* "The Importance of Place, Power, and Purpose in Pollinator Conservation" by Melanie Kirby, MSc., bridges together the relationships between humans, the land, and other living beings– bees, flowers, and their environs–to highlight our connections and interdependencies with the natural world as a call for the preservation of culture and honoring of tradition.

The idea of science in community continues with five *Brevia* covering a range of topics made possible by community-based observations, from snowpack observations to soil moisture to education and simple chats in the field. We'll once again hear many shorter perspectives on "What does community science mean to you?" from *Voices in Wind*, a section that after a few years of silence sings once again.

Three *Field Notes* provide tales from a field season in Alaska following severe wildland fires; making connections with the community from the perspective of a social scientist; and a collaborative project between a zoo, multiple federal agencies, and community members to study Pine Martens in Washington's Olympic Peninsula. Last but certainly not least, the 2024 issue includes both contributed poems and fine art as our ways of expression are unlimited and always different, much like the colors the sky paints onto mountains at dawn and dusk.

The Editors wish to express our **gratitude** to those who contributed to the 2024 issue and also to all those who have contributed in the past and to those who may consider contributing in the future. The writing and art published in the Mountain Views Chronicle cultivate the growing and ever-diversifying community of scientists that we are honored to be a part of. On that note, we hope to see many of you at the 2024 MtnClim meeting this September!

Sincerely,

Benjamin Hatchett, Editor,
& the Mountain Views Chronicle Editorial Team

Feature Article

The Importance of Place, Power, & Purpose in Pollinator Conservation

Melanie M. Kirby, MSc.
Extension Educator; Institution of American Indian Arts

There is a place sculpted by fire, water, and air over millennia, where chiseled landscapes encircle a long river carrying the source of life from melting alpine glaciers through juniper-freckled canyons and into valleys growing apples, wine grapes, pecans, cotton, and revered chiles. This is New Mexico —a place where traditions honor heritage but where the disparities of America's colonial imprint are palpable (Alfred, T. & Corntassel, J. 2005). This 'Land of Enchantment' is home to my maternal ancestors. It is where the Pueblo, Apache, and Diné peoples reside (Dunbar-Ortiz, 2007). It is where I learned my origins, and where I presently reside and manifest my existence as a professional apiculturist (beekeeper) and consilience researcher.

Bees have exposed me to the vibrations of the world—the broadcast and reception of living things—from the murmur of rain whispering its seepage into soil, to the swaying of sun-seeking stalks as they crescendo into bursting blossoms full of perfume and weeping nectar, helping to nurture our ever-present cycles of life, death, and reciprocity. The bees help us make sense of an unfair and unjust society that can and shall be reformed into a manifestation of our own design. A fair world where cultural diversity is accepted and allowed to nurture individuals who are empathetic, motivated, and driven by reciprocity. The bees teach us the ultimate lesson: that it takes a community to survive and succeed.

Diverse bees on flowers. Image Credit: Melanie M. Kirby.

Consilience: the linking together of principles from different disciplines, especially when forming a comprehensive theory; unity of knowledge

~Merriam Webster

Efforts to develop and extend outreach, education, and community collaborations are paramount to igniting and furthering the warmth of reconnecting with our shared spaces to develop conscientious approaches to land and water stewardship. All peoples, no matter what color, creed, race, religion, orientation, and in whatever location, have Indigenous ancestry. Focusing on Re-Indigenizing approaches to stewardship and conservation un-cancels knowledge systems developed through millennia.

The term of "Re-Indigenizing" is a means of reconnecting through the '*un-cancelling*' of Indigenous voices and knowledge systems (Nelson, 2008). The recognition of diverse knowledge systems is not a new concept, but the act of acknowledgement and acceptance of diverse knowledge systems has long been suppressed by forced assimilation to Euro-centric ideologies and practices (Leonard et al, 2020).

The lack of acknowledgement and acceptance of Indigeneity as a viable knowledge system is in direct correlation to the intentional genocide of Indigenous peoples and their communities around the globe. By trying to erase the food and animals, such as amaranth and buffalo, for example, an erasure is enacted of a people: their cultural perspectives, their traditional practices, and their legacy of continuity from past to present to future—ancestors to descendants (Jaimes, 1992). Indigenous peoples and cultures the world over have developed their knowledge systems over millennia and the expression of 'Indigeneity' is better reviewed through distinct situations in time and place and through multifaceted relationships (Michelle Harris, 2013).

This multifaceted approach to existing is embedded with the larger shared Indigenous World View of interconnectedness and kincentric ecology (Salmón, 2000) and can be contextualized in reference to the Four R's of Indigenous Higher Education from Barnhardt and Kirkness, 1991 which include:

- Respect
- Relevance
- Reciprocity
- Responsibility

More recently three more R's were added, as presented by Paulette Blanchard, PhD. and Michelle Montgomery, PhD. which include:

- Rights
- Relationships
- Redistribution/Reconciliation

Contextualization of these seven R's is simultaneous within Indigeneity (Montgomery and Blanchard, 2021).

Our abilities as Indigenous researchers, and storytellers encourages us to marvel in community on the majesty and mystery of our natural world.

Honeybees on comb with red dot queen (indicating age of queen). Photo Credit: Melanie Kirby.

We have a responsibility to Re-Indigenize scientific inquiry and to promote cultural expression as multifaceted parts of a greater whole.

Creative communication through science and community storytelling can be shared across cultures, and beyond borders. By reflecting on what bees can teach us, we can forward those lessons of belonging to a community, to a place, and to accepting the responsibility that comes with acknowledging and respecting relationships of how we as humans came to exist across landscapes; we can then better advocate for fair and equitable stewardship practices. We can also better advocate for respectful and relevant approaches to diverse cultural perspectives and nurture reverential acts of reciprocity to ensure that our plant, animal, and pollinator relatives survive and thrive as

we hope to—across time and space and in relationship with all of us.

This inclusivity aspect includes matriarchal development of Indigenous Knowledge and stewardship approaches (Kuhnlein, 2018). As the cultural distinctions between communities of Indigenous peoples has been manipulated to create opposition with western Eurocentric managed ecosystems, we must consider the question if the human race will survive relying on only one knowledge system? Indigenous women have long standing traditions of caretaking plants and being fascinated with insects. One pervasive example is relationships with honeybees (*Apis mellifera*) in cultures around the world (Crane, 1999), from the stingless bees in the jungles of South and Central America and Southeast Asia (Catacora-Vargas, 2021) to the mountain bees in Africa (Randall Hepburna, 2000). The first known cave painting of honey collection was observed in Valencia, Spain in the Cueva de las Arañas. The painting depicts a woman collecting honey from a hive up in a tree. Humans learned about the healing properties of honey in addition to the healing properties of plants and the healing properties of food (Hajar, 2002). For over two decades, I have worked directly with farmers and beekeepers, across cultures and landscapes who inspired me to learn the language of 'western science' in order to serve as a translator between the field and the lab and to help quantify farmers' observations so that, collectively, we could better advocate for more sustainable food systems and biodiversity conservation.

My commitment to broaden the narrative is rooted in Indigenous Knowledge system and epistemology. I was, for many years, considered an 'outlier' in my approach and in my communication style, which integrates poetry and mixed media. My efforts bridge disciplines and perspectives.

Flower Path Collective members Roxanne Swentzell (Santa Clara Pueblo), Melanie Kirby (Mestiza-Tortugas Pueblo), Addelina Lucero (Taos Pueblo and Yaqui), Beata Tsosie-Peña (Santa Clara Pueblo). [Not pictured: Teresa K. Quintana (Kiowa/Cochiti Pueblo). Image Credit: Group selfie.

