

the RESEARCHER

IDAHO NSF EPSCoR

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Idaho EPSCoR Annual Meeting participants during Coeur d'Alene Tribe Energy-Water Tour. See page 4.

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Andy Kliskey

LETTER FROM THE DIRECTOR

At the start of the new year, the I-CREWS project will reach the mid-point of its 5-year cycle. We are now at the stage of having a fully built-out and established team across college, Tribal, and university partners. We have also advanced past two critical reviews – our first Project Advisory Board (PAB) review and NSF's Year 2 virtual Reverse Site Visit (vRSV). Taken together the recommendations and our collective responses for these reviews provide timely and complementary advice for shaping the 2 ½ year run for I-CREWS. I

look at these external reviews as providing an essential opportunity to set out a clear roadmap for the necessary integration and interweaving to support the I-CREWS mission.

To borrow directly from our PAB: the term integration is used to describe the effort to bring together diverse perspectives, data sources, and disciplinary approaches in modeling the energy-water nexus across Idaho. Integration implies a kind of synthesis: combining parts into a coherent whole, often with the goal of producing a unified model or framework. Interweaving suggests a different kind of relationship — one that values the distinctiveness of each thread (discipline, site, stakeholder perspective) while emphasizing the strength and resilience that comes from their patterned interaction. Unlike integration, which can sometimes imply flattening or subsuming differences, interweaving allows for complexity, tension, and multiplicity to remain visible and productive.

We are engaged in both integration and interweaving and each has an important role in our project success:

- Integration challenges us to build models, scenarios, and representations that incorporate community perspectives into technical frameworks.
- Interweaving challenges us to foster meaningful connections across sites, disciplines, and knowledge systems — without necessarily forcing them into a single mold.

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Letter from the Director continued

The PAB has provided us with a valuable framework for how to approach the key steps in the development of alternative futures in each of the study sites that accommodate interweaving and integration in a balanced manner. That framework in turn supports the high-impact research paper outlines that we collaboratively developed for each study site in response to the vRSV.

Since both integration and interweaving approaches are necessary, we need to choose the right tool for the right job. Before each

major activity, we can ask ourselves: Is our goal here to merge outputs into a unified product (integration) OR is our goal to build and strengthen connections across differences (interweaving)? In doing this we can use our framing questions as the bridge between the two approaches. And so we have a roadmap that we can all benefit from as we advance through Year 3 of I-CREWS.

I-CREWS Research

Building Models and Relationships: Helping Idaho Plan for a More Resilient Energy-Water Future

By Lan Li

The I-CREWS team is breaking new ground in how science, technology, and community knowledge come together to solve some of Idaho's biggest challenges in energy and water management. Over the past years, researchers have made major progress toward a key goal — integrating qualitative insights and quantitative data to better model resilience across the state's energy-water systems.

Collaboration That Crosses Disciplines and Communities

Three research teams, including Characterize, Modeling, and Alternative Futures, are now working across Idaho's three study sites: the Treasure Valley, Shoshone-Bannock Tribe, and Coeur d'Alene Tribe. Supported by a cross-functional team, the effort ensures that local data, advanced modeling, and community engagement all inform one another. Recent project workshops on computational modeling, risk assessment, and machine learning brought together scientists, Tribal partners, and students to build shared understanding and capacity across disciplines.

Where AI Meets Energy-Water Resilience

Machine-learning models, such as Random Forests and Long Short-Term Memory (LSTM) neural networks, predict water and energy use across Idaho's diverse regions. Specifically, in the Treasure Valley early models are already reaching accuracy levels above 85%. The modeling team is also expanding its reach with physics-based hydrologic models (MODFLOW) and energy-system simulations (MATPOWER) to explore how growth, technology, and environmental change will affect both energy and water supply. The modeling team translates interviews, policy documents, and local perspectives using large language models (LLMs) — tools that help turn narrative information into data that can be combined with numbers from water-use records, population data, and energy trends. A new internal guide on AI-assisted qualitative analysis helps I-CREWS researchers apply these tools responsibly, emphasizing data ethics, cultural sensitivity, and human validation every step of the way.

