2012 AgExcellence

Montana State University College of Agriculture
and Montana Agricultural Experiment Station

MONTANA STATE UNIVERSITY

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The Year 2012 in Numbers

1,078 students enrolled in the College of Agriculture in 2012 from **18** countries and **47** states. Enrollment reflects a **24** percent increase since 2007. **NINE** new faculty. **188** students earned a degree from the College of Agriculture. **148** students received **203** scholarships. **$215,100** awarded to students through College and departmental scholarships. MAES 2011 biennium budget: **$23,565,781** and 2013 biennium budget: **$24,961,565.** Fiscal year 2012 Research Expenditures: **$19,651,293.** Animal and Range Sciences has the largest undergraduate enrollment with **319** students. **131** new grants reflect a five percent increase from 2011. **NINE** new plant varieties released since 2009: **FOUR** winter and **TWO** spring wheat varieties, a durum wheat, hay barley and a pea. **3,000** square foot barn built at the Bozeman Horticulture Farm complete with wash station and field equipment storage. The largest graduate student population of **58** is in Land Resources and Environmental Sciences. Awarded **$405,832** in new equipment for teaching and research programs including new microscopes, grain analyzers, and tractors across the College of Agriculture and the Montana Agricultural Experiment Station.

Agricultural Excellence Impacts Montana

What a year!

The Montana State University College of Agriculture and Montana Agricultural Experiment Station joined the country celebrating the 150 years of land-grant higher education across the United States through the original Morrill Act creating land grant universities. At MSU, we are proud to lead the state's agricultural community in historic pursuits, discover emergent technologies and create advances in research and multi-faceted outreach. As a university, a state, and a nation, we have much to be thankful for and to celebrate during this season of holidays.

On behalf of the entire faculty and staff, we want to take this opportunity to express our gratitude to Montanans across the state, for the trust we know you place in the College and Experiment Station. Your support allows us to invest critical resources wisely and widely for the betterment of our agriculture and natural resources.

We are of course referring to our financial resources, but more importantly, also the undergraduate and graduate students you continue to send us from every county and corner of Montana and beyond. We value each and every one of them, we share their excitement about the future, and we cherish the far-flung opportunities to share our knowledge, expertise, and ideas with them. We consistently witness and speak of their efforts and their excellence, in all facets of student success and alumni accomplishments, from scientific contributions to global impacts.

We celebrate a superb group of students, staff, and faculty, and in *Ag Excellence* 2012, we hope to share with you a snap shot of their achievements, accomplishments, and quality activities.

Jeff Jacobsen
Dean, College of Agriculture
Director, Montana Agricultural Experiment Station

Nora Smith
Assistant Dean for Academic Programs

FACULTY AND STUDENTS WITH EXCELLENCE

Joshua Obar, assistant professor Immunology and Infectious Diseases (ImID), was one of ten postdoctoral fellows selected nationwide for the American Society for Immunologists Public Policy Fellows Program. Obar joins an elite group of scientists representing immunologists in public policy and legislative activities impacting biomedical research. In March 2013, the fellows will gather in Washington, D.C., for a training session and visit their Congressional representatives. Obar was also awarded one of ten Centers of Biomedical Research Excellence Young Investigator Awards and had a featured abstract at the Fourth Biennial National Institutional Development Award Symposium of Biomedical Research Excellence.

Florence Dunkel, associate professor of entomology, Department of Plant Sciences and Plant Pathology, (PSPP) received the National Award for Teaching Excellence in Entomology.

John Priscu, Land Resources and Environmental Sciences (LRES) professor, received the Scientific Committee on Antarctic Research Medal for Scientific Excellence. The medal was awarded July 18, at a banquet in Portland, Oregon.

Jim Berardinelli, Animal and Range Sciences (A&RS) professor, received the Distinguished Teaching Award from the 2012 Western Section of the American Society of Animal Science.

Rachel Endecott, A&RS professor received the Extension Award from the 2012 Western Section of the American Society of Animal Science.

John Paterson, A&RS (retired), was awarded a Fellow of the American Society of Animal Science.

Jeff Mosley, A&RS, received a Fellow award from the Society of Range Management in February.

Clain Jones, LRES; **Mary Burrows**, PSPP; **Bill Hoch**, PSPP; **Jovanka Voyich**, ImID; **Rachel Endecott**, A&RS; all earned tenure and promotion to associate professor.

Rick Lawrence received the Teaching Award of Merit in recognition of meritorious efforts in college teaching.

Aaron Rains received the Graduate Student Teaching Award of Merit for recognition of meritorious efforts in college teaching. The National Association of Colleges and Teachers of Agriculture Teaching Award of Merit recognizes those whose efforts represent the very best in agricultural higher education and inspire others to achieve the highest levels of excellence.

Publications and Presentations

BRUCE D. MAXWELL'S research on the over-reliance of herbicides for weed control and how it has created a dramatic increase in genetically-resistant weeds was published in an article on integrated weed management and recognized in *Science Daily* and in *Wired* magazine.

WENDY STOCK'S "The Characteristics of Economics Graduate Students" was included as a chapter in the *International Handbook on Teaching and Learning Economics* published by Edward Elgar Publishing.

JACK BROOKSHIRE was published in *Nature Geoscience*. His research focused on nitrogen rich tropical forests where there are no nearby farms or industries.

SUSAN KELLY coordinated the Climate Change Summit in Hardin as part of the Crow Education Partnership Project organized in collaboration with the Hardin School District. MSU graduate students assisted.

JOHN PRISCU'S research was highlighted in: *Astrobiology* magazine: "Breaking Through the Ice at Lake Vostok"; *Scientific American*: "Russian Scientists to be First to Reach Ice-Buried Antarctic Lake"; *Scientific American*: "Melting Glaciers Liberate Ancient Microbes"; and the lab group was featured on Discovery Channel Canada: "Ice Microbes"; and *American Society for Microbiology Journal MICROBE*: "Microbial Habitability of Icy Worlds"

DAVID WARD appeared on a two-hour Public Broadcasting Service program produced for NOVA "Hunting the Elements." Using samples taken from microbial mats living in hot springs at Yellowstone National Park, Ward explained how life worked before oxygen was part of the atmosphere.

CHRISTINE FOREMAN and **SUSAN KELLY** organized Polar science activities on behalf of the National Science Foundation Polar Program Office at the National Science Teachers Association Meetings reaching more than 16,000 teachers.

LISA H. LONE FIGHT, a LRES master's candidate, co-authored an article "Effective Practices for Creating Transformative Informal Science Education Programs Grounded in Native Ways of Knowing" published in *Cultural Studies of Science Education*. The article focuses on culture, traditional knowledge, and science education and how Native ways of knowing can strengthen science education programs.

CHENGCI CHEN, **KARNES NEILL**, **MACDONALD BURGESS,** and **ANTON BEKKERMAN** wrote "Agronomic benefit and economic potential of introducing fall-seeded pea and lentil into conventional wheat-based crop rotations." The American Society of Agronomy, an international organization, selected the publication as self-study material and republished it in *Crops and Soils* magazine. All certified crop advisors study this publication and take a quiz to earn continuing education credits.

Students in the field for a soils course.

STUDENT EXCELLENCE

Jerome J. Schleier III, doctoral graduate of Land Resources and Environmental Sciences, won the 2012 Hollandsworth Prize for Best Student Paper Presentation at the annual meeting of the American Mosquito Control Association in Austin, Texas.

Krista Ehlert, master's student co-advised by Rick Engel and Jane Mangold, won the student paper oral presentation contest in the Range and Agriculture category at the Western Society of Weed Science 65th annual meeting in Reno, Nev. Her paper was titled "Using soil bioassays to assess imazapic degradation to improve cheatgrass management."

Kendra Kaiser earned a bachelor's in LRES last spring and has been working in the Watershed Hydrology Lab. Kaiser will pursue graduate study at Duke under the auspices of a National Science Foundation post doctoral fellowship and continue to work with John Dore and Lucy Marshall.

Christine Romano, a postdoctoral researcher with Timothy McDermott, will use her three-year NSF postdoctoral fellowship in biology to join the oceanography group at Oregon Health and Science University.

Ron Lodgepole, a LRES graduate student, member of the Chippewa Cree tribe and co-president of MSU American Indian Council, organized and ran the largest regional powwow in April at MSU.

Carly Grimm enjoyed working at the Horticulture Farm during the Organic Market Garden Class taught by David Baumbauer, manager of the Plant Growth Center.

Born to be Bobcats

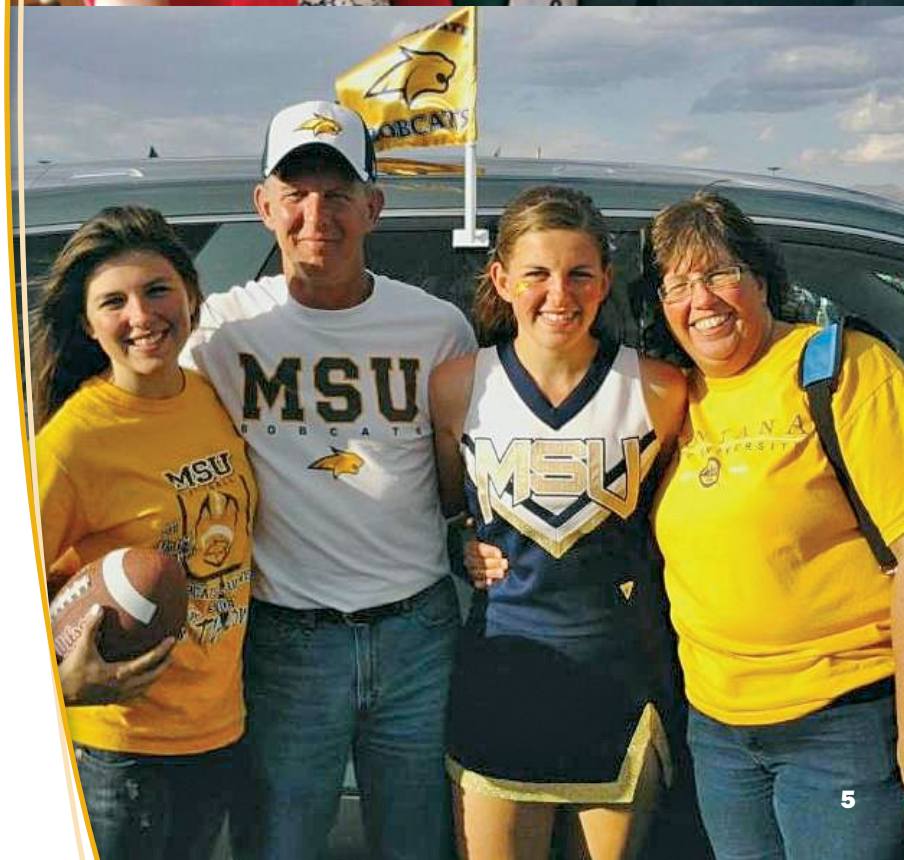
As the College of Agriculture (COA) joined in celebrating the 150th birthday of Land-grant education and the 4-H centennial, it was easy to get lost in the nostalgia of MSU's history. The more we focused on the past, the easier it was to see the future in our students. Like their predecessors they have remarkable dreams and aspirations and in many cases it appears they were absolutely born to be Bobcats! In this issue we are highlighting just a few students with deep MSU roots, and for those that remember, some roots go all the way back to Montana State College (MSC)!

Some might argue **Dawnita Deichman's** story started when she first arrived at MSU, but that would be omitting the fact her grandfather, Irvin Van Haur graduated from Montana State College in 1943 and her great-grandmother, May Van Haur, received her teaching credentials from MSC in 1918. Dawnita, from Hobson, Mont. is a junior in the Agricultural Education Teaching Option. As Dawnita explains, it started at a Polled Herford stock show in Texas when MSU sophomore, Marilyn Van Haur of Hilger met Dan Deichman a student from the University of Nebraska. According to Dawnita it didn't take long for the Nebraska guy to transfer to MSU where Marilyn was majoring in Home Economics. In 1980 Dan graduated in Animal Sciences and Marilyn in Home Economics.

