UW COLLEGE OF AGRICULTURE

AG NEWS

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Dear Friends and Colleagues,

It was great visiting with many of you during our annual Ag Appreciation weekend in Laramie. As part of that weekend's activities, our College of Agriculture Advisory Board met. During that meeting, updates about each of the college's programs were presented. Overall, the college is doing well. Preliminary data suggests our total college student enrollment will increase from 854 to approximately 870 from fall 2004. The college led the university in obtaining grant funding with $12.4 million to support our research. Other discussions concerned how we might better organize to improve our research, teaching, and extension services about weed sciences, forages, alternative crops, and horticulture. Opportunities being explored include closer contacts with the botany department here on campus, possible departmental mergers to create more cross-disciplinary contacts, and new leadership for our plant sciences programs. Input from the advisory board was obtained on this topic for our review of these important college programs.

Dean Frank Galey

A department that is doing great research work in support of Wyoming's needs is our Department of Agricultural and Applied Economics. During the year, the department conducted research about the economic impacts of a variety of natural resource and agricultural topics important to the state. To highlight a few, faculty members investigated the fiscal and economic impacts of water from coal-bed methane well development, regional water project development, grazing, drought, and carbon sequestration. The department's faculty also conducted studies related to our rural economy. Projects in this category involved health care, rural planning, consumer trade, forest service planning, and open spaces. On the agribusiness front, the team looked at emerging markets for agriculturally productive open space in Wyoming, impact of environmental amenities on ag land values, a cattle producer survey, and a project related to the wool industry. Overall, research accomplished by this department is very applied and provides material to help local leaders make economic decisions for their small businesses and rural communities.

In this issue, you will find an update on the College of Agriculture's brucellosis research efforts. You will also find articles on research we are doing about carbon sequestration in reclaimed mine lands and forests, food safety for space travelers, and investigation of habitat of the pygmy rabbit, a species of concern for the Wyoming Game and Fish Department. You will also see a story about issues relating to fertilizer and how they could affect sugar beet farmers in the next growing season.

I'm looking forward to seeing many of you as I travel the state in the coming months. Again, thank you for your support. Please stay in touch with your College of Agriculture!

Frank

Dean Frank Galey
College of Agriculture

""All our dreams can come true – if we have the courage to pursue them."
Walt Disney

UNIVERSITY OF WYOMING

FIRST CUT

Efforts by state employees go above and beyond for public safety

State health personnel, Wyoming State Veterinary Laboratory staff members, and troopers from the Wyoming Highway Patrol (WHP) cooperated this summer to ease a Wyoming family's rabies concerns.

An unvaccinated pit bull dog had bitten a skateboarder in Jackson. The owner resisted euthanasia of the dog, and the family's doctor wanted to start the teenager on a series of post-exposure vaccinations.

Authorization to euthanize the dog was obtained on a Friday morning, but the head had to be transported to the state veterinary lab in Laramie for testing. The UW College of Agriculture's Department of Veterinary Sciences operates the lab.

"A relay of Highway Patrol officers got the head from Jackson to Laramie by 6 p.m.," says Donal O'Toole, director of the lab. The troopers were trying to get the sample to Laramie by the close of business, and the relay involved troopers from five districts in western, central, and eastern Wyoming.

"This is not out of the ordinary," relates WHP Sgt. Stephen Townsend. "Troopers routinely transport items on emergency relays such as blood, medicines, snake-bite serum, and items such as the dog. We do have a policy on the transports of such items. Troopers are not to accept the item for transport unless it is packaged properly."

Ken Mills, professor of the Department of Veterinary Sciences and bacteriology and rabies section leader with the state vet lab, uses a fluorescent microscope. A fluorescent microscope allows scientists to visualize virus or bacterial infected tissues by directly labeling them with specific antibodies that have a fluorescent tag. In the case of rabies, the brain material stains a very bright apple green wherever viral proteins are present. If there is no rabies viral protein present, there is no adherence of the stain and no green color. The new $21,000 microscope is a real improvement over the one it replaced, which was almost 25 years old, says Mills.

Many requests are turned down because they are not an emergency, he says.

A request is given to the WHP supervisors along the route the relay would take. Each supervisor gives approval and selects personnel from the division to perform the relay. "Troopers are notified along the route so they can be in position to accept the item and then hand it off at the next relay stop, usually at a county or Wyoming Department of Transportation district line," says Townsend.

Amy Mae Boerger-Fields, laboratory technician in the state vet lab, stayed until 8 p.m. that day to conduct the test, says O'Toole.

"Fortunately, it was negative. Amy got the report to the physician that evening by phoning him at home," O'Toole notes. "I don't think many laboratories do stuff like this, and I need to get a letter of thanks out to the Highway Patrol for doing the relay. The teenager was told the dog did not have rabies, and therefore the teen did not have to go through a weekend wondering if he was going to die. Rabies is essentially 100-percent fatal if not treated."

The Department of Veterinary Sciences regularly deals with the rabies virus. "A young child was bitten by a bat in the Big Horn Basin, and the bat needed to be checked for rabies," says O'Toole. "A quick-thinking veterinarian with the Wyoming Department of Health used his personal credit card to get the bat on the last flight that day (a Friday) out of Worland and to Laramie."

Ken Mills, professor of the Department of Veterinary Sciences and bacteriology and rabies section leader with the state vet lab, tested the bat early on a Saturday morning.

"When I opened the box, the bat was screeching at me," recalls Mills. "This was not normal for a bat. The bat tested positive, and the entire family was put on preventive treatment."

Mills says the bat rabies strain of virus is what is seen in humans. The Centers for Disease Control recommended several years ago if a family finds a bat in the house, the bat should be tested for rabies. "If the bat can't be tested, they recommend starting treatment for rabies," he says.

Through September, his lab has conducted 554 rabies examinations with 15 skunks and two bats testing positive. Johnson County had eight positive skunks, Campbell County had four, Crook had two, and Sheridan County had one. Big Horn and Hot Springs each had one positive bat.

T I N G

Virginia Vincenti

Vincenti presents at distinguished speaker series

Professor Virginia Vincenti of the Department of Family and Consumer Sciences was invited to give the address for the 25th anniversary of the Margaret Ritchie Distinguished Speaker Series September 16 at the University of Idaho.

"I felt great they selected me," says Vincenti, 2003-2004 president of the American Association of Family and Consumer Sciences. "It's an honor."

Ritchie taught at the University of Idaho and was head of the Department of Home Economics for 27 years. Each year, the series invites a presenter to stimulate interest in family and consumer sciences and related fields.

The series selects the topic. Vincenti's presentation was "Legacies of the Past Influence the Future."

"Because you honor the past doesn't mean you live in the past," she says. "It's important to connect the past, present, and future."

Her selection for the subject is a natural. Vincenti's doctoral thesis was "A History of the Philosophy of Home Economics." Her book *Rethinking Home Economics: Women and the History of a Profession* was published by Cornell Press in 1997.

She began her topic discussing Verna Johannesen Hitchcock, a University of Idaho undergraduate student. Hitchcock became the first welfare director in Albany County in Wyoming, and she taught courses across the state for the Wyoming Department of Education and courses in the University of Wyoming College of Education. She was twice Wyoming Home Demonstration Leader and finally head of the UW Division of Home Economics from 1951-1962.

During the series weekend, Vincenti taught a graduate class, gave her address in an open public forum, and provided comments at the Margaret Ritchie School of Family and Consumer Sciences Alumni Brunch. She listened to alumni tell stories about Ritchie.

"Ritchie was someone people admired because of her character, her way of working with people, and her vision," says Vincenti. "She is still affecting the program there because of the speaker series. The students hear about her and get a sense of what being a professional means. They say things like 'when she talked to you, you got the feeling you were the most important person.' She was very professional in how she interacted with people. She had high standards. She was able to help the faculty as individuals grow in a positive way. She was able to handle conflict and help people get past whatever they were upset about."

In her formal lecture, Vincenti noted positivism, individualism, and capitalism – "Three powerful forces in culture that diminish our understanding of history," she says.

Positivism does not consider disciplines using non-scientific modes of inquiry to be creating valid knowledge, and it creates a perception that old ideas should be replaced with new. It ignores non-scientific aspects of the quality of everyday life and overlooks ethics.

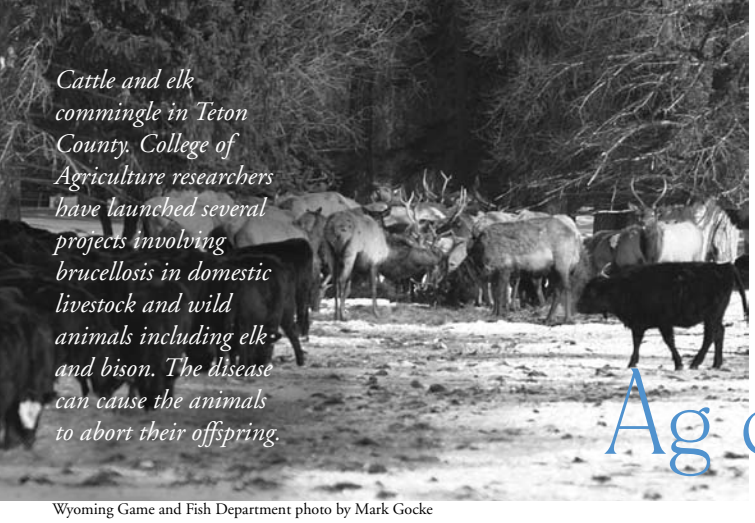
Capitalism grew out of individual rights and stresses the free pursuit of individual self-interest and continual growth of the economy, and it encourages creation of demand.