The model outputs will be shared with other I-CREWS teams, and Tribal and community knowledge holders for validation. This feedback loop keeps the research grounded, trustworthy, and relevant to Idaho communities. The modeling team is building not just models but also relationships, helping Idaho plan for a more resilient energy-water future.

Modeling Climate and Hydrological Impacts on Coeur d'Alene Lake: Informing Sustainable Water Quality and Management Strategies

By Laura Laumatia

The Coeur d'Alene Tribe and faculty from Idaho Water Resources Research Institute (IWRRI), University of Idaho – Moscow, and ISU are all excited to be collaborating on an I-CREWS seed grant that will advance our ability to understand changes in snowpack and their impact on Coeur d'Alene waters. The primary goal of this effort is to use a lake model to predict temperature dynamics in southern Coeur d'Alene Lake under a range of regional climate change and lake elevation scenarios. Water temperature and seasonal thermal stratification are critical productivity drivers in southern Coeur d'Alene Lake, which already has degraded water quality. Regional climate change predictions will modify boundary conditions of the model, creating a range of scenarios affecting the lake. An important boundary condition driving Coeur d'Alene Lake temperature is the intensity and timing of



View of Chatcolet Lake, Heyburn State Park

the St. Joe River hydrograph. A component of this project will analyze the influence on the St. Joe River hydrograph from air temperature, precipitation and snowpack from multiple Snow Telemetry (SNOTEL) sites in the St Joe River basin. The output from the SNOTEL and St. Joe River analysis will refine the climate change-modified boundary conditions of the lake model for southern Coeur d'Alene Lake. Using this output, the team will be able to collaborate with the broader site team to develop scenarios that couple the biophysical models with social

and economic factors, supporting community members and policy makers in developing long-range plans for the Basin.

The team has already begun working on this effort with updates to the current model of Coeur d'Alene Lake, and are looking forward to sharing results in the new year.

Researcher Partners with Shoshone-Bannock Tribes to Study Trout Populations and Habitat on the Fort Hall Bottoms

By Ila Garrido

Idaho State University graduate researcher Kaitie Warner is conducting an in-depth study on trout populations and habitat management on the Fort Hall Bottoms, one of the last intact floodplain river ecosystems in the region. Working in close partnership with the Shoshone-Bannock Tribes' Fish and Wildlife Department, Warner's research investigates how hatchery rainbow trout introduced outside the Fort Hall Reservation may be affecting native Yellowstone

cutthroat trout within Tribal waters as well as their responses to habitat improvement efforts.

The Fort Hall Bottoms hold deep cultural and ecological significance for the Shoshone-Bannock Tribes. Its land, water, and wildlife have supported generations and continue to play a central role in Tribal identity, heritage, and environmental relationships. Warner, a master's student in Biology advised by Dr. Colden

Baxter, is working to support the Tribes' long-standing commitment to protecting their resources by providing data to inform fish and habitat management. The study combines traditional ecological knowledge with scientific analysis, creating a model for respectful and collaborative research that centers Indigenous perspectives.

"I think it's important to realize that the Fort Hall Bottoms isn't just an outlined piece of land found on a map," said Warner. "Yellowstone cutthroat trout aren't just fish found in the area. These are important resources for the other fish, wildlife, and the Tribal peoples that rely on them for all cultural purposes. The Fort Hall Bottoms is a location that brings the Shoshone-Bannock Tribes' cultural values, relationships, and need for conservation together."

This project, supported by the National Science Foundation EPSCoR I-CREWS (Idaho Community-engaged Resilience for Energy-Water Systems) initiative, aims to answer three key questions: Are localized habitat improvements benefiting fish populations or should more focus be placed on restoring natural floodplain processes? What proportion of the trout in Tribal waters are sterile hatchery fish? And what are the long-term ecological consequences of rainbow trout on native species through competition or hybridization? To answer these, Warner is using historical and current data, mark-recapture techniques, and tissue analysis to assess

reproductive viability. The results will help guide both Tribal and external decision-makers, offering a clearer understanding of how fish populations are shifting and what strategies are most effective for conservation.

