the RESEARCHER

IDAHO NSF EPSCoR | WINTER 2019

Faculty, postdocs, graduate students, and collaborators from Bureau of Land Management assessing demographic traits of sagebrush in post fire habitats. This work will also be developed as a future GEM3 VIP course led by Trevor Caughlin, Assistant Professor in the Department of Biological Sciences at Boise State University.

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the
RESEARCHER

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LETTER FROM THE DIRECTOR

Janet Nelson, Interim Project Director

When many think of large statewide NSF EPSCoR Research Infrastructure Improvement (RII) Track-1 awards, we often think of basic science and engineering research conducted by academic researchers at Idaho's universities – and we should! Increasing our capacity for and conducting high quality research critical to State priorities such as those in the *Idaho Higher Education Research Strategic Plan* is indeed at the heart of the NSF EPSCoR program.

In fact, eligibility for NSF EPSCoR funding is based on a jurisdiction's level of basic research funding received from NSF, not simply the total funding received from NSF. Of the $24 million of NSF funding that Idaho academic institutions receive annually (FY16-FY18), about 75% of it is for research projects. The other 25% is received in support of education and human resources development activities, such as training and scholarship programs.

Long-term excellence in science and engineering research requires advanced education and training. That is why nurturing Science, Technology, Engineering, and Mathematics (STEM) education, training, and professional development pathways for people across Idaho is also an integral part of EPSCoR RII awards. Idaho's new Track-1 award *Genes by Environment: Mechanisms, Modeling, and Mapping (GEM3)* has an innovative and extensive plan to help Idaho achieve this goal.

Vertically Integrated Projects (VIP) are at the core of Idaho's GEM3 strategy for education and workforce development. VIP unites undergraduate education and research in a team-based context. As envisioned by EPSCoR at the national level, VIP and related activities will be highly integrated with the basic research program and will contribute to the preparation of a new and diverse cadre of competitive researchers, innovators, and educators. This issue of *the Researcher* features a summary of our GEM3 VIP approach, which is led by our colleagues at Boise State University.

Increasing the engagement of undergraduates in research is a top priority at many Idaho institutions, and I am excited for Idaho's universities and colleges to embark on this new journey together through collaborations made possible by the NSF EPSCoR GEM3 award.

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Collaboration

EPSCoR GEM3 Participants Meet for First Annual Conference

Members of Idaho's new statewide National Science Foundation (NSF) EPSCoR Track-1 Research Infrastructure Improvement (RII) project gathered in Sun Valley, Idaho for the EPSCoR Annual Meeting December 6-7, 2018. The meeting provided an opportunity for participants and collaborators in Idaho's NSF EPSCoR award to connect, communicate, and coordinate research and education activities related to the *Genes by Environment: Modeling, Mechanisms, and Mapping (GEM3).* The program is based on strong collaboration among Idaho's public universities and participation of Idaho's 2-year and 4-year colleges. The work will support lasting improvements in Idaho's academic research infrastructure and education capacity in areas that support state Science and Technology (S&T) priorities as described in *Idaho's Higher Education Research Strategic Plan.*

The annual meeting was also the first opportunity for the entire statewide team to meet together since the GEM3 project started on October 1, 2018 and the only annual meeting scheduled during the first year of the GEM3 award. Dr. Laird Noh, Idaho EPSCoR Committee chairman, and Dr. Janet Nelson, Idaho EPSCoR Interim Project Director and University of Idaho Vice President for Research and Economic Development, provided welcome and opening remarks, and the GEM3 leadership team gave an overview of the GEM3 mission, goals, and framework. The various project component leads in the areas of research, education, workforce development and diversity, also provided overviews of each individual GEM3 component's approach, goals, and strategy.

In addition, participants were able to learn more about and participate in related efforts, including GEM3 Data Management presented by Dr. Carrie Roever (NKN Environmental Data Manager), and a Working Group overview by Dr. Holly Wichman (U of I faculty and Director of Center for Modeling Complex Interactions-CMCI). These initiatives will be instrumental in connecting all the GEM3 participants in ongoing communication efforts at a statewide level.

