



MONTANA TEAM STUDIES CLIMATE CHANGE IN ICELAND

Institute on Ecosystems faculty member and Water Center Director **Wyatt Cross** and some of his students are conducting research in Iceland this summer. You can read about their work on the blog “Hengill Diaries” and be inspired by gorgeous landscapes and photos of research happening in the field.

The international team of ecologists studying streams in the Hengill region of Iceland is focusing on understanding the effects of global warming on stream food webs and ecosystem processes. Streams in the Hengill area are variably warmed by geothermal heat, with mean temperatures ranging from 5°C to 30°C. (41–86°F). Although temperatures are variable, stream solute chemistry is remarkably similar due to the indirect warming of groundwater. Streams in the area provide a unique natural laboratory for examining potential effects of climate warming on stream structure and function.

“Iceland offers Cross the chance to conduct natural experiments in an “unperturbed, pristine system,” said Institute on Ecosystems director **Cathy Whitlock**. “Lessons that he learns there are broadly applicable to watersheds in this region (of the United States).” Cross said he hopes to extend his research and collaborate with others to include streams in the northern Rockies that are highly vulnerable to future warming.

Iceland is possibly the most geothermally active country in the world, Cross said. An island just south of the Arctic Circle and east of Greenland, Iceland sits over two continental plates that are slowly drifting apart.
(Continued on page 6)



ABOVE: Team members walk to the research site in Hengill.

LEFT: Researchers made sandbags on site to improve the catchment area for the experiment.

UPCOMING EVENTS

Sept. 7, 2016:

Rough Cut Science talk kickoff

(Bozeman, MT) **Jamie McEvoy** (MSU Geography). EPS 126 at MSU, or watch online. Rough Cut talks continue each Wed. at noon throughout the semester.

<http://montana.adobeconnect.com/roughcutsience>

Sept. 27, 2016 (MSU-Bozeman)

Sept. 29, 2016 (UM-Missoula)

Distinguished Visiting Lecturer

William Schlesinger, Cary Institute

Oct. 13, 2016: (MSU-Bozeman)

**EPSCoR All-Hands Meeting
and IoE Science Summit**

For a full schedule of IoE events, visit
<http://montanaioe.org/>

PEOPLE & EVENTS

IoE IN THE MEDIA

National Geographic features Yellowstone Ecosystem researcher — MSU Ecology professor and IoE faculty fellow **Andrew Hansen** was quoted in a May 2016 *National Geographic* article about population growth in the Greater Yellowstone Ecosystem. Hansen's research focuses on interactions among biodiversity, climate change, and land use, with an emphasis on landscape management and protected areas.

Read the article at

<http://www.nationalgeographic.com/magazine/2016/05/yellowstone-national-parks-land-use/>

The Economist features pine beetle research — The research of **Sharon Hood**, a University of Montana alumna and U.S. Forest Service research ecologist, was recently featured in *The Economist* in an article on how wildfire affects pine beetle infestations. Hood works with many IoE researchers, and her journal article collaborator **Anna Sala** is an IoE affiliate and professor in the UM Division of Biological Sciences. The article outlines Hood's discovery that forests in which wildfires had been suppressed for a long time were more vulnerable to attacks by mountain pine beetles.

<http://www.economist.com/news/science-and-technology/21699100-controlled-fires-can-both-help-prevent-combustion-and-reduce-insect>

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IoE webpage: Montanaioe.org
EPSCoR webpage: mtnsfepscor.org

This material is based on work supported by the National Science Foundation under Grant EPS-1101342. Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Montana EPSCoR's Track I focus is on understanding the effects of climate change on sustaining healthy ecosystems and economic growth. The Institute on Ecosystems (IoE) is a statewide Institute based at the flagship research universities through which current Montana EPSCoR activities are implemented.

PHEAR EARNS NATIONAL AWARD, ATTENDS GLOBAL CLEAN ENERGY SUMMIT

Nicky Phear, Director of the University of Montana's Climate Change Studies minor program, was honored with a C3E Award for her leadership and achievement in education at the fifth annual C3E Women in Clean Energy Symposium on May 31 in Palo Alto, California.

