2025 SARE Project Descriptions

(03-06-25)

SARE Project Title	University/ College	Faculty/ Email	Full-time/ Part-time	In-person/ Virtual	SARE Opportunity Description	Will student be driving vehicle?
Application of GPS and Photo-grammetric Methods for Stream Flow Monitoring (in the Rock Creek and Salmon Falls Creek Drainages tributary to the Snake River Basin)	College of Southern Idaho (CSI)	**Jeffrey Cooper** jcooper@csi.edu	Full-time	In-person or hybrid	Research will focus on novel methods for monitoring open-channel stream flow utilizing photogrammetry techniques and GPS, evaluating techniques for accuracy and efficiency. Student(s) will participate in field data collection, data processing, and/or protocol development. Individuals will be responsible for a significant portion of the research and play a crucial role in the research's success.	Yes
Monitoring Air Toxics in Wildfire Smoke	Lewis Clark State College	**Nancy Johnston** najohnston@lcsc.edu	No preference	In-person	This project aims at measuring exposures and risk to communities of air toxics in wildfire smoke in various cities in the West/Northwest and Idaho. Diffusive sampling will take place weekly in the summer, with analysis at our LC AIR Lab using gas chromatography-mass spectrometry. We will compare sites over time with focus on key air pollutants or smoke indicators, such as particulate matter, benzene, furfural, and other hydrocarbons. Energy-water systems are under stress in Idaho due to warmer climates and drought in the summers,and increases in wildfires may result. Wildfire smoke can put communities at risk to air toxics and particulate matter. This project addresses the frequency of wildfires related to drought conditions on the county level, and the subsequent risk of air particulates (via Idaho Department of Environmental Quality monitors). In addition, air toxics will be measured and risk estimated when smoke impacts communities. This information will help communities plan and become resilient during these times of environmental change. This aligns with I-CREWS mission for Community-engaged Resilience for Energy-Water Systems. Students will learn the following skills: set up field air samples, use instrumentation to analyze air samples for concentrations of air pollutants, calculate air toxic concentrations from raw data, use software to conduct statistical and graphical analysis, prepare and	If the student has a vehicle, they may be asked to drive to sampling sites, but this is reimbursed and optional.

					present a scientific poster of results. Some general chemistry knowledge and spreadsheet/Google drive usage is desirable.	
Hybrid Data Query System Designed for Agricultural Spatial-temporal Analysis	College of Southern Idaho	**Brian Simper** bsimper@csi.edu	2 part-time students	In-person	This project aims to develop HexFlow, a novel machine learning system that uses hexagonal grid mapping to enhance precision agriculture through spatial analysis. By combining drone imagery processing and geospatial data modeling, a unified computational framework will be developed. This project will use remote sensing tools to monitor the evapotranspiration and soil moisture of different crops, and provide data on timely irrigation applications. Crops like corn, potatoes, and wheat will be directly monitored. Corn typically uses 22-30 inches of water per growing season which translates to 594,000 - 810,000 gallons of water per acre. On a one hundred sixty acre field, that would be roughly 95 million – 126.9 million gallons of water used to raise that crop. The data will be gathered and analyzed to recommend best water use practices, especially in drought conditions. This SARE opportunity will allow students to learn about convolutional networks, drone imagery analysis, and field scouting to confirm and improve machine model learning for agriculture.	No
Assessing the Water Resource Implications of Energy Transitions in the Arid Great Basin	Boise State University	**Sophia Borgias** sophiaborgias@boisestate.edu	Full-time	Virtual	This research project examines the water resource implications of energy transition development in the Great Basin region of the Western United States. Our research aims to improve regional data availability, capture local dynamics, and engage communities around this critical intersection. We are conducting a regional geospatial analysis of energy transition development, including renewable energy and critical mineral development, as well as place-based case studies using qualitative and participatory methods to elucidate particular water resource dynamics in this water-scarce region. The SARE student would assist with literature review, interview transcription, geospatial data collection, policy document review, and potentially other elements of the research project. This project offers a SARE student the opportunity to engage in mixed-methods research about the intersections of energy transitions and water resources. The student will gain exposure to a variety of methods and skills, including literature review, interview transcription, geospatial data collection, and policy document review. They will work with an interdisciplinary team comprised of a water governance scholar (Dr. Sophia Borgias, BSU PI), a climate policy scholar (Dr. Meg Mills-Novoa, UC Berkeley Co-PI), an energy transitions scholar (Dr. Elena Louder, UC Berkeley postdoc), a graduate water rights analyst (Alana Ballagh, UCB M.A. student), and a graduate geospatial analyst (Zane Cooper, BSU MEM student). They will learn about energy transition development, including critical mineral mining as well as solar, geothermal, and pumped storage hydropower development, and become familiar with the range of community responses to the opportunities and impacts that it presents in the water scarce Great Basin region. They will examine interviews, documents, and geospatial data related to broad trends across the Great Basin (including southern Idaho), as well as in several case study areas in Nevada. The ideal candidate would have a background in Environmental Studies or a related field, or some other source of familiarity with topics of energy transitions and/or water resources. Prior experience with qualitative and/or geospatial research is beneficial but	No

