



CORING INTO HOLOCENE ERA CLIMATE DATA

STUDY OF LAKE SEDIMENT RECORDS PROVIDES INSIGHTS ON EFFECTS OF CLIMATE CHANGE

Two researchers from Carroll College in Helena are part of a team studying the responses of humans and landscapes to Holocene Era climate change in central Montana. With students from Carroll, faculty members Patricia Heiser (Associate Professor Earth Sciences, Department of Life and Environmental Sciences) and Lauri Travis (Ph.D., Instructor Archeology and Anthropology, Department of Sociology) cored a small kettle lake in the glacial moraines near Gypsy Lake in the southern Big Belt Mountains near White Sulphur Springs, Montana.

The team obtained several ~ 2 meter cores through the ice, and lab analyses of the sediments are underway. They

will be returning to the lakes again this summer in the hope of obtaining deeper cores and to core another of the kettles. The Forest Service road is closed in winter so coring equipment had to be sledged in 1/2 mile, which is slightly less challenging than dragging coring rafts and platforms for just a 1/4 mile in summer.

This coring endeavor is part of an EPSCoR-supported pilot study: Understanding Human and Landscape Responses to Holocene Climate Changes in Central Montana (EPSCoR Focus Areas 2 and 3) initiated by Heiser and Travis (collaborating with Cathy Whitlock at MSU).

The objective is to link high resolution lake sediment records of pollen and charcoal with multiple archeological records of human resource use and occupation through the Holocene in the Big Belt Mountains.

This integrated landscape-scale approach will provide a better understanding of the linkages between climate, vegetation, fire, geomorphology and early human land-use patterns in an important and understudied climatic and ecological transition zone between Rocky Mountain Front and Great Plains.

The study fills an important geographic gap in the existing paleoclimate and archeological records, and may provide broader insights on orographic (mountain) influences of the Rockies on Pacific derived moisture across

ABOVE: Patricia Heiser and several student researchers from Carroll College core a small kettle lake in the glacial moraines near Gypsy Lake in the southern Big Belt Mountains.

LEFT: Lauri Travis (far left) of Carroll College works with students Whitney Wear, Colton Philp and Adam Debruyker, during Carroll College's summer archeological field school. Data from the field school is used in an EPSCoR-supported research project on Holocene Era climate change.

western North America.

UPCOMING EVENTS

June 22–26, 2015

MSU Peaks & Potentials Camp

(Bozeman, MT) IoE researchers will take part in a fun, interactive and educational camp for high-potential kids entering grades 5, 6 and 7.

<http://eu.montana.edu/peaks/>

November 1–4, 2015:

24th National NSF EPSCoR Meeting

(Portsmouth NH) With the theme "Collaboration: Advancing the Role of Science in the Service of Society," the 2015 national conference will focus on advancing collaborative capacity within, across and beyond EPSCoR jurisdictions.

<http://www.nsfepscor2015.org/>

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



PEOPLE & EVENTS

IOE IN THE MEDIA

National Geographic, Mother Jones feature IoE Bark Beetle research – The research of UM Professor of Entomology/Pathology and IoE Affiliate Diana Six on the role of bark beetles in forest health and management was featured recently in **National Geographic**, The Bug That's Eating the Woods (April, 2015); and **Mother Jones**, Bark Beetles Are Decimating Our Forests. That Might Actually Be a Good Thing (March, 2015)

Science features IoE research on oil and gas, ecosystems – An interdisciplinary IoE research team including Brady Allred (UM), Julia Haggerty (MSU), Steve Running (UM), and other partners, was published in the April 2015 issue of **Science**, the academic journal of the American Association for the Advancement of Science (AAAS): "Ecosystem services lost to oil and gas in North America" at <http://dx.doi.org/10.1126/science.aaa4785>

MSU magazine features bee research – An article highlighting researcher Michelle Flenniken's work investigating bee health, economics, sustainability and the role of bees in the environment was featured in Montana State University's Spring 2015 **Mountains & Minds** magazine. <http://www.montana.edu/mountainsandminds>

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EPSCoR / IoE TEAM GATHERS IN MISSOULA FOR ALL-HANDS MEETING

More than 40 researchers, administrators and professional staff gathered at the University of Montana March 26-27 for the Montana NSF EPSCoR "all-hands" meeting.