L to R: Catherine Bates, Dr. Donna Llewellyn, and Dr. Barbara Wood Roberts

Another statewide GEM3 activity is to provide ongoing training. This includes mentoring training for faculty working with underrepresented students. Attendees were able to participate in an Inclusive Mentoring workshop led by Catherine Bates (BSU LSAMP Coordinator), and Dr. Barbara Wood Roberts (ISU Graduate Recruitment/Intercultural Competency Lab). They also participated in the Toolbox Dialogue Initiative (TDI) workshop, presented by Dr. Sanford Eigenbrode (Professor of Entomology, U of I). TDI is an award-winning initiative that improves cross-disciplinary research projects by prompting dialogue among collaborators about the philosophical dimensions of their work together.

A poster session at the event provided time for faculty to talk with presenters in greater detail, and informal networking allowed for greater connection with collaborators outside of the academic community. The Project Advisory Board (PAB) and members of the Idaho EPSCoR Committee were also on hand to oversee GEM3 efforts and provide advice for moving forward. The PAB consists of nationally and internationally recognized scientists and educators from outside of Idaho who will regularly interact with GEM3 leadership and participants to provide independent guidance for the project's success.

Participants engaging in Inclusive Mentoring workshop activities

PAB members L to R: Dr. Anna Waldron, Dr. Michael Khonsari, Dr. Cliff Dahm, and Dr. Fred Allendorf

Idaho Research

Collaborative Research Explores How Land Conservation Could Help Mitigate Adverse Water-Sustainability Impacts

To address the increasing evidence of environmental change impacts on freshwater ecosystems especially through land use and climate change, Idaho EPSCoR researchers at University of Idaho, Boise State University, and Idaho State University, have been examining how land conservation could help mitigate adverse water-sustainability impacts. Their collaborative research was recently published in *"Science of The Total Environment"* in February 2019.

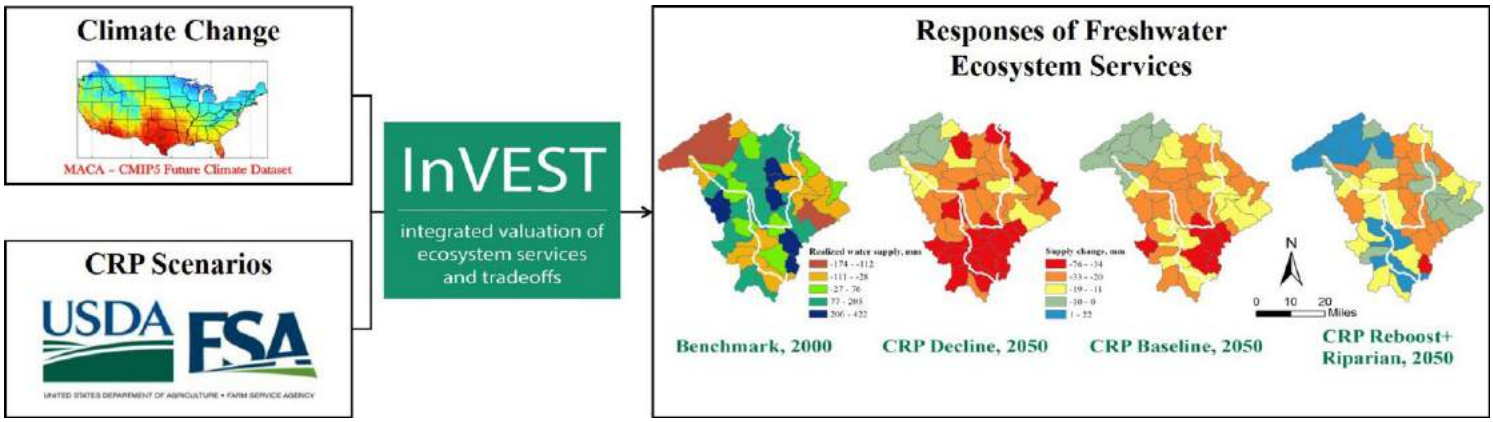
The article, "Land conservation can mitigate freshwater ecosystem services degradation due to climate change in a semi-arid catchment: The case of the Portneuf River catchment," details the research which is one of several products derived from statewide collaboration. Co-authors of this publication were involved in the NSF EPSCoR Research Infrastructure Improvement (RII) Track-1 *Managing Idaho's Landscapes for Ecosystem Services (MILES)* project (IIA-1301792).