					not required. The student will need regular access to a computer and internet, with the ability to join Zoom meetings every week or two over the summer.	
Application of Cold Atmospheric Pressure Plasma to Sanitization of Foodstuffs and Spacecraft Environments	Boise State University	**Ken Cornell** kencornell@boisestate.edu	Full-time (part-time if needed)	In-person	The research project that the student will work on involves the analysis of antimicrobial activity produced by two configurations of cold atmospheric pressure plasma devices (10x10 array, radial inward array) that we have developed in our lab. These devices ionize ambient air or other gasses to create reactive oxygen and nitrogen species that can inactivate planktonic and biofilm associated pathogens to reduce the spread of foodborne or surface-borne disease. The SARE student will work on testing two of our devices for: 1) antimicrobial activity against Pseudomonas aeruginosa, E. coli, and Staph. aureus planktonic cells and biofilms on steel and plastic surfaces, and 2) reactive oxygen species production (ozone, peroxide, hydroxyl radicals, and superoxide). Pseudomonas is a common cause of food spoilage, and E. coli and Staph. can cause of foodborne illness. Both organisms are also capable of causing a variety of other serious infections in humans. All the protocols are established in the lab for assessing antimicrobial activity and detecting reactive oxygen species. The desired knowledge and skills involve standard laboratory techniques (making solutions/media, autoclaving, etc), performing microbiology experiments to grow biofilms and planktonic cells and test plasma activity in a BSL-2 environment, and performing analytical chemistry experiments of reactive oxygen species using spectrophotometric and spectrofluorometric techniques. The proposed students are current undergraduate researchers in the lab and have the training and experience to complete the proposed research.	No (other than personal car)
Habitat Effects on Bird Biology: A Comparison of American Kestrels Nesting in Irrigated Agricultural Fields to Kestrels Nesting in Wildlands	Boise State University	**Julie Heath** julieheath@boisestate.edu	Full-time	In-person	This summer we will continue our long-term study of American kestrels nesting in southern Idaho. We are studying the migration, health, behavior, and reproductive behavior of kestrels that nest in agricultural systems and in wildlands. Past research has shown that the irrigated agricultural fields drive nesting phenology shifts in the birds. As farmers sow fields earlier, herbivores (e.g., voles) reproduce earlier, and so do predators, like American kestrels. We propose that the SARE student works with our team to monitor nesting American kestrels in our long-term study system and studies the links between nesting phenology, disease, migratory status (migrant or resident), and nesting habitat (i.e., nesting near irrigated fields vs. wildlands). Project compares migration strategies and/or pathogen infections between irrigated and wildland birds. Work is in the agricultural fields south of Boise around Kuna. Work will include reviewing images collected by remote cameras to determine when to visit nests for sampling adults and young. Fieldwork includes capturing and collecting samples from birds, and nest box maintenance as needed. The student will learn how to record and manage data, handle animals, and make scientific observations. The student will prepare a research poster on the proposed topic.	Yes, 4-wheel drive trucks. We will provide training.
Co-Creating Resilient Water Futures:	Idaho State University	**Jose Luis Benavides** josebenavides@isu.edu	Full-time	Virtual	As an assistant professor of digital media at Idaho State University, I will mentor my former digital media and 3D modeling students about water and energy system resilience in Idaho, focusing on the Snake River Basin. By learning about Indigenous governance and traditional knowledge systems alongside advanced AI and 3D modeling	No

