

the **RESEARCHER**

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Photo by: Benjamin Crosby

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University of Idaho



BOISE STATE UNIVERSITY

**Idaho State
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Message from the Director

Thank you for reading *the Researcher*, the newsletter for Idaho's Experimental Program to Stimulate Competitive Research (EPSCoR). We've been busy helping Idaho scientists and institutions pursue research and education related to Idaho's Research Infrastructure Improvement (RII) awards funded by the National Science Foundation (NSF) and the State of Idaho. In this issue, you'll find just a small fraction of the achievements of the many, many talented researchers and students involved in EPSCoR activities.



Peter Goodwin,
Idaho EPSCoR Project Director

The mission of EPSCoR is to advance excellence in science and engineering research and education in order to achieve sustainable increases in research, education, and training capacity and competitiveness. Idaho NSF EPSCoR facilitates cooperation among Idaho's research institutions in support of strategic priorities to improve quality of life, education, and the economy across Idaho and the nation.

Idaho EPSCoR has more than 275 participants from across the state, and that's not counting the more than 6,800 stakeholders, community members, and private entities researchers are working closely with to make Idaho a premier state for scientific research.

With awards from both NSF EPSCoR and additional competitive funding, participants in Idaho's EPSCoR program have won over \$30 million in grants to fund Idaho research for projects related to Managing Idaho's Landscapes For Ecosystem Services (MILES). Take a look at this issue, and check out just a little bit of what Idaho's research community is doing!

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MARSH CREEK

by Max Bartlett

Marsh Creek - a major tributary to the Portneuf River - has a sediment problem. Importantly, Marsh's 'impaired' waters flow into the Portneuf and impair that river as well. There have been efforts for almost half a century to improve water quality in Marsh Creek. Efforts totaling millions of dollars and requiring changes in how farmers manage their land. Now, a team of geoscientists, sociologists, biologists, and a political scientist from Idaho State University are evaluating the effectiveness of that work. They want to know whether these investments have yielded significant results.

Effectiveness, says ISU geosciences professor Benjamin Crosby, is measured in two domains.

"Do we actually see a measurable change in water quality?" Crosby says. "Can we go to our sensors that measure water clarity...to our calculations of sediment load...to our measurements of stream metabolism, and confirm that for X dollars of investment in new land management practices, we have a measurable improvement in stream quality?"

The other domain is this: do stakeholders and landowners notice a difference in the quality of the creek they live and work along? In other words, what's the human benefit from this work?

"Do people notice that the river is any better off because of investments made? Do they perceive that? Do they feel good about the personal investments they've made in conservation?" Crosby asks.

After all, these private landowners have, over the years, contributed about half the funding for the conservation work done to improve the creek. That's why ISU is taking a multi-disciplinary approach. It's about more than just the physical sciences, it's also about understanding the human interaction with Idaho ecosystems - an important part of MILES goals.

MILES researchers have been studying the lower Portneuf River in Pocatello for several years, but the Marsh Creek study is relatively new.

"This is a brand-new two-year project," Crosby says. "It's certainly something that is informed by the previous three years' work, and takes advantage of the kind of skills and partnerships and collaborations we've created."

Crosby emphasizes how important this kind of interdisciplinary research can be for stakeholders and researchers alike.


"There are new opportunities and new types of solutions that we're developing that are about merging together what's best both from a scientific perspective, and what's best from a social perspective," Crosby says.

It's just one part of how EPSCoR furthers Idaho research, not just in a laboratory but across Idaho lands, with Idahoans.



Photo provided by Benjamin Crosby

Jenna Dohman, a MILES-supported M.S. Geology student, measures water flow in Marsh Creek, a tributary to the Portneuf River.



THE IMPACT ON

By Max Bartlett

Photo taken by Tony Hisgett and used under Creative Commons license.

What disturbs birds more? A hiker walking by, or driving by in an off-road vehicle? Common sense tells us it's the latter. But what makes science so fascinating, and so powerful, is that it can defy common sense and surprise us in incredible ways.

About three years ago, Boise State University graduate student Rob Spaul found something interesting: golden eagles were disturbed more often not by vehicles, but by hikers. They were more likely to flush - in non-birder terms, fly away from their nests or perches - if someone walked by.