In this paper, the researchers evaluate the water supply, nutrient retention, and sediment retention in the Portneuf River basin in the context of joint effects and relative contributions of climate change, riparian buffer, and land conservation. The land conservation policy focuses on the Conservation Reserve Program (CRP), which is prominent in the basin and the largest agricultural land retirement program in the U.S.

Results suggest that degradation of freshwater ecosystem services is expected since climate change could result in over 50% less water yield and an increase in nutrients and suspended sediment in streams. However, an increase of CRP lands, which pays farmers to retire ecologically sensitive croplands, together with riparian protection efforts could significantly help reduce the degradation. In addition, researchers found that changes in dominant land use components in the catchment has a pivotal influence on the degradation trend.

The Portneuf River basin is a semi-arid agricultural catchment, which like many others, could face more severe impacts from climate change and the pressure of agricultural development. These findings can help raise public awareness of global change mitigation in semi-arid regions.

For local communities in Idaho, this project reveals the significant environmental benefits of conservation practices and implies a policy pathway to climate change adaption. CRP is proven to be a feasible solution to reserve ecosystem services in this and many previous studies, but its statutory cap also fluctuates as seen in the Farm Bill after 2000s. Attention to this policy will be an important piece of the puzzle for dealing with these challenges.



Research team members include Li Huang (U of I graduate student), and Dr. Haifeng (Felix) Liao (U of I), Dr. Michael Fragkias (BSU), Dr. Donna Lybecker (ISU), Dr. Kathleen Lohse (ISU), Dr. Danelle Larson (ISU post-doctoral researcher), and Dr. Colden Baxter (ISU)

Vertically Integrated Project (VIP) Gearing Up to Implement Workforce Development Strands across Idaho

The Boise State University lab (Zoology409), which studies the functional phenotypes of animals, will be offered as a VIP lab module, "Monitoring Functional Phenotypes of Wildlife," and will be taught by Dr. Jen Forbey, Associate Professor in Department of Biological Sciences, in fall 2019.

Planning for the GEM3 Education and Workforce Development components is underway at the participating institutions under the leadership of Dr. Donna Llewellyn, (Executive Director, Institute for STEM and Diversity Initiatives at Boise State University). GEM3 is using a Vertically Integrated Project (VIP) strategy which is a fully integrated research, education and workforce development program designed to increase the number, diversity and preparation of skilled scientists and engineers in GEM3 fields (bioinformatics, computational biology, conservation genetics, ecosystem management).

The VIP Program brings together undergraduate education and faculty research in a team-based context. Undergraduate VIP students earn academic credits, while faculty and graduate students benefit from the design/discovery efforts of their teams. The VIP creates long-term research and development experiences by extending the research beyond a single semester, allowing time for students to learn and practice professional skills, make substantial contributions, and participate in different roles as part of a larger multidisciplinary research team. The long-term nature of VIP also creates an environment of mentorship with faculty and graduate students mentoring teams. The VIP is implemented statewide, and the goal is to provide the scaffolding to support transdisciplinary science and grow the next generation of conservation science leaders and workers.

This effort includes the three research universities, Idaho State University (ISU), Boise State University (BSU), and University of Idaho (U of I), four primarily undergraduate institutions (PUIs) and more than a dozen public, private, and nonprofit collaborators and stakeholders. PUIs include North Idaho College (NIC), Lewis-Clark State College (LCSC), College of Western Idaho (CWI), and College of Southern Idaho (CSI).

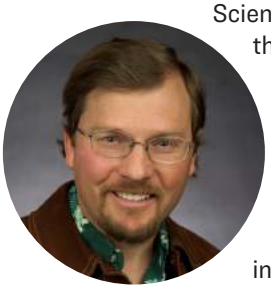
Plans are in place for implementing new courses. At BSU for example, Dr. Trevor Caughlin, Assistant Professor in the Department of Biological Sciences, is developing a VIP course titled, "Spatial analysis of environmental data: A VIP course to address sagebrush steppe restoration," which will have a soft launch summer 2019 (course offered to those interested/limited recruitment) with a full launch (targeted recruitment) in the fall 2019. The team is also discussing ways to implement cross-institutional VIP classes with both ISU and CWI, with more potential collaborations in the future.