Integrating Indigenous Knowledge and AI with Snake River Water Systems					technology, the project aims to imagine sustainable water management strategies and foster workforce development between the digital arts and environmental sciences. Our main objectives include two research questions guiding this student investigation of local Indigenous knowledge toward Energy-water system sustainability: • What role could adopting Indigenous knowledge and governance dynamics of water systems, especially considering water protection, play in determining resilience strategies or options to climate-driven technological changes with new technologies such as artificial intelligence? How could incorporating diverse ways of knowing by means of artistic interpretation with 3D modeling software and AI create viable pathways for more equitable and resilient futures for our water systems?	
The Role of Persistent Springs in Ensuring Reliable Water Flows During Dry Summers and Droughts	Idaho State University	**Sarah Godsey** godsey@isu.edu	Flexible, but some "campaign" weeks will be full-time.		Topic: Integrating water quantity and quality data with mapping to understand the role of springs in headwaters of southeastern Idaho During the summer of 2025, we seek an undergraduate SARE researcher interested in collaborating with Dr. Godsey's watershed hydrology research lab at Idaho State University (ISU). The student will explore how springs — where groundwater emerges at the Earth's surface — affect water quality and quantity in southeastern Idaho. In particular, the student will collaborate with faculty mentor S. Godsey and graduate student A. Sniadach to study headwater springs in the local Gibson Jack watershed. The SARE student will have the opportunity to learn to measure discharge, collect and analyze water quality data, and map variations in flow and water quality throughout a watershed. The SARE student will be expected to learn and carefully implement flow and water quality sampling protocols, deploy and maintain sensors to measure water flows in streams, filter and process collected samples, analyze water quality data, and create maps of results. The student will also contribute to the safety of the field research team, and should be comfortable walking up to 10 miles in a day, sometimes off trail, with up to a 40 lbs. backpack. Dr. Godsey will work with the student to select a specific research question of interest to the student related to the relative contributions of springs to reliable flow, especially during drought periods, or to improved mapping of spring occurrence. Throughout the research experience, the SARE student will build their professional network, learn more about sensitivity of Idaho's mountain streams to climate change, develop hydrological and water quality sampling skills, explore stream network mapping software, and hone their presentation skills in lab group and EPSCoR meetings. If the student wishes to present at the Idaho Council on Undergraduate Research, this effort will be strongly supported.	The student may drive or carpool in an ISU department vehicle. Local (<10 mi) trips may be completed in a personal vehicle if consistent with university guidelines.
Understanding the Degradation Behavior of Microplastics in the Environment	Idaho State University	**Joshua Pak** pakjosh@isu.edu	Full-time	In-person	Student will work on simulating how polymers degrade in the environment and will monitor molecular species coming from degradation sources. Particularly, student will prepare and characterize several condensation polymers (polyesters, nylon, polyureas, polyurethanes, etc.) and shorter molecules. These polymers and molecules will be prepared as microplastic samples and exposed to accelerated decomposition conditions simulating natural degradation of polymers in various environmental conditions (i.e. pH, UV exposure, temperatures, etc.). Student will monitor the degradation behavior to	No

					understand the amounts and types of potential toxic materials originating from polymer degradation. The knowledge gained from this project can lay a foundation for the detailed understanding of how different polymer-related environmental contaminants are introduced to our water. Student will learn typical synthesis and characterization techniques for organic chemistry. In addition, Student will be introduced to several analytical instrumental techniques such as NMR, IR, MS, DSC, and TGA. He will also be trained in written and oral communication skills.	
Resilience of Fish in a Dynamic Marine Environment	Idaho State University	**Devaleena Pradhan** praddeva@isu.edu	No preference	In-person	We have a marine fish lab that houses wild-caught bluebanded gobies, Lythrypnus dalli, a species of sexually plastic fish that rapidly responds to changes in its social and physical environment by changing its behavior. Undergraduate students in my team work in collaborative projects closely with faculty, graduate students and postdoc to develop novel approaches to investigate fish behavior and molecular underpinnings. A cohort of undergrads will work on complementary research projects to get a mentored research experience on topics that are broadly under the topic of resilience in an aquatic species. Two of these students are currently in a VIP course - getting summer research experience would help them continue exploring the process of scientific discovery. This work has broader implications for understanding how fish respond to changes in their environment. For example, two major threats on marine ecosystems worldwide 1) rising ocean temperatures and 2) ocean acidification. At the extreme level, both of these issues pose threats to the marine ecosystem such as the growth and survival of the kelp forest and coral bleaching along the California coast. These issues also directly affect survival of L. dalli. We have preliminary data showing changes in water chemistry such as pH can lead to death of fish and temperature stress increase disease susceptibility such as fungal outbreaks (ick) decimating fish populations.	No
Exploring Language, Meaning, and Perspective concerning Energy-Water Systems	Idaho State University	**Liz Redd** lizkickham@gmail.com	No preference	No preference	Language is not merely a system of communication, but encodes how we perceive the world and shapes how we share our ideas about the world. This project investigates how language is used across the I-CREWS grant activities to frame collaborations, community engagements, and perspectives concerning energy and water connections and human relationships to environment. AI tools will be used to apply discourse analysis and other linguistic methods to analyze data, including written and verbal texts. The student will be analyzing print documents, learning about discourse analysis methods, including data coding, thematic content analysis, intercoder reliability, code-book creation, meta-data and file management. Students will also learn about coding and data management tools, including AI tools and software. Distance students are welcome to work virtually! Desired knowledge and skills: • Experience with Excel and/or Google sheets • Experience with MS Word or Google docs • Excellent attention to detail • Proficient in English grammar and spelling • Willingness to learn new software and tools	No
Identifying Non-Productive	University of Idaho	**Mariana Dobre**	No preference	No preference	This project focuses on collaborating with the Coeur d'Alene Tribe to assess non-productive agricultural fields in the Hangman Creek watershed. The goal is to identify	Maybe but not required

