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Mitchell Meads (L), a postdoc researcher for I-CREWS and an affiliate of Boise State's Resilience Institute, and I-CREWS graduate students from around the state attended a retreat at the McCall Outdoor Science School. Photo credit: Mitchell Meads (BSU). *Story on page 5.*

A newsletter publication of the Idaho EPSCoR Office

the RESEARCHER

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LETTER FROM THE DIRECTOR

Andy Kliskey

This May 2026 edition of the Idaho EPSCoR letter celebrates the education, research, and workforce development capacity-building being generated through I-CREWS at the mid-point of our EPSCoR Track-1 project.

The computational focused story on the WEPPcloud model highlights one of I-CREWS' modeling outcomes and notably a tool that straddles its early development in Idaho's past MILES Track-1 with the current I-CREWS Track-1 project. WEPPcloud supports the Modeling component of I-CREWS and enables scenario projects in support of the Alternative Futures work.

Two important collaborations showcase our efforts in education and workforce capacity. The graduate student collaboration demonstrated through the Graduate Student Retreat at McCall Outdoor Science School (MOSS) is an important early-career development effort. Graduate students have vital roles in each site team, each research component, and support the education outcomes of I-CREWS. They are also a cohort in their own right whose role is strengthened by opportunities provided by this retreat to share and bond as a cohort across Idaho's universities, colleges, and Tribal Nations. And the collaborative work and leadership of the Workforce Development and Education team through their recent retreat, also at MOSS, provides a constructive demonstration of collaboration across Tribal Nations, colleges, and universities in Idaho.

The article on the "I-CREWS DataHub Comes to Life" is an example of infrastructure capacity providing the glue for connecting and sharing across the research components, the site level work, and the institutions through common access, archiving, and analysis of data and knowledge.

The expanding research capacity being developed on energy-water futures in Idaho is exemplified through the work of I-CREWS postdoctoral scientists and graduate students; Dr. Mitchell Mead's work and leadership in Treasure Valley and across the I-CREWS project on mapping energy-water futures;

Dr. Mikhail Samarin's work on energy access; graduate student Shreya Mul's emerging work on the potential of subsurface dams as supplements for regional energy-water systems; and graduate student Braelyn Shields' work to illuminate barriers and gaps in science, technology, engineering and mathematics (STEM) in rural schools across Idaho.

And so, this edition provides a celebration of each of these success stories and the hard work and endeavors of each contributor to I-CREWS.

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I-CREWS Research

Early EPSCoR Investments Lead to Accessible Watershed Modeling

by Sarah Penney-Jackson

Imagine a forest manager who needs to decide where to focus resources after a wildfire scorches thousands of acres: which hillsides are most likely to send muddy, erosion-laden runoff into a downstream reservoir or salmon stream? Right now, answering that question requires significant expertise, time, and resources.

Researchers at the University of Idaho (U of I) are helping to bridge the gap between cutting-edge watershed science and the real-world decisions made by land managers, forest planners, and water resource agencies, through the development of an accessible, open-source, online hydrological platform, the Water Erosion Prediction Project (WEPP) model, so that managers can model watersheds without needing to be a GIS expert to use it.

The goal is to help decision-makers understand how land use changes, timber harvest, wildfire, and other disturbances affect runoff, erosion, and sediment delivery across watersheds in the Pacific Northwest and beyond. With WEPPcloud, users are able to collect and analyze geospatial resources and perform process-based modeling to predict runoff, erosion, and sediment delivery in minutes. Users can select from a variety of processing options for climate inputs, wildfire, treatments, and land-management scenarios to support side-by-side comparisons and model calibration. They can then analyze and view results through interface reports and maps, and export results for planning, research, and post-fire response.

EPSCoR Investment

The U of I research team behind WEPPcloud includes Mariana Dobre, Research Assistant Professor at Department of Soil and Water Systems; Roger Lew, Research Associate Professor of Virtual Technology and Design; Anurag Srivastava, Research Scientist in Soil and Water Systems; and Erin Brooks, Professor in the Soil and Water Systems department. All are involved with the modeling component, with Dobre also contributing to the alternative futures research component.

