April 2017

AGADEMICS

APRIL 2017

UW | COLLEGE OF AGRICULTURE AND NATURAL RESOURCES

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New publication: Designing markets for habitat conservation

By Tanya Engel | April 2017

This bulletin applies research on agricultural markets to new market-based approaches for habitat conservation. Since it is a new idea, there are many details still to be worked out. For example, how will buyers and sellers find each other? How will prices be set? Will buyers and sellers negotiate both price and quantity for traded conservation? How much oversight will the relevant regulatory agencies have over transactions? This bulletin indicates the importance of thinking about market design when setting up a habitat exchange or bank, as the rules of trading can affect market outcomes for buyers and sellers. [read]

10 New Videos

By Tanya Engel | April 2017

Staking houseplants

Soil amendment myths

Homemade herbicide

Hazard trees

Seed germination

Peter Kukowski: Soil Management on Wyoming Farms and Ranches (series)

Spring spiders

Lawn mower maintenance

Pesticide sprayer cleaning

High tunnel repair

Department of Molecular Biology Seminars

By Tanya Engel | April 2017

Seminars are Fridays, 2:10-3 p.m., Animal Science/Molecular Biology building, room 103.

- **April 7**: “Localizing Peptidoglycan Synthesis for Bacterial Growth and Morphogenesis,” Yves Brun, Indiana University Bloomington
- **April 14**: “T Cell Vaccinology: What Infections Have Failed to Tell Us about Making Better Vaccines,” Ross Kedl, University of Colorado Anschutz Medical Campus
- **April 21**: “Advances in Molecular Biology, Population Genetics, and Bioinformatics Solve Real World Problems,” Bruce Budowle, University of North Texas Health Science Center
- **April 28**: “Regulation of Zebrafish Gonad Formation and Function,” Bruce Draper, University of California, Davis

Proposals Submitted

By Tanya Engel | April 2017

Ehmke, Mariah, Carlos Camargo, and Cameron Grant: $59,954 to University of Nevada Las Vegas for Behavioral Economic Measures to Improve Child Immunization Rates in Wyoming."

Ernest, Holly, and Beth Mendelsohn: $4,732 to Meg and Bert Raynes Wildlife Fund for "Great Grey Owls at the Range-Edge: Population Genomics and Ecology of an Elusive Boreal Raptor."

Ernest, Holly, and Braden Godwin: $4,291 to Meg and Bert Raynes Wildlife Fund for "Genetic Connectivity of a Rocky Mountain Hummingbird in Threatened Sky-Island Habitats."

Kniss, Andrew: $15,100 to Western Sugar Cooperative for "Weed Biology, Ecology, and Management in Sugarbeet (Continuation)," $7,833 to Bayer for "Weed Science Research & Education Program (Continuation)," and $15,000 to Monsanto Company for "Weed Management Research and Education (Continuation)."

Sharma, Vivek: $8,850 to Western Sugar Cooperative for "Quantification of Growing Season Crop Evapotranspiration and Crop Coefficients for Sugarbeet in Wyoming."

Sharma, Vivek, James Heitholt, and Jeremiah Vardiman: $23,302 to U.S. Department of Agriculture Agricultural Marketing Service for "Dry Bean Water Management and Yield Response under Surface and Sprinkler Irrigation."

Stump, William: $32,300 to Western Sugar Cooperative for "Disease Management in High Plains Sugar Beets (Continuation)."

Monies Awarded

By Tanya Engel | April 2017

Crane, Kelly, and Caleb Carter: $24,288 from Utah State University for “Pesticide Education for Urban and Small Acreage Users.”

Ernest, Holly: $10,000 from Wild Sheep Foundation for “Integrating Genetic Data with Translocation History to Inform Scientific Management of Bighorn Sheep.”

Gigley, Jason: $284,998 from National Institutes of Health (NIH) for “Impact of Fc N-glyclan Structure on HIV-Specific Antibody Functions.”

Gomelsky, Mark: $24,251 from U.S. Department of Agriculture National Institute of Food and Agriculture (USDA NIFA) for “FFY16 (2015-2017) Hatch SubProj Mol Biol.”

Latchininsky, Alexandre, and John Connett: $30,000 from University of California, Davis for “Wyoming School Integrated Pest Management Outreach and Training.”

Levy, Daniel: $239,655 from NIH for “Integration of Xenopus Extract and Microfluidics to Study Organelle Size Scaling – 2017-2018.”