This research has broader implications beyond Fort Hall. As water management, fish stocking, and habitat restoration continue to affect ecosystems across the West, Warner's findings could inform similar efforts in other areas facing interconnected ecological challenges. Importantly, the collaboration between ISU and the Shoshone-Bannock Tribes serves as an example of how academic research can support Tribal sovereignty and resource management goals while fostering mutual respect and knowledge sharing.

For Warner, the work is not only scientifically rewarding but also personally meaningful. "I have to say the most rewarding aspect about my research is being extremely lucky enough to witness the beauty of the Fort Hall Bottoms," said Warner. "There aren't many places left like that out there, and the fact that I get to contribute to a study focusing on this area to provide data for future use, it's extremely rewarding. One of the first creeks I snorkeled through, I was in awe. Brisk water touching my face, crystal clarity, bright green vegetation waving in the current, and schools of beautiful fish. I'm very fortunate to be given this opportunity to contribute to something for future generations and I'm looking forward to seeing the outcome."



Shoshone-Bannock Tribes Fish and Wildlife Department and Kaitie Warner, ISU researcher, study trout populations on the Fort Hall Reservation to gain understanding of how fish populations are shifting and what strategies are most effective for conservation.

I-CREWS Workforce Development

ASSERT - Aligning Stakeholders & Structures to Enable Research Transformation

The overall goal of the I-CREWS Education (Ed) and Workforce Development (WFD) plan is to develop individual, community, and institutional capacity for more resilient and planned futures with respect to education and E-W systems. I-CREWS builds capacity and implements programs at levels spanning undergraduate through graduate education, to faculty.

Expanding an innovative faculty professional development model for transformative scholarship is one of the I-CREWS objectives designed to empower academics to pursue impactful, community-engaged scholarship.

Aligning Stakeholders and Structures to Enable Research Transformation (ASSERT), a program developed at Boise State University, was recently expanded statewide, with new ASSERT programs at both Idaho State University and University of Idaho.

While each institutional ASSERT has tailored the program to their specific needs, the shared goal is to support faculty to overcome structural and personal barriers to performing transformative research. Faculty from all ranks and departments are welcome to participate and cohorts meet regularly on each campus to foster interdisciplinary collaboration and develop frameworks for engaged research.

The statewide ASSERT network is actively building partnerships, developing curriculum, coordinating a retreat, and advancing faculty support. ASSERT faculty have been identified at Idaho State University and Boise State University, and University of Idaho is currently interviewing faculty to fill the ASSERT roles for this year's cohort.



ASSERT Fellows during Spring Retreat 2025

Meet the ASSERT Team



JIM FREDRICKSEN

Boise State University

Jim leads the Institute for Inclusive and Transformative Scholarship and is a Professor of English Teaching. Along with co-leader Leslie Atkins, Jim guides Boise State's ASSERT program. Boise State celebrates its 10th cohort of ASSERT this year. "It's exciting to partner with our colleagues across Idaho this year," Jim explains, "because we know opportunities will develop and expand for everyone involved."



EMMA FOX-FOGLE

Idaho State University

Emma is the newly appointed ASSERT Lead and Research Coordinator in the Office for Research. She brings a commitment to expanding research opportunities and building relationships across disciplines. Emma shared, "I'm especially excited to collaborate with faculty and help expand research opportunities across campus. It's a great chance to support both faculty growth and ISU's research mission."



MARGARET PINNELL

University of Idaho

Margaret is the Director of the Center of Excellence for Teaching and Learning and a Professor of Mechanical Engineering. She leads efforts to recruit and mentor ASSERT Fellows from all disciplines, advancing faculty development and impactful scholarship.