The U.S. Clean Energy Education & Empowerment (C3E) program is led by the **U.S. Department of Energy** in collaboration with the Stanford Precourt Institute for Energy and the MIT Energy Initiative (MITEI). As one of eight mid-career women recognized by the C3E program, Phear was selected from a nationwide pool of nominations and chosen by the U.S. C3E Ambassadors, distinguished energy experts who serve as role models and advocates for women in clean energy.

The C3E Symposium was held alongside the seventh Clean Energy Ministerial, where energy ministers and other high-level delegates from 23 countries came together to discuss policies and practices to accelerate the global transition to clean energy. It was the first meeting of world leaders since the Paris talks. Phear joined conversations about the growing focus among investors and policy-makers to expand clean energy, cut global carbon emissions, and increase energy access.



ABOVE: Nicky Phear (right) of the University of Montana receives a national award at the Women in Clean Energy Symposium. The award was presented by Britt Ide (left), C3E Ambassador and president of Ide Energy & Strategy.

She even convinced **Greg Page**, Executive Chairman of Cargill, to come to Montana in November 2016 to talk with the agricultural and business community about climate change science and risk.

Phear is an Institute on Ecosystems affiliate, whose nomination for the C3E award was put forward by Program and Communications Manager **Anna Tuttle**, and by Bioclimatology Professor **Ashley Ballantyne**. Ballantyne is a faculty member in the Climate Change Studies (CCS) minor program, teaching Science of Climate Change and Ecosystem Climatology. Two CCS students are currently interning for the Montana State Climate Office, working with **Nick Silverman** on the Montana Climate Assessment.

MSU STUDENT TO APPLY NSF FELLOWSHIP TO STUDY VEGETATION AND FIRE DYNAMICS



Kristen Emmett, a PhD student in the Ecology Department at MSU, has received a National Science Foundation Graduate Research Fellowship, which will be used to help support the remainder of her PhD research and program.

As a PhD student in **Ben Poulter's** Ecosystems Dynamics Lab at MSU, Emmett seeks to expand our collective understanding of the impact on vegetation and fire dynamics in a changing climate within the Greater Yellowstone Ecosystem. Her research utilizes complex computer models to simulate vegetation growth.

"To put it simply, I build virtual forests

and subject them to different climate conditions," she said. "I'm looking to see how much and what type of plants grow and where. I'm also looking at the frequency, severity (how many trees burn), and size of fires. This information could help land managers and property owners prepare for the future." Emmett took part in the Communicating Ecosystem Science program at MSU in Fall 2015 and presented a workshop at the April 2016 Expanding Your Horizons event for middle school girls.

Emmett is also a recipient of an Institute on Ecosystems Graduate Enhancement Award and will be using this funding to attend a Fire training at the USFS Fire Lab in Missoula.

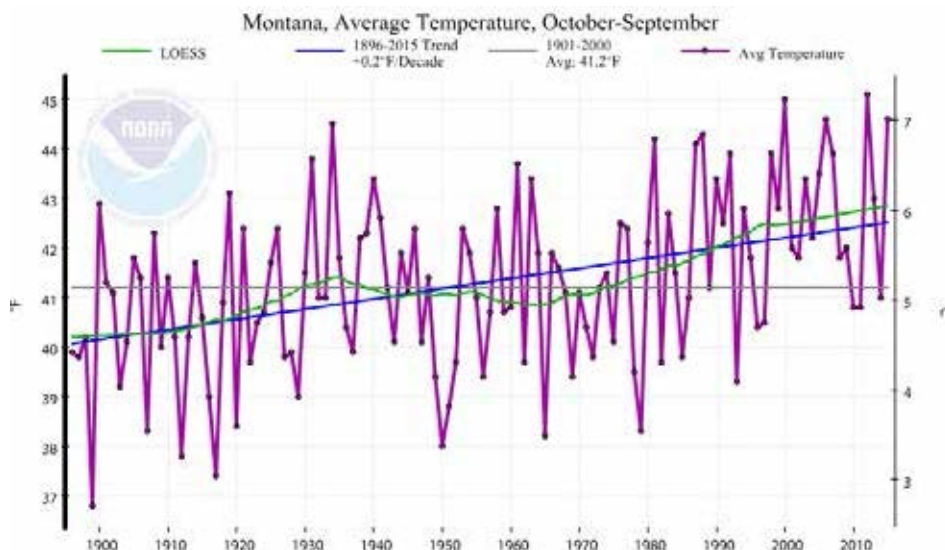
UPDATE: THE MONTANA CLIMATE ASSESSMENT

The EPSCoR-funded Montana Climate Assessment aims to be a sustained, stakeholder-driven assessment of climate in Montana, and will be the state's first such project. The MCA will assess the potential impacts of climate change on the citizens of Montana, especially the farmers, ranchers, foresters and water users in the state.

