

LRES Newsletter

The College of Agriculture

Spring 2015

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Congratulations Graduates!

In this edition, we celebrate the teaching, research, and outreach excellence demonstrated by LRES faculty, staff, and students.

We also recognize those graduating this year, which includes 26 undergraduates, 13 M.S. recipients, and 4 Ph.D. recipients. Graduating students, the department extends its sincere congratulations to each of you on your accomplishments and wishes you the very best in all your future successes. Stay in touch!

“Optimism is the faith that leads to achievement. Nothing can be done without hope and confidence.”

-Helen Keller

Tracy Sterling, Professor & Department Head

LRES Recognition

MSU Award for Excellence

LRES regularly produces a crop of outstanding students, and this year is no exception. Two seniors, **Russell Callahan** and **Katie Noland** (both focusing on Soil and Water Sciences) were recognized at the 33rd Annual Awards for Excellence. 40 MSU students are recognized each year for their 3.5 or greater grade point average, their campus leadership, and their community service. Students select a mentor to be honored with them; Callahan selected Assistant Professor **Tony Hartshorn**, and Noland selected Assistant Professor **Stephanie Ewing**.



Russell Callahan and Tony Hartshorn



Katie Noland and Stephanie Ewing

LRES Recognition

MSU Excellence in Service Awards

The MSU Employee Recognition Awards program was revised this year to honor those who emulate MSU's pillars of service excellence: Competence, Safety, Reliability, and Courtesy.

Linda McDonald was awarded the *Employee of the Year Award for Courtesy* and received a \$500 cash award and a gold pin. As described by nominator Merry Pacey, "When it comes to students and faculty, Linda is a very good listener and is able to respond to questions with authority. When students or faculty leave Linda's desk, they are equipped with the information and resources that they need. When meeting with students for the first time, Linda spends time getting to know them, and with that information is able to better assess their needs. Linda's professional goal in life is to make sure that these students reach their goals; she supplies them with the information they need to succeed, and students are empowered and expected to follow-through on their own. There are students who will attest that Linda was the reason that they were able to reach graduation; she was the catalyst for their success."



Faculty Excellence Awards

MSU's Faculty Excellence Awards ceremony in January recognized a wide range of accomplishments and contributions by MSU Faculty, with three of the awardees from LRES.



Bill Inskip won the *Provost's Award for Graduate Research/Creativity Mentoring*, which recognizes both the depth and breadth of his role as a mentor to LRES graduate students. In 27 years, he has been the major advisor to 21 graduate students and published a paper in a peer-reviewed journal with almost every one of them.



Scott Powell won the *Excellence in Online Teaching Award* for his key role in the development and growth of the online master's degree program in Land Resources and Environmental Sciences. Scott is academic advisor for the nearly 60 students now enrolled in the program, teaches two of its courses, and has been instrumental in designing the course roll out as the program has grown, while also engaging the nearly one dozen instructors in the program and providing trainings for best practices.



David Weaver won the *Charles and Nora Wiley Faculty Award for Meritorius Research* for his investigations into combating the wheat stem sawfly, the most economically destructive pest in Montana, and the orange wheat blossom midge, another pest posing significant threat to Montana's wheat industry.

NACTA Awards

The National College of Teachers of Agriculture (NACTA) Teaching Award of Merit recognizes those individuals whose efforts represent the very best in agricultural higher education and inspire all of us to achieve the highest levels of excellence. The department recognized the following awardees, chosen by the College of Agriculture, at our LRES Graduation Celebration in May 8th.



Stephanie Ewing, Assistant Professor, received the *NACTA Teaching Award of Merit* for her strong commitment to contributing to student success and educational excellence, from vital undergraduate instruction to graduate student mentoring. She launched her teaching program by offering a revitalized ENSC 454 (Landscape Pedology) course which includes impactful labs designed to offer multiple hands-on, relevant field trips across the Gallatin Valley along with challenging problem sets and writing assignments to facilitate meaningful student discovery and learning opportunities. She also works closely with undergraduates who engage in research projects in her lab and has brought the Environmental Analysis Lab into full operation, providing nearly 30 students significant laboratory analysis learning experiences over the past few years.



Patrick Lawrence, LRES PhD candidate, received the *NACTA Graduate Student Teaching Award of Merit* for his impressive instruction across multiple teaching opportunities in the College of Agriculture and off-campus. He taught the College's undergraduate Weed Ecology and Management (ENSC 443) course, receiving excellent evaluations, when his graduate advisor was on sabbatical leave last fall. He also taught a nine-week general environmental science course at Chief Dull Knife College on the Northern Cheyenne Indian Reservation last summer, in which he developed the hands-on curriculum and worked with students for six hours per day, with a large portion of the time in the field. He also regularly guest lectured about Precision Agriculture for our Sustainable Cropping Systems course, and he has been a teaching assistant for Soils. **Bruce Maxwell** is Patrick's Ph.D. advisor.

