# Fort Keogh Researcher


***Inside this Issue:***



## Introduction

*Dr. Rod Heitschmidt*
*Research Leader*

Many changes have occurred at Fort Keogh since our last *Fort Keogh Researcher*. Some highlights follow.

A. Construction of the new additions to our main building is continuing at a rapid pace. As you may recall, we are adding 3 new research laboratories, 15 new offices, a greenhouse, and a technology transfer area. Scheduled completion is late May but we are hopeful to beat that date by several days if not weeks. Our dedication ceremonies are scheduled for the evening of August 10. This addition greatly enhances our ability to meet our research mission and conduct effective technology transfer activities. The addition also necessitated we hire **Mr. Rod Stieg,** a native North Dakotan and long time resident of Miles City, as our new heating, ventilation, and air conditioning (HVAC) specialist (i.e., building engineer). Rod brings a wealth of experience to Fort Keogh as he has worked at the Miles City VA facility for many years.

B. In concert with increasing our physical research capacity, we have added 3 new scientists to our staff over the past few months to increase our intellectual research capacity. First, **Dr. Lee Alexander** has been hired as our molecular geneticist. Lee comes to us as a native Australian, via the USDA-ARS Meat Animal Research Center (MARC) in Clay Center, NE, via the University of Minnesota in St. Paul. We are extremely fortunate to have added Lee to the staff as he brings a wealth of experience

*Rod Heitschmidt, Research Leader and Range Ecologist*

and expertise to this position. Second, we have hired **Dr. Richard Waterman,** a native Coloradoan and recent New Mexico State University graduate, to lead the animal nutrition/ behavior component of our new noxious weed research program. Third, we have hired **Dr. Matt Rinella,** a native of Michigan and a recent Montana State University (MSU) graduate, to lead the rangeland weed ecology component of our new noxious weed research

program. We are extremely proud of all three of these individuals and are very grateful that we can bring them on at a time that they can help us capitalize fully on our new and upgraded research facilities.

C. In support of our expanded research program, we have hired **Ms. Jennifer Muscha,** another native North Dakotan and recent University of Wyoming M. S. graduate, as a Cat III rangeland scientist. We are also in the process of hiring three B.S. level range technicians to support our expanded program. We have also hired **Ms. Sue Miles,** a native Louisianan and recent Montana State University - Billings B.S. graduate as a secretary to replace Ms. Mary Ellen French whom we lost to cancer this past summer.

D. We have also hired **Ms. Whisper Alexander,** as the new Montana Agricultural Experiment Station (MAES) Assistant to the Superintendent as **Mr. Byron Hould** has transferred from Fort Keogh to the Department of Animal and Range Sciences at MSU. In addition, we have hired two new MAES Research Assistants (i.e., cowboys), **Mr. Mike Landers** and **Mr. R.J. Hubbard,** as well as **Mr. Phil Smith** as our MAES full-time heavy equipment operator.

E. Research findings from the Fort Keogh program continue to serve the local, regional, national and international range livestock industry well. This is reflected by the number of requests for our many recent publications (see Recent Publications in this and prior issues), the many invited presentations made by staff members throughout the United States and Canada, and recently in China (Dr. Grings) and South Africa (Drs. MacNeil and Heitschmidt).

Finally, I invite each and every interested citizen to continue to ask questions of us to learn more about the Fort Keogh operation and our research program and associated findings. Moreover, I strongly ask for your feedback as to the "appropriateness" of our activities. Are we solving problems important to you and your operation/business, and if not, what guidance can you give us? As many of you know, we have a very effective Customer Focus Group (CFG) that we interact with on a continuing basis. Their mission is precisely as conveyed by their name, i.e., they help us focus our program. But our CFG consists of only about a dozen members, and as such they cannot possibly represent every one of our customer's concerns and ideas. We invite each of you to share those concerns and ideas with us. We are here to serve and it is not possible to serve efficiently and effectively without your input. Please share.