Dawnita wanted to carry on the proud family tradition of being a Bobcat. "I selected MSU because it is close to home and I wanted this to be a family tradition," Dawnita shared. "I enjoy the clubs offered and the amazing internships. My parents worked really hard to get to school, and thankfully I don't have to work quite so hard," added Dawnita who is active in Collegiate Young Farmers and Ranchers and serves as a College of Agriculture Ambassador.

Samantha Sroczyk is a sophomore in Animal and Range Science with a pre-vet option. As a MSU cheerleader her Bobcat Pride is evident. What you may not realize is how deep the pride runs in Samantha's veins. Her mother, Theresa (McGowan) Sroczyk graduated from MSU in 1988 with a mathematics degree. Samantha's maternal grandparents met at a church luncheon during MSC freshman orientation. Bo McGowan was from Highwood and Sharon Fiskum was from Great Falls. Bo and Sharon graduated in 1959 with Bo receiving a bachelor degree from the COA and Sharon a degree in secondary education. They were married in 1960 and proceeded to send three children here – Mike, (B.S. 1994 in Elementary Education) Colleen, (1988 B.S. in Ag Econ) and Theresa. Of their six grandchildren, Sharon is proud to report five are definite Bobcats and one remains undecided.

As for Sam she claims she never really had a choice, "MSU had the program I wanted, and in our family you kind of have to be a Bobcat or you won't get a Christmas present from Grandpa Bo." Her sister Jen is a senior at Townsend high school and plans to attend MSU.



Upper photo: Dawnita Deichman and parents at high school graduation.

Lower photo: MSU family from left to right: Jennifer, Tom, Samantha and Theresa (McGowan) Sroczyk.

Photos provided by the families.

New Faces

Montana is pleased to welcome **BLAKE WIEDENHEFT** back to Montana State University. A native of Fort Peck, Mont. Wiedenheft received both his bachelor degree and his doctorate in microbiology from MSU (2006). Wiedenheft returned to Bozeman this summer as a new faculty member in Immunology and Infectious Diseases after spending five years at Univ. of Calif., Berkeley. Wiedenheft is a leading researcher on the positive role bacteria play in healthy individuals and will teach genome science spring semester.

Wiedenheft is married to **MICHELLE FLENNIKEN**, an assistant research professor in the Plant Sciences and Plant Pathology Department. Originally from Iowa, Flenniken also received a doctorate from MSU in 2006 and has opened a research lab exploring the molecular mechanisms underlying host-pathogen interactions in agricultural systems, including honey bees.

CARLY URBAN joined the Department of Agricultural Economics and Economics as an assistant professor and is teaching an introductory course, "The Economic Way of Thinking." Urban obtained her Ph.D. and M.A. in Economics at the University of Wisconsin-Madison, and a B.A. in Economics and International Affairs from George Washington University. Urban's research mixes public economics, industrial organization, and modern econometric techniques to answer questions on economic incentives in the political market. She was especially busy this fall studying negative political advertisements. An avid skier, she is excited to live amongst Big Sky mountains!

Carr discussed rangeland watershed management on a class field trip.

Animal and Range Sciences welcomed *three* new professors. **CRAIG CARR** is an assistant professor of rangeland ecology teaching range and pasture management this fall. Spring semester he will teach vegetation of western wild lands and a plant identification course. Carr received his undergraduate education from the University of Alberta in 1994 and went on to get his masters and doctorate from Oregon State University. Craig's dissertation examined understory responses in ponderosa pine forests. Carr served as an agrologist with the British Columbia Ministry of Forests in the Kamloops Forest Region and was the executive director of the Crooked River Watershed Council. Prior to moving to Bozeman, Carr was a research assistant professor at the University of Nevada–Reno. Some of his research interests include conifer encroachment and rangeland hydrology and watershed management. Carr is joined in Bozeman by his wife and three young children.

JENNIFER THOMSON is a new assistant professor of genetics. Born in Oregon and raised on a family farm, Thomson received her bachelor and master's degrees from Oregon State University. Thomson earned her Ph.D. degree from Washington State University. She has done post-doctoral research for the University of Maryland, the USDA Bovine Genomics Laboratory, and worked at the University of Alberta. Her research goals include identifying genetic markers and gene expression patterns for animal breeding decisions to make genetic improvement with economically important livestock traits. Thomson will teach graduate and undergraduate genetics courses this spring.

Jennifer Thomson proudly displays a Ion Torrent Semiconductor Sequencing Chip that holds genetic data.

CARL J. YEOMAN joined us from the Institute for Genomic Biology at the University of Illinois Urbana-Champaign, where he was a postdoctoral research fellow. Yeoman is an Assistant Professor of Rumen/Gastrointestinal Microbiology, and studies ecological and evolutionary dynamics of host-associated microbial ecosystems and genomes. He earned his Ph.D. at the Massey University in New Zealand. Yeoman will apply his expertise to the gastrointestinal and reproductive organ ecosystems of livestock, looking to improve productivity and reproductive success, while minimizing environmental impacts. Yeoman is teaching ruminant nutrition this fall with Pat Hatfield, professor in A&RS. This spring he will teach graduate students research methods.

GADI REDDY assumed leadership of the Western Triangle Agricultural Research Center in Conrad as superintendent and associate professor. Reddy joins the COA/MAES from Guam where he worked as a chemical ecologist and entomologist and gained an international reputation for field and laboratory work in England, India, Ethiopia, Germany, Spain, Finland, Austria and Guam. Reddy's research achievements include 90 publications in international journals regarding pest management, biocontrol, behavioral and chemical ecology and multitrophic interactions. He is currently researching ways to control insect pests on canola and sawfly and wireworms on wheat and barley. He is also continuing a federally-funded research project for insects that attack tomatoes.

Land Resources and Environmental Sciences welcomes their newest faculty member, **ANTHONY HARTSHORN** as an assistant professor of soil science. Hartshorn received his Ph.D. from the Univ. of Calif. Davis in 2003 and his bachelor's from Dartmouth College. His main research interests are in studying soil-landscape patterns with particular interest in salt-affected and low water-holding soils. Hartshorn is teaching soil resources to nearly 250 undergraduate students at MSU.

REBEKAH VAN WIEREN accepted a position as an assistant professor of landscape for the Plant Sciences and Plant Pathology Department. She will teach design courses including introductory hand graphics, site engineering, and senior design studio courses. Van Wieren received her Masters of Landscape Architecture and Masters of Natural Resource Planning at the University of Michigan. Her research focuses on brownfield redevelopment, green technologies for storm water management, and landscape ecology.

Harvesting barley at the Post Farm in Bozeman.

RESEARCH HIGHLIGHTS
Made Possible Through Grants

ALLEN HARMSEN and **MARK QUINN** hold grants from National Institute of Health (NIH). See article on page 17.

MARK YOUNG, Plant Sciences and Plant Pathology professor, is using about $3 million in grant money from the National Science Foundation and NIH to study the role of viruses in diverse ecosystems with applications in agricultural systems.

DAVID WEAVER, Land Resources and Environmental Sciences, and numerous faculty from the research centers receive significant funding from the Montana Wheat and Barley Committee for research on wheat stem sawfly.

WILLIAM INSKEEP, LRES, received an industry grant to study life in extreme environments using Yellowstone National Park as his laboratory. To learn more about Inskeep's research in Yellowstone National Park visit his website at www.rcn.montana.edu.

PATRICK HATFIELD, Animal and Range Sciences, continues to explore sheep grazing for pest management including both insects and weeds. Hatfield finished a study comparing chemical and mechanical fallow to grazed fallow and is now studying the impact of sheep grazing cover crops. Hatfield and his research team will evaluate how effectively the sheep eliminate cover crops and how well it works as feed for lambs.

BOK SOWELL, A&RS, is finishing a research project funded by the USDA and Forest Service to explore Rocky Mountain Juniper and Douglas Fir canopy influences on shrub cover in Montana.

COA and MAES: Impacting Agriculture

The College of Agriculture and Montana Agricultural Experiment Station believe in sharing how they invest resources in Montana programs. Below is the base funding chart showing what MAES, MSU Instruction, and Extension contribute to our total annual budget. The state fiscal year (FY) runs July thru June.

FIGURE 1: BASE FUNDING CONTRIBUTIONS FOR THE COA/MAES BY STATE FY

Base support from the State was critical as it provided nearly $14 million toward MAES and Extension programs. The University contributed $4 million from its general operating fund for instruction (state general fund and tuition). Federal U.S. Department of Agriculture capacity funds (Hatch) provided 10 percent of the MAES total.

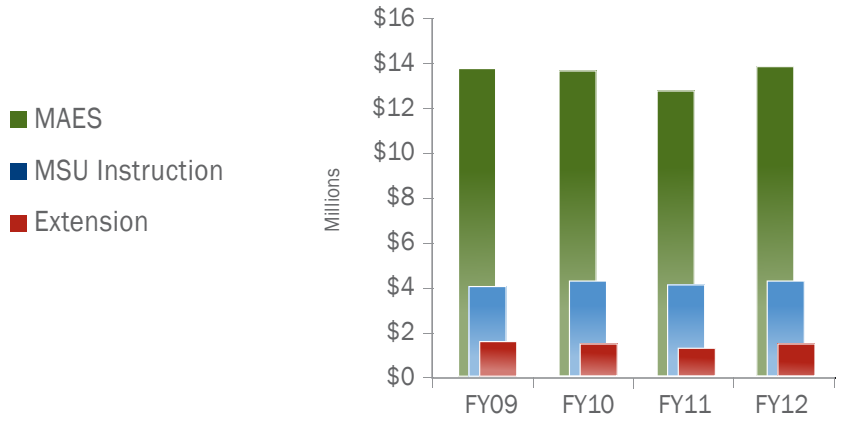
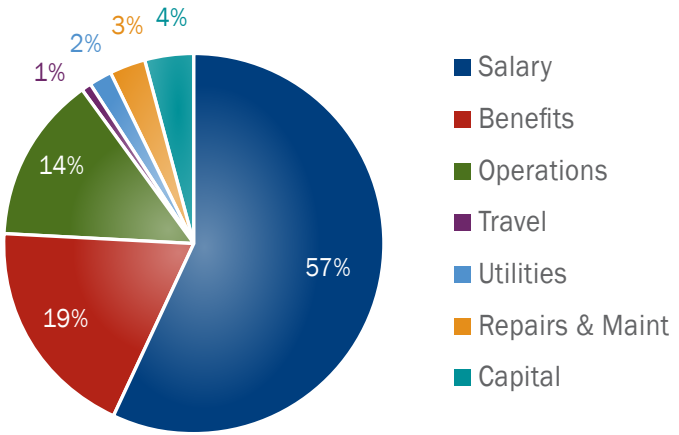


FIGURE 2: MAES EXPENSES BY EXPENDITURE CATEGORY



MAES expenses cover base costs for 93 faculty; 96 technicians and staff; 84 temporary and student workers; 58 graduate students; more than 200 buildings and 29,372 acres. The four percent for capital includes equipment and some minor construction expenses.

FIGURE 3: COLLEGE OF AGRICULTURE GRANT EXPENDITURES BY DEPARTMENT

The majority of the competitive grant money secured in the College and MAES faculty comes from the National Institutes of Health which funds critical projects in the biomedical sciences impacing human, livestock, and wildlife health. The College boasts three (ImID, LRES, and PSPP) of the top five departments at MSU for grant expenditure funding. Faculty members compete for private grants and also those from State and National programs. The COA and MAES successfully used $18 million of State and Federal money to leverage an additional $20 million in grants from external sources to support teaching and research programs.

The federal FY is Oct.-Sept.