I returned to academia to pursue a graduate degree in Entomology from Washington State University to learn the language of western science. I currently serve as the Extension Educator at the Institute of American Indian Arts in Santa Fe, New Mexico which is a contemporary art tribal college. This position allows me the ability to weave diverse knowledge systems—both Indigenous and Western—to integrate the arts into environmental science communication.

The Land of Enchantment Pollinator Preserve Initiative, as nurtured by the Puebloan Matriarch collective, *Poeh Povi: The Flower Path* was recently launched to better support reforestation and pollinator habitat regeneration efforts in the wildfire-impacted Sangre de Cristo Mountain range and surrounding Indigenous and neighboring communities along the upper Rio Grande watershed in northern New Mexico. The collective will be working to establish seed sanctuaries (repositories) in northern New Mexico and conduct community outreach events.

Women's Indigenous Knowledge is not an imaginary ideal. It exists and is alive. It is vibrant and adaptive. It is what will nurture all of us—from infancy to elderhood into the future, over and over again…as part of the Indigenous legacy of continuity, of connections to place, and our commitment to accept the responsibility and the power to be better stewards of our pollinators, and our planet. This is our purpose.

(A longer version of this article is currently in publication through the UN-FAO KnowledgeMakers, 2024).

Black and white photo of the author. Image Credit: Anne Staveley.

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Brevia

Powder for the People - How the Community Snow Observations Project Improves our Knowledge of our Snow Resources

David Hill
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The Community Snow Observations (CSO) project started in 2017 with a simple idea — that public participation could improve our understanding of snow distribution and evolution in mountain environments. Snow is important (and amazing) for so many reasons. It stores winter precipitation for later use, it provides habitat, and it helps to keep streams cool throughout late spring and early summer. Unfortunately, our knowledge of the "where, when, and how much" of snow is incomplete. Part of this is because doing science in mountain environments can be more challenging than in lower, flatter regions.

First of all, conditions can be harsh. Cold temperatures, thin air (gasp), and strong winds all increase the difficulties of performing field work. Second, access can be an issue. In many areas, there are no roads. This can be due to complicated terrain or due to wilderness protection policies. Regardless, the need to carry all of your scientific equipment yourself can be a limitation to what science can be carried out. Finally, the complex terrain of mountain environments means that weather, vegetation, streamflow, and other landscape conditions vary rapidly. From a field work point of view, this may mean that you need to take measurements in a great many locations to be representative.

Automated snow measurement stations, such as those in the snow telemetry or

CSO Ambassador Claudio Artoni measuring snow at the top of the Editbreen Glacier in Spitsbergen, Svalbard Islands. Photo Credit: Claudio Artoni.

SNOTEL network, are incredible tools for research and management, but do not have as much spatial coverage as we might like. Large-scale modeling programs help to fill in the gaps, but are often very coarse, missing most of the variability that is found in the mountains. The CSO project addresses this incomplete knowledge by crowd-sourcing snow information from many different user groups that spend time in high-mountain snowy environments. Our participants include recreational users (snowshoers, skiers, and hikers), professionals (ski patrollers, avalanche forecasters), and educational programs conducting classes out in the field.

The Community Snow Observations science team conducting field work in South Central Alaska in spring of 2022. Photo Credit: Nina Aragon.

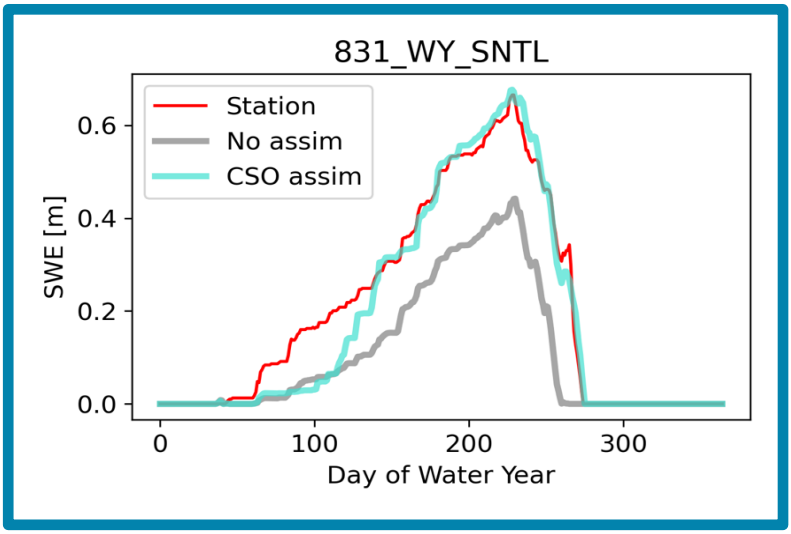

Figure 1: Example of the impact of community participation in our project. The snow water equivalent (SWE) from a station in Wyoming is shown for one water year. Without including public measurements (broad gray line), the model underpredicts the snowpack. When we include public measurements (broad teal line), the snow model's accuracy greatly improves. Credit: Christina Aragon.

Participating in CSO is very easy. Anyone can do it anywhere, any time they are around snow. You just need a measurement tool, such as a meter stick or an avalanche probe, and a smartphone equipped with the Snow Scope app from Propagation Labs (https://www.propagationlabs.com/app). When you enter the snow depth in the app, your phone notes the exact location and the time, and the measurement will be uploaded to our database as soon as you have service.

What do we do with these data points that we get from our community? We incorporate (a.k.a. assimilate) them into high-resolution models of snow distribution that we run across the United States. We run these models every day and, when we get a measurement from a participant that is different from what the model tells us, that information is used to do a course-correction on the model. This means that we adjust either precipitation rates or melt rates in order to help the model match the data. This process goes on throughout the entire snow season, so our models are constantly being nudged by the helpful observations we get from the public.

When we start getting snow depth submissions from the public (around day 100 of the water year, or mid-January), our model run 'with' data assimilation is quickly adjusted to match conditions on the ground (Fig. 1). Our work has shown that it takes surprisingly few measurements from the community to make a dramatic improvement in our ability to model the snow. By doing a better job of modeling the snow, we have the opportunity to also do a better job of predicting water availability throughout the spring and summer melt season.

From the outset CSO has wanted to be a two-way collaborative effort. Therefore, in addition to using data to improve models, it is also important to us to return real-time snow information to our participants that shows the value of their contributions.

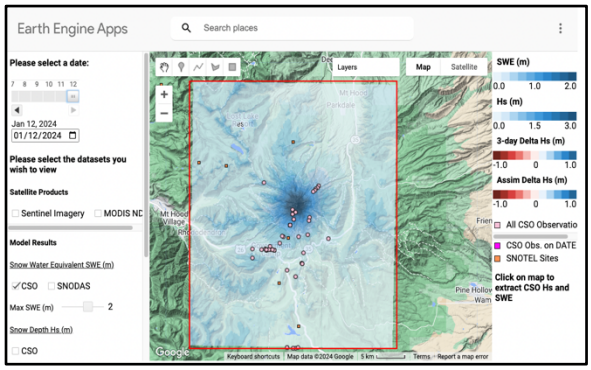

Figure 2: Example from mountainsnow.org, showing the modeled snowpack around Mt. Hood, Oregon.

We do this at mountainsnow.org (Fig. 2, previous page), where anyone can explore and interact with project model data and other sources of snow data, including satellite remote sensing.

We additionally and frequently engage our community through snow and avalanche workshops, public educational lectures, and more. We recruit new participants and ambassadors constantly and always welcome emails (communitysnowobs@gmail.com) and DMs at our social media channels (@communitysnowobs.org). The strong and steady growth in our project (Fig. 3) is a source of great satisfaction and optimism for our science team. You can't crowd-source without a crowd, and, as long as the outdoor community shows up and contributes their time and effort, we will do the same.

More information on this project can be found at: (communitysnowobs.org)

Photo of the author. Image Credit: Kendra Sharp.