Agricultural Fields for Decommissioning and Landcover Change in the Hangman Creek Watershed (Coeur d'Alene Tribe)		mdobre@uidaho.edu			agricultural areas that could benefit from decommissioning and transitioning to alternative land cover to improve soil health and water quality. This research will provide valuable insights into sustainable land management practices and their environmental impacts. Students involved in this project will participate in soil sampling, water quality data collection, and crop residue cover measurements. Additionally, students might be involved with both field and satellite data analyses and modeling, depending on skills and interests.	
Building Big Meadow: An Environmental History of an Experimental Forest	University of Idaho	**Alyssa Kreikemeier** akreikemeier@uidaho.edu	Full-time	No preference	Big Meadow Creek camp housed Civilian Conservation Corps workers on Moscow Mountain during the 1930s. One of 270 such camps across Idaho at the time, the public works project put 200 men to work between 1933 and 1942. Specifically, the CCC established camp F-141 four miles north of Troy, Idaho where the workers developed trails, managed wildfires, and established ponds along the creek. The site offers a case study of how the CCC impacted rural communities' relationship with infrastructure development, honing in on water infrastructure to determine how residents of Troy have accessed and understood water access over time. This student will utilize archaeological survey and field work, historical research, oral histories, and community collaborations to construct an environmental history of the CCC camp. They will then contextualize that environmental history among changing social, political, and environmental conditions from the 1930s through the time of the site's acquisition by the University of Idaho. Such a study will shed light on one rural community's perceptions of changing natural resources--specifically water--over time, and help environmental scholars to better understand the role of governance in water resource management. ***Prefer student with experience living or working in rural communities*	Yes, their own vehicle
Differentiating Groundwater Recharge Zones through Traditional and New Age Dating Techniques	University of Idaho	**Jeff Langman** jlangman@uidaho.edu	Full-time or Part-time	In-person	Develop a monitoring well program to test a new age-dating technique for discriminating primary recharge zones in a basalt aquifer system. Results of the study will be used by local/regional entities for water resource protection, enhanced recharge, and ensuring climate resiliency of the regional water supply. Project will include identification of appropriate wells for inclusion in the study through web-based, GIS, and in-person evaluation of existing wells in the basin. Sampling of wells and collection of field parameters through use of a multi-parameter probe and collection and preservation of groundwater samples for submission to multiple analytical laboratories. The student should be familiar with basic stratigraphic principles and comfortable interacting with landowners.	Yes – department truck
Field evidence of the spatial and temporal variation in bed shear stress in a gravel river	University of Idaho	**Angel Monsalve** amonsalve@uidaho.edu	Full-time	In-person	Bedload sediment transport equations assume uniform flow conditions, meaning that local and temporal changes in flow variables (such as water depth and velocity) remain constant throughout the studied reach. While this assumption has been used for decades and is somewhat valid for large, low-gradient rivers, in gravel-bedded rivers, especially mountain rivers, this assumption is far from reality. Most literature that acknowledges potential variability in flow variables in mountain rivers presents results from numerical models or proposes variations based on changes in topographic characteristics.	Yes, any car will work in this case

