Fort Keogh Researcher

LIVESTOCK AND RANGE RESEARCH LABORATORY

In cooperation with

INSIDE THIS ISSUE:

March 2010

Introduction, by Mark Petersen, Research Leader

Hello from the Cowboys, Staff, Students and Scientists at Fort Keogh!

We have had an interesting year and we have had many accomplishments. As previously reported in April, the bovine genome was published after an international effort and the participation of a number of our scientists (especially Lee Alexander, Mike MacNeil, Richard Waterman, and Andy Roberts) and technicians. One of our Line 1 Hereford cows donated the genetic material that was reported. The next important step for the future of this endeavor is to identify the most important genes influencing animal function. Fort Keogh is positioning itself along with Montana State University to conduct a portion of this important work.

A revealing 3-year study was completed this year under the direction of Tom Geary. He designed an experiment to uncover some of the mechanisms that cause 20% of all cows that conceive to fail to maintain a pregnancy. His preliminary data looks interesting and shows promise in providing new insight.

In rangeland experiments, two of our scientists (Matt Rinella and Lance Vermeire) are evaluating methods to manage annual bromes in an attempt to invigorate the native landscape and minimize deterioration caused by increases in annuals. We will keep you informed as the results unfold.

We are in the fortunate position of having the 1960 era wing of our building undergo a modernization to improve energy efficiency, space usage and create a healthier environment. We have also allotted space in the modernization for a tissue culture laboratory and a range vegetation dry laboratory. Each of these areas will improve our research capabilities. This modernization project was to be implemented 5 years ago but was postponed due to reapportionment of the funds to the recovery effort after Hurricane Katrina. Remodeling began the second week in February 2010. Asbestos abatement was concluded and the demolition has started. A number of organizations use our meeting room for various events during the year. Most likely, we will favorably respond to requests to use the meeting room again after October 2010.

Another important event for us will be an On-Site Expert Panel Review scheduled for September 20-24, 2010. We will have participation by our Customer Focus Group, experts from around the United States, and USDA-ARS leaders to review and evaluate our research accomplishments, goals, and direction of our future research. We anticipate receiving useful feedback from the review to assist us in setting priorities, objectives and intended impacts of research conducted at Fort Keogh.

With summer just a few months away, we would like to invite college students to apply for one of our range internships. It is a wonderful opportunity to work outside, learn to identify vegetation found in the Northern Great Plains, and become exposed to Rangeland Ecology and Research. Please see our web site

Introduction, continued

for application information or call our office. We also will be advertising a number of positions through Montana State University. The State Office Administrative position is being advertised and if you know of someone who would be good with animal records and databases, please encourage him or her to apply. There are two other positions open, one in the feedlot and another on the farm crew. The description for these positions can be found at www.montana.edu/jobs.

You will find an interesting article below by Richard Waterman, a Range Nutritionist, about nutritional decision-making. We have also added two new sections. First is a regular column by our Assistant Superintendent, Brad Eik, who will keep you informed about our livestock operations, and the second will be a calendar of Outreach events Fort Keogh personnel participated in during the past 6 months. We hope you enjoy the Fort Keogh Researcher and we get a chance to see you this summer. This winter has seemed like a tunnel so it is nice to see calves on the ground, snow disappearing, and little sprigs of new green grass. Take care.

Planning for next winter—How can I make the best use of winter range? When and how much do I feed? Do I supplement with energy or protein?

by Richard Waterman, Range Nutritionist

There are three objectives I would like to achieve in this article: 1) Provide evidence that supplementary feed is important and has a role in winter; 2) Discuss pros and cons of supplement delivery methods; and 3) Show advantages of different management schemes depending on the amount of risk a producer is willing to accept.

Before I begin my discussion, I would like to point out that there is no top secret, "silver bullet", answer to the questions posed in the title. In extensive western livestock production systems, each individual enterprise has resources and limitations it has to work around and within. This article provides documented and fundamental tools that will aid range-based enterprises with the ability to fine tune their operations by improving biological and economical efficiencies. You may ask what I mean by biological and economical efficiency. Take a moment and consider the engine in your vehicle! If the fuel filter is partially clogged the engine losses power, causing the engine to work harder and use more fuel to transfer energy to propel the vehicle. Decreasing the miles per gallon resulting in more frequent stops to purchase fuel thereby increasing out of pocket expenses. The grazing cow is similar to the scenario described above. There can be a number of reasons that result in "clogged" or inefficient biological systems in the cow that ultimately leads to poor economic outcomes. The biology of the grazing cow is such that there are two biological systems that must run in harmony to achieve biological and economic efficiency. These biological systems include the largest compartment of the cows stomach where fermentation occurs; the rumen, which is inhabited by microorganism that are first to gain access to feed consumed by the grazing cow. The other component is the cow herself which is reliant on byproducts produced by the rumen microorganisms from fermentation of consumed feed. This dependent relationship (each biological system relying on the other for survival) is why range cows can convert energy from range forages to ultimately nourish the cow thereby allowing acceptable production to occur and provide consumable products that customers seek.

