LRES Newsletter
The College of Agriculture
Fall 2015

Table of Contents

A Note from Our Department Head

Please enjoy perusing this fall's departmental newsletter highlighting some of our many research, teaching, and service pursuits. We currently enroll 121 undergraduate students, 80 M.S. students, and 24 Ph.D. students. We want to congratulate our graduates who have completed their studies this fall. Best wishes to you in your future endeavors!

Tracy Sterling, Professor & Department Head

New Faculty Member

Dr. Amy Trowbridge, Assistant Professor of Chemical Ecology

Prior to coming to Montana State, I was an NSF postdoctoral research fellow in Biology at both Indiana University and the Helmholtz Zentrum in Munich, Germany. My work focused on understanding the links between aboveground environmental stresses and their effects on belowground secondary metabolism and emissions. Using real-time techniques for measuring trace gases, we are beginning to understand how herbivory, seasonality, and the different types of mycorrhizae that are associated with plant roots influence belowground processes. Before delving into questions regarding belowground volatiles, I received my B.S. from the University of Illinois at Urbana-Champaign and my Ph.D. from the University of Colorado at Boulder where I studied how climate variables - including CO_2, precipitation, and temperature - influenced terpene concentrations and emissions and subsequent herbivore performance. In addition to understanding chemically mediated biotic interactions, I've also been involved in work in the Amazon investigating the role that plant secondary compound emissions play in driving atmospheric chemistry and regional climate dynamics.

Recently, I have been working towards developing a more integrative approach for assessing and predicting tree mortality through the incorporation of plant defenses and their influence on insect population dynamics. This has become a grand challenge in light of the widespread vegetation mortality events observed across the globe and requires a multi-disciplinary approach. I am working with entomologists, plant ecophysiologists, and ecological modelers to begin tackling this challenge using piñon pine as a model species. In addition to working on this semi-arid species in the southwestern US, my current work is also focused

Continued page 3

LRES Recognition

Western Sustainable Agricultural Research and Education (WSARE) produced a video featuring a study led by **Rick Engel** and its subsequent recommendations for improving sustainability on Montana wheat farms. Watch the video at www.westernsare.org/Learning-Center/From-the-Field/Improved-Nutrient-Use-Efficiency-in-Montana-Wheat.

Fabian Menalled and **David Weaver** were chosen as Premiere Presenters for the Entomological Society of America. Their presentation was highlighted in the Entomology 2015 Program Book.

Water Quality Extension Associate **Adam Sigler** was recognized for 10 years of service at MSU.

Cathy Zabinski will deliver a lecture on April 12, 2016 as part of the third annual Provost's Distinguished Lecturer Series.

Office Manager **Merry Paceley** was recognized for 15 years of service at MSU.

A photo by Ph.D. student **Chris Brown** was selected for the 2016 Entomological Society of America calendar.

The department was excited to announce the two awardees for the inaugural **Nielsen Graduate Research Assistantship Scholarship**. Both are new graduate students in LRES starting Fall 2015 and will receive a $3800 scholarship across two semesters. Nominations will be accepted for each subsequent year, during the prior Spring semester. Congratulations Joseph and Scott!

Joseph Old Elk (Advisor, Dr. **Stephanie Ewing**) – Joseph's Master of Science thesis work will evaluate the water quality drivers at Plenty Coups Spring located in Chief Plenty Coups State Park just outside of Pryor, MT, focusing on identifying how soil structure affects water movement and E. coli and fecal coliform contamination. He will use soil observation and comparison to Judith soils (same series) to draw inferences about land use, soil process, and water quality connections to better understand groundwater contamination pathways. Joseph holds his B.S. in Geospatial Sciences from LRES and is well poised to use this background to answer these questions.

Scott Robinson (Advisor, Dr. **Tony Hartshorn**) – Scott's dissertation project will explore the potential for combining a pedological approach to identifying dominant soil processes and specialized bacteria capable of converting arsenic to less mobile and less toxic forms. Together, these approaches should improve efforts to establish plants and minimize human exposures to arsenic in this semi-arid Deer Lodge Valley. His background in forest soils (Master's degree from Michigan Tech) and soil mapping fieldwork in the Custer National Forest provide an excellent foundation for his PhD research.

Ph.D. student **Nar Ranabhat** (advised by **Fabian Menalled**) gave an oral presentation entitled "Impact of cover crop termination methods on disease of wheat and lentil" at the American Phytopathological Society (APS) Annual Meeting in Pasadena, CA in August 2015.

M.S. student **Carlos Romero** (advised by **Rick Engel** and Chengci Chen, Central Ag Research Center) presented a paper on soil quality in central Montana at the 2015 Western Society of Crop Science Annual Meeting in Logan, UT in June 2015. He won third place for best oral presentation , earning the A. K. Dobrenz Student Paper Award.

M.S. student **Bo Walker** (advised by **Perry Miller**) received a grant from WSARE called "Cover Crop Grazing: Optimal Seasonality for Soil and Livestock Benefit".

M.S. alum **Aaron Rains** ('13) published his thesis research in Cold Regions Science and Technology (http://www.sciencedirect.com/science/article/pii/S0165232X15002165). Rains was advised by **Paul Stoy** and **Cliff Montagne**.

M.S. alum **Chris Welch** ('13) published his thesis research in Hydrological Processes (http://onlinelibrary.wiley.com/doi/10.1002/hyp.10638/abstract). Welch was advised by **Paul Stoy** and **Cliff Montagne**.

New Faculty Member: Amy Trowbridge

Continued from page 1

on understanding how constitutive and induced defenses in Ponderosa pine may influence its susceptibility to bark beetles here in the western US. Recent outbreaks in Montana and along the Front Range of the Northern Rockies have necessitated more work linking the genetic and environmental controls over defense with observed epidemics. To this end, we are beginning to collaborate with plant physiologists at the University of Montana to assess controls over defenses and factors that result in chemically susceptible trees.

