

the RESEARCHER

IDAHO NSF EPSCoR | FALL 2018



Jennifer Forbey (BSU faculty) and former graduate student, Peter Olsoy, watching a drone as part of remote sensing of rangeland landscapes using terrestrial laser scanners. (photo credit: Boise State University)


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LETTER FROM THE DIRECTOR



Janet Nelson, Interim Project Director

I am very pleased that this issue of *the Researcher* announces the arrival of Idaho EPSCoR's newest National Science Foundation (NSF) statewide Track-1 Research Infrastructure Improvement (RII) Award. We refer to this five-year, \$24 million project, which just started on October 1, 2018, as "GEM3" for Genes to Environment: Modeling, Mechanisms, and Mapping.

Our vision is for Idaho to lead the nation with thriving, collaborative, and inclusive research to discover and predict how plants and animals adapt to changing environments, resulting in sustainable management of natural resources. The project combines Idaho research strengths in bioinformatics, complex modeling, ecology, genomics, remote sensing, and social-ecological systems science to contribute to one of the most compelling national challenges identified by NSF: "Understanding the Rules of Life." This exciting new project is described in this newsletter and at www.idahogem3.org.

NSF EPSCoR currently has four RII investment strategies to strengthen the research and development competitiveness of EPSCoR jurisdictions. These are known as RII Tracks. Track-1 awards are large statewide awards to academic institutions for research that is critical to a state's science and technology strategic plan. The Idaho EPSCoR committee must identify the top research areas, as it did for the GEM3 project. Track-2 awards build collaborative teams among two or more EPSCoR jurisdictions. Track-3 awards broaden participation of underrepresented groups in STEM fields. Finally, Track-4 awards support non-tenured EPSCoR Research Fellows in extended visits to the Nation's best private, governmental, or academic research centers.

Idaho has been very successful in winning these NSF EPSCoR RII awards through the highly competitive NSF merit review process. Idaho institutions have at least one active award, and in some cases multiple awards, in every RII Track. These awards currently represent a \$27.3 million NSF investment, benefiting hundreds of researchers and students across The Gem State each year.

I am very proud of our research and education teams and how well they work together, and I look forward to our continued statewide collaborations in the new GEM3 project and beyond.

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Idaho EPSCoR Receives New Track-1 Award

Idaho's newest award, RII Track-1: Linking Genome to Phenome to Predict Adaptive Responses of Organisms to Changing Landscapes (2018-2023), will train a diverse workforce to discover fundamental knowledge of genetic mechanisms that can predict how organisms adapt to changing environments and thus inform evidence based management of natural resources.

THE RESEARCH:

Idaho's approach is through Genes to Environment: Modeling, Mechanisms, and Mapping (GEM3).

Two focal organisms will be under study: one aquatic (rainbow trout) and one terrestrial (sagebrush). These organisms are integral to ecosystems in the American West, and are central to land-use management decisions that influence the economy of the region. Significant data are already hosted by land and wildlife management agencies that can contribute to this research. New knowledge about the genetic mechanism that result in these organisms' ability to adapt to changing environments will apply to many other plants and animals as well.

A core group of over 30 GEM3 researchers and educators, many with existing cross-institutional and cross-discipline collaborations, worked together to develop this inspiring research and education plan.



Rainbow trout (*Oncorhynchus mykiss*)
(photo credit: E.R. Keeley)



Researcher in Sagebrush landscape
(photo credit: Jennifer Forbey)



GEM3
Genes by Environment
Modeling · Mechanisms · Mapping

www.idahogem3.org

DIVERSITY AND WORKFORCE DEVELOPMENT:

GEM3 includes a statewide participatory research program committed to the concept of Idaho EPSCoR's "ONEIdaho" vision of an integrated, productive and creative research culture and community of Idaho researchers that transcends institutional boundaries.

A fully integrated research, education, diversity, and workforce development program will be implemented to increase the number, diversity and preparation of skilled scientists and engineers in GEM3 fields. GEM3 adopts a Vertically Integrated Projects (VIP) strategy to establish an on-ramp for students and provide a range of training, mentoring and professional development support to both students and faculty. The goal is to provide the scaffolding to support transdisciplinary science and grow the next generation of conservation science leaders.

GEM3 will leverage state and federal resources to promote sustainable outcomes. Engagement of agency partners at all levels (biologists, land managers, policy makers, and administrators) will facilitate integration of science into management and policy and provide opportunities for knowledge sharing and development of professional networks between students and potential future employers.