Research at Fort Keogh has documented that cows utilize one class of biological fuel (glucose or blood sugar) differently depending on the quality of the forage consumed.[1] In other words, glucose or blood sugar can be an energy source that animal tissues use, just like fuel is the energy source for the engine in your vehicle. The cow depends on the microorganisms to provide a specific nutrient from fermentation so that glucose (blood sugar) can be made in the body. Once blood sugar is produced, it is delivered to the tissues through the blood. Dietary carbohydrates (which include fiber, starch and sugars) are nearly completely utilized by the rumen microorganisms so very little free glucose (sugar) gets past the rumen to be absorbed as sugar in the

"THERE IS NO TOP SECRET, "SILVER BULLET" ANSWER TO THE QUESTIONS POSED IN THE TITLE"

small intestine. In fact greater than 90% of all blood sugar (glucose) is produced by the cow's liver. The specific nutrient that is required for glucose production produced in fermentation decreases as forage quality declines resulting in inefficient metabolism and body weight loss in the cow. In other words, cow tissues (muscle and fat) are broken down to make up for the lack of the specific nutrient needed for glucose formation and glucose is required by both the cow and developing fetus.

Now we can recognize that there are times when additional feed can be beneficial (especially increasing the glucose supply) there are two questions that arise. First what type of feedstuff should be delivered? and secondly, how frequently do they need to be fed? In Table 1, there are three definitions that one should be familiar with for the remaining discussion.

If we first take a look at energy, the energy provided by rangeland vegetation is the reason why producers own grazing lands. The energy available in range forages decreases as forages mature, and as a result, consumption of grazed vegetation can be reduced resulting in an inability to consume enough energy to meet requirements. This situation is similar to what we experience during droughts (limited forage available), when rangelands may be over utilized, or during the winter when snow cover is too hard for cows to get to forages below. Therefore, there are times when additional energy from harvested or purchased feeds is beneficial. How these energy feedstuffs are fed can greatly influence the consumption of grazed forages available on rangelands. Research conducted at Fort Keogh has demonstrated that feeding supplemental grain when normal grazing occurs can impact performance and grazing behavior.[2] In addition, a summary of research on southwestern rangelands showed that providing energy daily improves animal performance greater than less frequent delivery.[3] A general rule of thumb is 1 lb of consumed corn will substitute for 1 lb of grazed forage.

Now, if we consider protein, which is often the primary limiting nutrient when mature forages are consumed. We can now discuss why protein is so important to ruminants grazing mature forages. By supplying high protein harvested or purchased feedstuffs, a protein deficiency is avoided. First, by delivering protein to the microorganisms, they are able to reproduce faster. This increase in number (and activity) of microorganisms allows for greater digestion of consumed forages which in turn provides more microbial fermentation products for absorption and utilization of the cow biological system. Furthermore, since more microbes are present, there is a greater supply of microbial protein that passes through the cows remaining three compartments for absorption in the small intestine. Protein is a functional component of microbial cells and is the primary source of protein utilized by the cow. This is why the synergistic relationship between the microorganisms and the cow is so important.

There are two primary routes feed protein follows after ingestion: The first being protein that is directly available to the microorganisms (known as either DIP – degradable intake protein or

Table 1. Definition of terms related to providing harvested or purchased feeds to livestock grazing rangelands.

Supplementation	Providing of a specific nutrient to reduce a deficiency and enhance the utilization of other dietary nutrients.
Substitution	Providing a single or group of nutrients that are lacking in a diet and in a quantity that replaces feedstuff consumed otherwise.
Full Feed	Providing a group of nutrients in the form of a complete ration (diet) with no expectation of the animal to receive feed elsewhere.