# Building Progress

Construction of the new additions to our main building is continuing at a rapid pace. As you may recall, we are adding 3 new research laboratories, 15 new offices, a greenhouse, and a technology transfer area. Pictured below is the outside of the technology transfer area to the left and to the right is the addition of the offices and labs. The finishing touches will be put on over the next two months and the greenhouse will be erected out back.

# How do management decisions affect the genetic make up of a cowherd?

*Andrew Roberts*
*Research Animal Scientist*

While producers often consider what their best approaches are for managing their cattle herd, it may also be important to consider how management decisions indirectly influence the type of the cattle that evolve in the herd. Two major factors affecting profitability of commercial cow-calf operations are **reproductive performance** and **feed costs** for wintering the cowherd. Reproductive performance has been estimated to have 5 to 10 times more impact on profitability than other traits. Likewise, cost of winter-feeds and supplements account for a major portion (50 to 70%) of the annual production costs. Therefore, management decisions that influence present and future aspects of feed requirements and reproductive performance have tremendous effects on long-term profitability of ranching operations.

**Why are EPDs for reproduction lacking?** Traditionally, calculated heritabilities for reproductive traits are low, indicating that differences in reproductive performance among cows are primarily due to environmental and management factors, as discussed below, rather than genetic differences. However, the complex nature of reproductive traits also contributes to the low heritabilities. This complexity arises from the fact that there are actually numerous traits that contribute to successful reproduction. For example, the first trait leading up to a successful breeding is that the heifer or cow comes into heat (i.e., the heifer must reach puberty or the postpartum anestrous cow must resume cycling). Second, a fertile ovulation must occur, and the female must be mated with fertile semen to bring about fertilization, which occurs in the oviduct. The embryo must travel to the uterus where biochemical communication between the embryo and uterus must be established to signal pregnancy. The uterus must then nurture the embryo into a fetus and provide for growth until birth occurs. Thus, what we generally refer to as reproduction actually involves a large number of traits regulated by numerous genes expressed in several organs and tissues. Each trait is completely dependent on the success of the previous trait. Thus a failure at any point in the process prevents evaluation of the subsequent traits. Another characteristic contributing to the low heritability of reproductive traits is the limited opportunities and methods to measure them. Generally we have a single success or failure every year, with little knowledge of where failure occurs in the traits discussed above. Compared to growth traits, where numerous measurements can be taken at many times during the year to improve accuracy of the estimated value of the trait. Current research at Fort Keogh focuses on developing better methods to characterize reproductive characteristics in cattle.

**Is it worth selecting for reproduction?** Because of the limitation in our current ability to adequately measure genetic components of reproduction, selection for reproduction traits beyond culling of open females is not generally practiced. The impact that reproductive performance has on profitability is too great to completely overlook the genetic aspects of reproduction. While it is obvious that cows that fail to get bred adversely affect profitability due to loss out of the herd and need for replacement, the time in which a cow breeds during the breeding season can also have large impacts on level of productivity. Table 1 shows an example of how time of breeding influences profitability through its affect on age of calf at weaning or time of sale. Assume all cows were mated to the same bull. Cow 1 was bred early and thus calved early, but had less growth potential than Cow 2. Cow 2 was breed during the 3rd 21-day period (length of an estrous cycle) and weaned 50 lbs less calf than Cow 1, even though the calf was gaining 0.3 lbs/d more than calf from Cow 1. Cow 3 has the same growth potential as Cow 2, but calved almost one cycle earlier. This earlier calving date resulted in Cow 3's calf being similar in weight at weaning to calf of Cow 1, and demonstrates that one cycle difference in birth date requires about a 0.3 lbs gain/d to compensate for weight at weaning for a 500 to 550 lb calf. While many commercial producers place emphasis on weaning weight, this example shows how early breeding can compensate for growth performance. An additional advantage of cows calving earlier in the calving season is that it allows longer time to resume cycling and be rebred for the following year, thereby decreasing the chances of being open. The additional pounds of calf produced because of being older at weaning combined with a greater chance of the cow remaining in the herd for more years of production can result in several thousand pounds difference over the lifetime productivity of cows that breed early each year compared to those that breed late and are culled earlier in life for being open. Another point to notice in the Table is the adjusted weaning weights. Adjusted weaning weights are a good tool to account for differences due to age of the cow and sex of the calf. Because commercial producers do not generally sell calves on an age-adjusted basis,

