

LRES Newsletter

Spring 2021

Justin Gay
Missouri River Breaks, Central Montana

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Land Resources and
Environmental Sciences



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Land Resources & Environmental Sciences

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Congratulations Graduates!

The Spring issue is dedicated to celebrating our outstanding students, staff, and faculty, particularly during the incredibly challenging year we have had during the global pandemic. Please enjoy reading about our department's many accomplishments as well as the many examples of excellence and classroom engagement.

"Never settle; keep climbing that ladder of success. As you're doing it, reach back to help others strive to be the best they can be." - Barack Obama

We would like to recognize those graduating this academic year, which includes 39 undergraduates, 18 M.S. recipients and one Ph.D. recipient. Students, you have each earned a truly impressive degree during an unprecedented year. It's a remarkable time to be an environmental scientist with so much important work to be done- we are so proud and excited for you to apply the knowledge and critical thinking skills you've mastered to be the leaders who improve our understanding and management of our natural and agricultural resources, making our one earth a better place.

Tracy Sterling, Professor & Department Head

Weed Science Society of America's Outstanding Extension Award Winner: Dr. Jane Mangold



Jane Mangold, a professor in the Department of Land Resources and Environmental Sciences in MSU's College of Agriculture, received the WSSA's Outstanding Extension Award at the society's virtual annual meeting in February. She was nominated by scientists and weed control specialists from around the university and state.

"I continue to be impressed with the energy and innovation Jane commits to her responsive and strong programming in weed science," said Tracy Sterling, head of the Department of Land Resources and Environmental Sciences. "She has truly integrated her research and Extension programming, which allows her to create relevant educational programs built upon her research questions."

Continued on Pg. 3

LRES Outstanding Senior Award - Madeline Beck

Every year the department recognizes an outstanding senior and the department's criteria for these awards are steep. Students must have strong scholarly standing, demonstrated interest in any aspect of environmental sciences, involvement and commitment in the classroom, leadership, participation and/or membership in scholarly and community groups and potential to contribute to environmental sciences in the future.



Nick presents Madi with her plaque

Madeline Beck is this academic year's award winner. She graduated this May 2021 in Land Resources & Environmental Sciences in the Geospatial & Environmental Analysis Option and a 3.74 GPA with Highest Honors.

I have had the pleasure of teaching Maddie in several Geographic Information System (GIS) classes and acting as her academic advisor. Her coursework has prepared her well to be an effective researcher. Maddie has successfully tackled many spatial science topics ranging from urban planning, ecology, geology, to land resources. Her awareness of spatial concepts would be a complement to any research program.

Maddie has applied herself above and beyond the vision of an excellent student. She has continuously challenged herself to take on several roles within labs at the MSU campus including Soil Science, Spatial Science, and GEOSWIRL. Maddie was integral to my curriculum modernization for GPS applications this past summer and through our collaboration we successfully deployed 40 new devices in class and graduate research.

In the GPS Mapping and Applications service learning Maddie was able to keep a team of her peers organized and on task as they worked to collect and publish data for the Crosscut Mountain Sports Center and Gallatin County GIS.

Maddie is a selfless and personable student who has a plethora of skills that would benefit any graduate research program and greater community. She is undoubtedly one of the most pleasant and amicable students in the classroom and lab and lift's up her peers' morale with her leadership and intelligence. Congratulations Madeline!

Nominated by: Nicholas Fox

Both Madeline Beck and her mentor Nicholas Fox were honored in the 2021 Awards for Excellence. To view the ceremony, please visit: <https://vimeo.com/486518886/e91a60df55>

LRES Exceptional Service Award - Bailey Servais

Bailey Servais is this academic year's award winner. She graduated this May 2021 in Land Resources & Environmental Sciences with a minor in Statistics and a 3.96 GPA with Highest Honors.

In addition to her academic work and her independent research, Bailey was an officer for the Science Policy Advocacy Network (SPAN) on campus, a student group organized around advocating for science literacy. She volunteered at Townes Harvest with weeding and harvesting, canvassed during the 2018 campaign for the responsible mining initiative, interned with the USGS, and has worked as an alpine ski coach for the Bridger Ski Foundation. We are nominating Bailey Servais for the LRES Outstanding Senior award because she has embodies the qualities of an outstanding student. She took her academic work very seriously, she was involved in extracurricular activities that supported her academic interests, she got experience working in the lab and conducting her own research, and she was an active member of the community at large. Congratulations Bailey!