Early EPSCoR investment was foundational to where the WEPP model research stands today. The 2013-2018 Idaho EPSCoR's Track-1 RII NSF project, Managing Idaho's Landscapes for Ecosystem Services (MILES), was fundamental in increasing the state's capacity to sustainably manage ecosystems affected by urban growth. MILES funding supported the recruitment of new researchers to the field. Both Lew and Srivastava began as post-doctoral fellows under the previous MILES project.

MILES supported early WEPP watershed modeling work which has evolved to become WEPPcloud. It helped establish the data infrastructure and computational frameworks needed to run complex hydrological models at meaningful landscape scales. Without that early investment in personnel, data pipelines, and

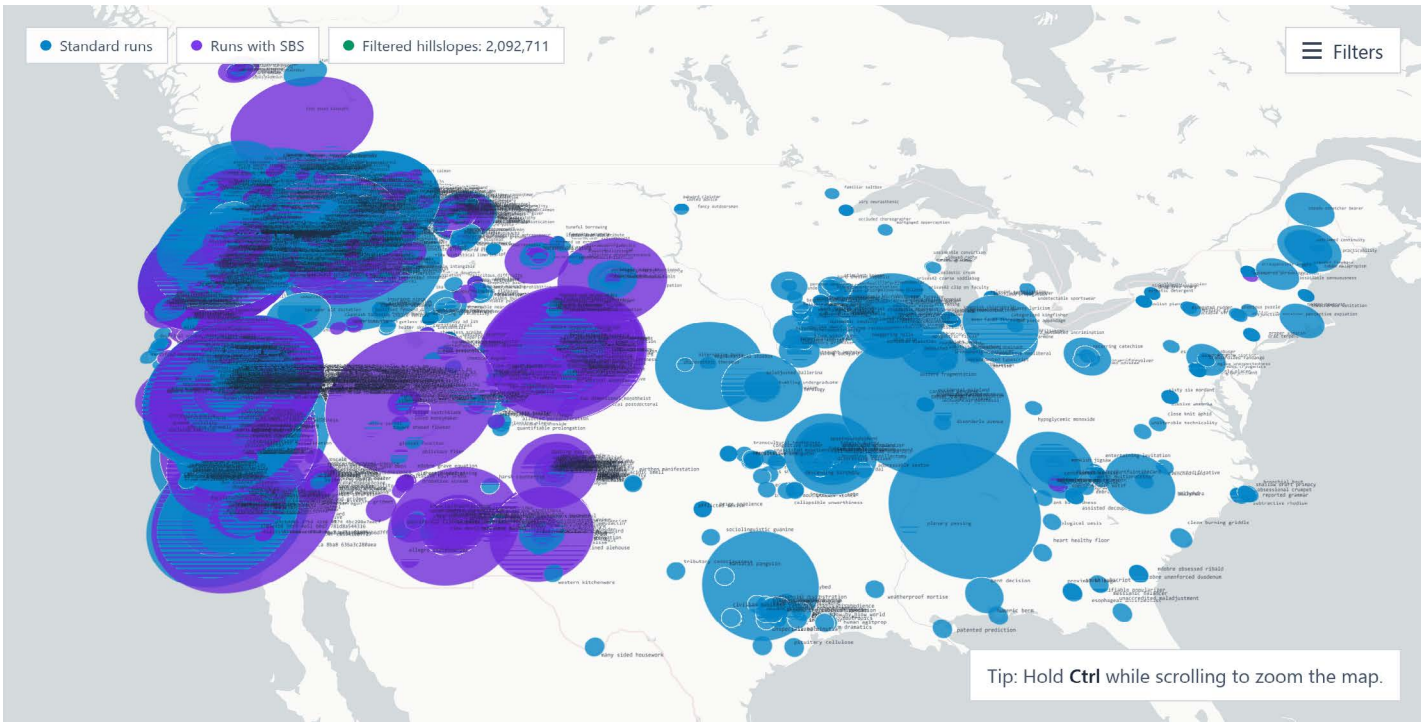


Figure 1. WEPPcloud usage dashboard showing geospatial distribution of model runs across the contiguous United States over the 90-day period ending April 5, 2026. Bubble size represents the relative number of hillslopes processed at each location. Blue circles indicate standard runs (n = 6,615 unique runs) and purple circles indicate runs for post-fire conditions.

high-performance computing and storage capacity, WEPPcloud would not have been possible, or would have been greatly delayed.