Under individualism, competition reduces cooperation, individual self-interest tends to dominate the greater good, autonomy is emphasized as is self-reliance, and has diminished the value of community. Individualism weakens families, isolates family members, reduces opportunities for people to get to know each other, and reduces opportunities to learn ethical reasoning and social skills.

"We need to become culturally reflective," Vincenti continues. "We are bombarded by messages constantly that serve particular persons' self-interests at the expense of others, families, communities, and society. That is important for us to consider."

On the Web: http://www.agls.uidaho.edu/fcs/alumni/alumni-photos.htm

http://www.uwyo.edu/FAMILY/Faculty/V_Vincenti.htm



Cattle and elk commingle in Teton County. College of Agriculture researchers have launched several projects involving brucellosis in domestic livestock and wild animals including elk and bison. The disease can cause the animals to abort their offspring.

Wyoming Game and Fish Department photo by Mark Gocke

Ag college research targets

by Robert Waggener, Editor
Office of Communications and Technology

Playing heavy metal, bluegrass, classical, or country music is one way Gerry Andrews takes the edge off when performing painstaking laboratory work on brucellosis. If he is in tune, the Department of Veterinary Sciences' assistant professor and his team could discover a new vaccine to help control the deadly disease in cattle, elk, and bison.

"It's a good thing I meditate," Andrews says jokingly as he carefully inserts a pipette into a gel containing a genomic DNA preparation of Brucella abortus, the bacterium that can cause elk, bison, and domestic cattle to abort their offspring. The disease is prevalent in western Wyoming and consequently has become a major agricultural and wildlife concern.

College of Agriculture Dean Frank Galey says politics have influenced brucellosis-related decisions by state lawmakers, but science is the top priority at the ag college and the Wyoming State Veterinary Laboratory.

A national effort to eradicate brucellosis in the United States was launched in the 1930s, and Wyoming was declared free of the disease in 1985. The state lost that status in 2004 when a herd of cattle near Pinedale became infected, probably after contact with infected elk from the nearby Muddy Creek feed ground, according to a report by the Wyoming Brucellosis Coordination Team, which formed in 2004 to identify issues relating to the disease and develop recommendations for control.

"If brucellosis gets into a completely naïve cattle herd (one that hasn't been exposed to the disease before), you will see an abortion storm, and that's what we saw with the Sublette County herd," says Donal O'Toole, director of the Wyoming State Veterinary Laboratory and head of the Department of Veterinary Sciences, which is conducting several brucellosis-related research projects. "That herd and two others that later tested positive were depopulated. Those guys were basically knocked out of business."

Brucellosis has received plenty of attention in Wyoming and the region, but many residents don't know if it's truly a problem or has just become a political issue between policymakers, ranchers, hunters, and environmentalists.

"It's definitely a problem to the cattle industry just in terms of the amount of testing the cattle now have to go through," O'Toole says. Livestock can't change hands until test results come back, and that's slowing down ranch operations. To O'Toole's knowledge, no one has completed an accurate estimate of what this costs the state, although he estimates it is several million dollars annually in testing, surveillance, and research on the state and federal levels.

"Looking at our operation alone, brucellosis testing at the state vet lab has gone from 46,000 samples per year to about 160,000. We've had to hire two new technicians to keep up."

O'Toole says Wyoming will seek to regain brucellosis-free status this winter. Its application must be approved by the U.S. Department of Agriculture (USDA), which will assemble a team of brucellosis experts to determine if control efforts are adequate. Even if the status is granted, O'Toole predicts, the state will continue to face challenges.

"All other states know is we have a wildlife reservoir of a disease that spills over periodically into cattle," he says in reference to the Greater Yellowstone Area. "So when we're selling cattle, even when we have our status back, the other states will likely have additional requirements on Wyoming, so the costs will still be there."

More important, O'Toole emphasizes, getting brucellosis-free status back does nothing to lick the brucellosis problem, and that's where Andrews and his colleagues

western Wyoming brucellosis problem

come in. They are tackling issues of vaccine development, delivery methods, and how to better diagnose the disease.

College of Agriculture Dean Frank Galey says politics have influenced brucellosis-related decisions by state lawmakers, but science is the top priority at the ag college and state vet lab.

"Our researchers are trying to find scientific answers for the policymakers. We have projects going on right now looking at the revaccination of cattle, we have diagnostic test development underway, and we have one faculty member who is very interested in vaccine development," Galey says. "The problem of brucellosis is a long way from being solved because it's so complex, but I think if we take this one bite at a time, we can make some progress."

Before a new vaccine is discovered, Andrews and his research team must first better understand the genes involved in *Brucella* virulence, the capacity of a microorganism to cause disease.

"To build a better vaccine, you really need to have a better understanding of the pathogens that cause a disease. With *Brucella abortus*, there is some knowledge out there of how the pathogen causes disease, but there is still much to learn," says Andrews, who is confident his team will discover new genes involved in the virulence. All of their efforts are now going into preliminary work.

Assistant Professor Gerry Andrews and other faculty members in the College of Agriculture are attempting to find a new vaccine that could successfully control brucellosis in cattle, elk, and bison.

On this particular day, Andrews is attempting to isolate genes from a vaccine strain of *Brucella abortus*. He is being observed by two undergraduate microbiology seniors taking an investigations course, Heidi Blittersdorf of Laramie and Caitlin Gade of Sundance. "Heidi, did you run a gel of that last DNA prep? How does it look?" Andrews asks. "Beautiful," Blittersdorf responds, matter-of-factly.

It's obvious Andrews is enthused about his work, even the tedious preliminary experiments necessary to find a new vaccine. "This background work is all part of science and, fortunately, I love it."

Other principal team members are Assistant Professor Larry Goodridge of the Department of Animal Science and William "Hank" Edwards, a Wyoming Game and Fish Department (G&F) wildlife disease specialist stationed on campus.

In another brucellosis project, veterinary sciences' Associate Professor Don Montgomery is researching the effectiveness of the vaccine RB51 on cows. The vaccine is now administered to calves to help prevent the disease, and Montgomery and Steve Olsen of the USDA's Agricultural Research Service in Ames, Iowa, are studying whether it will work in adult cattle.

"We want to know if you vaccinate adult cows with RB51, does it have any adverse effects on the cows or their fetuses," Montgomery says. "If they do abort, was the vaccine responsible? More importantly, does it give those cattle an advantage to ward off *Brucella abortus* infection?"

O'Toole supports the idea of focusing on vaccinating cattle in areas where brucellosis is a problem instead of spending resources on wild animals.

"That makes sense to me because the number of cattle herds that are exposed is pretty small, and you can easily get to the cattle," he

says. "If you have a perimeter of solidly vaccinated herds all around the Greater Yellowstone Area, that would be very advantageous; but the current vaccine (RB51) only gives 70-percent protection in cattle as administered to calves. If we had a vaccine that was as good as the rabies vaccine, which approaches 100-percent protection, I wouldn't say the problem is solved, but that would be a huge shot in the arm."

In an ambitious project launched this fall, researchers in the College of Agriculture are trying to develop better methods to identify infected elk that represent the highest risk to cattle and other elk. The team also wants to find better diagnostic and research tools to identify strains of brucellosis circulating among elk. An additional goal is to improve data about elk brucellosis incidence, correlation of seroprevalence (the frequency of individuals in a population having a particular element in their blood serum) with infection, and impacts of habitat improvement on dispersal of elk during Wyoming's harsh winter months.

In October, the research team received a $311,000 grant from the USDA's Cooperative State Research, Education, and Extension Service to help fund the work.

Principal faculty members involved are Andrews, Goodridge, and Professor Ken Mills and Associate Professor Todd Cornish, both of the Department of Veterinary Sciences. They will collaborate with the G&F, including Edwards and Jared Rogerson, a brucellosis feed ground habitat biologist in Pinedale.


Mandy Kauffman


Amanda Fluegel


Laura Linn


Heather Sanchez

Four graduate students are assigned to the project: Heather Sanchez of Albin, Laura Linn of Wilson, Amanda Fluegel of Dakota, Illinois, and Mandy Kauffman of Traverse City, Michigan.

"I am very excited about the project," Kauffman says. "I am from Michigan, where we face an interesting management situation with bovine tuberculosis in our white-tailed deer. I think brucellosis poses a similar situation in Wyoming, and I am looking forward to hopefully being a part of developing better ways to deal with the disease."

O'Toole notes: "This is the biggest thing our department has ever bitten off, and there will be a lot of people watching."

Brucellosis research is not without controversy, as attested by a five-year test-and-cull project that began this fall on a western Wyoming feed ground.