Promotion and Tenure



Congratulations to **Jack Brookshire** for earning tenure and promotion to Associate Professor. His achievement was recognized at President Cruzado's Celebratory Dinner on April 27th. Additionally, **Tony Hartshorn** earned retention. Please take a moment to congratulate our accomplished faculty! Please join us as we continue our tradition of celebrating these milestones together at Colombo's on May 13, 2015 at 5:00 p.m.



Further Recognition



Tony Hartshorn received an award from the Campus Sustainable Advisory Council for his commitment to and advocacy for sustainable practices.



Adam Sigler received an award for distinguished service from the Montana Rural Water Association for his contributions to water quality through education and research for his in revamping the Well Educated program (an education program for well owners). This success would have been impossible without **Katie Kaylor's** vital contributions to the program.



Merry Pacey completed the Leadership MSU program offered through the Office of President.



Tina Widhalm accepted an accounting position with ITC. She provided valuable assistance to LRES for over 4 years and will be greatly missed.



Byron Amerson, a graduate student advised by **Geoff Poole**, received a travel grant award from The Graduate School. Byron will travel to Vancouver, WA in May to present his doctoral research at the Pacific Coast Salmon Recovery Conference.



Alex Gaffke, a graduate student advised by **David Weaver**, was awarded a scholarship from the Montana Weed Control Association.



Katie Noland, a senior focusing on Soil and Water Sciences, received a "Torley" Award for Community Involvement. Her volunteer service highlights her passion for the environment. Katie also received an award from the Campus Sustainable Advisory Council that recognized her leadership within the Network of Environmentally Conscious Organizations.

Au revoir to Lucy Marshall



The department bids a fond farewell to one of our outstanding professors, **Lucy Marshall**, who is returning home after an amazing nine years with MSU. Dr. Marshall will be directing a research program in Watershed Analysis at University of South Wales in Australia where she has been on a fellowship these past two years which allows her to be closer to her extended Australian family. Lucy says: "I truly loved working with the staff, students and academics at MSU. While it is difficult to leave the university, I leave with a wealth of experience and memories that have enriched my academic capacity." She will be appointed as LRES Affiliate Professor and plans to continue collaborating with MSU faculty.

Get department news first.

Follow us on Facebook to see press releases, seminar announcements, and other student and faculty news reminders.



Think *in situ*: Let Nature be Your Guide

Faculty Spotlight: Dave Ward

After 21 years in the Microbiology Department and 17 years in the LRES Department, I reflect on where my career has taken me.

My main research emphasis has been to describe the composition, structure and function of photosynthetic microbial communities that form the colorful mats in the effluent channels of Yellowstone hot springs. My students and I have studied these mats as relatively simple, stable and, most importantly, *natural* model systems for understanding principles of microbial ecology.

In our Yellowstone research we study the present-day microbial communities formed by photosynthetic microbes that, like plants, do, or unlike plants, do not produce oxygen. The question we ask is whether we can learn how to differentiate fossil communities of these types. If we can, we will have a more precise way of connecting photosynthesis to the oxygenation of the Earth.

I have attempted to incorporate what nature has been telling me in my instructional programs, ranging from informal education projects in museums and Yellowstone, to formal undergraduate and graduate courses in Microbiology and LRES, to helping develop a one-of-a kind curriculum: Environmental Biology in LRES.

A major mid-career event for me involved being introduced to subjects I had not been asked to study as a Microbiology student--ecology and evolutionary biology. These subjects are the foundation of biology, yet were

(and still are) not a part of the traditional Microbiology curricula at MSU or anywhere else! As I transitioned to the LRES Department, I encountered many colleagues who realized

the necessity of these subjects for understanding the natural world. Yet, the traditional education of these environmental scientists had not acquainted them very much with microbial diversity, ecology and evolution!

Thus together we designed a curriculum that asked students preparing to be future environmental biologists to understand all organisms, large and small, based on principles of ecology, evolution and *in situ* physical/chemical realities. I tried to incorporate a natural way of thinking into my classes as well, attempting to counter the shortcomings of traditional curricula and courses we professors were guided by when we were students. It is my hope that the LRES faculty will transcend their disciplinary traditions and continue these approaches in their courses and curricula for the benefit of our students.

I conclude that I am a lucky guy! I landed at a smallish state school in a beautiful place where I could balance research and instruction, strive for excellence in both, and where I could



Dave Ward instructing Camp Wilderness high school students at Octopus Spring, Yellowstone National Park

work hard and play hard. My “other office” has been Yellowstone National Park. I have been fortunate to receive nearly career-long funding from the National Science Foundation, NASA, and the Department of Energy Pacific Northwest National Laboratory. I have been able to travel the world demonstrating that geographic isolation can also drive microbial speciation, and presenting the Ward Lab’s results.