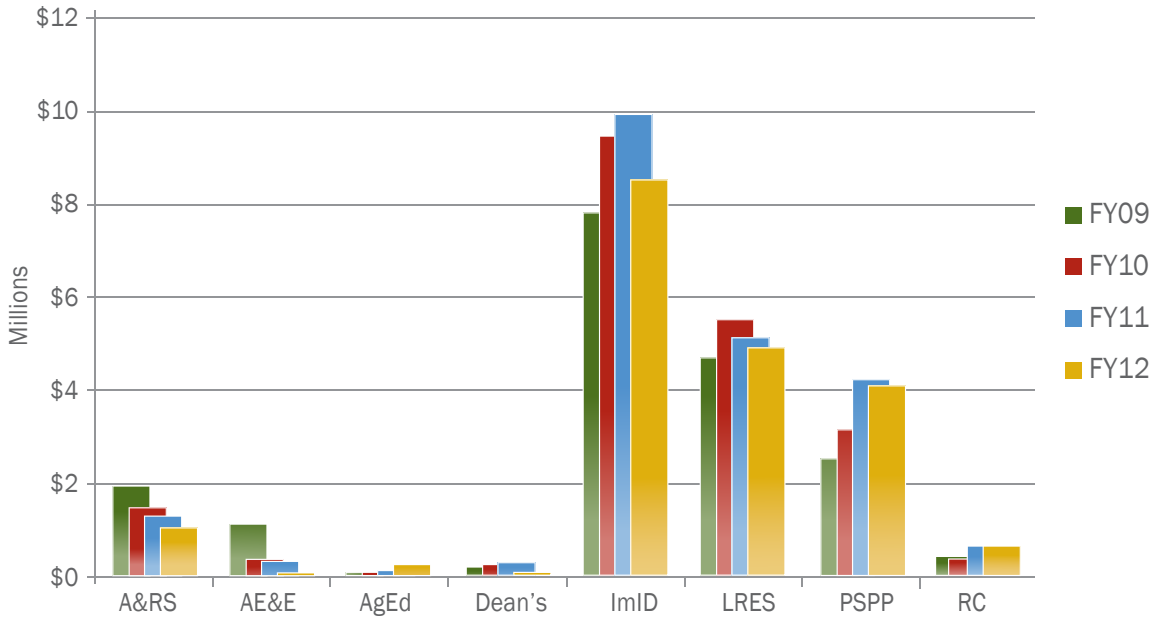
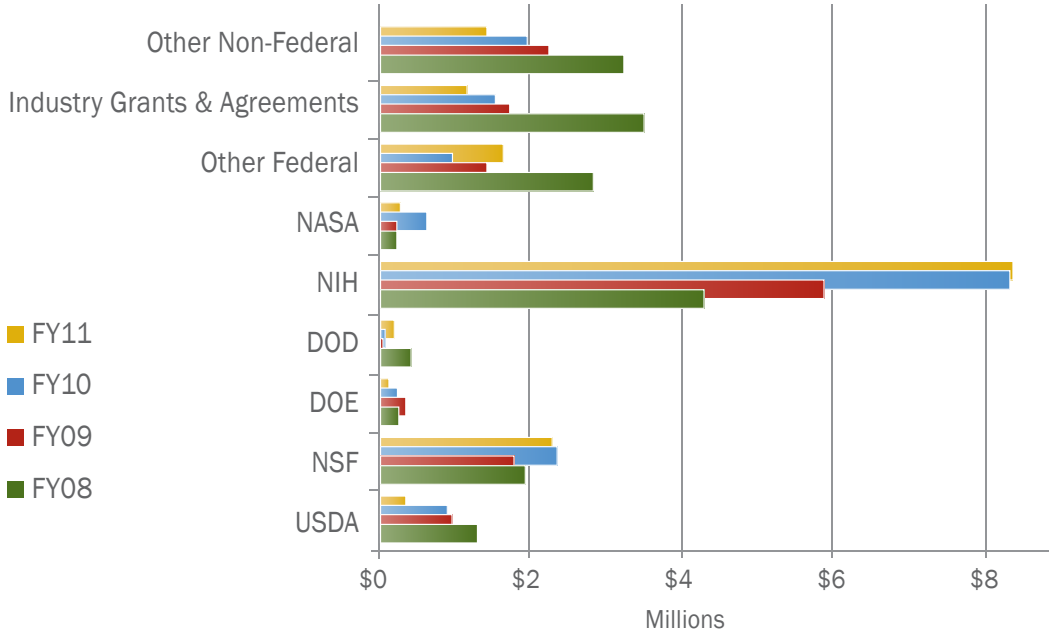


FIGURE 4: EXTERNAL FUND SOURCES PROVIDING SUPPORT TO THE COLLEGE OF AGRICULTURE (FEDERAL FY12 DATA IS NOT YET AVAILABLE)



The College and MAES are critical components to MSU research as evidenced by competitive grants secured from National Institutes of Health, National Science Foundation, USDA, NASA and the Department of Defense. Funds were also procured from the non-federal entities such as the Noxious Weed Trust Fund and the Montana Wheat and Barley Committee. In 2012 investigators developed new and enhanced varieties of spring and winter wheat, delved into pest management and continued with leading research in animal health, policy, food safety, and food security. Researchers published findings in traditional formats and capitalized on technology and internet advancements in an effort to share new agriculture technologies throughout the world. Examples include the interactive website to help producers select the optimum herbicides for their crops and the increased use of video conferencing.

CONNECTING MSU TO MONTANA AND THE REGION

LRES DEVELOPS NEW ONLINE MASTER'S DEGREE

A new online master's degree in Land Resources and Environmental Sciences is proving popular with place-bound students who are currently working and can't attend face-to-face graduate courses in Bozeman.

The program's first course began this fall and includes students from all segments of the work force: profit and non-profit businesses, government agencies and the military. Many students are in Montana, but others log-in from throughout the U.S. and overseas.

The 30-credit program is designed for flexibility, because students come from so many different backgrounds, said LRES professor Bob Peterson, who, along with assistant research professor Scott Powell, teaches in and helped develop the online program. Students choose from more than a dozen elective courses, including integrated pest management, landscape and ecosystem ecology, environmental risk assessment, environmental remote sensing, and watershed analysis. Students complete their degree by writing a professional paper, which they can tailor to professional goals and personal interests.

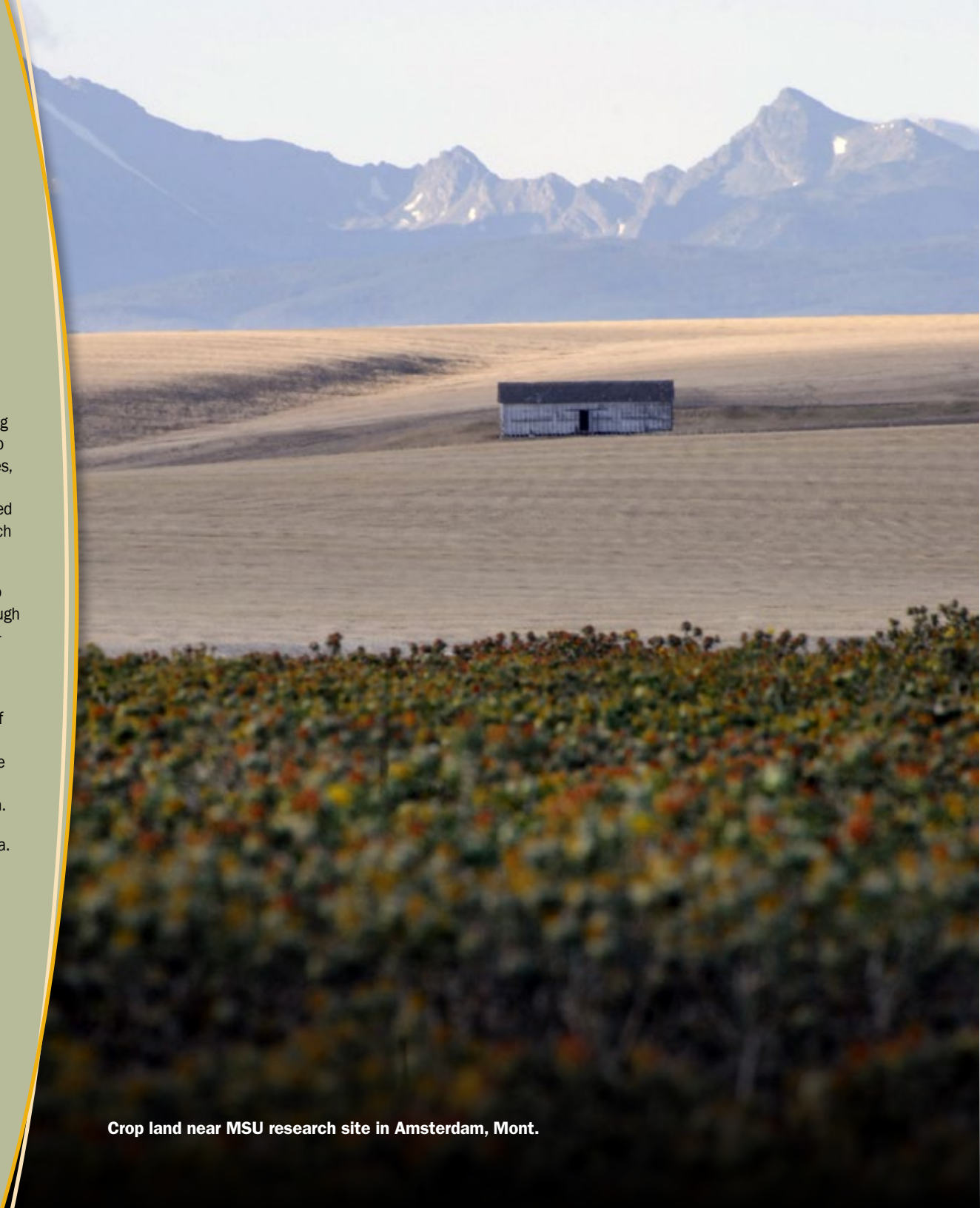
Peterson and Powell, who partnered with MSU Extended University to develop the online master's, are reaching out to their distance learning students through facebook.com/MSUEnvironmentalMasters and by recording the LRES department's weekly seminar series lectures. This helps online students participate across the miles.

Peterson, Powell, and assistant professor Lucy Marshall presented the idea of an online LRES master's after MSU President Waded Cruzado recognized the development of new distance learning programs as a top priority for MSU. She asked faculty to present ideas for new online programs that could serve non-traditional audiences, and the LRES online master's was one of those chosen.

Learn more about the new online LRES master's degree at http://eu.montana.edu/environmental-masters. If you would like a poster or program brochures, contact Lisa Brown at lisa.brown@montana.edu.

AGRICULTURE ECONOMICS AND ECONOMICS ALSO GOES THE DISTANCE

The Department of Agricultural Economics and Economics also introduced its first online course this fall, ECNS 101, *The Economic Way of Thinking*. Students enrolled in the online course for many different reasons including scheduling conflicts, family or work commitments, or they were not near the campus.



Crop land near MSU research site in Amsterdam, Mont.

AGRICULTURAL ECONOMICS & ECONOMICS

Project 2030: Helping Montana's Leaders Plan for the Future

Montana will become much older in coming decades as the "Baby Boom" generation reaches traditional retirement age. Changing demographics will affect state and local government budgets in a variety of ways. Department of Agricultural Economics and Economics professors Myles Watts, George Haynes, and Doug Young recently completed Project 2030, a report analyzing how changes in the age distribution in Montana over the next several decades will impact Montana's tax base and income and property tax revenues. This distribution will also impact public expenditures on Medicare, education, corrections, and other public services.

The next two decades are likely to be significantly different than the last four, because there will be a smaller "demographic dividend." On the expenditure side, the impacts of increases in per student spending in K-12 were ameliorated by fewer students and a larger working age population paying bills. In the next two decades, changes in the school age population will have a more modest impact on expenditures. Growth in per capita income swelled with Baby Boomers moving into the workforce and into their peak earning years. Substantial increases in women's labor force participation also helped raise per capita incomes. Soon the Baby Boomers will retire and women's labor force participation rates are not expected to rise. Thus, prior increases in state and local government spending have been mostly offset by increases in ability to pay as measured by personal income. Over the next 20 years, income growth may slow and the "demographic dividend" may shrink, making continuing increases in expenditures per Montanan more difficult to digest.