Bailey holding plaque with advisor Cathy Zabinski

Nominated by: Cathy Zabinski and Scott Powell

WSSA's Outstanding Extension Award - Dr. Jane Mangold

Continued ...



Mangold, who has been a part of the MSU faculty since 2008, leads MSU's Integrated Invasive Plant Management Group and has presented at nearly 400 Extension programs across all 56 Montana counties. In addition to community education programs through Extension, she researches ecology and the management of invasive plants. Between Extension and research grants, she has managed more than \$4 million in funding since she arrived at MSU.

"Dr. Mangold establishes productive collaborations that directly benefit the citizens of the state of Montana," said Mary Burrows, associate director of the Montana Agricultural Experiment Station and director of the Schutter Diagnostic Lab, which works to identify plants and insects and educate the public about invasive species. "She has provided hands-on teaching opportunities to many thousands of individuals in our state ranging from homeowners to county weed coordinators."

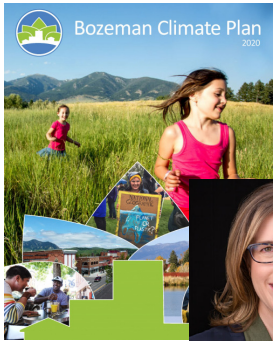
Mangold also serves on the Montana Invasive Species Council and has served on the board of directors for the Western Society of Weed Science. She has partnered with state and federal agencies, nonprofits and private agricultural companies to educate about and management of invasive species. She assisted in the development of the Montana Grasses smartphone app, which provides glossaries, diagrams and descriptions to help users identify native and invasive grass species around the state. Her Monthly Weed Post has been sharing tidbits about invasive plants and noxious weeds since 2011.

"What really separates Jane as a truly unique and outstanding Extension specialist is her incredible knowledge base, coupled with her approachability, demeanor and humor," said Clain Jones, an MSU soil scientist and Extension specialist and one of Mangold's nominators. "These qualities encourage her clientele to ask her questions and engage in her programs."

Article published by MSU News Service March 1, 2021

<https://www.montana.edu/news/20914/msu-weed-specialist-receives-national-award>

Alumni News



Natalie Meyer, LRES MS alum and Sustainability Program Manager for the City of Bozeman, was one of nine women to receive the U.S. Department of Energy Government Award. She was honored at the ninth annual U.S. C3E Women in Clean Energy Symposium for her achievements and leadership in clean energy as well as sustainability initiatives introduced in the Bozeman Climate Plan.

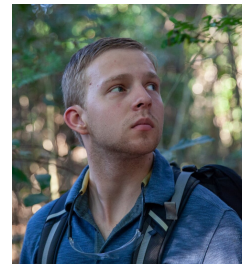


LRON Alum **Dr. Shavonn R. Whiten** (front row, far left) published in Entomology Today for article "*From the Bench to a Broader*

Impact: Traveling a Non-Traditional Path for Science to Benefit the World".



Shavonn R. Whiten, Ph.D. (front row, far left), traveled to the Virus Resistance Cassava for Africa (VIRCA) Plus meeting in Mombasa, Kenya, to serve as USAID Donor Representative



Miles Maxer, LRES Interdisciplinary major, wins NSF Graduate Research Fellowship to study at the University of Florida

beginning this Fall after completing the Blackstone LaunchPad/Techstars Fellowship program.

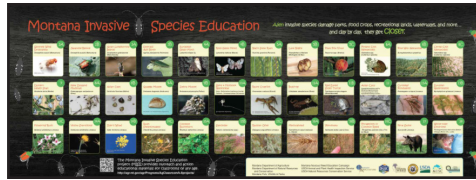


Erik Killian, alum and MSU Ph.D. candidate, receives MontanaView remote sensing fellowship for his work utilizing publicly accessible technology to approach precision agriculture research.

LRES Recognition



LRES Ph.D. student **Sasha Loewen** received MontanaView's remote sensing fellowship for organic farming research.



Specialists in LRES and the Montana Invasive Species Education (MISE) project partner with State agencies to expand invasive species education. To learn more visit:

<https://invasivespecies.mt.gov/montana-invasive-species/Educator-Resources>



Congrats and best wishes to **Chris Caron** at his new job! The Wheat Stem Sawfly lab will miss you.