In addition to training graduate students in state-of-the-art analytical techniques and integrative approaches towards addressing questions in chemical ecology, I am eager to teach and engage undergraduates in research opportunities as well. I will be teaching the ever-popular BIOB 160 every other spring as well as a 200-level Environmental Science course and an upper-division/graduate course that will explore different topics related to chemical ecology. I hope that these courses will inspire students to think critically about the world and consider pursuing careers in STEM.

Amy Trowbridge

Graduate Students Receive Funding

Six graduate students received enhancement funds from the Institute on Ecosytems (IoE) to assist them in their research:

Subodh Adhikari was awarded an IoE travel grant for his project "Impacts of farm management systems on biodiversity, ecosystem services, and pollination networks in the Northern Great Plains." Adhikari is advised by **Fabian Menalled** and Laura Burkle (Ecology),

Krista Ehlert and **Kim Taylor** were each awarded an IoE travel grant to attend the Ecological Society Association meeting. Ehlert is advised by **Jane Mangold** and **Fabian Menalled**, and Taylor is advised by **Bruce Maxwell**.

Priyanka Kudalkar and **Tristy Vick-Majors** were each awarded an IoE research grant to assist with supplies and analysis Both are advised by **John Priscu**.

Nar Ranabhat was awarded an IoE travel grant to attend the American Phytopathological Society annual meeting. Ranabhat is advised by **Fabian Menalled**.

Additionally, three graduate students received funds from MSU's The Graduate School (TGS) to assist with their research.

Subodh Adhikari was awarded a research grant from TGS for his project "Impacts of farm management systems on biodiversity, ecosystem services, and pollination networks in the Northern Great Plains." Adhikari is advised by **Fabian Menalled** and Laura Burkle (Ecology)

Byron Amerson was awarded a travel grant from TGS to present his research at the Pacific Coast Salmon Recovery Conference in Vancouver, WA. Amerson is advised by **Geoff Poole**.

Aaron Klingborg was awarded a research grant from TGS for his project "Scaling Forest Nutrient Limitation from Trees to Forests." Klingborg is advised by **Jack Brookshire**.

New LRES Staff

Katie Collins - Administrative Associate managing the front desk

Kyla Crisp - Research Associate in Fabian Menalled's lab

Philip Davis - Research Associate in Bruce Maxwell's lab

Stephany Flakker - Accountant handling PCard transactions

Charlotte Hoover - Research Associate in Jeff Littlefield's lab

Anne Loi - part-time assistance to LRES for IT-related concerns in addition to existing duties for the Spatial Sciences Center

Erin Wall - Research Assisant and Program Manager for the Water Quality Extension program, working with Adam Sigler

Peterson & Piccolomini Study Effects of Mosquito Control Pesticides on Pollinating Bees

Robert K. D. Peterson, a 2015 [Mosquito Research Foundation (MRF)] grant recipient, has been involved in research on mosquito management and environmental risk since 2004. Dr. Peterson is a Professor of Entomology at Montana State University, where he leads the research, teaching, and outreach program in Agricultural and Biological Risk Assessment. He teaches undergraduate and graduate courses, including environmental risk assessment, insect ecology, and various special-topics graduate courses.

M.S. student Alyssa Piccolomini prepping adult female alfalfa leafcutting beas for dosing with etofenprox

Much of Dr. Peterson's research in recent years has emphasized comparative risks associated with insect-borne pathogens and management tactics. In addition to risks related to pesticides used in mosquito control, his lab has assessed and published risks from drugs, repellents, treated bed nets and battle-dress uniforms, and mosquitofish.

In 2015, Dr. Peterson received a grant from the MRF to investigate the "Risks to Pollinating Bees from Adult Mosquito Control". In trying to evaluate the risks of pesticides used for mosquito control on bees, Dr. Peterson's research, led by M.S. student **Alyssa Piccolomini** aims to determine: (1) LD_{50} values for alfalfa leafcutting bees when exposed to permethrin, etofenprox, and deltamethrin; (2) the effects on foraging alfalfa leafcutting bees and honey bees the day after field applications of permethrin, etofenprox, and deltamethrin; and (3) the effects on populations of alfalfa leafcutting bees after field applications of permethrin near nest boxes. Results from Alyssa's research conducted in 2015 look promising and will help shed some light on the effects, if any, that pesticides used for mosquito control have on pollinating bees.

Bob Peterson & Paula Macedo, as published in News from Mosquito Research Foundation

Research in Pictures

Grad student Baadma Dovchin, undergrad Taylor Simpson, and Professor Emeritus Cliff Montagne spent the summer in remote northern Mongolia, sampling soils around the Delger Murun River.

Priscu Named Regents Professor

The Montana University System Board of Regents approved MSU's request to confer upon Dr. **John Priscu** recognition as a Regents Professor, the Montana University System's highest honor for faculty of distinction.

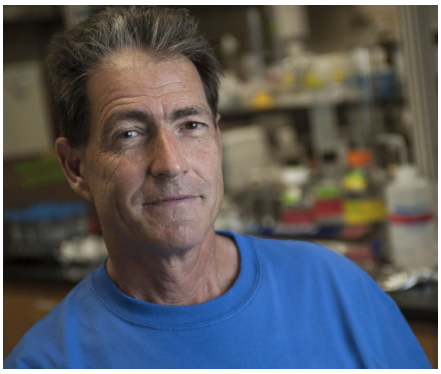


Photo by Kelly Gorham

A professor in the MSU College of Agriculture's Department of Land Resources and Environmental Sciences, Priscu is a renowned polar scientist who studies the microbial ecology of Antarctic ecosystems. Since coming to MSU in 1984, Priscu has led numerous international research expeditions, including traveling to the Antarctic every year for the past 30 years. He has also played a leadership role in developing programs and facilities to study life in extreme environments, and his graduate students are recognized as the next generation of leaders in cold science.

The MSU News Service published a detailed article by Anne Cantrell highlighting Priscu's contributions to the University and the international scientific community that make him worthy of such an honor. The full article is available at www.montana.edu/news/15868/msu-s-john-priscu-named-montana-university-system-regents-professor.

The ceremony on November 19 officially conferred the title upon Priscu in the Stand Union Building.