The reasons for this are not fully known, at least not yet. Researchers hypothesize that vehicle behavior may be more predictable from a bird's-eye view, and the long lifespan of a

golden eagle might make it tougher for them to adapt. But with EPSCoR funding, scientists at Boise State University are finding answers.

"Very few people are talking about this problem, and it's rapidly going to become a problem in the West," Kathryn Demps says. Demps is an Assistant Professor of Anthropology at Boise State University. That's right: anthropology.

One might not think of a social science, like anthropology, as key to understanding the natural world. But at Boise State, researchers have come to blur the lines between biology and anthropology. Demps is working with Julie Heath, a Biological Sciences professor, and biology grad students Rob Spaul and Eric Frey - but Frey got his start in anthropology. They were also assisted by three EPSCoR-funded undergraduates. It's the kind of interdisciplinary effort that EPSCoR is made to further.



GOLDEN EAGLES



An Idaho ATV rider fills out a survey about his use of Idaho lands for recreation. Researchers wanted to know what effects these off-road vehicles had on golden eagle populations.

Understanding impact on golden eagles could be especially crucial, because they have the same legal protections as bald eagles. As humans expand into previously unoccupied areas in a fast-growing state like Idaho, they're more likely to come into contact with eagles. So researchers want to understand how to minimize the negative effects of that contact on the birds. It's healthier for the birds - and a lot easier on people, too.

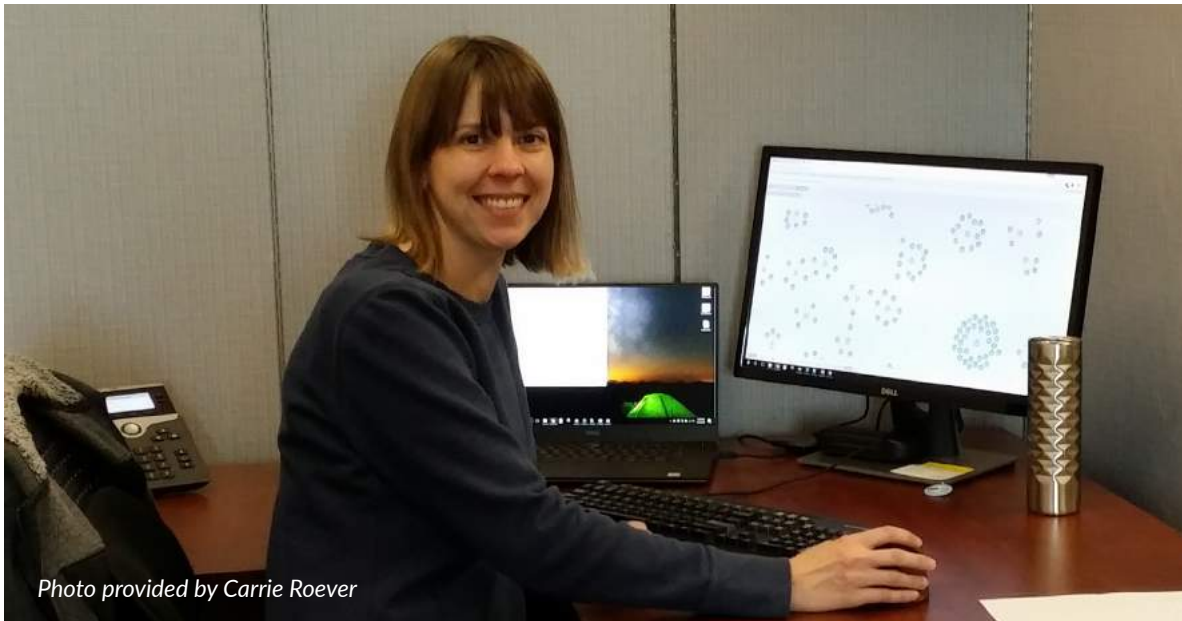
To find out how people use Idaho's public recreation areas, these scientists used a type of tag-and-release program for people, much like they would for birds. Instead of metal bands around their ankles, they lent hikers and other recreationists GPS devices, so that they could track exactly where they were going and how long they were staying. It's all about quantifying how people have fun. So far, they've focused on the Owyhee mountains.