Tim Seipel, LRES and MSU Extension cropland weed specialist hosted cropping seminars on herbicide chemistries in the Golden Triangle.



M.S. candidate, **Meiling Wong** received the Graduate Sustainability Research Award at the Intermountain Sustainability Summit this spring.

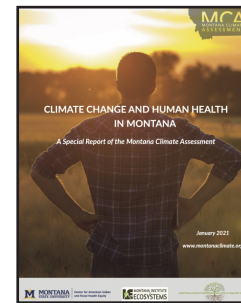


Bob Peterson was interviewed about murder hornets in the U.S.A. in *Western Front Online*.



Scott Powell, Jane Mangold and Zach Fighter received

a grant funded by the MT Noxious Weed Trust Fund titled, "Multi-scale analysis of *Ventenata* control treatments on the Crow Reservation".



Bruce Maxwell team's new report outlines how climate change impacts health in Montana.



Clain Jones, Extension Soil Fertility specialist, was recognized by the Soil Science Society of America's Soil Science Education and Extension award and by the American Society of Agronomy for his education materials.

MSU Giving Day



Students and faculty from the Land Resources and Environmental Science Department helped raise \$1,186 for the annual research colloquium and projects that supplement coursework with learning experiences outside of the classroom. Thanks to all for your contributions!

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

Jessie Sheperd, Administrative Associate, lresfrontdesk@montana.edu

Dorie Seymour, Administrative Associate, dorie.seymour@montana.edu

ENSC 448 Students Help Reimagine Soroptomist Park in Bozeman

Through a collaborative program that seeks to serve community needs, Montana State University students have gained real-world experience by creating conceptual designs for a city park in downtown Bozeman.



in the Department of Plant Sciences and Plant Pathology and the Stream Restoration Ecology course (ENSC 448) in the Department of Land Resources and Environmental Science spent the semester designing potential layouts for the park and researching best practices for maintaining and improving the stream health of Bozeman Creek, which runs through the park.

The Community-Engaged and Transformational Scholarship program, or CATS, an initiative of MSU's Western Transportation Institute, matches projects identified and prioritized by Montana communities with students and faculty in relevant disciplines at MSU to assist in making those projects reality.

During the Fall 2020 semester, students in two undergraduate courses in the MSU College of Agriculture joined the city of Bozeman in imagining how Soroptomist Park might be improved in the future. Students in the Advanced Landscape Design Studio

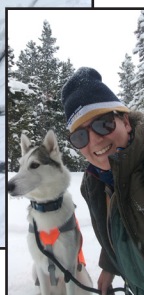
“Working with my peers on creating a restoration plan for Bozeman Creek allowed a hands-on experience you just don't get in a classroom,” said Sylvie Coston, a student in the Stream Restoration Ecology course led by professor Geoffrey Poole. “This program is great for students who learn better by not just retaining, but applying knowledge gained over the semester.”

Article published by MSU News Service April 21, 2021

<https://www.montana.edu/news/21105>



Photo by: R.E.D.



Sixth Annual LRES Ski Social

Our Sixth Annual LRES Ski Social was held at Crosscut Mountain Sports Center on Presidents' Day, Monday, February 15th. While the event looked different this year it was still well attended by faculty, staff, and students. The morning was spent cross-country skiing, snowshoeing, and socializing (from a distance) on a perfect bluebird day! Snow conditions were fantastic and overall it was a great day. We are so fortunate to have this beautiful facility here in Bozeman and hopefully we can continue coming back for this annual event!

CROSSCUT

Mountain Sports Center

Community Chair, Geoff Poole

LRES Undergraduate Capstone

Each semester, LRES seniors in their final semester tackle an interdisciplinary, current natural resource management question/issue using their disciplinary knowledge integrating and applying what they have learned throughout their years while earning their Environmental Science degree. Students work independently and in groups to research and critique literature and communicate their results both through writing and a team presentation to the public. The students in Spring 2021 Capstone Course focused on:

Importance of Preserving Green Infrastructure in an Urbanizing Gallatin County

“Modern communities develop on the skeleton of their infrastructure” (Kramer 2013). This is a quote from the History of Bozeman’s Water System. As the hardscape infrastructure was originally laid out for the City, we built ourselves around those systems to take advantage of services they supply.