Planning for next winter (continued)

RDP – ruminally degradable protein); and the second path is largely that of protein which escapes microbial degradation and flows directly to the small intestine (known as UIP – undegradable intake protein, RUP – ruminally undegradable protein, or by-pass protein). I will not go into further detail of these forms as they are beyond the scope of this article. Just be aware that there are different forms and that protein that escapes microorganism degradation is targeted to go directly to the cow. When feeding protein, timing of the delivered feed can influence how efficiently it is utilized. Targeting a time of day that does not disrupt a grazing bout will be most beneficial. In summary, range cow research demonstrates that providing protein 2 to 3 times a week is just as beneficial as daily delivery.[3]

Lastly, in Table 2, a risk and reward chart is presented for evaluation of operations and how a little "change" in their management may help them improve biological and economic benefits. Producers, managers, and/or livestock husbandry personnel know their livestock and resources better than anyone. Therefore, if changes can be made, they must occur within the constraints of the enterprise at hand, and there is no single management practice that works for all enterprises. Use Table 2 to initiate an evaluation of current management, and consider if increasing risk would benefit your operation. Since hay is a common feedstuff fed to range cows, Table 2 only discusses the use of hay as a supplemental, substitution, or full feed. However, there are many other alternatives that could be considered. If alternatives to feeding hay are sought, a summary of research conducted on southwestern rangelands that has focused on different low cost supplementation strategies is available.[4] Please feel free to contact me or others here at Fort Keogh with questions and/or concerns relating to your enterprise.

References:

1. Waterman, R.C., Grings, E.E., Geary, T.W., Roberts, A.J., Alexander, L.J., and MacNeil, M.D. 2007. Influence of seasonal forage quality on glucose kinetics of young beef cows. *J Anim Sci* 85:2582-2595.

2. Adams, D.C. 1985. Effect of Time of Supplementation on Performance, Forage Intake and Grazing Behavior of Yearling Beef Steers Grazing Russian Wild Ryegrass in the Fall. *J Anim Sci* 61:1037-1042.

3. Wallace, J.D. and Parker, E.E. 1992. Range supplements - what we have learned. *Livestock Research Briefs & Cattle Growers Short Courses*:20-27.

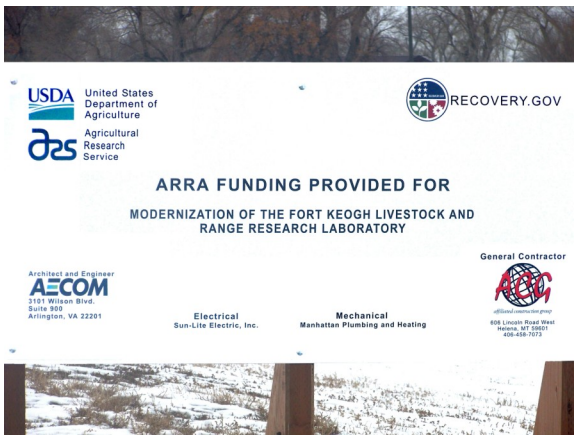
4. Petersen, M.K. 2006. Strategic low cost supplementation. *Proc West Sec Am Soc Anim* 57:3-6.

Table 2.