An emphasis is placed upon understanding what changes will occur and how these changes will impact people and nature. The goal is to provide science-based information that can support any actions needed to protect these resources.

The MCA is intended to inform relevant decision-making and adaptation planning for a changing Montana, and this initiative builds on broad interest for stakeholder-driven climate-change information that can help ensure a productive and rewarding future for all Montanans.

So far, the project involves 27 individuals from two MUS institutions, one state agency, and one non-profit heavily involved in the project. The group participated in over 40 exploratory listening sessions with stakeholders throughout the state who gave input about what climate information is needed and useful ways for that information to be delivered (see stakeholder list at montanaioe.org/mca/team).



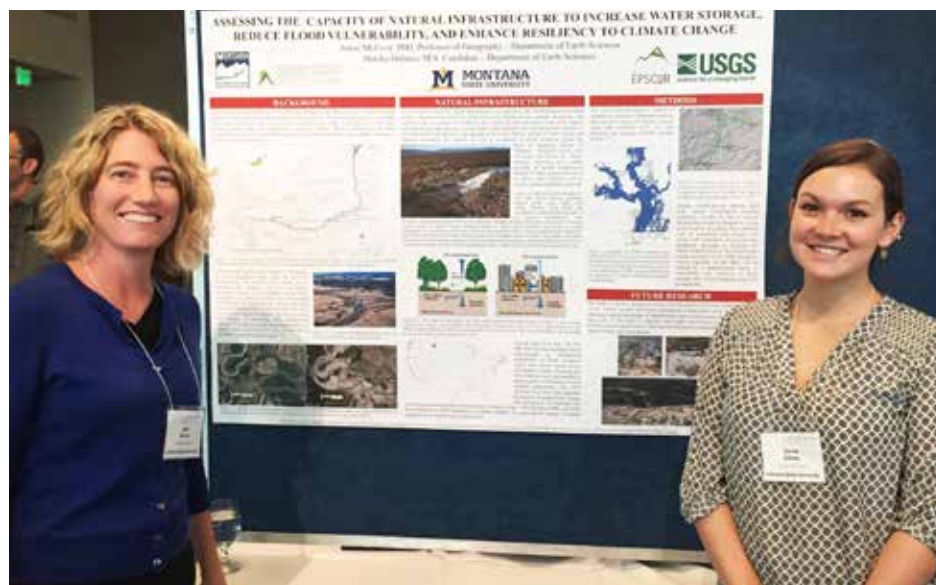
The MCA team is currently conducting extensive literature reviews. To start, the group is collecting information about climate efforts by other groups across the state—agencies, NGOs, universities, tribes, K-12, stakeholder groups, and others. This will allow the MCA to share information about the project and coordinate where needed. Particularly, this will help the team with outreach planning. Partnering with groups across Montana in the summer of 2017 (when the MCA comes out) is of the utmost importance.

The EPSCoR outreach teams have also been working on developing educational resources that help teachers, students and members of the public understand

the MCA and current climate science research.

This fall, the written chapters will go out for internal review, peer review, and public comment. We look forward to getting this information out to Montanans via a user-friendly website, k-12 curriculum, “brown bag” lunches, seminar talks, annual stakeholder meetings, and an MCA Road Show that will travel to urban/rural/tribal communities across the state.

Stay connected! Join our mailing list by emailing ioeinfo@montana.edu for updates on the assessment progress, dates for brown bag lunch talks, and more.



WATER STORAGE THESIS SPRINGBOARDS HOLMES TO MONTANA DNRC WATER POST

Danika Holmes, a former master's student of Jamie McEvoy's at Montana State University, successfully defended her thesis in Spring 2016 and is currently employed full-time as a water specialist with the Montana Department of Natural Resources and Conservation in Missoula. Her thesis was “Natural Water Storage and Climate Change Resiliency in Montana.” (Holmes is on the right, with McEvoy, left.)