To learn more about ASSERT, visit the I-CREWS website: www.idahocrewws.org/ASSERT

Creating Community Integrated Projects to Address Energy Water Issues



Students participate in a Community Integrated Programs (CIP) course designed to work with the City of McCall, Idaho to prepare educational events that would help the City to gain community input on their Climate Action Plan.

The Idaho Community-engaged Resilience for Energy-Water Systems (I-CREWS) project is implementing a variety of ways to develop individual, community, and institutional capacity for more resilient and planned futures with respect to education and E-W systems.

Community Integrated Programs (CIPs) are a course type offered for undergraduate and graduate students, and are jointly developed with community members to address community-identified issues, particularly those related to energy and water systems.

The collaboration can include community members, students, and faculty and can also engage learners from across disciplines and knowledge systems in an effort to identify different interdisciplinary and innovative solutions to complex energy and water challenges.

Dr. Karla Eitel, Co-Lead for I-CREWS Education and Workforce Development, is leading efforts by identifying and recruiting new potential CIP courses

to the project. CIPs include shared leadership across contexts (for example, between the University and a Tribe, or local government) and work across knowledge systems. The CIPs are also aligned to priorities for I-CREWS and community, with outcomes and products created from the CIP also being relevant and useful to the community.

One of the first CIPs developed as part of I-CREWS was a course designed to work with the City of McCall, Idaho to prepare educational events that would help the City to gain community input on their Climate Action Plan.

The CIP seminar, titled NRS 501: Seminar in Socio-Ecological Systems, was created in Fall 2024 and implemented in Spring 2025. The instructors were both Karla Eitel from University of Idaho, and Meredith Todd, from the City of McCall.

Student learners included a total of 23 graduate students in Master of Natural Resources in Environmental Education and Science Communication along with over 60 community members which included high school students, and non-profit leaders.

The collaborative approach has given students and community participants a greater understanding of what is needed to solve complex problems. Some of the things learned through this process are that local issues cannot always be explained by scholarly literature -we also need local knowledge. Participants are also realizing that there are rarely only two sides to an issue, and reasonable people may still disagree on solutions. Most importantly, effective problem solving requires addressing difficult emotions and diverse perspectives on complex issues.

The CIP course has provided students with valuable skills needed to effectively navigate these issues and identify new and creative ways to connect with

the community. Students are taking part in a variety of activities from reading and synthesizing literature related to climate impacts on mountain communities, conducting workshops for high school participants, to interviewing and engaging community members to gain local perspectives.

The City of McCall is set to adopt its Climate Action Plan in Fall 2025. The next cohort of graduate students at the University of Idaho McCall Field Campus is planning a speaker series for the community with the

goal of continuing to educate and raise awareness of the ways that environmental change is impacting energy and water systems as well as other aspects central to the wellbeing of this mountain community.

I-CREWS participants are encouraged to consider developing and implementing their own CIPs. To learn more, visit the I-CREWS Education and Workforce Development site for information on how to apply (<https://idahocrewns.org/cip-program/>).