At ISU, Dr. Keith Reinhardt, Associate Professor Plant Physiological Ecology, and Dr. Ernest Keeley, Professor in Fish Ecology, will co-teach a joint VIP course on Investigating/Describing/Studying Phenotypes. Also, Dr. David Tank, U of I faculty in the Department of Biological Sciences, is working with a graduate student to develop a small sophomore level course that will be a soft launch to an eventual VIP course at U of I.

In addition to the VIP courses, lab modules are also being created as a mechanism to identify and recruit students who may have an interest in the GEM3 research. BSU doctoral students, with GEM3 faculty guidance and support, are developing two lab modules. The first module, "Remotely Sensing Plant Phenotypes," will be a 2-3 week lab module that will be placed into Ecology and Evolution at BSU in fall 2019 and into General Ecology at CWI in spring 2020. The second module, "Monitoring Functional Phenotypes of Wildlife," will be a lab module for an Animal Physiology and Nutrition class at BSU, taught by Dr. Jen Forbey, Associate Professor in Department of Biological Sciences, in fall 2019 and for the Structure and Function class at CWI in fall 2020. Also, in fall 2019, Dusty Perkins, Associate Professor of Biology at CWI, will develop a lab module for his Ecology class that explores "ecotypic variation in showy milkweed" with a focus on identifying locally relevant adaptive traits to maximize restoration success.

Idaho Research

Idaho State University's Colden Baxter Receives Jean'ne M. Shreeve NSF EPSCoR Research Excellence Award



Dr. Colden Baxter, Idaho State University Biological Sciences professor, is the recipient of the 2018 Jean'ne M. Shreeve NSF EPSCoR Research Excellence Award. Baxter received the award at the Idaho Established Program to Stimulate Competitive Research (EPSCoR) Annual Meeting in Sun Valley held Dec. 6.

"Dr. Baxter joins a very small, exclusive group of Idaho scientists who have received the Shreeve award," said Dr. Laird Noh, chair of Idaho EPSCoR. "Dr. Shreeve set high standards for scientific excellence for herself and others. For several years she was a member, and then Chair of the committee which selects the Presidential Medal for Science for the United States. As Chair of the 17 member Idaho EPSCoR Committee, it is a pleasure to add Dr. Baxter's name to this roster of award winners."

Inspired by University of Idaho Distinguished Professor Jean'ne M. Shreeve for her imaginative leadership of EPSCoR in Idaho for more than 20 years, Idaho EPSCoR established this award. It recognizes the accomplishments of faculty members at Boise State University, Idaho State University, the University of Idaho or other state institutions of higher education who have previously been active participants in the NSF EPSCoR program.

Baxter first participated in NSF EPSCoR in Idaho as a junior faculty member upon joining ISU in 2004. This prestigious award is for the research accomplishments resulting from his productive career, assisted by early involvement in NSF EPSCoR Research Infrastructure Improvement programs.

"I consider this quite an honor, as Idaho's NSF-EPSCoR program has been essential to my development as a professional," Baxter said. "It has provided key support for innovative scientific research and education, helped change the culture of science to include more connections among different fields of study, and begun transforming the way scientists and society interact."

State Rep. Maxine Bell Receives Honorary Jean'ne M. Shreeve Research Excellence Award

Longtime Idaho State Rep. Maxine Bell has been presented with the first ever honorary Jean'ne M. Shreeve NSF EPSCoR Research Excellence Award by the Idaho EPSCoR Committee.

The award normally recognizes the accomplishments of professors at Idaho universities. This is the first time since it was established in 2011 that it has gone to a non-faculty member. The honorary award recognizes Bell's long-standing support for high-quality scientific research at Idaho's universities and her extraordinary leadership at the state level.

Idaho EPSCoR Committee Chairman Dr. Laird Noh said Bell, who retired from the Legislature last year, has always been an advocate for students. "Whether promising young students with EPSCoR or the hundreds of thousands of Idaho public school students for whom she constantly advocated in the Legislature, Maxine was looking to the future and building a better Idaho," Noh said.

Bell, of Jerome, retired in December after more than 30 years at the statehouse. She also worked as an active farm partner on the family row crop farm southeast of Jerome until 1997, when the Bells retired from day-to-day operation of the farm. She was appointed by the State Board of Education to the Idaho EPSCoR Committee in 2001 and has been an active member for nearly 18 years.