IoE GRADUATE STUDENTS SELECTED FOR ENHANCEMENT AWARDS

Thirty-four graduate students in environmental science-related fields received funding from the Institute on Ecosystems for support of their educational projects. The awards are used for travel, supplies, publication support or research, or can be used to attend or convene a professional meeting. Each student works with an Institute on Ecosystems-affiliated faculty member.

Christine Brissette – (Forestry and Conservation Sciences, UM) will research hydrologic response to channel reconfiguration restoration (faculty sponsor, Kelsey Jensco).

Zachary Hoylman – (Forestry and Conservation Sciences, UM) was awarded funds for equipment to quantify soil moisture impacts on forest productivity (faculty sponsor, Kelsey Jensco).

Clancy Jandreau – (Forestry and Conservation Sciences, UM) will survey ranchers involved in the Sage Grouse Initiative (faculty sponsor, Jill Belsky).

Colin Maher – (Forestry and Conservation Sciences, UM) was awarded funds for travel to alpine whitebark pine field sites (faculty sponsor, Cara Nelson).

Peter Metcalf – (Forestry and Conservation Sciences, UM) was awarded funds for travel to Yellowstone to study bison management (faculty sponsor, Libby Metcalf).

Gerard Sapes – (Forestry and Conservation Sciences, UM) was awarded funds for field materials for investigating geographic variation in hydraulic thresholds of ponderosa pines (faculty sponsor, Anna Sala).

Matthew Metz – (Wildlife Biology, UM) was awarded funds to develop a model that predicts wolf kill locations in Yellowstone (faculty sponsor, Mark Hebblewhite).

Jeffery Strait – (Wildlife Biology, UM) was awarded funds for lab testing of genetic markers related to trout hybridization (faculty sponsors Lisa Eby/ Gordon Luikart).

Devin O'Brien – (Biological Sciences, UM) was awarded funds for equipment for Computational Fluid Dynamics work (faculty sponsor, Douglas Emlen).

Jacob Dyste – (Systems Ecology, UM) was awarded funds for field work addressing of channel reconfiguration restoration sites (faculty sponsor, Maury Valett).

James Mouton – (Biological Sciences,

UM) was awarded funds for testosterone EIA kits and a field technician (faculty sponsor, Thomas Martin).

Sam Pannoni – (Biological Sciences, UM) was awarded funds for lab costs associated with DNA sequencing of microbial communities (faculty sponsors, Bill Holben/ Gordon Luikart).

Tim Wheeler – (Biological Sciences, UM) was awarded funds to attend International Association of Lichenologist Conference (faculty sponsor, John McCutcheon).

Zachary Robinson – (Biological Sciences, UM) was awarded funds to travel to sample brook trout genetic rescue experiments (faculty sponsor, Andrew Whiteley).

Erik Anderson – (Microbiology/ Immunology, MSU) was awarded funds for equipment to extract DNA from soils (faculty sponsor, Ryan Jones).

Ayodele Gilbert – (Land Resources and Environmental Science, MSU) was awarded funds to attend PaleON summer course on using long term data (faculty sponsor, Ben Poulter).

Subodh Adhikari – (Ecology, MSU) was awarded funds to travel to Ft Lauderdale to present at ESA meetings (faculty sponsor, Fabian Menalled).

Nick Pinkham – (Microbiology/ Immunology, MSU) was awarded funds for equipment to extract DNA from mosquitoes (faculty sponsor, Ryan Jones).

Sarah Benjaram – (Earth Science, MSU) was awarded funds to attend summer course on spatial analysis in order to be able to use Lidar data (faculty sponsor, Jean Dixon).

Will Thompson – (Fisheries/Wildlife Management, MSU) was awarded funds to cover driving costs to visit sites to measure pika abundance (faculty sponsor, Laura Burkle).

Ethan Wologo – (Land Resources and Environmental Sciences, MSU) was awarded funds to attend short course on hydrology to learn new technique (faculty sponsor, Stephanie Ewing).

Maureen Kessler – (Microbiology/ Immunology, MSU) was awarded funds for a blood analyzer to assess health of bats in Australia (faculty sponsor, Raina Plowright).

Nancy Mahoney – (American Studies, MSU) was awarded funds to travel to three reservations to do in depth interviews about

preserving cultural heritage archaeology and landscapes (faculty sponsor, Michael Neeley).