New LRES Graduate Students

Fall 2015

Marianne Alford
M.S. LRES Online
Baton Rouge, LA

Michael Benson
M.S. LRES Online
Waynesburg, PA

Christopher Caron
M.S. LRES Online
Augusta, ME

Hillary Cimino
M.S. LRES Online
Missoula, MT

Shannon Dillard
M.S. LAND
Advisor: Hartshorn

Tanya Driver
M.S. LRES Online
New Town, ND

Marena Gilbert
M.S. LRES Online
Woodland Park, CO

Tara Ginn
M.S. LRES Online
Las Vegas, NV

John Hallman
M.S. LRES Online
Montgomery, TX

Tara Hannon
M.S. LRES Online
Sacramento, CA

Drew Langston
M.S. LRES Online
Greenbille, SC

Cianne Martin
M.S. LRES Online
Bozeman, MT

Madison Nixon
M.S. LRES
Advisor: Menalled

Joseph Old Elk
M.S. LRES
Advisor: Ewing

Michael Oldham
M.S. LRES
Advisor: Powell

Alyssa Piccolomini
M.S. ENTO
Advisor: Peterson

Scott Robinson
Ph.D. ESEC
Advisor: Hartshorn

Tara Saley
M.S. LRES
Advisor: McDermott

Tessa Scott
M.S. LRES
Advisors: Menalled & Z. Miller

Mark Sees
M.S. LRES Online
Orlando, FL

Blair Shackford
M.S. LRES Online
Oklahoma City, OK

Hayley Smith
M.S. LRES Online
Jackson, TN

Allison Tischler
M.S. LRES Online
Lafayette, IN

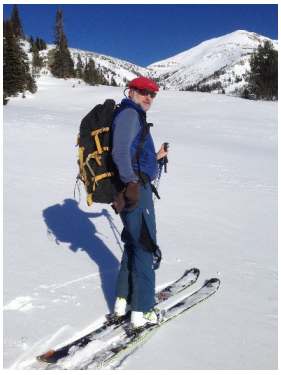
ESEC: Ecology & Environmental Studies
LAND: Land Rehabilitation
LRES: Land Resources & Environmental Sciences
ENTO: Entomology

Maxwell's Sabbatical Highlights

Bruce Maxwell spent his Fall 2014 sabbatical leave at the University of Montana (UM) where he focused on three major goals to grow his research and teaching programs. Some of the highlights, including some backcountry skiing, were

1.) embarking on a manuscript with UM's Dr. Ragan Callaway on the theoretical base for an invasive plant species management framework to capture Bruce's focus this past decade on the topic, and growing the interaction between MSU and UM invasive scientists by bringing together multiple scientists to collaborate and submit NSF-PIRE and Australian Research Council grants,

2.) increasing his technical modeling and programming skills through work with Dr. Paul Caplat at Lund University in Sweden to learn techniques of individual based models using Net Logo and R statistical software, and



3.) adapting the Agroecology Option of the Sustainable Food and Bioenergy Systems (SFBS) degree program to incorporate systems thinking and social-ecological systems (SES) analysis by collaborating with colleagues from several universities with similar programs from around the US and Canada to publish a paper on integrating systems thinking into an undergraduate food systems curriculum.

Bruce Maxwell

Environmental Analysis Laboratory News

Joe Capella knows an organic horizon when he sees it.

A senior in Wildlife Habitat/Rangeland Ecology, Capella has spent the past two academic terms working in the LRES Environmental Analysis Laboratory, quantifying carbon and nitrogen in grassland and wetland soils from central Montana and around the Gallatin Valley. In between terms he honed his field mapping skills as part of the Glacier Park soil survey with LRES alum **Jay Skovlin**. Now, working as both a research assistant in **Stephanie Ewing**'s lab and as an undergraduate teaching aid for Ewing's Landscape Pedology class, Capella has made his field skills count and acquired lab skills as well. "I never thought I would do this much chemistry," Capella said. "But it turns out to be a useful way to think about land use and disturbance."

Joe's work to assess carbon and nitrogen inventories in soils of the Judith River Watershed will provide key data for comparing nitrogen dynamics in uncultivated grasslands and soils managed for wheat production. "Joe stands out for his hard work, curiosity, and kindness," Ewing said. "He made all the difference for students in pedology, and sets a great example for any of our field savvy students interested in analytical lab experience."

In undertaking soil carbon and nitrogen assessment, Capella has worked with LRES Research Associate **Rosie Wallender** to sieve and mill the soils, and with EAL Chemist **Jane Klassen** to prep them for analysis. His work has given him plenty of insight about how to assess carbon inventories: "Basically it's all about careful sample collection and handling. Once you go to the trouble of prepping and analyzing samples, you realize how important it is to get the sampling right, to think about uncertainties and controls, and make sure your measurements good enough to address your question."

An avid mountaineer and musician, Capella found an early love of landscapes that brought him west from New Jersey for college at MSU. To date, his work experience in Montana has included everything from working the kitchen at Bar IX to moving bison on a ranch in the Shields Valley. As a teaching aid this term, Joe put a lot of time into helping students make quantitative assessments of soils; now he is challenged to complete his own in the spring semester. If all goes well, he will be continuing to build on his diverse experience this summer, devoting more of his time to beautiful landscapes.

Stephanie Ewing & Jane Klassen

Alumna to Spend a Year in Mars Dome

"At 3:15 p.m. on Aug. 29, Whitefish resident **Carmel Johnston** [(M.S. in Land Resources and Environmenal Sciences, Fall 2013)] began a year in relative isolation on a barren slope of the Mauna Loa volcano in Hawaii. The brown, rocky terrain echoes the desert landscape of Mars and serves as the site of the fourth NASA-funded Hawaii Space Exploration Analog and Simulation (HI-SEAS) mission, a research project of the University of Hawaii. Johnston, 26, a soil scientist, is the crew commander of a six-person team. …

"In addition to making sure everyone is healthy and happy as the crew commander, Johnston will be experimenting with food production. Before joining the Mars simulation, Johnston was a soil scientist with the Natural Resources Conservation Service and spent her summer mapping Glacier National Park soils. Within the first few days in the HI-SEAS Habitat, Johnston started an aquaponics system to grow vegetables. …

"Crewmembers will conduct different experiments and any time they go outside to collect samples, they have to gear up in space suits. Johnson's research entails experimenting with Martian regolith simulant, which mimics the properties of Martian 'soil.'