Since Bell's appointment, research and development expenditures from all sources at Idaho's universities and colleges have nearly doubled, from $82.5 million to $155 million in 2016. Also during this period, Idaho's share of National Science Foundation research funding tripled. These investments in academic research have addressed water and natural resources issues, biomedical science needs and other topics of importance to Idaho, as well as educated and trained hundreds of today's scientists.

L-R: Dr. Janet Nelson (Idaho EPSCoR Interim Director and U of I Vice President for Research and Economic Development), Maxine Bell (Idaho State Representative), and Dr. Laird Noh (Idaho EPSCoR Committee Chairman)

Research Collaboration with Coeur d'Alene Tribe Extends beyond Track 1 Award

R-L: Stephanie Estell, MS Graduate Student at U of I, and Ben Scofield, Coeur d'Alene Tribe Water Resource Specialist

Through a research partnership between the Coeur d'Alene Tribe and the University of Idaho, work is underway to improve the understanding of the interaction between submerged aquatic plants (especially invasive milfoil) and larvae of a plant-eating caddisfly found in Chatcolet Lake at the southern end of Coeur d'Alene Lake in northern Idaho.

Chatcolet and Coeur d'Alene lakes are important recreational destinations in northern Idaho. Invasive milfoil can interfere with multiple beneficial uses of Chatcolet Lake as well as Coeur d'Alene Lake proper and its associated waterbodies. Milfoil can interfere with recreation as well as displace native plant species.

The Coeur d'Alene Tribe is committed to managing milfoil in a responsible and ecologically balanced manner. Improving our understanding of the conditions that can influence the effectiveness of management actions should ultimately help reduce and better manage invasive milfoil.

The research partnership between the Coeur d'Alene Tribe and the University of Idaho reflects a collaboration that was instrumental in the NSF EPSCoR Track-1 project, *Managing Idaho's Landscapes for Ecosystem Services (MILES)*, and is continuing on independently after the end of the MILES award.

Stephanie Estell, a U of I student whose graduate research and education was funded through the MILES project, is now part of the new research team. She is being co-supervised from each entity and is working closely with Ben Scofield, Coeur d'Alene Tribe Water Resource Specialist, who provides field support and logistics. She also works closely with Dr. Frank Wilhelm, Professor of Limnology in the U of I Department of Fish and Wildlife Sciences, who oversees thesis logistics and coursework.

Other team members have included an INBRE intern from North Idaho College and Coeur d'Alene Tribe high school students from the Tribe's summer youth program. Students gained valuable hands-on experiences and insights into research aspects involved with lake management.

The research team believes it is important to understand the environmental factors that shape the aquatic plant community, especially when active management of milfoil is underway. The team also hopes that this research will help them understand the magnitude of the caddisfly's impact on the aquatic plants and develop a better understanding of the caddisfly's life history. Accurately gauging the performance of milfoil treatment is difficult when environmental factors such as caddisfly herbivory, which can contribute to the dynamics of the plant community, are unknown.

According to Stephanie, "Lake management is complex, and an effective strategy requires not only a holistic understanding of how the parts of the ecosystem operate together but also how the parts function individually."

As a result of the research, some important outcomes include: 1) a description of when these caddisfly larvae are present in Chatcolet Lake, which translates to when they likely feed on aquatic plants and potentially reduce the presence of invasive milfoil; 2) estimated consumption rates for important native aquatic plants and invasive milfoil for the caddisfly; and 3) ranked importance of different food sources, including invasive milfoil, which helps understand its potential to serve as a biocontrol agent for invasive milfoil. Biocontrol agents are living organisms that can be used to reduce the presence of a pest species, for example ladybug beetles added to a garden to remove aphids from favorite plants.

Idaho EPSCoR

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Congratulations to...

- **Dr. Shawn Benner** (BSU Professor and Director of Human-Environment Systems) on being named Associate Dean of the College of Innovation and Design at Boise State University.
- **Dr. John Anderson**, head of U of I Virtual Technology and Design (VTD) Program, and **Dr. Andy Kliskey**, the co-director of the U of I Center for Resilient Communities (CRC), on being selected to serve as representatives for Sustainable Development Solutions Network (global initiative for the United Nations).
- **The U of I's McCall Outdoor Science School (MOSS)** for winning a University Economic Development Association (UEDA) Award of Excellence for serving up innovative educational programming in ways that sustain regional economic development.