Sharon Quisenberry, Dean  
Dean's Office college of Agriculture/AES  
Montana State University  
PO Box 172860  
202 Linfield Hall  
Bozeman, MT 59717-2860

Dear Dean Quisenberry,

Per your request, our committee has completed our final written report. The committee was composed of:

Jeffrey D. Armstrong, Chair  
John Grande  
William C. Krueger  
Matthew Lucy  
Daniel Pomp  
Jim Peterson  
Robert P. Wettemann

We were pleased to have participated in the review of the department. As we have outlined in the attached report, we are optimistic about the future. Your leadership has been excellent and most helpful in assisting the department in securing resources necessary to accomplish your goals.

Sincerely,

Jeffrey D. Armstrong  
Professor and Head

JDA/sel  
C: committee members
Final Report
Animal and Range Science Review Committee
May 21, 2000

The Department of Animal and Range Science has several natural advantages. Montana is a wonderful state with abundant natural resources, resources that blend well with animal agriculture. It was also readily apparent to the review team that producers are very supportive of the department. We were especially pleased to have two excellent producers join us on the review team.

Agriculture is the largest contributor to the state’s economy. Within agriculture, animal agriculture provides more than 48% of gross receipts with over 88% of the animal receipts derived from cow-calf operations. As a consequence of the natural resources in the state and the abundance of range land, the major animal agricultural enterprise is beef cattle production, primarily cow-calf with the end result a focus on beef.

The review team found the combination of animal science and range science to be very positive. This was apparent from the faculty and stakeholders as well. One faculty member aptly put this in perspective as “our national niche.”

Recommendation – Maintain animal and range science together as a single department.

The Department of Animal and Range Science has a good mix of extension and research programs. Almost all programs are applied in nature, that contributes to the strength of the extension and applied research programs. The department, with strong industry involvement, has been successful in securing federal funding for several key programs. This should be continued.

Upon reviewing the departmental facilities and staffing plan, it became clear that several tough decisions were made in the past. For example, the swine and dairy facilities were closed. More recently, a hire was made in meat science and the abattoir renovated. These types of tough decisions, especially with regard to what one will do and not do, need to be continued.

Several challenges became apparent during the review. Turnover in leadership at the department and college level has contributed significantly to what we believe is failure to focus the long-term vision of the department. We believe the opportunities and personnel are present but the collective vision needs to be cultivated and developed.
Overall, additional FTE are needed to cover the current responsibilities. Several faculty with heavy teaching loads could be conducting additional research. Equally important, several faculty with extension and research appointments are spread very thin. All three functions would be enhanced by the addition of new faculty.

The departmental laboratories and other facilities on campus are in dire need of replacement. Laboratories for existing faculty are not adequate. Moreover, additional space will also be needed for new faculty hires.

Although resources and facilities have been limiting, the committee suggests that deliverables of good programs, i.e., productivity should be enhanced. The faculty is strongly encouraged to enhance output of peer-reviewed publications and seek greater outside funding. Fundamental to enhancing programs and attracting new faculty is the establishment of a Ph.D. program. The committee was pleased with the reception of this idea at the summary meeting. It was encouraging to hear many faculty speak of interest in the new food and agriculture initiative. Coupling this interest in grantsmanship with new FTE, namely folks interested in basic research, will have long-term effects on the department and the clientele.

Collectively, the lack of sufficient resources (faculty, facilities and funds) has resulted in a poor moral and entrepreneurial spirit. An influx of resources will be helpful; however, faculty will have to decide to change attitudes as well. The entire department should engage in strategic planning that includes a strong vision for the future.

Recommendations:

- Engage strategic planning
- Solidify leadership – all levels including that of the faculty
- Replace retiring faculty and hire new faculty
- New building – sharing with Veterinary Molecular Biology makes ‘strategic sense’
- Basic research – more details provided later in the report
- Enhance publications – scholarly publications includes teaching, extension and research
- Seek extramural funding
- Establish a PhD program

During the course of the review, the review team became very excited about the potential for the department. We believe this department can become the flagship animal and range science department in the region. Moreover, we challenge the department to become the flagship department in the college. The excitement and vision shown by the new Dean of the college encouraged the team. We also found this to be true with the stakeholder group, they were all very excited about the department and the college. The department should capitalize on this attention and work with the Dean to see that all recommendations are implemented.
As the department engages the strategic planning process, we would encourage you to set lofty goals. We spent several minutes talking about what the department could achieve in the very near future.

The potential for realizing an outstanding development program is great. This additional funding could be used to fund an endowed chair, judging program, and undergraduate and graduate programs.

We believe it is very important to have focused programs. It seems clear that a major focus in the department is the production of high quality calves on high quality land that lead to excellent end product (beef). Range science, nutrition, beef cow reproduction and quantitative genetics are key areas if this focus is to be achieved. Specifically, this should be translated through a planning process into identification of key faculty hires. We suggest that some of these may include – nutritional biochemistry, rumen microbiology, animal breeding (new technologies), beef cow reproduction (basic mechanisms), landscape ecology and grazing management. This is a topic worthy of additional discussion; however, we do believe it is important that basic science is emphasized in at least three or four of these hires.

**Recommendations:**

- Establish clear areas of focus
- Examples include:
  - Nutrition, range emphasis
  - Cow-calf
  - Backgrounding
  - Meats as related to product produced
- Beef cow reproduction
  - Range of basic to applied
  - Must be in synchrony with producer needs
- Genetics
  - Application of new technologies into breeding programs
  - Statistical, reproductive and molecular
- Create opportunities for competitive funding
- Form synergistic research teams
- Maintain applied research programs

The review team was pleased to consult with current graduate students. The students viewed the combination of animal science and range science as very positive. They know each other well and speak highly of the departmental seminar. Additional discipline seminars are needed to enhance student development.

Basic components of the undergraduate programs in animal science appear to be present. Some stakeholders and students expressed concern with ‘weed-out’ courses and “core curricular” courses. Students were complimentary of the faculty but desire more
interaction / social contact. They were especially supportive of ‘real-life’ experiences presented by faculty.

Stakeholders strongly encouraged the department to provide judging team activities for the students. The committee agrees with this assessment. We encourage the department to challenge the industry to increase involvement by funding judging teams. They have shown a willingness and ability to assist in support for extension and research programs. Moreover, they are very supportive of providing a new building for the department. The clear message is that “Industry is receptive to specific requests”!

**Recommendations:**

- Enhance graduate student stipends
- Improve computing support – especially printing for graduate students
- Increase faculty involvement with students
- Enhance TA experiences – some are purely labor and not stimulating
- Encourage courses from other departments
- Consider naming a coordinator of graduate programs
- Maintain ‘gate-to-plate’ mentality not just cow-calf in programs
- Internships should be required
- Make better use of 4H and FFA emphasis in the state
- Allow more time for hands on experiences – 2 vs. 4 h labs
- Establish judging teams
  - Maintain academic quadrathlon
  - Livestock judging team
  - Plant identification team
  - URME team
  - Enhance industry involvement with development, judging teams and facility support

Although the committee was asked to focus on research and teaching, we felt it important to comment on the extension structure within the university. First, we found that the extension specialists within the department were more than willing to work together. In addition, we detected a positive attitude and enhanced coordination. However, we found that the structure resulted in multiple lines of reporting with inadequate discussions being held with regard to budgets and staffing.

The committee also received feedback from heads of other departments and stakeholders. Department heads generally believed that coordination could be enhanced. More importantly, stakeholders had the strong perception that extension, teaching and research are under separate structures so management is not coordinated very well.

**Recommendations:** Administration considers moving agricultural extension under the College of Agriculture. Adding an Associate Dean for Extension would facilitate this. This will enhance coordination of research and extension, and extension and teaching.
Review of Range Science
This review is to synthesize comments reflecting our view of what the Range Science aspect of the Department could be like in five years. It is based on the input received from the faculty, knowledge of the reviewers, and an understanding of the future role of Range Science in animal agriculture. The comments are not intended to suggest particular insufficiencies in the current programs but more to suggest what a comprehensive program suited to Montana may be like.

Range Science Research

Basic Research
The Department should have a program of basic ecological research. This is the fundamental science underpinning the applications of management to desired outcomes. From this research it is possible to predict the potential for landscape conditions under the normal vagaries of weather and in response to inevitable catastrophic events. This knowledge is necessary to develop responsible goals for outcome-based management. This research would include areas such as:

- Plant and animal community structure and competition among species. It would include specific work on invasive species.
- Water quality potentials in natural systems in terms of sediment, temperature, pH, and other aspects that are particularly important to cold-water fish.
- Wildlife habitat with some emphasis on species of plants and animals that are or may be listed as endangered or threatened.

The area of landscape ecology should be developed in the Department. This is a newly developing highly computer dependent discipline that is most likely going to be the foundation for large scale land use decisions in the future. Within this discipline the possibilities for economical monitoring of land use impacts on a practical scale are important.

Applied Research
This aspect of the research program should be focused on development of new approaches to management of land and livestock, particularly in the context of issues of concern (like environmental problems), or opportunities for increased economic returns from management (like new forages). It would need to involve extensive partnerships with other faculty in the Department, College and other scientists in a wide variety of areas. There is great opportunity to bring new knowledge from external research programs into new applied research. For example, applied research programs including some existing efforts could focus on issues such as:

- Livestock grazing impacts with respect to-
  - Wildlife habitat
  - Weeds
- Environmental quality (especially water but other amenities as well)
- Forage quality (including new varieties as well as manipulation of quality by specific grazing practices)
- Land restoration or rehabilitation
- Developing forage bases on depleted lands
- Restoration of native plants, particularly with respect to weed control projects
- Developing practical methods to rehabilitate rangelands
- Monitoring
- Development of new techniques that are accurate
- Landscape scale (probably GIS/GPS based)
- Economical techniques (current techniques are too expensive)
- Developing techniques that can be used to assess compliance with regulations

Range Science Teaching
The teaching program is a strong, traditional Range Science program. It has served students well in their careers following graduation. The program should be considered for Accreditation by the Society for Range Management. We believe it is very close to meeting accreditation requirements. Success in this would establish MSU as the excellent educational program that it is. In addition to current courses the faculty should consider integration of some courses into the program to be sure students are fully up to date with modern skills when they graduate. These suggestions are:
  - Watershed
  - GIS/GPS courses
  - New minors for the new job market
  - Consulting (include emphasis on water/water quality, GIS, measurements)
  - Agency changes (water, endangered species)

The faculty and College should consider implementation of a Natural Resources degree. Based on current interests of urban students it is very likely that there will be a significant demand for such a broad-based degree. This appeals to urban students and can be an avenue to train students for new niches in job markets. Not only will it capture new students for the Department and College it will put the curriculum in the hands of a faculty that will ensure a practical orientation. I suspect MSU will have such a degree in the near future. If so, it is probably best that it be in Animal and Range Sciences.

Range Science Extension
The current Range Science program is excellent and well received by the clientele. This needs to be maintained. The workload and travel demands are very high for existing contributors to the Extension program. It may be possible to reduce some of the load by hiring one or two extension "aides" to do some of the basic work. This could be an individual with an MS in Range Science that would be of significant help to the specialists.

Conclusions
The review team would like to express its appreciation for the wonderful hospitality provided during the review. We all enjoyed the wonderful Montana scenery and weather!
The committee was greatly excited about the future of the department. We believe it is important that you first and foremost engage in strategic planning. Strong leadership and vision will be required to take you to the next level. You can achieve your goal of becoming the flagship department in the college and the flagship animal and range department in the region.

We encourage each faculty, staff and student that reads this report to first think of ways of enhancing one’s own program and attitude. Please have a “can do” attitude that is contagious. Second, it is equally important that new facilities, support and faculty positions be secured. Planning and a consensus of where the department is headed must precede this. Establishment of a PhD program is fundamentally important for success.

The sky is the limit – please reach high!
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Challenges
Montana agriculture is facing many challenges and changes in the next few years. The challenges include low commodity prices, high production costs, and competition with commercial and residential growth for agricultural acres. The changes facing Montana’s agricultural community are many, specifically, economics, land use as it relates to the urban-rural interface, competitiveness in the emerging global economy, federal and international trade policies, genetically modified plants and animals, food safety issues, product development, system diversification, and environmental issues. Additionally, resources from federal and state sources for instructional and research budgets are stagnate. I would like you to comment on how the Animal and Range Sciences Department is responding to these challenges and changes.

Strategic Plan
The COA/MAES is currently engaged in a strategic planning process to determine how we can proactively address the challenges and changes facing Montana agriculture. Our mission is to provide education, research, and extension/outreach programs that will meet the changing needs of agriculture in a global environment. Our focus is to generate and disseminate new knowledge and technology that will, in turn, increase the competitiveness of Montana agriculture, preserve the quality of the environment, improve the quality of human and animal life, and add value to Montana’s resources. A primary objective of the College and Experiment Station is to enhance the educational and research process to make a larger societal contribution. We must provide quality educational and outreach activities to our clientele.

Program Goals and Objectives
➤ Goal 1: Students Competitive in the Market Place
  ▪ Enhance Undergraduate Programs
  ▪ Enhance Graduate Programs
  ▪ Improve Recruitment and Retention of Students
  ▪ Ensure an Environment Conducive for Active Learning
➤ Goal 2: High Quality Research Programs
  ▪ Expand Scientific Knowledge Base
  ▪ Enhance Economically Viable and Sustainable Agricultural Systems
  ▪ Improve Natural Resources Management and Enhance Environmental Quality
  ▪ Strengthen the Quality of Life and Community Viability
➤ Goal 3: Expanded Learning Opportunities
  ▪ Implement Distance Education and Continuing Education Programs
  ▪ Expand Summer School Programs

Operational Goals
➤ Goal 1 - Nationally Recognized Faculty
➤ Goal 2 - Public Relations Program
➤ Goal 3 - Resource Plan (Budget/Infrastructure)

Once our goals and objectives are clearly outlined, we will have them reviewed and validated by faculty, staff, students, and clientele. Departments and faculty will then propose initiatives, projects, and quality measures that will be reviewed and validated as above. Our long-term vision is to be one of the best Colleges of Agriculture/Agricultural Experiment Stations in the western region with excellent education, research, and outreach programs. Faculty and staff are expected to have relevant and productive programs. While the strategic plan is still being finalized, I would like to know how prepared the Department is to meet the goals of the plan. Will they be able to meet these goals with their current resources and structure or are changes required?
Department Information
There has been a recent drop in student enrollment. Undergraduate enrollment has dropped by almost 40 students in the last three years. Graduate student enrollment has remained static. Faculty has remained relatively steady over the past three years, with the exception of the recent addition of a meat science professor. The Departmental budget has experienced some shortfalls due to low livestock prices. This Department should be one of the best programs in the region for animal science and range science, especially with the emphasis on animal and range interaction.

Charge
The Animal and Range Sciences Department Review Committee is charged with evaluating existing resources, personnel, and programs, considering future state and regional needs in animal and range sciences, and formulating recommendations to focus education, research, and outreach programs. While your focus is the instructional and research components of the Department, I would like you to be as comprehensive as possible and include comments on extension.

Instruction
Identify major strengths and weaknesses. Is the curriculum relevant, focused and challenging? Are student needs being met? Is the Department aggressive about recruiting graduate students? Is the graduate program stimulating and competitive?

Research
Identify major strengths and weaknesses. What is your general assessment of the direction of ARNR research? Does it have the appropriate focus? Is the research program of the Department relevant and productive? Is the balance between animal science and range science productive? Are we investing in faculty and programs correctly? Are there research programs that should be redirected to optimize return on investment and to provide opportunities for placing more emphasis on other higher priority research areas?

Outreach and Extension
Identify major strengths and weaknesses. Are the extension efforts of the Department meeting the needs of the clientele, specifically Montana producers? Are they employing correct methodology for outreach, i.e., are they taking advantage of new and advanced technology to provide their programs? Are the communications and linkages with other departments, research centers, extension, and commodity groups at an optimal level?

Administration
What is your assessment of the administrative leadership, internal communications, administrative procedures, and interdisciplinary activities in the Department? Identify any specific concerns or recommendations for improvement.

Infrastructure
Are the facilities and equipment adequate to serve the instructional and research objectives of the Department? Identify any specific recommendations for improvements to the infrastructure to help the Department meet its goals.

Request for Recommendations
Please provide specific recommendations for change and improvement in any area. Identify strengths that need to be maintained and applauded and weaknesses that need to be improved or removed.

Sharron S. Quisenberry
Dean, College of Agriculture and Director, Montana Agricultural Experiment Station
The purpose of this review is to evaluate existing resources, personnel and programs and make recommendations on future direction that best meet the state and regional needs. The Department’s current vision is:

“The Montana State University Animal and Range Sciences Department will be an eminent institution of higher education with programs of excellence in teaching, research and extension to meet the priority needs of the people of Montana and the nation. The department will be a national leader in range livestock issues, with well-funded relevant research programs, proactive extension programs and outstanding undergraduate and graduate programs that attract the best students and prepare them to meet the future challenges of the industry.”

The objective is to formulate a set of recommendations that will be used internally (within the College of Agriculture/Montana Agricultural Experiment Station and Animal and Range Sciences Department) to assist the Animal and Range Sciences Department to focus programmatic needs. The review team is charged with evaluating all programs within the department but the primary focus will be on the teaching and research programs.

The review team will be composed of the following:

Dr. Jeffery Armstrong, Department Head, Department of Animal Sciences, Purdue University, 1151 Lilly Hall, West Lafayette, IN 47907-1151, Phone: (765) 494-4808, jarmsfr5@purdue.edu

Dr. William C. Krueger, Department Head, Department of Rangeland Resources, Oregon State University, Strand Agriculture Hall 202, Corvallis, OR 97331-2218, Phone (541) 737-3341, kruegerw@ccmail.orst.edu

Dr. Matthew C. Lucy, Assistant Professor, Department of Animal Science, University of Missouri, 164 Animal Science Research Center, Columbia, MO 65211, Phone: (573) 882-9897, lucym@missouri.edu

Dr. Daniel Pomp, Associate Professor, Dept. of Animal Science, University of Nebraska, A218 Animal Science, Lincoln, NE 68583-0908, Phone: (402) 472-6416, dpomp@unl.edu

Dr. Robert P. Wettermann, Regents Professor, Department of Animal Science Oklahoma State University, Stillwater, OK 74078, Phone: (405) 744-6077 rpw@okway.okstate.edu

Mr. Jim Peterson, Executive Vice-President, Montana Stockgrowers Association, P.O. Box 1679, Helena, MT 59601, Phone (406) 442-3420.
Montana Agriculture and the Importance of Rangelands and Livestock to the States Economy

Montana is the fourth largest state in the U.S. but has one of the lowest population densities in the U.S.