"Being from Montana and having spent time in the remote Arctic studying the effects of permafrost thaw on gas emissions, Johnston believed she was prepared for this type of mission when she read the application. …

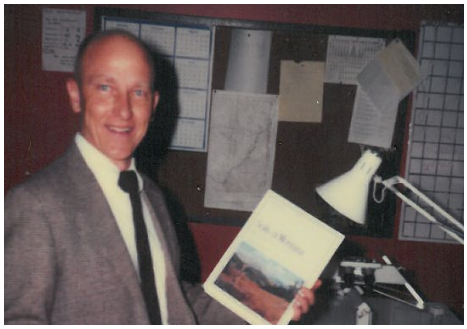
"Once Johnston completes the HI-SEAS mission, she has the opportunity to do another one-year mission in 2016 at the Flashline Mars Arctic Research Station. Johnston said she wants to get through the first year before deciding to enter into a consecutive year away from friends and family."

Excerpts from Whitefish Pilot article by Hilary Matheson. Full text available at www.whitefishpilot.com/news/woman-to-spend-a-year-in-mars-dome

College of Ag Names Nielsen Honorary Alumni

Jerry Nielsen, MSU Professor Emeritus was recognized as the college's honorary alumni during the college's Celebrate Agriculture Harvest Breakfast event on Saturday Nov. 7. Nielsen taught at MSU from 1966-1999 and has a long history of supporting and advocating for soil science at MSU. He was also instrumental in the recent legislation naming the Scobey Soil Series as Montana's official state soil and providing support for the newly remodeled campus soil lab. Additionally he and LaVonne established the Nielsen Graduate Research Assistantship in the MSU Department of Land Resources and Environmental Sciences. The assistantship supports graduate students working with faculty to research soils in Montana.

Tracy Sterling



Research in Pictures

Fabian Menalled's lab crew set up transects, trapped bees, and collected pollen in organic fields at Big Sandy, MT.

Research Associate Stacy Davis poses next to a giant thistles while collecting plant samples at a rangeland resiliancy site near the Missoula, MT landfill

Engel and Jones Debunk Fertilizer Myth

Dr. **Rick Engel**'s research program has focused on nitrogen management and cycling in Montana agricultural soils. One management issue he is concerned with is nitrogen losses to the environment from agriculture. Recently his research has focused on ammonia losses to the atmosphere from urea fertilizer.

In Montana, nitrogen fertilizer typically represents a grower's highest annual cost input. Often it is applied to farm fields as urea during the late fall, winter, or early spring when soils are cold, frozen, or covered with a modest snowpack.

Rick Engel in Hill County, MT standing in front of ammonia sampling device

To address the question of ammonia losses from this fertilizer, Dr. Engel conducted over 20 on-farm trials in northern and central Montana, and Gallatin County since 2010. In addition, he hired numerous undergraduate students to assist with the collection and processing of field data, and partnered with Dr. **Clain Jones** (Soil Fertility Extension Specialist) to facilitate outreach to the Montana ag-community.

Ammonia losses were quantified using a micrometeorological approach referred to as the integrated horizon flux method. This approach required Dr. Engel to erect masts equipped with ammonia samplers in the middle of farm fields. Ammonia losses were then monitored over gas sampling campaigns that lasted 8 to 12 weeks following application of urea fertilizer.

Working with Dr. Jones, Dr. Engel's research brought new information to Montana growers and debunked long-held beliefs that ammonia volatilization from urea was not significant if applications were made during cold weather months. In addition, Drs. Engel and Jones provided management recommendations to growers on how to minimize atmospheric loss of fertilizer nitrogen.

This research was funded by a number of agencies or groups including the Montana Fertilizer Advisory Committee, USDA-NRCS, private industry and the USDA Western Sustainable Agriculture Research and Education program (SARE). It was recently recognized by the national SARE office by highlighting this project at the SARE web site (http://www.sare.org/).

Rick Engel

Undergrads Dionne Zoanni and Liz Draper assisted Engel and Jones

Bachelor's Degrees Awarded

Fall 2015

Environmental Sciences - Environmental Biology
William D. Allen
Jacquelyn Megan Bergner - honors

Environmental Sciences - Soil & Water Sciences
Simon Isaac Fordyce - honors
Katelyn Anne Noland - highest honors
Marrina Jo Simpson - honors

Geospatial & Environmental Analysis
Emery U. Three Irons
Samuel Brian Tittle

Graduate Degrees Awarded

Summer 2015

Ph.D. Ecology & Environmental Sciences
Ryan deMontmollin Jennings

M.S. Land Rehabilitation
Andrew Augustus John
Deicy Noemi Sanchez Espinoza

M.S. Land Resources & Environmental Sciences (Online)
Alexa Azure
Michael Michno

M.S. Land Resources & Environmental Sciences
Elizabeth S. K. Vick
Lisa Lone Fight
Stephen Johnson
John Charles Sugden

M.S. Land Resources & Environmental Sciences (Online)
Shea Allen
Christopher Cote
Sara Drane
Jeri Irby
Jennifer Schmitz
Nicole Smith

Fall 2015

Ph.D. Ecology & Environmental Sciences
Patrick Lorenzo Davide Della Croce
Patrick Glenn Lawrence

Klingborg Presents at Centennial ESA Meeting

The annual meeting of the Ecological Society of America (ESA) is a venue to share research, learn from fellow researchers, and network amongst the thousands of attendees. After two field seasons of romping through the forests of the Swan Valley in northwestern Montana, master's student **Aaron Klingborg** had collected enough data to present his findings at the centennial anniversary ESA meeting in Baltimore this August.