"What are people looking for in their recreation experience? There's a lot of research done on recreation," Demps says. "The data that we have shows that people want to see nature and wildlife, and they want to get exercise."

The other half of the equation is measuring the effects of recreation on the birds. To this end, researchers are creating a "stress landscape." They're modeling the physical points in the land where birds are most stressed by their interactions with humans, by looking at stress hormones like cortisol in raptors.

It's all to help land managers have the data they need to best manage Idaho's ecosystems. It will help departments like the Bureau of Land Management with their dual mandate.

"I want the public to know that we're trying to do the science to benefit them in the long run," Demps says. "To make sure we keep these amazing recreation opportunities that Idaho has open for them available to future generations."



Carrie Roever is the newest member of the Northwest Knowledge Network team

Photo provided by Carrie Roever

Making a Difference

By Max Bartlett

Dr. Carrie Roever has worked and studied around the world. With a Master's degree from the University of Alberta and a PhD from South Africa's University of Pretoria, her journey to Idaho has been a long one. We're very excited that she brought her data management skills to the MILES project.

Roever is working with the Northwest Knowledge Network (NKN) at the University of Idaho on data management. She's developing data maps, drawing connections between individual projects and MILES' research questions. It also helps to find researchers who are doing similar work, and improve coordination, while promoting common research goals.

Roever's not just interested in data management. She's applied those skills to study mammal movement patterns, in order to help land managers make better decisions for their ecosystems. In Alberta, she studied grizzly bear movement around roads. She discovered that efforts to protect the land around the roads was attracting bears.

"When the road comes through, they put clover along the roadside to stabilize the soil," Roever says. "That's a really good bear food."

And in Africa, Roever worked to help protect elephants and manage parks that housed them. As she explained, many public parks that are home to elephants aren't far from each other, 70 to 80 miles apart. That's short enough for elephants to travel between them.

"Some of these parks have growing populations, and that creates a lot of strain on the vegetation," Roever says. "Other parks have a declining population due to poaching or a lack of resources."

So Roever created models to map the routes elephants used to move between the parks. Based on her research, park managers could protect paths that were crucial to the survival of elephants.

"What excites me the most is seeing the real-world applications," Roever says. "You go out as a student and you're just doing these studies to get a degree. But to see this data implemented on the ground is very rewarding."

It was a love of animals that brought Roever to science - and, as she explains, a fear of blood that kept her away from veterinary medicine. But good data can make a huge difference for animals worldwide.

Roever says that carefully organizing data can benefit researchers in their work for years.

"Everyone's come back to a file that they don't remember what it's for," Roever says. "Whenever you publish a paper, people could come to you with questions about that study, maybe years later, and you're expected to know."

In short, data management may not seem as exciting as elephants - but it's just as important.



Carrie Roever holds a GPS collar for tracking elephants. Roever researched the movement patterns of elephants between parks in Africa.

LAKE HEALTH

By Max Bartlett

Lake Fernan has an algae problem. For much of the year, the lake is a health hazard. Toxic algae have taken over the lake, and despite the hard work of scientists, it has yet to be restored.

The problem, says undergraduate Biology student Steve Van Horn, is eutrophication. In other words: the lake is just too productive. Nutrient runoff from resource and land use development in the watershed means the lake is a great place for algae to live and reproduce. Too much algae disrupts the natural food chain of the lake, and kills off existing plant and animal life.

Reversing the process of eutrophication is incredibly difficult. And some worry that it could happen in nearby Lake Coeur d'Alene, vital to the area's economic and environmental health. But what if scientists had an early warning system, to see when eutrophication was coming?

That's what Van Horn hopes to develop. The key may lie in large-body cladocerans: a kind of microscopic crustacean. Despite being called "large-body," they're zooplankton, microscopic creatures that live in the upper layer of water bodies.

"What's really interesting about them..." Van Horn says "...is that they're a great indicator species for eutrophication."

In a body of water, there are four layers to the food chain. At the bottom are phytoplankton, tiny plants like algae. They're eaten by zooplankton, such as the cladocerans. Those zooplankton are eaten by small fish, which are in turn eaten by large fish. Having the right balance between them is essential to having a healthy ecosystem.