Essentially, MILES developed the institutional capacity and collaborative networks across two seemingly different departments (Soil and Water Systems and Department of Design and Environments) at the U of I that allowed the team to take watershed modeling from a research exercise to a practical, deployable tool used by agencies and land managers in the field.

That initial investment has since multiplied as WEPPcloud has attracted additional extramural funding and provided hands-on training opportunities for numerous students at various stages of their academic careers, demonstrating the lasting return on EPSCoR's early support.

Collaboration

Collaboration is central to this work. The team works closely with colleagues across various departments both at the U of I as well as colleagues from other universities such as Washington State University, Portland State University, Michigan Technological University, Iowa State University, University of Nevada Reno, and Purdue University, among others, drawing on expertise in hydrology, soil science, water resources, computer science, and more recently economics, to continually improve the model's capabilities and applicability. The team also maintains active partnerships with federal entities including the U.S. Forest Service (USFS) Rocky Mountain Research Station, who is both end-user and co-developer of the applications the team builds.

Outcomes

The outcomes of WEPPcloud modeling offer significant benefits for water resource management and are expanding to other areas as well. In addition to providing accessible and user-friendly watershed modeling for land managers, the research has helped improve post-disturbance response planning.

By applying WEPPcloud to post-wildfire and post-harvest landscapes, the work is directly informing emergency watershed protection efforts and helping agencies prioritize where erosion and runoff risks are greatest after disturbances, reducing downstream impacts on water supplies and aquatic habitat. Every year the tool is used by Burned Area Emergency Response teams across the Western U.S. to help them assess post-fire risks.

The workflows and data integrations developed through this research are also being adopted well beyond the region, with versions of the tool now operational in Europe and Australia, supporting watershed management decisions across the U.S. and internationally.

WEPPcloud makes answering that question (where to focus resources) faster, cheaper, and more reliable.

Cleaner water in Idaho's streams means healthier fisheries, safer drinking water for communities, and more resilient landscapes that recover faster from fire and drought. In a state where water is life, for agriculture, for recreation, for wildlife, and for people, tools that help us protect watersheds are tools that protect our future.

"What excites us most about this work is seeing a forest hydrologist, a district ranger, a civil engineer, or a student open WEPPcloud on their laptop and immediately start asking better questions about a particular watershed. Science has its greatest impact when it gets used, and this tool is getting used across the US. To date, we have over 4,700 registered users applying the tool in nearly every state and we feel like the initial EPSCoR's investment in Idaho's research capacity made that possible, and we are proud to be part of carrying that forward."~ Mariana Dobre, Research Assistant Professor at U of I's Department of Soil and Water Systems.

Research content provided by Mariana Dobre, Research Assistant Professor at U of I's Department of Soil and Water Systems and Roger Lew, Research Associate Professor of Virtual Technology and Design at U of I.

I-CREWS Research

I-CREWS Graduate Students Connect and Collaborate at McCall Retreat

By Emily Elden

Recently, graduate students from three Idaho universities took part in a retreat in McCall, Idaho. Held at McCall Outdoor Science School (MOSS), a University of Idaho College of Natural Resources site, the gathering was an opportunity for students to connect and share experiences as graduate research assistants with Idaho's Community-engaged Resilience for Energy-Water Systems (I-CREWS).

Led by Mitchell Meads, a postdoc researcher for I-CREWS and an affiliate of Boise State's Resilience Institute, students braved the snow and participated in team-building activities, presented their unique research projects and enjoyed mapping exercises designed to identify potential connections between research areas.