<table>
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<th>Montana Population</th>
<th>Land and Land Utilization</th>
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<td>Population (1990)</td>
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<td>People per Square Mile</td>
<td>Total Land Area (mil. acres)</td>
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<td>Farm Population</td>
<td>All Land in Farms and Ranches (acres)</td>
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<td>People per Farm</td>
<td>Proportion of land in Farms &amp; Ranches</td>
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Sixty-two percent of the land area in Montana is privately owned while the remainder is federal land, state land or Indian reservations. Montana has a somewhat smaller percentage of federal land than other rural western states (e.g. Idaho, Nevada, Wyoming).

Of the 60 million acres in farms and ranches, 66% is classified as pasture and rangeland. Therefore, Montana has about 40 million acres of the farm and ranch land that is rangeland and pasture. In addition 29.5 percent of the land in
Montana is federal land of which a large percentage is leased for grazing of the state’s livestock herds.

Utilization of Land In Farms and Ranches, %

- Range & Pasture: 65.9%
- All Others: 1.5%
- Harvested Cropland: 13.7%
- Cult. Summerfallow: 8.2%
- Other Cropland: 7.4%
- Woodland: 3.3%

Montana Ag. Stat., 1998

Agriculture is the most important industry in Montana. The figures below portray the importance of agriculture to Montana’s economy. A comparison of the farm sector to the other basic industries of tourism (measured by non-resident travel), mining, wood and wood products, and gas and oil show that agriculture is the state’s most important basic industry. The farm sector accounts for 38% of gross sales, 31% of the income, and 34% of the state’s employment.
Livestock products and crops are about equal in importance in terms of total receipts with each contributing about 50% of the total agricultural receipts.

### Cash Receipts From Marketing Montana Commodities

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<td>$991,494,000</td>
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- Lambs and Wool, 1.8%
- Barley, 6.8%
- Dairy Products, 1.8%
- Sugar Beets, 2.9%
- Hogs and Pigs, 1.7%
- Other Crops, 5.5%
- Hay, 4.9%
- Other Livestock, 1.4%

Wheat, 33.9%
Cattle and Calves, 41.5%

Montana Ag. Stat., 1998

However, that is where the similarities end. Cattle and calves are the largest single commodity and wheat is second. All other livestock commodities are really of minor importance compared to cattle and calves which account for 88% of the total livestock receipts.

### Cash Receipts From Livestock, %

- Cattle and Calves, 88%
- Others, 3%
- Hogs and Pigs, 3%
- Lambs and Wool, 3%
- Dairy Products, 3%

Montana Ag. Stat., 1998
Thus, the vast majority of livestock income in the state is generated within the beef cattle sector. Further, Montana is primarily a cow/calf state. With most of the cattle being raised on range-based operations. Montana also has many of the best purebred beef cattle herds in the country, and seedstock from these herds is in great demand. The stock growers of the state own approximately 1.6 million beef cows. Traditionally, most of the calves produced are sold at weaning time in the fall with the majority of these calves going out-of-state to backgrounding, stocker or feedlot enterprises. In 1997, of the 600,000 calves shipped out of state, Nebraska fed approximately 257,000 Montana calves.
Animal and Range Sciences Department

Montana's economy is highly dependent on livestock and associated industries (see previous section of Montana agriculture). The Animal and Range Sciences Department was established to serve those industries that matter most to Montana. Range-livestock agriculture is arguably the most important factor shaping the history, economy, culture, and personality of Montana. Since its establishment in 1960 (with the merger the departments of Dairy Science, Poultry Science, Animal Industry and Range Management), the Animal and Range Sciences Department has provided educated human resources, science-based information, and the mechanism for transferring technology to the broad spectrum of users with vested interests in animal agriculture and associated natural resources. Rooted deep in the national land-grant tradition, the department's teaching, research and extension programs are dedicated to preventing and/or solving problems facing Montana, it's animal agriculture industry and society.

The Departmental history is almost as old as Montana State University. In 1898 Robert S. Shaw served as the first professor of agriculture and instructor in dairy husbandry. F.B. Linfield, for whom Linfield Hall was named, was a professor of animal husbandry (dairy) from 1902-1903 prior to becoming Director of the Agricultural Experiment Station. The Animal Husbandry Department was formed in 1929 and headed by Louis Vinke who was replaced by D.W. Chittenden in 1932, the same year that John A. Nelson was named head of the new Dairy Industry Department. R.T Clark was named head the Animal Husbandry Department in 1937 and served until 1946 when Fred S. Willson was named department head. Also in 1946, Range Management was added to the department and the department was named the Department of Animal Industry and Range Management. At the same time a Department of Poultry Science was added to the college. In 1960 the departments of Dairy Science, Poultry Science, Animal Industry and Range Management were combined into the Animal and Range Sciences Department headed by Fred S. Willson.

Almost all of the tenure track faculty in the department have split appointments between the College of Agriculture, the Montana Agricultural Experiment Station and/or the Montana Extension Service. Most of these split appointments are between two of the three partners in the Land Grant institution. Currently in the department there are 7.00, 6.65 and 7.35 FTE on tenure track appointments in the College of Agriculture, the Montana Agricultural Experiment Station and the Montana Extension Service, respectively. Although the department has lost some FTE since 1970 there was also a decision made by the department to redirect more FTE into the range area recognizing the importance of the natural resource issues not only for the livestock industry but to the state and nation as a whole. In 1968 there was approximately 19.5 FTE in the general area of the animal sciences and 4 FTE in the range science area. Currently in the range science area there are 8 FTE compared to 13 FTE in the Animal Science area.
Additionally, much of the range research is now conducted at Red Bluff Research Ranch as compared to essentially none in 1970. When the College reorganized in July of 1998 the range watershed position (Hook) was moved to the new department of Land Resources and Environmental Sciences (LRES). In addition, Dennis Cash, a forage extension specialist transferred from Plant Sciences to Animal and Range Sciences on January 1, 1999. There has been a significant shift to more FTE in the extension area from the teaching and research area. In 1970 there was 3.0 extension FTE whereas there is currently 7.35 extension FTE.

Thus in recent years the department has structured its faculty to meet the mission and vision of the department. The mission statement for the department is:

"The mission of the Animal and Range Sciences Department is to create, evaluate and communicate science-based knowledge to enhance the management of Montana’s livestock and rangeland resources in ways that are economically, socially and ecologically sustainable."

Additionally, when reorganization was occurring strong arguments were made to keep animal science and range science together as one department in order to best serve the range livestock industry.

**Brief Overview of Animal and Range Sciences Facilities**

**Linfield Hall:** The newer part of Linfield Hall that houses the offices for the Animal and Range Sciences Department was completed in 1955. At that time in addition to the offices the building housed the meats laboratory, dairy processing plant, and a small nutrition laboratory. The dairy processing plant was closed in 1967 and some of the space has been renovated into Reproductive Physiology Laboratories. The nutrition laboratory was moved to the MSU Livestock and Teaching Center (MSULC) west of campus in 1969. Little other renovation has taken place in Linfield Hall since that time. This part of Linfield Hall also has 3 classrooms and the old nutrition laboratory was converted into the College of Agriculture student computer lab. Additionally, one faculty member and 6 research associates are housed in the older part of Linfield Hall. With the renewal of the program in Meat Science renovations are currently being made in the Meat Laboratory to bring it closer to current standards.

**MSU Livestock and Teaching Center (MSULC):** This facility is located one mile west of the main campus on 500 acres of land. Most of the buildings were constructed in 1967. This facility includes the Nutrition Center, Miller Pavilion, Horseshoeing School, Feed mill, Beef Center and Swine Center (which is currently closed). The nutrition center, in addition to laboratories, has pens with Calan gates to individually feed 32 head of cattle. The feedlot located adjacent to the nutrition center can feed approximately 300 head of cattle in a variety of pens. The Beef center has facilities for approximately 100 to 150 head of cows.
Miller Pavilion is primarily used for equitation courses and by the MSU Rodeo team for practice. This facility has a large riding arena, a small barn with 7 stalls and outside pen space for 80 horses. The swine center was closed 5 years ago due to budget constraints and probably will not be reopened because of environmental concerns.

**FORT ELLIS:** This facility is located 5 miles east of Bozeman close to the Bozeman Pass. On May 7, 1909 Governor Norris appointed Linfield as Custodian of the military property. Then in 1923 the Montana Legislature approved "State Concurrent Resolution No.13 introduced by Senator Harmon of Gallatin County dedicating "said Fort Ellis Military Reservation" to the Agricultural Experiment Station of Montana for use in carrying on experimental work in agriculture in accordance with the several legislative enactments providing for the establishment and control of said Agricultural Experiment Station." In 1930 Fort Ellis farm was dedicated as the headquarters for the range sheep investigations conducted by Montana Agricultural Experiment Station. Most of the buildings were constructed between 1930 and 1933 and most of these are still in use today. Today the 640 acre property is divided east and west by the railroad, a county road, a secondary highway and the interstate. Particularly, the construction of I-90 through Fort Ellis made the management difficult compared to prior to its construction.

**RED BLUFF RESEARCH RANCH:** The Red Bluff Research Ranch located at Norris, MT, approximately 40 miles west of Bozeman on the Madison River. The ranch was once a thriving late 19th-early 20th century gold mining community in the Hot Springs Mining District, which was second in gold production only to Alder Gulch. At its peak of activity, there may have been a population of approximately 3,000. There are two cemeteries dating from the 19th century that are still legally active. Historic thoroughfares include a well-preserved portion of the original Virginia City-Bozeman Stagecoach route. There are 38 gold mines on the land; approximately 23 are privately owned. The Red Bluff Mine was the initial 1864 gold producer. The ranch nearly surrounds the town of Norris. The founder of Norris, Alexander Norris, may have owned much or all of the Red Bluff Ranch at one time. The Red Bluff Research Ranch (previously known as the Rowe Brothers Ranch) was purchased for $164,000 ($16.83 per acre). The total acreage was 9,746. Two U. S. Forest Service Grazing Permits (Muddy Creek, Cache Creek) in the Gallatin National Forest came with the Rowe property. Some small additional land exchanges and purchases have taken place over the last 45 years. The grazing permits were returned to the Forest Service in 1976. A new lambing facility and mixing barn at the ranch was constructed in about 1990, making lambing much easier. There are currently about 170 head of cattle and 900 head of sheep maintained on a year-round basis at the ranch. The sheep are herded by a Peruvian herder. Livestock along with the range areas, are used for both teaching and research. One of the primary limitations of Red Bluff is the lack of necessary fencing and water development to conduct large replicated grazing trials.
Montana Wool Laboratory: The Montana Wool Laboratory was established by the sheep producers of Montana to serve the sheep industry. In 1945, the Montana Legislature established the Montana Wool Laboratory as part of the Agricultural Experiment Station. Until about 1980, the Montana Wool Laboratory was operated as a separate unit of the Montana Experiment Station. At that time, it was incorporated into the Animal and Range Sciences Department. The purpose of the laboratory (as established by the legislature) "shall be the carrying on of effective scientific and practical research and testing work to develop as complete and accurate knowledge of wools as possible." It is one of only three research wool laboratories in the United States. The Montana Wool Laboratory's purpose is to support MSU sheep research, teaching, and research efforts. In addition, research projects associated with objective measurement of wool are conducted. This laboratory also collaborates with many scientists throughout the west concerning wool aspects of their research activities. Cooperative work is currently being conducted with University of Nevada, the US Sheep Station at Dubois Idaho and University of Minnesota.

Other Off Campus Facilities Important to the Department:

Bandy Experimental Ranch is 3,700 acres and located near Ovando about 200 miles west of Bozeman. Montana Agricultural Experiment Station and the University of Montana own the Bandy Ranch jointly. The ranch has a herd of 200 cows and is used for livestock, riparian, wildlife and forestry research. This ranch must be self-sustaining and is supported by income from livestock sales and revenue from a conservation easement.

Northern Agricultural Research Center (NARC) is located near Havre 300 miles northeast of Bozeman. NARC and Animal and Range Sciences have a long-standing very productive cooperative relationship in the beef cattle breeding area. NARC has 6,960 acres mostly used for livestock. The station has herds of 100 purebred Hereford cows and 300 crossbred cows. Recently a new feeding facility has been built at NARC and 80 steers are fed yearly.

Livestock and Range Research Laboratory is located at Miles City 300 miles east of Bozeman on the Yellowstone River. This ARS research laboratory has 45,000 acres of rangelands and about 1200 head of beef cattle. Our primary collaboration with LARRL is through cooperative graduate students that take course work at MSU and conduct their research in collaboration with at scientist at LARRL. If funding permitted more collaboration could be worked out with LARRL scientist, most of whom have affiliate appointments in the Animal and Range Sciences Department.
**ANIMAL AND RANGE SCIENCES FACULTY**

The heart of any department is its faculty, and as with most departments in Colleges of Agriculture they have split appointments. Animal and Range Sciences has a faculty of 21. Of that 21 FTE, 7.00 have College of Agriculture teaching appointments, 6.65 have Montana Agricultural Experiment Station appointments and 7.35 have Extension appointments. Sixty percent of the faculty are trained as animal scientist and 40% of the faculty are range scientist. The table below presents the appointments of each faculty member and on the following pages are short faculty vitae.

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**Subtotal by Discipline**

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<td>6.65</td>
<td>7.35</td>
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Raymond P. Ansotegui

235 A Linfield Hall  PO Box 172900  MSU-Bozeman  Bozeman, MT  59717-2900
(406) 994-5569  FAX (406) 994-5589  raymonda@montana.edu

EDUCATION

<table>
<thead>
<tr>
<th>Degree</th>
<th>Institution</th>
<th>Major</th>
<th>Year</th>
</tr>
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<tr>
<td>BS</td>
<td>University of Nevada-Reno</td>
<td>Animal Science</td>
<td>1970</td>
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<tr>
<td>MS</td>
<td>University of Nevada-Reno</td>
<td>Range Nutrition</td>
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<tr>
<td>Ph.D.</td>
<td>New Mexico State University</td>
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PROFESSIONAL EXPERIENCE

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<tr>
<td>1994-Present</td>
<td>Associate Professor</td>
<td>Animal &amp; Range Sciences Montana State University</td>
</tr>
<tr>
<td>1976-94</td>
<td>Assistant Professor</td>
<td>Animal &amp; Range Sciences Montana State University</td>
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<tr>
<td>1973-1976</td>
<td>District Sales Manager</td>
<td>American Breeders Service</td>
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MOST SIGNIFICANT RESEARCH AND TEACHING ACCOMPLISHMENTS

- Quantification of range forage intake by suckling calves.
- Demonstrated changes in forage intake of suckling calves relative to milk intake.
- Determined ruminal kinetics and forage utilization by suckling calves grazing native range.
- Demonstrated that combinations of progestins and prostaglandins can be used to successfully synchronize estrus in beef heifers and cows.
- Effects of form and intake of trace minerals on immune function in beef heifers.
- Taught 30 different classes at MSU

SOURCES OF FUNDING TO SUPPORT RESEARCH PROGRAM

<table>
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<tr>
<th>Source</th>
<th>Description</th>
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<tr>
<td>ZinPro Inc.</td>
<td>Trace Minerals for beef cattle</td>
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<td>High Mountain Ranches</td>
<td>Effects of cubing hay on yearling beef heifers</td>
<td>16,500</td>
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<td>High Mountain Ranches</td>
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<td>Specialty Vegetable Oils</td>
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<td>Grand Laboratories</td>
<td>Vaccine grants (yearly)</td>
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<tr>
<td>Producer and Industry</td>
<td>Semen grants (yearly)</td>
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RESEARCH AND TEACHING GOALS AND DIRECTION FOR NEXT FIVE YEARS

- Effects of micro nutrients on performance and the immune system of beef cattle.
- Range forage utilization of cattle with different production potentials.
- Nutritional factors effecting heifer performance and puberty.

PUBLICATIONS (Previous 4 years)

REFEREED PUBLICATIONS


REVIEWED PUBLICATIONS, ABSTRACTS AND PROCEEDINGS (Previous 3 years)


James G. Berardinelli

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EDUCATION

<table>
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<th>Degree</th>
<th>Institution</th>
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<tr>
<td>BA</td>
<td>University of Connecticut</td>
<td>Biology</td>
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<tr>
<td>MS</td>
<td>West Virginia University</td>
<td>Reproductive Physiology</td>
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<td>PhD</td>
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PROFESSIONAL EXPERIENCES

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<td>Post-Doctoral Research Fellow</td>
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<tr>
<td>1982-88</td>
<td>Assistant Professor</td>
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<tr>
<td>1988-93</td>
<td>Associate Professor</td>
<td>Montana State University</td>
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<tr>
<td>1993-Present</td>
<td>Professor</td>
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Research Emphasis: Beef Cattle & Sheep, Post-Partum Effects of Bulls, Physiology of the Oviduct and its Effects on Fertility

MOST SIGNIFICANT RESEARCH ACCOMPLISHMENTS

- Discovered that the progesterone rise before puberty in heifers and ewe lambs from intra-ovarian luteal tissue.
- Determined that estrous synchronization with PGF2a not only depends on the dose injected but also the time of the luteal phase at which it is injected.
- Demonstrated that the presence of bulls does not influence the occurrence of puberty in heifer but bulls significantly reduce the postpartum interval to estrus in suckled first-calf cows.
- Established that pregnancy rate of heifers bred at puberty are lower than those of heifers bred at a later estrus.
- Demonstrated that sperm transport is not a major factor limiting fertility at puberty in ewe lambs.
- Determined that selection for reproductive rate in females alters testicular structure and capacity to produce testosterone.
- Found that oviductal protein content changes dramatically among prepuberal ewe lambs and ewe lambs at puberty and again as they mature.
- Determined that feeding excess degradable intake protein to mature ewes before breeding may alter early embryonic growth and development by altering the ovarian steroid hormone concentrations which in turn affect oviductal transport of embryos.