Participants learned about research accomplishments for each of the project's focus areas, additional collaborations that integrate focus areas, and the Institute on Ecosystems' Social-Ecological Systems Initiative. Updates also covered education, outreach and diversity initiatives and plans for the Institute on Ecosystems' upcoming statewide climate assessment. SpectrUM Discovery Area hosted a bus tour and evening reception.

Special guests included Bob Coyne, Montana NSF EPSCoR's new program



IoE Focus Lead Maury Valett of UM presented research efforts that link changes in landscape patterns to ecosystem processes.

officer; Julia Melkers, evaluator; University of Montana Vice President for Research Scott Whittenburg; and Montana State University Vice President for Research Renee Riejo Pera.

RICHARD READY, AG ECONOMICS AND ECONOMICS, MSU



Dr. Richard Ready started March 1 as Professor in the department of Agricultural Economics and Economics at Montana State University with a

joint-appointment in the Montana Institute on Ecosystems. A natural resource and environmental economist hired with EPSCoR support, Dr. Ready comes to MSU from Penn State. He has extensive experience working with agencies and

local governments, environmental and industry groups, and private stakeholders on a wide range of issues related to natural resources and the environmental, particularly issues regarding conflicts over land development such as siting of undesirable land uses. His research primarily focuses on three areas: valuation of ecosystem services using both stated preference and revealed preference approaches, the dynamics of land use change, and adaptation to climate change.

HOOD PRESENTS RESEARCH ON BEETLES, FIRE ECOLOGY

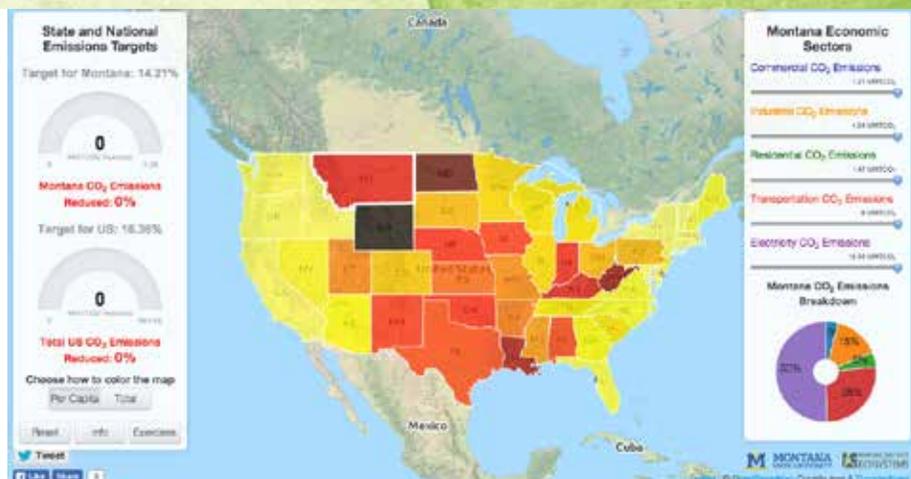


Sharon Hood, a University of Montana post-doctoral researcher, was invited to testify before the U.S. Congress on her research related to fire ecology and bark beetles. Hood presented on May 5 before the U.S. Senate's Committee on Energy and Natural Resources concerning the federal government's role in wildfire management, the impact of fires on

communities and potential improvements to be made in fire operations.

Hood earned her PhD in Biological Sciences from UM in 2014 and shared information about her dissertation on the impact of removing wildfire on Ponderosa pine resistance to mountain pine beetle. As a student, she was supported by research funding from NSF EPSCoR.

Hood shared information on how fire plays an essential role in many of our nation's forests; how management activities in Ponderosa pine forests can affect resistance to mountain pine beetle; and advocated for how both basic and applied research are imperative to increase our understanding of the complex relationship between fire and bark beetles.