Option 1:	Option 2:	Option 3:	Option 4:	Option 5:
(Highest level of risk)	(Higher risk)	(Moderate risk)	(Marginal risk)	(Low risk)
Provide Mineral	Provide Mineral	Provide Mineral	Provide Mineral	Provide Mineral
No Hay supplementation or substitution	Feed hay once a week (after morning grazing bout) at a rate of 15-20 lbs per head	Feed hay every three days (after morning grazing bout) at a rate of 15-20 lbs per head	Feed hay every other day (after morning grazing bout) at a rate of 5-20 lbs per head	Feed hay daily (after morning grazing bout) at a rate of 5-20* lbs per head
Native range provides enough grass to allow cows to consume as much feed as they want and winter range utilization is optimized!	This is a substitution of native range and cows will most likely not graze the remainder of the day. Cows do not become accustomed to feeding using this approach and you will get better utilization of winter pasture. A good quality hay running 15% or greater in CP will allow nitrogen recycling to occur for 48 to 72 hours (results in aiding the rumen microbes to better utilize the poor quality dormant native range) Allows for low labor cost and conserves harvested or purchased feedstuffs.	This is a substitution of native range and cows will most likely not graze the remainder of the day. Cows may become accustomed to feeding using this approach and you will get sporadic utilization of winter pasture. A good quality hay running 15% or greater in CP will allow nitrogen recycling to occur for 48 to 72 hours (results in aiding the rumen microbes to better utilize the poor quality dormant native range) Allows for reduced labor cost and conserves harvested feedstuffs.	This is a supplementation/substitution of native range and cows will most likely not graze the remainder of the day at higher levels of delivery. Cows will become accustomed to feeding using this approach and you will get sporadic utilization of winter pasture especially if feeding site remains constant. A good quality hay running 15% or greater in CP will allow nitrogen recycling to occur for 48 to 72 hours (results in aiding the rumen microbes to better utilize the poor quality dormant native range) Increased labor cost and utilizes harvested feedstuffs.	This is a supplementation/substitution/full feed of native range and cows will most likely not graze the remainder of the day at higher levels of delivery. Cows will become accustomed to feeding using this approach and you will get substantially lower utilization of winter pasture. A good quality hay running 15% or greater in CP will allow nitrogen recycling to occur for 48 to 72 hours (results in aiding the rumen microbes to better utilize the poor quality dormant native range) Results in the highest labor cost and utilization of harvested feedstuffs.
NOTE: There should be a contingency plan in place to go to full feed if winter storm conditions are such that native range becomes unavailable (Ice on top of snow such that cows are unable to break it and get to the native range, native range becomes inadequate to provide enough forage for appetite). Always evaluate your cows and let them determine if this approach is appropriate.				

REMODELING PROGRESS

The demolition/tear out of the original part of the building is coming close to being finished—everything has been stripped to the bones. Soon they will have the electricians and plumbers working. The goal is to be done by September.



Assistant's Corner by Brad Eik

Greetings from Fort Keogh! My name is Brad Eik. I am the new Assistant to the Superintendant and Director of Outside Operations. I started in November and will be providing an article to each Fort Keogh Researcher informing the readers of news and updates within our operation. This first article will be an introduction to our outside crews and what they have been up to. I will start with the Feedlot/Farming crew which consists of the supervisor Benny Bryan and his two crew members, Justin Kiel and Lynn Scheid. They have been very busy in the feedlot this winter with feeding, hauling hay, treating sick animals, weigh days for all the calves in the feedlot, and assisting with several other projects too numerous to describe. The calves look fantastic and thanks to their hard work last summer we were able to grow all the feed we need at the Fort. We did not have to purchase anything off the farm and for that they deserve a big pat on the back and thank you. They are also in charge of feeding our sale bulls which I was told by several buyers looked the best they have in years, so good job guys—keep it up!

We have two cowboy crews here consisting of the Physiology/Nutrition crew and the Genetics crew. The Physiology crew is supervised by Mike Woods along with his crew members Doug Armstrong, Alan Mason, and Tyler Johnson. They are in charge of the Season of Calving known as SOC's and Physiology cow herds, which are two separate groups predominantly Hereford/Angus. Their winter has been busy feeding cows, assisting in data collection (including cow body weights), and giving our breeding females their pre-calving shots which we try to do 8-10 weeks prior to calving giving the second shot 6 weeks later. We have also started their pre-breeding shots. They are also nearly finished with the early calving SOC cow herd with over 100% survival rate. This is a direct result of their long days and hard work. We appreciate their efforts very much. We are just getting started calving the other cows and heifers so the long days will continue for them. Thanks again for the dedication and effort to make Fort Keogh a success.

Next we have our Genetics crew supervised by Tom Mott with other members Mike Landers, R.J. Hubbard, and Dennis Logan. They are responsible for the care of our Line 1 Herefords and the CGC composite cows, a research herd which are Red Angus, Charolais, and Tarentaise. Much the same as the other cowboy crew, they have been busy with feeding cows and feedlot cattle workings along with pre-calving and prebreeding vaccinations for all the breeding females. They are also getting ready to start calving their cows and heifers as well. Being in charge of getting the Line 1 sale cattle ready also takes up a good portion of their time. We had a good sale on March 6th. The sale would not be a success without them taking the time to help get all the photographs taken for the catalog and video taken for the internet and spending time showing buyers around. These guys do so much to make us proud of the sale and we thank them for all of their efforts.

We also have our exceptional Maintenance crew supervised by Kenny Strobel and consisting of Sam Hould, Eddie Arnoldt, and Phil Smith. They are definitely the back bone of Fort Keogh as they keep everything running from the pickups and trailers to the tractors and feed truck. They are also in charge of maintenance of corrals, water facilities, scale houses, and road maintenance. They have spent their winter with snow removal and keeping roads open so we can get cattle fed on the range and in the feedlot as well as keeping the fleet and everything else operational. We really couldn't do anything here without them and we tip our hats to their continued dedication and hard work.