As I begin to transition to retirement, I look forward to blending time for other interests with finishing what I started in my Yellowstone microbiology research program. I hope that my work on these natural model microbial communities will guide those working on other microbial communities toward a more natural view. I also look forward to continuing informal education projects that attempt to change the way people think about microorganisms.

Dave Ward

Outstanding LRES Senior & Outstanding Senior in College of Agriculture: Dionne Zoanni



Dionne graduates this semester earning a B.S. in Environmental Science with a concentration in Geospatial and Environmental Analysis and a minor in Soil Science with Honors, impressing her professors with her dedication to achieving tasks presented to her and her keen intellect. She has been a straight-A student during her last four semesters, during which she has taken a demanding upper-division curriculum, outperforming the graduate students in the classes. She has been continually on the Dean’s list since 2012 and has been the recipient of numerous merit-based scholarships (MUS Honors, Hedegaard, Wagner-Heritage, Campbell Family).

Ms. Zoanni has also contributed heavily outside the classroom. She has been involved in the American Indian Research Opportunities program, the non-profit HOPA Mountain Native Science Fellows program, and the American Indian Science and Engineering Society. She has contributed to the MSU research mission as a research assistant in Dr. Engel’s soils research lab. Her summers have been spent putting into practice what she has learned here at MSU for the benefit of the Fort Peck Reservation, with two summers spent working as a watershed analysis assistant for the Office of Environmental Protection in Poplar, Montana.

Ms. Zoanni has been an outstanding student for MSU and we will be proud in the future to point to her as one of our graduates. She has been the kind of student an advisor uses as a role model for other students. The Department is very proud to name her “Outstanding LRES Senior” and the College’s Outstanding Senior.

Nominator, Advisor Rick Lawrence

Taylor Assesses Lodgepole Pine Invasion in Southern Hemisphere

My research has brought me to a myriad of amazingly beautiful and ecologically fascinating sites around the Southern Hemisphere from the monkey puzzle forests of southern Chile to the beech forests of New Zealand’s South Island. In my quest to determine the drivers and impacts of lodgepole pine invasion on ecosystems in the Southern Hemisphere, I traveled to New Zealand, Argentina, and Chile. Throughout my travels I was lucky enough to work with great international collaborators, which broadened my horizons and introduced me to different scientific approaches.

Through my research, we discovered that patterns of pine invasion vary from site to site and depend on factors such

as invasion age and native vegetation type. As lodgepole invasions progress and become dense, we see lower native plant species diversity than in similar uninvaded areas. The same pattern was observed where lodgepole encroaches into sagebrush shrublands in its native range here in Montana.

One of the main concerns in the Southern Hemisphere is that the



Kim Taylor in Castle Hill, New Zealand

flammable and fire-adapted lodgepole may alter fire behavior in a way that promotes its own growth after fire and is detrimental to native plants. This is a particular concern as fire frequency is predicted to increase in our study sites due to climate change. Our results suggest that lodgepole invasion does increase wildland fire fuel loads, which could result in higher severity fires in densely invaded areas.

While my study is drawing to a close, I am confident that the connections and experiences gained throughout my project will prove invaluable in my future career.

Kim Taylor, Ph.D. Student

Environmental Analysis Laboratory News

Meryl Storb has been bagging a lot of peaks lately.

Storb is a first-year Ph.D. student in the Watershed Hydrology Lab, and this semester she is a graduate RA in the EAL, working closely with Facilities Manager/Chemist **Jane Klassen** to develop protocol for water sample analysis on the ion chromatograph (IC). The peaks she's bagging are high points in water (or eluent) conductance over time, telling her about the amount of solutes like nitrate, sulfate and chloride.

Formerly a consulting hydrogeologist, Storb is no stranger to data assessment. "I've done a ton of data validation, but now I understand why I had to throw out certain results. Matrix interference finally makes sense!" As a graduate RA, Storb will analyze a range of sample types in preparation for her own work on environmental controls of stream metabolism around the Big Sky watershed.

"Meryl's dedication and thoughtful approach make her a great addition to the EAL", said **Stephanie Ewing**, who shares lab director responsibilities with

Jack Brookshire. A MAES equipment grant to Ewing and Brookshire helped fund the recent purchase of the Dionex ion chromatograph in the EAL.

Storb is excited about the possibility of undertaking her own analyses on the IC. "While there is water quality data (at Big Sky), this work will help us understand where the water is coming from." Once she masters the IC, Storb may apply her new skills to other instrument capabilities in the EAL, such as isotopic analysis of water.