SOURCES OF FUNDING FOR RESEARCH PROGRAM

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<th>Year</th>
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<td>NRICGP, USDA Competitive Grant.</td>
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<td>1998-99</td>
<td>USDA, CSREES, HECG Program</td>
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<tr>
<td>1999-02</td>
<td>NRICGP, USDA Competitive Grant</td>
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RESEARCH GOALS & DIRECTION FOR NEXT FIVE YEARS

- To determine and understand the role and regulation of the oviduct and oviductal protein secretion in limiting fertility in beef heifers and ewe lambs.
- Understand mechanism whereby the bulls decreases postpartum interval to estrus in suckled first-calf cows.

PUBLICATIONS (last five years)


Cardenas, H., J.G. Berardinelli, P.J. Burfening and M.A. Lane. 1994. Histomorphology, oLH/hCG receptors and in vitro testosterone secretion in Rambouillet rams from lines in which females had been selected for high or low reproductive rate J. Reprod. Fertil. 102:201-207

Jane Ann Boles

230B Linfield Hall  PO Box 172900  MSU-Bozeman  Bozeman, MT  59717-2900
(406) 994-7352  FAX (406) 994-5589  jboles@montana.edu

EDUCATION

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<td>Ph.D.</td>
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PROFESSIONAL EXPERIENCE

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<td>1999-present</td>
<td>Assistant Professor</td>
<td>Animal and Range Sciences</td>
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<tr>
<td>1991 – 1993</td>
<td>Postdoc. Fellow,</td>
<td>Department of Animal &amp;Poultry Science,</td>
<td>University of Saskatchewan</td>
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Research Emphasis: Meat Science, Tenderness, Processing and Utilization of underutilized cuts

MOST SIGNIFICANT RESEARCH ACCOMPLISHMENTS

- Developed processing scheme to recover functional proteins from bone
- Established processing recommendations for the use of cold-set binders in beef products
- Investigated consumer attitudes towards processed beef products
- Identified reduced titin and nebulin degradation in pale, soft and exudative meat
- Identified increased myosin degradation in rapid glycolyzing turkey muscle
- Determined effect of pre-rigor meat and chopping time on the color stability of fresh sausage.

SOURCES OF FUNDING TO SUPPORT RESEARCH PROGRAM

New to Montana State - Previous employment research grants included


Saskatchewan Agriculture Development Fund 1998-2000. Effect of supplemental calcium and Vitamin D in feedlot diets on beef tenderness, a cooperative project with the Department of Animal and Poultry Science. $103,600.

Saskatchewan Agriculture Development Fund and Saskatchewan Beef Development Fund 1997-1999. Demand for Value Added Beef Products, cooperative project with Agricultural Economics. $150,000.


RESEARCH GOALS AND DIRECTION FOR THE NEXT FIVE YEARS

- Evaluate affect of feeding regimes on beef and lamb
- Investigate the effect of processing changes on tenderness of processed beef and lamb products
- Evaluate Novel ingredients in processed meat products
SELECTED PUBLICATIONS


Jan G.P. Bowman
230C Linfield Hall  PO Box 172900  MSU-Bozeman  Bozeman, MT 59717-2900
(406) 994-5563  FAX (406) 994-5589  jbowman@montana.edu

EDUCATION

<table>
<thead>
<tr>
<th>Degree</th>
<th>University of Missouri</th>
<th>Major</th>
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<tr>
<td>B.S.</td>
<td>University of Missouri</td>
<td>Animal Science</td>
<td>1977</td>
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<tr>
<td>M.S.</td>
<td>University of Missouri</td>
<td>Animal Science</td>
<td>1979</td>
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<tr>
<td>Ph.D.</td>
<td>University of Missouri</td>
<td>Ruminant Nutrition</td>
<td>1986</td>
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PROFESSIONAL EXPERIENCE

<table>
<thead>
<tr>
<th>Year</th>
<th>Position</th>
<th>Major</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998-present</td>
<td>Associate Professor</td>
<td>Animal &amp; Range Sciences</td>
<td>Montana State University</td>
</tr>
<tr>
<td>1992-1998</td>
<td>Assistant Professor</td>
<td>Animal &amp; Range Sciences</td>
<td>Montana State University</td>
</tr>
<tr>
<td>1988-1992</td>
<td>Assistant Professor</td>
<td>Animal Science</td>
<td>Ohio State University</td>
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</table>

Research Emphasis: Beef Cattle Nutrition, Forage Intake & Utilization, Development of Improved Barley Genotypes

MOST SIGNIFICANT RESEARCH ACCOMPLISHMENTS

- Developed and released "Valier", the first feed barley selected on the basis of improved ADG for cattle.
- Determined changes in feeding behavior can be used to detect morbid feedlot steers 3 days earlier than visual observation.
- Established calf intake of self-fed liquid supplement is similar to cow intake on a body weight basis.
- Identified changes in delivery method can be used to reduce variation in intake of self-fed supplements.
- Determined high protein liquid supplements improve forage intake and digestibility by grazing cows.
- Established the CV for individual cow intake of self-fed liquid supplement is large (55 to 150%).
- Identified QTLs for ruminal digestibility and particle size on barley chromosomes 3 and 4.
- Determined heritability of digestibility in barley to be 50%.
- Established cattle fed high-grain diets based on different barley varieties differ in feedlot performance.

SOURCES OF FUNDING TO SUPPORT RESEARCH PROGRAM  TOTAL since 1992 = $2,233,389

- USDA - Special Grant, 1999-00 $600,000
  Barley Feed for Rangeland Cattle
- USDA - Special Grant, 1998-99 $600,000
  Barley Feed for Rangeland Cattle
- USDA - Special Grant, 1997-98 $500,000
  Barley Feed for Rangeland Cattle
- MT Wheat & Barley Committee, 1997-98 $20,000
  Rapid Feed Quality Analysis Technology for Barley
- Roche Animal Nutrition & Health, 1997-98 $5,000
  Feeding Behavior of Feedlot Cattle
- USDA - Special Grant, 1996-97 $250,000
  Barley Feed for Rangeland Cattle
- American Feed Industry Association, 1996-97 $12,500
  Liquid Supplement Delivery to Cows on Native Range
- MT Wheat & Barley Committee, 1996-97 $20,000
  Rapid Feed Quality Analysis Technology for Barley
- Roche Animal Nutrition & Health, 1996-97 $10,000
  Development of Feedlot Feeding Behavior Technology
- North American Barley Genome Mapping Project, 1996-97 $10,000
  Determination of Genetic Markers Associated with Processing Characteristics of Barley
- MT Wheat & Barley Committee, 1995-96 $25,000
  Development of Rapid Feed Quality Analysis Technology
- North American Barley Genome Mapping Project, 1995-96 $15,000
Determination of Genetic Markers Associated with Digestibility of Barley for Beef Cattle

USDA - National Research Initiative Competitive Grants Program, 1995-97
Ruminal Digestion of Barley as Affected by Endosperm Protein Fractions

$49,989

RESEARCH GOALS AND DIRECTION FOR THE NEXT FIVE YEARS

- Use marker assisted selection to develop barley varieties specifically improved for feed quality.
- Evaluate effects of supplement delivery on intake & utilization of forages by grazing beef cows.

SELECTED PUBLICATIONS


Peter J. Burfening

119 Linfield Hall ♦ PO Box 172900 ♦ MSU-Bozeman ♦ Bozeman, MT 59717-2900
(406) 994-5573 ♦ FAX (406) 994-5589 ♦ pjb@montana.edu

EDUCATION

B.S.  Colorado State University  Dairy Science  1964
M.S.  North Carolina State University  Animal Science  1967
Ph.D. North Carolina State University  Physiology with a minor in Genetics  1968

PROFESSIONAL EXPERIENCE

1964-68  Research Assistant  North Carolina State University
1968-73  Assistant Professor  Montana State University
1973-78  Associate Professor  Montana State University
1978-97  Professor of Animal Science  Montana State University
1997-present  Department Head  Montana State University

Research Emphasis: Physiological and Genetic Factors That Effect Reproductive Performance in Beef Cattle and Sheep

MOST SIGNIFICANT RESEARCH ACCOMPLISHMENTS

- The principal cause of calving difficulty is calf birth weight. Calf birth weight can be reduced by sire selection thus reducing calving difficulty. Using estimated breeding values for calving difficulty when selecting sires, if available, is more effective in reducing calving difficulty than selection against large birth weights.
- Selection for and against reproductive rate in sheep is effective in changing prolificacy.
- The primary correlated response to selection for or against reproductive rate was a change in ovulation rate with little or no change in embryonic survival.
- No significant correlated responses were observed for any of the growth or fleece traits measured in the experiment.
- No differences were observed between lines selected for or against reproductive rate in the length of estrus, length of the estrous cycle, number of non-atretic antral follicles on the ovary around the time of ovulation, LH surge at estrus or IGF-1 at estrus.
- Selection for Scrotal circumference (SC) in ram lambs resulted in significant increases in SC. However, when SC was adjusted for ram body weight at the time of measurement, body weight of mature ewes decreased. A positive genetic correlation was observed between SC and number of lambs born in the rams' daughters.

SOURCES OF FUNDING TO SUPPORT RESEARCH PROGRAM

"Montana Beef Network: An Integrated Total Quality Management Approach For Beef production."
USDA/CSREES Special Grant
1999 ........................................................................................................... $500,000
2000 ........................................................................................................... $750,000

"Agriculture in a Global Context: Innovation in Multidisciplinary, Experiential Learning" USDA/CSREES
Higher Education Challenge Grant
1999 ........................................................................................................... $247,653
RESEARCH GOALS AND DIRECTION FOR NEXT FIVE YEARS

- If I continue to conduct any research it will be in the area of understand the physiological process that resulted in increased ovulation rate.

PUBLICATIONS

Author or co-author of 61 referred publications, 5 reviewed papers, 75 papers presented at scientific meetings and 27 popular articles.

IMPORTANT PUBLICATIONS


S. Dennis Cash

235 B Linfield Hall  PO Box 172900  MSU-Bozeman  Bozeman, MT  59717-2900
(406) 994-5688  FAX (406) 994-5589  dcash@montana.edu

EDUCATION

<table>
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<tr>
<th>Degree</th>
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<th>Major</th>
<th>Year</th>
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<tbody>
<tr>
<td>BS</td>
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<td>Crop Science</td>
<td>1977</td>
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<tr>
<td>MS</td>
<td>New Mexico State University</td>
<td>Agronomy</td>
<td>1978</td>
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<tr>
<td>Ph.D.</td>
<td>Montana State University</td>
<td>Crop &amp; Soil Science</td>
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PROFESSIONAL EXPERIENCE

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<tr>
<th>Year</th>
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<th>Institution/Location</th>
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<tr>
<td>1998-Present</td>
<td>Associate Professor</td>
<td>Animal &amp; Range Sciences  Montana State University</td>
</tr>
<tr>
<td>1992-Present</td>
<td>Extension Forage Specialist</td>
<td>Montana State University Extension Service</td>
</tr>
<tr>
<td>1982-92</td>
<td>Forage Breeder</td>
<td>Northrup King</td>
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MOST SIGNIFICANT RESEARCH AND TEACHING ACCOMPLISHMENTS

Research: Released or cooperated with release of 22 alfalfa cultivars. Forage quality studies with alfalfa and dryland Montana grasses.

Teaching: Comprehensive educational programs for producers and agribusiness clients in forage crop production.

SOURCES OF FUNDING TO SUPPORT RESEARCH PROGRAM

- SARE-IPM mini-grant, 1999  Variation in alfalfa quality and palatability due to time of day swathed.  $978
- SARE-IPM mini-grant, 1999  Winter wheat trials: forage winter wheat.  $981
- USDA NRCS GLCI mini-grant, 1998  Dryland forage grass quality demonstration.  $1800
- MSU Department of Entomology Sustainable Agriculture mini-grant, 1998  Willow Creek Growers pea and lentil field demonstration project.  $2990
- Cattleman’s Choice Loomix, LLC., 1998  Evaluation of ‘Forage-Gro’ on alfalfa.  $1000
- USDA NRCS and MSU Foundation Seed Program, 1998  Dryland forage grass breeding project.  $6610
- Montana Department of Agriculture, 1998  Enhanced marketing opportunities for Montana hay.  $6160
- USDA NRCE and MSU Foundation Seed Program, 1998  Dryland grass forage quality.  $41,520
- Cenex/Land O’Lakes, 1997  Field evaluation of bloat potential in “LIRD” alfalfa.  $40,000

RESEARCH AND TEACHING GOALS AND DIRECTION FOR NEXT FIVE YEARS

Research: Regional collaboration with forage specialists in 11 western states for joint research projects and reporting of cultivar adaptation trials.

Teaching: Reorient my outreach program to reduce exhaustive travel schedule – design distant and web-based training programs, fewer (but larger) regional programs.
PUBLICATIONS (Last 3 years)

REFEREED PUBLICATIONS


REVIEWED PUBLICATIONS, ABSTRACTS AND PROCEEDINGS


Rick Funston

USDA-ARS Fort Keogh
Rt. 1 Box 2021
Miles City, MT 59301
(406) 232-8223  FAX (406) 232-8209  rick@larrl.ars.usda.gov

EDUCATION

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<th>Degree</th>
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<tr>
<td>BS</td>
<td>North Dakota State University</td>
<td>Animal Science</td>
<td>1985</td>
</tr>
<tr>
<td>MS</td>
<td>Montana State University</td>
<td>Animal Science</td>
<td>1987</td>
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<tr>
<td>PhD</td>
<td>University of Wyoming</td>
<td>Reproductive Biology</td>
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PROFESSIONAL EXPERIENCES

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<tr>
<td>1998-present</td>
<td>Extension Beef Specialist</td>
<td>Animal and Range Sciences</td>
<td>Montana State</td>
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<tr>
<td>1995-1998</td>
<td>Assistant Professor</td>
<td>Animal Science</td>
<td>Chadron State College</td>
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<tr>
<td>1993-1995</td>
<td>Postdoctoral Fellow</td>
<td>Dept. of Physiology</td>
<td>Colorado State</td>
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Extension Emphasis (90%): Reproductive management, beefability programs, Montana Beef Network, beef quality assurance
Research Emphasis (5%): Increasing reproductive efficiency in beef cattle
Teaching Emphasis (5%): Cow/calf management

MOST SIGNIFICANT RESEARCH ACCOMPLISHMENTS

- Demonstrated the importance of glucose in reproductive function in ruminants.
- Demonstrated the presence of GnRH receptors in the bovine cumulus oocyte complex.
- Demonstrated a GnRH- like compound in bovine seminal plasma.
- Demonstrated that components of the hypothalamic and peripheral IGF system change with differing stages of the estrous cycle in beef cattle.

SOURCES OF RECENT FUNDING TO SUPPORT RESEARCH/TEACHING PROGRAM


GOALS FOR THE NEXT FIVE YEARS

- Assist county agents, industry consultants and ranchers with beef cattle reproduction, genetic, nutrition, health and beef quality assurance issues. Work with MT Stockgrowers and producers on the Montana Beef Network.

MAJOR PUBLICATIONS (last five years)


L. C. (Sandy) Gagnon

228 Linfield Hall ♦ PO Box 172900 ♦ MSU-Bozeman ♦ Bozeman, MT 59717-2900
(406) 994-6623 ♦ FAX (406) 994-5589 ♦ gagnon@montana.edu

EDUCATION

<table>
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<tr>
<td>BS</td>
<td>Montana State University</td>
<td>Animal Science</td>
<td>1966</td>
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<tr>
<td>MS</td>
<td>Montana State University</td>
<td>Animal Physiology</td>
<td>1969</td>
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PROFESSIONAL EXPERIENCE

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<tr>
<td>1999-Present</td>
<td>Associate Professor</td>
<td>Montana State University</td>
<td>Animal Science</td>
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<tr>
<td>1999-Present</td>
<td>Equine Extension Specialist</td>
<td>Montana State University</td>
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<tr>
<td>1994-1999</td>
<td>Associate Professor</td>
<td>Montana State University</td>
<td>Animal Science</td>
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<td>1993-1994</td>
<td>Office of the Dean</td>
<td>Montana State University</td>
<td>College of Agriculture</td>
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<tr>
<td>1990-1993</td>
<td>Associate Professor</td>
<td>Montana State University</td>
<td>Animal Science</td>
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<tr>
<td>1975-1984</td>
<td>Assistant Professor</td>
<td>Montana State University</td>
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<tr>
<td>1969-1975</td>
<td>Instructor</td>
<td>Montana State University</td>
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Research Emphasis: Nutritional factors that effect growth of horses and effects of grazing on habitat.

MOST SIGNIFICANT RESEARCH ACCOMPLISHMENTS

- Effects of horse's use on wilderness meadows and behavior of horses during confinement by various methods.
- Establishing intake of free roaming horses and nutrition of growing horses.
- Development of the Bandy Experimental Research Ranch in cooperation with the University of Montana, School of Forestry.

FUNDING TO SUPPORT RESEARCH PROGRAM

- MT Ag Experiment Station (4 yrs to 1999): $1,000
- NRCS: $131,000
- USNPS: $5,700
- MT Pride: $60,000
- MT Beef Council: $40,000

RESEARCH GOALS AND DIRECTION FOR THE NEXT FIVE YEARS

Exchanged MAES appointment for Extension appointment.
PUBLICATIONS

Author or co-author of 18 various publications.


Wayne F. Gipp

235 Linfield Hall  PO Box 172820  MSU-Bozeman  Bozeman, MT  59717-2820
(406) 994-3415  FAX (406) 994-5589  wgipp@montana.edu

EDUCATION

B.S.  Cornell University  Animal Science  1966
M.S.  Purdue University  Animal Nutrition  1968
Ph.D.  Cornell University  Swine Nutrition  1971

PROFESSIONAL EXPERIENCE

1993-Present  Extension Swine Specialist  Montana State University
1993 (Jan-July)  Visiting Swine Specialist  University of Nebraska, Lincoln
1980-1993  Extension Swine Specialist  Montana State University
1976-1980  Assistant Professor (Nutrition)  Arizona State University
1971-1976  Assistant Swine Nutritionist  Cargill-Nutrena Feeds

PROGRAM EMPHASIS

Extension - Pork quality improvement, Enhanced profitability, Sustainable production, Organization assistance, Youth programs

Teaching - ARNR 331 (Swine Production:, 3 credit); ARNR 231 (Applied Techniques in Livestock Management: Swine, 1 credit); Undergraduate Advisement

MOST SIGNIFICANT RESEARCH (CREATIVE ACTIVITY) ACCOMPLISHMENTS

- SOE program and software to stimulate awareness of pork carcass quality characteristics.
- Live animal ultrasound evaluation awareness.
- Pork 2000 Task Force; Swine Industry Development Committee
- Information resources for swine producers (Pork Quality Assurance, Environment Assurance Program, NPPC Competitive Seminars, NPPC Extension Swine Educators Materials)
- Live hog market development.
- Assistance to swine industry organizations.