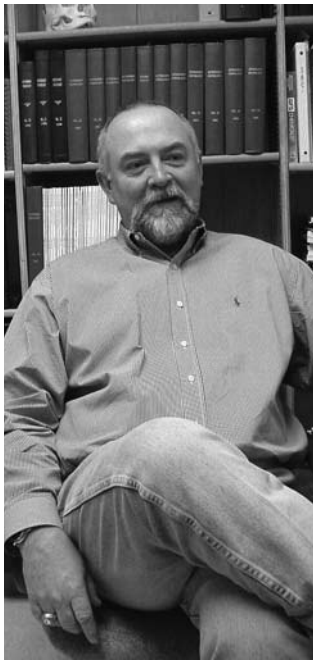
"It is basically a large experiment the G&F has committed to; it wants to determine if the percentage of infected animals goes down if test-positive animals are removed from the herd," says O'Toole, whose department will help the G&F document cases. It involves running elk through chutes, holding them for testing, and literally sending some of them to slaughter if they are positive. We know this works for cattle because this is how it was done to eradicate brucellosis in the United States, but this kind of a study has never been done before in elk."

"A lot of folks on the environmental side are not happy with this kind of hands-on management with a wild animal because they see brucellosis as a problem with cattle, not elk," O'Toole continues. "Some people feel pretty uncomfortable when you see large numbers of free-ranging elk held in corrals. That's not how we want to think of the animals. We want to think of elk roaming free on spruce- and aspen-covered mountain sides."

On the agricultural side, O'Toole says, ranchers whose operations border G&F feed grounds are as valid as those raised by environmentalists. The elk are being unnaturally concentrated at exactly the time when transmission of the disease usually occurs, and that's late winter and early spring during the calving season. Cattle, elk, and bison

are attracted to newborns, and this curiosity can lead to a fatal attraction when a newborn happens to be an infected fetus that was aborted.

Why not close the feed grounds? This would force the elk to disperse, and studies have already shown that brucellosis is self-limiting in free-ranging elk. This was the most contentious topic addressed during meetings of the Wyoming Brucellosis Coordination Team. The team consists of 19 members including Mills and Galey, who was appointed chair by Governor Dave Freudenthal.



Veterinary sciences' Associate Professor Don Montgomery is researching the effectiveness of the vaccine RB51 on cows. The vaccine is now administered to calves to help prevent brucellosis, and Montgomery and Steve Olsen of the USDA's Agricultural Research Service in Ames, Iowa, are studying whether it will work in adult cattle.

There are also 10 technical advisers including O'Toole and William Gern, UW's vice president for research. Ranchers, hunters, G&F personnel, veterinarians, politicians, and state and federal officials are also on the committee.

Discussions eventually turned to the issue of closing feed grounds, which proved to be the 800-pound gorilla in the closet, according to the group's 37-page report delivered in early 2005 to the governor and legislature. From a purely veterinary or scientific perspective, closure of the grounds makes sense; however, the report indicates social, economic, and political factors won out.

The G&F estimates the elimination of winter feeding would result in an elk mortality of between 40 and 80 percent in western Wyoming because of the loss of natural habitat. Sportsmen would have fewer opportunities, and businesses that depend on hunting would have a tougher time making ends meet. Few would stand for watching elk starve to death. Another argument for maintaining the grounds is the ability to cull infected elk and administer vaccines to entire herds.

The efficacy of vaccines now available (RB51 and Strain 19) is marginal in elk, and Andrews and his team are working to change that; but they, too, face political roadblocks. After 9/11, the federal government listed

Rebecca Ashley, a laboratory technician I in the Department of Veterinary Sciences, examines serum samples for brucellosis in the regulatory serology section of the Wyoming State Veterinary Laboratory.

Brucella abortus as a potential bioterrorist agent, or Select Agent. This listing effectively halted research on brucellosis in large animals.

"Let's say Gerry comes up with a good candidate vaccine," O'Toole says. "The only way to prove that it works is to put the thing into elk and challenge them a couple of weeks later with a known virulence strain of *Brucella abortus* and see if they resist infection. That is the meat in the sandwich, but we're pretty darned constrained at the moment because we can't do any vaccine challenge studies."

O'Toole says he hopes the government comes up with a common-sense solution that will enable laboratories to resume using *Brucella abortus* in large animals in outdoor settings – and soon. "They could easily require a $10 to $20 million outdoor facility equipped with multiple electric fences, reinforced concrete, and acres of buffer zones – something like the German POW camps in World War II. That would be absurdly expensive and ridiculously restrictive, and no one would pay for it."

Assuming the restrictions are softened and the Andrews team proceeds, heavy metal music and all, what kind of chance does it have in developing an effective vaccine? "It's kind of a shot in the dark, but Gerry and his colleagues have a fairly high level of confidence in this," O'Toole says. "It's a cliché, but the only way never to fail is to never try."

Determining pygmy rabbit habitat

by Steven L. Miller,
Senior Editor
Office of Communications and Technology

The heat of high summer in Wyoming would linger into the evening as Melanie Purcell and her crew wrapped their pygmy rabbit traps in burlap to place amidst the sagebrush-spotted landscape.

The burlap was draped around the wire box traps to make them look more like the burrows the pygmy rabbits dig, and then they were placed beside burrow entrances. Pygmy rabbits, *Brachylagus idahoensis*, are the only rabbits in North America known to dig their own burrows. Purcell baited the traps with apples. She'd check the traps in the morning after 8. The traps were set in the evening because literature suggests the rabbits are active at dawn and at dusk.

She would find out the dawn-and-dusk habit may be true in the other environments where the rabbits are found – in the Great Basin states – but she observed that the Wyoming rabbits were routinely seen several times a day. She would also begin to realize the soils where the rabbits lived were related to their distribution.

Purcell, a zoology graduate student, is working closely with Department of Renewable Resources Professor Stephen Williams, a member of her graduate committee. Although Williams is not a zoologist, he does work with soils and the biology of soils, and thus the interest in the connection with Purcell's project.

Researcher Melanie Purcell, with shovel, and technician Connie Schuler dig pits to take soil samples at 0-10 cm, 50-60 cm, and 100 cm. at this site on the Mesa near Pinedale.

Purcell's pursuit of pygmy rabbit data might have started as a youngster growing up in Longmont, Colorado. "I guess I've always been interested in science. Since I was little, I have always been an outdoors type of person – camping, playing in the dirt, and fishing, catching insects and animals," she says. "It carried over. It's something I am connected to and am passionate about. I want to spend my life doing something I enjoy and care about."

She earned her bachelor's degree in wildlife biology from Colorado State University. Her plans were to earn a Ph.D then go to work in academia. "Now, I don't think that is what I want to do," she says. "When done with school, I want to go to work for awhile with some type of management or conservation agency probably as a biologist. I don't care if it's government or non-government. I'm interested in all the ecosystem components. I like all parts of it."

The pygmy rabbit is designated as endangered in the Columbia Basin Distinct Population Segment by the U.S. Fish and Wildlife Service and is listed as a species of special concern in Wyoming by the Wyoming Game and Fish Department (G&F).

Melanie Purcell

The rabbits were not documented in Wyoming until 1981, although they may have been previously mistaken for small cottontails and not identified as an entirely different rabbit. They are found only in the southwestern and central portions of the state. Purcell had conducted pygmy rabbit survey work for the Wyoming Natural Diversity Database, and when G&F and Bureau of Land Management (BLM) wanted someone to examine the distribution of the pygmy rabbit, she hopped.

"I knew their characteristics were different compared to other rabbits," Purcell notes. "They exist in patchy

no pint-size task

areas and are sagebrush obligates – they eat entirely sagebrush. Also, I was interested in this project because I thought it would be exciting to be one of the first people to do research on them in the state and build a basic understanding of where they exist and what types of habitats they are using."

Purcell had to find and document them first. Their easternmost boundary is believed to be near Farson, about 40 miles north of Rock Springs. Her team drove back roads and hiked endlessly to look for habitat and presence or absence of pygmy rabbits.

The group surveyed south of Interstate 80 between Rock Springs and Baggs and north of I-80 between Farson, Riverton, and Rawlins. She used a handheld GPS unit to map approximately 200 locations and plotted about 900 GPS points.

Only one rabbit characteristically occupies a burrow complex, which usually range from two to 10 burrows, but four to five burrows are more common; however, a rabbit pair will occupy the same burrow complex during the breeding season. The rabbits breed in late winter and early spring and can have up to two litters per year with up to six young per litter. They finish reproducing by June.

Technician Anna Goetz and Melanie Purcell, kneeling, check traps near Cumberland Gap.

This female pygmy rabbit was trapped near Kemmerer. The rabbits average about 7 inches in length.

A female digs a separate burrow for her young and builds her nest. The hole is then backfilled for protection after giving birth. Weasels and raptors appear to be the rabbits' principal predators.

They are called pygmy for a reason. "The largest rabbit I caught was 500 grams (slightly over a pound). Really little! They would fit into the palm of your hand," she says. "The length was 17 centimeters (just under 7 inches). They were all brown with short, brown tails rather than the puffy, whitish tails like cottontails, and their ears are more rounded. They look almost like a pika with more of a rabbit look."