Love Stowell, Sierra, and Holly Ernest: $23,278 from U.S. Fish & Wildlife Service for “Genetic Matrixing of Greenback Cutthroat Trout at the Leadville National Fish Hatchery, Colorado.”

Nathanielsz, Peter: $103,322.70 from NIH for “Project 3: 2017-2018,” $206,789 for “Project 2: 2017-2018,” $106,951 for “Project 1: UC Denver – 2017-2018,” and $836,046 for “Mechanisms of Placental, Fetal Brain and Renal Outcomes of IUGR – 2017-2018.”

Scasta, John: $7,200 from Colorado State University for “Southern Rockies Fire Science Exchange Network.”

Scasta, John, Daniel Rodgers, and Preston Smith: $130,151 from Bureau of Indian Affairs for “Enhanced Ecological Vegetation Inventory of High-Elevation Basins in the Wind River Indian Reservation to Link Native American Culture with the Rangeland Resource.”

Stump, William: $7,000 from Wyoming Department of Agriculture for “Research to Improve Dry Bean Production in Wyoming.”

Thompson, Jennifer: $500 from various sponsors for “Barnyards and Backyards – An Innovative Project to Reach Out to Wyoming’s Small Acreage Landowner with Conservation Programs.”

Zalesky, Douglas: $55,720 from USDA NIFA for “FFY16 (2015-2017) Hatch SubProj WYGISC.”

UW Equestrian Team earns third, fourth

By Tanya Engel | April 2017

The University of Wyoming Equestrian Team wrapped up regional competitions in March, placing fourth in Western and fifth in hunt seat.

Ali Neuens of Centennial, Colorado, and Emily Cokl of South Jordan, Utah, are continuing on to Intercollegiate Horse Shows Association (IHSA) zone competition April 8-9 at Stanford University in California.

At Western Horsemanship Regionals March 5 at Colby Community College in Colby, Kansas, Erin Conley of Estes Park, Colorado, earned third in advanced horsemanship. Taylor Nofsinger of Littleton, Colorado, took fifth in intermediate horsemanship.

At Hunt Seat Equitation Regionals March 11 at Colorado College in Colorado Springs, Neuens nailed second in open equitation on the flat and third in open equitation over fences to become the Zone 8, Region 5 reserve high point rider in open equitation.

Cokl earned second in walk-trot equitation, and Kelly Munson of Houston earned third in intermediate equitation on the flat.

At Stanford, Neuens competes again in open equitation on the flat and Cokl in walk-trot equitation.

The IHSA promotes competition for riders of all skill levels, who compete individually and as teams. Equestrian Team riders do not need to own horses to practice or compete.

The UW Equestrian Team coach is Jessica Ford; Brenda Alexander, associate professor in animal science, is adviser.

Erin Conley in open reining

Team picture with ribbons at western show Feb. 18-19 at University of Nebraska in Lincoln, Nebraska

Ali Neuens in open equitation

Cheyenne sessions highlight increased property value, natural resource protection

By Tanya Engel | April 2017

Kristina Hufford, associate professor, ecosystem science and management

Tips and techniques small-acreage landowners can use to improve property values and protect natural resources are featured at a Cheyenne workshop in April.

"Habitat Restoration on Small Acreage" is 8 a.m.-5 p.m. Tuesday, April 25, on the Laramie County Community College campus, says Kristina Hufford, University of Wyoming Extension specialist in restoration ecology.

Topics include soil management, value of native plants, adapting large-scale seeding practices for small acreages, managing livestock to preserve land value, weed management, and conservation tools for private land and areas of concern, such as riparian and wetland sites.

The workshop is a collaboration between UW Extension and the Wyoming Reclamation and Restoration Center in the College of Agriculture and Natural Resources.

"The workshop will provide tools for regional landowners who want to enjoy the outdoors and protect natural resources on their properties," says Hufford, an associate professor in the Department of Ecosystem Science and Management.

For more information, contact Hufford at (307) 766-5587.

Researchers discover ‘switch’ that allows microbes to recognize kin

By Tanya Engel | April 2017

Associate Professor Daniel Wall found that certain single-cell soil microbes recognize their kin, allowing them to unite and cooperate for protection and form multicellular structures.

How one-celled microbes recognize their kin is described in a paper by University of Wyoming scientists and published online this week in the Proceedings of the National Academy of Sciences.