PROGRAM GOALS AND DIRECTION FOR NEXT FIVE YEARS

The ability of MSU to develop and deliver detailed, original swine programs to the producers of the state is limited. Therefore the major focus of the MSU swine Extension program is to consolidate cutting edge technology and information from national sources for delivery to Montana producers via a variety of formal and informal needs. The SOE (Swine Symbol of Excellence) program serves as means to monitor carcass quality improvement as well as a stepping stone for delivery of information on national trends. The Ultrasound program is a complement to SOE. Greater emphasis will be placed on Environmental Assurance Programs, Comprehensive Nutrient Management Plans and other programs that assist producers in dealing with environmental issues. Web and print based production management information resources for beginning and/or small scale producers will be revised and expanded. Information based decision making aids are becoming increasingly available to producers. The MSU Extension program will provide awareness and assistance in this area.
PUBLICATIONS REFEREED OR REVIEWED JOURNALS


PAPERS PRESENTED AT SCHOLARLY MEETINGS


SOFTWARE

EDUCATION

B.S. Montana State University Range Science 1983
M.S. New Mexico State University Range Science 1985
Ph.D. University of Nebraska-Lincoln Ruminant Nutrition 1988

PROFESSIONAL EXPERIENCE

1996-present Associate Professor Montana State University
1995-1996 GS-13 Research Scientist USDA-ARS, Dubois, ID
1991-1995 GS-12 Research Scientist USDA-ARS, Dubois, ID
1988-1991 GS-11 Research Scientist USDA-ARS, Dubois, ID
1985-1988 Research-Teaching Assistant University of Nebraska
1983-1985 Research Assistant New Mexico State University

Research Emphasis: Nutritional and management factors that improve sheep production efficiency and role of sheep in holistic farm management systems.

MOST SIGNIFICANT RESEARCH ACCOMPLISHMENTS

- Demonstrated that grazing sheep can reduce over-wintering populations of wheat stem sawfly in grain stubble fields.
- Demonstrated that older lambs finished on pasture or on a high concentrate diet are a quality meat product that has palatability characteristics similar to younger lambs finished in confinement.
- Investigated the zinc and copper requirements of sheep, demonstrating that form of mineral impacts animal mineral status and that NRC requirements for gestating and lactating ewes are low.
- Examined the role of supplemental vitamin E on lamb survival and immune function, determining that vitamin E is a cost-effective method of reducing neonatal mortality, but its role may not be enhanced immune function.
- Investigate intake regulation and the impact of energy demand and consumption of growth hormone.
- Determined biological characteristics and nutrient requirements of sheep differing in breed and production potentials.
- Investigated the occurrence of Escherichia coli 0157:H7 in sheep.
- Researched the effects of specific nutrients, grain types, process methods, and general nutritional management on ewe and lamb performance and digestive dynamics.
- Explored management strategies that a) minimize labor and harvested feed inputs to range sheep operations and b) maximize returns on appropriate strategic inputs.

RESEARCH GOALS AND DIRECTION FOR NEXT FIVE YEARS

- Evaluate nutritional and management strategies that reduce neonatal losses via improved immune function and fetal energy status.
- Incorporation of grazing sheep into farming systems to control wheat stem sawfly and other grain pests.
- Determine the variation in intake of different forms of supplement

PUBLICATIONS

Author or co-author of 36 refereed publications, 14 invited national and international papers, 65 proceedings, abstracts, and research reports, and 25 invited regional, national and international presentations.
PEER REVIEWED JOURNAL PUBLICATIONS


MANUSCRIPTS ACCEPTED


MANUSCRIPTS IN PRESS

James E. Knight

219 Linfield Hall • P.O. Box 172820 • MSU-Bozeman • Bozeman, MT. 59717-2820
(406) 994-5579 • FAX (406) 994-5589 • jknight@montana.edu

EDUCATION

B.S. Michigan State University Wildlife Management 1973
M.S. Michigan State University Wildlife Biology 1975
Ph.D. University of Michigan Natural Resource Management 1980

PROFESSIONAL EXPERIENCES

1999-present Agriculture & Natural Resource, Program Leader Montana State University, Extension Service
1994-present Extension Wildlife Specialist, Professor Montana State University, Extension Service
1981-1994 Extension Wildlife Specialist, Professor New Mexico State University, Cooperative Extension Service

MOST SIGNIFICANT ACCOMPLISHMENTS

♦ Developed procedures for beneficial use of livestock to enhance wildlife habitat.
♦ Developed several wildlife damage control methods for elk, deer, coyotes, snakes, pest birds and rodents.
♦ Developed natural resource multiple-use educational techniques presently used in all states.
♦ Developed strategies for mediation and dispute resolution utilizing multi-interest involvement in ecosystem management decisions.

SOURCES OF FUNDING TO SUPPORT RESEARCH AND EXTENSION PROGRAMS

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<th>Year</th>
<th>Program</th>
<th>Source</th>
<th>Amount</th>
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<tr>
<td>1999</td>
<td>U.S. Fish &amp; Wildlife Service</td>
<td>Prairie Dog Education</td>
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<td>1998</td>
<td>NRI Competitive Grant Prgm</td>
<td>Coordinated Elk Management</td>
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<td>1994-99</td>
<td>MT. Dept. Fish &amp; Wildlife &amp; Parks</td>
<td>Extension Wildlife Education</td>
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<td>1998</td>
<td>U.S. Fish &amp; Wildlife Service</td>
<td>Endangered Species Education</td>
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<td>1995-98</td>
<td>USDA SARE</td>
<td>Riparian Education</td>
<td>$98,000</td>
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<tr>
<td>1995</td>
<td>USDA SARE</td>
<td>Influencing elk &amp; livestock riparian use</td>
<td>$7,800</td>
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GOALS AND DIRECTION FOR NEXT FIVE YEARS

♦ Develop programs to address problems and opportunities associated with multi-interest involvement on public land management decisions.
♦ Develop programs to address elk-livestock grazing issues.
♦ Develop education programs to improve understanding and cooperation in future natural resource multiple-use issues.

SELECTED PUBLICATIONS


Rodney Kott

222 Linfield Hall † PO Box 172820 † MSU-Bozeman † Bozeman, MT 59717-2820
(406) 994-3415 † FAX (406) 994-5589 † rkott@montana.edu

EDUCATION

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<th>Degree</th>
<th>Institution</th>
<th>Major</th>
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<tr>
<td>BS</td>
<td>Texas A&amp;M University</td>
<td>Agricultural Education</td>
<td>1974</td>
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<tr>
<td>MS</td>
<td>Texas A&amp;M University</td>
<td>Animal Science</td>
<td>1976</td>
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<tr>
<td>PhD</td>
<td>New Mexico State University</td>
<td>Animal Science</td>
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PROFESSIONAL EXPERIENCES

1980-present  Extension Sheep Specialist  Animal & Range Science Dept  Montana State Univ.

Extension Emphasis: Sheep Management

MOST SIGNIFICANT EXTENSION PROGRAMS

- Conduct 20 to 30 sheep production workshops throughout Montana on sheep genetics, reproduction, nutrition, health, management & marketing.
- Coordinate the Montana Central Ram Test and the Montana On-Farm Ram Testing Program.
- Conduct enhanced wool preparation and marketing workshops which are designed to add value to wool produced in Montana.
- Work with leaders from other states to help facilitate national sheep related programs such as wool classing schools (train certified wool classifiers) and National Sheep Improvement Program (a genetic record keeping package)
- Develop and conduct a carcass lamb evaluation program for Montana 4H youth lamb projects

SOURCES OF FUNDING TO SUPPORT RESEARCH PROGRAM (1995 to present)

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<tr>
<td>2000</td>
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<td>Sheep Competitiveness</td>
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<td>Wool Research</td>
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<td>Hoffman</td>
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<td>Wool Research</td>
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Publications (1995 to present):


Book Chapters


Don D. Kress

226 Linfield Hall  PO Box 172900  MSU-Bozeman  Bozeman, MT  59717-2900  
(406) 994-5576  FAX (406) 994-5589  dkress@montana.edu

EDUCATION
B.S.  Univ. of Idaho  Animal Science  1964
M.S.  Univ. of Wisconsin  Animal Science & Genetics  1966
Ph.D.  Univ. of Wisconsin  Animal Science & Genetics  1969
with minor in Statistics

PROFESSIONAL EXPERIENCE
1964-69  Research Assistant  University of Wisconsin
1986-87  Visiting Professor (Sabbatical)  University of Nebraska
1980-99  Professor of Animal Science  Montana State University
1999-present  Interim Assoc. Dean, COA  Montana State University

FTE = 70% Admin., 30% MAES

Research Emphasis: Beef Cattle Genetics and Breeding, Genetics of Beef Cow Size and Cow Efficiency, Crossbreeding Systems, Maternal and Paternal Heterosis, Selection for Scrotal Circumference and Antagonistic Traits, Genetics of Carcass Characteristics

MOST SIGNIFICANT RESEARCH ACCOMPLISHMENTS
- Biological types of beef cows that are intermediate in size and milk production are most productive under most Montana range conditions.
- Biological types of beef cows must be matched to feed and range resources.
- The risk associated with choosing the incorrect biological type of cow to match to resources is greater under western range conditions.
- Maternal heterosis is extremely important for beef cow productivity and efficiency - hence, it is extremely important to use crossbred cows.
- Simple crossbreeding systems can be used to mimic the more complicated "textbook" crossbreeding systems that are more difficult to manage.
- Sire by environment (region, herd) interactions are important, thus breeders should purchase sires from environments similar to their own environment.
- Scrotal circumference of bulls is closely related to puberty in heifers.
- Selection for greater yearling weight but smaller birth weight using a selection index (I = YW - 3.2BW) is very effective.
- Paternal heterosis is 3% or greater for calf wn. wt. per cow exposed.
- Maternal heterosis is worth $70 per year per cow in the herd.
- There are genetic differences among breeds for cow biological efficiency.

SOURCES OF FUNDING TO SUPPORT RESEARCH PROGRAM
- Montana Agricultural Experiment Station, Beef Breed Associations of Montana, American Breeders Service, Beefbooster, American Salers Association, American Simmental Association, Montana Beef Council, USDA Special Grant.

RESEARCH GOALS AND DIRECTION FOR NEXT FIVE YEARS
- Beef cow maternal performance, range forage intake and cow efficiency.
- Effects of selection for scrotal circumference.
- Genetic differences for carcass characteristics including tenderness.
PUBLICATIONS AND AWARDS

Author or co-author of over 200 scientific and technical publications and over 100 abstracts. Recipient of Outstanding Teacher Award in College of Agriculture and Teaching Excellence Award from MSU Alumni and Bozeman Chamber of Commerce. Received the prestigious Animal Breeding and Genetics research award (Rockefeller Prentice Memorial Award) from the American Society of Animal Science for outstanding animal breeding research.

SELECTED PUBLICATIONS LAST FIVE YEARS


Clayton B. Marlow

230 Linfield Hall • PO Box 172900 • MSU-Bozeman • Bozeman, MT 59717-2900
(406) 994-2486 • FAX (406) 994-5589 • cmarlow@montana.edu

EDUCATION

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<th>Major</th>
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<tr>
<td>BS</td>
<td>University of Wyoming</td>
<td>Range Management</td>
<td>1974</td>
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<td>MS</td>
<td>Washington State University</td>
<td>Forest &amp; Range Management</td>
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PROFESSIONAL EXPERIENCES

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<tr>
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<td>Associate Prof.</td>
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<td>Associate Dean</td>
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<td>1984-1989</td>
<td>Associate Prof.</td>
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<td>1980-1984</td>
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MOST SIGNIFICANT RESEARCH ACCOMPLISHMENTS

- Developed effectiveness rating for a series of grazing practices for protecting water quality
- Developed a method for monitoring wildlife/livestock use of willows
- Established existence of inherent variation in response to grazing among and between stream reaches
- Description of the interaction between stream bank stability and livestock grazing.
- Identified the response of certain sedges and willows to grazing.
- Identified establishment requirements for Bebbs Willow.

SOURCES OF FUNDING TO SUPPORT RESEARCH PROGRAM

- United States Geologic Survey
- Environmental Protection Agency
- United States Forest Service
- Montana Water Resources Center
- Trout Unlimited
- Cooperative States Research Service
- Montana Ag Experiment Station
- National Park Service

RESEARCH GOALS AND DIRECTION FOR NEXT FIVE YEARS

- To further describe those physical climatic and biological forces that shape riparian communities and affect water quality. Activities will be focused on the effect of grazing pressure on riparian function and water quality. Short term efforts will be directed to collaborative work on DNA “tagging” for identifying fecal coliform sources.

PARTIAL LIST OF PUBLICATIONS

REFEREED ARTICLES


Jeffrey C. Mosley

218 Linfield Hall ⧫ PO Box 172820 ⧫ MSU-Bozeman ⧫ Bozeman, MT 59717-2820
(406) 994-5601 ⧫ FAX (406) 994-5589 ⧫ jmosley@montana.edu

EDUCATION

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<td>MS</td>
<td>University of Idaho</td>
<td>Range Resources</td>
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<td>PhD</td>
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PROFESSIONAL EXPERIENCE

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<td>1987-1989</td>
<td>Research Associate and Lecturer</td>
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<td>1984</td>
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MOST SIGNIFICANT ACCOMPLISHMENTS

- Developed guidelines for using prescribed sheep grazing to enhance nutritive quality of browse for white-tailed deer and Rocky Mountain elk.
- Developed guidelines for using prescribed sheep grazing to increase conifer growth.
- Demonstrated that Rocky Mountain elk may be intermediate feeders in wet habitat types vs bulk feeders in drier habitat types.
- Demonstrated that fecal streptococci should not be used to assess water pollution by wild and domestic ungulates.
- Determined that 7-day grazing periods are generally appropriate for short duration grazing of native rangeland.
- Developed frequency sampling procedures for evaluating mountain meadow vegetation.

CURRENT SOURCES OF FUNDING FOR RESEARCH AND EXTENSION PROGRAM

- USDA-CSREES Rangeland Research Grants Program
- Bureau of Land Management
- Rocky Mountain Elk Foundation
- Montana Agricultural Experiment Station
- National Fish and Wildlife Foundation
RESEARCH AND EXTENSION GOALS FOR NEXT FIVE YEARS

- Facilitate collaborative processes for managing natural resource conflicts.
- Further develop prescribed livestock grazing strategies for vegetation management.
- Examine the influence of social hierarchy on riparian habitat use by rangeland cattle.
- Develop prescribed burning guidelines for controlling conifer encroachment.

REFEREED JOURNAL PUBLICATIONS (last 5 years)


EDUCATION

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<td>PhD</td>
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PROFESSIONAL EXPERIENCES

1996-present  Associate Professor  Range Science  Montana State University
1990-1996     Assistant Professor  Range Science  Montana State University
1988-1990     Research Associate   Range Ecology  Montana State University
1983-1987     Research Assistant   Range Ecology  Utah State University

Research Emphasis: Winter grazing, weed and insect management with livestock

MOST SIGNIFICANT RESEARCH ACCOMPLISHMENTS

- Developing methods for monitoring microclimates on rangelands grazed during winter
- Determined that yearling sheep that have had experience with leafy spurge as lambs graze it more readily than yearlings that have not had experience with leafy spurge

SOURCES OF FUNDING TO SUPPORT RESEARCH PROGRAM  $729,890

- USDA CSREES 1999-2002  Success of spotted knapweed  $167,000
- B.C. Ministry Forest 1997-1998  Evaluating animal unit equivalence  $15,000
- Noxious Weed Trust Fund, 1997-98  Comparing sheep and goat use of weeds  $26,000
- USDA CSRS Competitive Grant 1996-98  Winter stress on beef cattle  $59,850
- Noxious Weed Trust Fund, 1996-98  Native grass establishment - weeds  $16,840
- USDA CSRS Competitive Grant 1995-98  Livestock-grasshopper interactions II  $79,850
- Noxious Weed Trust Fund 1994-96  Biodiversity of knapweed infested lands  $11,800
- Noxious Weed Trust Fund, 1994-95  Carbohydrate reserves of spotted knapweed  $6,200
- USDA CSRS Special Grant, 1993-95  Sheep grazing leafy spurge II  $118,500
- USDA CSRS Competitive Grant 1993-95  Livestock-grasshopper interactions  $179,100
- USDA CSRS Special Grant, 1992-94  Sheep grazing leafy spurge I  $118,500
- Noxious Weed Trust Fund, 1991-93  Sheep grazing spotted knapweed  $25,000
- Golden Sunlight Mine, 1991-92  Pyrite amendments  $6,250

RESEARCH GOALS AND DIRECTION FOR NEXT FIVE YEARS

- Determine stress-response of beef cattle grazing on winter range
- Develop a model that will predict winter nutrient needs for livestock
- Develop effective grazing recommendations for controlling noxious weeds

PUBLICATIONS (last five years)


John Paterson

215 Linfield Hall  PO Box 172820  MSU-Bozeman  Bozeman, MT 59717-2820
(406) 994-5562  FAX (406) 994-5589  johnp@montana.edu

EDUCATION

BA Western NM University  Chemistry  1973
MS Utah State University  Animal Science  1976
PhD University of Nebraska  Ruminant Nutrition  1979

PROFESSIONAL EXPERIENCES

1996-present Extension Beef Specialist Animal and Range Sciences Montana State
1993-1996 Professor and Head Animal and Range Science Montana State
1979-1993 Professor Animal Science Univ. of Missouri

Extension Emphasis (70%): Nutritional programs for cows in late gestation, computer software, beef quality assurance, Montana Beef Network

Research Emphasis (20%): Beef cattle mineral/protein nutrition, Forage utilization,
Teaching Emphasis (10%): Feedlot Nutrition & Management

MOST SIGNIFICANT CAREER RESEARCH ACCOMPLISHMENTS

• Demonstrated that the toxic alkaloid in tall fescue reduced blood flow to peripheral and core body tissues in cattle.
• Demonstrated that inclusion of high fiber byproduct feedstuffs into supplements resulted in similar animal gains as cereal grain-based supplements.
• Demonstrated that weaned heifers supplemented with high levels of Zn had reduced storage of Cu in the liver.