Tapiwa Mwila, a third-year graduate student in Boise State's Computing Ph.D. program and a member of the I-CREWS modeling team, said she thoroughly enjoyed the retreat. She noted feeling an immediate sense of community and highlighted the meaningful exchange of ideas.

"It was a truly lovely experience," Mwila said. "Just seeing what everyone is working on and identifying potential connections between research areas… I am currently in touch with a few of those students, and we may explore potential collaboration that could support our broader graduate study goals."

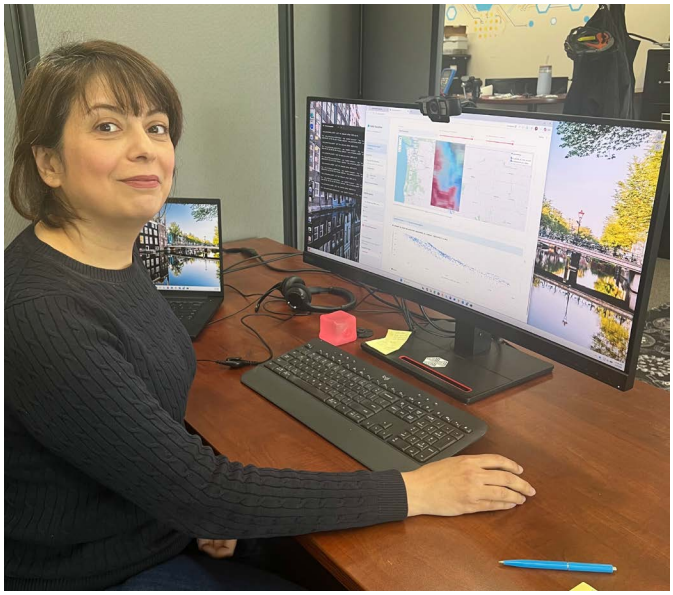
From Infrastructure to Insight: The I-CREWS Data Hub Comes to Life

By Sanaz Salati

Over the past year, the Idaho's Community-engaged Resilience for Energy-Water Systems (I-CREWS) Energy-Water Data Hub has transitioned from an early-stage setup to a functioning platform now supporting active research across Idaho. Designed to facilitate data sharing and collaboration among a large, multi-institutional team, the Hub is central to connecting the project's Characterize, Modeling, and Alternative Futures research components operating across three study sites: the Coeur d'Alene Reservation, Fort Hall Reservation, and the Treasure Valley including Boise.

Data Migration and Infrastructure

A key development this year was the migration of all project data from OwnCloud to a purpose-built platform hosted at the Idaho National Laboratory's Collaborating Computing Center (C3). The transition involved standardizing data formats and coordinating workflows across multiple research teams. While data integration is an ongoing process, the core infrastructure is now stable and actively supporting research activities.



Sanaz Salati, I-CREWS Statewide Data Manager, showcasing the I-CREWS Data Hub homepage, a searchable catalog to discover, access, and share water, environmental, and energy research datasets from across Idaho.

Researcher Access and Authentication

The Hub uses the InCommon federated identity system, allowing researchers to authenticate using their existing institutional credentials or through Google, Microsoft, ORCID, and GitHub accounts. This eliminates the need for separate platform accounts and has helped lower access barriers for participants across I-CREWS partner institutions.

Once authenticated, users can search the dataset catalog, download data, and contribute their own datasets to the Hub. A searchable metadata index supports discovery of both publicly available and project-specific datasets across the full range of I-CREWS research themes.

Available Datasets

The Hub currently hosts data spanning six thematic domains relevant to Idaho's energy-water systems:

- Climate and hydrology: Daily temperature, precipitation, and snow water equivalent data; ERA5 atmospheric reanalysis; high-resolution meteorological surfaces from gridMET; and SnowClim snowpack projections at 210-meter resolution across the western US.
- Ecological data: Satellite-derived vegetation indices, gross primary productivity, evapotranspiration, land surface temperature, and wildfire hazard and burn probability layers from MODIS.
- Energy systems: Wind resource data from NREL's WIND Toolkit, solar radiation records from the National Solar Radiation Database (NSRDB), and proximity data for photovoltaic facilities, wind turbines, and power plants across Idaho.
- Social and community data: Census population estimates, net migration trends, energy and housing burden indicators, community resilience scores (BRIC), and air quality exposure data.
- Water management and hydrology: Surface water features including rivers, lakes, and the USGS 3D Hydrography Program dataset; groundwater quality records from Idaho's Environmental Data Management System (EDMS); water rights points of diversion, water banks, municipal service boundaries, and irrigation organization data administered by IDWR; global reservoir dynamics from the Deltares Water Availability model; and cropland data from USDA's National Agricultural Statistics Service.
- Soils: STATSGO2, gSSURGO, and gNATSGO datasets providing detailed physical and chemical soil properties across Idaho — key inputs for modeling water infiltration, agricultural water use, and land-surface hydrology.

Consolidating these datasets within a single platform with consistent access controls reduces duplication of effort and supports more efficient data exchange across research teams.

Building Research Capacity Across the Project

Two project-wide workshops were held this year to build capacity among I-CREWS researchers. The first addressed data management practices relevant to the Hub, and the second focused on high-performance computing workflows using the Falcon and Lemhi supercomputers. These sessions were designed to ensure that researchers can effectively use the tools and infrastructure available to them.

Indigenous Data Sovereignty

A data-sharing agreement with the Coeur d'Alene Tribe is currently under review by the legal counsel of both the University of Idaho and the Tribe. Once finalized, the Hub will implement the agreement's provisions in full. Tribal data will be stored, accessed, and shared exclusively in accordance with the Tribe's guidance, with access controls and data handling protocols configured accordingly to uphold data sovereignty and protect sensitive community information.

Upcoming: Data Visualization Tools

The next phase of Hub development includes integration of a visualization tool that will allow users to interact with complex datasets directly in their browser. This will support exploration of geospatial files, satellite imagery, climate model outputs, and tabular data without requiring specialized software. The tool is intended to broaden access to Hub data across the I-CREWS team, including researchers who may not have backgrounds in GIS or data engineering.

Next Steps

Development of the I-CREWS Data Hub is ongoing. Planned enhancements include expanding the dataset catalog, integrating Jupyter notebooks and API code snippets to support reproducible data access workflows, and adding a Globus endpoint to facilitate transfer of large datasets. The Hub is designed to grow alongside the project, with the goal of providing a reliable and well-documented data infrastructure in support of Idaho's energy-water research community.

I-CREWS Research

Mitchell Meads: Mapping Treasure Valley's Energy-Water Future

By Emily Elden

In the last 25 years, the Treasure Valley's population has nearly doubled, with booming growth in residential, commercial and tech development. Boise State environmental management scientist Mitchell Meads is investigating how this explosive growth affects natural resources and the communities that depend on them.

Tackling Treasure Valley's energy and water challenges

Meads is a postdoctoral research fellow for Idaho's Community-engaged Resilience for Energy-Water Systems (I-CREWS) and an affiliate of the Boise State Resilience Center. He is also the site leader for the I-CREWS Treasure Valley site.

As site leader for the Treasure Valley study area, Meads engages local experts in municipalities, policy and other fields to identify energy and water challenges across Ada and Canyon counties, which comprise most of the Boise metropolitan area. His team found that while usage is increasing, consumption rates lag behind population growth — indicating that informed management can allow for more strategic planning tied to resilient systems.

For example, community stakeholders and experts have growing concerns about water availability and extreme weather uncertainty. Unprecedented changes in snowpack, streamflows, and groundwater threaten current systems' capacity to meet future needs. Meanwhile, evolving land use patterns are reshaping both the regional landscape and long-standing water demands.

Energy demands present related considerations. Population growth continues at a rapid pace, and

Mitchell Meads, postdoctoral research fellow in Idaho's Community-engaged Resilience for Energy-Water Systems (I-CREWS) and site leader for the I-CREWS Treasure Valley study site.

new facilities like the Meta Data Center in Kuna and the proposed Gemstone Technology Park will strain systems further. How much these centers will affect energy costs for residents remains unclear.