When not in the lab, Storb can be easily spotted flying across campus on her Extracycle, or flying up trails on her nordic skis. Perhaps you also caught her at the LRES Research Colloquium on April 20, where she presented on her methodological research and development in the EAL.

The EAL provides analytical support for students and faculty undertaking plant, soil and water analyses. Similar to Storb's experience, both undergraduate and graduate students working in the lab can obtain research credit as they develop analytical skills with hands-on research



Ph.D. student Meryl Storb gets to know the inner workings of the EAL's Dionex Ion Chromatograph.

expertise. Comprehensive analyses of water samples and soil extracts are now possible in the EAL, with charges calibrated to cover materials and labor at affordable levels. Capabilities include nutrients and trace metals, as well as analysis of particle size distribution and total carbon and nitrogen in solid samples. Currently, about 25 faculty and 34 students have worked with the lab to undertake analysis of a range of environmental samples.

*Stephanie Ewing, Jane Klassen,
& Rob Payn*

Research in Pictures

Adam Sigler, water quality specialist and graduate student, collects water samples



On the ENSC 460 field trip in April, Russell Callahan and David Fast discover that the soils at the Story Mill wetland are naturally anaerobic - with reduced iron and reduced sulfur.



Science Communication

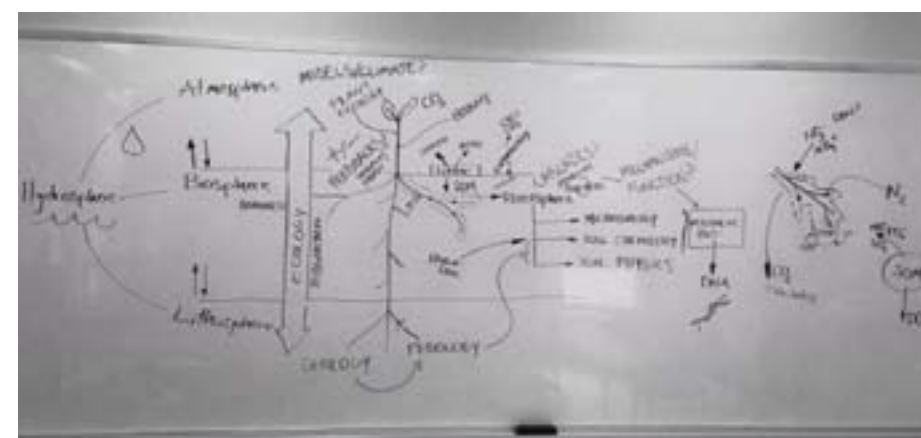
The science we do matters, but as scientists we spend far more time talking about our work to people whose expertise matches our own, and we forget that our technical vocabulary and approach to thinking about problems is practically a foreign language to non-scientists.

Alan Alda, whom some of us first knew as Hawkeye from the long-running TV series *M*A*S*H**, helped start the Alan Alda Center for Communicating Science at SUNY Stony Brook. After hosting the PBS program "Scientific American Frontiers", Alda was convinced that scientists had amazing stories to share, if they could only figure out how to talk about their research to non-scientists.

The Communicating Science Center provides courses for science graduate students at Stony Brook and offers a series of workshops for scientists and medical professionals, including a Summer Science Institute, which I attended last summer. The summer institute is a mix of hands-on workshops and practical advice about how to increase science communication training on your campus. Participants use improvisation to think about audience and how their message is received, workshops to practice distilling their message, and a television studio where they practice being interviewed by TV and radio journalists.

The need for better science communication is not going away, and in LRES we are starting to incorporate science communication into our curriculum. This past fall, **Jane Mangold** invited MSU's Executive Director of Communications, Tracy Ellig, to talk with LRES grad students and faculty about "Working with Media 101: A Crash Course", and LRES capstone students presented their semester's work on renewable energies to a full room at the Bozeman Public Library in November.

Cathy Zabinski



Conceptual mapping of disciplines and research questions in soil ecology as summarized by students in LRES 561 Belowground Ecology

The Heart of the Matter: Advising Students

Linda McDonald, LRES's academic coordinator, attended the regional NACADA (National Academic Advising Association) conference in Coeur d'Alene, Idaho from March 11-13, 2015. The focus of the conference was "The Heart of the Matter – Advising for Student Persistence, Retention, and Success."

Session topics included:

- learning helpful ways of approaching common difficult situations to prepare students to adapt more successfully in college,
- overcoming barriers to successful college transition and degree completion,
- being a pro-active advisor and discussing strategies to assist students before it is "too late",
- an ecological theory of academic advising to work together for student success,
- coaching students to success by guiding them to their own answers,
- why grit and failure are both keys to success in college, and
- solving the case of preparing faculty to advise undergraduates.