SOURCES OF RECENT FUNDING TO SUPPORT RESEARCH/TEACHING PROGRAM

1999 USDA-CSREES Montana Beef Network $500,000
1997 Consolidated Nutrition Protein supplementation of heifers 10,500
1996 ZinPro Corp. Mineral nutrition of weaned calves 8,000
1997-2000 MT Beef Council Beef Newsletter $30,000

GOALS FOR THE NEXT FIVE YEARS

• Assist county agents, industry consultants and ranchers with beef cattle nutrition, health and beef quality assurance issues through Montana Beef University and the Montana Beef Network. Management strategies to reduce morbidity in weaned calves.

MAJOR PUBLICATIONS AND PRESENTATIONS


Bok F. Sowell

231 A Linfield Hall  MSU-Bozeman  Bozeman, MT 59717-2900
(406) 994-5558  FAX (406) 994-5589  bok@montana.edu
82% teaching, 18% research

EDUCATION

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<td>Wildlife Science</td>
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<tr>
<td>Ph.D.</td>
<td>New Mexico State University</td>
<td>Animal Science/Range Nutrition</td>
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PROFESSIONAL EXPERIENCE

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<td>Associate Professor</td>
<td>Animal &amp; Range Sciences</td>
<td>Montana State University</td>
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<td>1993-98</td>
<td>Assistant Professor</td>
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<tr>
<td>1989-1992</td>
<td>Assistant Professor</td>
<td>Animal &amp; Range Sciences</td>
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MOST SIGNIFICANT RESEARCH AND TEACHING ACCOMPLISHMENTS

Teaching: 1998 MSU College of Agriculture Top Ten Instructor Award
1998 MSU Phi Kappa Phi/Anna Krueger Fridley Teaching Award

Research: Developed technique to detect sick animals 3 days earlier than conventional methods
Developed methods which reduced variation in supplement intake by range beef cattle
Improved feed delivery methods for feedlot cattle

RESEARCH AND TEACHING GOALS AND DIRECTION FOR NEXT FIVE YEARS

Teaching: Combine more case studies with critical thinking

Research: Rangeland Pasture Insurance Pilot Project
Forage Use and Feeding Behavior of Range Livestock

PUBLICATIONS

REFEREED PUBLICATIONS


PEER REVIEWED PUBLICATIONS


Gene Surber

217 Linfield Hall • PO Box 172820 • MSU-Bozeman • Bozeman, MT 59717-2820
(406) 994-5560 • FAX (406) 994-5589 • gsurber@montana.edu

EDUCATION

BS Montana State University Agricultural Science 1970
MS Montana State University Animal Science 1972

PROFESSIONAL EXPERIENCES

1994-Present Extension Natural Resources Specialist Montana State University
1990-1994 Hydrologic Unit Area-Godfrey Creek Extension Coordinator MSU/Extension Gallatin County
1980-1994 County Extension Agent Chairman MSU/Extension Gallatin County
1974-1980 County Extension Ag Agent MSU/Extension Gallatin County
1972-1974 County Extension Agent MSU/Extension Park County

Extension Emphasis: Grazing Land Conservation Initiative (GLCI), Western Integrated Ranch/farm Education (WIRE) and Livestock/Water Quality Issues

MOST SIGNIFICANT EXTENSION ACCOMPLISHMENTS

• Grazing Lands Conservation Initiative, GLCI: Coordination of activities designed to enhance private grazing lands management. Coordinated activities on 39 grazing lands demonstration projects on over 120 individual's private lands.

• Western Integrated Resource Education, WIRE: Teach Integrated Ranch Resource Management concepts to ranches via a 5 week, 30 hour course. Approximately five hundred and fifty people from 250 ranches have completed the course in 5 years. Thirty-four County Extension Faculty have been trained as teachers of the WIRE course.

• Demonstrated the enhanced effects to livestock production through providing off stream or off reservoir watering sources for livestock.

• Demonstrated Best Management Practices (BMP's) that minimize water quality contamination from livestock confinements. Provide on ranch evaluations of Animal Feeding Operations and suggested BMPs to protect water quality.
SOURCES OF FUNDING

1994-1997  USDA S.A.R.E  Western Integrated Resource Education (Shared)  $90,000
1994-1995  USDA NRCS  Grazing Lands Conservation Initiative  $12,000
1995-1996  USDA NRCS  Grazing Lands Conservation Initiative  $44,500
1997-1998  USDA NRCS  Grazing Lands Conservation Initiative  $60,000
1996-1998  DEQ 319 E&I  Riparian Area Grazing Education  $70,000
1997-1998  USDA NRCS  Grazing Lands Conservation Initiative  $83,423
1999  USDA NRCS  Grazing Lands Conservation Initiative  $22,700
1999  EWQI-IPS  MT Water Quality Empowerment Project  $36,704

EXTENSION GOALS AND DIRECTION FOR NEXT FIVE YEARS

- Enhance private grazing lands management through identifying needs of private landowners and developing educational materials to assist them in addressing those needs.
- Coordinate the activities of the state GLCI program for private landowners and government agencies.
- Assist landowners through extension agents to implement environmentally sound, economic and socially acceptable BMP's thereby enhancing the sustainability of the grazing livestock industry.
- Coordinate activities for, train teaching staff and teach ranchers the integrated ranch management concepts via the Western Integrated Resource Education course.

MAJOR PUBLICATIONS (last five years)


EDUCATION

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<tr>
<td>BS</td>
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<td>Animal Science</td>
<td>1971</td>
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<td>MS</td>
<td>Montana State University</td>
<td>Animal Science</td>
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<tr>
<td>PhD</td>
<td>University of Nebraska</td>
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PROFESSIONAL EXPERIENCES

- 1993-present Professor Montana State University
- 1996-1997 Acting Department Head Montana State University
- 1988-1993 Associate Professor Montana State University
- 1987-1988 Associate Professor North Carolina State University
- 1981-1987 Assistant Professor North Carolina State University

Research Emphasis: Livestock Production Systems, Animal Breeding and Genetics

MOST SIGNIFICANT RESEARCH ACCOMPLISHMENTS

- Developed life-cycle bio-economic model for pork production and determined breeding objectives for swine based on economic efficiency.
- Showed that cytoplasmic inheritance is not an important source of phenotypic variation in beef cattle.
- Demonstrated the importance of using practical crossbreeding systems for small beef herds.
- Demonstrated the importance of breed substitution and heterosis on efficiency and profitability in cow-calf, feedlot, and integrated beef production systems.
- Demonstrated that selection of beef replacement heifers on the basis of yearling pelvic area will have minimal effects on subsequent calving difficulty.
- Developed a life-cycle bio-economic model for beef production under range conditions.
- Demonstrated the economic impacts of wild elk on cattle enterprise profitability.
- Demonstrated that cow-calf production systems may be more profitable by extending the grazing season even if herd size is reduced.
- Demonstrated the effects of maternal traits on beef cow-calf profitability.

SOURCES OF FUNDING TO SUPPORT RESEARCH PROGRAM

- 1991 USDA (With several other researchers) $290,000
- 1991 Beefbooster Management Ltd (With D. D. Kress) $8,000
- 1992 High Mountain Ranches, Inc. (With R. P. Ansoltegui) $24,726
- 1994 Egyptian National Agricultural Research Project $12,000
- 1994 USDA-NRI (With J. R. Lacey) $44,085
- 1997 American Simmental Assoc. (With D. D. Kress) $5,000
- 1998 American Simmental Assoc. (With D. D. Kress) $5,000
- 1998 USDA-NRI (With three others) $290,000
- 1998 NCBA $1,500
RESEARCH GOALS AND DIRECTION FOR NEXT FIVE YEARS

♦ Identify economically sustainable elk/cattle management strategies.
♦ Continue to study alternative management systems to improve profitability of beef production systems in Montana.
♦ Evaluate the effects of selection for carcass traits on beef cow-calf enterprise profitability.

PUBLICATIONS

Author or co-author of 59 refereed publications, 18 reviewed papers, 48 abstracts, 28 technical reports, 20 popular articles.

SELECTED PUBLICATIONS SINCE 1995


EDUCATION

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<td>University of Idaho</td>
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<td>University of Wyoming</td>
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PROFESSIONAL EXPERIENCES (MAES)

- 1965-1966 Range Aide
- 1967-1970 Research Fellow
- 1970-1980 Range Management Specialist (MCES)
- 1980-present Professor of Range Science

Research Emphasis: Shrub Ecology and Management

MOST SIGNIFICANT RESEARCH ACCOMPLISHMENTS

- Reported the influence of secondary compounds in woody plants on herbivore digestion and forage intake.
- Reported the biological and economic responses of four brush control methods.
- Reported relationships of fire-shrub-herbivore interactions.
- Reported comprehensive findings of shrub - ungulate relationships on the Northern Yellowstone Winter Range.
- Reported the relationships between livestock grazing strategies and their effect on the nutritional quality of bluebunch wheatgrass.
- Reported the morphological responses of bitterbrush to browsing as well as the variation of crude protein in the species with an assessment of community characteristics that influence bitterbrush cover and browsing.
- Reported the taxonomy, distribution, and habitat of all rabbitbrush taxa in Montana.

SOURCES OF FUNDING TO SUPPORT RESEARCH PROGRAM (last 5 years)

- NPS, USFS, FW&P, Rocky Mountain Elk Foundation, & Safari Club Int. Sagebrush ecology $ 37,500
- BLM, FW&P, & Foundation for North American Wild Sheep Bighorn habitat relationships – Cooperator 122,000
- MT FW&P Sagebrush – Fire Relationships 12,000
- ROCKY MOUNTAIN ELK FOUNDATION – Interrelationships of elk, fire and browse 13,600

RESEARCH GOALS AND DIRECTION FOR NEXT FIVE YEARS

- To expand our knowledge of shrubs and their role in range ecosystems to benefit management opportunities for a variety of rangeland resources.
RECENT IMPORTANT PUBLICATIONS 1995 - 1999


Faculty Teaching Loads

The University submits an annual Teaching Load Report to the Governor’s Office for all tenure track faculty. The figure reported is instructional FTE (IFTE) and is calculated as the number of credits taught in a semester divided by the faculty members teaching FTE. So for example if a faculty member taught 3, 3-credit lecture courses and that person had a .5 FTE College of Agriculture teaching appointment the IFTE would be \((3 \times 3)/.5 = 18\).

Many classes have credits divided among different components. For example, a 3-credit class might have a 2-credit lecture section and a 1-credit lab section. If the class had multiple lab or discussion sections, appropriate credit is given for each section having an assigned meeting time and place. Thus, a 3-credit class with a 2-credit lecture component and five 1-credit lab sections would generate a total of 7 class credits. From the above example if the faculty had a .5 FTE College of Agriculture teaching appointment the IFTE would be \(7/5 = 14\). The IFTE figure does not evaluate advising or most independent studies.

I use a 2-year rolling average IFTE value for faculty in the Animal and Range Sciences Department to help evaluate teaching loads for the teaching faculty. The reason for the 2-year average is to take into account courses that are taught on an every other year basis. The table below shows the IFTE for faculty with a teaching appointment.

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Average 5.88 21.9 20.4 21.1 21.3 20.8 19.2 20.2 18.6 18.9

The average IFTE for the fall of 1999 is for the College of Agriculture is 15.8 and the University is approximately 18.
Enrollment Trends in Animal and Range Sciences

The figure below shows the enrollment trends for both undergraduate and graduate students since 1991. Students in animal science have decreased by about 20 students from a high of 165 in 1996 to 147 in 1998. Part of this change in enrollment is probably due to the new animal biotechnology degree that is being offered through the Department of Veterinary Molecular Biology. The number of undergraduate range students has decreased from a high of 85 in 1991 when the students that were interested in the abused lands area were mostly range students and in the range science program to about 50 students in recent years. This is the result of the start of the abused land degree, which is now offered in the new department of Land Resources and Environmental Sciences. The same trend is true for graduate enrollments.

In the figure below, enrollments in animal science and range science are broken down by gender. I am concerned that the largest decrease in students appears to be in males majoring in animal science and has been fairly steady for the last 4 years. This raises the question about the structure of curriculum and is it serving the students properly.
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(ARNR 231 Lvst Mgmt Swine (Practicum) New Course)
(ARNR 232 Lvst Mgmt Sheep (Practicum) New Course)
(ARNR 233 Lvst Mgmt Horse (Practicum) New Course)
(ARNR 234 Lvst Mgmt Beef (Practicum) New Course)
(ARNR 235 Lvst Mgmt Range (Practicum) New Course)
(ARNR 240 Prin Ntr Res Ecol Revised from ARNR 431)
(ARNR 331 Swine Prod New Course)
(ARNR 353 Rngland Res Measure Revised from ARNR 353)
(ARNR 354 Rngland Res Measure Revised from ARNR 353)
(ARNR 420 Endocrine Phys Course cancelled)
(ARNR 421 Assist Reprod Tech Revised from ARNR 363)
(ARNR 438 Rng-Wildlife Rel Revised from ARNR 438)
(ARNR 440 Ntr Res Policy Revised from ARNR 440)
(ARNR 453 Rngland Res Measure Revised from ARNR 453)
(ARNR 456 Conflict Res Ntr Res Mgmt Revised from ARNR 456)
(ARNR 480 Lvst Health Mgmt Revised from ARNR 480)
(ARNR 507 Research Methods (Seminar) Revised from ARNR 507)
(ARNR 520 Adv Anml Nutr Revised from ARNR 520)
(ARNR 521 Adv Rum Nutr Revised from ARNR 521)
(ARNR 522 Rng Nutr Tech Revised from ARNR 522)
(ARNR 523 Adv Phys Reprod Revised from ARNR 523)
(ARNR 524 Adv Anml Breeding Revised from ARNR 524)
(ARNR 540 Rng Ecosystem Measure Revised from ARNR 540)
(ARNR 541 Rng Ecophysiology Revised from ARNR 541)
(ARNR 542 Adv Ntr Res Ecol Revised from ARNR 542)
ANIMAL & RANGE SCIENCES
EXIT INTERVIEW QUESTIONNAIRE

In order for us to keep track of you in the future, would you please fill out the following information?

Name: ________________________________

Major: ________________________________

Minor: ________________________________

BACKGROUND:

Local Address: ________________________________

Permanent Address: ________________________________

Telephone Number: Local: ____________ Permanent: ____________

Reason for coming to MSU: ________________________________

PLACEMENT:

Have you already accepted a job to start after graduation? _____ Yes _____ No

Employer: ________________________________

Description of Position: ________________________________

Salary: ________________________________

Position Desired: ________________________________

If the answer was NO to the first question, what do you plan to do after graduation?

________________________________________________________________________

________________________________________________________________________

Resume Attached? _____ Yes _____ No

OTHER:

Would you like to be added to our mailing list to receive departmental newsletters? _____ Yes _____ No

Thanks for taking time to fill out this questionnaire! Good luck to you in your future endeavors.
Animal & Range Sciences Graduation Questionnaire
Semester _____ Year _____

Name (optional) ____________________________________________

Academic Advisor __________________________________________

1. What is your overall assessment of the quality of your education at MSU?
   (Circle one.)
   1. excellent
   2. very good
   3. good
   4. poor
   5. very poor

Reasons for your answer __________________________________________
   __________________________________________
   __________________________________________

2. What is your overall assessment of the quality of education in the Department of Animal & Range Sciences? (Circle one.)
   1. excellent
   2. very good
   3. good
   4. poor
   5. very poor

Reasons for your answer __________________________________________
   __________________________________________
   __________________________________________

3. Who were the two most effective teachers you had in the Department of Animal & Range Sciences.
   a. ___________________________ b. ___________________________

Reasons for your answer: __________________________________________
   __________________________________________
   __________________________________________

Who were the two most ineffective teachers you had in the Department of Animal & Range Sciences?
   a. ___________________________ b. ___________________________

Reasons for your answer: __________________________________________
   __________________________________________
   __________________________________________
4. What courses in your major contributed most to your professional development? (Please list courses by Rubric/Number, i.e. ARNR 100.)

5. What courses outside of the department of Animal & Range Sciences contributed most to your professional development? (Please list courses by Rubric/Number.)

6. What do you believe are the strongest features of your education in the Department of Animal & Range Sciences?

7. What do you believe are the weakest features of your education in the Department of Animal & Range Sciences?

8. How do you rate the quality of advising in the Department of Animal & Range Sciences? (Circle one.)
   1. excellent
   2. very good
   3. good
   4. poor
   5. very poor

   Reasons for your answer ____________________________________________
   ____________________________________________

9. What is your overall rating of the faculty in the Department of Animal & Range Sciences?

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<tr>
<th></th>
<th>Excellent (1)</th>
<th>Good (2)</th>
<th>Fair (3)</th>
<th>Poor (4)</th>
<th>Very Poor (5)</th>
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<tr>
<td>Ability to Teach</td>
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<tr>
<td>Knowledge</td>
<td></td>
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<tr>
<td>Interest in Students</td>
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</table>

   Additional Comments: ____________________________________________
   ____________________________________________
10. Was your progress toward the completion of your degree as rapid as you would have preferred?  _____ Yes  _____ No

11. If your answer to #10 was NO, which of the following contributed to your slower progress? Check all that apply and rank in order most important (1) to least important.

_____ I had to limit the number of hours I took for financial reasons
_____ I had to limit the number of hours I took for personal reasons
_____ I had to work and did not have enough time to carry a full load
_____ I was a transfer student and had to take additional classes
_____ I changed majors after I enrolled at MSU (How many times?) ______
_____ I did not receive adequate advising
_____ I couldn't get into courses because of: (Check all that apply)
   _____ a. too few sections
   _____ b. alternate year offering
   _____ c. time conflicts within our department or in other departments

Additional reason(s): ____________________________________________

12. How did you finance your education? Check all that apply from most important (1) to least important.

_____ Worked at a part time/full time job during the academic year
_____ Worked during the summer
_____ Scholarships
_____ Loans
_____ Workstudy
_____ Help from my parents
_____ Help from my spouse
_____ Other  ____________________________________________

13. What clubs were you a member of during your undergraduate program?

_____ Block and Bridle
_____ Range Club
_____ Horsemans Club
_____ Land Reclamation Club
_____ Pre-Vet Club
_____ Other; please identify  _______________________________________

14. In order to help us continually improve our departmental teaching program would you please give your input on the following? How can we improve?