Molecular biologist Daniel Wall and Ph.D. student Pengbo Cao solved a piece of the mystery surrounding how bacteria recognize family members, helping them band together for protection and even unite to become true multicellular organisms for survival.

“Self-identity reprogrammed by a single residue switch in a cell surface receptor of a social bacterium” describes how a lone amino-acid switch they found can govern how the soil bacterium *Myxococcus xanthus* recognizes its kin. The article is available online at http://bit.ly/pnaswall.

Microbes have a bad rap for being socially inept, but actually many of them live quite social lives.

“If they really want to thrive, they need to come together, recognize each other and assemble into multicellular structures to form something that’s beyond the ability of the individual,” Cao says. “I was pretty amazed how such a small, single-cell microbe could exhibit such sophisticated social behaviors.”

These efforts build on an earlier discovery by Wall and colleagues in the College of Agriculture and Natural Resources that found a particular cell receptor called TraA facilitated recognition among *M. xanthus* cells and allowed them to come together and exchange proteins and other components, a process called outer membrane exchange.

Cao noted different strains have different TraA sequences.

“The TraA receptors ensure when cells come in contact the sharing of cellular resources only occurs with close relatives that have identical or very similar TraA receptors,” Cao says.

Wall and Cao asked if different TraA receptors allow cells to selectively bind one another. They put different receptors into the same parent strain that were labeled with different color markers and showed that cells with different receptors formed distinct kin groups.

They then questioned how one receptor could create such diversity in recognition among natural populations so, using molecular scalpels and wrenches, they assembled parts of different TraA receptors and tested if cell recognition could be reprogrammed.

“Cao took the simplest case of two receptors very similar in sequence that only had 11 amino-acid differences yet did not recognize each other,” Wall says.

Cao made a series of chimeras, using half of one receptor and half of another, and observed what the bacteria recognized. They found that a single amino acid within the receptor plays an important role in the

recognition.

“This was a surprising result — that changing one amino acid had such a dramatic impact on specificity,” Wall says.

By changing this residue, they even engineered a TraA receptor with unique specificity that only recognized itself.

They hypothesize the malleability of TraA has allowed it to evolve and create social barriers between myxobacterial populations which, in turn, avoids nasty interactions with exploitive relatives.

Recognition is an important process, because misrecognition of a neighboring cell could be lethal. Hundreds of different proteins are transferred during outer membrane exchange, Wall says. Included in the mix are toxins and, if the other cell is not a true clonemate or self, it won’t have the antidote and will die. Wall and Cao speculate that such adverse interactions may drive and maintain diversification of TraA sequences in nature.

M. xanthus’predatory nature has drawn agricultural interest.

“They kill and consume other bacteria,” Wall says. “That’s how they make their living, by eating their microbial neighbors.”

Scientists want to use that predatory behavior for biocontrol.

“Myxobacteria themselves do not harm plants, but they can kill pathogens of crops,” Wall says. “*M. xanthus*, along with other types of microbes, are organisms of interest to use as a natural way to control and protect crops from disease.”

A time for insects

By Tanya Engel | April 2017

County weed and pest professionals from around the state and environmental health specialists from F.E. Warren Air Force Base gathered at the College of Agriculture Building March 14-16 for the 13th annual University of Wyoming Entomology Short Course led by Alex Latchininsky and Scott Schell of the Department of Ecosystem Science and Management.

From big-picture concerns, such as grasshopper treatments, invasive aquatic species, and decline of native bees, to microscopic identification of insects, participants examined insects from a range of perspectives.

“The heart of the course is the identification,” said Schell, “but we always cover new topics, including ones participants request.”

Latchininsky, a professor, and Schell, a UW Extension specialist, taught insect identification, from major orders and their characteristics to specimen handling, and the use of a microscope, Peterson’s Field Guide, and Lucid keys, which can be accessed on a cell phone to “drill down” through a matrix of characteristics (wings, legs, mouthparts, body shape, etc.) until possibilities are narrowed or an identification made.

A new resource this year was the pocket-sized guide, “Wyoming’s Stream Macroinvertebrates,” published by the University of Wyoming Berry Biodiversity Institute.

Scott Schell and Marta Iwaseczko of Teton County Weed and Pest view a molted exoskeleton of a large grasshopper species. These insects grow by shedding the old exoskeleton and expanding the new one while it’s still soft.