*(Continued on page 4)*

Table 1. Effect of date bred on weight at weaning

| | Date Bred | Date Calved | Calf Birth Wt | Wean Date | Calf Wean Wt. | 205d Adj WW | Birth Wean ADG |
|---|---|---|---|---|---|---|---|
| Cow 1 | 1 | 2/1/02 | 70 | 8/25/02 | 550 | 550 | 2.34 |
| Cow 2 | 42 | 3/15/02 | 70 | 8/25/02 | 500 | 611 | 2.64 |
| Cow 3 | 24 | 2/24/02 | 70 | 8/25/02 | 550 | 611 | 2.64 |

*(Continued from page 3)*

they should also be cautious about buying or selecting bulls with high adjusted weaning weights without taking birth date into account. Selection of bulls born early in the herd out of older dams may improve genetics for reproduction. At the minimum, producers should consider how selection decisions for replacement bulls and heifers may influence the future genetic composition of the cowherd, realizing that reproductive performance should not be sacrificed for increased growth.

**One of the biggest environmental factors affecting reproduction is the nutritional influence on the rebreeding performance of cows after calving**, which is directly related to the amount of feed provided to the cowherd during the winter months for traditional spring calving operations. Thus, producers are faced with the critical decision every winter of feeding just the right amount of winter feed and (or) supplement to ensure acceptable levels of rebreeding during the subsequent spring, yet not over feed to minimize cost of production. The amount of winter feed required may vary from year to year depending on quality and quantity of forage produced each year. Thus it's not a simple process of repeating what worked in previous years. If cows are treated too "good" during the winter, selection pressure is relaxed, allowing animals that require greater nutrient inputs to remain in the herd. This can be balanced out economically if a greater level of output compensates for the greater input cost. In contrast, if cows are short changed on winter supplement, selection pressure is increased, eliminating those cows with greater nutrient requirements, and if the nutrient limitation is great enough the economic consequences may be dire due to a large number of cows failing to breed back. Thus, management decisions on how much to supplement not only affects short-term profitability, but may also alter genetic aspects of the herd that have long term effects on profitability.

**Use visual appraisal of body condition score to monitor the nutritional status of the cowherd**. General guidelines are to ensure body condition scores are somewhere between 5 and 6 at calving. At this level of condition, neither the ribs nor the spinous processes (i.e., points of the backbone) will be very apparent, unless cows have been shrunk. When evaluating body condition, it's important to remember that nutritional requirements differ due to age of the cows, and with respect to season of calving. Because heifers and 3 to 4 year old cows are still growing, these cows have additional nutritional demands placed on them than older fully-grown cows. Younger animals may be better managed at higher levels of body condition (i.e., closer to a 6) than the mature cows. This is especially true for first calf heifers and 3-year old cows coming out of drought situations, as these females have a much greater chance of coming up open. The large amount of growth and physical size of the fetus during the last 2 months before calving bring about corresponding increases in nutritional requirements and decreased capacity for intake. Thus, quality as well as quantity of feed available becomes important, and the ability to increase condition score becomes more challenging during this period. Season of calving influences nutrient requirements to maintain body condition due to increased nutritional requirements in periods of severe temperatures and the duration of time before spring forage is available. Calving earlier in the season means longer periods of supplementation/feeding during times of greater nutritional demand (i.e., last trimester of pregnancy and lactation).