Meet Mathematician Tapiwa Mwila

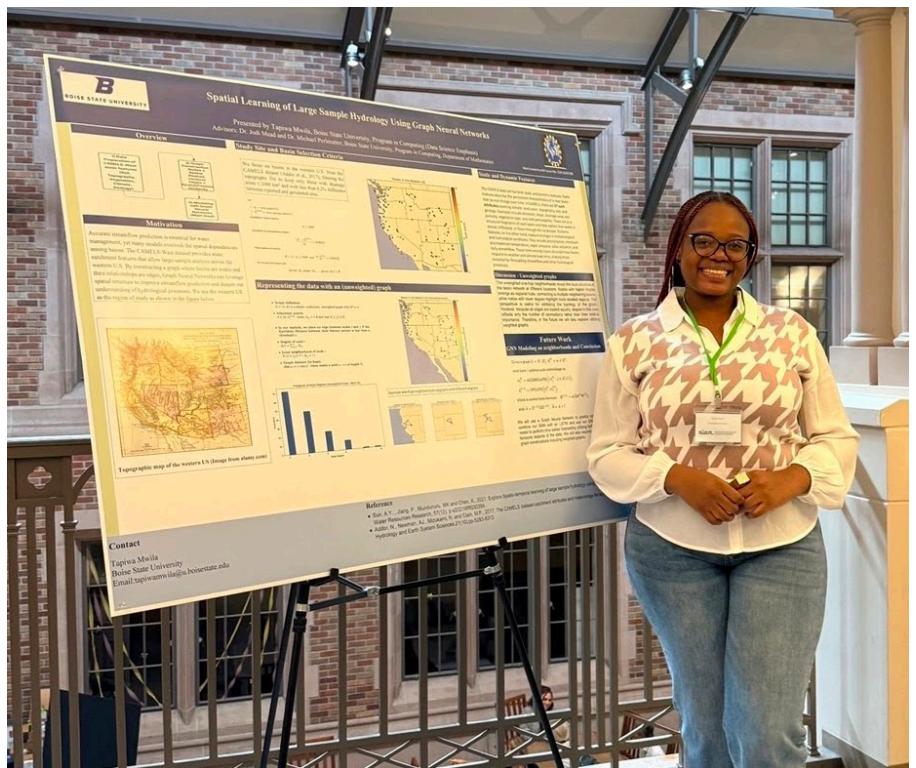
By Emily Elden

To say Tapiwa Mwila is a go-getter would be an understatement. Originally from Zambia, she traveled over 1,300 miles from home to attend graduate school at the African Mathematical Institute (AIMS) in Kigali, Rwanda. After earning her master's degree in mathematical sciences (with an emphasis in data science), she then pursued her studies across the globe in Boise, Idaho, logging an additional 7,450 miles.

Now a third-year graduate student in Boise State University's Computing PhD Program, Mwila applies her knowledge of mathematics and data science for I-CREWS (Idaho Community-engaged Resilience for Water-Energy Systems). This multidisciplinary project is funded largely by the National Science Foundation's Established Program to Stimulate Competitive Research (EPSCoR).

Mwila joined I-CREWS in 2024. She and fellow student, Jon Flores, work alongside Lan Li, professor of materials science and engineering; Michael Perlmutter, assistant professor of mathematics; and Jodi Mead, professor of

mathematics. Joined by researchers from other areas of Boise State, Idaho State University and the University of Idaho, the team works to compile, compute and create data models that will inform state energy-water projects.



Tapiwa Mwila, Boise State graduate student

People of I-CREWS

Focusing on the Treasure Valley Region—specifically, Ada and Canyon counties—Mwila has been studying data related to groundwater flow and resource consumption. The team compared trends in usage rates to population shifts and water policy. This approach allows the modeling team to train machine learning models which forecast future usage.

In October, Mwila presented some preliminary work at the Pacific Northwest Section of SIAM (Society for Industrial and Applied Mathematics) Biennial Meeting in Seattle, Washington. This conference brings together individuals from a wide variety of industrial and educational communities from across the globe.

Mwila expressed gratitude for the experience, which allowed her to share, learn and network with experts from a variety of industries and geographies.

Back at Boise State, Mwila enjoys her I-CREWS research and modeling work because it is so relevant to the Idaho community and her own professional aspirations.

“I really love that we get to work with real-time data,” Mwila stated. “I’ve pictured myself taking up a career in modeling, especially for machine learning. So, I’d say what I’m currently doing is completely in line with my career goals.”

Tribal Scholar Takes on New Assistant Professor Role at University of Idaho



Shanny Spang Gion

In fall of 2020, a new Visiting Tribal Scholar position was created at the University of Idaho (U of I) in an effort to identify ways in which institutions of higher education could facilitate Indigenous student education, increase enrollment, and increase success rates of existing students.

The two-year position, which received financial support from the College of Natural Resources and Idaho NSF EPSCoR, aimed to increase completion rates for Native American students by providing culturally responsive support in the form of mentoring to Indigenous students, Indigenousizing curricula in the affiliated programs, and by providing direct linkages to regional tribes to engage in research or projects of mutual interest to the scholar and college.