Cladocerans are filter-feeders. They float around the water, living on nutrients that pass through their filters. But algae forms into long filaments in large amounts, and those filaments clog up the cladocerans' filters. Too many nutrients, too much algae. Too much algae, the cladocerans starve. Once the zooplankton die off, the fish soon follow. And that just means the algae have lots of nutrients and no predators.



University of Idaho Biology student Steve Van Horn examines phytoplankton up close, part of his research into their crucial role in lake health.

Van Horn wants to figure out exactly what the threshold for zooplankton is before a lake dies. If scientists know what sort of zooplankton numbers a lake should have, and when the numbers indicate a crisis, they'll have an easily-measurable gauge for the health of an aquatic ecosystem. And preventing eutrophication before it starts is a lot more cost-effective than trying to reverse it.

Part of that prevention, Van Horn says, means being aware of what people are putting into the water. Humans are the biggest source of eutrophication.

"Be aware of how much fertilizer you're putting on your lawn. Be aware of what you're flushing down your drains, which goes into the water table," Van Horn says. "Every action we take has a consequence on the ecosystem we live in."

An early-warning system, such as the one Van Horn is studying, would give both scientists and stakeholders better tools with which to measure the health of a lake - and the impacts of human activity around it.

University of Idaho and Coeur d'Alene Tribe Come Together For Tribal Sovereignty Course

By Max Bartlett and Heather Keen, Coeur d'Alene Tribe

University of Idaho and Coeur d'Alene tribal students attended courses in 2015 on Indian tribal sovereignty developed and taught by University of Idaho's Dr. Mark Solomon, alongside co-instructor Laura Laumatia, who works as the Lake Management Coordinator for the Coeur d'Alene Tribe.

The courses explored both present-day tribal law and the historical precedents that led to the current relationship between indigenous tribes and the federal government. Students included Coeur d'Alene tribal members as well as non-tribal students.

"It is a course of the head and the heart. They cannot be separated when we talk about the indigenous people of this country and their relationship to the federal government," said Solomon. "It's an exploration of history, it's an exploration of morality and ethics, and it's a personal exploration."

That personal exploration came as a surprise to Solomon, whose background is in managing natural resources across jurisdictional lines.

"My expectation of the class was that we would do a somewhat heartfelt but academic exercise exploring history and its ramifications," Solomon said. "Instead, it became a time where that was both explored and internalized, then brought to the class so it could be aired and felt by all."

"There's really nowhere to learn about tribal sovereignty, so unfortunately it's vastly misunderstood. It is something that affects tribal members daily so this is really a unique opportunity for students to

learn more about the policies that affect tribes in Idaho," Laumatia said.

The course was also funded in part by MILES, as part of an effort to further research and education about ecological, and socioecological, systems.

"With most indigenous peoples, you cannot separate the concept of people from the land," Solomon said. "In the Okanogan language group, the same word for 'land' and 'body' is used. You can't get a tighter socioecological system than an indigenous tribe in their landscapes. One measure of the course's success is that of the roughly 16 tribal students enrolled in the class, at least 6, maybe more, have now gone on to enroll in degree programs at the University of Idaho."

The course continued in 2016, taught by Laumatia and the Coeur d'Alene tribe.



Mark Solomon, right, teaching a course on tribal sovereignty at a Coeur d'Alene tribal classroom.

UI Professors Recognized for National and International Research Contributions

By Max Bartlett and Tara Roberts

University of Idaho researchers Sanford Eigenbrode and Ron Hardy have been awarded the Jean'ne M. Shreeve NSF EPSCoR Research Excellence Award for their internationally recognized research that benefits the people and state of Idaho.

EPSCoR selects researchers from University of Idaho, Boise State University or Idaho State University each year to receive this prestigious award, which is named for longtime UI chemist and former Idaho EPSCoR director Dr. Jean'ne Shreeve.

Eigenbrode, a University Distinguished Professor of entomology in the UI College of Agriculture and Life Sciences, came to UI in 1995 to study insect ecology. He received a three-year Idaho EPSCoR grant to examine the ecological role of glucosinolates as plant defenses in 1996, and has since worked on competitively funded research projects totaling \$28 million. He is the director of the five-year, \$20 million Regional Approaches to Climate Change for Pacific Northwest Agriculture



Dr. Sanford Eigenbrode

(REACCH) project, an advocate for transdisciplinary approaches to research, and a dedicated researcher of the chemical ecology of interactions among insects and plants, the biological consequences of climate change on agriculture and the philosophical dimensions of collaborative research.