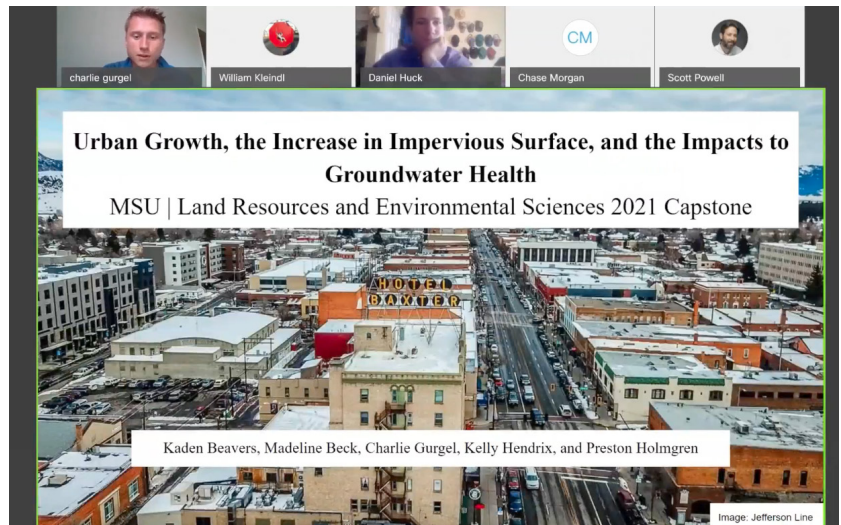
Our County is one of the fastest growing communities in America. Even if Gallatin’s growth rate were to level out, the County could receive another 55,000 people by 2045. Half of those arrivals are expected to land in Bozeman. The City projects a need for 12,700 new housing units in Bozeman to fit all those new families. To have the space to build those new homes, developers need anywhere from 1,800 to 3,100 acres. The current supply in city limits for residential development is 1,300 acres. So as the City fills within its boundaries, that population will spill into the County. The City and the County differ in managing natural areas, groundwater, surface water, and open space (and its habitat). These rules are coupled with expanding road networks and their traffic, and sewage and waste management. The existing natural cover in Lower Gallatin County provides ecological services. As the County and its cities urbanize, there are inevitable impacts on these resources. What happens to the ecological services these natural areas provide? Do they increase? Is there a threshold before they decrease? If they are erased either from direct or indirect impacts, how are these services (e.g., stormwater management) replaced, and at what costs? This interface between the natural and the man-made environment will have many challenges. However, these challenges are very common to land managers and happen all over the United States. These areas provide a green infrastructure that we should use as a skeletal structure for our future metropolitan area. To do this, we must identify and maintain these systems. This semester we discussed the relationship between ecological structures, the functions these structures support, and the services these functions provide to maintain human well-being. We met with developers in the region and how they work with or around these ecological elements. We talked with green infrastructure specialists in Denver and how their city retrofits ecological elements that have been eliminated. We met with an economist to discuss how these drive the flow of money and a developer that profits from projects that enhance green components. Lastly we talked to journalists on the best way to get this message out to our community decision makers. As the capstone students begin their careers as environmental scientists, they will run into numerous similar problems. Below are four papers developed by the students for this project:

1. Soil Health & Integrity Affect Soils’ Ability to Perform Vital Ecosystem Services: Chase Morgan, Emily Daniels, Emily Vandenberg, Lars Heinstdt, Daniel Huck

2. Urban Growth, the Increase in Impervious Surface, and the Impacts to Groundwater Health: Kaden Beavers, Madeline Beck, Charlie Gurgel, Kelly Hendrix, and Preston Holmgren

3. Maintaining Green Infrastructure in an Urbanizing Bozeman, MT: Rachael Robbins, Colton Komar, Cecily Munro, Kayleigh De Lanoy

4. Understanding and Maintaining Ecosystem Services in the Bozeman Area: Elena Marburger, Ryan Malmquist, Riley Hagan, Terran Wieder



Dr. William Kleindl

To read more about this and other Capstone projects, please visit:
<https://landresources.montana.edu/capstone.html>

11th Annual LRES Research Colloquium



Dr. Martin Entz (above) was this year's keynote speaker discussing: "Organic Agriculture deserves a place at the grownups table".

From April 12-15th, the LRES Graduate Student Organization (GSO) hosted the 11th annual LRES Research Colloquium. Graduate and undergraduate students shared their research through posters and oral presentations in a fully remote format. Posters were available for viewing from April 12th through the 15th and viewers were able to ask questions and interact with the presenters. A total of 13 posters displayed the diversity of the LRES Department, ranging from temporal and agricultural

system impacts on dryland soil bacterial communities to optimizing the location of a composting system using spatial science.