The conference drew 400 attendees from across Region 8, including Hawaii, Alaska, Canada, Washington, Oregon, Idaho, and Montana.

Linda McDonald

Science Under the Antarctica's Ross Ice Shelf with the

I excitedly awoke about four hours after takeoff from New Zealand. I had slept through the part of the flight, when the view out the porthole-like window was nothing but ocean, but now we started to see unending stretches of ice. The LC-130 ski-equipped Hercules (affectionately known as a "Herc") lumbered slowly southward toward Antarctica. On my ice flight, as Antarcticans call it, were five strangers and a lot of cargo. Despite two previous trips to Antarctica, the thrill of arriving on the continent took over. Every trip to Antarctica provides new wonder and reminds me how lucky I am to be in this austere beautiful place. The Herc finally began its descent, and the landing skis wrestled themselves into position. The door opened, the constant Antarctic summer daylight streamed in,

and the six passengers stepped out onto the McMurdo Ice Shelf.

Science starts immediately upon arrival in Antarctica. The window of opportunity during the Austral summer is limited, and time on the continent is precious and expensive. The WISSARD (Whillans Ice Stream Subglacial Access Research Drilling, wissard.org) project aimed to study the ocean beneath 2500ft of the Ross Ice Shelf (RIS). Our site was in the far south-eastern corner of the RIS, about 500 miles from McMurdo Station, about 8 miles out to sea from the grounded margin, where the West Antarctic Ice Sheet transitions from continental ice sheet to an ice shelf floating over the Ross Sea. We travelled to the field site by air, but the million pounds of drill and camp equipment was pulled by tractor traverse. The

first science flight brought **Tristy Vick-Majors** (LRES PhD student), **John Priscu** (LRES Professor), other scientists, and essential gear in case the next flights did not make it until after science started. This almost happened. The majority of science equipment, along with myself and the remainder of the science team, were slated for the next flight. This second flight made its first attempt to get into camp, but a low-hanging cloud, perfectly timed, and placed just over camp, forced our plane to divert back to McMurdo and try again the next day. The next three days involved more weather delays without attempts to fly. Finally the weather cleared, and we were airborne and able to land at camp. The entire team was on-site 12 hours after breakthrough and the start of science. These are the usual ups and downs of Antarctic field work.

The opportunity to conduct science at a deep field site through a 1.5ft diameter, 2500ft deep borehole is indescribably valuable. We utilized every moment the borehole was open to collect samples. Once water or sediment samples were brought to the surface, they were processed in our on-site microbiology/geochemistry lab. Each water sampling campaign lasted about 28 hours, including 9 hours of collecting 8 gallons of water and 19 hours of sample processing. Tristy recalls, "I was so excited to set up experiments with this unique sample," at the beginning of 19 hours and remembers being, "Exhilarated! Followed by really tired..." after she was done processing. Our conduit to



From left to right, Mark Skidmore (MSU Earth Sciences), Alex Michaud, John Priscu, and Tristy Vick-Majors prior to boarding the Herc back to McMurdo.

WISSARD Team



Our view from the microbiology and geochemistry lab, looking towards the Transantarctic Mountains and the south pole.

the subglacial environment was open for 12 days, resulting in 21 gallons of water and 16, 8-inch sediment cores.

The borehole closing marked the end of sample collection and of our time in the interior of Antarctica. We frantically packed all the gear and samples for a safe flight back to McMurdo. Tristy acknowledged she would miss the excitement of discovery that comes with this type of fieldwork, while I hesitated to give up the final views of the Transantarctic Mountains from my tent. I relented; the three-hour flight back to McMurdo was a welcomed nap.

Some sample processing and packing in McMurdo remained to be done, but the intensity of sampling was over, and the pace of life returned to the normal Antarctic science rush. As the season

wound down, I reflected on our successes this season, which went beyond collecting and processing unique and difficult samples. Several WISSARD team members achieved noteworthy personal accomplishments. A geophysics graduate student from Costa Rica spent six weeks in the interior of the continent; it was his first time seeing snow! A microbiology graduate student from Tennessee, shared her first ever camping experience with us, on the Ross Ice Shelf. Scientific success was our primary goal, but it was enhanced by introducing new people to the joys of Antarctica. Their experiences on this trip will be remembered for a lifetime and strengthen their abilities to

interpret the data we collected which, in turn, makes the science stronger. As I boarded the northbound plane to summery New Zealand, I was already anxiously awaiting my next opportunity to return to the ice.

Alex Michaud
Ph.D. Student

We'd love to hear from you!

To share your research and/or professional accomplishments in an upcoming newsletter, please contact:

- **Tracy Sterling**, Department Head, tracy.sterling@montana.edu
- **Julie Witte**, Administrative Associate, lresfrontdesk@montana.edu


New LRES Courses


The Department introduced two new courses in Spring 2015.