Hardy is the director of UI's Aquaculture Research Institute (ARI). With over 20 years at UI, Hardy has



Dr. Ron Hardy

studied sustainable fish nutrition, published 83 peer-reviewed papers and earned recognition as one of the world's top scholars in his field. Under Hardy, ARI's partnership with the federal Agricultural Research Service has received more than \$20 million in funding and leads the world in sustainable fish feeding research. Hardy led the

transformation of the Hagerman Fish Culture Experiment Station from a small laboratory to a massive multi-building research complex. It now employs 35 people, and frequently hosts researchers and students.

Annual Conference

By Max Bartlett

More than 100 researchers, stakeholders, students and others from across Idaho met at the 2016 Idaho EPSCoR Annual Meeting in Coeur d'Alene, October 20 and 21.

2016 Fulbright Ngā Pae O Te Maramatanga Senior Scholar Kepa Morgan opened with an address on how the knowledge of indigenous peoples can contribute to environmental stewardship.

The topic of indigenous peoples provided a bookend for lectures, with National Geographic Education Fellow and

Explorer and Indigenous Peoples Scholar Jon Waterhouse delivering a speech on the topic to end the first day.

Faculty and students from Idaho colleges and universities presented their research related to the NSF EPSCoR Track-1 project, Managing Idaho's Landscapes for Ecosystem Services (MILES), with topics ranging from land use in cities to social networking as a collaborative tool, ecosystem services in the Treasure Valley, Lidar mapping, water quality, and more.



National Geographic Education Fellow and Explorer Jon Waterhouse presents at the 2016 MILES Conference in Coeur d'Alene.



2016 Fulbright Ngā Pae O Te Maramatanga Senior Scholar Kepa Morgan addresses MILES participants and stakeholders.

With WC-WAVE Tools, ISU Student Studies Mountain Climates

By Max Bartlett and Heather Keen, Coeur d'Alene Tribe

Idaho State University graduate student Clarissa Enslin is investigating the dynamics of the rain-snow transition zone in southwest Idaho mountains. Working alongside professor Sarah Godsey, Enslin examined a complex climate relationship: How does the distribution of snow impact how watersheds respond to mid-winter rain?

To take a closer look, Enslin didn't just wait for the rain. She used a modeling program called iSNOBAL, with help from a team with the Western Consortium for Watershed Analysis, Visualization and Exploration (WC-WAVE), a three-state NSF-funded collaboration between Idaho, Nevada, and New Mexico EPSCoR.

iSNOBAL allowed Enslin to model snow accumulation and melting patterns, in order to simulate snow and rain in the Reynold Creek Experimental Watershed. This visualization tool makes it easier than ever before for researchers to study the impacts of weather on Idaho lands - without

being dependent on that weather to make their research possible.

Enslin learned that five factors work together to determine how meltwater and rain impact streamflow during what's known as a "rain-on-snow event" - which is exactly what it sounds like. Those factors are the initial snow conditions, how it rests on the mountain, its elevation, the wind, and vegetation.

What does it all mean? Early results indicate that more frequent years with less snowfall - and therefore less snowpack - will have a serious impact on water availability, biochemical processes in the soil, and Idaho ecosystems as a whole.

Tools that allow researchers to predict these impacts, like iSNOBAL, give us an edge in dealing with them, and preserving the value of Idaho's lands and waterways.



Photo provided by Sarah Godsey.

Clarissa Enslin, left, and Chao Chen, right, collecting data in the field for snow research.

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Kudos

Kudos to the now award-winning Idaho Science Journal.

A collaboration between Idaho EPSCoR and Idaho Public Television won several awards for an episode titled “Eagles and Off-Roaders,” featuring MILES research on the effects of recreationists on golden eagle populations. You can read more about that research in this newsletter. Congrats to everyone who worked on it!

Kudos to Donna Lybecker,

Department Chair and Professor of Political Science at Idaho State University and long-time MILES participant. She was recently selected for the Environmental Protection Agency’s National Advisory Committee.