Kristen Emmett – (Ecology, MSU) was awarded funds to visit Fire lab in Missoula. Attend Fireworks training (faculty sponsor, Ben Poulter).

Amanda Obery – (Education, MSU) was awarded funds for software to do statistical analysis of data on role of education in determining environmental attitudes (faculty sponsor, Michael Brody).

Jennifer Woodcock-Medicine Horse – (American Studies, MSU) was awarded funds to attend summer course on qualitative methods to use studying Indigenous methodology (faculty sponsor, Robert Rydell).

Kelsey Matson – (History & Philosophy, MSU) was awarded funds to travel to Natural Bridges National Monument to look at solar power system (faculty sponsor, Timothy LeCain).

Jim Junker – (Ecology, MSU) Will perform analysis to determine the carbon and nitrogen content of multiple organic matter pools across the temperature gradient (faculty sponsor, Wyatt Cross).

Aaron Feldhaus – (Earth Science, MSU) was awarded funds to collect and analyze soil samples (faculty sponsor, Jean Dixon).

Buzz Nanavati – (Earth Science, MSU) was awarded funds to travel to a workshop on databases in Boulder and conference in NM where he will present a poster (faculty sponsor, Cathy Whitlock).

Leo Calle – (Ecology, MSU) was awarded funds to present a poster at ESA meetings in Ft Lauderdale (faculty sponsor, Ben Poulter).

Martha Jenkins – (Plant Sciences/ Plant Pathology, MSU) was awarded funds to attend annual meeting of Mycological Society and present poster (faculty sponsor, Cathy Cripps).

Will Glenny – (Plant Sciences/ Plant Pathology, MSU) was awarded funds for travel to Penn State to attend international conference on pollinators. Present poster (faculty sponsor, Michelle Flenniken).

Shannon Dillard – (Land Resources and Environmental Sciences, MSU) was awarded funds for lab analysis of soil samples - focusing on invasive plant (faculty sponsor, Tony Hartshorn).

IoE UNDERGRADUATE INTERNS

Sitting around a table with the 2016 Institute on Ecosystems Undergraduate Interns is an engaging experience. These students are working hard from June to September to conduct research across Montana and the world, and the stories they already have about the progress of their research and the processes they have developed is simultaneously funny, interesting, and inspiring.

Montana University System IoE undergraduate interns work with IoE-affiliated faculty on coordinated research projects that explore the effects of climate change in sustaining healthy ecosystems and economic growth, businesses, and communities. Thirteen students are participating this year.

Michelle Meagher – (Biological and Chemical Engineering, MSU) will study cultivation and isolation of species of *Archaea* inhabiting alkaline hot springs in Yellowstone National Park at Thermal Biology Institute at MSU (faculty sponsor, Brent Peyton).

Lila Hamburg – (Ecology/Biochemistry, MSU) will study the interactive effects of temperature and food quality on stream invertebrate growth rates at the Cross Lab at MSU; field work in Iceland (faculty sponsor, Wyatt Cross).

Laura Ippolito – (Agroecology, MSU) will research the economic consequences of climate change on agriculture in Montana in Bozeman libraries (faculty sponsor, Bruce Maxwell.).

Emily Hultin – (Chemical Engineering, MSU) will study carbon and nutrient cycling in wetlands, streams, lakes and other environments in rivers of South Central Montana (faculty sponsor, Christine Foreman).

Derek Snyder – (Civil Engineering, Bioresources option, MSU) will study historic human-climate-wildfire relationships in the mixed-conifer forests of the Confederated Salish and Kootenai tribes (faculty sponsor, Greg Pedersen).

Taylor Simpson – (Ecology, MSU) will examine the long-term water use of Douglas fir at the Hu Lab at MSU and Lubrecht Experimental Forest (faculty sponsor) Jia Hu.

Frances Ambrose – (Ecology, MSU) will research the effects of environmental temperature on the survival and health of developing bees at O'Neill Lab at MSU (faculty sponsor, Kevin O'Neill).

Reid Longley – (Biological Sciences, UM) will study nitrogen fixation by heterocyst-forming cyanobacteria as a pathway for new nitrogen entering a river system on the Clark Fork River (faculty sponsor, Scott Miller).