Conducted in conjunction with advisor **Jack Brookshire**, the research Klingborg presented centered around two major questions: how do trees that live in areas of limited nutrient availability work to acquire and use nutrients, and how do these tree-level strategies influence the larger forest ecosystem? Their research approached these questions from two angles. First, forest inventories were conducted to estimate the biomass of fine roots in the forest and these measures were combined with a nutrient uptake model to provide an indication as to the ability of trees to obtain nutrients when they are available in soils. Secondly, the efficiency at which trees resorb nutrients from their leaves before they fall was measured as an indicator of how tightly these trees recycle nutrients.

Aaron Klingborg evaluates field site in the Swan Valley

Results of the study indicated that big trees matter. From their research, it was estimated that a single mature tree in a mixed stand could be responsible for over 20-percent of the annual nutrient flux in the stand. These findings indicate the potential for processes such as fire, disease, natural death, or other disturbances that effectively remove large trees from stands to have profound impacts on nutrient cycling within forests. Ultimately, Klingborg and Brookshire hope their work will lead to improved integration of small-scale processes like nutrient uptake with larger scale observations of forest dynamics. Such integration would improve the ability of global models to predict the responses of the world's forests to changing climate conditions. Klingborg and Brookshire thank the LRES department and the Graduate School for support in making their research and trip to ESA possible.

Aaron Klingborg

Professional Spotlight

Ed Davis, Cropland Weed Research Associate Specialist

Ed Davis is the Cropland Weed Research Associate Specialist at LRES. He was first appointed a Weed Science Research Associate in 1984. Ed is an invaluable member of the Montana State research and extension community. Over the years, he has collaborated with many MSU professors, research associates, and technicians; he continues to serve as a liaison between MSU Faculty and graduate students, farmers across the state, and agrichemical industry reps. Ed's knowledge of weed biology, ecology, and management is outstanding, and he is extremely experienced on herbicides and their integration into sustainable weed management programs.

Among his many activities, Ed conducts field and greenhouse trials, oversees workers, assists undergraduate and graduate students, operates and maintains project equipment and machinery, and compiles research results. Ed regularly gives research and extension presentations at professional and outreach meetings such as professional weed societies, Montana State agricultural associations, as well as regional and local grower meetings. Every year, Ed's dedication and effectiveness are reflected in the more than 45 field trials he conducts, the 35,000 miles he drives across Montana, and the competitive and non-competitive funding he secures to support this research.

Ed is the current Research Chair of the Western Society of Weed Science (WSWS) and has served as Agronomic Crops Section Chair, Session Moderator, and Graduate Student Paper/Poster judge. He is also a board member for the Montana Weed Control Association. His many contributions to the discipline were recognized by his receipt of a 2014 Distinguished Achievement Award from WSWS.

MSU Delegation Visits Universities in China to Grow Collaborations

An MSU Delegation visited multiple universities in four provinces while in China in late October and early November. Those traveling were VP and Dean Charles Boyer, Associate Provost David DiMaria, LRES Department Head **Tracy Sterling**, and Sydney Superintendent Chengci Chen from the Research Centers Department who graciously translated and coordinated most of the trip, with President Cruzado joining us later in the trip to visit the Confucius Institute and US Embassy while in Beijing.

VPs Boyer and Wang signing 2+2 agreement for Fujian Agricultural and Forestry University students to complete degrees at MSU

The goal was to increase student and faculty exchange among various universities where we have had long-time collaborations at two institutions thanks to **Tim McDermott**, and to formalize 2+2 programs in which Chinese students complete their Junior/Senior year at MSU. Universities visited included the fourth top Agricultural University in the world, China Agricultural University in Beijing, the China University of GeoSciences in Wuhan, the Fujian Agricultural and Forestry University in Fuzhou, and Huazhong Agricultural University in Wuhan.

Boyer, DiMaria, and Sterling in discussions at China University of GeoSciences in Wuhan to grow Environmental Science collaborations

Our amazing trip coordinator, Dr. Chengci Chen (MSU Research Centers Department) on the Great Wall

Visit to Huazhong Agricultural University and meeting with Dr. Geijao Wang's (holding purse) lab and its members – she is a long-time collaborator of Tim McDermott's

Tracy Sterling

Alumna's Story and Research Highlighted in INBRE Publication

The following are excerpts from the Montana INBRE Spotlight article published in that organization's November 2015 Newsletter

"It was the summer of 2012, and **Shavonn Whiten** [(M.S. in Entomology, Summer 2014)] had just moved to Bozeman, Montana, to work on an invasive species project with the US Geological Survey (USGS) Northern Rocky Mountain Science Center. Upon moving, the Baton Rouge, Louisiana, native recalls having to adjust quickly to life in Montana. …

"Part of the adjustment was learning to navigate in an environment that was statistically less than one percent African-America[n]. 'In Montana, I learned to see an individual for their inner attributes, and could no longer use outer appearance as a shortcut to define my support system,' said Shavonn. 'I had to get past the color barrier, quickly realize that we all have qualities in common, and use that realization to identify people who I could empathize with and who could empathize with me. Outside of my research, living in Montana helped me become more confident in what I had to offer as an individual.'

"Meanwhile, Shavonn's job with USGS also required that she continue her education by taking science classes related to her work. … As luck would have it, during Spring semester 2012 Shavonn was introduced to professor **Robert Peterson**, Ph.D. …

"During their initial conversation, Shavonn found interest in the research Bob's laboratory conducted. Growing up in Louisiana, she was very familiar with mosquitoes. In addition, her recent travels to Ghana solidified her interest in a career centered on public health and mosquito control. It wasn't long before Shavonn approached Bob about beginning a master's degree in entomology at MSU.

Shavonn conducts laboratory research in Bob Peterson's lab

"Shavonn's research both confirmed and expanded on previous studies. Through precisely controlled laboratory experiments, Shavonn verified that increasing ambient temperature does indeed alter the toxicity of certain pesticides (Type-1 pyrethroids to be exact) for certain mosquitoes (*Aedes aegypti*). … Higher ambient temperatures may mean less effective mosquito control.