Evolution for Environmental Scientists (ENSC 260), is taught each spring by **Kevin O'Neill**. This course provides students with an overview of the mechanisms and patterns of evolution, focusing on methods in the field and the role of evolutionary biology in understanding issues in environmental science.

Insect Ecology (BIOE 422), is taught in alternate spring semesters (Spring Odd) by **Bob Peterson**. Students in this course will study the influence of biotic and abiotic factors on insect population and community dynamics. An emphasis is placed on seasonal adaptations, dispersion, life table analysis, r- and k-selection, ecological methods, and insect-plant interactions.

New LRES Staff

 **Katelyn Miller** joined LRES in January 2015 after completing her M.S. in Land Resources & Environmental Sciences through the online master's program, advised by **Jane Mangold**. Katelyn works as a Research Associate in David Weaver's Lab.

 **Noelle Orloff**, formerly an LRES research associate with the weed ecology and management research group, accepted a new position in LRES as the Plant Identification Diagnostician for the Schutter Diagnostic Lab, beginning in May 2015.

GSO Activity: 5th Annual LRES Research Colloquium

On April 20 the LRES Graduate Student Organization (GSO) hosted a successful 5th Annual LRES Research Colloquium. This is the key LRES function that provides students, staff, and faculty a snapshot of the impressive diversity of research being conducted within the department. The event offered 27 students the opportunity to present their research via talk or poster and socialize over hors d'oeuvres and drinks in a professional meeting-type atmosphere.



Above: Judges David Weaver, Jane Mangold, and Mike Ivie (PSPP)

Below: Jeff Patriarche presents "Autonomous Lake Profiling System Sheds Light on Antarctica's Polar Night"



Left: first place oral presenter, Deicy Sánchez, and her advisor, Tony Hartshorn.

Right: second place oral presenter, Alex Gaffke, and his advisor, David Weaver.

The colloquium began with a poster session followed by oral presentations and finished with a thought-provoking keynote talk by National Park Service wolf biologist, Doug Smith. Also, the raffling off of an array of great door prizes generously provided by local businesses added a fun element to the afternoon.

One new addition this year was an oral presentation competition presided over by judges Mike Ivie, **Jane Mangold**, and **David Weaver**. Although the high quality of all of the presentations made it difficult to decide, **Deicy Sanchez** and **Alex Gaffke** took home the first and second place iPad Air awards, respectively. Congratulations Deicy and Alex and thanks to all oral and poster presenters on a job well done! Many thanks to the judges who kindly donated their time, and to the LRES department and the Office of Activities and Engagement who generously funded the event.

LRES GSO Officers: Chris Brown, Collin Preftakes, Nar Ranabhat, Stephen Johnson, & Subodh Adhikari

New Graduate Students

Spring 2014

Ph.D. Ecology & Environmental Sciences

Joseph Amiotte
Advisor: Bob Peterson

Andrew Bobst
Advisor: Rob Payn

Keenan Brame
Advisors: Tim McDermott & Anne Camper

Badamgarav Douchin
Advisor: Tony Hartshorn

M.S. Land Resources & Environmental Sciences

S. Katie Fogg
Advisor: Geoff Poole

Robert Walker
Advisors: Perry Miller & Cathy Zabinski

M.S. Entomology

Dayane Reis
Advisor: David Weaver

M.S. Land Resources & Environmental Sciences (online)

Megan Couser
Whitefish, MT

Emily Price
Dana Point, CA

Ricardo Segovia
Vancouver, BC, Canada

Zaddy Tofte
Big Sky, MT

Innovative Ideas from Researchers and Ranchers

The Quivira Coalition works to build economic, environmental, and social capacities of rural western communities. Attending the Coalition's annual conference provided me with an opportunity to learn from on-the-ground land managers sharing innovative and positive solutions for rural and agricultural issues in the Western U.S. and beyond. This strengthened my knowledge base and provided me with new tools for my graduate research and the LRES course I instruct, NRS 421 (Holistic Thought and Management).

A father and son team shared their success with improving land health on their farm in North Dakota by focusing on problems rather than treating symptoms. This illustrates how concepts taught in LRES can be applied in real life with positive ecological, economical, and social outcomes.

The owner of a small family organic produce farm in central California shared methods to improve ecosystem resilience.

Similar to holistic management, the farm management goal and plan focus on improving system processes.

I also met others involved with holistic management education, including Professor Rob Rutherford, who started the holistic management course at Cal-Poly. We enjoyed sharing and exchanging teaching techniques for our two courses.

The Quivira Conference offered me the chance to learn from motivating presentations, see the positive management outcomes of progressive on-the-ground practitioners, and engage in meaningful conversations with others involved in sustainable resource management of our western landscapes.