The professors agree aging will impact state and local government budgets. While governments will pay more for the elderly for Medicaid and other services, the expenses may be offset by lower educational and correctional costs. While aging may reduce income tax revenues, these declines will likely be offset by increased residential property taxes.

However, relatively small impacts on combined state and local budgets may conceal substantial changes by level of government and state region. Most rising expenditures on the elderly are paid from state as opposed to local funds, while a substantial portion of K-12 education is paid for locally. Similarly, migration of people from rural areas may increase taxable values per student in Montana's smallest schools while lowering them in urban areas.

Greater fiscal challenges may emerge from trends in education and health care costs, potential decreases in federal funding, and slower income growth. K-12 education expenditures per student and Medicaid expenditures per participant have increased faster than general inflation and income. Currently, the federal government pays two-thirds of Medicaid expenditures, but pressure on federal budgets may result in significant decreases. Federal and state policy changes may affect enrollment and Medicaid costs.

Along with federal dollars, state and local governments increasingly rely on charges and fees, which have doubled as a percentage of personal income over 40 years. Given the largest single recipient is higher education, significant decreases in federal funds for research, instruction, and outreach may result in reductions in activity or further increases in charges and fees at higher education institutions. In contrast, state and local taxes have decreased as a percentage of income. Further decreases in taxes in combination with increasing costs for education, corrections, and social services would create a fiscally unsustainable situation.

Unbiased Analysis across Montana: Policy & Economics in the Presidential Election

This fall the Agricultural Economics and Economics Department offered students and the community a unique opportunity to examine economics and the politics of the presidential campaign. The course Obama and Romney: Policy and Economics in the 2012 Presidential Election met weekly to examine and analyze the presidential candidates' positions on major policy issues from an economic perspective. Professor Vince Smith, AE&E, coordinated the course meetings, while discussions on specific policy issues were led by AE&E experts in oil and energy policy; social security; taxation and tax policy; immigration, healthcare, and education policy; and financial regulation. Students, staff, faculty, university visitors, and Bozeman community members attended the weekly presentations. To listen to the lectures visit the website at Montana.edu/econ and click on the News icon.

Agriculture 2012: A Changing Landscape

In October, AE&E hosted the 2012 Fall Economics Outlook conference, Agriculture 2012: A Changing Landscape which kicked off Celebrate Agriculture!! Nearly 180 participants gathered to learn about current agriculture issues from faculty and guest speakers. Professors presented workshops on the Montana and U.S. agriculture outlook, cattle cycles, the impacts of drought on cattle inventory, Montana elevator industry changes, implications of the Canadian Wheat Board reform, landowners and oil leasing, and implications of banking reform on small agriculture lenders in Montana. John Anderson, deputy chief economist at the American Farm Bureau, spoke about agricultural policy in a volatile environment. According to feedback surveys, participants valued meeting others in the industry and exchanging information regarding cattle trends and grain elevator expansions within the state.

AGRICULTURAL EDUCATION

RECOGNIZING EXCELLENCE

TYLER HEUPEL, a senior in Agricultural Education, completed his student teaching at Shields Valley High School under the direction of Jim Rose, '83 graduate of Ag Education. Tyler's brother Justin teaches Ag Education in Kalispell, Mont.

ASHLEY NEWELL completed her student teaching this fall at Park High School in Livingston, Mont. Newell, originally from Victorville, Calif., appreciated the opportunity to learn from the experience of Kevin Foch who teaches Ag Ed in Livingston.

MARTIN J. FRICK, professor Agricultural Education, published a paper in the Slovenian *Journal Agricultura* regarding the need to build a cooperative business in Slovenia.

FAST FACT: MSU agricultural education students spend a combined average 5,400 hours beyond class time each academic year volunteering with 4-H, FFA and other service organizations.

Students in agricultural education explore animal science in a rich, hands-on program.

Justin Heupel teaches basic GPS skills to his class. Photo provided by Heupel.

Addressing the Needs of Montana

As unemployment remains high and Americans worry about the economy, the outlook in the Agricultural Education Division in the College remains optimistic. With job placement at nearly 100 percent for recent graduates, the division prepares students to teach the intricacies of agriculture in schools and communities and prepares them to effectively communicate with research experts, stakeholders, and the public. Graduates are marketable in Ag Education, Extension, and private industry, transferring research-based information into lessons and seminars for schools, businesses, and the public.

Nearly 70 percent of the Ag Ed graduates teach in Montana. One of these graduates, Jim Rose, class of 1983, is an Ag Ed teacher at Shields Valley High School. He strongly believes agricultural education is still important. "We need to understand the role agriculture plays in feeding the world. It is important for consumers to know what impacts the quality and quantity of their food." Rose has been teaching Ag Ed at the high school for 30 years and while the community demographics are changing, there remains a strong agricultural base. "I still teach animal science, plant science, and very traditional agriculture programs," stated Rose.

"The subjects we teach in Agricultural Education are the same as they have been for many years. However, the content which we teach within those subjects has changed immensely."

Much further north and west, Ag Education has been taught for nearly 100 years in the Flathead Valley, and Flathead and Glacier High Schools now offer a broader approach to agriculture through the H.E. Robinson Vocational Ag Center. The curriculum includes forestry, fish and wildlife management, animal husbandry, veterinary science, and precision agriculture as well as animal and plant sciences. According to 1996 COA graduate and current Ag Ed teacher Justin Heupel, "The program is as diverse as its community." The satellite campus operates a 100 acre farm where the students directly apply what they learn to growing crops and raising livestock. "With an increasing world population it is an exciting time to be in agricultural education," added Heupel who credits the program with opening up job opportunities for students who might not otherwise have an agricultural background.

Current Ag Ed senior, Chisholm Christensen of Hinsdale, Mont., chose to study Ag Ed because he likes the idea of being a jack-of-all-trades. "I wanted to learn more about Ag business, economics, and plant sciences. Ag Ed hits on all of it," he added. Chisholm is not the first in his family to study Ag Education. His father, Chris, graduated from Ag Ed in 1988 and taught at Hinsdale High School for 14 years before returning to ranching.

Students and alumni of the Ag Education division are proud to represent MSU in Montana communities where they interact with diverse segments of the population. Ag Ed has been part of the curriculum at the Land Grant Institution since 1917 with the passage of the Smith Hughes Act. The need for education in this area has not diminished, but rather increased according to students in the division and their faculty advisors. "The science is there – throughout the entire College," Shannon Arnold, Ag Education assistant professor added, "but the knowledge about that science needs to be shared."

"We are the only program in the College that focuses on future teachers and educators," explained Arnold. "We work with Montana's most important natural resource – its people," she added.

COA students enjoyed participating in Field Day activities at the Post Farm in Bozeman.

The MSU equine program has grown rapidly since its inception in 2003.

New Money for Equine Science at MSU

"The MSU Equine Science Program recently received new money in support of the program growth," stated Jeff Jacobsen, Dean of the College of Agriculture.

The Animal and Range Sciences Department, the COA and the Provost joined a student and faculty-driven initiative to enhance the equine science curriculum. The 12 additional equine science credit hours include courses in equine anatomy and physiology, equine ethology, exercise physiology and equine diseases.

Several sources helped finance the new programs. Along wwith the Dean's Office, the MSU Safety and Risk Management office collaborated with A&RS and received grant funding to install a new sprinkler system in the indoor riding arena to control dust. The Dean's Office paid for new paint, fencing, landscaping and lights for the indoor arena.

The equine program continues to benefit from the efforts and support of the Equine Boosters of Montana State University. This year the boosters contributed money for new pipe fencing and new footing for the indoor, outdoor and herding arenas.

"The footing is a combination of dirt and sand that needs replaced periodically – especially with high use," explained Shannon Moreaux, A&RS assistant professor. The Equine Boosters provide 15 to 18 horses annually for the Colt Breaking and Advanced Horse Training courses. Students start training the horses fall semester. The horses are then sold at the Top of the West Horse Sale, in conjunction with the Kentucky Derby. Proceeds go back to the boosters for additional projects and also to help get more horse donations for the next academic year.

BRIEF HISTORY:

Professor Bob Miller started the program in 1960 and was honored by the dedication of the Miller Pavilion in 1968. Many facility and program improvements have occurred over the last 40 years. In 2003 the College introduced the Equine Science Option, one of three options for Animal Science students. The other options are the Science Option which includes many pre-vet students and the Livestock Management and Industry Option.

EQUINE SCIENCE OPTION:

In 2004 enrollment in the Equine Science Option shot up from six students to 41. Today there are 82 students in the bachelor's program. The curriculum includes chemistry, biology, anatomy, math, economics, business, statistics, range management, physiology, genetics and basic and advanced courses that apply to domestic livestock and some companion animals like dogs and cats. The students must take eight credits of equitation course work including beginning and intermediate lessons in Western and English riding, Colt Breaking and Training, Specialized Horse Training, Rangeland Monitoring or Horse Management Practicum. Equine Nutrition, Equine Reproduction, Small Pasture Management, Diseases of Domestic Livestock, Equine Form to Function and Equine Lameness are also required.

OPPORTUNITIES FOR THE HORSE ENTHUSIAST

Student-driven activities at MSU include a Horseman's Club, the Intercollegiate Horse Show Association Team, Stockhorse Team, Polo Team and Driving Team. The equine extension program offers an Annual Equine Conference, Annual Youth Horsemanship School, local producer and elementary equine education, and support for non-profit programs like Eagle Mount and 4-H.

FAST FACTS:

- Out-of-state students comprise 40 percent of the Equine Option population.
- The Equine Boosters of MSU are a nonprofit serving the equine education program.
- The 2013 Top of the West Horse Sale will be May 4 with proceeds going to the MSU Equine Science Program.
- The COA, A&RS department and the Equine Program hosted the 2012 National Association of Equine Affiliated Academics annual conference.
- Dr. Moreaux serves on the National Association of Equine Affiliated Academics Board of Directors.
- An MSU Equine Science graduate student and an undergraduate student became the first MSU students to win four awards at international equine and animal science research competitions.

Plug Your Nose and Hold Your Breath

Anyone who has been in a dissection lab can probably remember the first encounter with that hideous stench as the smells combine to assault the senses and confuse the nose. Hence, when invited into the Animal Bioscience Building on a warm September afternoon to observe a dissection of a ewe's digestive tract I caught myself taking a deep gulp of fresh clean air as I pushed the glass doors to the lab open and entered the "operating room." I stepped up to the table, holding my tablet in a professional manner and trying not to use up too much oxygen – dreading the moment I would need to inhale that next breath – the stinky knock your socks off breath of air – remember the smell? After what seemed an eternity – I am good at holding my breath – I took a timid breath so I wouldn't embarrass myself by passing out and becoming the new subject of the class. SHOCKER!! I didn't smell anything. I tested my nostrils to see if they were plugged – air in – air out…no smell…

Bailey Engle, a sophomore in A&RS, prepares samples in Thomson's lab.

The College of Agriculture has shared the many features of the state-of-the-art Animal Bioscience Building, but they haven't written about some of the state-of-the-art equipment. The necropsy down-draft tables, funded by Cargill, suck in the smells and waste products of the carcass leaving the room as fresh smelling as it would be in a reading lab. "The table was worth every bit of the $50,000," commented Jim Berardinelli, Animal & Range Sciences professor. "It has changed the way we teach these classes." A camera system has also been incorporated in the lab's design. The ceiling camera has a 432x zoom resolution and is controlled via remote control. The camera can view in detail a dissection twice the thickness of a human hair. The image is simultaneously projected on a large screen in the front of the room. "Instead of 10 students crowding around a table, we can allow 25 students a perfect view. If they miss something they can download the file later and re-watch the lab on their own computers," explained Berardinelli.

Jennifer Thomson, a new assistant professor in A&RS, is quick to add the *Ion Torrent Personal Genome Machine* to the list of new equipment. Scientists use the small genetic sequencer, about the size of a desktop printer, to profile genetic information in samples taken from livestock. The genome machine sequences both the messenger molecules of RNA in a particular tissue and the DNA codes. The machine cost $95,000 and was funded by Thomson's start-up which included support from the Dean, Vice President for Research, the Montana Experimental Program to Stimulate Competitive Research (EPSCoR), with the National Science Foundation.