"One way that Shavonn's research parted from many of her predecessors is that it systematically focused on adult mosquitoes as opposed to more immature insect development stages. From a public health perspective, this is significant because adult mosquitoes, not their eggs, larva or pupa, are the vehicles for the transmission of pathogens that cause diseases like dengue, chikungunya, and yellow fever. By using adult mosquitoes for her experiments, Shavonn ensured that her data would be relevant to future discussions involving common control strategies that attempt to suppress disease-causing pathogens by disabling their main avenue of transmission. …

"Today, the generally accepted consensus among climatologists is to expect somewhere between a 1 and 3.5 degree Celsius increase in the annual mean surface temperature by the year 2100. … Significantly, and for reasons outside of the scope of this article, this anticipated warming is likely be most prevalent during evening hours – precisely the time of day in which adult mosquitoes tend to be most active and most susceptible to traditional pesticide application strategies. …

"Shavonn … credits Bob Peterson at MSU for getting her started in the field of entomology. 'Without [P]rofessor Peterson's support, I don't think I would have ever been introduced to entomology – a field that combines all of my interests.' …"

*Shavonn published her thesis research in the Journal of Medical Entomology. Her paper is titled "The Influence of Ambient Temperature on the Susceptibility of Aedes aegypti (*Diptera: Culicidae*) to the Pyrethroid Insecticide Permethrin," and was co-authored by Bob Peterson.*

Look for a call for abstracts early in spring semester for the LRES Research Colloquium

The LRES Research Colloquium will be held in the Strand Union Building on **April 26, 2016** (more details coming soon).

The event offers on-campus and online graduate and undergraduate students from LRES an opportunity to present their research to friends, colleagues, and faculty in an informal setting. All LRES undergraduate and graduate students are encouraged to submit. Come and share what you have been working so hard on!

Other highlights of the Colloquium include a keynote talk, door prizes, and prizes for the best presentation(s). Appetizers and beverages will be served.

Questions? Interested in helping organize the event?

Email **lresgso@gmail.com** or touch base with a current planning committee member: Collin Preftakes, Christopher Brown, Nar Ranabhat, Tessa Scott, Jeff Patriarche, and Subodh Adhikari

Stephen Johnson and Subodh Adhikari hand out doorprizes at the Spring 2015 LRES Research Colloquium

LRES Graduate Student Organization Update

The LRES Graduate Student Organization (GSO) is looking forward to the coming year with a new leadership committee. The Co-Chairs and Faculty and Staff Liaisons are **Nar Ranabhat** and **Subodh Adhikari**; the Social Committee Liaisons are **Christopher Brown** and **Collin Preftakes**; the Curriculum Committee Liaison is **Tessa Scott**; the Mentoring Committee Liaison is **Jeff Patriarche**. The Faculty Advisor for the GSO will continue to be Dr. **Jane Mangold**.

For those unfamiliar with the LRES GSO, the role of the group is to facilitate networking opportunities for LRES grad students by organizing student activities and providing an interface with faculty. The main even that the GSO organizes is the annual LRES Research Colloquium, which gives students an opportunity to present on their findings.

Other important activities include social events, volunteering and community service involvement.

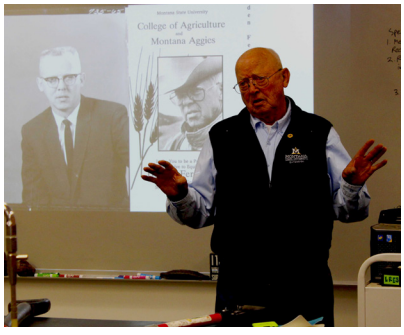
Look for an email soon for the next LRES social event. All LRES students, staff, and faculty members are invited. This is an opportunity for LRES members to network and socialize in a casual setting at an off-campus location that typically involves pizza and beer. You never know where a networking opportunity like this may lead, so please join us!

Interested in participating in the GSO? Do you have ideas on how to promote community amoung the LRES grad students? Feel free to contact us at **lresgso@gmail.com**.

Soils Lab Receives Facelift

The Soils Lab in Leon Johnson Hall received a facelift earlier this year. Students walking down the second floor hallway can now see into the lab through a 24-foot window and admire the magnificient monoliths hanging in the lab. Other updates modernize the workspace for the 21st century soils student.

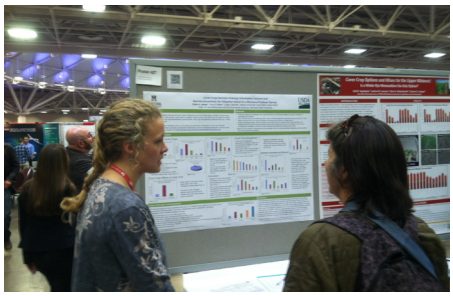
On November 5th, the lab was rededicated in honor of **Hayden Ferguson**, professor emeritus.



The newly remodeled and rededicated Hayden Ferguson Soils Teaching Laboratory features more than 40 soil monoliths, or preserved vertical slices of soil profiles with their varied rock content, colors, textures and structures for each soil layer. Photos courtesy of the MSU College of Agriculture.

Strong Attendance by LRES at 2015 Joint ESA, CSSA, SSSA, and ASA Meeting in Minneapolis

The joint meetings of the Crop Science Society of America (CSSA), Soil Science Society of America (SSSA), American Society of Agronomy (ASA), and the Entomological Society of America during November 15-18, which drew over 4000 attendees, offered a unique opportunity for many members of LRES to attend. **Tracy Sterling**, LRES department head, spread the word about LRES and the Montana State Graduate School from a booth in the exhibition hall. Fifteen LRES faculty, staff, and students attended; graduate students **Subodh Adhikari**, **Chris Brown**, **Megan Housman**, **Collin Preftakes** and **Carlos Romero** presented on their research; Drs. **Rick Engel**, **Clain Jones**, **Tim McDermott**, **Fabian Menalled**, and **David Weaver** presented their work, as did **Rachel Kurnick**, Research Technician; Dr. **Perry Miller** organized a session; and Dr. **Bob Peterson** was involved in several ESA business and committee meetings. The meeting provided a great opportunity for all in attendance to get caught up on the latest research, discuss their own work, and network with students, professors, and industry representatives.