Laboratory sections of classes ____________________________________

Course offerings _____________________________________________
Classroom facilities

Computer Access/Training

Advising

Job Placement

Internships

Other Suggestions

15. Other comments about your undergraduate education:
SENIOR EXIT INTERVIEWS

The following is a summation of part of the senior exit interviews that are conducted with graduating seniors for the last 3 semesters. All graduating seniors are asked to participate in this process but many do not choose to do so. Below each table are the student comments that are presented verbatim and are not edited. I did not include the comments about the effectiveness of the individual instructors. That information is used during the annual evaluation process for each faculty member. At the end of the summarization is a copy of the senior exit interview form.

<table>
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<tr>
<th>Overall Assessment Of Quality Of Education At MSU</th>
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<td>Semester/year</td>
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<tr>
<td></td>
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<tr>
<td>No.</td>
</tr>
<tr>
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<tr>
<td>Very Good</td>
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<td>Good</td>
</tr>
<tr>
<td>Poor</td>
</tr>
<tr>
<td>Very Poor</td>
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</table>

Comments:

Animal Science Replies:

Fall 98
- Too many core and other irrelevant classes and not enough classes in the major
- I felt as if the professors didn't take time to get to know the students
- The Ag Department has a lot of better teachers than other departments but overall, MSU is good.
- Education is limited to farm animals
- Some problems transferring credits from Northwest College
- My education here has been very diverse and challenging, particularly the Biotech curriculum. The quality of teaching was also quite exceptional.

Spring 99
- I feel that we have top-notch professors who teach at a very professional level.
- I think this could be improved by requiring fewer core classes and allowing more electives (i.e., welding and more range science for me, but it would vary for everyone)
- After going thru ARNR 100, 200, & 300 level classes being over exact same notes – gets redundant.
- Good Ag classes, thought core classes were a waste of time and money.
- I feel I have learned a great deal from MSU and am excited to start working.
- I learned a lot and had lots of fun. I just hated the core classes.
- For not having a cattle background, I learned a lot about the aspects of running a successful ranch.
- Covers a broad spectrum of agricultural topics with specific classes offered.
- College of Ag professors very helpful, personal.

**Fall 99**
- I feel that I got a good education but some of the courses are not needed like genetics.
- The faculty and their interaction with students has allowed me to learn a great deal more than just being lectured at, and the projects and research opportunities add to the base that the classes give.
- I've grown much both as a person and academically. I've been able to pursue many interests and find out what I really want to do with my future.

**Range Science Replies:**

**Fall 98**
- More hands-on and practical experience is a must. Classes with content like the senior seminar should be included in the curriculum more than once.

**Spring 99**
- Some classes were excellent yet some seemed to have no bearing on your future plans.
- Feel confident in my abilities I feel college has been a worthwhile investment.

**Fall 99**
- Most of the courses taught you what you need for the professional field.
- Don't have much to compare it to. Professors are generally interested in you as an individual.

**Overall assessment of quality of education in Department of Animal and Range Sciences**

<table>
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<th>Semester/year</th>
<th>Animal Science</th>
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</tr>
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<td>Good</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Poor</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Very Poor</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
COMMENTS:

Animal Science Replies:

Fall 98
- The department seemed to offer classes that not only satisfied degree requirements but ones that were mentally stimulating and sometimes challenging.
- Most professors have a thorough knowledge of subject taught, care for student's as individuals, hands-on labs.
- The Ag Dept has a lot over the rest of the school. I didn't have much experience with cattle before school, but have learned a lot!
- The professors are all well educated and concerned about the welfare of individual students.
- Instructors concerned with the students as individuals, were very knowledgeable in their areas of expertise.

Spring 99
- Department, professors teach on a one to one level – genuinely care for the students and are very personable.
- Classes were interesting and instructors all were interested in the students.
- I learned a lot
- This could easily be excellent with some courses available in meat science.
- Professors were easy to talk to, showed concern for students.
- I really enjoyed all of my professors.
- The faculty were very personable and available for help
- College of Ag professors very helpful, personal
- I would like to have more hands-on with the animals
- MSU has so much potential, they could do much more with their money than spend it on a football stadium!

Fall 99
- Excellent Professors and learning experience.
- I learned the basics of range management and animal management. I've also learned enough to feel confident giving advice for agricultural operations like beef and sheep.

Range Replies:

Fall 98
- Overall good professors with lots of interest in students

Spring 99
- Pertinent subject matter, excellent advising and instruction, excellent course schedules.
- Professors and faculty all very nice. Classes tried to give you the information needed for a future career.
Fall 99
- I think part of the individual attention comes from small class size and a small college.
- Most of the range and animal science courses are based on scientific studies and not just lecturing and it will help me in my career choice.

<table>
<thead>
<tr>
<th>Courses In Major That Contributed Most To Professional Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal Science</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>Semester/year</td>
</tr>
<tr>
<td>ARNR 100</td>
</tr>
<tr>
<td>ARNR 211</td>
</tr>
<tr>
<td>ARNR 240</td>
</tr>
<tr>
<td>ARNR 320</td>
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<tr>
<td>ARNR 321</td>
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<tr>
<td>ARNR 322</td>
</tr>
<tr>
<td>ARNR 330</td>
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<tr>
<td>ARNR 401</td>
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<tr>
<td>ARNR 420</td>
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<tr>
<td>ARNR 421</td>
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<tr>
<td>ARNR 430</td>
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<tr>
<td>ARNR 432</td>
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<tr>
<td>ARNR 434</td>
</tr>
<tr>
<td>ARNR 435</td>
</tr>
<tr>
<td>ARNR 437</td>
</tr>
</tbody>
</table>

Question: What do you believe are the strongest features of your education in the Department of Animal & Range Sciences?

Animal Science Replies:

Fall 98
- The ability to communicate with anyone on any level.
- The professors got to know the students on a personal basis – this made it easy to ask for help.
- I’m more interested in equine instead of bovine, so Sandy Gagnon was a real asset to my education. He was the strongest feature by far.
- Relationships with faculty and other students.
- Reputation of program.
- Lab procedures, Animal nutrition. Ability to read and evaluate scientific literature.
- The diverseness of it. The education delivered by this major allows one to experience every field of study and apply them to one goal.

Spring 99
- The hands-on experience provided in labs was outstanding - also, my internship was a very valuable learning experience.
- The areas of reproduction and nutrition.
- Beef and reproduction classes
- The closeness of all Ag students and teachers (almost family like – very comforting). The wonderful facilities and opportunities we have such as the Pavilion, beef barn, feedmill, etc.
- I was fortunate to have very knowledgeable professors and teachers.
- Have good knowledge of resources to use if I ever have questions. – Learning all areas of animal production agriculture.
- The opportunities available to students to get hands-on work.

**Fall 99**
- The relationships with the faculty.
- Good, caring professors.
- The teachers know their stuff and were very helpful.
- The management courses which forced me to integrate all of my ARNR classes. They were hard, but I’d rather take more like them than some of the repetitive ones.

**Range Replies:**

**Fall 98**
- The professors overall are very engaged with their research and their students.

**Spring 99**
- The fact that Range students learn quite a bit of Animal Science has proved very useful.
- The faculty – they seem to be interested in students as individuals. I believe that is very important.

**Fall 99**
- The small classes and individual attention. Not only did I get to know my classmates but I felt like I could ask my professors questions.
- Professors do not view teaching as a chore but as a passion and they want you to gain the most out of each class if you are willing to work at it.

**Question:** What do you believe are the weakest features of your education in the Department of Animal & Range Sciences?

**Animal Science Replies:**

**Fall 98**
- My advisor and the College of Ag need to try to recruit possible job opportunities for students.
- Almost every class focuses on beef cattle nearly the entire semester (some have some sheep). There needs to be more equine to be more well rounded.
- Limited species knowledge.
• A bookkeeping class would have been very useful. Knowledge of other segments of industry, i.e. packers & feedlots, would be useful.
• Range management – Ag & Livestock Management option should be able to manage all resources not just the animal side. There should be more range classes required for the animal science, and as well the range majors should be required to take animal production classes.
• The politics of it all, for example, the disagreements that exist within the Biotech degree over classes and between departments. Furthermore, the decisions of cutting classes that are vital to some degrees are changing the way they are taught when there really is only one way, i.e. VTMB 271
• For my current job, it would have helped to learn more about dairy cattle (got some nutritional differences in 320).
• Not enough working with animals in classes/labs.

Spring 99
• The genetics course that was required – was very disappointing.
• Knowledge of meat and carcass traits.
• No meat science classes – need to have some type of meat class to add to the knowledge learned.
• Would have liked more hands-on classes. 100 and 230 (330) were very much similar.
• Some 'bad' teachers who seem to not care about their jobs and the lack of funding the department has.
• Job opportunities

Fall 99
• Information given tends to be boring and then not applied. The only class that I really had to think things through is ARNR 434. That is where I learned the most.
• ARNR 401
• Taking tests.
• Taking ARNR 230 after 320, 321, etc. By taking all encompassing classes after the specifics is frustrating and BORING! Not allowing us to integrate the knowledge more until the very end – it would be better if someone would point out the BIG Picture once in awhile.

Range Replies
Fall 98
• Not enough hands-on experience, many professors are not keeping up with the times, i.e. agency and private organization work

Spring 99
• The advising. Some classes that would have benefited my education I didn’t know about until this past year. Also, stress internships and where to find them.
• Some classes didn’t flow well with each other. Sometimes using things from one class that were pertinent to another was difficult.
- Fall 99
  - Need to require more riparian management classes. If you work for the Forest Service, you need to know how to access riparian areas (PFC, Vegetation health, Bank stability, etc.)
  - My major was not designed to specialize in my specific interests. I obtained an Extension minor to fulfill this need.

**Question:** What is your overall rating of the faculty in the Department of Animal & Range Sciences?

### Animal Science

<table>
<thead>
<tr>
<th>Score</th>
<th>Ability to teach</th>
<th>Knowledge</th>
<th>Interest in students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Good</td>
<td>5</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Fair</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>Poor</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Very Poor</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### Range Science

<table>
<thead>
<tr>
<th>Score</th>
<th>Ability to teach</th>
<th>Knowledge</th>
<th>Interest in students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Good</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Fair</td>
<td>0</td>
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<tr>
<td>Poor</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Very Poor</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Comments:**

**Animal Science**

**Fall 1998**
- Some teachers teach about research etc., that they are interested in rather than what is useful to students.
- Very knowledgeable staff. Even if you didn't take their classes the Professor showed an interest in your endeavors.

**Spring 1999**
- The majority of teachers seem to be interested in the students and what they teach – it's the rate few that spoil the bunch.
- Faculty always pleasant and willing to help.
Fall 1999
- I never realized how great Ray and Becky are until I met kids from other schools. They kept me from taking unnecessary courses and by allowing me to do what I liked allowed me to graduate early. They both stuck by me when I had medical problems – they helped me survive without losing any status. Sometimes profs forget that we have several hard classes at the last couple of semesters. They need to realize we’ve only got so many hours outside of class per week!
- My 1st advisor was Becky Mattix, which was fine. A semester before I was to graduate, I was given another. It really sucked. I was doing a double degree program and no one knew what they were doing so I was on my own.
- My advisor was switched to Dr. Kress and then switched back to Tess. Neither of them got to know me.
- Pete Burfening was very helpful!

Range Science
Fall 1998
- (none)

Spring 1999
- (none)

Fall 1999
- Bok did the best he could since I was a transfer student and he was usually available when I had questions.
- Clayton does a very good job of caring for the student’s goals and not his own personal goals.
Alumni Survey

A survey of alumni who graduated with either a BS or MS degree between 1985 and 1999 was conducted with the help of the Alumni Foundation. The alumni foundation provided a list of names and addresses of students who had graduated during this period of time. A survey instrument was developed and mailed to each graduates address. The survey instrument is attached. The survey was sent to 393 Animal Science and 183 Range Science graduates, respectively. The survey was conducted during the fall 1999 semester.

A total of 202 (35%) of the students (BS and MS) surveyed responded. Of the BS students that responded, there were 103 and 49 of the Animal Science and Range Science students, respectively. At the present time we have not evaluated the MS students separately from the entire group. Many of the non-responders were students that we did not have a current address on and the survey was returned by the post office.

In addition to the responses to the questions that are summarized on the following pages there is also a book with the written answers to the questions that allowed for an open response. I did not reproduce these 202 pages.

In general these comments can probably be summarized as Alumni would have like to have had more instruction on Communications (written and oral), problem solving skills, computer skills and to have gotten more “hands on experience” while undergraduates. A significant group of students would also like a practical animal health course and a livestock evaluation course.
September 17, 1999

Dear Animal and Range Sciences Alumni

I am contacting you as an alumni of the Animal and Range Sciences Department at Montana State University to help us improve our degree programs and course offering for future students in the department. One of the most important ways we know of to improve our curriculum is to ask you, as a former student, how well the curriculum served you in your chosen endeavor. Your input is invaluable to our department as we prepare our curricula and courses for the new millennium.

The information that you provide will be of great assistance in evaluating our present curriculum and making changes to improve the curriculum and course offerings. You may be assured of complete confidentiality. The questionnaire has no identification number on it and your name will never be placed on the questionnaire.

I sincerely hope that you could take a few minutes, think back to your college career and fill out the enclosed questionnaire. When you have completed it please place in the self-addressed envelope and return to us. I would be most happy to answer any question that you might have. Please write, e-mail or call. My address and phone number is on the top of this letter.

Sincerely,

Peter J. Burfening
Department Head and Professor of Animal Science
Department of Animal & Range Sciences Alumni Questionnaire

General Information (Please Circle Your Answers)

1. 1. Female 2. Male

2. Your current age: 1. 20-25 2. 25-30 3. 30-35 4. 35-40 5. 50+


2. Married 5. Widow
3. Divorced 6. Co-habitation

5. Did you have any dependents while you attended MSU? 1. YES 2. NO
How many? 1 2 3 4 5 More than five

University Course Work: (Please Circle Your Answer)

6. How many semesters/quarters did you attend MSU?

Semesters: 
1. 4 or less
2. 6
3. 8
4. 10
5. More

Quarters:
1. 6 or less
2. 9
3. 12
4. 14
5. More

7. In what year did you graduate? 19_____

8. What was your degree and major?

Degree: 
1. Bachelor’s
2. Masters

Major: 
1. Animal Science
2. Range Science
9. Did you work while attending Montana State University?  
1. YES  2. NO

If yes, how many hours, on average, did you work per week?
1. Less than 10  2. 10-12  3. 14-17  4. More than 17

10. Please rate the curricula in the Department of Animal and Range Sciences to meet these general education and science goals: (Check the appropriate box)

<table>
<thead>
<tr>
<th>Excellent</th>
<th>Average</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Focused on topics in detail.
- Pointed out contributions from other cultures.
- Improved analytical thinking.
- Encouraged thinking, speaking and writing.
- Promoted creative thinking
- Promoted problem solving.
- Explained hypothesis testing and research methods.
- Explained basic and applied aspects of science.

11. Please rate how well the curricula you followed at MSU prepared you with the Scientific or Technical Knowledge and/or specific Technical Skills necessary for you to be successful in your career. (Circle Your Answer):

<table>
<thead>
<tr>
<th>Excellent</th>
<th>Average</th>
<th>Little or None</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12. How well did the curricula you followed prepare you for the following?

<table>
<thead>
<tr>
<th>Excellent</th>
<th>Average</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

1. With the people skills for success in your career?
2. Successfully function within a business environment?
3. To organize projects and manage people?

13. What Scientific or Technical Knowledge and/or specific Technical Skills would you like to have obtained, but did not in the courses required for your degree?

1.
2.
3.
4.
14. If you found your degree of little importance in gaining employment in your chosen field, were there other University courses or experiences that helped?

1. YES  
2. NO

If so, please list them:

1.

2.

3.

4.

15. Please rate the learning environment at MSU and in the Animal and Range Science Department.

<table>
<thead>
<tr>
<th></th>
<th>Excellent</th>
<th>Average</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSU's campus stimulates learning.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Library holdings and collections.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Access to computer facilities.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Classrooms.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Laboratories in general.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Animal &amp; Range Science Livestock facilities.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Animal &amp; Range Sciences Laboratories.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>

16. Are there any specific recommendations that you have to help improve the degree programs and placement of students? Please include courses or "topics" suggestions to be added or deleted from the curricula.

1.

2.

3.

4.

If you completed a Masters Program, please answer questions 17 through 23, if not, skip to question 24.

17. Did you receive an assistantship from the Department?  
1. YES  
2. NO
18. Did you teach any undergraduate classes? 1. YES 2. NO

19. Did you complete your Master’s degree in 2 years? 1. YES 2. NO
   If not, how many years did it take? _____________

20. Which aspects of your training were the most valuable? (Circle all that apply)
   1. Scientific method
   2. Problem solving
   3. Instructors
   4. Fellow Graduate students
   5. Facilities - Laboratories - Equipment
   6. Staff
   7. Classes available

21. Which of these items were the most disappointing? (Circle all that apply)
   1. Scientific method
   2. Problem solving
   3. Instructors
   4. Fellow Graduate students
   5. Facilities - Laboratories - Equipment
   6. Staff
   7. Classes available

22. What was your impression of the value of your education (money spent/education received)?

23. What areas need the most improvement?
Your Career:

24. Your Current employer? _______________
   Number of years employed? ____________
   Position Title: _______________
   Job Responsibilities: (Check All That Apply)
   1. Manager
   2. Foreman
   3. Owner
   4. Salesman
   5. Researcher
   6. Producer
   7. Other _______________

25. Is this your first job after graduation? 1. YES 2. NO

26. If no, what was your previous job history? _______________

27. If the job is related to your MSU major field of study, how long after graduation did it take to obtain employment in this field?
   1. Hired before graduation 2. 1-6 months 3. 6-12 months 4. 12-18 months

28. If your current job is not related to your MSU major field of study, why have you chosen a career in this field of work?

29. Rate each of the following for effort and effectiveness in helping you find employment in your chosen field:

<table>
<thead>
<tr>
<th></th>
<th>very effective efforts</th>
<th>no help or no effective help</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Advisor:</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Individual Professor(s):</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Department of Animal and Range Sciences</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>College of Agriculture (Dean’s Office) Placement Efforts</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>MSU Career Services</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Other (List and Rate)</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
30. Rank the following attributes which **MOST** helped you acquire the job you now have.