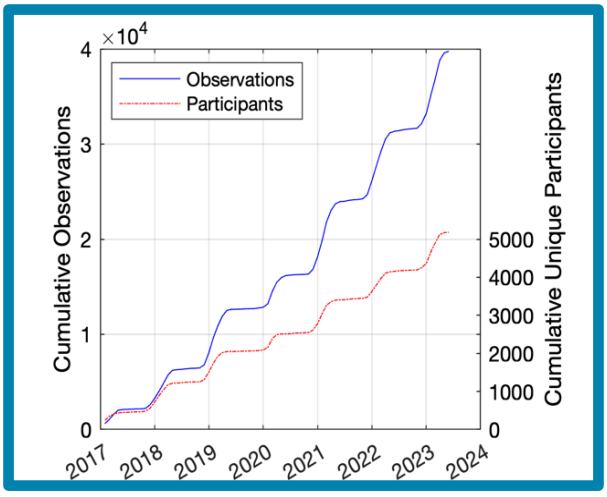

Figure 3: Cumulative participants and observations since the beginning of the Community Snow Observations Project. Image Credit: David Hill.

Poetry

Haiku

From Mountains in the Greenhouse, 2020

Sky, rock, sunlight, snow
The eternal wind rising
Follow the faint trail

~Don McKenzie

Don McKenzie is a fire and mountain ecologist, and one of the six founders of the Western Mountain Initiative. Currently he is editing a forthcoming 2nd edition of "The Landscape Ecology of Fire," to be published by Springer in 2025.

Brevia

Let's Go Sit on a Rock and Talk

Natalie Little
Intermountain Regional Sustainability and Climate Coordinator, USDA Forest Service (Natalie.little@usda.gov)

Mairin Glenney
NEPA Coordinator on the Ashley National Forest, USDA Forest Service (Mairin.glenney@usda.gov)

It was certainly a blessing to be able to work from home during the COVID-19 pandemic. However, after over a year of working from home, USDA Forest Service employees Natalie Little and Susan Leslie brainstormed on how to once again see each other, visit field sites, and share knowledge in-person. Spending time with people in-person helps in building trust, developing friendships, and providing opportunities for spontaneous interaction and solution development, including over breaks, lunch, and dinner. They envisioned a week-long workshop, with travel on Monday and Friday, presentations on Tuesday morning in-person, virtual, and recorded, and then 2.5 days of field visits with no phones, no laptops, no MS Teams, and no Zoom.

With the goals of relationship building, information sharing and face-to-face interaction, the first workshop of this model was held June 6-10, 2022 on the Dixie National Forest, based in Cedar City, Utah. The co-leads were Natalie Little, Intermountain Regional Sustainability and Climate Coordinator, based in Ogden, Utah and Susan Leslie, Sustainability and Climate Coordinator on the Dixie National Forest, based in Cedar City, Utah. They had their fingers crossed, and non-emergency travel was approved the month before the June 2022 workshop.

Workshop attendees at Government Park, Utah, June, 2023. Image Credit: Natalie Little, USDA Forest Service.

Work for this workshop had begun in 2021, when Natalie and Susan set out to create the agency's first ever Intermountain Regional Climate Change Coordinators' Workshop. It would be nearly a year until the first workshop, but they saw that specialists and program managers needed a place to discuss ideas, develop networks, and build connections focused on climate change work.

This first workshop in 2022 brought together climate coordinators, program managers and specialists from across the region, along with agency partners. The workshop consisted of a partial day of classroom presentations and discussion with a virtual component and three field tours to different districts on the Dixie National Forest. The discussions held throughout the workshop focused on impactful topics such as the integration of climate change into National Environmental Policy Act (NEPA), building successful partnerships, and specialist field presentations on species of concern. The field component of the tour enabled specialists to see on-the-ground projects showing forest-level examples of climate change adaptation and project management strategies.

Attendees met with the forest fish biologist to talk about Paunsaugunt boreal toad and their population relationships to woody browse; the timber program manager to discuss bark beetle outbreaks and the impacts on timber, specifically Ponderosa Pine; and the forest wildlife biologist to talk about habitat condition improvements in sagebrush and pinyon-juniper communities, to name a few examples.

Leadership saw the key connections made and great ideas that came out of the 2022 workshop and supported the region holding a second workshop. The workshop took place June 5-9, 2023 on the Ashley National Forest, co-led by Natalie Little and Dustin Bambrough, Ecosystems Staff Officer, based in Vernal, Utah. This workshop focused on climate change effects on fire management, drought and hydrology issues, and recreation.

At the 2023 workshop, climate change specialists throughout the region were joined by early career resource assistants, a relatively new hiring program in the agency. The melding of early, middle, and late career folks at the 2023 workshop was reflected in the rich discussions held, blending critical institutional knowledge with new ideas. Conversations were engaging and fruitful, with some saying that driving to the field sites was some of the most enriching time spent with the experienced personnel. Participants, especially early career, were strongly encouraged to get in a different vehicle each field day to help them meet all of the other attendees.

The workshop's structure purposefully built in time and space for newer employees to have intentional conversation with seasoned employees. Topics ranged from the landscape to career path, to what everyone brought for lunch. The workshop allowed for a level playing field for all attendees to

Workshop attendees at the Red Canyon Visitor Center, Utah, June 2023. Image Credit: Lars Christensen, USDA.

contribute to the conversation. Water, drought, resources, and partnerships were topics as the landscape guided dialogue and exploration of what was on people's minds throughout the field tours.

Seeing that the workshop model was producing tangible outcomes including specialist networking and project solutions, the Boise National Forest volunteered to host a workshop June 3-7, 2024. Natalie Little and Terre Pearson-Ramirez, Environmental Coordinator on the Boise National Forest, are currently planning the upcoming workshop, which will also have a strong research component. Charlie Luce with USDA Forest Service Rocky Mountain Research Station is also on the planning committee.

As the landscapes, people, and partnerships evolve through the years, the workshops also continue to evolve to meet emerging needs. By partnering with Rocky Mountain Research Station, we'll be emphasizing the successful research being done in the region and how the work can support successful land management. A great example of a previous climate change partnership was the publication of the Climate Change Vulnerability and Adaptation in the Intermountain Region General Technical

Report (GTR), Part I and Part II. This report has provided a wealth of climate change information and adaptation strategies since its publication in 2018 and will continue to be a resource for many years to come. This next workshop will bring together land management specialists and scientists to focus on critical program work and to develop collaborations with research similar to that modeled in the 2021 publication Intermountain Region – Rocky Mountain Research Station Science Partner Program: A road map to connecting Forest Service science and management. These deliberate efforts to partner strengthen our networks and ability to access and utilize the best available science.

So once again, we'll have 2.5 days of field trips with no phones and no laptops. We'll just be listening to one another in person, participating in discussions in the field, enjoying a brown bag lunch on a rock or in the back of a truck, and making some new friends over dinner.

In the spirit of the Forest Service motto, "caring for the land and serving people," we'll be learning how to more deeply care for people, including each other, and serve our land. By sharing this story, we hope to remind ourselves that we truly need each other and to foster those important relationships and friendships.

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Poetry

Treeline

Faltering hands of forest
reach to greet heaven
Ancient elfin pines
play in rock gardens
Fierce winter battles
snow tortured needles
Summer armistice
flowers cones nutcrackers
In the thin air
again pondering
How quickly it is
a lifetime here passes

~ G.M. MacDonald

Glen MacDonald is a Professor at UCLA and Director of the White Mountain Research Center. He has conducted research on treeline in Canada, the Western United States and Russia.

Photograph & Poetry

Lower falls on Shirley Creek in the Sierra Nevada, June 2023. Image Credit: Larry Ruth.