Their range is about 30 to 50 meters (33 to 55 yards) from their burrows, which are thought to go as deep as about one meter (40 inches).

The rabbits appear to favor areas having thick sagebrush with deep, soft soil. Some selected habitats include sand dunes where sagebrush exists and on mima mounds where sagebrush is thicker and taller than the surrounding sagebrush (mima mounds are remnants of ice-wedges left over from the last ice age).

"We took soil samples from different depths within all those sites," she says. "It seems that, when digging our pits, we were finding out most or all the non-use sites harder to dig and were hitting hard pan soil 40 centimeters (16 inches) down. It was hard to get any deeper than that."

Oil and gas development in southwestern Wyoming has heightened interest in the pygmy rabbit and also

Technicians train to learn the habitat, sign, and research procedures for the pygmy rabbit project.

has produced sightings that can't be confirmed. A consulting company that surveyed a pipeline from Wasmsutter into Colorado claimed to find them, but checks requested by the BLM did not document them. There is debate whether they are there. If they are, it would be their first documentation in Colorado.

Elevation seems to play a role along with hydrology and types of soils in the distribution of these animals. "In Wyoming, we are finding them between 6,500 to 7,500 feet; however, in places like Nevada and Utah, they are found between 4,000 to 7,000 feet," notes Purcell. "The climate is different there. The types of sagebrush found in Wyoming at that elevation exist at lower elevations in other states." She also says mountain chains lacking sufficient sagebrush cover and soil may also be a barrier to pygmy rabbit migration.

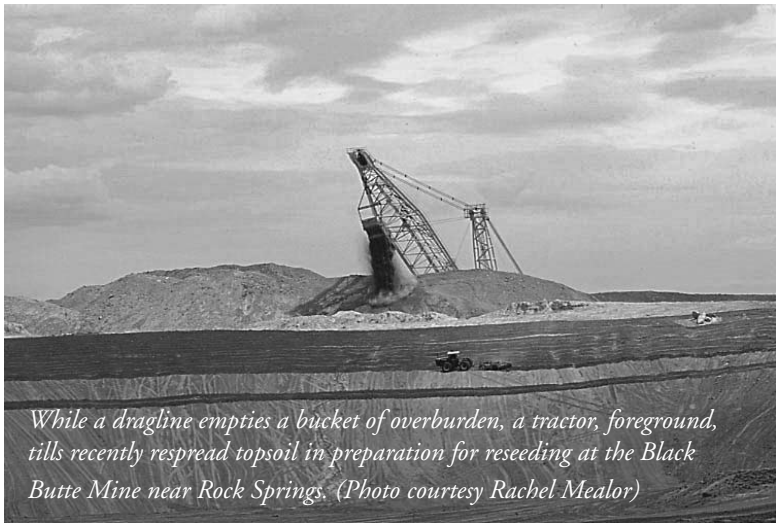
Purcell hopes her research provides data to establish where the species boundary is and the habitat they are using. "It will open up a lot of opportunities for research, including effects of natural and human-caused disturbance," she says. "There is the possibility of other research on population dynamics and genetics, whether these aggregations of rabbits we are finding are continuous populations or whether they are isolated populations."

Pygmy rabbit scat next to a quarter for scale.

Pygmy rabbits are far from abundant and have only been known in Wyoming for a short time, says Williams. " It could easily be conjectured they are unimportant biological components of Wyoming ecosystems. But we do not know this. One feature of biology is that often species have importance more dramatic than their actual biomass, abundance, or distribution suggests."

So why study them? "We try to be good stewards of resources including the biological resources of this planet," says Williams. "We cannot let something as seemingly insignificant as the pygmy rabbit go unstudied. Such would be counter to our ethics and our obligation to life on this globe. There are potentially lots of threats to the pygmy rabbit. There is an argument this species could disappear before we know much about it. It seems unlikely our own well-being is mirrored by the survival of this dainty, hard-to-observe creature, but you never know."

Scientists coax carbon into reclaimed mine lands, forests



While a dragline empties a bucket of overburden, a tractor, foreground, tills recently respread topsoil in preparation for reseeding at the Black Butte Mine near Rock Springs. (Photo courtesy Rachel Mealor)

by Steven L. Miller,
Senior Editor
Office of Communications and Technology

Three University of Wyoming researchers are attempting to determine best management practices to harness the Earth's primal forces and turn landscapes into sponges for carbon.

Or, at least through the efforts of Pete Stahl, Daniel Tinker, and George Vance, find more efficient ways to coax carbon out of the atmosphere and stick it into the landscape.

The Department of Energy makes sequestering carbon look easy on its Web site. A yellow sun playfully hides behind a cloud. Below the cloud, an arrow angles down and to the left into a forest growing green, and to the right another arrow swings down into an ocean blue crested white with waves.

Simple? Not exactly.

Stahl, professor in the Department of Renewable Resources, is peering into ways reclaimed mining land can be best managed to absorb carbon in the atmosphere. "More and more scientists believe global warming is a real phenomenon," he says. "If we can come up with ways to keep carbon out of the atmosphere, that can be really important."

Johnathan Anderson, left, a former graduate student at UW, and Lachlan Ingram, a post-doctoral scientist, examine a native grass site adjacent to reseeded areas at the Dave Johnson Mine operated by Glenrock Coal Company near Glenrock.

The disturbed agricultural environment, forest ecosystems, and mine lands have increased the loss of soil organic matter needed to root carbon in the ground, says Vance, environmental soil science professor in the Department of Renewable Resources who works with several peers in carbon sequestration research.

Pasture soils are high in carbon but, once plowed, soil organic matter is reduced. "The moldboard plow was a positive in getting the land ready for planting, but it also hurt the soil in respect to the nutrient resource," he notes.

Producing fertilizer to pump up the nutrients uses carbon-based material to make, which pumps more carbon into the atmosphere.

Vance and others are looking at what types of forest harvesting, if any, produces more carbon sequestration, whether mulch helps re-establish mine lands or if a nurse crop is beneficial to establishing grass, and whether grazing is beneficial or a detriment. "We have a paper coming out that shows light grazing can be beneficial," notes Vance.

Wyoming's surface mining legacy offers a unique test tube to examine best management practices of grazing, topsoil replacement methods, mulch use, and grass and forb seed.

Peter Stahl

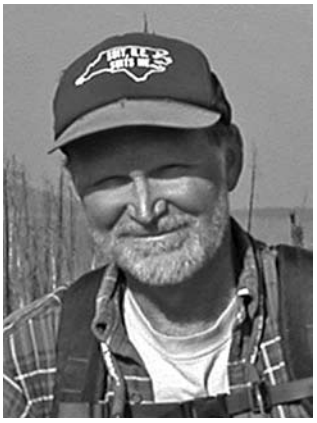
"We are looking at management practices that can maximize the recovery of the soil carbon," notes Stahl. "The biggest component of soil organic matter is organic carbon."

Stahl compares sites on a half-dozen Wyoming coal mines. Since mining companies are required to keep records of their land reclamation efforts, there is a long-term canvas for comparisons.

Stahl's own career is part of the continuity. He works with contacts made during his undergraduate days at UW. "I was lucky enough to come back and re-establish the contacts I knew then," he says.

One area, near Hanna, has been so successfully reclaimed that "if you go up there, you wouldn't know a mine was ever there," Stahl notes.

Stahl samples soil at three depths – from 0-5 centimeters, 5 to 15 centimeters, and 15 to 30 centimeters ("Where most of the action is on rangelands," he quips) to determine the amount of soil organic matter.



Daniel Tinker

He's had at least one moment that raised his eyebrows. Rangeland reclaimed from surface mines and grazed by domestic livestock and wildlife seems energized.

"The mining companies are doing such a good job reclaiming that there is a period those sites are more productive than undisturbed sites," he says.

Re-establishing a plant community takes a few years, and then the site enters an extremely productive span for several more years.

Another, not quite "Aha!" moment but still an illuminating one, was his revisit of the Hanna site. "We saw that the amount of organic carbon in the soil had increased so much. Sagebrush had re-established on the reclaimed mine land, which is significant because it captures all the snow," he says.

Stahl is also examining best forest management practices in the Medicine Bow

George Vance

National Forest and another area in the Black Hills in northeastern Wyoming with Vance and Tinker, an assistant professor in the Department of Biology.

"We are looking at how different forest management practices influence carbon levels in the soil," Stahl notes.

In order to do that, researchers had to first estimate how much carbon exists in above- and belowground plant material before they could determine any rates of replacement.

That's where Tinker, who also has ongoing research projects in the Yellowstone area, put his forestry expertise to use.

Tinker smiles as he says tree samples from his Black Hills carbon sequestration research are sitting beneath him in the Aven Nelson Building. Drawn from Tennessee to the forests and mountains of the West, he worked for outfitters in the Jackson Hole area and in Colorado but returned to college at age 37 to earn his master's degree and eventually his doctorate.

"I spent many years working for outfitters in the mountains," he reminisces. "I began feeling like the forest and mountains had given so much to me I decided to get out of that business and see what I could give back."

Tinker's research looked at three timber stands which were being managed differently and one stand where there has been no forest management. Tinker's team had to determine the amount of carbon in each of the above- and belowground pools, then somehow determine how

much carbon was being sequestered each year.