**Management on a herd basis vs. an individual animal basis.** As with many management aspects of ranching, managing body condition is generally done on a herd basis. That is, ranchers manage for an average body condition on all animals in the herd, rather than insure that each individual cow is fed to the same desired body condition. In some operations, a herd may be split to allow for managing of animals based on different classes such as age, body condition or some other method of sorting; but these situations still manage for an average response for each different group. Thus there are always animals that are below and above the desired body condition. Even the recommendation of managing cows at a body condition between 5 and 6 at calving is based on research that indicates significant decreases in rebreeding occurs when the herd is managed below this level of condition. Thus the research is based on a herd response, not the response of

all individual cows. In fact many cows can and do rebreed at lower body condition scores, and some cows do not rebreed when maintained at the recommended condition score. So while feeding is carried out on a herd wide basis, ranchers should consider making selections of replacement animals based on performance of individual animals.

**Which type of cow is the best fit to a production environment?** Is it the skinny cows, average cows or the fat cows? Cows that are above average body condition may be so because they require less food for maintenance and (or) their level of productivity was lower than that of other cows. Cows in this later scenario are "self savers" as they convert more nutrients to themselves rather than their calves. This type of cow may be better suited for operations with minimal supplemental feeding, realizing that weaning weights will be lower. In contrast, cows that are below average condition may require more food for maintenance and (or) may be more productive. To determine which cows within a herd are the most efficient, and thus the ones to select for, a logical first step is to **define the environment with respect to inputs and expected outputs**. It is important to remember that larger cows take more food for maintenance than smaller cows, approximately 7% increase in maintenance requirements per 100 pounds difference in weight. In addition, maintenance requirements are greater for cows with higher milk production than cows with lower milk production. Does this mean larger cows with high milk production are less efficient? Not necessarily, as these types of cows would also have greater potential for production of larger calves at weaning. Thus greater input requirements may be off set by greater output. Total amount of inputs can be increased to meet the greater demand of higher producing females, or herd size can be reduced to allow similar output per unit of input. So before trying to identify the best biological type of cow for a particular operation, it is first important to establish availability and cost of feed resources that define the environment the cows are to work in. This step is often overlooked because most producers make bull and heifer selection decisions based on growth performance and the type of cows may end up driving the environment. Over time, increases in growth performance drive the amount of feed required to sustain the increased productivity of females coming into the herd, or there is constant selection pressure against the higher producing females (i.e., they fail to remain in the herd because of reproductive failure). So either the herd evolves towards greater production at the cost of greater inputs, or there is a decrease in lifetime productivity of cows due to reduced longevity of females in the herd.

**Use cow and calf weights to determine productivity.** Once a level of feed input has been established, measuring weights of calves and cows at weaning will provide insight into level of productivity and maintenance requirements. In addition to cow weight, height and (or) body condition needs to be determined, as a tall skinny cow may weigh the same as a short fat cow. If cows differ in size, but each produce calves that are a similar proportion of their body weight (i.e., if they wean the same percentage of their body weight), then level of production is similar if they are in similar body condition. It is important to remember that differences in body condition at weaning influences amount of supplement needed to get through the winter and achieve the desired body condition at time of next calving. If a bigger skinnier cow weans a similar percent of her body weight compared to a smaller fatter cow, then level of production may not be similar because the bigger skinnier cow may need to be fed more through the winter to prevent her from failing to rebreed the subsequent year. This approach requires records on individual animals and a change in managing on a herd basis to an individual animal approach. Such an approach will provide an opportunity to select replacements based on the dam's performance as well as the heifer's performance.

As individual bulls have a large contribution towards the future genetic make up of a herd, it is important to consider purchasing or selecting bulls that are either raised in similar nutrient environments as the cows, or have daughters that perform under similar environments as your operation. This is becoming of even greater importance with the current industry's selection pressure for carcass traits. At present there is little information on whether carcass traits are antagonistic or not towards important maternal and reproductive traits. The future will provide the answer to whether selection for extreme carcass characteristic will be detrimental towards traits important in the cow herd, but past experience provides ample examples of how selection for extremes ends up with undesirable results. The future will also provide direct measures or EPDs for efficiency and more reproductive traits, to assist producers in making genetic improvements in these areas. However, there is still much that is not known about whether efficiency in one environment relates to efficiency in all environments. So for now, evaluation of cows within your herd provides an opportunity to make genetic progress towards reproductive efficiency under your specific management and feeding practices.