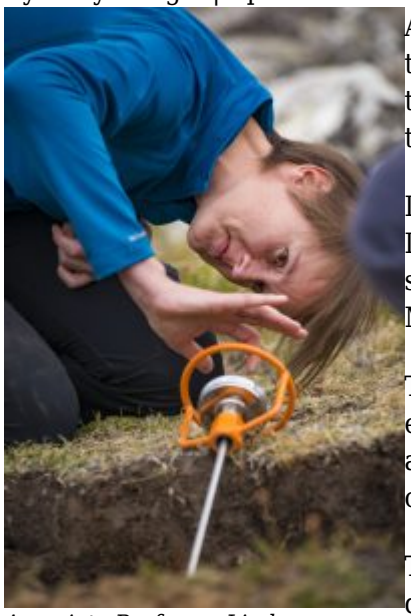
Scott Schell shows Scott Fischer of Natrona County Weed and Pest a dried insect, which he handles by the head of the pin (not the specimen).

Alex Latchininsky (left) keeps things lively with Bobbi Haley of Big Horn County Weed and Pest and Patrick Bookout of Platte County Weed and Pest.

Matt Jolivet of Natrona County Weed and Pest examines a soft-bodied specimen under the microscope. Immature stages of insects such as moths and sawflies are submerged in a watch glass with preserving fluid for protection and clear viewing.

Study in Ecology journal finds nitrogen pollution hinders forest decomposers

By Tanya Engel | April 2017



Associate Professor Linda van Diepen during pedology fieldwork atop Medicine Bow Peak in the Snowy Range Mountains.

A researcher at the University of Wyoming is a member of a team of scientists that found atmospheric pollution may be altering forest ecosystems in ways that are difficult to reverse, according to their study published in January in the journal *Ecology*.

Linda van Diepen, assistant professor of soil microbial ecology in the Department of Ecosystem Science and Management, collaborated with scientists from the University of New Hampshire and University of Wisconsin-Madison. She is lead author of the article.

The study is the first to investigate a three-part domino effect: long-term exposure to pollution causes organisms to evolve, altering their growth habits and functions, and, in turn, altering the ecosystem processes those organisms control.

The team focused their study on a group of tiny organisms with a disproportionately large impact on the ecosystem: soil fungi.

"They are the recyclers of the ecosystem – the primary decomposers of wood, leaves, and other plant material," says Serita Frey, professor of natural resources and the environment at the University of New Hampshire and a lead author of the study.

Without them, Frey notes, dead material would not be broken down. "We would be buried in leaves and wood, and no new nutrients would be made available for plants to use."

Soil fungi are sensitive to environmental stress, and they evolve quickly in new conditions. In the lab, the team analyzed soil fungi samples, half reared in petri dishes polluted with nitrogen as an environmental stressor.

But there was a twist. Some of the fungi samples were polluted to begin with – collected from a long-term study plot at the Harvard Forest in Petersham, Massachusetts where, for the past 28 years, nitrogen had been added to simulate chronic industrial pollution.

After 14 weeks in the lab, the scientists found the polluted samples were stymied in their ability to perform decomposition, their primary function in the ecosystem.

"The fungi from polluted plots had evolved," says Frey. "They weren't decomposing as much plant material as the same species collected from a less polluted area. Something about the organism had changed in a fundamental way."

Even when grown in an unpolluted petri dish, fungi from polluted areas weren't able to match the decomposition function of their neighbors from cleaner soils.

Some species of fungi were more sensitive than others – particularly a species called Irpex, which decomposed up to 44 percent less plant material after being polluted long-term. This fungus is from a subset

of fungi that decompose wood.

“Only a small subset of fungi can actually decompose wood,” notes Frey. “It’s troubling to see this group so affected.”

Although 28 years of nitrogen pollution has altered fungal community composition and diversity of the study plots at Harvard Forest, other pollution studies have shown resilience of the fungal community diversity with no significant changes in species composition.

“However, given the results of our study, we now have to look beyond effects on biodiversity; functional abilities of the fungal community may be affected even in the absence of changes in fungal diversity,” explains van Diepen.

Because decomposition is central to ecosystem function, the scientists said, a critical next question is determining whether, and how, fungal communities can recover after long-term nitrogen pollution.

Nitrogen pollution deposited on Earth’s ecosystems from the atmosphere has increased 200 percent since the beginning of the Industrial Revolution.

Anne Pringle, associate professor of botany and bacteriology at the University of Wisconsin-Madison and a co-author on the study, adds, “As long as nitrogen pollution continues to be a feature of our rapidly changing world, the evolution of fungi will likely shape how ecosystems function.”