To solve the first problem required lots of manual labor coupled with the development of mathematical equations. To solve the second problem required a skill almost anyone who has ever felled a tree knows; however, gathering the data was not that easy.

Tinker had to develop allometric equations, which relate easily measured tree characteristics, such as diameter, to the entire tree, to determine the biomass. "We had to cut down lots of trees and weigh individual parts," he explains. "The only way is to cut a tree into little pieces and weigh the pieces in the field."

The chunks then had to be later dried and weighed again to discount moisture. The researchers then established total mass of the individual components, including roots, stems, branches, and needles.

They felled 80 trees. "If you know the biomass of an entire tree, approximately 48 percent is carbon," he says. "If you know the number of trees per acre, you can establish the amount of carbon above- and belowground because we developed allometric equations that work for belowground tree components, too, such as the roots."

The scientists looked at tree rings to determine the amount of carbon stored each year. "Each ring marks the annual amount of growth. Since our allometric equations are based on the diameter of the tree, you look at successive diameters. We looked at the last five years. Through simple subtraction, you can determine how much biomass has been added to the tree annually."

Land on the Bridger Coal Company in southwestern Wyoming shows reclamation efforts in the foreground. (Bridger Coal Company photo)

Tinker then observed the biomass in the three sites – even-age management where trees of the same age were left standing, uneven-age management where there has been more selection in the trees removed, and uneven-age management areas that were more intensely harvested.

All data is preliminary, but Tinker says while the unmanaged stand contains more biomass in the current pools, all three managed areas are probably storing carbon at higher rates than the unmanaged area. He cautioned the data only provides a snapshot of conditions over the last five years, but the data could be compared with known events, such as the dry conditions during the Dust Bowl years of the 1920s and 1930s, if tree rings were collected from that era.

The result of his outfitting years seems to return as he reflects on the importance of the science.

"One of my jobs as a researcher is to try to understand how the system works and provide managers the best information on which to base their decisions," he says. "I firmly believe science should not make the decisions but should inform them. To manage a system, we need to understand it. The days of being completely hands-off from a management perspective are gone. Humans are part of the equations now."

On the Web: www.bigskyco2.org/

www.bigskyco2.org/Overview.htm

http://cdiac2.esd.ornl.gov/

Food safety in unlimited space may

by Steven L. Miller,
Senior Editor
Office of Communications and Technology

Tales chronicling this small force attacking a larger foe while sailing amidst the stars probably isn't fodder for Hollywood. One might title it "Phage Wars," and future astronauts would agree it will be good for what ails them.

Animal science Assistant Professor Lawrence Goodridge and doctoral student John Willford are developing a simple test for food-borne bacterial pathogens using bacteriophages – viruses that infect larger bacteria – to seek out and attack specific bacteria. If successful, travelers on long-duration space flights will be easily able to use the test to avoid nasty intestinal ailments.

John Willford introduces bacteriophages to the Phast Swab. The tubes are incubated for an hour and a half then the tops snapped, which releases a substrate into the bottom of the tube to react with an enzyme.

An army marches on its stomach and astronauts on long-duration flights will travel on theirs. "To get to Mars, you can never transport enough food from the Earth," says Goodridge. "You have to grow your own food on Mars and en route. That opens the door to bacteria. Anything that goes up in space is sterilized, but all you need is one bacterial pathogen, and it could multiply. What is needed is a rapid method of bacterial detection."

Astronauts face psychological challenges on long-duration flights, and something as simple as eating fresh food goes a long way to help astronauts with that, he notes. Sterilized food is tasteless, and there can be a disagreeable odor. "Safe food that is fresh is the issue. Astronauts on a trip to Mars are 18 months out and back plus their time on Mars. They could be out four years."

A Wyoming NASA Experimental Program to Stimulate Competitive Research (EPSCoR) grant is funding their research titled "Development of a Luminescent Biosensor for Rapid Detection of *Escherichia coli* O157:H7."

Goodridge and Willford launched their project and filed a preliminary patent on their biosensor, termed the Phast Swab, this fall. "Our interest is food-borne pathogens, and our test is designed to be used to detect different bacterial pathogens without expensive instruments," says Goodridge. Their method is of interest to both the food industry and NASA.

Weight and space considerations force equipment on spacecraft to be designed for multiple purposes. Currently, many food pathogen tests are not practical, Goodridge says. Some have too many steps, are long, and can be expensive to perform. Or they are complex, and personnel need extensive training.

"We wanted to make sure the tests are robust, easy, and repeatable," he notes.

Goodridge and Willford harness the ambitions of phages to infect bacteria to create a test that only requires a person identify colors.

A phage looks somewhat like a NASA lunar module as it settles upon the larger bacteria. Certain phages attack specific kinds of bacteria. Sitting "upright" with its six tail fibers attached to the bacteria, the phage inject their DNA into the bacterium and use the bacteria to reproduce. The phage reproduce in enough numbers that the bacteria eventually burst.

Goodridge and Willford take advantage of this phage reproduction, by genetically modifying the phage to produce an enzyme. The phage produces the enzyme in such amounts during reproduction that it can be identified through a simple mixing of a solution.

Goodridge and Willford combined known bacteriophage research with tubes used for hygienic purposes to produce their Phast Swab system.

depend upon micro world test

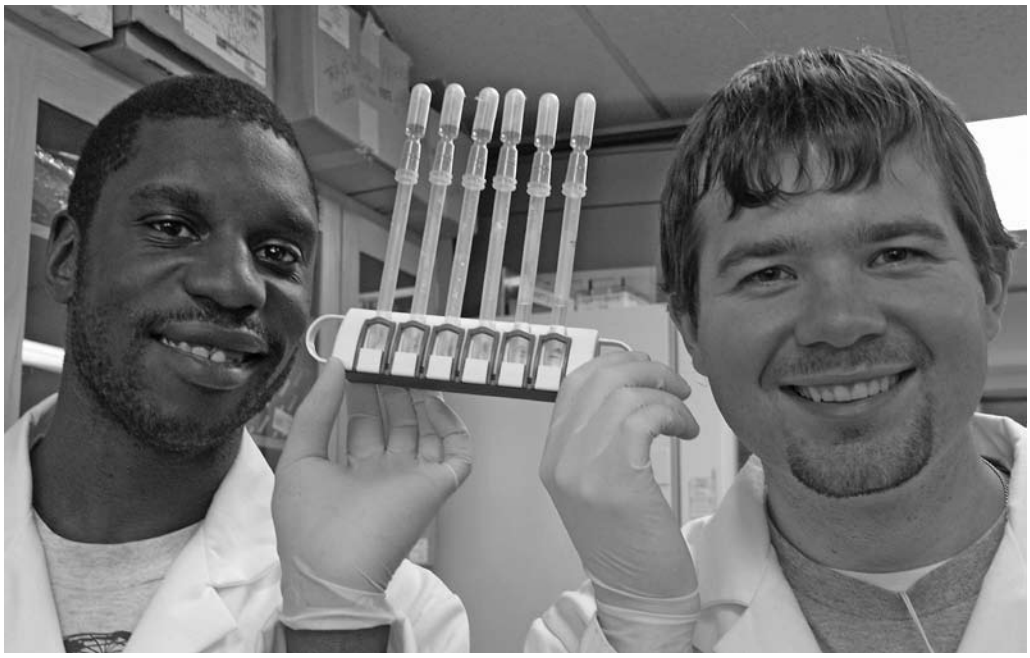
Their invention, the Phast Swab, looks like an eyedropper with a long cotton swab attached on a tube. The bottom of the tube contains a growth media and immunomagnetic beads specific for the bacteria to be tested. The swab is removed; the surface to be tested is swabbed, and the swab is returned to the tube. The sample is enriched for eight hours to allow the bacteria to grow. The immunomagnetic beads trap the growing bacteria, and the bacteriophage is added. The Phast Swab is incubated at 37 degrees Celsius for one and one-half hours. The cap of the Phast Swab is then broken, which releases a substrate into the bottom of the device, where it reacts with an enzyme that is produced as the bacteriophages are reproducing. A positive test is red, and a negative test is yellow.

Willford wants to reduce the test time to six hours.

The end system will be fast, simple, and portable. "We will make it very applied for people with no training or expertise," says Goodridge.

There are complex details yet to be worked out.

The duo wants to develop ways the phages can be specific, for example, to *E. coli* O157:H7, *Salmonella,* or *Listeria*, and methods to make the test more sensitive.



Lawrence Goodridge (left), assistant professor in the Department of Animal Science, and John Willford, doctoral candidate, display their Phast Swab equipment designed to test for food-borne pathogens.

Willford is beginning research that will lead to switching tail fibers of phages so only one type of genetically modified phage need be used, and aren't required to genetically modify a bacteriophage for each type of bacteria to be tested.

The project builds upon Goodridge's doctoral work, but success was not possible until technology had advanced, and he figured out how to modify swab tubes being used for hygienic purposes for their invention. "That was a major 'Aha' moment," says Goodridge. Phage research they could utilize has existed for two decades. They were able to combine inventions to create a new one.