Planning for resilience

Meads works with a range of I-CREWS team members to understand historical, current, and projected scenarios in order to improve communities' resource management.

"In a rapidly changing region, proactive planning is essential to protecting both people and resources.

By leveraging local-level experts' knowledge, we can inform decision-making now to meet desirable futures and avoid undesirable ones," Meads said.

Similarly, by translating insight and expertise into strategic action, the team strives to turn long-term risks into manageable challenges that support a sustainable future.

From childhood wonder to community impact

Meads traces his environmental interests to his childhood in Orlando, Florida. The mix of urban spaces and subtropical wetlands fueled his love of the outdoors. Though his initial interests and degree were biological, his graduate studies led him to appreciate the ways humans affect the environment — especially through policy and planning.

At Texas A&M University, Meads studied the flood-reducing mangrove ecosystems in coastal areas and earned his doctorate in Marine and Coastal Management Sciences. Meads noted, "I found my passion at this intersection between nature, environment and society."

Inspiring future leaders in energy-water management research

Meads now shares that passion with future generations. In Oct. 2025, he engaged fourth and fifth graders at a Nampa elementary school in a mapping exercise where they planned scenarios to deal with a flood or wildfire. More recently, Meads led I-CREWS graduate students from three Idaho universities on a retreat in McCall, Idaho, roughly two hours north of Boise. Students had the opportunity to build connections and share research with peers from multiple site projects and disciplines.

"Dr. Mitchell created such a supportive atmosphere," said Tapiwa Mwila, a graduate student in Boise State's postdoctoral computing program. "He guided discussions, asked thoughtful questions and offered clear, well-informed feedback. Imagine, he did this for each and every student… This was amazing."

When asked about highlights of his first year in Boise, Meads said, "I didn't come to Idaho with deep roots, but the people here have made it feel that way. Working alongside Idaho communities that value connection and collaboration has strengthened my commitment to interdisciplinary, community-engaged research — because that's what creates lasting resilience."

I-CREWS Research

Local Researcher Maps the Hidden Disparities of Energy Access

By Ila Garrido

As conversations around community resilience grow, one postdoctoral researcher is examining the geographic patterns of regional energy systems. Mikhail Samarin is a researcher with the Idaho's Community-engaged Resilience for Energy-Water Systems (I-CREWS) project whose current work concerns home heating, fuel poverty, and community energy projects. He is also contributing to a major review paper for the I-CREWS project that centers on the adaptive capacity of coupled energy-water systems. His goal is to determine which framework best applies to particular study sites within I-CREWS.

Through critical cartography and comparative analyses, Samarin is mapping out how fuels used for home heating vary across the state. He found that some communities located right next to larger cities and gas service laterals nevertheless lack or have limited access to utility gas. As a result, these places have higher dependence on more expensive options to heat their homes. Conversely, some remote and recreation-oriented towns enjoy access to cheaper, utility supplied heating, regardless of difficult terrain or distance from major cities of Idaho.

"Such patterns are not really acknowledged, or they may be viewed as naturally occurring," Samarin noted about the distribution of main sources used for home heating. By critically comparing local economic factors with these uneven energy geographies, his work challenges that very premise. In other words, these spatial differences are not formed by chance. Instead, past and present infrastructure planning, configurations of energy systems, and socioeconomic conditions in certain areas have collectively contributed to these uneven patterns. By bringing this understanding to the forefront, his research supports a future vision where communities, especially non-metropolitan ones, create and manage their own small-scale energy systems. This shift would empower

people to move away from relying solely on corporate energy provision or resorting to more expensive sources like propane, wood, or fuel oil.

Samarin draws his interest from a background in examining various housing problems geographically. By shifting his focus to energy, he combines the two as essential facets of community resilience. He noted that it is deeply rewarding to study regions that are often overlooked in scholarly work. Living in the region he studies allows him to immerse himself in the research, using local data, GIS, and community planning documents to better understand local energy issues.