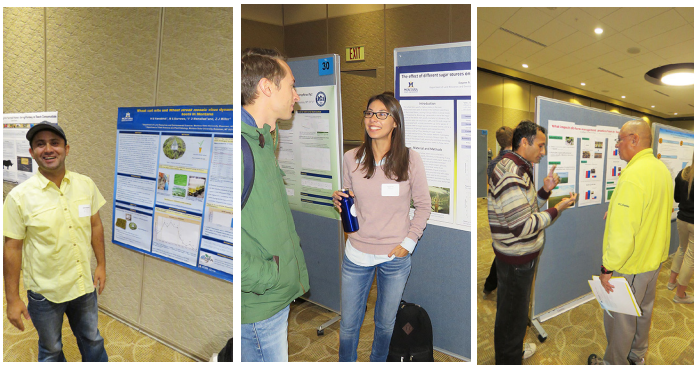


Rachel Kurnick, Research Technician, presenting cropping systems research

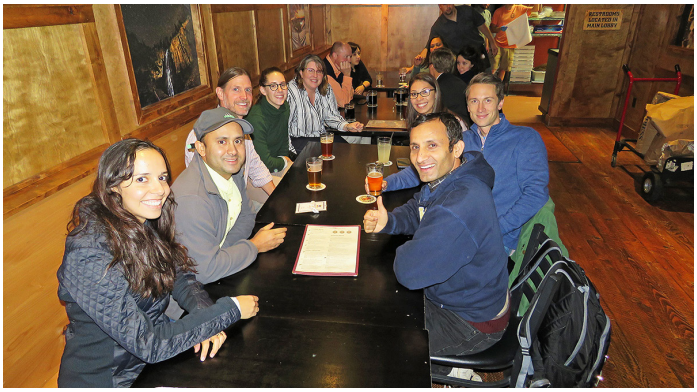
LRES graduate student recruitment booth

LRES Students Help Organize and Participate in the 3rd Annual Graduate Student Summit

The 2015 Graduate Student Summit occurred on October 29 and 30 and included both interactive and lecture-type sessions on key skills that graduate students can put to use throughout their time as students at MSU and beyond. Some of the most popular sessions included "Grant Writing: The Good the Bad and the Ugly" and "Creating a Resume for Non-academic Careers". Other sessions included the value of networking, career pathways, an elevator pitch workshop, interviewing in both academic and non-academic careers, and a keynote talk of strategies for being a successful graduate student given by Dr. Robert M. Augustine, the Senior Vice President for the Council of Graduate Schools. A well-attended poster session included posters by **Subodh Adhikari**, **Dayane Andrade dos Reis**, and **Nar Ranabhat** from LRES. The event was organized by the Graduate School and a planning committee of graduate students including **Chris Brown** from LRES. If you missed the event this year, be sure to watch for it next fall. The expertise provided during the event is invaluable and will contribute to your success.



Nar (left), Dayane (center), and Subodh (right) presented posters.



Chris Brown

New LRES Grants Awarded from Dec. 2014 - Nov. 2015

These funds fuel our research and teaching mission - to discover new knowledge, to engage and train students using laboratory and field studies across local to global scales, and to enrich the lives of Montanans. Please take a minute to congratulate our faculty and staff on their meaningful work and impressive accomplishments.

Agency & LRES (Co)PI	*Title*
Montana Grants	
Montana Department of Agriculture	
Maxwell	Patterns and Mechanisms of Cheatgrass Invasion in the Northern Great Plains
Montana Department of Environmental Quality	
Sigler, Kaylor	2015-2016 Volunteer Water Quality Monitoring Support
Montana Department of Natural Resources & Conservation	
Mangold	Evaluation of Invasiveness and Control for Pure Versus Hybrid Eurasian Watermilfoil in Montana
Montana Fertilizer Tax Fund	
Engel, Jones, Miller	Fertilizer Management Strategies for Enhanced N Recovery and Reducing N Losses in No-till Wheat
Ewing, Brookshire, Jones, Klassen, Payn	Research Analytical Chemist, Environmental Analytical Laboratory
Miller, Ewing, Jones	Fallow Replacement and Nitrogen Rate Effects on Nitrate Leaching, Yield, and Quality
Miller, Jones, Zabinski	Do Cover Crop Mixtures Grown During the Summer Fallow Period Improve Soil Quality Compared with a Sole Pea Cover Crop or No Cover Crop?
Miller, Jones	Long-Term N Management in Alternative Crop Rotations
Montana Noxious Weed Trust Fund	
Mangold	Economic Impact of Noxious Weeds on Grazing Capacity of Montana Rangeland
Mangold	Montana Noxious Weed Education Campaign
Mangold, Orloff	Mitigating Priority Effects of Invasive Plants During Revegetation by Altering Perennial Grass Planting Date
Menalled, Mangold, Orloff	A Meta-Analysis of Previous Canada Thistle (*Cirsium arvense*) and Field Bindweed (*Convolvulus arvensis*) Control and Management Studies
Littlefield	Biological Control of Common Tansy & Ox-eye Daisy
Littlefield	Biological Control of Invasive Hawkweeds
Littlefield	Biological Control of Russian Knapweed
Littlefield	Biological Control of Whitetop
Rew, Mangold, Menalled, Seipel	Managing Dense Cheatgrass Infestations on Rangeland, and Understanding its Impacts Under an Altered Climate
Weaver	Optimizing Available Toadflax Biocontrol Resources and Evaluation of Efficacy of Candidate Stem-Galling Weevils
Weaver	Testing Candidate Agents for Biological Control of Russian Olive: Ensuring Impact on Weed Population Growth
Montana Research and Economic Development Initative	
Co-PI: Lawerence	Optics and Photonics Research for Montana Economic Development
Co-PIs: Maxwell, Ewing, Miller, Payn, Rew, Weaver	Increasing Profitability by Improving Efficiency of Montana's Farm and Ranch Lands
Montana Wheat & Barley Committee	
Maxwell, Menalled	Expanding the Understanding of the Impacts and Management of Field Bindweed (*Convolvulus arvensis*) in Organic Grain Production
Menalled, Mangold, Orloff	Assessing Integrated Approaches to Manage Canada Thistle (*Cirsium arvense*) and Field Bindweed (*Convolvulus arvensis*) in Small-Grain Systems. A Meta-Analysis Approach.
Miller	Legacy Effects of Long-Term Diversified Cropping Systems
Stoy	Modeling Carbon Gain, Water Use, and Grain Yield Across a Wheat/Fallow Cropping Sequence
Weaver	Improving Performance of Wheat Stem Sawfly Parasitoids
Weaver	Integrated Pest Management of Wheat Stem Sawfly
Weaver	Isolation of the Wheat Stem Sawfly Endosymbiont, *Spiroplasma spp.* and Characterization of its Impacts on Sawfly Reproduction and Fitness: A Potentially Novel and Safe BioControl Agent