Ultima Thule

A poem should aspire to silence. – C.D. Wright

Are there flowers? First fireweed
purple, then paintbrush, peaking
through manzanita,
halfway down the rapids, striation
and splay water against rock,
a trumpet whirling orange,
alpine lily amidst ferns azure
flows downstream,
and time fractures
cracking a crescent moon
out of the cliff and
shines
off a big boulder, asters rise, float by,
goldenbush shimmer
from the gravel, sway,
yellow-red columbine
urge me along, until
sun on my back
no reason
to move
this all
enough, this moment
I almost missed.

~ Larry Ruth

Understanding Water in the Yampa River Basin through Collaborative Research and Community Engagement

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Center for Western Weather and Water Extremes[1]

Jacob Morgan
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Yampa Valley Sustainability Council[2]

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Colorado Mountain College Steamboat Springs[3]

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Center for Western Weather and Water Extremes[1]

1. Center for Western Weather and Water Extremes (CW3E) is a research center at Scripps Institution of Oceanography at the University of California San Diego with a mission to support effective policies addressing the impacts of extreme weather and water events in Western North America.

2. Yampa Valley Sustainability Council (YVSC) is a nonprofit organization serving as a leader, catalyst, and resource for building a sustainable and resilient Yampa region.

3. Colorado Mountain College (CMC) is a college focused on training students to pursue careers in ecosystem science and sustainability while contributing to the climate readiness and resilience of its local mountain communities and beyond.

Water is scarce in the Southwestern U.S., and it plays a crucial role in sustaining the region's vibrant ecosystems, economies, and communities. In the face of a rapidly changing climate, communities are finding it increasingly challenging to ensure a sustainable and reliable water supply. Science has a role to play in adapting to this changing climate by providing accurate forecasts of precipitation and water availability. Science and its communication and outcomes are better when research is done in close collaboration with stakeholders and populations who have foundational knowledge about the region. This article describes our efforts to develop lasting research and community partnerships that will enable multiple projects such as the one described here, a project focused on improving monitoring of water resources and better-informing decisions about water management.

Our research partnership is based in the Yampa River Basin, nestled in the upper reaches of the Colorado River watershed, which spans seven U.S. states and part of Mexico. The partnership consists of researchers, staff, students, and faculty from our three institutions: CW3E[1], YVSC[2], and CMC[3]. The team first began working together in 2018 after early discussions made it apparent that the interests and goals of our respective institutions were well-aligned. Our first collaboration was the 2018 Yampa Basin Rendezvous (YBR), an event we co-established with a local conservation group devoted to protecting the Yampa River, Friends of the Yampa.

YBR is an annual meeting focusing on water and weather in the Yampa Basin and is attended by researchers, community members, water users, and water managers. A major goal of the meeting is to build community and encourage collaborative problem-solving and planning. Over the years, co-organizing YBR has steadily strengthened our relationships, culminating in funded research work together: the Y-BASIN (Yampa Basin Atmosphere and Soil moisture Integrated Network) project.

Y-BASIN is a multi-year collaborative research effort aiming to improve understanding of water supply in the Yampa Basin and of its importance to overall Colorado River watershed health.
In the Yampa Basin, as in much of the Southwestern U.S., one of the main challenges in predicting water supply is uncertainty in springtime "snow-to-flow" projections. The basin's rivers and reservoirs are fed by springtime snowmelt, which is becoming increasingly difficult to accurately predict. One hypothesis is that as the region becomes drier on average the increasingly dry soils may act as a sponge by absorbing the melting winter snowpack. This, in turn, reduces the amount of water that runs into the rivers and reservoirs and ultimately flows into the Colorado River.

Simultaneously, warmer air temperatures may also decrease reservoir inflow by causing more snowpack to be lost to the atmosphere through sublimation or evaporation. Investigating these two processes in the context of the Yampa Basin is imperative to improving local water management strategies and requires a detailed network of reliable measurements of soil moisture and climate variables throughout the basin.

To address this knowledge gap, the Y-BASIN project team started building a network of weather stations to monitor soil and atmospheric conditions throughout the basin, supplementing the existing networks in the region, such as the USDA Natural Resource Conservations Service's foundational Snow Telemetry (SNOTEL) sites. Y-BASIN stations record the temperature and moisture content of the soil down to a depth of 40 inches, as well as wind speed and direction, air pressure, air temperature, relative humidity, solar radiation, rainfall, and snow accumulation. An additional six stations will be deployed in the coming years, which, in conjunction with pre-existing stations, will amount to a basin-wide network of observations of publicly available, real-time data.

CMC, CW3E, and YVSC team members work together to dig the soil moisture pit at a new weather station site. Image Credit: Nathan Stewart.

Ever since its collaborative origin at the Yampa Basin Rendezvous, the Y-BASIN project has consistently sought to conduct work in partnership with the community. The first step in the project was to perform a detailed, quantitative analysis of the basin's most important meteorological and hydrological regions to determine where to locate the weather stations. This required input and contributions from a broad range of participants. The analysis team included CW3E graduate students and researchers, CMC undergraduate interns, YVSC GIS specialists and staff, university faculty, and local water managers and engineers. This team also solicited feedback from the Colorado Basin River Forecast Center and NOAA forecasters as well as the SNOTEL team.

Together, this diverse group of people collaborated in the intensive and iterative process of refining the criteria for network site selection and then choosing the best sites using their criteria. This collaborative effort improved our understanding of the

basin due to the wide range of stakeholders, priorities, and skill sets that took part. The end product of the analysis was a report detailing the project team's proposed weather station locations, which includes sites on both public and private lands. This siting choice is, in part, a result of our diverse site-selection team: having such a broad range of participants involved in the site-selection process encouraged and enabled us to consider siting options that otherwise would not have been possible.

We also hope that it will help us to build and strengthen relationships with a variety of public agencies, NGOs, and private landowners who agree to host sites. Here, the strong relationships that YVSC has developed through its dedicated work in the community have been and will continue to be crucial for finding enthusiastic site hosts.

Before, during, and after the station installations, we continue to work closely with each of the hosts to determine how our data can be of most benefit to everyone involved. Hosts contributed invaluable knowledge towards a variety of essential project elements, including final site selection, installation techniques, station maintenance, and ideas for future instrumentation. Hosting the stations on private land also created opportunities for the hosts to share their excitement for the science. For example, some hosts independently volunteered for their site to be part of outreach efforts. This speaks to the enduring stewardship aspects of private landowners contributing to local scientific research and education.

The Y-BASIN project team also prioritizes involvement in education and outreach within the local community via pre-existing connections with our partners and sponsors, which we hope to expand in the coming years. In partnership with Aspen Global

CMC, CW3E, and YVSC team members work together to install a tower at a Y-BASIN station deployment in 2023. Image Credit: Ethan Morris.

Change Institute, the Y-BASIN project team annually funds and mentors undergraduate summer interns working on Colorado River science. Furthermore, the project team members each host tables at the annual Yampa Youth Water Festival, organized by the Upper Yampa Water Conservancy District (a Y-BASIN sponsor). The festival introduces local 5th graders to the wide variety of exciting ongoing water science in the Yampa Valley.

From our perspective, the long-standing relationship between YVSC, CW3E, and CMC is the reason the Y-BASIN project began. The project demonstrates the value of building inter-agency and institutional partnerships that co-develop research and inspire new collaborative research questions directly relevant to their communities.

Throughout this project we have been grateful for the reminder that community partnerships lead to the most impactful progress. We hope to find, as so many projects before us have, that this approach to research can lead to groundbreaking outcomes.

We will continue building on the flourishing connections between our partnered institutions and within the community to support water management and planning in the Yampa Valley and beyond.