Last but certainly not least, we have Sandi Locke, Administrative Associate, who has been in charge of the cattle records here for over 20 years. Sandi has been-working part-time since she retired, but has informed us she will be leaving permanently to help her husband on the family ranch. I just want to thank her for all the years of great service to Fort Keogh and the bull sale of which she has been a major contributor of its continued success. My time with Sandi has been short but she is an incredible person and will be missed greatly when she goes. I wish her the best of luck in retirement and her future endeavors. I would also like to introduce Nancy Gilbertson who is retired from ARS. She does a great job assisting Sandi proofreading the cattle records and data.

The bottom line is we are a complex operation and to make it work we all need to be a team. There isn't one crew or member more important than the other. This place is a success because we all work together to get the job done and I hope we can continue to be successful long into the future.

This has just been a brief description of what the crews do and I hope it gives everyone an idea of how much we are like an everyday working ranch trying to be self-sustaining. The biggest challenge is that we need to be economically efficient and still produce cutting edge research for ranchers to take advantage of and put into use. It's a challenge we work towards everyday at Fort Keogh.

I thank you for your time and in closing I would like to let you know we do have two job openings on the Farm/Feedlot crew open now as well as an opening for the Administrative Associate. If you have any questions or concerns about job openings or anything else, please contact me at 406-874-8226 or you can also check them out at the MSU website http://www.montana.edu/jobs/.

Fort Keogh Outreach Activities

Boise, ID, October 2009, Mark Petersen presented an invited talk titled "Defining the Role of Nutrition in Beef Cows Reproduction—Ways to Improve Biological and Economic Efficiency" at the Pacific NW Animal Nutrition Conference.

Argentina and Punta Arenas, Chile, October 2009, Mark Petersen traveled to Argentina and presented a talk entitled "Cow Calf Production in Semi-arid Regions: Science and Technology News" to the Argentine Association of Animal Production 32nd Annual Conference during the Animal Nutrition Session and presented a talk "Animal Production in the US" at the Kampenaike Experiment Station.

Ketchecan, AK, October 2009, Matt Rinella was invited to present a talk "A Precautionary Tale: Impacts of Spotted Knapweed in Montana" at the Invasive Species Conference.

Kansas City, MO, October 2009, Mike MacNeil gave an invited presentation titled "A Genetic Evaluation for Sustained Reproductive Success" to the Breed Improvement Committee and general membership at the American Hereford Association Annual Meeting.

Colstrip, MT, November 2009, Matt Rinella went to to take a tour of the mine areas and evaluate the noxious weeds in the area.

Malta, MT, November 2009, Lance Vermeire attended the NRCS Technical Specification meeting.

Williston, ND, December 2009, Andy Roberts was invited to present a talk titled "Beef Cow Longevity and Efficiency with Limited Feeding Management" at the Bovine Connection Meetings.

Casper, WY, December 2009, Lance Vermeire presented a paper titled "Managing Annual Bromes in the Northern Great Plains" at the Range Beef Cow Symposium.

Nevada, January 2010, Tom Geary presented several talks at the Cattlemen's Update 2010 Management Strategies that Pay sponsored by the University of Nevada Cooperative Extension Service to about 525 people over the week. The program was also broadcasted.

Miles City, MT, January 2010, Rachel Endecott and Mark Petersen presented talks at the Cow Capital Beef Day hosted by the MSU Extension. Mark's talk was titled "Livestock Water Quality" and Rachel's was "Beef Cattle Production." Over 40 people attended the talks.

Medora, Killdeer, and Bowman, ND, January 2010, Andy Roberts gave an invited talk titled "Beef Cow Longevity and Efficiency with Limited Feeding Management."

Missoula, MT, January 2010, Matt Rinella gave a talk titled "Advances in Leafy Spurge Control with Grazing and Invasive Annual Grass Control with Tordon, Banvel, and Milestone" at the 53rd Montana Weed Control Association Annual Conference.

Hobson, MT, January 2010, Rachel Endecott, Mark Petersen, Andy Roberts, and Lance Vermeire gave talks to producers on Fort Keogh Research. The meeting was sponsored by the Judith Basin County Extension Service and the Judith Basic County Stockgrowers. About 40 people attended.