I-CREWS Education and Workforce Development

Education and Workforce Development Team Gathers in McCall, Idaho

by Sarah Penney-Jackson

The Idaho's Community-engaged Resilience for Energy-Water Systems (I-CREWS) Education and Workforce Development Team attended a retreat on February 17-19 at the McCall Outdoor Science School (MOSS) University of Idaho Field Campus in McCall, Idaho. There were 12 in attendance from around the state including Boise State, University of Idaho, Idaho State University, as well as the Coeur d'Alene Tribe. The team also had participants from Idaho's 2-4 year colleges including College of Western Idaho, College of Southern Idaho, and Lewis Clark State College.

The purpose of the retreat was to build community and relationship amongst the team, evaluate progress, and plan for success for the rest of the remaining activities. As there are many components to I-CREWS education and workforce development, the group discussed ongoing projects designed to promote I-CREWS research within communities, including the Vertically and Community Integrated Projects (VIP/CIP) taking place around the state, and the Summer Authentic Research Experience (SARE) Program, taking place this summer.

One of the activities included working to develop and refine Energy-Water Systems Literacy Principles – one of the major milestones for I-CREWS education and workforce development. This "framework" for Energy-Water Systems Literacy is meant as a tool that can guide educators to think about the understandings, skills and dispositions necessary to support more resilient futures for communities with respect to energy-water systems.

In addition to meeting times, participants were also able to enjoy McCall's recent snowfall and use free time to explore trails, ski, and enjoy the neighboring hot springs. The networking event helped create new ideas and a clear pathway for the next phase of the I-CREWS project.

I-CREWS Education and Workforce Development Team gather in front of the yurt. Photo credit: Ila Garrido (ISU)

Team members gather in one of MOSS's yurts for workshop discussion.

Graduate Student Illuminates New Solutions for Infrastructure Resilience

By Emily Elden

Shreya Mul, a graduate student in Boise State's civil engineering master's program, won first place in the poster competition at the 2026 GeoCongress Conference in Salt Lake City, Utah. Her research on stabilizing problematic soils is a culmination of her academic work in geotechnical engineering.

Research tackles costly soil problems

Mul's winning presentation, "Hydrophobic Stabilization of Expansive Soils," addresses a major infrastructure challenge. Expansive soils swell with high moisture and shrink when dry, causing billions of dollars in damage to foundations, roads, and buildings each year.

Rather than relying on traditional stabilizers like lime or cement, Mul's research evaluates how hydrophobic — water-repelling — chemical treatments can reduce soil's attraction to water, thereby reducing the risk of moisture-related damage and improving structural durability. Preliminary results show significant reductions in swelling potential compared to untreated soils.

Her advisor, professor and department chair, Bhaskar Chittoori, attended the conference and witnessed her win. "I could not be prouder," Chittoori said. "Shreya is meticulous, responsible, intellectually curious, and incredibly hardworking — qualities that make for an exceptional graduate student. Mentoring students and watching them succeed like this is easily the most rewarding part of academic life."

Connecting research to Idaho's water challenges

Beyond soil stabilization, Mul's research extends into broader questions of infrastructure resilience. She is a graduate researcher for the Idaho Community-based Resilience of Energy-Water Systems (I-CREWS). Alongside civil engineering professors Bhaskar Chittoori and Nick Hudyma, Mul collaborates on a project led by Bruce Savage at Idaho State University to examine the potential of subsurface dams as supplements for regional energy-water systems.

"What excites me most is how both of my research projects intersect around resilience," Mul said. "Whether storing water underground or preventing foundational damage, my work focuses on designing systems that are not only structurally sound, but also adaptive, sustainable, and long-lasting."

Shreya Mul accepts first place honors at 2026 GeoCongress Conference in Salt Lake City, Utah.

From earthquake survivor to soil engineer

Mul's path to engineering began in childhood, watching her civil engineer father sketch detailed building plans by hand. "I was always fascinated by how careful lines on paper could eventually become real structures," Mul said.

Growing up in Nepal, she witnessed stark contrasts between the developed capital city of Kathmandu and rural areas and realized the power infrastructure plays in shaping people's lives.