"People in science are very creative, especially in applied science, but they don't have much patience," he notes. "Someone in science may invent something, which at that moment is not useful. Five years later, there is another invention and maybe, through combining the two methods, somebody creates something special."

Scientists may also work without an end product in mind. "Scientists don't always begin with the end in mind," adds Goodridge. "For example, who is going to be using the test? We have a method that will be used by people with minimal training. Tests have to be simple. There are a lot of tests out there that work well but only if the tester has extensive training. After a five-minute discussion, the person should be able to do our test."

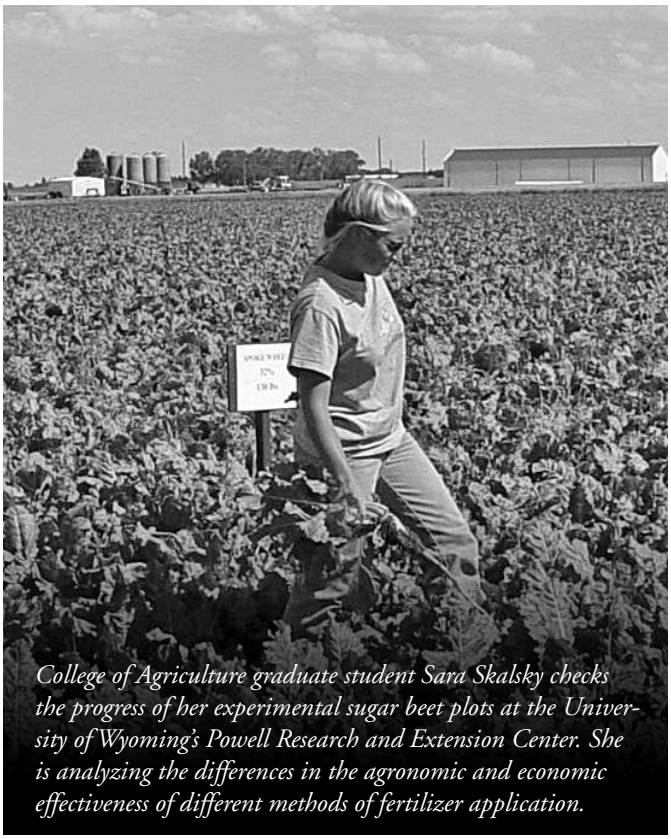
Wyoming sugar beet farmers await

by Robert Waggener, Editor
Office of Communications and Technology

Many sugar beet farmers in the Big Horn and Wind River basins who have relied on dry ammonium nitrate to fertilize their fields are pondering what to use next growing season.

The dry fertilizer is in short supply nationwide, and it likely won't be available in 2006 in the two western Wyoming basins, according to local cooperatives. College of Agriculture research could help sugar beet farmers in those two areas as well as in southeastern Wyoming decide which of the alternative fertilizers would work best for their operations.

Some sugar beet producers apply all of the nitrogen fertilizer needed by the sugar beet crop before planting. Others use a split application approach with a portion applied before planting and the remainder applied to the growing crop in early summer. Because of its favorable chemical properties, granular ammonium nitrate has been a good fit for both pre-plant and mid-season applications.



College of Agriculture graduate student Sara Skalsky checks the progress of her experimental sugar beet plots at the University of Wyoming's Powell Research and Extension Center. She is analyzing the differences in the agronomic and economic effectiveness of different methods of fertilizer application.

The most economical alternative is granular urea, but this fertilizer can injure seedling sugar beets when applied in large amounts prior to planting and can volatilize into the atmosphere when applied mid-season. As dry ammonium nitrate becomes less available, split application may become even more common so that large pre-plant urea applications can be avoided.

There are several fertilizer materials and application methods available for adding mid-season nitrogen to furrow-irrigated sugar beets, and research by a College of Agriculture graduate student may help farmers decide which of these would be best for their operations.

"Which fertilizer and associated application method can make them the most money?" asks Sara Skalsky of Powell, who started her research last year while earning a bachelor's degree in agricultural business. She is now expanding the project as she works toward a master's in agricultural economics.

Based on her early findings, Skalsky has good news for sugar beet farmers in the Big Horn and Wind River basins. She found that knife or spoke injection of liquid urea-ammonium nitrate (UAN) is more cost effective than using granular ammonium nitrate.

"Many of the farmers up here are still trying to determine which fertilizer they will use next year," says Rick Graham, agronomy department manager for Big Horn Cooperative Marketing Association based in Greybull. "We're aware of Sara's research, and a number of farmers up here are looking forward to the final results. They are in a wait-and-see mode."

Graham adds, "I think many will still use liquid UAN, but we'll have to figure out how to use the other products because ammonium nitrate won't be available. We have a little left in our inventory, but once it's gone, it's gone. Some of the options are urea, urea-ammonium nitrate, ammonium sulfate, and some phosphate blends."

UW fertilizer research

Sara Skalsky

Big Horn Cooperative Marketing Association previously purchased granular ammonium nitrate from two plants in Canada and the one near Cheyenne, says Graham, who notes the two Canadian plants closed this year and the Cheyenne facility quit selling agriculture-grade fertilizer though it continues to manufacture ammonium nitrate for explosives. He says the dry fertilizer is still available in the South, but it would be economically unfeasible to ship it to northern Wyoming.

Skalsky's research also may help sugar beet farmers in Platte, Laramie, and Goshen counties, says Paul Morrill, location manager for Panhandle Cooperative Association in Torrington.

Morrill says many growers in the area use dry urea early in the season and follow with UAN in June.

"We've had good luck with the urea and UAN down here. We haven't had any complaints from growers. I didn't know there was a concern in northwestern Wyoming until I was in Powell, and that's when I learned of Sara's project. She's doing excellent research up there, and I hope someone can do similar research down here," he says.

Regardless if a study is launched at UW's Sustainable Agriculture Research and Extension Center near Lingle, Morrill notes, he is looking forward to reading Skalsky's final report.

Subtracting fertilizer and application costs, Skalsky's beet trials using a spoke wheel to inject 130 pounds of liquid UAN per acre netted $1,241 revenue while knife injections netted $1,192.

This compares to $1,100 in per-acre revenue, above fertilizer and application costs, for the same amount of granular ammonium nitrate and $1,163 when the granular application rate was increased by 20 percent.

(Continued on page 18)

Dry ammonium nitrate under increased scrutiny

A "significant portion" of the domestic industry is no longer producing dry ammonium nitrate, a popular fertilizer among sugar beet producers and other farmers, says Kathy Mathers, vice president of public affairs for The Fertilizer Institute based in Washington, D.C.

Mathers says ammonium nitrate has been under increased scrutiny by both state and federal governments since it can be used by terrorists to make bombs. She notes it was the primary ingredient in the 1995 Oklahoma City bomb.

"There is pending federal regulation in both the U.S. Senate and the House that would require all purchasers of ammonium nitrate to register with the Department of Homeland Security in their states. It would also require everyone who sells it to keep records about the purchases," Mathers says. "The Fertilizer Institute supports this legislation because it is good, common sense legislation."

She adds, "There is still some ammonium nitrate manufactured in the states, and some is imported because there continues to be healthy demand."

The institute represents the makers, transporters, and providers of fertilizer.

The Fertilizer Institute

Nourish, Replenish, Grow

Coulter injection of liquid UAN resulted in revenue of $1,156 above fertilizer and application costs. This method involves a high pressure stream of liquid UAN being directed into the soil by a rolling coulter, which is a blade or wheel attached to the beam of a plow that makes vertical cuts into the soil.

"Based on my early findings, I would use a knife injection of liquid UAN since spoke wheel injector equipment is less available than is equipment for the other three methods," Skalsky says. The disadvantage of knife injection is that it causes much greater soil disturbance than do spoke and coulter injections, resulting in greater horsepower requirements, reduced application speed, and increased risk of plant injury.

"Spoke would be ideal, but the application method depends on what is available in the area," she says.

Skalsky emphasizes her recommendation is based on only one year of data, and results from the second year of trials – including tonnage, percentage of sucrose, and sugar yield – are currently being analyzed. The beets were harvested in mid-October at the UW Powell Research and Extension Center.

"Preliminary results from 2005 suggest the advantage of liquid over dry nitrogen sources may be less this year than last, and coulter injection may compare more favorably to the less common knife and spoke wheel injection methods," says Bart Stevens, who is assisting Skalsky with her research. Stevens is a former Powell R&E Center soil specialist now with the U.S. Department of Agriculture's Agricultural Research Service in Sidney, Montana.

Using a concrete mixer, College of Agriculture graduate student Sara Skalsky of Powell mixes urea with Agrotain. Urea is a common fertilizer, but it volatilizes easily, meaning plants don't receive as much of the nitrogen as they should. Agrotain inhibits the activity of the urease enzyme, and by doing this it keeps the urea from volatilizing.

When Skalsky learned there was interest among growers in finding a dry granular source to replace ammonium nitrate, she expanded her research this year to include Agrotain-treated urea and ammonium sulfate in addition to last year's liquid and dry forms of nitrogen.