November. President Obama’s proposed Climate Action Plan aims to reduce U.S. greenhouse gas emissions by 26 to 28 percent below 2005 rates. Hoy’s Web application shows each U.S. state’s current carbon dioxide emission levels as reported to the Environmental Protection Agency and broken out by sector (commercial, residential, industrial, transportation, and electric production). Users select a state and adjust emission levels from different economic sectors to see what actions can meet the national target reduction rate for 2025.

An educational section offers investigative questions that could be used to further explore the application.

As a member of the Ecosystem Dynamics Lab, Hoy contributes to Ben Poulter’s research investigating the role of climate and humans on terrestrial ecosystems using vegetation models, remote sensing, forest inventory and physiological measurements. The lab’s research also focuses on the critical role that land ecosystems play in the earth system by mitigating climate change, providing habitat for biodiversity, and resources, such as food, fiber and water for humans.

To learn more about the project and access the online tool, visit <http://shiny.poulterlab.montana.edu/GHG/>

HELPING THE U.S. VISUALIZE GREENHOUSE GAS EMISSION REDUCTION ONLINE

IOE UNDERGRADUATE STUDENT CREATES WEB APPLICATION TO VISUALIZE U.S. GREENHOUSE GAS EMISSION REDUCTIONS



As part of a Montana Institute on Ecosystems (IoE) summer internship and Montana State University Undergraduate Scholars Program research

project, a student recently developed a public Web site to allow users to explore different scenarios for reducing carbon dioxide emissions in each of the 48

contiguous U.S. states. The application was created by Jerad Hoy of Helena, a sophomore in computer science, while working closely with Ben Poulter, an MSU assistant professor of ecology and IoE faculty member.

Hoy said he created the online resource to help people better understand how each state plays a role in meeting new national emissions reductions goals, which were announced by President Barack Obama last

UTRAC PROGRAM ENGAGES AFTER-SCHOOL SCIENTISTS

KIDS EXPLORE SNOW SCIENCE IN INFORMAL STEM LEARNING ENVIRONMENT

IoE researchers and outreach professionals have received funding from the National Science Foundation’s Advancing Informal STEM Learning (AISL) program to engage Montana kids in scientific explorations relating to the carbon cycle, including considering whether life is found under snow.

The program, called Using Technology to Research After Class (UTRAC), works with youth in Montana after-school programs to improve students’ science, technology, engineering and math (STEM) learning and carbon cycle literacy.

IOE researchers Tony Hartshorn and Paul Stoy of MSU’s Land Resources and Environmental Sciences department serve as the PI and Co-I. Other co-investigators include Nick Lux of the Department of Education and Kim Obbink of Extended

University.

MSU pre-service teachers have piloted the program in six schools and will help further refine and test the materials this fall. The UTRAC team plans to share their lessons learned, network of educators, and newly created resources with other IoE researchers who are interested in NSF



Elementary school students visited the MSU campus during an out-of-school day to learn about snow science, microbiology and the carbon cycle.

EPSCOR-SUPPORTED STUDENT RESEARCHES MUSEUM BEST PRACTICES



Jennifer Woodcock-Medicine Horse, a PhD student in American Studies at Montana State University, received EPSCoR support to research how museums

educate the public about climate change.

Woodcock-Medicine Horse traveled to museum association conferences and to museums in California, Alaska and Colorado in order to investigate best practices

of both mainstream and indigenous museums. Her initial source interviews led to the hypothesis that the public is more likely to engage with climate change and sustainability if presented in an art/human/positive paradigm rather than a “doom and gloom” perspective.

“Museums are ideally situated, geographically and socially, to educate the public about climate change and inspire and mentor youth to craft imaginative solutions to maintain a habitable planet,” she said.

Woodcock-Medicine Horse will complete her research with a five week internship at the Smithsonian and is also completing a trilogy of short films documenting sustainability initiatives on the Cheyenne, Crow and Wind River reservations. The first film, *Buffalo Come Home*, explores the effect of climate change on Yellowstone and the positive ramifications of transferring excess bison to the Wind River Reservation. The films will be available to regional museums and schools.