On April 15th, the Dean of the College of Agriculture, Dr. Skreekala Bajwa, warmly welcomed all attendees with some introductory remarks. Oral presentation were presented on WebEx, followed by live question and answer sessions with each of the speakers. Presentation topics also included a diverse array of subjects, such as food resources for grizzly bears.

The event concluded with our keynote speaker, Dr. Martin Entz (University of Manitoba), who presented on how and why organic agriculture is a viable and sustainable means to produce food. He also touched on the potential for organic agriculture to aid in restoring ecological systems and our relationship with the land, something that is desperately needed, particularly in the context of a warming climate.

At the end of Dr. Entz's talk, GSO announced the prize winners for poster presentations. Individuals who took first place were awarded an REI giftcard valued at \$150 and second place winners received a \$75 REI giftcard.

Although we hope that posters and oral presentations will take place in person next year, students did a wonderful job of communicating their research through this online format. We would like to give a huge THANK YOU to our panel of judges, which included Dr. Danielle Ulrich, Dr. Anthony Slominski, Dr. Bill Inskeep, Dr. Bruce Maxwell, Dr. Michael Reidy, Dr. Gina Himes Boor, Dr. Craig Carr, and Dr. Bill Kleindl.

Thank you to all who helped make the 11th Annual LRES Research Colloquium a success!

GSO Leadership:

Laissa Cavallini dos Santos, Clare Dittmore, John Bowley, Mary Farina, R. Sasha Loewen, and Dr. Jane Mangold

2021 Colloquium Winners:

Poster Presentation

Undergraduate

1st: Daniel Huck (UG)

"Using spatial sciences to provide solutions to more efficient composting in Bozeman, MT"

2nd: Sophie Grimm (UG)

"Tree cover change and carbon sequestration across the Northern Great Plains"

Graduate

1st: Tindall Ouverson (G)

"Temporal changes and system-level differences impact dryland soil bacterial communities"

2nd: Kara Hettinger (G)

"Using population growth rates and soil health characteristics to assess management of Field Bindweed"

Oral Presentation

Graduate

1st: Libby Mohr (G)

"The influence of hyporheic heterogeneity on stream solute dynamics"

2nd: Clare Dittmore (G)

"Natal source region and abundance of the army cutworm moth in the Absarokas of Wyoming"

Poster presentations, April 12th-15th on BOX

Presenter	Presentation Title
Samuel Thomas Koeshall	Pea Leaf Weevil Management in Yellow Pea to Optimize Yield and Protein Content
Lexi Emery	Stomatal adaptations to climate change may explain changing crop yield patterns
Braedon Lineman	Optimization of Organic Green Manure Seeding Rates for Increased Grain Yield
Rochelle Krottingham	A Toxicological Risk Assessment for Per- and Polyfluorinated Substances (PFAS) at a Contaminated Site in Gustavus, Alaska
Kael Von Buskirk	Locating Solar Suitability in Gallatin County, MT Based on AHP Multi-Criteria Decision Analysis
Grace Wynne	Estimating Risk of Grizzly-Human Conflict in the Greater Yellowstone Ecosystem Using Weighted Raster Overlay
Suzzy Walsh	Belowground Analysis of Crop and Management Choice in Arid Bioenergy Systems
Tindall Ouverson	Temporal changes and system-level differences impact dryland soil bacterial communities
Brian White	Climate Change and the Effect it Will Have on Irrigation in the Big Hole Valley
Lyra Reynolds	How do metabolic stoichiometric ratios and alkalinity influence whole-stream metabolism estimates from carbon dioxide signals?
Daniel Huck	Using spatial sciences to provide solutions to more efficient composting in Bozeman, MT
Kara Hettinger	Using Population Growth Rates and Soil Health Characteristics to Assess Management of Field Bindweed
Sophie Grimm	Tree Cover Change and Carbon Sequestration Across the Northern Great Plains