To find out more about the Y-BASIN project visit the CW3E or YVSC websites: https://cw3e.ucsd.edu/cw3e_observations_surfacemet_yampa/, https://yvsc.org/soil-moisture-monitoring-network/

Brevia

NASA MAIANSE: SnowEx Internship Experiences—Who's Measuring Winter?

Megan Mason
SnowEx Data Support Scientist
NASA GSFC/SSAI

NASA mentor visiting Fond du Lac Tribal Community College in Cloquet, Minnesota, Fall 2023. Left to right: Courtney Kowalczak (FDLTCC faculty), Ashla Ojibway (student intern), Valerie Ross Zhaawendaagozikwe (student intern), Megan Mason (NASA mentor), Carl Slack (FDLTCC Faculty), Hailey Anderson (student intern), and Steve Gebhard (FDLTCC Faculty). Image Credit: Taylor Warnes.

Goonikaa – "there is (a lot of) snow."

This Ojibwe phrase was taught to me by a student intern who shared it during a hot mid-July day while we grappled over the previous winter's snowpack data during our zoom meeting. As a mentor, I provide the technical information about measuring seasonal snowpack. Upon learning this phrase and other shared Anishinaabe stories, I came to reflect on the cultural history imperative to a place where snow has been integral to the landscape for millennia. Specialized internship programs, such as NASA's MAIANSE (pronounced MAIN-ZE), are increasing the skilled and diverse workforce in STEM fields for American Indian and Alaska Native serving institutions through the power of early engagement and supported learning environments.

My story is only one of many other student-intern mentor relationships. In the summer of 2021, I began as a mentor to one of two student interns at Fond Du Lac Tribal and Community College (FDLTCC), an architectural haven nestled in Minnesota's Northwoods, a thirty-minute drive west of Duluth. To date, five other undergraduate students attending our nation's Minority Serving Institutions (three at FDLTCC, one at University of Alaska Fairbanks, one at Oglala Lakota College, South Dakota) have proudly earned the title of NASA intern - an honorable title amongst family, friends, and peers.

Student interns attend weekly calls with a paired NASA mentor and also receive support from a home institution faculty member who already knows them and program staff of MAIANSE. We work in tandem to familiarize students with the NASA SnowEx science objectives and relevant snow measurements for the semester's focus and ask them to come prepared to present a weekly update once they delve into project work. Based on the student's skillset or desired skill set, we create a project that utilizes SnowEx field campaign data and connects to place-based research to match student interests and the

needs of their home institution and communities.

For example, at FDLTCC students implemented a student-led snow measurement program that aligns with future NASA snow mission goals and 1854 Treaty Authority management decisions, an Inter-Tribal natural resource management agency. A variety of snow monitoring projects have been implemented incrementally at three sites: one on campus and two in permitted state park study zones. Snow depth measurements are the primary focus to support the ongoing study of critical wintertime moose habitat. Students measure depth by manually probing along a transect or deriving depths from stationary time-lapse image sets. Students have gained experience measuring snow water equivalent (SWE) and relating their findings to snowpacks throughout the western US. This winter, for the first time they will deploy a student-made snow tube to collect SWE data to locally inform the amount of available liquid water throughout the winter season. Students have been trained on this method as it was performed during the SnowEx fieldwork; though through their implementation we will learn more about taking measurements in the Great Lakes region.

Two aspects of the internship model standout as uncommon when compared to a more traditional internship approach. The inclusion of the home institution faculty member has proven instrumental in the student's success taking on a potentially intimidating role at a federal institution where the full duration of the internship is sponsored remotely. Faculty, having already gained student rapport, can better support communication and project objectives between the student and the NASA mentor, helping to ensure student needs and their educational background and experience are better understood.

Above: Fond du Lac Trical and Community College (FDLTCC) students measuring SWE at the Minnesota campus location. Image Credit: Arianna Northbird.

Below: FDLTCC students getting mid-winter snow water equivalent interval board measurements. Image Credit: Ariana Northbird.

Often, faculty members create connections between the project discussion and a relevant classroom learning experience, leaving the student better equipped to grasp

new skills. Furthermore, the value added by faculty to bridge cultural awareness gaps based on their institutional knowledge enriches the supportive learning environment for both the NASA mentor and their student.

Another part of the pedagogy is that internships can extend for up to four semesters for an individual. The opportunity to renew the position on a semester cycle allows us more time to iterate over the research project and layer on more complexity, deepening the student's mastery of the methods and analysis applied. Additionally, the option for semester renewal helps us mentor individuals that are already full-time students with family commitments or mental health barriers. In the case of our FDLTCC students, we've witnessed a positive outcome in the peer-mentor aspect created when a more seasoned intern guides the way for newer interns.

When asked what was the most valuable skill acquired at the completion of a student's internship, there were three common responses. Firstly, students have said that their fear of presenting dramatically decreased thanks to the repetition and coaching offered throughout the back-to-back internships. Secondly, the majority report their confidence or ability to ask questions has greatly improved due to learning a new software program such as ArcGIS or being exposed to coding. Finally, most comment on their newfound leadership skills that were required to take charge in organizing field or lab work, teaching a measurement method to a peer, or leading a data peer-review session.

This program goes far beyond the tangible field or computer skills required to measure snow. The impact is in the communal growth and the growing pains endured to connect our distinct and diverse identities and communities and serve the next-generation scientists.

For more information on MAIANSE visit: https://www.nasa.gov/learning-resources/minority-university-research-education-project/maianse/

For more information on SnowEx visit: https://snow.nasa.gov/snowex/campaigns

To view Megan's recent conference poster visit : https://drive.google.com/file/d/1mz-42k4f4Ntyv0TFLTK3Zs7eITSrmLb8/view?usp=drive_link

Brevia

Caring for the Clark Fork

Rayelynn Brandl,
Executive Director, Clark Fork Watershed Education Program, Montana Technological University

The Clark Fork Watershed Education Program (CFWEP) started in 2005, with a call to action by the citizens of the state of Montana to ensure that the next generations of Montanans would care for the restored landscapes of the Clark Fork River. At the time of CFWEP's beginning, restoration work within the nation's largest contiguous Superfund site was just beginning, and the focus of work was located largely in Butte amongst the most damaged stream ecosystems within the complex.
Today, the program serves thousands of students throughout the Clark Fork within the communities of Butte, Ramsay, Anaconda, Deer Lodge, Drummond, Phillipsburg, Bonner, Clinton and Missoula along with the Blackfoot Watershed schools Avon, Elliston, Helmville, Lincoln, Sunset, and Seeley. Since 2005, the program has

served over 80,000 students during its nearly two decades of service.

The program approach is simple, engage students 'early, often, and always' in learning about their landscapes and taking actions to help improve and conserve their local landscapes. The program model is based on the best practices of place-based education, working from the teachings of Sobel and others to first establish student connections to place, then inspire curiosity, and finally instill stewardship. CFWEP scientists visit local classrooms for four days, providing background history about the watershed, followed by watershed science topics. Students have a full-day field trip on the fifth day, during which they practice the skills of a watershed scientist, studying macroinvertebrate abundance, completing a riparian assessment, and measuring water quality.

At the heart of the program is the simple and effective approach of creating wonder and awe for students. On any typical CFWEP field trip, one can hear the exclamations from students when they find their first stonefly in the macroinvertebrate tub. When they learn that the stonefly is an exemplar of a sensitive species and has only been found in recent years in Silver Bow creek, they ask the foundational question, "Why was it gone? What makes this one so special?" and therein is the hook set. Program partners have studied how effective the program is for achieving its goals, and students demonstrate statistically significant gains in their attitudes toward caring for the environment and scientific background knowledge (Brandl, Peltomaa & Alvarado, 2019).

The CFWEP program is growing and expanding to other watersheds, utilizing the best practices of place-based education and lessons learned facilitating the program in the Clark Fork. As such, the program will be re-branding to *Ripple: The Center for Education and Ecosystem Studies*. The program partners are dedicated to the vision of inclusive, place-based watershed science education for all of Montana's students.