STATE ALIGNMENT:

The State of Idaho has demonstrated long-standing commitment to develop its research bases through EPSCoR by contributing to non-federal match as part of the appropriation for the State Board of Education (SBOE). GEM3 is fully aligned with and guided by the state's Science and Technology (S&T) plan, Higher Education Research Strategic Plan, approved by the SBOE. The Idaho EPSCoR Committee selected GEM3 following an analysis of strengths and a rigorous year-long external review process. The topic was deemed to have the highest impact based upon several factors, including: (1) contribution to long-term economic and educational priorities of the state; (2) seamless integration of the academic strengths and priorities of the state's research universities; (3) ability of Primarily Undergraduate Institutions (PUIs) to contribute to the integrated research, education, and workforce development activities; (4) industry demand for a larger, more diverse, and better trained biological sciences workforce; and (5) value added to national strategic priorities.

Idaho EPSCoR GEM3 science leads and core team members have been meeting to develop the GEM3 strategic plan. A planning meeting was held on October 8-9, 2018 in Moscow, ID. For more information please visit the new GEM3 website now available at: www.idahogem3.org

The Established Program to Stimulate Competitive Research (EPSCoR) is designed to fulfill the mandate of the National Science Foundation (NSF) to promote scientific progress nationwide. Research Infrastructure Improvement Track-1 (RII Track-1) awards provide up to \$20 million total for 5 years to support improvements to physical and cyber infrastructure and human capital development in research areas selected by Idaho's EPSCoR steering committee as having the best potential to improve future R&D competitiveness of the State.



L to R: Andrew Kliskey, University of Idaho (UI) faculty in the College of Natural Resources and Co-Director of the Center for Resilient Communities (CRC), David Griffith, UI Affiliate Faculty in the CRC, and Sara Williams, graduate student in Landscape Architecture, work together on SESCOPA as part of the CRC legacy efforts for Idaho MILES.

STRENGTHENING INTERDISCIPLINARY RESEARCH WITH THE CURRENT PRACTICES ARCHIVE (CPA)

One of the major focuses for Idaho EPSCoR is strengthening interdisciplinary research. That means bringing together researchers from many fields, advancing communication and data access, and tearing down the “silos” that have traditionally kept disciplines apart.

“Science historically in the last couple hundred years has become very siloed, very disciplinary, very reductionist,” Andrew Kliskey says. “And we’re sort of now realizing the importance of bringing multiple disciplines together, of weaving different perspectives to work on significant issues.”

Kliskey, University of Idaho (UI) faculty in the College of Natural Resources and Co-Director of the Center for

Resilient Communities (CRC), helps manage the Social-Ecological Systems Current Practices Archive (SESCPA). Social-ecological systems, a field combining physical sciences, sociology, and cultural anthropology, among others, have been a big part of MILES research. Kliskey and his research partner, Lil Alessa, UI faculty and Co-Director of CRC, wanted to archive some of the experiences they’ve had from their 15 years of interdisciplinary research.

“We wanted some way to document what has worked and what hasn’t worked,” Kliskey says. “Students who want to do interdisciplinary research, young faculty, federal agency scientists, often they’re doing this sort of work anyway.”

The SESCOPA is a place for researchers to provide case studies of SES practices. It is called the “current practices archive” because it’s more than a set of guidelines: it’s a database of real experiences in the field and lab, both good and bad.

“Not only a how-to, but a how-not-to. Not only showing what works, but what hasn’t worked,” Kliskey says. “We learn by our mistakes. By including what hasn’t worked, those are useful learning moments.”

Researchers who want to use the archive or submit their own case studies can find it here:

<https://sescpa.nkn.uidaho.edu/>

Research Highlights

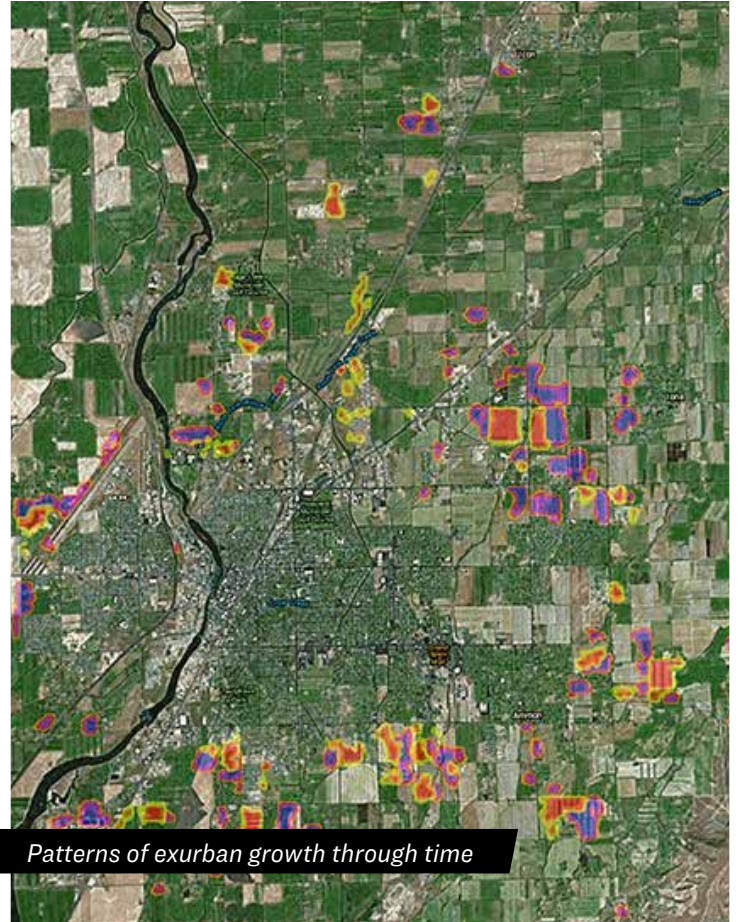
Paths to the Wellbeing of Mid-sized Cities

A new collaborative research study by MILES researchers at Idaho State University, Boise State University, and University of Idaho, was recently published in “Urban Ecosystems” in June 2018.

The article, “A comparative study of urban fragmentation patterns in small and mid-sized cities of Idaho,” examines the impact of urbanization on ecological function and its effect on the provisioning of ecosystem services. This collaborative study could help to inform and balance urban growth within and around Idaho’s mid-sized cities which has the potential to minimize habitat fragmentation, increase property values, and create human communities that highlight the ecosystem services that are important to the residents.

According to the research team, realized and perceived boundaries exist in many forms: geographical, biophysical, political, and social. However, the nature of such boundaries and the extent to which they overlay one another to create “SES domains” is understudied. In many cases, social and ecological boundaries may not map simply on one another, highlighting mismatches of social-ecological domains. This study is conducting a common suite of analyses and cross-site comparisons of the structure, function, and overlap of social and ecological boundaries in Idaho’s mid-sized cities.

For this study, the team examined landscape fragmentation at the level of small- and medium-sized cities in Idaho, identifying the influence of distance from the center of city on the values of the landscape metric. They also studied how the landscape metrics of built-up areas change over time, and analyzed the economic value of ecosystem services, local development, their relationship in Idaho’s mid-sized cities, and cross-site comparisons for both of those. The team also conducted random-sample surveys of households within urban, sub-urban, ex-urban and rural areas in order to add the social valuation component to their research.



Patterns of exurban growth through time

This research on mid-sized city growth is allowing scientists and students from Idaho’s large universities to collaborate and to help inform partners and stakeholders. This work will help to determine best practices for growth and development, and protecting ecosystem services that are highly valued by individuals in Idaho. Finally the cross-site comparisons will also allow for information and strategy sharing among Idaho’s mid-sized cities.

To access the journal link visit:

<https://link.springer.com/article/10.1007/s11252-018-0770-x>

MEET KELLY HOPPING- NEW MILES FACULTY



Dr. Kelly Hopping

Idaho EPSCoR is happy to welcome one of its newest MILES participants, Boise State University assistant professor Kelly Hopping.

Hopping has a PhD in Ecology from Colorado State University and did her postdoctoral research at Stanford University in the Department of Earth System Science and Woods Institute for the Environment.

Her research examines how interacting aspects of global change affect ecosystems

and livelihoods, particularly in high-elevation and pastoral regions. Much of her work has focused on the Tibetan Plateau, where she has investigated the social-ecological dynamics of climate change, and grazing policy.

It's one reason Hopping is so excited to join the Human Environment Systems (HES) program at Boise State University. Not only does it allow her to examine these economic and ecological tensions, but to find solutions through interdisciplinary research.

Hopping will use the resources and connections she finds through HES and MILES to determine her new areas of research in the coming months. "I think we're really encouraged to work with communities and people to understand what issues they're facing," Hopping says. "I think that's what we need more of."