Thomson's lab also includes a *Maxwell 16* (a machine which extracts nucleic acid and runs 16 DNA samples at a time), a polymerase chain reaction machine (amplifies a single piece of DNA and makes copies), a refrigerated micro centrifuge (cold spinner), and a computer bio-analyzer which measures RNA and DNA samples. "All of this equipment will increase quality control," explained Thomson. "It helps identify genetic markers, so producers can make better decisions about the animals they breed." Students in the MSU Animal Genetics and Breeding program are the first generation to have access to this type of equipment and genetic information.

While the Illumina MiSeq sounds like it belongs in an episode of "Star Trek," it is actually in the Animal Bioscience Building and does similar work as the Ion Torrent. The Illumina MiSeq collects specific information from multiple DNA molecules helping scientists study microbial life in a sample. The Illumina MiSeq will enable animal scientists to explore livestock-associated microbial ecosystems quicker and with greater accuracy. Carl Yeoman, another new assistant professor in A&RS, is researching essential bacteria in the digestive and reproductive tracts of livestock and using the Illumina MiSeq with his classes and research projects.

Thomson and Yeoman believe the equipment will eventually improve reproduction and rangeland efficiency. "It extends what we can understand and share," stated Yeoman. "Before we were limited to understanding only the microbial bacteria we could grow on an agar plate which was as little as one percent of the total population."

To put the new equipment in perspective Yeoman explained that his Ph.D. faculty advisor sequenced 300 nucleotides in three years. Yeoman can now sequence 15 billion nucleotides in 24 hours at a fraction of the cost. "We have leading edge research infrastructure that supersedes other learning institutes," stated Yeoman.

"Our students are learning the latest technologies to answer tomorrow's questions. This can revolutionize the livestock industry," Glenn Duff, department head for A&RS, proudly shared.

According to Duff and other faculty members the new equipment provides MSU students the opportunity to interact directly with the latest molecular technologies available in microbial ecosystems, and it will empower the research outcomes of graduate students, bringing Animal and Range Sciences at MSU to the front of current molecular research in the U.S.

FAST FACTS:

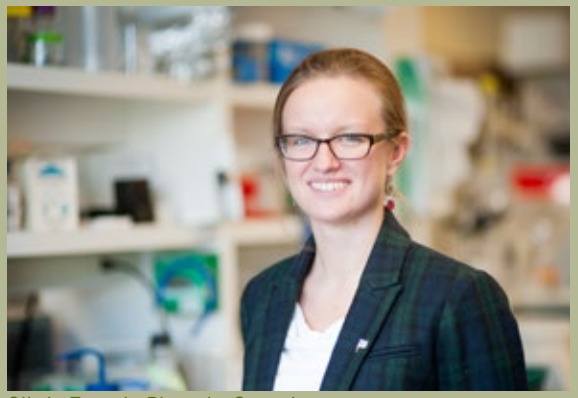
- The Illumina MiSeq technology is being used by the graduate level nutrition classes to characterize changes in fiber and liquid rumen microbes associated with changes in feed particle length in ewes.
- MSU faculty members are also using the MiSeq to help members of the Crow Indian Reservation identify sources of antibacterial-resistant E. coli contaminating the Little Big Horn River and residential wells.
- The Illumina MiSeq cost $125,000 and was generously funded by the College of Agriculture and the Montana Agriculture Experiment Station.
- Other funding for new equipment came from NSF EPSCoR.

IMMUNOLOGY & INFECTIOUS DISEASES

RECOGNIZING EXCELLENCE

- The Pre-veterinary Program, directed by **DR. REBECCA MATTIX**, has grown to more than 200 students.
- New financial resources have been secured which will now fully support the growth in **ANATOMY and PHYSIOLOGY** courses.
- All students admitted to veterinary school on the Western Interstate Commission for Higher Education program last year were **MSU PRE-VETERINARY STUDENTS**.
- Ph.D. student **ROBERT WATKINS** received a travel award from the Society for Leukocyte Biology to attend the Annual Scientific Meeting Oct. 27-30, 2013, in Maui, Hawaii.
- Ph.D. student **OLIWIA ZUREK** was selected by the American Society for Biochemistry and Molecular Biology for Fall Hill Day to spend a day in Washington, D.C. visiting with senators and congressmen to advocate biomedical science research and funding.

According to Zurek, she came to MSU because of the excellent Molecular Biosciences Program. The Montana Idea Networks of Biomedical Research Excellence (INBRE) sponsored her first year of laboratory rotations where she explored subjects including plant sciences, chemistry, and immunology and infectious diseases and eventually selected a research program with ImID professor Jovanka Voyich-Kane exploring host immune responses to Methicillin-resistant Staphylococcus aureus diseases. Research results may help treat against life threatening infections.



Oliwia Zureck. Photo by Sepp Jannotta.

Improving Medical Research throughout Montana

MSU is the lead institution of a network of 15 colleges and universities that received a five-year award from the National Institutes of Health. The award is part of an institutional development award to build research in states currently receiving little NIH funding. The Montana Idea Networks of Biomedical Research Excellence (INBRE) strives to improve research capabilities in Montana through education and networking. In Montana the researchers are focusing on infectious diseases and environmental health related issues. Allan Harmsen, professor in the Department of Immunology and Infectious Diseases, is the director of the Montana INBRE program.

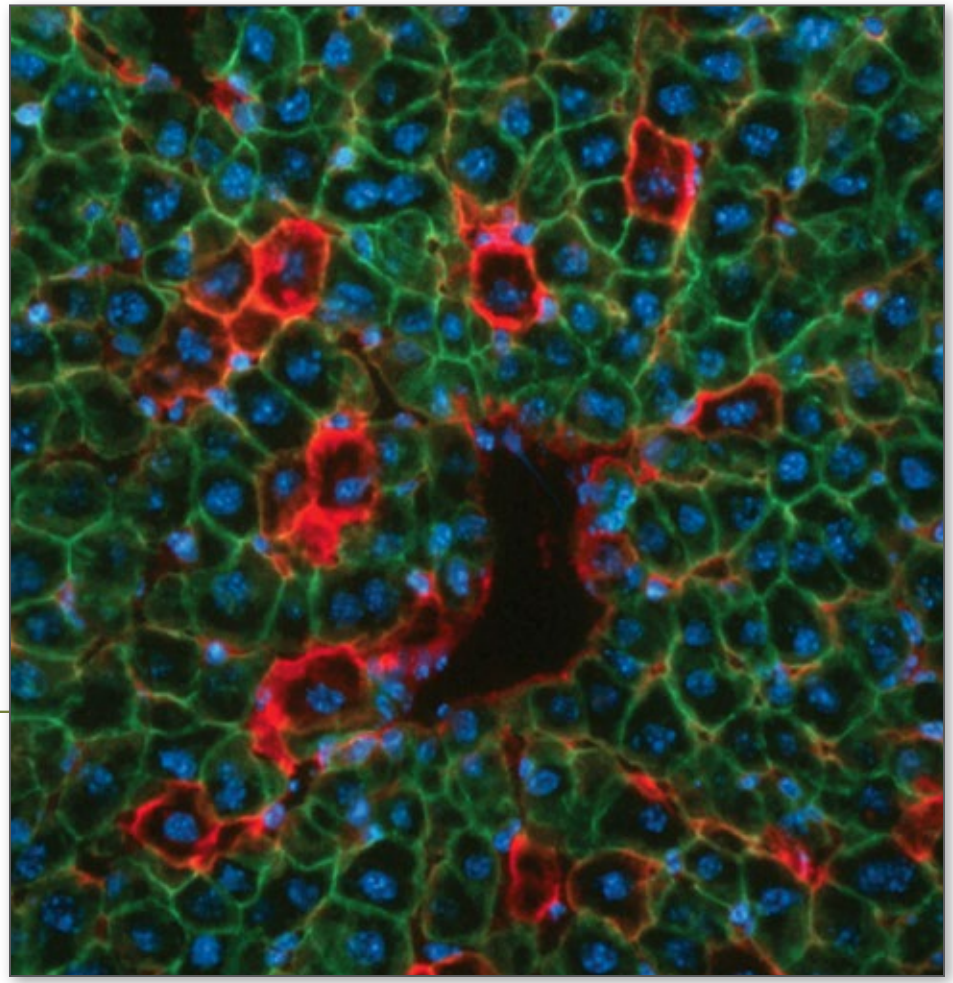
INBRE funds graduate and undergraduate programs throughout Montana encouraging students to pursue careers in biomedical or health related fields. Each year the program brings approximately $3 million into the State. According to Stephanie Cunningham, director of the Molecular Biosciences Graduate Program at MSU, "INBRE affords the University the ability to launch fellowships for exceptional students, so they can find the right program and commit to a Ph.D."

ImID professor Jovanka Voyich-Kane recently benefitted from the fellowship program gaining two doctoral candidates, Robert Watkins and Oliwia Zurek. "I was accepted to the INBRE-funded Molecular Biosciences Graduate Fellowship Program in 2008 and this was my deciding factor for attending Montana State University," stated Watkins who studies host immune responses to MRSA (Methicillin-resistant Staphylococcus aureus) diseases. "The fellowship/INBRE allows us to spend money directly on research-related materials. "Without INBRE funding, I am certain my graduate experience would not have been as enriched as it has been," concluded Watkins, who will graduate this spring.

INBRE projects also focus on emerging infectious disease and environmental health issues, with other College departments receiving funds. Shavonn Whiten, a first-year graduate student in LRES, received funding through INBRE and EPSCoR. The 24-year-old native of Baton Rouge, La. worked with a research team at a university in Ghana, Africa studying malaria before coming to MSU. "INBRE's goal is to increase science and medical awareness in Montana," explained Whiten who is researching how temperature affects the ability of insecticides to manage mosquitoes. "If you apply my research to global warming and the impact temperature has on insecticides it *is* a biomedical issue," said Whiten. Robert Peterson, LRES professor is her faculty advisor.

Fluorescent Cells Confirm New Discovery

Edward Schmidt, an associate professor with ImID, and his lab associates published a paper in the scientific journal *Hepatology*, demonstrating adult stem cells in the liver continuously produce new liver cells throughout life. While scientists have known for decades the liver contained stem cells, nobody had ever seen them doing anything. Schmidt's team was able to see "birth" of new liver cells from the stem cell pool by using a line of mice carrying transgenes that make mouse cells fluorescent red, but causes the red stem cells to switch to green when they differentiate into liver cells. Scientists in California and Belgium confirmed the study which has now received support from the National Institutes on Aging, which is providing Schmidt's team, in collaboration with Professor Tomas Gedeon in the MSU Mathematical Sciences Department, $1.125 million over the next five years to study and model the roles of stem cells in liver growth, maintenance, and rejuvenation.



Dr. Edward Schmidt used a special fluorescent microscope to capture the mouse liver indicating both pre-existing and new born liver cells. The red liver cells developed from stem cells within five days and haven't yet converted to green. The green cells have already converted from stem to liver cells in five or more days. "This shows that livers have an intrinsic method to replace damaged areas," explained Schmidt. "We don't yet know how effective it is and what the clinical application might be." This new information could potentially help doctors better treat people with livers damaged from cancer, environmental exposures, hepatitis or other problems.

LAND RESOURCES & ENVIRONMENTAL SCIENCES

Crops scientist Perry Miller carefully handles the spines on this safflower crop in the Gallatin Valley.

LRES Impact Spans the Globe

It is 9 o'clock Thursday morning in Bozeman and the assignment is to write a feature on the recent graduates from the Land Resources and Environmental Sciences Department's masters and doctoral program. This is no easy task as we must determine the time differences for England, New Zealand, New York, and Indiana. If it is 9 a.m. Thursday, Mountain Standard Time then it is 4 a.m. Friday in New Zealand. It is only an hour ahead in Indiana and two hours ahead in New York, but time for the new doctors in the United Kingdom to head to their local pubs.