Lora Soderquist
M.S. Student

Building Connections and Examining Mines in Peru

In November 2014, **Tony Hartshorn** and his graduate student **Deicy Sánchez** traveled to Peru to participate in the 20th Latin American Congress of Soil Science in Cuzco and to conduct some technical and academic activities.

During the first week, Hartshorn and Sánchez visited the four most important mining projects in Cajamarca: The Zanja, Tantauatay, Colquirrumi, and Yanacocha, which is the largest gold mine in Latin America. The goal of their visit to these mines was to evaluate the reclamation efforts that are being developed in this part of Peru, to look for future opportunities for collaboration between LRES and Peruvian

environmentalists, and to evaluate the applicability of Sánchez's master's project in these mines.

They also met with universities and important institutions of the city of Cajamarca interested in conducting environmental projects.



Tony pointing out the reclamation done by Colquirrumi Mining Company

Between their activities, Hartshorn and Sánchez also gave some talks in universities and on major local television media. As a result of this visit, important academic and social interest links have been established between these Peruvian institutions and LRES-MSU. The department expects to continue to develop these relationships, and perhaps establish an exchange program.

Deicy Sánchez
M.S. Student



Deicy and Tony discuss challenges in mining remediation on a local TV station in Cajamarca

Montana 22nd State with a State Soil

Dozens of LRES-Connected Montanans Show Their Support

On February 3, 2015, more than 50 fourth-graders from Longfellow Elementary School in Bozeman traveled to Helena to testify in support of Senate Bill 176 before the Senate Agriculture Committee. This bill aimed to designate the Scobey soil series (technically, a fine, smectitic, frigid Aridic Argiustoll) as our State Soil, making Montana just the 22nd state with a legislatively designated State Soil.

The Senate Agriculture Committee narrowly approved the bill (6-5), which then passed out of the full Senate, over to the House. In late March, the fourth grade students returned to Helena to testify before the House Agriculture Committee. This committee unanimously approved the bill 22-0, passing it to the House for a vote. The House passed the bill on April 9. Gov. Steve Bullock will travel to Longfellow on May 7 for a ceremonial signing of the bill into law. This timing is perfect: in December 2013, the United Nations General Assembly passed a resolution declaring 2015 the International Year of Soils.

The Scobey soil joins other legislatively

designated symbols such as the state bird (the Western meadowlark, *Sturnella neglecta*), the state flower (the bitterroot, *Lewisia rediviva*), and the state tree (the ponderosa pine, *Pinus ponderosa*).

The fourth grade “Soil Scouts” (including three “LRES kids”: Kai Lehnhoff, Phineas Fischer, Cooper Hartshorn) learned an amazing amount about soils and the legislative process, guided primarily by Douglas Fischer, a part-time instructor in MSU’s Honors College, as well as **Jerry Nielsen**, an emeritus professor from our department. Two fourth grade teachers, Kristin Sigler and Debbie Nelson, shepherded the students all year, an effort nicely chronicled at <http://montanasoil.weebly.com/>. Other LRES faculty with behind-the-scenes roles included **Cliff Montagne**, **Stephanie Ewing**, **Erik Lehnhoff**, and **Tony Hartshorn**.

Dozens of others associated with MSU supported the effort, including



Above: Governor Steve Bullock signs SB176 into law at Longfellow Elementary on May 7, 2015.

Soil is essential to many quintessential Montana industries. If you think about it, in addition to the food we eat, even cattle grow on soil.

Below: Cliff Montagne teaches Longfellow students about soils; note Scobey monolith to his right.



students **Katie Noland**, who testified in Helena, and **Jacob Hoffman** and Nathan Norby, who helped the scouts with video work. Ashley Kroon, **Ryan Jennings**, **Sam Atkins**, **Tucker Colvin**, **Erik Anderson**, **Russell Callahan**, Nate Looker, Justin Martin, and **Hannah Johnson** facilitated hands-on introductions for 55 fourth graders in the Fall with support from LRES Department Head **Tracy Sterling** and Plant Growth Center Director David Baumbauer. More than a dozen parents (including Bozeman Representative Tom Woods), Bozeman Senator JP Pomnichowski (author of SB176), numerous LRES (and “Plant and Soil Science”) alumni, and the Bozeman School District supported these soil literacy efforts.

Tony Hartshorn & Douglas Fischer



Our crew of 52 soil-savvy students enjoy many of Montana’s natural resources that are grounded in soil. From the grass in our soccer fields to the trail winding its way to Bozeman’s M, our favorite activities are rooted in the soils of Montana. In soil grows the essence of Montana, and we believe soil is the “living skin” of our great state.