MAKING ACADEMIC RESEARCH ACCESSIBLE TO THE PUBLIC

Jenna Narducci, a recent M.S. graduate in Geoscience via the Human-Environment Systems (HES) program at Boise State University, has been having an impact on how stakeholders manage land use change and loss of farmland due to urbanization in the Treasure Valley.

Rapid urbanization is occurring at a global scale. Over half of the world's population lives in urban areas, and the percentage continues to rise. Jenna's research has implications for valued environmental resources that may be directly or indirectly affected by such urbanization.

Jenna's research team focused on capturing the diverse social values associated with the environment, and communicating those results to the public in easily-shared formats.

As Jenna points out, "Quantifying and sharing this information in a way that grabs people's attention is important, both in terms of biophysical and economic impacts. Planning for trade-offs between resources likely to occur with urbanization also requires understanding social values associated with those resources."

The research team has already published one paper with an additional paper under review. The team also utilized new techniques to expand their audience and took the time to organize and share raw data in such a way that other organizations could utilize the outputs or methods for their own projects.

According to Jenna, "Investing our time in creating products like story maps and white papers helped us reach a broader audience, as opposed to focusing only on academic



Jenna Narducci, former Idaho EPSCoR MILES graduate student

publications. We set a precedent for the HES program by demonstrating the success of a nontraditional interdisciplinary program.

We integrated activities normally considered external to a M.S., e.g. creating story maps, writing a white paper, and giving talks to the public. This type of work would not be possible without incorporating it into my research assistantship through EPSCoR."

Jenna now works for Idaho Department of Lands where she serves as a coordinator between the state, the Bureau of Land Management, stakeholders, and land owners. According to Jenna, her work with collaborative, interdisciplinary groups has contributed to her success. "Working in an environment where people with diverse backgrounds and interests are coming together to meet common goals prepared me for my current position," Jenna states. "My time spent at Boise State working on an EPSCoR project was invaluable."

To read about one of the many examples of where Jenna's research is being utilized visit: <http://edibleidaho.ediblecommunities.com/>

Boise State University team participants include: Jenna Narducci (BSU), Jodi Brandt (BSU), Christian Sprague, Shawn Benner, Michail Fragkias, Jen Schneider, and Jillian Moroney

Idaho State University team participants include: Antonio Castro, Cristina Quintas-Soriano, and Dainee Gibson

Kudos

Kudos to **David Rodgers**, Professor in Geosciences at Idaho State University and member of the MILES leadership team, who received a Fulbright Scholarship and is spending the next academic year at the University of Central Asia (UCA) in Khorog, Tajikistan. He will be teaching, helping to plan a 4-year curriculum in Environmental Science, and completing research at the university's Mountain Societies Research Institute, whose goals are similar to the Idaho NSF Managing Idaho's Landscapes for Ecosystem Services (MILES) project.

Kudos to **Jennifer Forbey**, Associate Professor in the Department of Biological Sciences at Boise State University, and her research team for receiving a \$6 million NSF EPSCoR Track-2 Award to understand and manage resistance to toxins. The project, titled "Genomes Underlying Toxin Tolerance" will be known as GUTT. The GUTT team will reveal how herbivores and their gut microbes tolerate defensive toxins produced by the wild plants they consume.

Kudos to **Armando McDonald**, Professor in the Department of Forest, Rangeland, and Fire Sciences in the College of Natural Resources at the University of Idaho, on a new NSF EPSCoR RII Track-2 FEC award. The award, in which Dr. McDonald was involved as a collaborator, focuses on multi-scale, multi-physics modeling framework for genome-to phenome mapping via intermediate phenotypes. Three universities, the University of Kentucky, University of Idaho, and Clemson University, have leveraged their research expertise to create the Kentucky/Idaho/Clemson Plant Biomechanics Consortium (KIC-Consortium). The project will provide opportunities and interdisciplinary research for seven early career faculty and build a robust intellectual infrastructure in this field through training programs.

Other

SIGN UP FOR E-NEWS

In addition to the newsletter, Idaho EPSCoR also has an E-News publication in coordination with the Idaho INBRE program which is published twice a month. To subscribe - visit www.idahoepscor.org

IDAHO EPSCoR ANNUAL MEETING

Save the date! The Idaho EPSCoR Annual Meeting will be held in Sun Valley, Idaho on December 6-7, 2018. Check the EPSCoR website (idahoepscor.org) for details.

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