The LRES graduates are as diverse as the locations where they are working. What they have in common is their success finding remarkable jobs and the positive experiences they shared at MSU. LRES has one of the largest graduate programs on campus averaging 55 students. Within the past year, 11 students completed a master's program and 11 received doctoral degrees. The story today is the stimulating job opportunities and the places these graduates are living, working, and studying.

Two students from the master's degree program are staying at MSU as research technicians, two landed jobs in private industry in Montana, one is with the USDA and Animal and Range Sciences as a research technician, and one is working as a biological science technician for the Northern Rocky Mountain Science Center. Canada National Parks hired a graduate to serve as a research manager and two are pursuing doctorates at the University of Alberta and Duke University.

The doctoral program sent expertise around the world with six taking postdoctoral placements in the United Kingdom, Pennsylvania State University, Univ. of Oregon, Univ. of Alaska, Univ. of Nevada-Reno and the University of South Antarctica. Tim Covino is assuming a postdoctoral fellowship at Duke University. One will remain at MSU and another is off to Sweden to serve in postdoc research positions. Tyler Smith, a Great Falls native, is now an assistant professor at Clarkson University in Potsdam, New York. I was able to catch up with a few of the graduates and their faculty mentors and here is a brief summary of what they are currently doing.

Justin O'Dea is working as a county extension agent for Cornell University in his home state of New York. With a master's degree in LRES, O'Dea focused on agronomy, soil science, and ecology. His advisor was Perry Miller, a LRES professor. "It was the excellent committee that pushed me," shared O'Dea. "I was always challenged and they put a lot of effort into me. They pushed me to be a scientist with a high degree of integrity and skill," he added. LRES is a diverse department with a supportive and cohesive environment. "We were able to find interest in each other's work, and it motivated us," added O'Dea.

Tyler Brummer has been accepted into a fully funded Ph.D. program at Lincoln University located in Christchurch, New Zealand and will be associated with Landcare Research, a government organization overseeing ecological and natural resource programs. Brummer is working at MSU until his program starts in February.

Jerome Schleier III, originally from Salem, Ore., graduated in May with a doctorate in ecology and environmental sciences and was offered a choice of positions in Dow Agro Sciences in Zionsville, Indiana. He selected a position as a scientist helping develop new technologies for pesticide formulations and applications. "I get to use everything I learned at MSU," commented Schleier. While sharing how much he enjoys his job, he is quick to credit the faculty in LRES for helping him achieve this position. Bob Peterson, LRES professor, served as Schleier's advisor for nearly 6 years. "I couldn't have asked for a better education. The faculty, the experience, all of it…I wish I could turn the clock back and do it all again!"

Lesley Noelle Orloff is a MSU research technician focused on the ecology and management of rangeland weeds, especially revegetation. According to LRES professor Jane Mangold, "Orloff is a valuable asset to the weed ecology program due to her ability to recognize the complexity of weed management and implement research that teases apart those complexities to come up with applied solutions." Originally from Illinois, Orloff attended the University of Montana and received her bachelor's degree in Natural Resource Conservation. Orloff enjoys her position as a MSU research technician, because in her words, "it is like solving a puzzle every day." The Montana community affords Orloff the opportunity to work in rural communities where she finds others willing to share their knowledge about the land they grew up with.

Mac Burgess met Perry Miller, LRES professor in 2006 at a conference in Memphis, Tenn., and earned his Ph.D. in April. Burgess writes, "I was impressed by his practical approach to agricultural research, and we shared common research interests. Perry spends a lot of time talking to farmers, doing applied research that is immediately relevant to their needs, and sharing the results with MSU students. I was fortunate to have the opportunity to share in all aspects of his research projects, and learned a lot about challenges and rewards of farming in the northern Plains." Burgess is now a Penn State project manager investigating the value of different cover crops in Pennsylvania dairy feed production.

James Meadow started his graduate program with LRES professor Cathy Zabinski with the goal of advancing soil ecology research in ecological restoration. He is working as a postdoctoral research associate at the Biology and Built Environment Center at the University of Oregon and shared the following:

"I was very attracted to the microbial ecology research being done in Yellowstone, and delved in upon noticing soil research in this fascinating system was underrepresented. I came away with an understanding of soil science, plant and microbial ecology, microbiology, statistics, and also teaching. The flexibility and inherent interdisciplinary nature of our department allowed me to broaden my research when new opportunities arose."

Fred Pollnac, studied invasive plant ecology and credits his committee members with helping him become not only a better scientist, but better able to share his research through frequent presentations. "I always felt my committee wanted nothing more than for me to succeed in my program and to produce quality research which would be of value to the scientific community. They helped me to achieve both of those goals in a very positive manner," offered Pollnac a postdoctoral researcher at MSU with LRES professor Lisa Rew.

As the emails flow back and forth across the U. S. my computer buzzes with an incoming Skype™ call. Marie Sabacka, recent doctoral graduate from MSU – originally from the Czech Republic is skyping from her house in Cambridge, U.K., Sabacka received a master's degree from the Center for Polar Ecology in Prague. While completing her master's in Prague she frequently consulted the research conducted by LRES professor John Priscu. During one of her frequent reviews of his online website she noticed he was looking for a doctorate student in glacier microbiology. She applied for the position and started working on her doctorate at MSU in 2005. Sabacka traveled extensively to Antarctica with research teams from here. She is now working in Cambridge for the British Antarctic Survey as a glacier microbiologist and biogeochemist and will spend 5 months this winter in the South Orkeny Islands of Antarctica.

John Priscu, professor in LRES and faculty advisor for Marie Sabacka believes that the diversity of the LRES programs helps students successfully transfer into the "real world." According to Priscu, "students will often encounter situations where the diversity of scientific disciplines they were exposed to in LRES allows them to make well-informed decisions." Other faculty members echo his sentiment.

LRES professor of soil science and extension specialist Clain Jones, believes the unique opportunities to work and study in diverse places like the Antarctic, Arctic, Yellowstone National Park, and incredible agricultural fields and rangelands in Montana makes the LRES program at MSU highly competitive. "High interest in the program has allowed us to select top notch students who excel and very frequently obtain first author publications from their research," added Jones. This year's graduates certainly attest to that success.

For more information on the LRES programs please visit their website at http://landresources.montana.edu.

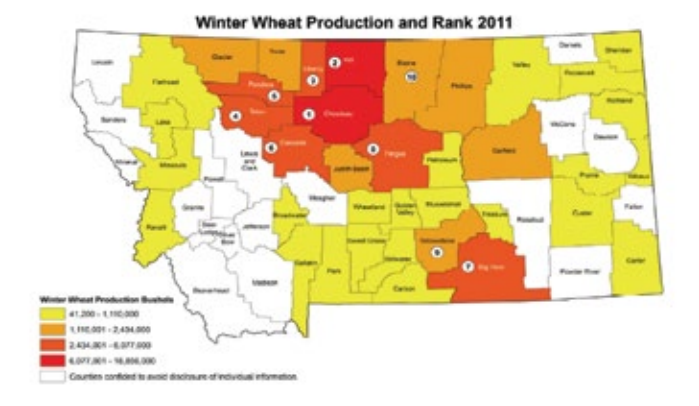
WHERE ARE THEY NOW?

Master of Science Degrees

- Dustin Anderson: environmental scientist for Tetra Tech
- Joy Barsotti: research technician for USDA ARS
- Tyler Brummer: Ph.D. candidate at Lincoln University in Christchurch, New Zealand
- Benjamin Dorsey: Ph.D. candidate at University of Alberta in Edmonton
- Leslie Jones: biologist for the U. S. Geological Survey Northern Rocky Mountain Science Center
- John Mallard: Ph.D. candidate in Eco-Hydrology at Duke University
- Ann McCauley: Department of Environmental Quality in Helena, Mont.
- Justin O'Dea: Cornell University Extension Agent
- Lesley Noelle Orloff: MSU research technician
- Matthew Scrafford: Ph.D. candidate in Wildlife Biology at the University of Alberta
- Russell Smith: restoration consultant in Livingston, Mont.

Doctoral Degrees

- Melissa Bridges, University of Warwick, United Kingdom: postdoctoral research
- Macdonald Burgess, Pennsylvania State: postdoctoral research
- Tim Covino, Duke University: postdoctoral fellowship
- Christian Klatt, Swedish University of Agriculture Sciences: postdoctoral research
- James Meadow, University of Oregon: postdoctoral research
- Randall Mullen, University of Alaska-Fairbanks: postdoctoral research
- Fredric Pollnac, MSU: postdoctoral research
- Marie Sabacka , British Antarctic Survey, Cambridge, UK: Glacier Microbiologist/Biogeochemist and part-time for the Center for Polar Ecology in the Czech Republic
- Jerome Schleier, III: scientist for Dow Agro in Zionsville, Ind.
- Tanya Skurski, University of Nevada-Reno: postdoctoral research
- Tyler Smith, Clarkson University in Potsdam, New York: assistant professor



This map was taken from the National Agricultural Statistics Service and the Montana Annual Statistics Book found on the internet at www.nass.usda.gov.

FAST FACTS:

- Montana shipped 73.9 million bushels of wheat in the first 6 months of 2012 and 92 percent of it went west.
- Japan imports 950,000 metric tons of Montana winter wheat per year citing its high quality which performs well in breads and noodles.
- Winter wheat has a higher yield but lower grain protein content than spring wheat.
- The MSU College of Agriculture's Cereal Quality Laboratory tests the grain for end-use qualities.
- David May is a student in the master's program studying a nematode -- a microscopic worm that attacks roots of the wheat. May is exploring how to incorporate genetic resistance into winter wheat.
- The Montana Wheat & Barley Committee invested an average of $87,500 annually in the MSU winter wheat program totaling nearly $2 million since 1993.

PLANT SCIENCES & PLANT PATHOLOGY

Winter Wheat Breeding Program Impacts Montana Producers

For many in Montana the approach of winter means it's time to pull out the skis and snow boards; for others winter brings the consistent cold that encourages winter wheat seedlings to vernalize and ultimately, flower and head. The winter wheat breeder at Montana State University is among those that view winter as a chance to see how well the new cultivars respond to the climatic conditions of Montana as they continually develop improved varieties of winter wheat that excel in this sometimes harsh climate.

Phil Bruckner, professor from the Department of Plant Sciences & Plant Pathology, directs the University's Winter Wheat Breeding Program, a cooperative effort between Montana Agricultural Experiment Station and the wheat producers of Montana. The breeding team of Bruckner, Jim Berg and Ron Ramsfield, and most faculty and staff at the Research Centers have worked together for more than 18 years. According to Bruckner, "The objective of the breeding program is to develop improved cultivars of winter wheat adapted to Montana's climate and cropping systems. We are looking for lines which possess superior on-farm production characteristics (grain yield, winter hardiness, adequate and durable pest resistance, stress tolerance, and agronomic characteristics)." Breeders also focus on superior end-use quality characteristics.

Winter wheat normally experiences less drought and heat then spring wheat. Generally planted in September, winter wheat emerges in the fall and will ideally have four to six leaves before the cold arrives. The plant then requires five to six weeks of consistent cold weather to flower and head. No-till practices have positively impacted winter wheat as the snow offers more insulation and moisture than it did under fallow conditions. The growing cycle is completed in July and August when farmers harvest the wheat – usually earlier than spring wheat. Because it completes its life cycle under more favorable conditions, winter wheat has a higher yield per acre than spring wheat in Montana.

Bruckner, an applied geneticist, has been developing improved plants for almost 30 years and is continually starting new plant breeding cycles. Genetic diversity is necessary to develop high yielding cultivars. As the plant parents improve, so do the progeny. The process is slow and can take ten years between hybridization of superior parents and the selection, testing, and release of a superior variety. "The most difficult trait to improve is grain yield, which is controlled by multiple genes and strongly influenced by environment," Bruckner explained.