The 2015 Gorkha earthquake — a 7.8 magnitude disaster responsible for the loss of nearly 9,000 human lives — cemented her resolve to pursue geotechnical engineering.

"Experiencing that disaster personally, seeing buildings collapse, communities disrupted and families affected, deeply impacted me," Mul said. "It made me question not just how structures are designed, but how the ground beneath them behaves during such events."

Mul, graduates this summer and credits her I-CREWS experience with centering her professional ambitions. "Being part of this interdisciplinary EPSCoR project shaped my goal of focusing on climate-resilient infrastructure and addressing long-term water and energy challenges."

Graduate Research Highlights Critical Gaps in Rural STEM Education

By Emily Elden

Rural Idaho teachers want to bring real-world STEM learning to their students but struggle to access relevant resources. That's one key finding in new research led by Braelyn Shields, a graduate student in Boise State's Master of Environmental Management program. Working alongside Angela Crawford, assistant research professor of STEM education at University of Idaho, the research illuminates critical gaps and areas for new alignment between what STEM organizations offer and what educators actually need.

"Our goal was to understand the barriers between STEM organizations and rural schools, and we were really interested in how needs might differ based on local context," Shields said. "Idaho is characterized by very diverse ecological landscapes, and that can impact how people connect to a place."

The research, part of Idaho's Community-engaged Resilience for Energy-Water Systems (I-CREWS) initiative, surveyed STEM organizations and met with K-12 educators in focus groups across Idaho to understand why resources aren't reaching rural classrooms. For Shields, a Boise native, the project connected perfectly with her interest in place-based education.

From student to researcher — with a surprise reunion

Shields joined the research team in spring 2024 as a graduate assistant to Jared Talley, then an assistant professor in Environmental Studies in the School of Public Service. Soon after joining, the project brought about an unexpected reunion.

Shields's graduate research position reconnected her with someone from her middle school days: Angela Crawford. Crawford was senior personnel on the I-CREWS STEM education project, but she also happened to be Shields's seventh-grade math teacher.

"We were in a meeting regarding the survey, and [Crawford] said, 'Oh my God! I was your teacher!' So, our team became really close, and it was such a fun project working alongside my former teacher," Shields said.

Three major barriers blocking rural STEM education

The research revealed a disconnect: STEM organizations believe they are meeting educator needs, but teachers identified three major obstacles preventing them from using available resources.

Lack of awareness tops the list. Though many organizations offer STEM resources, 67-77% of organizational respondents live outside of Idaho, so regional and community knowledge is second-hand and often misses locally specific realities necessary for place-based instruction. For example, many organizations overlooked mining as a significant economic driver in many rural communities.

Geographic accessibility creates additional challenges. Responding K-12 educators overwhelmingly said they were unfamiliar with many organizations and curricular resources. Professional development opportunities also vary considerably by region, creating gaps in access to resources.

Finally, educators identified time, support and capacity to adapt materials as a significant challenge. When organizations don't market resources well, teachers spend hours searching for relevant materials or designing their own from scratch. When existing resources lack local industry context, lessons want for the place-based relevance that grounds learning in reality.

Streamlining STEM education

The findings point to clear solutions. Educators want:

- A single directory of STEM organizations and resources, searchable by topic and region
- Better marketing and communication from STEM organizations
- Funding for liaison positions to coordinate resources and support
- Materials that reflect local and environmental context

Such changes could improve STEM education not just in Idaho, but nationwide.

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Building bridges between communities and agencies

Shields will graduate with her Master of Environmental Management degree this summer. Her research is scheduled to appear in International Education Studies in April 2027. She's currently finishing her thesis on forest collaboratives' strategies and hopes to work for the United States Forest Service or Bureau of Land Management in a community liaison role.

"My time with I-CREWS has really made me appreciate the collaborative process of research. Hearing from others who think differently is one of the greatest things about learning," Shields said. "I would love to find myself helping communities and agencies support federal projects as well as local interests."

Her research demonstrates how collaborations between universities, organizations and educators can create meaningful change.

Braelyn Shields, I-CREWS Graduate Assistant at Boise State.