# Recent Publications

(for reprints email us at reprint@larrl.ars.usda.gov or call Sue at 406-232-8224)


Alexander, W.L., R.P. Ansotegui, D.S. Spickard, C.K. Swenson, E.E. Grings, and T. W. Geary. 2003. Effect of supplemental trace mineral level and form on peripubertal bulls. Beef Questions and Answers 8(5):10-11.

Cronin, M.A., Patton, J.C., Balmysheva, N. and MacNeil, M.D. 2003. Genetic variation in caribou and reindeer (*Rangifer tarandus*). Animal Genetics 34:33-41.

Cronin, M.A., Patton, J.C., Balmysheva, N. and MacNeil, M.D. 2003. Genetic variation in caribou and reindeer (*Rangifer tarandus*). Animal Genetics 34:33-41.

**Geary, T.W.** 2003. Improve your AI pregnancy rates. Western Farmer-Stockman. March. p. 44-45, 48, 50.

**Geary, T. W.**, E. L. McFadin, M. D. MacNeil, E. E. Grings, R. E. Short, R. N. Funston, and D. H. Keisler. 2003. Leptin as a predictor of carcass composition in beef cattle. J. Anim. Sci. 81:1-8.

Geary, T.W., E.L. McFadin, M.D. MacNeil, **E.E. Grings**, R.E. Short, R.N. Funston, and D.H. Keisler. 2003. Leptin as a predictor of carcass composition in beef cattle. J. Anim. Sci. 81:1-8.

Haferkamp, M.R., and MacNeil, M.D. 2004. Grazing effects on Carbon Dynamics in the Northern Mixed-Grass Prairie. Environmental Management. http://www/springerlink.com/app/home/contribution/asp?wasp=hlugnkrwrl6gjxhpyddj&referrer=parent&backto=issue,15,73;journal,1,72;linkingpublicationresults,id:100370,1

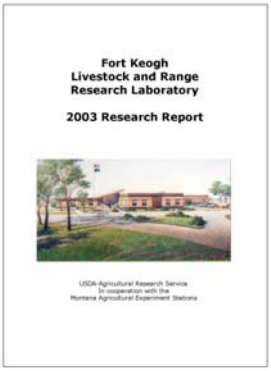
Larson, J.E., Lamb, G.C., **Geary, T.W.,** Stevenson, J. S., Johnson, S.K., Day, M.L., Kesler, D.J., DeJarnette, J. M., Landblom, D.G., and Whittier, D. Estrus synchronization of replacement beef heifers by using GnRH, Prostaglandin $F_{2\alpha}$ (PGF), and Prosterone(CIDR): A multi-location study. Cattleman's Day 2004.

Larson, J.E., Lamb, G.C., Stevenson, J.S., Marston, T. W., Johnson, S.K., Day, **Geary, T.W.,** M.L., Kesler, D. J., DeJarnette, Schrick, F.N., and Areseneau, J.D.. Estrus synchronization of suckled beef cows by using GnRH, Prostaglandin $F_{2\alpha}$ (PGF), and Prosterone(CIDR): A multi-location study. Cattleman's Day 2004.

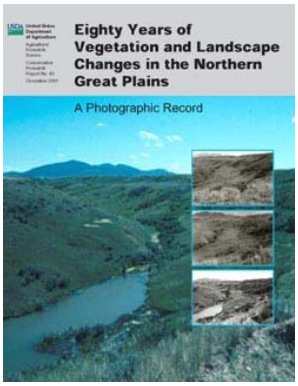
Merrill, M.L., R.P. Ansotegui, N.E. Wamsley, P.D. Burns, and **T.W. Geary**. 2003. Effects of flunxin meglumine on embryonic loss in stressed beef cows. Beef Questions and Answers 8(5):9-10.