The breeding program is important to Montana agriculture. Montana farmers planted 2.2 million acres of winter wheat in 2012, ranking fifth in the United States for the number of acres planted, according to the USDA National Agricultural Statistics Service, Montana Field Office. Three of the top four varieties planted in Montana this year were developed by the MSU Winter Wheat Breeding Program. *Yellowstone*, *Genou*, and *Rampart* made up more than half of the total winter wheat planted. Winter wheat brings in about $600 million in revenue each year to Montana and maintaining an adequate supply requires a rigorous breeding program to support the

Montana wheat producers. Bruckner and his team rely on a combination of field, greenhouse, and laboratory efforts for successful cultivar development.

Bruckner's team uses eight sites in Montana and North Dakota for research and development. The Agricultural Research centers throughout Montana offer different growing conditions. The program also uses the Williston, N.D., research center because of its severe winters. Growing under extreme conditions helps the researchers select for good winter hardiness. The Post Farm in Bozeman is the headquarters for the project. The Farm offers ideal growing conditions with less severe winters, few hail storms and a mild September for planting. This results in a high yield crop increasing seed availability.

Professor Phil Bruckner and seed manager Ron Larson examine wheat growing at the Bozeman Post Farm. Photo by Heather Rimel.

The MSU Winter Wheat Breeding Program has introduced 18 varieties of winter wheat since 1992 when Bruckner first came to the University. The varieties include *Vanguard*, *Rampart*, *Genou*, *Yellowstone*, *Norris*, *Decade*, *Bearpaw*, and *Judee*. "Our real report card is the variety utilization reports," stated Bruckner who also relies on feedback from survey data. "If the product isn't better the producers won't use it." Based on usage reports the MSU Wheat Breeding Program is extremely successful.

Yellowstone is the most common winter wheat variety for 2012 and was the highest yielding variety for 2011. *Yellowstone* has a hollow stem and is resistant to stripe rust. It accounts for 23 percent of the state's planted acreage with half a million acres seeded. *Yellowstone* is a hard red winter wheat developed and introduced in 2005. The variety is high yielding with medium test weight, maturity, height, and protein. *Yellowstone* is excellent for baking and makes quality noodles. *Yellowstone* is moderately resistant to dwarf smut and stripe rust, but is susceptible to stem rust.

Montana farmers planted 433,500 acres of *Genou*, which made up 20 percent of the total winter wheat acreage in 2012. *Genou*, a solid-stem hard red winter wheat was released by MSU in 2004 to manage wheat stem sawfly. The newest releases of solid stem winter wheat are *Judee* and *Bearpaw*. *Vanguard* and *Rampart* were the first solid stem varieties available in Montana protecting against wheat stem sawfly, and *Rampart* is the fourth most common winter variety planted this year in Montana.

A recent variety, *Decade*, was released for production in Western N.D., and Eastern Mont., where higher levels of winter hardiness are required. *Decade* is in its first year of production in Montana where local producers have planted 34,000 acres. Early indications are that it will be a popular choice with seed companies and ultimately the end-user, farmers.

When the breeders find a product they want to pursue, they do statewide yield testing first on the eight research centers that represent diversity in environmental and production characteristics. Lines that perform well are then tested in smaller trials on 12 to 15 farmer's fields in Montana. "The farmers that volunteer to grow the cultivars help themselves, the experiment station, and the industry," explained Bruckner. It is not uncommon for seed companies to notice a test crop and make inquiries explained Bruckner. "They are proactive and interested in new things."

Terry McKeever and his dad, Lyle, have been offering test sites to the Northern Ag Research Center for many years. "Having the offsite is beneficial to us, because we know what works in our community," stated Terry a grain and seed producer from Loma. "We try to keep the site in the same area of the fields, because the neighbors like to pull over and see how the crop is doing – especially the varieties that are produced to combat sawfly," he added.

Bruckner credits the success of the wheat breeding program to the Montana wheat producers and the Montana Agricultural Experiment Station who provide funding for the breeding program, facilities, and the equipment. Berg and Ramsfield add credibility and experience to the long-term program. "Also critical to the success of the breeding effort is a much larger set of cooperators that are involved in different aspects of the program, including plant pathologists, entomologists, agronomists at the various research centers, cereal quality laboratory staff and more," concluded Bruckner.

RECOGNIZING EXCELLENCE

PHIL BRUCKNER teaches field crop production and will teach plant breeding this spring.

JIM BERG has worked in the winter wheat breeding program since 1994 and plans to stay until they introduce a variety that beats the *Yellowstone* yield.

RON RAMSFIELD graduated from the College of Agriculture in 1973 and spent 20 years at the Eastern Agricultural Research Center in Sidney before returning to MSU.

RESEARCH CENTERS

Prashant Jha at the Southern Agricultural Research Center explains study results regarding glyphosate resistant crops in a sugar beet field.

Decision-Making, Agronomy, and Outreach

Montana Agricultural Research Centers are sharing advancements in the industry through traditional field days, while also by using some of the latest computer technologies. Kent McVay and Prashant Jha at the Southern Agricultural Research Center developed a new online tool for producers to use when selecting herbicides. From the sarc.montana.edu site, click on the "agronomy decision tools" and choose between fertilizer recommendations, herbicide selection, or assistance developing an irrigation schedule. The interactive herbicide selection table allows farmers to enter the current crop data and the next planned crop along with a time schedule. By selecting specific weeds present in the fields, the program compiles data and offers users appropriate herbicide options. The intent is not to rank or recommend any particular herbicide, but filter out chemicals that don't fit the crop, rotation interval, or the weed spectrum.

Peas and lentils as pulse and cover crops.

Researchers at the Central Agricultural Research Center continue improving crop lines for both food and forage uses. Superintendent David Wichman summarized progress in four areas: peas and lentils, hooded barley, spineless safflower, and winter triticale. Researchers at the center successfully planted Austrian winter, green, and yellow peas during fall planting with several consecutive successful harvests. Researchers encourage growers in Central Montana to try these fall plantings. Wichman selected improved hooded hull-less barley lines for forage and grain production with higher levels of beta-glucan, a soluble fiber. Developing shorter season safflower offers another rotational crop producers can market as bird seed, cattle forage and upland game bird habitat. In spite of safflowers' coarse appearance, cattle find it palatable and it is highly digestible minimizing calf scours. Wichman is also proud of the progress made with the winter triticale study. Triticale, a cross between rye and wheat, offers producers an alternative forage crop that also has good potential for food as it is often found in seven grain breads and grows well in Central Montana.

According to Darrin Boss, superintendent for the Northern Agricultural Research Center, livestock health and growth rates remain critical issues. Boss is investigating long-term effects and interactions between crossbreeding, maternal efficiency and residual feed intake on mixed grass prairie using a GrowSafe facility recently installed at NARC. Currently, every NARC heifer and developing bull is evaluated through the GrowSafe system which monitors their feed intake and behavior. This study will help producers evaluate the maternal productivity of animals on the northern mixed grass in relation to residual intakes. Researchers are looking forward to using more genetic analysis as animal and range sciences professors Jennifer Thomson and Carl Yeoman develop advanced genetic programs in Bozeman. See article on page 15.

Cattle feed at the GrowSafe System installed at NARC. Photo provided by David Wichman.

AG EXCELLENCE AROUND THE WORLD

LEARNING WITHOUT BORDERS

Montana State University researchers, teachers, staff and students are developing partnerships, exploring agricultural science and sharing learning all over the world.

From our students who travel to trade perspectives with people in Mongolia, Croatia, Africa, and elsewhere—to our scientists who collaborate in global research partnerships—to our MSU experts who share their environmental and economic insight with the U.S. government, there are no borders when it comes to the discovery of knowledge.

This section recognizes just a few of the many activities that MSU scholars took part in around the world during 2012.

Dean Jeff Jacobsen and Wenxiong Lin, vice-president of the Fujian Agriculture and Forestry University toured a commercial vegetable production greenhouse south of the Fujian Province in China.

KRISTEL SLIFER, a senior in Plant Science and Plant Pathology spent the spring semester at the University of New South Wales in Australia as part of the MSU Study Abroad program.

TUCKER COLVIN, an environmental biology major in Land Resources and Environmental Sciences, studied in Chile this fall.

BLADE SCHUETT, a senior in Animal and Range Sciences did a summer internship on a commercial cattle ranch in Australia.

DAVID BAUMBAUER, MARTY FRICK, **VINCE SMITH** and **PAT MCGLYNN** traveled to Croatia and Slovenia to develop exchange possibilities. David worked bees in Zagreb and on the Adriatic Coast in Primosten, Croatia.

DEAN JEFF JACOBSEN and **CHENGCI CHEN** from the Central Ag Research Center visited two Universities in China to discuss potential student and faculty exchanges and research collaboration opportunities.

TIM McDERMOTT, Land Resources and Environmental Sciences, spoke at a Geobiology Conference at the University of Geosciences in Wuhan, China about environmental influences and constraints on microbial arsenic.

LRES professors **BRUCE MAXWELL** and **DAVID WEAVER** traveled to Argentina on two separate occasions to share their expertise. Maxwell shared his research regarding conifers at a tree encroachment workshop, and Weaver presented at a seminar hosted by the Entomological Society of Argentina.

LIZ GALLI-NOBLE, director for the Center for Invasive Species Management, housed within LRES, coordinated the *Weeds across Borders* conference in Mexico with experts from North America.

Sharing their extensive research of the hot springs in Yellowstone National Park (YNP), **DAVE WARD** spoke about cyanobacterial communities at an International Society for Microbial Ecology in Copenhagen, Denmark, and **ERIC BECRAFT** shared a poster outlining the Synechococcus ecological species living in the Mushroom Spring at YNP. **CHRISTINE FOREMAN** and **HEIDI SMITH** also displayed posters at the symposium. Their work focused on microbial communities in Glacier environments.

RECOGNIZING CONTRIBUTIONS

PEOPLE WHO MAKE A DIFFERENCE

It takes more than bricks and mortar to create an environment that ignites discovery and exploration, yet sustains connections between the many diverse individuals who live and breathe agriculture and natural resources in Montana. The following articles touch on the contributions of just a few of the wonderful people who have provided vision, leadership and passion that makes MSU's College of Agriculture and the Montana Agricultural Experiment Station much more than just a school or research operation.

MONTANA AGRICULTURAL EXPERIMENT STATIONS

College of agriculture field classes.

Montana State University President Waded Cruzado presents an Outstanding Agricultural Leaders Award to Madge and Larry Pilster.

Outstanding Ag Leaders 2012

The College of Agriculture presented its annual Outstanding Agricultural Leaders awards during the Celebrate Agriculture!! weekend October 26-27. Receiving the award for 2012 were **DALE SCHULER,** a grain producer from Carter, and **LARRY** and **MADGE PILSTER**, sheep ranchers from Alzada.

This year's recipients exhibited outstanding leadership in Montana public service, as agricultural producers, industry advocates, agri-business leaders, and as friends of agriculture. A selection committee comprised of three Montana agriculture representatives, a College of Agriculture faculty member and a student, reviewed the applications. This award has been presented by the College since 1999.

SCHULER is a 1982 graduate of the Agricultural Economics and Economics Department. Schuler was one of the first farmers in the Golden Triangle to use no-till farming practices which reduces moisture loss and helps retain nutrients in the soil. He has helped lead the agricultural industry in advanced technology and is applauded by fellow grain growers as a consensus builder. Schuler has served as the president of the National Association of Wheat Growers, president of the Montana Grain Growers Association and chairman of the U.S. Wheat Associates Joint International Trade Policy Committee, and is currently serving as president of the Montana Grains Foundation. Schuler has been a volunteer with Dutton Fun Day, Chouteau County 4-H, the Catholic Church-Dutton, and the Fort Benton Schools. Schuler is married to Margie and has two daughters, Bethany and Katie.

LARRY and **MADGE** (Marcott) **PILSTER** met in 1962 at Montana State College. They were married soon after Larry graduated from the College of Agriculture in 1965, Larry was drafted and served eight years in the Army National Guard. While he was at basic training, Madge worked on the family's ranch with her in-laws and learned the different facets of the operation. Larry and Madge have worked side-by-side for 47 years on the family sheep and cattle ranch in Alzada where they currently run approximately 1,700 head of sheep and 300 head of Angus cows.