					The variability in flow properties can significantly affect sediment transport predictions because it is used to estimate the applied bed shear stress and, consequently, the bedload transport rate. In this project, we will collect direct evidence of the degree to which this variability is observed at both local and temporal scales In this opportunity, the student will gain practical field experience in river hydrodynamics and sediment transport. The student will learn how to measure and analyze critical hydrological parameters through hands-on data collection techniques. Specifically, they will: • Collect field measurements of water depth, flow velocity, and discharge using modern hydraulics instrumentation • Develop skills in measuring and interpreting velocity profiles across river cross-sections • Apply field data to river analysis modeling to understand flow dynamics and sediment transport mechanisms • Analyze spatial and temporal variations in bed shear stress in gravel-bedded river systems Desired knowledge/skills include: • Basic understanding of fluid mechanics principles • Interest in field-based research and willingness to work in outdoor river environments • Data analysis capabilities and attention to detail • Ability to work collaboratively in field settings • Interest in learning specialized hydraulics measurement techniques and equipment This experience will provide valuable training in hydraulics field methods while contributing to research on how variable flow conditions affect sediment transport in gravel-bedded rivers.	
Sustainable Energization: A Game of Energy Decision Making	University of Idaho	**Terance Soule** tsoule@uidaho.edu	Full-time	In-person	The goal of this project is to develop an educational, resource management game focused on energy systems. Players will represent different regional energy utilities and make decisions about resource development, sustainability, investment, system interconnection, competition, and cooperation in a contiguous game space comparable to the western US in geography, energy intensity, water and other natural resources, and urban/rural mix. Initially, this game will be deployed for educational purposes within the University of Idaho curricula such as Energy Literacy courses and the Energy Executives Course and ideally, eventually will be used in secondary education courses by STEM educators throughout the state. The game will support two to six teams (with AI's allowing individual play) and have an instructor interface through which the instructor can monitor player decisions and can modify the environment (e.g. changing demand, introducing new technologies, changing legal requirements, triggering accidents, etc.). Games can be spread over several days, e.g. one set of decisions per real day, providing the instructor time to discuss the impact of each round of decisions with their class. For the proposed SARE students will be developing the design document for the game (described below) and a wireframe, prototype, including:	No

					• Developing the requirement specifications for the game. • Discovering and documenting all the required utility, environmental, and socio-economic details required to adequately model the region. This will involve interviews with subject matter experts, including members of the I-CREWs team, of the College of Engineering's Energy Institute, and game developers with Polymorphic Games. • Game genre. • Art style selection. • Developing, in a game engine such as Unity, a wireframe prototype. The participants will be learning about energy systems, including their interplay with water and other natural resources, the economy, economic and population growth, etc. and will be developing their programming and related skills involved in developing educational video games. The primary desired skills are experience with programming, and ideally game development, and a willingness to learn, as much of the energy systems and related knowledge is likely to be new. Project development will be supported by Polymorphic Games, the University of Idaho's on campus game development studio, co-founded by the PI, Terence Soule. Polymorphic Games uses an undergraduate development model that has produced multiple educational games, including several that were released on the Steam gaming platform. And by a collaboration with the College of Engineering's Energy Institute, which will assist with collaborations with the required subject matter experts.	
Community-Centered Human-Wildlife Interactions and Conservation in Idaho	University of Idaho	**Kenneth Wallen** kwallen@uidaho.edu	Full-time	In-person or hybrid	The project will examine Idahoans' interactions with and connection to carnivore species, primarily the gray wolf (Canis lupis), which influence socioecological feedback in water and energy systems (the focus of I-CREWS) and explore the implications of human-wildlife interactions and human-human conflict via a mixed methods research design. While carnivore research is a common ecological topic of study, it has also become increasingly common as a topic for the social sciences given their cultural value to tribes and shifting community priorities in Idaho. The student will be expected to collaborate with the faculty advisor and participate in research design, methodological development, data collection, data analysis, and reporting findings. The student should be interested in conducting social sciences (or socioecological) research, the human dimensions of wildlife conservation, and related to human-environmental relationship inquiry. The student should be able to work independently and as part of a group. Ideally, the student should have a background in basic social science research design and methods. This opportunity will provide the student with skills necessary to pursue research after graduation (if interested) or basic knowledge of natural resources management, wildlife conservation, and public involvement if they pursue a career in government or nonprofit sector	No