Gaffke and Sing Lead Section of Entomological Symposium

Montana State University doctoral candidate **Alex Gaffke** and Rocky Mountain Research Station Research Entomologist **Sharlene Sing** organized and led a half-day symposium during the 62nd Annual Meeting of the Entomological Society of America, held November 16-19th in Portland, OR. Their symposium, “Classical Biological Control of Invasive Plants: Complex Challenges, Semiochemical Solutions” was competitively selected by section symposium leadership. University faculty, graduate students and agency scientists

delivered a total of ten presentations on the role of chemical ecology in invasive plant biological control programs. Topics ranged from identification and development of pheromones, to predicting host range of biological control agents, to induced resistance in invasive plants. The overall meeting had more than 1,000 presentations with an attendance exceeding 3,400.

Alex Gaffke, Ph.D. Student

Simulating Evolution to Understand Microbial Communities

Wood Reports on IGERT Internship

I was granted the opportunity to travel to Middletown, CT for a month-long internship in Fred Cohan’s lab at Wesleyan University to work on a project that is integral to my research. Cohan and his colleagues have developed a



Jason treks through Yellowstone conducting research

program called Ecotype Simulation that simulates the processes of evolution (divergence of character, and the struggle for existence) to predict the number of bacterial

species (ecotypes) in a sample of DNA. Since the identification of closely related, ecologically distinct populations within a microbial community is complicated by the lack of phenotypic differences, this program has been an extremely useful tool for gaining a better understanding of the structure of the community of bacteria living in an alkaline siliceous hot spring in Yellowstone National Park.

Prior to my work on the program during the internship, it would take about a week to run the simulation on a small dataset containing only 200 sequences of DNA. Since modern DNA sequencing methods can easily produce a thousand times that number of sequences from a single environmental sample, my goal for the internship was to increase the speed of the program so that it could handle a million sequences

in that same time frame. While the goal of handling a million sequences in a week has not yet been realized, the most recent version of the program had no problem analyzing almost 200,000 sequences in four days. Ongoing work to replace the slowest remaining part of the simulation should allow for this goal of analyzing a million sequences in a week to be realized.

Traveling to Middletown to work closely with Cohan and his colleague Danny Krizanc would not have been possible without financial help from **Bill Inskeep** through the NSF IGERT program, **Tracy Sterling** of the Land Resources and Environmental Sciences Department, and my advisor **Dave Ward**.

Jason M. Wood, Ph.D. Student

Research in Pictures



Agroecology major Talinna Appling sampling Locoweed plants at the Post Farm to collect RNA for determining differential gene expression

Madi Nixon and Ali Thornton, undergraduates, assess weeds on sweet clover plots at Big Sandy, MT



Bachelor's Degrees Awarded 2014-2015

Fall 2014

**Environmental Sciences -
Environmental Biology**

*Tucker Colvin
Taylor Westhuisin
Chad Wilkinson*

**Environmental Sciences -
Soil & Water Science**

*Erik Anderson
Tara Donohoe*

Land Rehabilitation

*Kathryn Abbott
Cameron Gehrman*

Spring 2015

**Environmental Sciences -
Environmental Biology**

*Katrina Burgoyne
Luke Byington
Cassie Mosdal
Michaela O'Donoghue
Nathaniel Powell-Palm
Morgan Solomon
Britton Tew*

**Environmental Sciences -
Soil & Water Science**

*Russell Callahan
Caleb Lehner
Kenneth Linder*

Geospatial & Environmental Analysis

*Kyle Becker
Dionne Zoanni*

Land Rehabilitation

*Allison Beall
Elizabeth Draper
Colin McClure
Nicholas Uehling*

**Land Resource Sciences - Land
Resources Analysis & Management**

Piper Dixon

**Sustainable Foods & Bioenergy
Systems - Agroecology**

*Talinna Appling
Madison Nixon*

Graduate Degrees Awarded 2014-2015

Summer 2014

**Ph.D. Ecology &
Environmental Sciences**

Karin Neff

M.S. Entomology

Shavonn Whiten

M.S. Land Rehabilitation

*Sean McKenzie
Hally Strevey*

**M.S. Land Resources &
Environmental Sciences**

*Badamgarav Douchin
Christina Herron-Sweet
Ronald Lodgepole*

Fall 2014

**Ph.D. Ecology &
Environmental Sciences**

*Fabian Nippgen
Zackary Jay*

**M.S. Land Resources &
Environmental Sciences**

Sarina Bao

**M.S. Land Resources &
Environmental Sciences (online)**

Katelyn Miller

Spring 2015

**Ph.D. Ecology &
Environmental Sciences**

Jacob Beam

**M.S. Land Resources &
Environmental Sciences**

*Aiden Johnson
Kelly Mildemberger
Millie Olsen
John Sugden*

**M.S. Land Resources &
Environmental Sciences (online)**

Elizabeth Eiring

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).