Both have served on numerous local, county, state and national committees as members and leaders. Larry has served as the board chairman for the Center of the Nation Wool Warehouse in Belle Fourche, S. D., since 1991 and is currently the chairman of the American Wool Council. Madge is the former president of the Montana Wool Growers Women and the American Sheep Industry Women's Organization.

They have served 4-H, school and county boards, the volunteer fire department, Montana Public Lands Council, and Montana Stockgrowers Association. Larry and Madge have three grown children: Shawn, Lane (Dawn), and Misti (Del) and five grandchildren.

Dale Schuler poses for pictures with his wife, Margie, and daughters Katie and Bethany after receiving the Outstanding Agricultural Leaders Award.

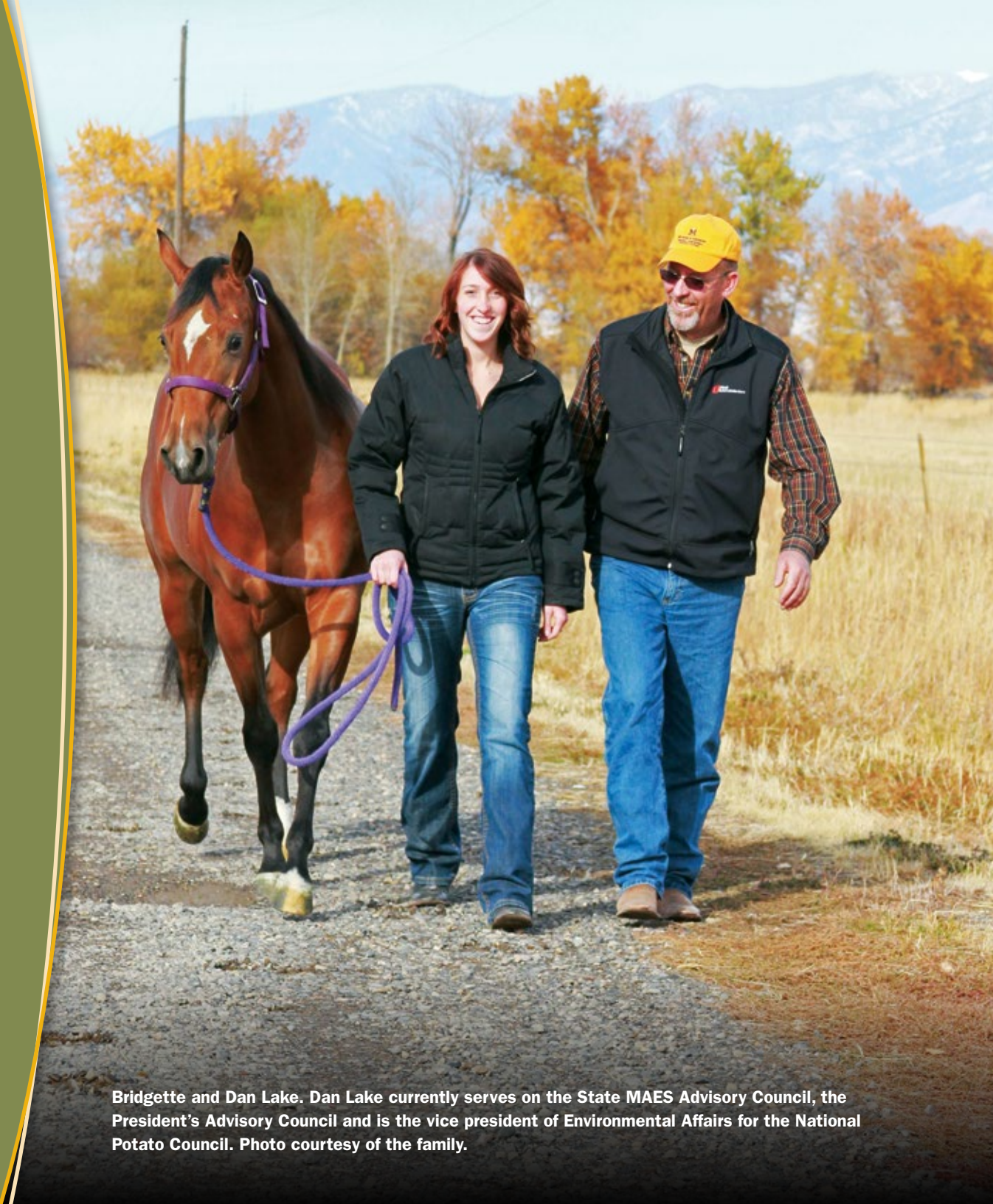
SUSTAINING OUR EFFORTS

STRONG ROOTS TO THRIVE

Despite the difficult global economy, the College of Agriculture and the Montana Agricultural Experiment Station are grateful for the past and present and optimistic about the future.

We have been fortunate to have incredibly generous friends. These friends have donated to scholarship programs, research programs and building projects that not only contribute to current successes, but place us at the edge of a new frontier of research prominence and student engagement.

As we welcome more and more students while changing and adding programs to meet their needs, the support of our friends becomes even more critical. Together, we'll meet the challenges of the years ahead and keep Montana agriculture strong and competitive.



Bridgette and Dan Lake. Dan Lake currently serves on the State MAES Advisory Council, the President's Advisory Council and is the vice president of Environmental Affairs for the National Potato Council. Photo courtesy of the family.

Bobcat Tradition

A great Bobcat tradition is passing school spirit onto the next generation – even better is when you can keep it in the College of Agriculture. Dan Lake, a 1987 graduate of the COA, is sharing his love for MSU with his daughter, Bridgette, a senior in Animal and Range Sciences. "Being a Bobcat is just part of growing up in our house," she commented.

Dan, a third generation farmer from Ronan, remains committed to the University and the relationships he forged with fellow students and faculty while at MSU. "I enjoyed my time at Montana State University and the unique relationships I developed with my instructors. I still rely on those relationships," stated Dan. "There probably isn't a week goes by I don't call them with a question or for some advice," he added.

Bridgette, an equine science student, agrees with her dad and values the expertise of her instructors. She credits Dr. Shannon Moreaux, Animal and Range Sciences professor, with connecting to his students and challenging them to excel. Bridgette plans to pursue a career in equine reproduction. A member of the MSU Equestrian Team, Lake competed at the Semi-Finals Inter-collegiate Horse Show Association in Florida last summer.

While the tradition of being a proud Bobcat hasn't changed in 25 years, farming certainly has explained Dan. "It is so science based – you don't get lucky anymore. We manage crops for maximum production. Managing everything is important if we want to survive." Dan argues successful farming takes a strong science and business background. "We can't handle a struggle crop without science," added Dan defining a struggle crop as one impacted by weather, insect, or disease pressure. Dan uses computer modeling daily – computers evaluate his crops' need for fungicide, insecticide and water management.

"Farming is a fast moving, high tech industry," concluded Dan. "The MSU degree was just the start – staying in touch and being involved has made the biggest difference. We want our kids to get as much out of it as we did and I think Bridgette is doing that."

2012 Honor Roll of Donors

Each and every donation advances the College of Agriculture, resulting in a positive impact on our students. Below is a list of those who donated money to the College between November 1, 2011 and October 16, 2012. The dates for the donor honor roll were selected based on the *Ag Excellence 2010-2011* Honor Roll and accounting practices. These generous donations went toward student scholarships, facility improvements and support for students, faculty, and research programs. We sincerely thank you for these special donations.

"An investment in knowledge always pays the best interest."

– Benjamin Franklin

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We included an envelope in this publication if you want to join the Alumni Association or donate to the students and faculty in the College of Agriculture. If you have questions regarding how your gifts impact the College of Agriculture and the Montana Agricultural Experiment Station please call our Development Director, Darin Paine at 406-994-7671.

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MAES Advisory Council

The Montana Agricultural Experiment Station Advisory Council visited the Northwestern and Western Agricultural Research Centers in Creston and Corvallis this summer. While this sounds like the normal workings of an advisory council, it isn't always easy in Montana, because of the great distances. Pam Linker, Butch Andersen, Markus Braaten and I put in nearly 3,500 miles during the cross state tour. It was a terrific opportunity to spend time with the local advisors and producers at these two Research Centers. The tours definitely gave us a better feel for each centers unique agricultural environment. The tours and all of the interactions were very educational and much appreciated.

The MAES Advisory Board is looking forward to representing the Experiment Station in Helena during the 2013 legislative session. We will strive to help our legislators understand the unique and critical aspects of agriculture throughout Montana. Our future goals include continued updating of current facilities and helping to place the right researchers in the right locations across the Department of Research Centers. This will allow them to conduct research relevant to the local areas in Montana. Each advisory council member believes that the non-biased research that comes from our research centers is critical in helping farmer and ranchers sort through the myriad of new farming practices and management tools available today.

We are highly engaged volunteers!

Brett Nedens
MAES Advisory Council Chair

Agriculture students at work in David Sands' lab.

Tracy Dougher, professor of Plant Sciences and Plant Pathology, observes a student grafting plants.

Update on the Robert E. "Dr. Bob" Gough Memorial Scholarship

Dr. Robert "Bob" E. Gough passed away September 14, 2011 after battling cancer and was eulogized in *Ag Excellence* 2010-2011 as "an incomparable colleague and an extraordinary human being." A memorial scholarship was established in Dr. Bob's name to benefit horticulture students.

Thanks to generous donations the scholarship fund has approximately $20,000 of the $25,000 needed to fully endow the scholarship. An envelope is enclosed in this publication if you would like to make a donation in honor of Dr. Bob, or to any of the other scholarship funds through the College of Agriculture. Your support is greatly appreciated. If you have any questions please contact the College of Agriculture Development Director, Darin Paine at 406-994-7671 or email darin.paine@montana.edu.

Bob Gough and Cheryl Moore-Gough.

College of Agriculture and Montana Agricultural Experiment Station

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John Sherwood, Plant Sciences & Plant Pathology (PSPP)

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Agricultural Economics & Economics	*Agricultural Business*	*Agribusiness Management*	*Farm and Ranch Management*		*Agricultural Business*		*Master of Science in Applied Economics*
Agricultural Education	*Agricultural Education*	*Ag Relations*	*Broadfield Teaching*				*Master of Science in Agricultural Education*
Animal & Range Sciences	*Animal Science*	*Equine Science*	*Livestock Management & Industry*	*Science*	*Animal Science*		*Master of Science in Animal & Range Sciences*
	Natural Resources & Rangeland Ecology	*Rangeland Ecology & Management*	*Wildlife Habitat Ecology & Management*		*Natural Resources & Rangeland Ecology*		*Doctor of Philosophy in Animal & Range Sciences*
Land Resources & Environmental Sciences	*Environmental Sciences*	*Environmental Biology*	*Soil and Water Science*		*Soil Science*	*Water Resources (LRES)*	*Master of Science in Land Rehabilitation (multi-unit)*
	Geospatial & Environmental Analysis						*Master of Science in Land Resources & Environmental Sciences*
	Land Rehabilitation						*Doctor of Philosophy in Ecology & Environmental Sciences*
Plant Sciences & Plant Pathology	*Plant Science*	*Crop Science*	*Plant Biology*				*Master of Science in Plant Pathology*
	Environmental Horticulture	*Envir. Horticulture Science*	*Landscape Design*		*Environmental Horticulture*		*Master of Science in Plant Science*
							Doctor of Philosophy in Plant Science
Immunology & Infectious Diseases	*Pre-Vet Non-degree Program*						*Master of Science in Immunology & Infectious Diseases*
							Doctor of Philosophy in Immunology & Infectious Diseases
Multidisciplinary	*Biotechnology*	*Animal Systems (ImID)*	*Plant Systems (PSPP)*				
	Sustainable Foods & Bioenergy Systems	*Agroecology (LRES)*	*Sustainable Crop Production (PSPP)*	*Sustainable Livestock Production (A&RS)*			
					Entomology (LRES A&RS and PSPP)		*Master of Science in Entomology (multi-unit)*

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