Federal Grants

US Department of Agriculture

Mangold	Enhancing Decision Making by Ag Producers in Montana with Weather Variability
O'Neill, Peterson	Investigating Alternative Forms of Developmental Mortality in Alfalfa Leafcutting Bees

USDA National Institute of Food and Agriculture

Mangold, Menalled	Montana State University's Extension Implementation Plan for Integrated Pest Management
Menalled, Engel, Miller	Assessing the Resiliency of Integrated Crop-Livestock Organic Systems in Water-Limited Environments Under Current and Predicted Climate

USDA Animal and Plant Health Inspection Service

Littlefield	Rearing and Release of *Aulacidea subterminalis* for the Biological Control of Invasive Hawkweeds
Littlefield	Redistribution and Monitoring of Biological Control Agents for Russian Knapweed

USDA Bureau of Land Management

Littlefield	Biological Control of Invasive Plants Impacting BLM Managed Lands
Mangold	Noxious Weed Education and Awareness in Montana: Sharing and Distributing Information About Management and Control of Invasive Species

USDA Natural Resources Conservation

O'Neill	Demonstrating and Quantifying the Influences of Incentive Based Rest Rotation Grazing on Food Insects of Sage-Grouse, Rangeland Pollinators, and Vectors of West Nile Virus

US Bureau of Indian Affairs

Weaver	Biological Control of Noxious Weeds

National Aeronautics and Space Administration

Powell	Downscaling IPCC Land Use Scenarios for Global Change Adaptation Planning in Mountainous Environments

National Institute of Health

McDermott	Arsenical Production in Germ Free and Humanized Mice

National Science Foundation

Dore	Institute on Ecosystems - INSTEP Year 3
Ewing	Institute on Ecosytems - INSTEP Year 3
McDermott, Dore	Biological Basis for Methane Synthesis in Oxic Lake Waters
Poole	Institute on Ecosystems - INSTEP Year 3
Priscu	Environmental Assessment of the McMurdo Dry Valleys: Witness to the Past and Guide to the Future

Private, University, Regional, and Other State Grants

Jet Propulsion Lab

Priscu	The WATSON Project: Wire-Line Analysis Tool for Subsurface Observations of Northern-ice-sheets

Koch Biological Solution

Engel	Evaluation of Biological Exudates on Growth of Spring Wheat

Mosquito Research Foundation

Peterson	Risks to Pollinating Bees from Adult Mosquito Control

North Carolina State University

Weaver	iPIPE: Montana Northern Great Plains Wheat Component

Pacific Northwest National Labs

Inskeep	Microbial Design Principles in High-Temperature Systems

University of Wyoming

Menalled, Mangold	Implementation of SARE Professional Development Program Plan for Montana

Western Region SARE Program

Miller, Walker, Zabinski	Cover Crop Grazing: Optimal Seasonality for Soil and Livestock Benefit

LRES Capstone Course Project, Fall 2015

This fall, the LRES Capstone class focused on clearly defining the terms "Ecosystem Functions" and "Ecosystem Services" by researching management or restoration case studies where these concepts are applied in concurrence or in contradiction.

In the middle of the semester, the Executive Office of the President released a memorandum directing all government agencies to "develop and institutionalize polices to promote consideration of ecosystem services, where appropriate and practicable, in planning, investments, and regulatory contexts." That memorandum directs agencies to develop a framework to identify and classify key ecosystem services and to assess impacts to those services from Federal actions.

With this memo, the LRES senior capstone class suddenly found themselves as the vanguard of applied thought in resource management. Their findings were presented on campus and at the Greater Yellowstone Coalition, and can be found on the LRES website.

Bill Kleindl

LRES 2015-2016 Scholarship Recipients

August & Mary Sobotka Memorial Agricultural Award
Allison Cooley

Bill & Anita Jones Agricultural Scholarship
Mathew Bain
Emma Bode
Katie Noland

Cliff Montagne LRES Scholarship
Chase Gruber

Clyde & Helen Erskine Excellence in Ag Scholarship
Kaylee Schmitz

College of Agriculture Scholarship
Sarah Spear

Dr. Arthur H. Post & Margaret Post Scholarship
Chance Noffsinger

Koebel Family Scholarship
Lauren Saint Pierre

Land Resources Stewardship Scholarship
Mathew Bain
Jessica Chrisp
Hailey Gelzer
Raeleigh Price
Kaylee Schmitz
Sarah Spear

Newman Family & Friends Scholarship
Subodh Adhikari

Newman/Abbott Nutrition Undergraduate Scholarship
Jessica Hays
Conner Mertz

Ted & Thelma Fosse Scholarship
Braden Leach
Chance Noffsinger

Opportunities to Support LRES

A gift to the department is a great way to support student and faculty endeavors. Donations can be earmarked for student scholarships or internships, graduate fellowships, undergraduate and graduate student programs, endowed professorships, and more. For information about making a donation to the Department, please contact Kevin Brown, MSU Alumni Foundation, College of Agriculture, Director of Development (406-994-4851 or kbrown@montana.edu).

MONTANA STATE UNIVERSITY
College of AGRICULTURE