For more information about the program, please visit our website at www.cfwep.org or reach out to CFWEP's Director for Programs and Evaluation, Chris Pavlovich at cpavlovich@mtech.edu.

Sudents measureing riparian health on Silver Bow Creek. Image Credit: Rachel Neal, CFWEP.

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Poetry

The River in the Cold

On the coldest days,
the river becomes a quiet place,
the new beavers are settled into a lodge
built just before snowfall,
the ice slushes along,
stretching almost from bank to bank,
and the buffleheads are gone
from the surface.

I don't know where they go,
these little duck buoys
but if tomorrow's warmer,
they will be back,
arriving and departing with
a murmur of wings
and a piping of commentary,
and the Canada geese will be back,
coasting in,
heralding themselves on landing,
lest anyone miss the grandeur of their
arrival.
Less certain of a visitor is the bald eagle,
perching on a tall stag tree
with the top cut off,
keeping a keen eye open for lunch.

All these neighbors,
all this life,
just one bend away--
just down the path.

~ Elise Osenga

Elise Osenga is the Community Science Manager for the Aspen Global Change Institute. She manages the Roaring Fork Observation Network, and when in the field always keeps an eager eye out for wildlife.

Pacific marten in the Goat Rocks Wilderness, WA. Image Credit: Ben Wymer.

Field Notes

The Olympic Marten Project

Ben Wymer
Wildlife Research Technician & Photographer

Ben Wymer is a trained wildlife ecologist, certified wildlife tracker, and conservation photographer. Ben's career in both land conservation and wildlife research has taken him across the northern latitudes of the contiguous U.S., working in New Hampshire, New England, Washington, and Minnesota.

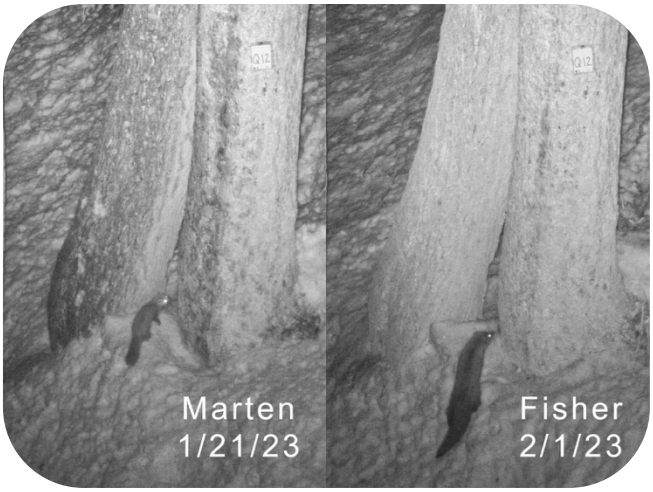
So, you want to be a field tech in the Olympics? Can you carry a 50+ pound pack all summer? How do you feel about climbing trees? How do you handle the stress and exhaustion of being in the field for over a week at a time? How comfortable are you with being bitten and badgered by bugs? Do you feel comfortable traveling off trail, up steep slopes; across, underneath, and around monstrous trees; and through thick, spiny brush? These are some of the struggles and laughable moments that embody many field positions.

These were also the trials and tribulations myself and the team I was a part of endured in order to detect Pacific martens across the Olympic Mountains of Washington.

This summer (2023) I worked as a wildlife field technician for Dylan Hubl, a Master's student at the University of Washington in Aaron Wirsing's Predator Ecology Lab. I studied Pacific martens in the Olympic Mountains. This project is part of a partnership between the University of Washington, Olympic National Park, Olympic National Forest, and Woodland Park Zoo. We hiked, backpacked, and bushwhacked over 500 miles and did a few hundred feet of tree climbing this summer. Our objective? To collect the data from 67 motion-triggered cameras that had been left out for a year, across the Olympic National Park and Olympic National Forest, all in the hopes of detecting Pacific martens that call the Olympic Peninsula home. But how did we accomplish all this? Well, like anything, one step at a time.

How many times did I pack and repack my backpack this summer? Too many to count! Preparing for our backpacking trips had an added element of complexity because not only were we packing for ourselves, we also had project-related gear to pack in and out to camera sites. Minimalism was the name of the game.

Each camera site was a minimum of 250 meters from trails or roads. Tightening the packs and pulling out the Garmin GPS unit, we prepared ourselves for whatever lay between us and the cameras, before taking the plunge. At each camera site, there were two cameras, a scent dispenser, hairbrushes, and other small accessories. Each camera site had a primary and secondary camera. The primary was placed 18-25 feet up a tree facing down toward the scent dispenser, which was 15 ft above the ground in an



Trail camera photos of a marten (left) and a fisher (right) attracted to a scented camera station. Image Credit: Aaron Wirsing's Predator Ecology Lab, University of Washington, editted by Ben Wymer.

adjacent tree. The secondary camera was in a tree at a site about 100-150 meters away, facing a wildlife trail. This secondary camera acted as a control for the scented primary site. Thus, we had to carry climbing equipment to ascend and remove the equipment, which had been set up the previous summer. A complete camera site setup weighed about 11 pounds, and we typically collected at least two setups per trip.

Now, what was in the scent dispensers you may be wondering. Well, it was a lovely concoction of a skunk gland mixture, so you can imagine how we smelled as we passed people on the trails…Oh boy, did we get some funny looks and exasperated words from other hikers!

Back from the field and after a thorough shower, we would review whatever camera footage we had not already reviewed in the field. All manner of critters were attracted to our scent dispersers. Some of the most common species were deer, bears, Douglas squirrels, mountain lions, bobcats, and Roosevelt elk. Two species of special importance were martens and fishers.

Both members of the weasel family, martens (American and Pacific martens) and fishers have a typical weasel-like build: long, narrow body, relatively short legs, and pointed snout. However, what makes both species unique from their other weasel cousins is their semi-arboreal lifestyle. Specially adapted ankle joints allow fishers and martens to scale down trees head-first. This adaptation is key to their livelihoods, as both species pursue arboreal prey and both require tree cavities for giving birth and rearing young.

Being 2-7 times lighter and about half to two-thirds times smaller (in terms of body length and width) than fishers, martens spend more time in trees. Despite their more arboreal nature, most of a marten's time is still spent on the ground.

After a complete extirpation in the mid 20th century, due largely to trapping, logging, and development, fishers were reintroduced to the Olympic Mountains starting back in 2008. Now fifteen years later, we recorded fishers at 15 sites and across a wide range of the Olympics, including in new areas compared with previous monitoring efforts.

Pacific martens have a more muddied story. Like their larger cousins, the fishers, martens were also trapped across the Olympics. Before European settlers arrived at the Salish Sea and Olympic Peninsula, martens lived from the tidelands (all along the Pacific Coast) to the timberline (on mountain tops) across Washington, Oregon, and California, much like Pacific martens on Vancouver Island do to this day. However, after decades of trapping up through the 1940s and 50s and deforestation at lower elevations, martens seemed to disappear from much of the coast and lower elevation forests. Between 1968 and 2022, prior to the retrieval of this project's cameras, the USDA Forest Service and National Park Service had reported only 26 marten detections, through similar camera sites and sightings from the public. This project is the largest concerted effort to search for martens, to date, on the Olympic Peninsula. But why was this study focused solely on the Olympics? Due to logging, development, and construction of large road systems, such as Interstate-5, martens on the Olympic Peninsula are isolated from populations to the east, in the Cascade Range, and to the south, in Oregon.

A scent dispenser, created by Robert Long, with accompanying hair brushes designed to attract martens and collect hair samples. Image Credit: Ben Wymer.