<table>
<thead>
<tr>
<th></th>
<th>Very Important</th>
<th>Important</th>
<th>Not Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work experience (outside of college)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Technical training (outside college)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Work experience gained through college (Worked in a lab, on the Towne Farm, etc)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Technical knowledge gained through degree work</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Thank you for taking the time to complete this survey. If you would like to comment on any of the questions, space has been provided on the following page (back cover).
Rate the curricula in Animal and Range Science to meet these general education and science goals.

All Students
Rate the curriculum in Animal and Range Science to meet these general education and science goals:

- ALL STUDENTS

- MALE

- FEMALE

- Explained Basic and Applied Aspects of Science

- Explained Hypothesis Testing

- Problem Solving

- Creative Thinking
In your career, all students

techincal knowledge and/or specific technical skills necessary for you to be successful.
Rate how well the curricula you followed at MSU prepared you with the scientific or...
How well did the curriculum you followed prepare you for the following?
Rate the learning environment at MSU and in the Animal Range Science Dept. All Strand/Elements
Rate each of the following for effort and effectiveness in helping you find employment in your chosen field. All students have the option to rate in any range from 0 to 45.

- 29.4 College of Agriculture
- 29.3 Dept. of Animal Science
- 29.2 Individual Professors
- 29.1 Advisor
Rate each of the following for effort and effectiveness in helping you find employment in your chosen field. All students.

Male

Female
Rank the following attributes which most helped you acquire the job you now have. All 5 points.
general education and science goals - Animal Science
Rate the curriculum in Animal and Range Science to meet these
In your career - Animal Science

Technical Knowledge and/or Specific Technical Skills necessary for you to be successful

Rate how well the curriculum you followed at MSU prepared you with the Scientific or...
Science Department - Animal Science

Please rate the learning environment at MSU and in the Animal and Range Science Department - Animal Science.
Rate the learning environment at MSU and in the Animal and Range Science Dept. - Animal Science
employment in your chosen field - Animal Science

Rate each of the following for effort and effectiveness in helping you find
employment in your chosen field - Animal Science

Rate each of the following for effort and effectiveness in helping you find
Rank the following attributes which most helped you acquire the job you now have—Animal Science.

- Degree Work
- College
- College
- Technical Knowledge Through Work Experience Outside
- Technical Knowledge Through Work Experience Outside
- Sex
- Sex

Summary for SEX = MALE (45 detailed records)

MALE

Summary for SEX = FEMALE (58 detailed records)

FEMALE
Speaking and Writing
10.4 Encouraged Thinking

Other Cultures
10.2 Pointed all Contributions from

10.3 Improved Analytical THINKING

10.1 Focused on Topics in Detail

Summary for SEX = MALE (22 detailed records)
2 MALE

Summary for SEX = FEMALE (21 detailed records)
1 FEMALE

General Education and Science Goals - Range Science
Rate the curricula in Animal and Range Science to meet these
Rate the curricula in Animal and Range Science to meet these goals - Science and science goals.

Sex

1.0-5 Promote Problem Solving
1.0-7 Explain Hypothesis Testing
1.0-8 Explain Basic and Applied Aspects of Science
In your career, Range Science is a Science that requires specific scientific skills to be successful. Rate how well the curriculum you followed at MSU prepared you with the scientific or technical knowledge and/or specific technical skills necessary for you to be successful.

- [ ] 0
- [ ] 1
- [ ] 2
- [ ] 3
- [ ] 4
- [ ] 5
- [ ] 6
- [ ] 7
- [ ] 8
- [ ] 9
- [ ] 10
- [ ] 11
- [ ] 12
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- [ ] 21
- [ ] 22
- [ ] 23
- [ ] 24
- [ ] 25
- [ ] 26
- [ ] 27
- [ ] 28
- [ ] 29
- [ ] 30

Summary for SEX = MALE (22 detail records)

- Average: 2

Summary for SEX = FEMALE (27 detail records)

- Average: 1
How well did the curriculum you followed prepare you for the following?
Science Department - Range Science

Please rate the learning environment at MSU and in the Animal and Range
Rate the learning environment at MSU and in the Animal and Range Science

Dept. - Range Science

15.6 Animal and Range Laboratories in General

2.1 2.4 2.7

Avg Summary for SEX = FEMALE (37 detailed records)

2 2 2

Summary for SEX = MALE (22 detailed records)

FEMALE

MALE
Rate each of the following for effort and effectiveness in helping you find employment in your chosen field - Range Science.

29-1 Advisor

29-2 Individual Professor(s)

29-3 Dept. of Animal and Range

29-4 College of Agriculture

Summary for Sex = 2 (22 detailed records)

MALE

Summary for Sex = 1 (27 detailed records)

FEMALE
Rate each of the following for effort and effectiveness in helping you find employment in your chosen field - Range Science.

29-46 Other

29-5 MSU Career Services
Rank the following attributes which most helped you acquire the job you now have.
Range Science

Degree Work
3.0-4 Technical Knowledge Through

College Work Experience Outside
3.0-1 Technical Training Outside

Summary for SEX = MALE (22 detail records)

SUMMARY FOR SEX = FEMALE (27 detail records)

MALE

FEMALE
ANIMAL AND RANGE SCIENCES RESEARCH PROGRAMS

The figure below shows the number of refereed publications and the total grant and contract dollars per year for the last 5 years. There has been a very large increase in the grant dollars in the department much of which can be attributed to USDA special grants but also the faculty as a whole has become much more active in pursuing grant dollars.

The number of refereed publications is lower than I would like to see and needs to increase significantly.

The following two tables present a list current MAES and Grant funded research projects. Followed by a long table presents the graduate students who have completed their M.S. degrees in the last 5 years their current positions and the publications that resulted from their research work. All recent faculty research interests, current grants and recent publications can be found in their short vitas. Graduate student support and lack of non-resident fee waivers for graduate students continues to be a significant issue and is causing a great deal of difficulty in recruiting graduate students.
<table>
<thead>
<tr>
<th>Project Fund/Type</th>
<th>Investigators</th>
<th>Title</th>
<th>Start/term Dates</th>
<th>Status</th>
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<tbody>
<tr>
<td>MONB00170</td>
<td>Olson, B. B., Paterson, J. A.</td>
<td>DO WINDBREAKS MINIMIZE STRESS ON CATTLE GRAZING WINTER RANGE</td>
<td>09/01/1996 to 08/31/1999</td>
<td>$59,000</td>
</tr>
<tr>
<td>MONB00172</td>
<td>Olson, B. B.</td>
<td>SUCCESS OF SPOTTED KNAF WEED: COMPETITION OR SITE ALTERATION</td>
<td>07/15/1999 to 07/31/2002</td>
<td>New</td>
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<tr>
<td>MONB00173</td>
<td>Hatfield, P. G., Kott, R., Burgess, D.</td>
<td>REDUCING NEONATAL LOSSES IN SHEEP PRODUCTION SYSTEMS</td>
<td>10/01/1998 to 09/30/2001</td>
<td>New</td>
</tr>
<tr>
<td>MONB00174</td>
<td>Burfening, P. J.</td>
<td>SELECTION FOR REPRODUCTIVE RATE: EVALUATION OF PHYSIOLOGICAL PARAMETERS</td>
<td>10/01/1994 to 09/30/2000</td>
<td>New</td>
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<tr>
<td>MONB00175</td>
<td>Tess, M. W., Kress, D. D., Knight, J. E.</td>
<td>SYSTEMS ANALYSIS OF LIVESTOCK ENTERPRISES</td>
<td>10/01/1996 to 09/30/2001</td>
<td>Revised</td>
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<tr>
<td>MONB00176</td>
<td>Olson, B. E.</td>
<td>WINTER GRAZING TN MONTANA</td>
<td>10/01/1994 to 09/30/2000</td>
<td>Extended</td>
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<tr>
<td>MONB00179</td>
<td>Bowman, J. G.</td>
<td>EVALUATION AND IMPROVEMENT OF BARLEY FOR FOOD AND FEED</td>
<td>10/01/1995 to 09/30/1999</td>
<td>Extended</td>
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<td>Special Grant</td>
<td>Bowman, J. G.</td>
<td>BARLEY FEED FOR RANGLAND CATTLE</td>
<td>09/15/1999 to 09/30/2000</td>
<td>New</td>
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<td>MONB00181</td>
<td>Kott, R., W., Hatfield, P., Minikhiem, D.</td>
<td>WOOL RESEARCH - MONTANA</td>
<td>01/15/1996 to 01/31/2000</td>
<td>$28,000/year</td>
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<tr>
<td>MONB00183</td>
<td>Berardinelli, J. G., Burfening, P. J., Adair, R.</td>
<td>REPRODUCTIVE PERFORMANCE IN DOMESTIC RUMINANTS</td>
<td>10/01/1996 to 09/30/2001</td>
<td>Revised</td>
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<td>MONB00184</td>
<td>Wambolt, C. L.</td>
<td>SHRUB ECOLOGY AND FORAGE RELATIONSHIPS</td>
<td>10/01/1996 to 09/30/2003</td>
<td>Revised</td>
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<td>MONB00185</td>
<td>Kott, R. W., Hatfield, P. G., Minikhiem, D. L.</td>
<td>WOOL RESEARCH - MONTANA</td>
<td>06/15/1999 to 06/30/2001</td>
<td>New</td>
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<td>MONB00186</td>
<td>Marlow, C. B., Callan, N. W., Sherwood, H. W.</td>
<td>CHARACTERIZATION OF SUCCESSIONAL PROCESSES IN WESTERN MONTANA RIPARIAN ZONES</td>
<td>10/01/1997 to 09/30/2000</td>
<td>New</td>
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<tr>
<td>MONB00188</td>
<td>Tess, M.</td>
<td>EXPLORATORY RESEARCH IN ANIMAL AND RANGE SCIENCES</td>
<td>07/01/1988 to 06/30/2000</td>
<td>Extended</td>
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<td>MONB00194</td>
<td>Bowman, J., Blake, T., Sowell, B.</td>
<td>NUTRITIONAL MANAGEMENT OF RANGE BEEF COWS AND CALVES</td>
<td>10/01/1997 to 09/30/2002</td>
<td>New</td>
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<tr>
<td>MONB00195</td>
<td>Hatch</td>
<td>Kott, R. W.</td>
<td>SHEEP NUTRITION AND LAMB MORTALITY</td>
<td>10/01/1994 to 09/30/1999</td>
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<tr>
<td>MONB00196</td>
<td>Hatch</td>
<td>Sowell, B., Bowman, J. G., Grings, E.</td>
<td>LIVESTOCK BEHAVIOR AND PERFORMANCE</td>
<td>10/01/1997 to 09/30/2000</td>
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<td>MONB00198</td>
<td>Hatch</td>
<td>Knight, J. E.</td>
<td>WILDLIFE AND LIVESTOCK INTERACTIONS</td>
<td>10/01/1999 to 09/30/2004</td>
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<td>MONB00200</td>
<td>Hatch</td>
<td>Anotegui, R. P.</td>
<td>INFLUENCE OF TRACE MINERAL SUPPLEMENTATION ON RANGE BEEF CATTLE PRODUCTION</td>
<td>10/01/1999 to 10/01/2004</td>
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<td>MONB00204</td>
<td>Competitive Grant</td>
<td>Tess, M. W., Knight, J. E., Mosley, J. C., Griffith, D. A.</td>
<td>COORDINATED ELK MANAGEMENT FOR SUSTAINABLE BEEF CATTLE</td>
<td>11/01/1998 to 10/31/2001</td>
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<td>MONB00206</td>
<td>Hatch</td>
<td>Mosley, J. C.</td>
<td>INFLUENCE OF SOCIAL HIERARCHY ON DISTRIBUTION OF RANGELAND CATTLE</td>
<td>10/01/1997 to 09/30/2000</td>
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<tr>
<td>MONB00210</td>
<td>Special Grant</td>
<td>Mosley, J. C.</td>
<td>RIPARIAN HABITAT USE BY RANGELAND CATTLE: INFLUENCE OF SOCIAL HIERARCHY</td>
<td>09/15/1997 to 09/30/2000</td>
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<tr>
<td>MONB00213</td>
<td>Competitive Grant</td>
<td>Berardinelli, J.</td>
<td>BULLS-COW INTERACTIONS ATTENUATES THE COW-CALF BOND REGULATING ANESTRUS</td>
<td>09/01/99 to 08/31/02</td>
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<td>MONB00216</td>
<td>Hatch W-166</td>
<td>Gipp, W. F.</td>
<td>EVALUATION AND IMPROVEMENT OF BARLEY FOR FOOD AND FEED</td>
<td>10/01/1993 to 09/30/1999</td>
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<td>MONB00219</td>
<td>Special Grant</td>
<td>Paterson, J.A., Burfening, P.J.</td>
<td>MONTANA BEEF NETWORK: AN INTEGRATED APPROACH TO PRODUCING QUALITY BEEF CATTLE</td>
<td>03/01/99 to 02/28/00</td>
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<td>MONB00219</td>
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<td>Paterson, J.A., Burfening, P.J., Funston, R.</td>
<td>MONTANA BEEF NETWORK: AN INTEGRATED APPROACH TO PRODUCING QUALITY BEEF CATTLE</td>
<td>03/01/00 to 02/28/01</td>
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### M.S. GRADUATES From 1995 through 1999

<table>
<thead>
<tr>
<th>Student</th>
<th>Major</th>
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<th>Graduation date</th>
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<tr>
<td>SUSAN RAE WINSLOW</td>
<td>RAS</td>
<td>Sowell</td>
<td>June 1995</td>
</tr>
<tr>
<td><strong>Plant Specialist at the NRCS Plant Materials Center in Bridger, MT.</strong> <strong>Winslow</strong>, S. and B.F. Sowell. A comparison of methods to determine plant successional stages. Journal of Range Management (Accepted with revisions.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JOHN MICHAEL BEAVER</td>
<td>RAS</td>
<td>Olson</td>
<td>July 1995</td>
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<tr>
<td>CHRIS ALLEN MEHUS</td>
<td>RAS</td>
<td>Wambolt</td>
<td>December 1995</td>
</tr>
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<td><strong>unknown</strong></td>
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<tr>
<td>THOMAS SCOTT HIRSCH</td>
<td>ANS</td>
<td>Kress</td>
<td>December 1995</td>
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<tr>
<td>Nutritional Consultant, Danville, CA (No Publication)</td>
<td></td>
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<tr>
<td>JENNIFER LEE BIRDSALL</td>
<td>RAS</td>
<td>Sowell</td>
<td>December 1995</td>
</tr>
<tr>
<td>LISA MARIE MCKINLEY SHERBER</td>
<td>ANS</td>
<td>Bowman</td>
<td>December 1995</td>
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<tr>
<td>JOANNA L. ROBERTS</td>
<td>RAS</td>
<td>Olson</td>
<td>May 1996</td>
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<td>BURK JAY RHODES</td>
<td>RAS</td>
<td>Marlow</td>
<td>May 1996</td>
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<tr>
<td>TRISTA LYNN HOFFMAN</td>
<td>RAS</td>
<td>Wambolt</td>
<td>May 1996</td>
</tr>
</tbody>
</table>
USFS – Gardiner, MT


ERIK JASON ENEBOE
ERIK JON SWENSSON
ERIK JON SWENSSON
LINE TO 346 - 3.16620

Land Management Specialist, Montana Department of Natural Resources.
(No Publications)

Nutri-lix as a sales rep in Billings, MT.

BRENT LYLE ROEDER
BRENT LYLE ROEDER

Sheep Foreman, Seiben Livestock, Inc, Cascade, MT

TRACIE-MARIE M. BERNARDINI (ROEDER)
TRACIE-MARIE M. BERNARDINI (ROEDER)

Housewife Seiben Livestock, Inc, Cascade, MT
(No Publications)

KENDAL SCOTT WALHOF
KENDAL SCOTT WALHOF

Unknown at present – Manhattan, MT

WENDY LEA FULLER
WENDY LEA FULLER

Research Associate, Animal and Range Sciences Department, Montana State University, Bozeman
(No Publications)

DEBRA JEAN JULIEN
DEBRA JEAN JULIEN

Data Base Manager, Leachman Cattle Company, Billings, MT
(No Publications)

JIE WENG
JIE WENG

Graduate Student, Ontario, CA

JEFFREY ALAN GROSS
JEFFREY ALAN GROSS

Wildlife Biologist, MT Dept. Fish, Wildlife and Parks, Dillon, MT

ADAM JAY GROVE
ADAM JAY GROVE


ERIK JASON ENEBOE
ERIK JON SWENSSON
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ADAM JAY GROVE
ADAM JAY GROVE


<table>
<thead>
<tr>
<th>ERIC THOMAS MILLER</th>
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<th>May 1998</th>
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County Extension Agent,


<table>
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<tr>
<th>ALLISON VIRGINIA EARLEY</th>
<th>ANS</th>
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<th>August 1998</th>
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Research Associate, South Dakota State University in Brookings, SD.


<table>
<thead>
<tr>
<th>LISA PRAHARANI</th>
<th>ANS</th>
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<th>August 1998</th>
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Returned to Indonesia (No Publication)

<table>
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<th>LEIF PAUL ANDERSON</th>
<th>ANS</th>
<th>Paterson</th>
<th>November 1998</th>
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Research Associate Montana Beef Network, Animal and Range Sciences, Bozeman, MT

No Publication

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<th>Darin, Law</th>
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<th>Marlow</th>
<th>May 1999</th>
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University of Montana (PhD)

**Law, D., C.B. Marlow, J.C. Mosley, S. Custer, P. Hook and R. Leinard.** Water Table Dynamics and Willow, Sedge and Cottonwood communities. Northwest Science. (Submitted and under revision).