Clare Vergobbi – (Ecological Restoration, UM) will study genetic differences in whitebark pine trees that survive mountain pine beetle outbreaks at Diana Six Lab (faculty sponsor, Diana Six).

Laura Dameron – (Biological Sciences, UM) will investigate interactions between the microbiome and fish hosts in Glacier National Park (faculty sponsor, Bill Holben).

Jordan Foster – (Environmental Chemistry, Montana Tech) will study the role of microbes in biogeochemical cycling in the headwaters of the Clark Fork River (faculty sponsor, Alysia Cox).

Macy Ricketts – (Biological Sciences, Montana Tech) will study microbial colony composition along environmental gradients following glacial retreat in Glacier National Park (faculty sponsor, Martha Apple).

Patrick Demaree – (Biological Sciences, UM) will study how the length of drought events affects ponderosa pine seedling tissue growth at Sala Physiological Plant Ecology Lab (faculty sponsor, Anna Sala).

Theresa Galhouse – (Environmental Science, UM Western) will study alpine tundra cushion plants influence on golden mantled ground squirrel populations in the Pioneer Mountains (faculty sponsor, Wendy Ridenour).

Q: WHAT DO YOU GET WHEN YOU PUT 100 CLIMATE SCIENTISTS IN A ROOM?

A: 97 (or more) scientists who agree that climate- warming trends over the past century are extremely likely due to human activities.*

***Multiple studies** published in peer-reviewed scientific journals show that **97% or more** of actively publishing climate scientists agree that climate-warming trends over the past century are **extremely likely due to human activities.**

Source: <http://climate.nasa.gov/scientific-consensus/>



RESEARCH

ICELAND — continued from Page 1

Hot pools are everywhere, and volcanic activity is common. The country drew widespread attention last spring when a glacier-covered volcano erupted and spewed ash across Scandinavia and western Europe.

“Much of the Earth is getting warmer and more climatically variable, especially at northern latitudes,” Cross continued. “Understanding the response of streams to warming is important because these responses will largely determine what will happen to the valuable ecosystem services provided by streams and rivers that we use every day and often take for granted.”

Some of those services include purifying water, detoxifying waste and recycling

nutrients, Cross said.

The Hengill Diaries blog features photos and descriptions of some of the challenges faced working in remote country, including building sand bags to bring up water levels in a cachement area, spray painting the black sections of a cold pipe white to help minimize solar heating of the water and keep the temperature down, and finding creative ways to keep pesky (but cute) local sheep from trampling on equipment.

Visit <http://icelandstreams.blogspot.com>



A team member repairs pipe used to transport stream water for temperature treatments.

RESEARCHERS IDENTIFY GRAVEL BED FLOODPLAINS AS KEY HABITATS

University of Montana researcher Ric Hauer has been part of an interdisciplinary group of researchers who have identified gravel-bed river floodplains as some of the most important ecological habitats in North America. Working with a team of scientists to study the Yellowstone to Yukon ecoregion, Hauer has stated that gravel-bed river floodplains support more than 70% of the ecoregion's bird species, and that large mammals

need the floodplains for habitat, food, and migration corridors.

“If we think about the Flathead River, for example,” says Hauer, “flowing from British Columbia into the US and along the western edge of Glacier National Park, we might wrongly imagine that the river is only water flowing in the channel. But, these gravel-bed systems are so much more than that. The river flows over and through the entire floodplain system, from valley wall to

valley wall, and supports an extraordinary diversity of life. The river is so much bigger than it appears to be at first glance.”