Miles City, MT, January 2010, Matt Rinella was invited to give a talk titled "The Good News and Bad News" at the Custer County Conservation District Winter Grazing Seminar held at Fort Keogh.

Miles City, MT, February 2010, Brad Eik, Sue Bellows, and Brooke Shipp judged the Rural School Science Fair held at the Sacred Heart School.

Denver, CO, February 2010, Jennifer Muscha, Mark Petersen, Aaron Roth, Kim Haile, and Lance Vermeire attended and presented posters at the Society for Range Management Meetings.

Missoula, MT, February 2010, Matt Rinella was invited to present a talk titled "Spotted Knapweed Control Effort Imperils Native Plants" at the 2010 Montana Plant Conservation Conference, sponsored by the Montana Native Plant Society and the University of Montana.

Brookings, SD, February 2010, Tom Geary presented a talk on embryonic mortality via cell phone as bad weather inhibited his travel to the James Bailey Herd Health Conference sponsored by the South Dakota Veterinary Medical Association.

St. Joseph, MO, February 2010, Mike MacNeil presented a talk on the system for genetic evaluation of feed intake and efficiency to the Board of Directors of the American Angus Association.

Miles City, MT, February 2010, Mark Petersen gave an overview of the research program at Fort Keogh to the Miles City Leadership class. Followed by a tour of the facility.

Bozeman, MT, February/ March 2010, Rachel Endecott and Lance Vermeire traveled to Bozeman for the Interviews for the Head of the Animal & Range Science department position.

Miles City, MT, February 2010, Mark Petersen gave an overview of the research at Fort Keogh to the Kiwanis group.

Ottumwa, IA, February 2010, Tom Geary presented a talk titled "Addressing Beef Cow and Heifer Estrus Synchronization Protocols and Provide New Updates That Can Improve Breeding Success and Reduce System Cost" at the Cornbelt Cow-Calf Conference.

Billings, MT, March 2010, Jennifer Muscha is serving on the Society for Range Management planning committee for the 2011 meetings to be held in Billings, MT.

Sidney, MT, March 2010, Andy Roberts presented a talk titled "Beef Cow Longevity and Efficiency with Limited Feeding Management" at the USDA-ARS NPARL.

USDA-ARS
Livestock and Range
Research Laboratory
243 Fort Keogh Road
Miles City, MT 59301-4016

We're on the web!
http://www.ars.usda.gov/npa/ftkeogh

If you have email and would rather receive this newsletter as a .pdf file, send an email to diona.austill@ars.usda.gov to be added to the list.

Recent Publications

Atkins, J. A., M. F. Smith, K. J. Wells, and T. W. Geary. Factors affecting pre-ovulatory follicle diameter and ovulation rate to GnRH in postpartum beef cows Part I: Cycling cows. J. Anim. Sci. (In press). 2010.

Atkins, J. A., M. F. Smith, K. J. Wells, and T. W. Geary. Factors affecting pre-ovulatory follicle diameter and ovulation rate following GnRH in postpartum beef cows Part II: Anestrous cows. J. Anim. Sci. (In press). 2010.

Chitko-McKown, C., and MacNeil, M.D. 2009. Development of Fibroblast Cell Lines From the Cow Used to Sequence the Bovine Genome. Animal Genetics (in press).

Geary, T.W., Ansotegui, R.P., MacNeil, M.D., Roberts, A.J., and Waterman, R.C. 2010. Effects of flunixin meglumine on pregnancy establishment in beef cattle. Journal of Animal Science 88:943-949.

Progar, R.A., Markin, G., Milan, J., Barboulettos, T., and Rinella, M. 2010. Inundative Release of Aphthona spp. Flea Beetles (Coleoptera: Chrysomelidae) as a Biological "Herbicide" on Leafy Spurge (Euphorbia esula L.) in Riparian Areas. J. Economic Entomology (in press).

Reinhart, K.O., and Clay, K. 2009. Spatial variation in soil-borne disease dynamics of a temperate tree, *Prunus serotina*. Ecology 90:2984-2993.

Reinhart, K.O., Van der Putten, W.H., Tytgat, T., & Clay, K. 2010. Virulence of soil-borne pathogens and invasion by Prunus serotina. New Phytologist 186:484-495.

Please check our website http://www.ars.usda.gov/npa/ftkeogh for these and other publications. Email sue.miles@ars.usda.gov for copies of reprints.