THE HISTORY OF MONTANA NSF EPSCOR, PART 2



Montana was one of the original five EPSCoR states when the program was established by the National Science Foundation in 1979 to help build science and technology infrastructure in the states that, at that time,

received the least federal research and development funding. The second of this two-part series on Montana's history as an EPSCoR state was written by Dr. Bob Swenson, emeritus vice president for research at Montana State University. This account is, in Dr. Swenson's words—a “memory, not a history.” Swenson was at MSU at this critical juncture, and we appreciate this documentation. See <http://montanaioe.org/content/montana-epscor-newsletter-january-2015> for the first installment.

THE IMPACT OF NSF EPSCOR IN MONTANA

NSF EPSCoR has had a big impact on Montana. Here are three success stories:

Science in Rural America

In May 1996, Montana NSF EPSCoR organized an historic conference in Montana: “The Future of Science in Rural America” hosting national science leaders and Montana scientists, policy makers and politicians.

Montana's governor, Marc Racicot, and John Mercer, Speaker of the Montana House, gave state perspectives, while Sen. Conrad Burns spoke on the importance of research support in rural states. National-level participants included Jack Gibbons, National Science Advisor to President Clinton; Neal Lane, director of the National Science Foundation; and Ernest Moniz, associate director for science at President Clinton's Office of Science and Technology

Policy (presently the Secretary of Energy). Swenson, who was then MSU's Vice President for Research and Chair of the National EPSCoR Coalition, helped lead discussions on the future role of research in a rural state like Montana. The Montana-D.C. exchange continued throughout the 1990s, and Montana hosted the heads of NSF, NASA, and NIH; two President's Science Advisors; the NASA Chief Scientist; an Associate Director of NSF; and an Under Secretary of Commerce.

THE BIRTH OF BIOFILM RESEARCH

In 1990, the NSF funded MSU's Engineering Research Center (ERC) proposal with Bill Characklis as director. NSF had previously funded about a dozen ERCs—all at major research universities—so there was some controversy within NSF about placing an ERC out in the “sticks.” Though, sadly, Characklis died in June 1992, the project lived on with Bill Costerton as ERC Executive Director and James Bryers as ERC Director of Research. Thereafter, the future of the center was never in doubt. We were told that our ERC was one of the most –if not THE most – successful of those funded by NSF and one of the few that lasted long after the ERC funding was over. Today, the Center for Biofilm Engineering continues as the nation's leader in this area of research. (CBE celebrated its 25-year anniversary on May 13.)

GROWING THE LOCAL ECONOMY

The 1993–1999 NSF EPSCoR project focused on developing four cluster activities at MSU, including one in Laser Optics. In 1995, the Optical Technology Center (OPTEC) was established, with its

partner Spectrum Lab created in 1999. These centers can be partially credited with the number of optics companies in southwest Montana, which has grown from nine in 1993 to 36 in 2015. Many were founded by MSU grads and employ MSU grads.

Montana NSF EPSCoR expands

In 1994, Dr. Walt Hill from the University of Montana joined forces with Dr. Gary Strobel at MSU to develop the broader collaborative Montana NSF EPSCoR program we know today. This brought research funding to UM at higher levels, substantial enough to begin to make a difference. The program continued to grow and include greater statewide participation from 2000–2015. We will highlight some of the impacts in our next newsletter.

IN SUMMARY

When I became VPR in 1990, three elements were essential in the rapid expansion and great successes of the research/creative activities programs, all arising from EPSCoR impacts: 1) A spirit and atmosphere conducive to success in research development existed on campus, and in the state. 2) Money to grow research was becoming available from four new sources: EPSCoR grants; state match and seed grants; 100 percent of IDCs available on campus; and Congressional-directed funding. 3) An administration that was willing to use EPSCoR-like programs as catalysts and support and encourage looking for or creating opportunities – good ideas were the coin of the realm.

I conclude with this quote on EPSCoR...

“Students and citizens of all states have the right to expect to share in the opportunities for high quality education, access to front-line research, and the quality