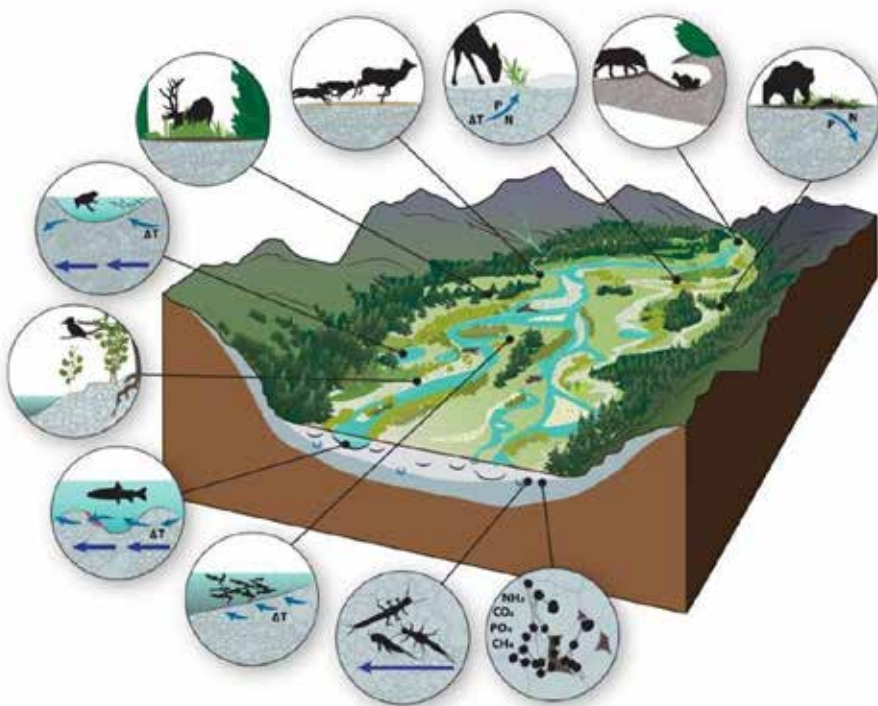
The group of scientists involved includes Hauer; Harvey Locke, co-founder of the **Yellowstone to Yukon Conservation Initiative**; UM professors Vicky Dreitz, Mark Hebblewhite, Winsor Lowe and Cara Nelson; Clint Muhlfeld, research aquatic ecologist from the **U.S. Geological Survey**; Professor Stewart Rood from **University of Lethbridge**; and biologist Michael Proctor of **Birchdale Ecological**.

Recently, the team published a paper titled “Gravel-Bed River Floodplains are the Ecological Nexus of Glaciated Mountain Landscapes” online for *Science Advances*.

Hauer is the director of The Center for Integrated Research on the Environment (CIRE), a partner of the MT Institute on Ecosystems and the University of Montana.

To learn more about the research and the importance of these ecological areas, visit <http://advances.sciencemag.org/content/2/6/e1600026>

LEFT: Hauer's illustration shows the complexity of organisms that benefit from gravel-bed river floodplain ecosystems.



IOE FACULTY, STUDENTS ENGAGE YOUTH IN ECOSYSTEM SCIENCE

This spring, Institute on Ecosystems affiliates engaged 290 high-school students in hands-on ecosystems science experiences through We Are Montana in the Classroom, the University of Montana's role-model engagement initiative designed to inspire youth about higher education and career pathways.

Next academic year, We Are Montana in the Classroom is partnering with the **Martin Family Foundation** on a \$135,000 project that will engage ecosystems-science role models with K-12 learners in

the Bitterroot Valley through in-classroom and outdoor education experiences that will complement spectrUM's mobile "Water" exhibit, designed in collaboration with IoE researchers. Prospective role models are invited to contact Nathalie Wolfram at nathalie.wolfram@umontana.edu to learn more about this opportunity.

RIGHT: UM doctoral candidate Mandy Slate (Division of Biological Sciences) shares a leaf identification activity with AP biology students at Missoula's Hellgate High School.



UM GEOGRAPHY PROFESSOR TO CONDUCT CLIMATE CHANGE RESEARCH IN SLOVENIA

Sarah Halvorson (Geography, UM) received a Fulbright Fellowship to conduct research on climate change perceptions and adaptation scenarios in the south-central European country of Slovenia during spring semester 2016. She was previously a recipient of a Fulbright Doctoral Dissertation award to conduct fieldwork in the Karakoram Range, Northern Pakistan (1997-1998). While in Slovenia, Halvorson has been collaborating with other geographers and environmental social scientists on an assessment of experiences and observations of climate change risk and vulnerability among Slovenia's mountain communities and other climate-dependent sectors. Her primary research collaborator is the Slovenian geographer and mountaineer Dr. Irena Mrak who was a Visiting Fulbright Scholar to the UM Department

of Geography during the academic year 2012-2013. Her institutional hosts are the Geološki Zavod Slovenije (GeoZS, Geological Survey of Slovenia) in Ljubljana and the College of Environmental Protection in Velenje.