Sowell, B.F., J.G.P. Bowman, **E.E. Grings**, and M.D. MacNeil. 2003. Liquid supplement and forage intake by range beef cows. J. Anim. Sci. 81:294-303.

**Vermeire, L.T.**, Mitchell, R. B., Fuhlendorf, S.D. , and Wester, D.B. Selective control of rangeland grasshoppers with prescribed fire. J. Range Manage. 57:29-33. 2004.


There are still copies of the 2002 Research Update and Eighty Years of Vegetation and Landscape Changes in the Northern Great Plains available. If you didn't receive a copy and would like one, call 406-232-8200 and we will be glad to send you one.



# Society for Range Management
# Award Recipients

Presented at the 57th Annual Meeting, Salt Lake City, Utah, January 2004

## Sustained Lifetime Achievement Award

Dr. Marshall Haferkamp has been involved in educational activities in the field of Range Management with his teaching career at three universities and continuing his career with ARS. He has been an active member of SRM for 39 years, serving as committee member and officer in the Texas and Northern Great Plains Sections. He has served on numerous committees at the parent Society level, chaired several, and is currently an Associate Editor of the *Journal of Range Management*.

Through the ARS and universities he has worked with peers, producers, agency personnel, and academia concerning information discovered by his research. This illustrious career spans almost 40 years of aggressive, state-of-the-art technical developments in range management. During this time, Marshall has contributed over 255 published documents and made more than 50 presentations in both technical and non-technical forums.

Dr. Haferkamp's areas of greatest contributions to research include: 1) identifying germination traits of important rangeland plants used for seasonal pastures and in restoration ecology; 2) developing new understanding of the management of problem species such as Japanese brome; 3) developing effective planting, establishment and post-establishment grazing schemes for planted forages; 4) developing effective drought management strategies; and 5) serving as a member of an ARS research team investigating the role that US rangelands in carbon sequestration processes.

For his continued commitment and contributions to the art and science of rangeland management, the Society is proud to recognize Dr. Marshall Haferkamp with its Sustained Lifetime Achievement Award.

## Fellow Award

Dr. Heitschmidt has been a stalwart in the Society during his 37 years of membership. At the Section level, he has served as President of the Northern Great Plains section, as a member of the Board of Directors of the Texas section and as a member and chair of numerous committees in both sections. He has also served on the Board of Directors of the parent Society, as a member and chair of numerous committees, and as President. Dr. Heitschmidt is also active at the international level serving on numerous rangeland science international committees and boards. His leadership focus has always been on fostering understandings and appreciation for the critical roles that each and every member plays in the success of an organization.

During Dr. Heitschmidt's 30+ year research career, he has authored or co-authored over 250 scientific articles and 85 abstracts and made over 150 invited presentations. As a grassland ecologist, he has focused his research largely on understanding livestock grazing processes both from an ecological and production agriculture perspective.

For Dr. Heitschmidt's contributions to range management programs both in terms of scientific research and professional leadership, the Society is proud to present him with its Fellow Award.

USDA-ARS Fort Keogh
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In cooperation with
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Feel free to pass on this issue of the Fort Keogh Researcher to others interested in agriculture and agricultural research.

To be added to our mailing list, request a copy through our website or contact Diona Austill by phone (406-232-8200), fax (406-232-8209), or email (diona@larrl.ars.usda.gov)

## Upcoming Events

| | |
|---|---|
| May 5-7 | School Tours |
| August 10 | Building Dedication |
| August 11 | Field Day |

There are still copies of the 2002 Research Update and Eighty Years of Vegetation and Landscape Changes in the Northern Great Plains. If you didn't receive a copy and would like one, call 406-232-8200 and we will be glad to send you one.