Of the 67 camera sites, across elevations ranging from about 1,500 ft to over 5,000 ft, we detected martens at five sites. Four of the five detections were on different ridgelines, generally above 3,700 ft in elevation, though there was one detection below 3,000 feet along a stream, captured during the winter. Notably, three of these occurrences were on

ridgelines where martens had not been detected previously. In addition, potential marten scats collected while we hiked will be processed to determine the species. If these scat samples come back as marten, they will add more data points of potential marten occurrences. With so few marten sightings in the past 70 years (26 detections before this summer), each occurrence is extremely valuable. Between our five observations and numerous collected scats, the hope is that this project will shed more light on marten distribution across the Olympics and help guide future projects.

From sea level to mountain top, we walked. Through rainy days, bugs, and thorny brush, we toiled. Blood, sweat, and possibly some tears were left out in the Olympics this summer, but I would do it all over again. The freedom, awe, and sense of being in mountains such as the Olympics pulls at your heart strings. A piece of me will always be left in those mountains, and the adventures we undertook will always live in my memory. Perhaps, someday, I'll have the privilege of seeing a marten there in person.

Field Notes

The Haul Road

Chuck Truettner,
American Forests

"Everything is bigger in Texas, everything is a MONSTER in Alaska!"

As I looked over the tranquil, eerie landscape of a stand-replacing wildfire north of the Arctic Circle, last summer's motto echoed in my ear. The Douglas Fire was a ~23,000 acre wildfire that had burned the prior summer, turning the mature black spruce forest into a charred burn scar.

The Douglas Fire burn scar reaches past treeline into the alpine tundra. Image Credit:Chuck Truettner.

The freshly combusted boreal forest had been spared during the 2005 fire year when the North Bonanaza (196,000 acre) and Chapman Creek (171,000 acre) wildfires ignited north and south of our current field site along The Haul Road.

I took a quick breather after measuring the diameter at breast height (DBH) of a crisp, black spruce snag, looked up and noticed that the fire had burned past treeline on the surrounding mountains. I had never seen a wildfire scorch tundra, and it made for a sad realization that the drying effect of a warming Arctic was the likely culprit. All of a sudden, we heard a gust of wind flow down the mountain heading straight towards us and... wooooooosshhhhHHHHH! The gust blew past us like a ghost ship riding a squall through a sea of spruce. Then stillness.

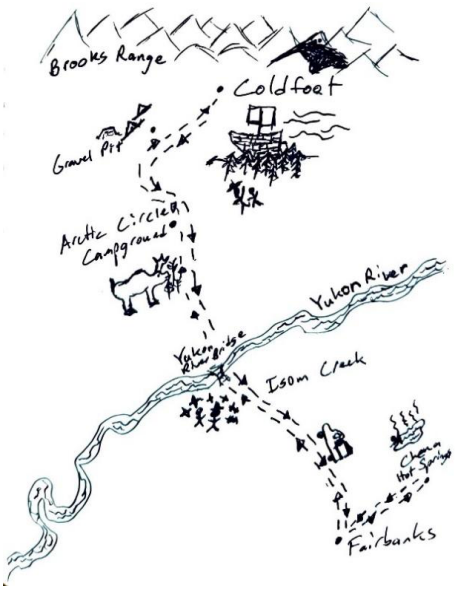
The Haul Road, the nickname for the Dalton Highway, is a rustic highway that starts north of Fairbanks and terminates at Prudhoe Bay on the Arctic Ocean. It was built in the 1970s to service the freshly constructed Alyeska pipeline. Semi-trucks

hauling pipes and fixtures for repairs have the right of way when driving on the highway, except for the occasional excavator (four times bigger than I had ever seen) delaying the sparse traffic as it fixed major dents in the road from melting permafrost. We used the Haul Road as our work bloodline for a two-week campaign to quantify the amount of carbon combusted in recently reburned fire scars. Our mission for the field season was to collect soil profiles and tree cross-sections at as many sites as possible and ship them back for isotopic analysis in the Walker/Mack Lab at Northern Arizona University.

About a week prior from sampling the Douglas Fire burn scar, a new graduate student, Matt Behrens, and myself loaded up our rig with enough field supplies, food, and water to sample burn scars in the boreal forest from the Yukon River north to Coldfoot Camp in the Brooks Range.

Our first day of sampling went a little slow as we tramped through the tussocks of soil organic matter that formed the floor of the boreal forest. Afterwards, we set up camp on a forest service road adjacent to the Isom Creek burn scar and were immediately swarmed by an endless population of mosquitoes. I exhaled, thinking to myself that this was the start of a long field season. I had spent the last fifteen years working on desert mountains, which have their own challenges in the field, but June working next to the Yukon River was a whole different scenario. I looked over at Matt, the more experienced Alaskan field worker, and he seemed to have a controlled calm. Over the next few days, he showed me plenty of tricks to avoid those blood suckers, as well as navigating through the Alaskan swamps.

The next week was full of pleasant weather and productive sampling as we started getting into a better flow with each burn scar sampled. We worked our way across the Yukon River Bridge and north of the Arctic



Map of the Haul Road Field Campaign. Drawing Credit: Charles Truettner.

Circle. The long days allowed for extended daylight, and by the time we had finished sampling the Douglas Fire, I felt like a true Alaskan fieldworker, especially after setting up camp for four days in a gravel pit on the side of the road. We made it to Coldfoot Camp for some warm showers and hot meals from a buffet that ranged from Indian food to meatloaf, a pleasant surprise. We then camped under beautiful mountains at the southern edge of the Brooks Range. With our fuel planned accordingly, we made it back down to Fairbanks for a 4th of July break.

Matt and Felicia in a field of horsetail at a triple burn scar. Image Credit: Chuck Truettner.

After spending some time in Valdez and kayaking to the rapidly retreating Columbia glacier, we picked up a new crew member, Felicia Amundsen, and made our way to Manley Hot Springs for our next phase of sampling. The helicopter pilot met us the next morning, and we spent the next three weeks heli-sampling across Interior Alaska. Felicia's positive attitude and Matt's expert experience made the three weeks fly by as we sampled fourteen more fire scars and nearly doubled the field sites for the entire study.

Working in burn scars in remote Alaska gave me an insight on how natural fire regimes are rapidly changing with a warming Arctic, with fire frequency and severity increasing at an alarming rate. Yet, I learned to respect how burn scars formed by megafires alter ecosystems, and seeing those deciduous trees sprouting back in bare mineral soil, resetting the boreal forest successional cycle, gave me hope that nature finds a way if we give it enough time.

The author riding shotgun with a clear shot of Denali. Image Credit: Felicia Amundsen.

North Fork Drive and Bridge covered in rushing water from the North Fork of the Kaweah River. Image Credit: Julia Goolsby.

Field Notes

During the Flood: Connecting with residents while doing social science field work

Julia Goolsby
University of Colorado Boulder

When I arrived at the Sequoia Kings Canyon National Park Headquarters in March 2023, my National Park Service (NPS) collaborator told me there was a storm in the forecast—but really, I shouldn't worry about it. It was my first solo research trip, representing my team in a journey across the park system. In total, we interviewed over 80 park staff about their responses to climate-driven, transformative change to park landscapes. In Sequoia, ecological transformation has taken the form of high-severity fire devastating Giant Sequoia groves (Dilsaver, 1994).

Since the Organic Act of 1916, the NPS mission has been to conserve parks "unimpaired for the enjoyment of future generations." However, with climate change, the goal of maintaining historical conditions is increasingly infeasible.

As NPS staff rethink what it means to steward natural landscapes, our social science research team set out to learn more about how personal, emotional, social, and institutional factors shape their decisions. However, I didn't expect my trip to coincide with a real-time natural disaster.