Halvorson continues to collaborate with Florence Dunkel (Plant Sciences & Plant Pathology, MSU; see also below) on water quality and waterborne disease research, which includes participation of undergraduate and graduate students. Their most recent publication was entitled "Women's Perceptions of Health, Quality of Life, and Malaria Management in Kakamega County, Western Province, Kenya" and was published in *GeoJournal* on May 4, 2016.

See <http://link.springer.com/article/10.1007/s10708-016-9701-7>

MONTANA TAKES PART IN NATIONAL NANO DAYS OUTREACH EDUCATION



Several Institute on Ecosystems faculty, staff and students presented their research at the annual NanoDays/MicroDays outreach event hosted by IoE outreach partner MSU Extended University on Feb. 29. Nearly 400 people ranging from preschool through adult attended that day, learning about microbes in soil, water quality and other current topics.

ABOVE: A photo of IoE program manager Anna Tuttle presenting tree ring data by Jia Hu was featured in a national publication showcasing outreach events around the country.

MSU PROF PUBLISHES ON EDIBLE INSECTS

Florence Dunkel (Plant Sciences & Plant Pathology, MSU) recently wrote several book chapters, including "Introduction to edible insects" in "Insects as Sustainable Food Ingredients: Production, Processing, and Applications" (A. Dossey, Ed., Elsevier Publ. Co. Boston, Massachusetts (currently in press)); "Edible insects, a neglected and promising food source" with co-author A. Van Huis in "Sustainable Protein Sources" (eds. S. Nadathur, J. Wanasundara, L. Scanlin. Elsevier Publ. Co. Boston, Massachusetts.

In press); and "Historical and cultural perspectives of edible insects" with co-author E.M. Costa Neto in "Insects as Sustainable Food Ingredients: Production, Processing, and Applications." (A. Dossey, Ed. Elsevier Publ. Co. Boston, Massachusetts. In press.)

To learn more about the research and the importance of these ecological areas, visit <http://advances.sciencemag.org/content/2/6/e1600026>

OUTREACH

COLOR IT WILD ENGAGES ALL AGES IN YELLOWSTONE ECOSYSTEM EDUCATION

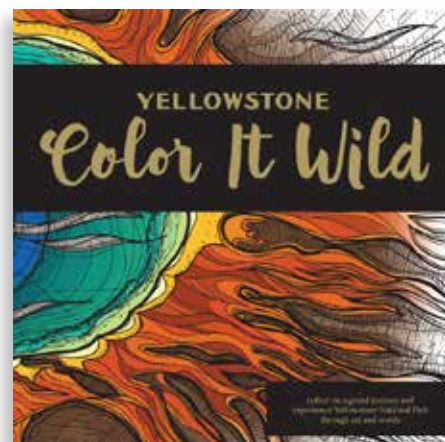
In May, the Montana Institute on Ecosystems partnered with **Yellowstone National Park's** Resource Education and Youth Programs team to create *Yellowstone: Color It Wild*, a coloring book for all ages featuring 26 regional artists and writers inspired by the scenery of Yellowstone. The book includes illustrations, short essays, poems, and inspiring historical and contemporary quotes.

Adult coloring books have become a publishing phenomenon, and *Yellowstone: Color It Wild* offers fresh inspiration for those who enjoy these books as well as an inviting format for those discovering this hobby for the first time. The book encourages visitors to take a journey around the Grand Loop of Yellowstone and experience the park through the art and words. Coloring enthusiasts can use their inspiration to color and create illustrations or doodles of their own that

conjure memories of their time exploring Yellowstone National Park.

With park partners, the coloring book effort supported the start of a Visiting Artist Outreach Program in Yellowstone, which does not have a formal “arts in the parks” program. This summer, Park visitors can color with local artists and other visitors at monthly pop-up art events.

Yellowstone's Resource Education and Youth Programs team and the Montana Institute on Ecosystems work to expand public outreach opportunities about the park through a variety of media projects. **Emily Yost** at the IoE provides the technical assistance to Yellowstone, working in close collaboration with park staff to produce interpretive and educational media. Yost is also coordinating park content for the new NPS Yellowstone National Park app (find it in the App Store, Android coming soon), assistance with the Yellowstone for Kids



book (also to be published by Yellowstone Association this summer), improving the park's website content, and other park media.

Yellowstone: Color It Wild (76 pages, soft cover, \$14.95) is available in Yellowstone Association park stores and online.