Explaining the Agrotain-treated urea, Stevens says, Agrotain inhibits the activity of the urease enzyme that converts urea to ammonia. Warm, windy conditions can cause this ammonia to be lost to the atmosphere when urea granules are on the soil surface. Slowing the conversion to ammonia may reduce this volatilization loss. When ammonia is lost in this way, plants don't receive as much nitrogen, which may impact growth.

Skalsky is anxious to compare the second-year trials to the beets grown last year. "The weather plays a big role in fertilizing. Last year, we could see visual differences on the beet tops throughout the summer depending on which fertilizer and application was used. This year, we couldn't see a difference."

In 2004, she notes, rain fell at the Powell R&E Center right after the fertilizer was applied. This year, weather was wet early, but it didn't rain for a week following the mid-season fertilizer application.

Skalsky says there has already been interest in her research. A number of growers asked questions during an agriculture business conference last December in Casper, and she received additional inquiries during a Western Sugar Company tour in July at the Powell R&E Center, where she presented preliminary results.

Her graduate research will explore other areas of the sugar beet industry as well. "I'm trying to approach my research on the level of how it will help the farmers," notes Skalsky, who grew up on a farm in the Powell area. The title of her thesis is "An Economic Analysis of Firm Impacts of Alternative Mid-Season Nitrogen Applications for Sugar Beets and Community Impacts of CAFTA."

As approved earlier this year, the Central American Free Trade Agreement will allow Central American coun-

tries to export sugar equaling 1.2 percent of U.S. consumption to the United States tariff free. This will grow to 1.7 percent over 15 years, Skalsky says. "Because of this, the price of sugar received by farmers will eventually decrease. I'm trying to find alternative ways to increase their profits."

Graham says the higher fertilizer and fuel prices have his customers in the Big Horn and Wind River basins "screaming. The prices are as high as they have ever been, and some of the farmers are asking themselves, 'What am I going to do?'"

Skalsky poses the question: "How low can sugar prices get while still allowing farmers to turn a profit taking into account such things as CAFTA and higher fertilizer and fuel prices? If they can't turn a profit, which crop would be a good alternative in the Big Horn Basin?" Skalsky's research will examine alternatives including corn, barley, beans, alfalfa, and alfalfa seed.

Stevens says, "I caution that we only have one year's yield data with the sugar beet trials and, as we have seen this year, nitrogen response varies a lot from year to year. Still, I think our petiole data show pretty clearly that placing the liquid fertilizer close to the plant row gets the nitrogen to the plant sooner. Last year, that led to higher yield. This year, it may not. We're just waiting for final data."

The petiole, the stalk by which a leaf is attached to a stem, determines nitrate uptake in beets. Too little nitrogen can result in poor leaf canopies, premature yellowing, and reduced yields. Too much nitrogen can cause reduced sugar content and increased impurities.

"Providing the right amount of nitrogen at the right time promotes the rapid establishment of a full leaf canopy, which is critical to maximizing sugar production," Stevens says. The bigger the leaf is, the greater its capacity to capture sunlight, which can then be converted to sugar. When fully grown, a sugar beet weighs from two to five pounds and produces 10 to 25 tablespoons of sugar.

Examining data from last year's trials, Skalsky says, spoke and knife treatments produced 27.6 tons per acre while the coulter method resulted in 26.8 tons.

The granular ammonium nitrate trials using the same application rate as the liquid fertilizer (130 pounds per acre) yielded 25.4 tons. When 20-percent more dry fertilizer was used, the yield increased to 26 tons.

Sara Skalsky grinds samples from sugar beets to determine how much nitrogen content is left in the leaves.

Per-acre sugar yields follow: spoke, 10,570 pounds; knife, 10,119; coulter, 9,982; granular ammonium nitrate, 9,298; UAN increased by 20 percent, 9,701.

"An advantage of liquid fertilizers is that they can be easily injected into the soil near the roots of the growing plant," Stevens explains. The spoke system is said to cause minimal soil disturbance while placing the fertilizer in a good position for root uptake. The coulter and knife systems put the product in small furrows that are subsequently filled with loose soil above the fertilizer band.

With the knife method, nitrogen was injected eight inches from the beets on the irrigated side of the plant row.

Injections were five inches from the beets with the spoke wheel and coulter methods.

Nitrogen was injected three inches deep with all three liquid applications.

Skalsky's graduate adviser is Jim Jacobs, former director of the Wyoming Agricultural Experiment Station, which oversees the Powell R&E Center and other centers near Sheridan and Lingle. He is now a professor in the College of Agriculture's Department of Agricultural and Applied Economics.

PROGRAM NOTES


Mariah Tanner Ehmke

Agricultural and Applied Economics

A new assistant professor in the Department of Agricultural and Applied Economics will focus on agribusiness, splitting her time between teaching and research.

"I hope to pursue basic research that will enhance our understanding of successful firm behavior and changing consumer behavior in the changing, global marketplace," says **Mariah Tanner Ehmke**.

She will teach agribusiness marketing and management classes beginning next spring. She is now developing the curriculum for those classes and continuing research on the economic behavior of individuals and firms in agriculture.

She earned a bachelor's degree in human ecology at Kansas State University in Manhattan, Kansas, a master's in agricultural economics from The Ohio State University in Columbus, Ohio, and a Ph.D. from Purdue University, West Lafayette, Indiana.

Two students in the department were among four finalists in this fall's Wyoming Farm Bureau Young Farmer & Rancher Collegiate Discussion Meet on the University of Wyoming campus.

Discussion about today's perception of the agriculture industry and agri-terrorism led sophomore agriculture business major **Clayton Elliott** of Powell to a first-place finish.

Senior **Becki Boyd**, an ag business major from Strasburg, Colorado, made the finals. Another student in the college, sophomore **Stacia Berry** of Cheyenne, who is majoring in animal and veterinary sciences, placed second.

Rebecca Freeburn, a junior from Fort Laramie majoring in ag business and environment and natural resources, was one of six UW students selected as UW Gold winners this school year.

Cardinal Key, the junior class honor society, sponsors UW Gold, which replaces traditional Homecoming royalty. Students are nominated on their success in academic studies, community service, and leadership.


Terrill Weston

Animal Science

Department of Animal Science students swept a tri-state graduate student poster competition this fall in Fort Collins, Colorado, says department Head and Professor **Doug Hixon**.

Each year the Nebraska, Wyoming, and Colorado Chapter of the American Registry of Professional Animal Scientists and the Allied Feed Industry sponsor the Colorado Nutrition Roundtable in March and September in Fort Collins.

At the fall meeting, a poster competition is open to graduate students in the animal nutrition field who are from the three states.

Terrill Weston of Lander, who is working on a master's degree under Associate Professor **Bret Hess** and Professor **Dan Rule**, placed first with a poster titled "Effects of resting and inter-seeding on sagebrush-grassland site previously grazed by beef cattle."

The interdisciplinary project includes scientists from the High Plains Grassland Research Station operated by the U.S. Department of Agriculture's Agricultural Research Service near Cheyenne and the College of Agriculture's Department of Renewable Resources.

Weston won $500.

Rebecca Atkinson, a Ph.D. student from Lingle, placed second with a poster titled "Effects of ruminal protein degradability and frequency of supplementation on visceral nitrogen flux in lambs fed low-quality forage." She is collaborating with a University of Kentucky scientist.

Atkinson, who is being advised by Associate Professor **Paul Ludden**, won $250.

Chuck Murrieta, a Ph.D. student from southern California who is working under Hess and Rule, placed third and won $100. His poster was titled "Mammary lipid metabolism in primiparous beef cows fed high-linoleate safflower seeds." His project also involves collaboration with scientists at Colorado State University.

Betty Holmes

Family and Consumer Sciences

The Department of Family and Consumer Sciences (FCS) currently has two searches in the department – one for a faculty member in child and family studies with a child and youth area of expertise and one for an academic professional to direct the Cent$ible Nutrition Program (CNP) and Expanded Food and Nutrition Education Program.

The search committee for the faculty position is screening applicants. Interviews for the academic professional position were in late November. The CNP was awarded the Leadership, Innovation, and Nutrition Collaboration Award for Excellence in Practice. The award was presented in Arlington, Virginia, to **Mary Kay Wardlaw** and **Cindy Frederick**, co-directors of the Food Stamp Nutrition Education Program in the FCS. The entire CNP team was recognized at the University of Wyoming Cooperative Extension Service's Extension Professional Improvement Conference in Laramie in October.

"Let Their Voices Be Heard," a collection of quotations from the qualitative research efforts of Wellness IN the Rockies, has just been released. Its focus is the complexities of the interviewees' lives in relation to physical activity, good and healthy eating, and body image. The book, authored by **Betty Holmes**, senior CES educator, **Suzanne Pelican**, CES food and nutrition specialist, and **Fred Vanden Heede**, Wellness IN the Rockies consultant, has been distributed to the CES county offices, members of and consultants for WIN Wyoming, selected state CES food and nutrition specialists, members of the Society for Nutrition Education, key U.S. Department of Agriculture contacts, and selected faculty and staff members of colleges of agriculture and health sciences. The book is also available for purchase at the UW Bookstore and through Amazon.com.