Shanny Spang Gion, an enrolled citizen of Northern Cheyenne Tribe of Montana, was selected to fill the role as the first new Visiting Tribal Scholar. Spang Gion, who has a Bachelor of Science in Environmental Science from Montana State University-Bozeman and a

graduate degree from Montana Tech in Hydrogeology and Technical Communication, also had her sights set on completing a doctoral degree at U of I with a research focus on serving Tribal communities.

In 2025, Spang Gion completed her Ph.D. in Indigenous and critical water geographies and also took on a new role of Assistant Professor of Tribal Water at University of Idaho. The position, which is in conjunction with Idaho EPSCoR I-CREWS, aims to develop an integrated approach to water and/or energy-related research, scholarship, and teaching that center on Indigenous knowledge systems, ways of knowing, and science guided by Tribal interests and priorities. This work is centered in and committed to co-production of integrative and collaborative research and outreach in partnership with Tribal Nations, natural resource management agencies, and local communities.

Relationship building has always been at the core of Spang Gion’s work and is something she is excited about. She states, “Becoming an Assistant Professor where I am able to center Indigenous ways of knowing, water, and water relations with tribes is a powerful shift in how teaching, research, and scholarship is done with and by Indigenous people. I’m honored to be in this role at University of Idaho and aim to continue transformative work in concert with the amazing students, colleagues, and mentors here at U of I.”

Stephanie Lenhart Joins I-CREWS in New Environmental Governance Role

By Emily Elden

Most people have a basic concept of energy management through monthly utility bills. Stephanie Lenhart, however, brings more than two decades of experience working at the intersections of energy policy and environmental governance across the American West. From state government positions to private consulting and academic research, she possesses an extensive understanding of the institutions and systems that manage energy and protect the environment.

Now, she's extending her expertise in environmental governance through I-CREWS, Idaho's Community-engaged Resilience for Energy-Water Systems. Lenhart is a new associate professor in the School of Public Service and the School of the Environment and is affiliated with the Energy Policy Institute at Boise State. Her courses focus on environmental and energy policy governance.

I-CREWS is a multidisciplinary project that studies and addresses how changes, such as population, technology, and weather, affect Idaho's energy-water systems. It connects Boise State researchers with colleagues from multiple universities, colleges and Tribal nations to understand resource trends and design more resilient approaches for energy-water systems. However, to meet the needs of unique communities, many levels of administration and policy must be considered — this is where Lenhart comes in.

Lenhart's research explores how new technologies are integrated into the existing institutions and policies that manage energy across the Pacific Northwest. Her governance expertise, in collaboration with I-CREWS' partners, makes her very well-suited to contribute to the development of insights that inform Idaho communities about anticipated pressures and potential ways to adapt.



Faculty Instructors at Zena Creek Ranch Field School (left to right) Stephanie Lenhart, School of Public Service; Jen Pierce, Geosciences; Todd Otanicar, College of Engineering; Kendra Kaiser, Idaho Water Resources Research Institute

Along with her environmental governance role, Lenhart serves as co-investigator with Lejo Flores and Irene Cionni, recent seed-award recipients, studying Idaho's compound energy drought (extended periods with minimal wind and solar energy). She is also the program lead for Boise State's new Master of Environmental Management and faculty coordinator for the Zena Creek Ranch Environmental Field School, where undergraduate and graduate students explore land, water and energy sustainability through inquiry-based learning.

An advocate for her field, Lenhart's commitment to community drives her work. "It's such a critical time in how we manage the connection between energy and water resources," she said. "New technologies, increasing demands for power, and shifts in weather are restructuring the system in really profound ways that have direct implications for affordability and reliability... I feel really fortunate to be working in an area that's so dynamic."

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From the cover



Idaho EPSCoR Annual Meeting participants during Coeur d'Alene Tribe Water Tour. See page 4.