Oral presentations, April 15th via WebEx

Time	Presenter	Presentation Title
2:00	Dr. Skreekala Bajwa	Event opening remarks
2:15	Caitlin Mitchell	The role of snow in soil water storage and nutrient dynamics in semiarid dryland cereal production systems of central Montana, the Northern Great Plains
2:21	Lilly Sencenbaugh	Suppression of native and non-native grass seed germination using mustard biofumigation
2:27	Libby Mohr	The influence of hyporheic heterogeneity on stream solute dynamics
2:33	Kaleb Baber	Pulse crop management to enhance biological nitrogen fixation in the northern Great Plains
2:39	Colter Mumford	Cheatsgrass (<i>Bromus tectorum</i>) potential to induce soil legacy effects that alter competitive interactions between Bluebunch Wheatgrass (<i>Agropyron spicatum</i>) and Silverleaf Phacelia (<i>Phacelia heftofti</i>)
2:45	Melting Wong	Three Tools To Combat Herbicide Resistant Wild Oat
2:51	Nathanael Johns	Improving restoration efforts of breeding sites to increase recruitment of Anaxyrus boreas in western Montana
Break		Door Prizes
3:07	John Bowley	Exploring the Ecophysiological Heat Tolerance of <i>Ceriodictya haemorrhagica</i> Inhabiting Hot Springs in Yellowstone National Park
3:13	Bryce Curry	Woody plant expansion drives reallocation of carbon, nitrogen and phosphorus in the Northern Great Plains
3:19	Willa Fouts	Impacts of crop rotations and nitrogen fertilizer on soil biological factors in semi-arid Montana
3:25	Katerina Lozano	Analysis of summer food resources for the grizzly bear at moth aggregation sites
3:31	Hannah Duff	Predicting the effects of climate change on the invasion potential of a winter annual plant in Yellowstone National Park
3:37	Clare Dittmore	Natal source region and abundance of the army cutworm moth in the Absarokas of Wyoming
Break		Door Prizes
4:00	Dr. Martin Entz	Organic agriculture deserves a seat at the grownups table
5:00	Wrap Up	Announce presentation winners

Thank you to our judges

Dr. Anthony Slominski
Dr. Bill Inskeep
Dr. Bill Kleindl
Dr. Bruce Maxwell

Dr. Craig Carr
Dr. Danielle Ulrich
Dr. Gina Himes Boor
Dr. Michael Reidy

Fund provided by



Event organized by the LRES Graduate Student Organization

A Tribute to Our Graduates: From LRES Faculty + Staff



*Congratulations
Graduates!*



Congratulations Bobcats!! Graduation Day- May 1, 2021



LRES Degrees Awarded: Spring 2021

Bachelor's Degrees

Environmental Sciences - Environmental Biology

*Kaden S. Beavers, with Honors
Colton J. Komar*

Emily A. Vandenberg, with Highest Honors

Environmental Sciences-Environmental Science

*Kayleigh M. De Lanoy
Charles O. Gurgel, with Highest Honors
Riley P. Hagan*

Jarred L. Hunsaker, with Highest Honors

Ryan J. Malmquist, with Highest Honors

Elena K. Marburger, with Honors

Chase M. Morgan, with Highest Honors

*Cooper P. Tedford
Terran M. Wieder*

Environmental Sciences - Soil & Water Science

Kelly R. Hendrix, with Honors

Cecily E. Munro, with Honors

Geospatial & Environmental Analysis

Madeline M. Beck, with Highest Honors

Lochlin S. Ermatinger, with Honors

Lars O. Heinstedt, with Honors

Land Rehabilitation

Emily N. Daniels, with Highest Honors

Daniel C. Huck, with Highest Honors

Rachael E. Robbins, with Honors

Sustainable Foods & Bioenergy Systems-Agroecology

Kellen C. Gronwold

Cameron M. Hursh, with Honors

Graduate Degrees

Master of Science

Land Rehabilitation

Jordan T. Meyer-Morey

Kristen E. O'Neill

Willa Fouts (Summer)

Land Resources & Environmental Sciences

Sydney Atencio

Simon I. Fordyce

L. Tindall Ouverson

Latrice D. Tatsey

Mei Ling Wong

Online Master of Science

Land Resources & Environmental Sciences

Anna C. Anderson (Summer)

Nathanael D. Johns

Rochele E. Knottingham

Robert Tan

Zaddy A. Tofte

Doctor of Philosophy

Ecology & Environmental Sciences

Gabriel T. Bromley

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 Jesse Tuftte, MSU Alumni Foundation, College of Agriculture, Director of Development (406-994-4815) or jesse.tuftte@msuaf.org.