Mark Stayton

Molecular Biology

Mark Stayton, an associate professor in the Department of Molecular Biology, is collaborating with Professor **Rich McCormick** of the Department of Animal Science to develop a rapid, blood-based test for the early diagnosis of brisket disease in cattle.

"Brisket disease develops in response to high altitude when reduced oxygen concentration causes pulmonary hypertension leading to heart enlargement and death," Stayton says.

In the Rocky Mountains, brisket disease is widespread with incidence in the calf crop up to 5 percent. It is a genetic disease and, when a carrier bull is used, the proportion of calves showing symptoms can be substantially higher.

The only diagnostic test available is PAP (pulmonary arterial pressure). PAP testing involves measuring blood pressure in the pulmonary artery using a catheter inserted into the jugular vein and threaded through the heart and into the pulmonary artery. PAP tests are costly, invasive, and difficult to perform, Stayton says.

Stayton and McCormick are developing a rapid, inexpensive blood test that could be used in the field by producers to identify cattle at risk for brisket disease. They have identified a set of genes in the white blood cells of cattle with early-stage brisket disease that differ in expression compared to healthy cattle.

Using their bovine gene data as a starting point, they will determine whether these leukocyte genes can be used as diagnostic markers of brisket disease.

"In the final phase of research, we will test Wyoming cattle herds for correlation between expression of these marker genes and development of brisket disease," McCormick says.

PROGRAM NOTES


Ginger Paige

Renewable Resources

Faculty members in the Department of Renewable Resources are tackling contemporary statewide agricultural and resource management issues, and they are solving clientele problems using applied research, management, and extension programming.

K.J. Reddy developed a process to remove arsenic from drinking water, a worldwide contribution. He is now developing techniques to remove carbon dioxide emissions from coal-fired power plants, implicated in deterioration of the ozone layer leading to accelerated global warming. **Ginger Paige, Reddy, Larry Munn,** and **Quentin Skinner** continue research and extension efforts to improve coal-bed methane by-product water. **George Vance** is investigating soil carbon sequestration issues, and is seeking methods to enhance soil carbon levels essential for numerous soil biological and ecological functions. **Peter Stahl** is exploring efficient utilization of soil microbes to facilitate vegetation re-establishment on mined lands and reduce soil contamination using phyto-remediation practices. **Ann Hild** is investigating integrated management techniques to mitigate impacts from invasive weeds on native rangeland vegetation, a factor that significantly reduces livestock and wildlife carrying capacity on rangelands.

Alex Latchininsky and **Scott Schell** are assessing practices to reduce grasshopper impacts on desirable rangeland forage production and control undesirable plant establishment. **Tim Collier** continues work with weeds and pests using insect biocontrol techniques to reduce noxious weeds.

In extension education, **Paul Meiman** and **Jim Waggoner** continue to sponsor successful statewide "range management 101/201 schools," teaching range ecology and management principles to diversified audiences. **Meiman** is also working with property owners to maximize sustainable agricultural production and natural resources on small acreages. **Michael Smith** teaches rangeland monitoring to agricultural producers and resource management agency personnel, educating clients in evaluating range condition and wildlife habitat quality.

For more information about applied research, extension, and teaching programs in the department, visit its Web site at http://uwadmnweb.uwyo.edu/UWRENEWABLE .


Kaycee Nelson

Academic and Student Programs

The concept of a retreat is certainly not new; however, the Office of Academic and Student Programs decided to host its own brand of retreat, one for the entire office – Associate Dean **Jim Wangberg**, staff assistant **Kelly Wiseman**, recruitment coordinator **Pepper Jo Six**, academic and personal counselor **Teresa Castano**, and student assistant **Kaycee Nelson**.

Rather than call it a retreat, why not call it an "Advance," as the purpose was to move ahead with new ideas and advance the office agenda.

The agenda was developed beforehand by soliciting ideas from everyone. Four themes guided morning-long discussions: communications, teamwork, interpersonal skills, and skill building. "A connecting thread is the way in which we create a satisfying workplace," Wangberg says.

The meeting was held at the Hitching Post, Cheyenne, for a distraction-free environment and a professional workshop setting. An easel, sticky notes, and enthusiasm were all that were needed to occupy the morning and fuel lively discussions. "Even though one of the ground rules was not to create more work for an already exceptionally busy staff, we still came away with fresh ideas," he notes.

An advance should not be all work and no play, so the afternoon was dedicated to a continuation of teamwork and skill-building themes. "Original plans to play golf were foiled by a Wyoming thunderstorm so plan B was implemented, and we embarrassed ourselves at the bowling alley, which reminds

me of one other ground rule: What happens in Cheyenne, stays in Cheyenne," he says.

"Try advancing; you and your office and program will enjoy and benefit from the experience."


Cole Ehmke

Cooperative Extension Service

Three employees recently joined the University of Wyoming Cooperative Extension Service.

Cole Ehmke began as a business development and financial management specialist in August. He has a master's degree in agricultural economics from the University of Sydney, Australia, where he was a Fulbright Scholar. Prior to coming to UW, he worked as an assessment specialist for Purdue University CES.

Jeremy Green started with CES in October as the assistant university extension educator for 4-H/youth in Laramie County. He graduated this year from Vanguard University of Southern California, Costa Mesa, California, with a bachelor's degree in political science and history. He is a 4-H alumnus from Oregon.

Ryan Rapp began work in September in the Department of Plant Sciences as a temporary forage specialist. He is completing his master's degree in agronomy-weed science at UW.

CES educators were honored during the Extension Professional Improvement Conference in September in Laramie. **Denise Smith**, educator in Converse, Natrona, and Niobrara counties, received the Jim DeBree Award. 4-H program associate **Melissa Johnson** of Park County received the Newer Employee Recognition Award. The Creative Excellence Recognition Award went to Big Horn Basin area educator **Phyllis Lewis**.

The CES's Cent$ible Nutrition Program received the national Leadership, Innovation, and Nutrition Collaboration Excellence in Practice award in September from the U.S. Department of Agriculture, Food and Nutrition Service. "The University of Wyoming CES Cent$ible Nutrition Program is one of the best-led and best-executed nutrition education programs in the nation," says Associate Dean and CES Director Glen Whipple. **Mary Kay Wardlaw** and **Cindy Frederick**, acting co-directors of CNP and members of the Department of Family and Consumer Sciences, accepted the award in Arlington, Virginia.


Justin Moss

Agricultural Experiment Station

This fall has been a busy time for the Agricultural Experiment Station (AES) with the competitive grants program and design and initiation of construction projects at the Sustainable Agriculture Research and Extension Center (SAREC) near Lingle. In addition, an expansion to the Denny J. Smith Memorial Seed Laboratory at Powell has been proposed and is awaiting approval by the state legislature.

In response to the most recent call for proposals to the competitive grants program, AES received 13 new proposals and will be able to fully fund at least four of them. "A strong internal and external review panel has been established, and we hope to make the awards by early December," says Associate Dean and AES Director **Stephen Miller**.

The face of SAREC is changing daily with initiation of construction projects on the office complex, shop, hazardous materials handling area, and the animal handling facilities. Bids for the animal research pen facilities were to be opened the end of October.

"We have seen several personnel changes at the research and extension centers with **Justin Moss** replacing **Roger Hybner** at Sheridan and **Abdel Mesbah** serving as interim director at Powell while **Alan Gray** recovers from a serious accident," Miller says.

"We encourage anyone who is interested to drop by and visit our research facilities at Lingle, Sheridan, and Powell."

PROGRAM NOTES

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Ag Development

Alumni and friends of the College of Agriculture who wish to help support our students and programs should take note of the recent Katrina Emergency Tax Relief Act of 2005, says Anne Leonard, director of ag development and college relations.

"The UW College of Business summarized this act for its alumni and has allowed us to reprint excerpts," Leonard says.

To encourage charitable giving this fall, Congress enacted legislation which temporarily suspends various income tax limits for charitable contributions. The Katrina Emergency Tax Relief Act of 2005 allows donors to deduct up to 100 percent of their adjusted gross income for cash donations they make from August 28 until December 31, 2005. These changes apply to gifts to all qualified charities, not just those involved in disaster relief. Thus, year-end contributions to the University of Wyoming Foundation, the College of Agriculture, the College of Business, or other academic programs, qualify.

The tax break is significant: Usually, donors cannot write off more than 50 percent of their adjusted gross income for deductions for charitable gifts.

Ken Dugas (bachelor's of science in accounting, 1981), CPA and partner with the Cheyenne firm of McGee, Hearne & Paiz, LLP, concurs. "This temporary change in the law by Congress is quite extraordinary. Taxpayers who have considered making any significant charitable contributions as part of their tax planning should strongly consider making such contributions before the end of the year in order to take advantage of the greater deduction being allowed by this act."

The new law also encourages retirement-fund gifts. Donors over age 59½ can make withdrawals from IRAs, 401(k), and other retirement plans, and use those funds to make charitable gifts with no penalty. The temporary suspension of the limits on charitable deductions for income tax purposes means these gifts will be fully deductible for federal income taxes, regardless of size.

For more information on this window of opportunity to take advantage of tax benefits while supporting nonprofit organizations, contact your tax adviser directly.

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