Tulare County crew repairing the bridge after the flood abated. Image Credit: Julia Goolsby.

At 6am on the fifth day of my trip, my host knocked on my door and told me to evacuate. I looked outside and saw the river rushing through the backyard. An "atmospheric river" had hit the park, melting the snowpack, and causing a major flash flood. The river grew to eight times its size in a few hours.

Unfortunately, it was already too late to evacuate—the river had swept away part of the bridge. The sheriff issued a mandatory evacuation, but we had no way out. Despite the circumstances, my host and their neighbors remained calm.

We packed our things and moved to higher ground, where my hosts' neighbor welcomed me into her home. The next day, the flood subsided, fortunately leaving the neighborhood mostly intact. However, I canceled my interviews, as park staff were responding to the flood. Reflecting on the atmospheric river—one of many that winter, possibly exacerbated by climate change—I realized I was experiencing firsthand what I had set out to study.

Participant observation is a method in which a researcher learns by participating in the study context. Thus, the researcher can study how people behave and think in the moment—rather than what they report afterward. Although I was not studying floods, I recognized a rare opportunity. I spent the next few days walking back and forth to the bridge—the only way to determine its state of repair—and meeting residents. We discussed their connections to the park, their predictions about the future, and their emotional exhaustion with repeated disaster. I realized that Sequoia staff might share their concerns, since most live near the park. Our study had been focused on events within the park boundaries—but after this experience, I learned that local community context is also deeply important. After three days, the county repaired the bridge, but with another storm forecasted, I opted to leave the area and conducted the rest of my interviews via Zoom. Although I was concerned about holding such sensitive interviews virtually, my interviews were actually some of our most informative and rich, because I was able to connect with participants about the flood.

In sum, although I would not have wished for such a disastrous flood to occur, much less during my research trip, I walked away feeling lucky. Experiencing the fear and fatigue of the flood, I gained invaluable insight into how it feels to live near a national park undergoing transformation. I have carried this forward into the next steps of our project.

This fieldwork was part of a project titled "Cross-Park RAD Project (CPRP): A Case Study in Four National Parks Investigating How Institutional Context and Emotions Shape Manager Decisions to Resist, Accept, or Direct Change in Transforming Ecosystems." The team is led by Amanda Cravens (U.S. Geological Survey) and includes collaborators Heather Yocum and Julia Goolsby (Univ of Colorado Boulder), Brian Chaffin (Univ of Montana), and Stefan Tangen (USGS). The study included Acadia, Capitol Reef, Glacier, North Cascades, and Sequoia National Parks, as well as the Confederated Salish & Kootenai Tribe. For more details, visit: https://www.usgs.gov/programs/climate-adaptation-science-centers/science/cross-park-rad-project-cprp-a-case-study-four

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Poetry

Jan 14

Blizzard winds cleared the air,
new moon deep in the dusk
airborne ice bounces earthy reds
off the glimmering lake
onto the glowing ring
of darkening snowy mountains

~ Jim Thorne

Jim Thorne works for the Department of Environmental Science and Policy at the University of California.

Voices in the Wind

What does community science mean to you?

Community-led fisheries monitoring in action (contributed by Aaron Poe). Image Credit: Tanana Chiefs Conference.

"Good community science infuses local knowledge and cultural perspectives into the process of question formation, data collection, analysis, and reporting."

~ Aaron Poe
Network Program Officer at the Alaska Conservation Foundation, Northern Latitudes Partnerships.
northernlatitudes.org

"Community science is the coming together of all parties connected to the scientific process: the scientists themselves, the host communities (human and non-human), the logistics and support staff making the science happen, and the audience of people who will learn from the science--be they politicians or local governments or students of the future."

~ Ali Dibble
Program manager, Juneau Icefield Research Program

Voices in the Wind

What does community science mean to you?

"Community Science is actionable, place-based, important work that takes many forms and is often not recognized for the value it has.

Community Science is working in a way that centers and supports community leadership, priorities and strengths.

Community Science is using various combinations of methods, processes, tools and resources together for advancing community identified priorities and community desired outcomes."

~ Lauren Divine,
Director, Ecosystem Conservation Office, Aleut Community of Saint Paul Island.

"Community science in public health carries the voice, perceptions, actions, and values of the community of interest through the scientific process. This can be as simple as engaging with the population directly to gather data and information or more integrated, such as teaching someone from the community, who speaks the language of a key population, to lead the data collection process to solicit meaningful and rich responses from the community of interest through the lens of someone who shares and deeply understands the culture."

~ Heather Kerwin
District Epidemiology Program Manager, Washoe County Health

News & Events

Save the Date!

MtnClim Conference
***Tentative:* Sept 16-19, 2024**

The MtnClim Conference is a biennial event centered on mountain climate, water, and ecosystem science. This conference, organized by the CIRMOUNT consortium, brings students, early-career researchers, and established scientists together to explore timely themes. This year's session topics include long-term datasets, hydroclimate extremes, fire, and humans in the mountains.

Every MtnClim meeting includes oral and poster presentation sessions, keynotes by thought leaders in the field, and a session on exciting emerging research from early-career scientists. Other opportunities for networking, such as options for field excursions, will also be included in the agenda. This year's dates are currently set for Sept. 16-19. As we are firming up the program and location, look to the CIRMOUNT listserv for an announcement. We hope to see you there this year!

Join the CIRMOUNT Listserv

Looking to stay up-to-date on CIRMOUNT news, jobs, and more? Sign up for the CIRMOUNT listserv!
https://lists.cirmount.org/mailman/listinfo/cirmount

Other was to participate include:

- Join the CIRMOUNT listserv: (cirmount@lists.cirmount.org)
- Participate in MtnClim, CIRMOUNT's bi-annual conference
- Contribute to the *Mountain Views Chronicle*, CIRMOUNT's annual publication (mtclimmvc@gmail.com)
- Ask to join the Leadership Team (charles.truettner@gmail.com)

CIRMOUNT Leadership Team

Co-Chairs:
Scott Hotaling
Elise Osenga

Chair Elect/Secretary:
Chuck Truettner

Treasurer:
Brian Smithers

MtnClim 2024 Organizing Committee:
Charlie Luce (Chair)
Scotty Strachan (Chair)
Adrienne Marshall (Chair)
Martha Apple
Monica Arienzo
Sudeep Chandra
Michael Dettinger
Adrian Harpold
Benjamin Hatchett
Scott Hotaling
Jia Hu
Jeremy Littell
Stephanie McAfee
Meagan Oldfather
Shad O'Neel
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Dave Peterson
Greg Pederson
Charles Truettner
Anna Wilson

Mtn Views Chronicle Editorial Team
Elise Osenga
Charlie Truettner
Martha Apple
Jeremy Littell
Meagan Oldfather
William Rudisill
Benjamin Hatchett
Erik Beever

About CIRMOUNT

CIRMOUNT is a grassroots-driven community of scientists, resource managers, and others dedicated to advancing and integrating research on mountain systems.

Learn more about CIRMOUNT:
https://www.fs.usda.gov/research/rmrs/projects/cirmount\

Artwork: Photography

Wavy Powerlines Along the Divide. Butte, MT sites along the Continental Divide in southwestern Montana, where copper mines wrought extensive environmental damage, but also supplied copper for electricity. Today, it is rebounding with environmental restoration and academic, governmental, and community involvement. I took this photograph of snowy houses and powerlines as I walked along the Copper Way Trail, once a railway hauling ore to the town of Anaconda for smelting. Anaconda is also undergoing a renaissance. (iPhone 13 Pro with Liquify in Procreate software. Image Credit: Martha Apple)

Artistic view of gnarled wood on a dead portion of a limber pine on the southeast side of Mt. Jefferson, in the Toquima Range of central Nevada. Image Credit: Dr. Shana Weber, University of Michigan.