<table>
<thead>
<tr>
<th>JOHN D. BAILEY</th>
<th>ANS</th>
<th>Ansotegui</th>
<th>September 1999</th>
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To begin a Ph.D. U of KY in January 2000

No Publications

<table>
<thead>
<tr>
<th>J. TODD DANIELS</th>
<th>ANS</th>
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Altech, Lexington, KY (Located in Montana)


|---------------------------------------------------------------|

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<tr>
<th>Daniels, J. T., P. G. Hatfield, D. E. Burgess, R. W. Kott, and J.G.P. Bowman.** Evaluation of Ewe and Lamb Immune Response when Ewes were Supplemented with Vitamin E. (In Review)</th>
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<th>BRUCE SHANKS</th>
<th>ANS</th>
<th>Tess</th>
<th>December 1999</th>
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Start Ph.D January 2000, South Dakota State University, Brookings, SD

No Publication
Draft Document

A Path to the Future
Strategic Plan for the Department of Animal and Range Sciences

Introduction

Montana's economy is highly dependent on the livestock industry and associated industries. The Animal and Range Sciences Department was established to serve those industries that matter most to Montana. Range-livestock agriculture is arguably the most important factor shaping the history, economy, culture, and personality of Montana. Since its establishment in 1960 (with the merger of the departments of Dairy Science, Poultry Science, Animal Industry and Range Management), the Animal and Range Sciences Department has provided educated human resources, science-based information and the mechanism for transferring technology to the broad spectrum of users with vested interest in animal agriculture and associated natural resources. Rooted deep in the national land-grant tradition, the department's teaching, research and extension programs are dedicated to preventing and/or solving problems facing Montana, its animal agriculture industry and society.

Teaching, research and extension functions form the core of the Department of Animal and Range Sciences. Many faculty within the department hold joint appointments in two of the three functions. This interactive system creates synergisms that are possible only when students, teaching faculty, research scientists and extension specialists work side by side rather than in isolation or with boundaries defined by function.

The Department of Animal and Range Sciences represents a true partnership among federal and state government and private sectors. This partnership ensures that programs entertain the broader opportunities for teaching, research and extension: they also ensure that objectives and needs pertinent and specific to Montana receive appropriate attention.

The Planning Process

The Department of Animal and Range Sciences initiated a comprehensive planning process in the fall of 1995. Then in the winter and spring of 1998 a series of strategic alignment workshops were held. This plan outlined in this document evolved from those discussions. A faculty committee was appointed to develop a draft of the plan followed which incorporated faculty input. The plan was then given to College of Agriculture, Montana Agricultural Experiment Station (MAES) and Montana State University-Bozeman Extension Service Administration for input. Following that stakeholder meeting was held to gather additional input into the plan prior to finalization. As with all strategic plans this document needs to be fluid and updated on a regular basis by all concerned parties.

Issues and Priorities-the Rationale

The primary purpose of strategic planning is to help identify critical issues, priority areas and future directions. Developing goals which are consistent with the strengths of the Department and which can be accomplished within its environment is an important benefit of strategic planning. Additionally, since strategic planning focuses on new directions, not all significant teaching, research and extension programs are specifically mentioned in this plan; however, many of those not mentioned continue to be important. Our number one priority continues to be a commitment to research and education programs dedicated to a profitable, sustainable and safe animal agriculture industry in Montana.

This strategic plan sets new directions for the Animal and Range Sciences Department, affirms some recently initiated changes and strengthens many programs in which the department has a comparative advantage. The strategic plan emphasizes an environment where original thought and research on applied problems and fundamental mechanisms are encouraged. Scientific investigation is essential to enhanced efficiency in animal agriculture and to solving current problems of environmental degradation, economic competitiveness, and sustainability. Greater emphasis on multidisciplinary approaches is required to solve many problems.

Providing an adequate supply of leaders for the 21st century is a major challenge for the College of Agriculture and the Animal and Range Sciences Department. Recruiting and retaining a quality
student body; modifying and strengthening undergraduate and graduate programs; and enhancing faculty and staff development are important to success in this area.

The interaction between animal agriculture and the environment has created a wide range of public concerns, including animal use of "the public's" natural resources, global climate change, water quality, wildlife resources and others. These concerns have elevated the importance of teaching, research and extension programs in the interactions of animal agriculture and natural resource management.

The Animal and Range Sciences Department cannot simply maintain the status quo, but must move forward with progressive, forward-looking teaching, research and extension programs. This is an extremely difficult task in an era of taxpayer revolts, shrinking budgets (relative to inflation), and a public attitude that questions the value of public support for higher education (both instruction and research). Strategic planning is a way to guide these decisions, to take advantage of those areas in which the Department has a competitive advantage, and to reallocate resources to high priority areas. Changes which are difficult to make quickly can be part of this longer term planning process.

The initial steps in the strategic planning process were to revise the mission statement and develop a vision statement for the Animal and Range Sciences Department.

Mission

The mission of the Animal and Range Sciences Department is to create, evaluate and communicate science-based knowledge to enhance the management of Montana's livestock and rangeland resources in ways that are economically, socially and ecologically sustainable.

Vision

The Montana State University Animal and Range Sciences Department will be an eminent institution of higher education with programs of excellence in teaching, research and extension to meet the priority needs of the people of Montana and the nation. The department will be a national leader in range livestock issues, with well-funded relevant research programs, proactive extension programs and outstanding undergraduate program that attract the best students and prepare them to meet the future challenges of the industry.

Human Resources

One of the primary missions of universities is the development of human resources. Much of the value we add to the agricultural industry of the state is through human resources developed on campus and through extension education programs. Human resources are challenged to new heights amid the current technology revolution. The result is that education is more important than ever. A major challenge for the Animal and Range Sciences Department is to help ensure an adequate supply of scientific expertise and leaders for the next century. Enrollments in Animal and Range Sciences have been growing over the last few years. But there is a need for recruiting more quality students and with a greater diversity.
Goal 1  Enhance undergraduate and graduate programs and having faculty and facilities to challenge these students to greater levels of accomplishments.

Specific Targets:

1. Assess the quality, standards and viability of current undergraduate and graduate programs.
   - Can't be all things to all people therefore there is a need to develop strategies to prioritize programs and use of FTE.
   - Meet annually with industry advisory groups to provide input for curricular needs (one advisory group or Stockgrowers, Woolgrowers and Natural Resource groups)
   - Survey past graduates to assess strengths and weaknesses (to be accomplished during the summer and fall of 1999).

2. Recruit high quality undergraduate and graduate students.
   - Develop relevant curriculum changes to be assessed by meeting with clientele groups, prospective employers and from surveys of past graduates.
   - Increase undergraduate scholarships
   - Increase graduate student stipends
     - Include graduate assistantships in grant proposals
   - Provide adequate fee waivers for graduate students. This is an institutional issue but we need to keep the pressure on.

3. Include more inquiry based learning, technical writing, group discussions, oral reporting experiential learning experiences and in our academic offerings.
   - Develop a writing across the curriculum program to be implemented by the fall of 2000
   - Become more active in the undergraduate scholars program. Double our participation in this program by the end of AY 01-02
   - Include more case study problems in undergraduate and graduate courses.
     - Work with industry and agency personnel to develop case study problems
   - Incorporate more research experience in undergraduate curricula to enhance critical thinking and analytical skills of graduates.
   - Internship required of all students
   - Effective and efficient utilization of field laboratories providing for quality experiential learning opportunities for students in their major field of study
   - Provide more support for field trips

4. Develop and strengthen programs to retain academically qualified students.
   - Freshman common experience course for both animal and range science students.
   - Evaluate and re-vitalize some courses and course offerings
• Create enthusiasm for animal agriculture and natural resource management and its study through more contact with industry leaders (to be accomplished with a sophomore seminar in the livestock area and a 'range inspection trip' for range students)

Goal 2  Enhance faculty and staff development

Specific Targets:
1. Develop a professional development program to include exchange programs, mini-sabbaticals, study leaves, on-the-job training and recognition programs.

2. Provide opportunities/decrease the risks for faculty to develop and implement innovative teaching methods.

Goal 3  Improve formal and informal professional and life-long learning opportunities

Specific Targets:
1. Develop educational programs convenient to adult learners.
   • Use of interactive technology rather than extensive travel
   • Balance the use of modern technology with traditional approaches to out-reach programs

2. Employ distance learning and computer-aided technology for instructional programs.
   • Departmental web pages that are relevant and timely
   • Provide more course information via the internet

3. Emphasize prevention of problems as well as solution to existing problems

Goal 4  Recruit and Retain High Quality Faculty

Specific Targets:
1. Continue thorough, careful recruitment procedures.
   • Involve industry where appropriate
   • Provide good start-up packages by using departmental IDC dollars to leverage matching support from the College and central administration (VPR's office).
   • Plan for retirements/replacements

2. Establish mentors and/or support groups for new faculty.

3. Develop new strategies for salaries
   • 9-month contracts plus summer appointments and/or grant supplementation of summer salary.

Improve the Profitability and Sustainability of Animal Agriculture
The Animal and Range Sciences Department strives to be a leader in providing research-based information to livestock producers and land managers. Applied research and extension programs in animal and natural resource management will continue to be the cornerstone of our programs. Continued research on and the development of new technologies along with a basic understanding of the scientific basis of these new technologies will reduce the cost of production, contribute to increased profitability and competitiveness of our farms and ranches. Most public concerns or problems are multidisciplinary in nature, while most faculty and most departments are disciplinary in orientation.

**Goal 1  Increase the knowledge of animal and rangeland systems and their interactions**

*Specific Targets:*

1. Incorporate more basic science into the research programs. It appears that the majority of the research effort is very applied.
2. Genetically improve animals with particular reference to reproductive and carcass traits
   - Fill the meat science position (accomplished)
   - Begin to discuss the future direction of the animal breeding program (Kress's potential retirement)
   - Strengthen the reproductive physiology/animal breeding program in the department (Burfening move to department head and potential retirement)
3. Develop new and innovative educational programs to communicate the value and procedures to implement research-based practices.

**Goal 3  Increase efforts in adding value to Montana's livestock and rangeland enterprises**

*Specific Targets:*

1. Strengthen research on new and value-added products that can be produced in Montana.
   - Fill the meat science position (accomplished)
   - Provide laboratory and teaching facilities that focus on adding value to Montana products
   - Use of livestock to add value to other agricultural products and for landscape manipulation such as noxious weed control etc.

**Goal 2  Increase Efficiency in Production of Major Agricultural Enterprises**

*Specific Targets:*

1. Strengthen working relationships with off-campus organizations.
   - Use advisory committees
2. Develop/refine/promote production and management practices compatible with environmental quality, long-term sustainability, profitability and competitiveness yet are based on sound science

**Key Relationships**

Often disregarded but important is the fact that there are two major, somewhat independent decision-makers in a university. They are the administration, involved in the overall management and the
faculty, who actually decide what to teach, what research to accomplish, and through outreach, what needs to be extended to the public. This characteristic of universities makes the decision-making process very complex (Meyer, 1998). Thus in order for the department to move forward in a progressive manner relationships with key people both in industry and the university administration are important. It is the perception of the department that we need to strengthen our relationships with these key industry leaders and university administrators in order to generate support for our programs and to aid in facilitating change within the department.

**Goal 1** Develop high quality relationship with key industry leaders and resource management agency personnel resulting in a positive effect on the reputation and funding of our department

**Specific Targets:**
1. Clientele need to feel the we are giving them their dollars worth and they will come to us for answers to questions and to help them solve problems
   - Provide more timely information on departmental research projects to clientele
   - Provide support for teaching and research faculty to travel within the state presenting research results
2. Resource management agencies will recognize departmental faculty as sources of experience allowing positive input into resource management decisions.

**Goal 2** Strengthen university administrative support for the Animal and Range Sciences Department.

**Specific Targets:**
1. Elevate activity in grants and contracts arena by doubling the grant dollars within the next 5 years (see figure 1 for changes in G&C activity over the last 5 years).
   - Faculty need time to work on grant proposals therefore the addition of research associates or post-doctoral faculty to proposals will aid faculty in time to write additional proposals
   - Rewards need to be given for success
     - Return of part of the departmental IDC's
2. Continually strive to keep higher administration informed about new activities in the Animal and Range Sciences Department.
3. Continue development of faculty/county agent communications

**Infrastructure Development**

**Goal 1** Develop state of the art teaching, research and extension facilities

**Specific Targets:**
1. Develop a teaching/extension facility located at the Montana State University Livestock and Teaching Center (MSULC).
   - Will address student need hands-on laboratories with livestock
   - Must be close to campus to be easily accessible and fit within students academic schedule
   - Will involve agricultural organizations in supporting efforts to improve facilities
   - Will involve students more actively in the planning process
   - Will provide facility for extension workshops
2. New surgical facility that meets the University Animal Care and Use Standards
   • Needs to be located at the MSULC
   • Partner with VTMB if possible

3. Provide facilities and equipment in strategic research areas.
   • Pursue NSF and USDA equipment grants more rigorously
   • Re-invest more IDC's in laboratories and equipment
   • Reward productive faculty with equipment and/or remodeling when necessary

4. Develop a long-term plan for use and improvement of departmental resources
   • Allows for planned investment in resources and prioritizes where those investment need to be made
   • Allows for industry input use of and development of departmental facilities

**Goal 2** Increase our flexibility to use MAES operating dollars and decrease our dependence on earmarked revenues.

*Specific Targets:*
1. Pursue legislative change in earmarked revenues
2. Establish a revolving account to buffer against fluctuations in livestock and feed prices
<table>
<thead>
<tr>
<th>Faculty</th>
<th>CA</th>
<th>MAES</th>
<th>ES</th>
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<tr>
<td>Anotegui, Ray (FY)</td>
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<td>Forage Crops</td>
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**Potential Vacant Positions from retirements within 10 years (retire at age 63 or 30 years of service)**

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<tr>
<th>Faculty</th>
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<th>Area of Specialization</th>
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<tr>
<td>Anotegui, Ray</td>
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<td>Ruminant Nutrition</td>
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<td>Burfening, Peter</td>
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<td>Wambolt, Carl</td>
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<td>Shrub Ecology</td>
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ARNR 100
Introduction to Animal Science
Spring 2000

Class: MWF 8:00-8:50 LinH 125

Instructors:
Dr. Ray Ansotegui Dr. Jane Ann Boles
235 Linfield Hall 230 B Linfield Hall
994-5569 994-7352


EXAMS:

Exam 1 = 100 pts. Optional Comprehensive Final Exam = 100 pts.
Exam 2 = 100 pts.
Exam 3 = 100 pts. If all 5 exams are taken, the best four scores will be counted for grade calculation
Exam 4 = 100 pts.
Total 400 pts.

NO MAKE-UP EXAMS WILL BE GIVEN.
If a student cannot take an exam, he/she must take the final.

Grades: Grades assigned by total points as follows:

- 400 - 370 = A
- 369 - 340 = B
- 339 - 305 = C
- 304 - 270 = D
- under 269 = F

Tentative Lecture Schedule

January 12 - February 9 Chapters 1 - 9 Introduction, Animal Products, Allied Industries
February 11th EXAM I

February 14 - March 1 Chapters 10 - 14 Artificial Insemination Estrous Synchronization and
   Embryo Transfer, Genetics, Selection, Mating Systems
March 3rd EXAM II

March 6 - April 5 Chapters 15 - 21 Nutrients, Digestion, Absorption, Growth and
   Development, Environment, Health
April 7th EXAM III

April 14 - April 30 Chapters 22 - 32 Beef, Dairy, Swine, Sheep, Poultry, Horses

May 3rd 8:00 a.m. - 9:50 a.m. EXAM IV AND FINAL EXAM
Instructor: Bok Sowell  
Phone: 994-5558  
Office: 231A Linfield Hall  
Office Hours: Monday 4-5, Tuesday 8-9,  
Thursday 8-9, or by appointment.

Class Location: 125 Linfield Hall,  
Monday - Wednesday - Friday  
8:00 - 8:50 AM

Objectives: Introduction to principles of rangeland ecology and management. Conservation of  
soils and vegetation emphasized, while managing for livestock, wildlife, timber,  
recreation and other uses.

To introduce the process of scientific thinking to manage natural resources.

Text: ARNR 101 Packet (Available at the MSU Bookstore)

Suggested Books: (Available at MSU Bookstore)  
$12.00.  
3. This House of Sky. Ivan Doig.

Grades:  
Four exams of 100 one-point questions. (NO DROPPED EXAMS!!)  
Practice Exam  

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<th>Points</th>
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<td>C</td>
<td>280</td>
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<td>D</td>
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Total Points 430

Special testing available only if notified in advance. No extra credit. Study sessions to be arranged.

LAB FOR ARNR 102 Begins on September 1, 1999
<table>
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<tr>
<th>IMPORTANT DATES</th>
<th>TOPICS/PAGES</th>
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<tr>
<td>August 30</td>
<td>Classes Begin</td>
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<td>September 6</td>
<td>HOLIDAY - No Classes</td>
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<tr>
<td>September 10</td>
<td>Practice Exam 7:00-9:00am</td>
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<tr>
<td>Sept. 13</td>
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<td>Sept. 20</td>
<td>LAST DAY TO DROP W/O GRADE</td>
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<td>Sept. 24</td>
<td>EXAM 1 7:00 - 9:00 AM</td>
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<td>EXAM 2 7:00 - 9:00 AM</td>
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<td>Nov. 12</td>
<td>EXAM 3 7:00 - 9:00 AM</td>
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<tr>
<td>Nov. 25-26</td>
<td>HOLIDAY - No Classes</td>
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<tr>
<td>December 14</td>
<td>EXAM 4 4:00 - 5:50 PM</td>
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* Tentative Schedule - Subject to Change
ARNR 102  
Rangeland Resources Lab  
Fall 1999

Instructor: Bok Sowell  
Phone: 994-5558  
Office: 231A Linfield Hall  
Hours: Mon. 4-5, Tues. 8-9, Thurs. 8-9, or by appointment  
Labs: Room 231 LinH  
Sec. 1 - Wed. 1:10 - 3:00  
Sec. 2 - Wed. 3:10 - 5:00  
Sec. 3 - Thurs. 1:10 - 3:00  
Sec. 4 - Thurs. 3:10 - 5:00  
Sec. 5 - Fri. 1:10 - 3:00  
Sec. 6 - Fri. 3:10 - 5:00

Required Textbook: Common Montana Range Plants – Extension Publications, 118 Culbertson, $15.00  
Range 101 Packet – MSU Bookstore

Objectives: Students should be able to identify 60 common range plants, identify range sites, calculate stocking rates and estimate utilization of forage. Plants are available for study in the basement (Rm 20) of Linfield Hall.

GRADES: Plant Identification Exams – Three @ 100 pts. each  
Weekly Quizzes & Homework  
Lab Final  
300 pts  
100 pts  
150 pts  
TOTAL 550 pts  
A = 495  
B = 440  
C = 385  
D = 275

**Plant Identification Exams must be taken in registered sections. Incorrect spelling will be graded as wrong.**

<table>
<thead>
<tr>
<th>LAB DATES</th>
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<tr>
<td><strong>LAB DATES</strong></td>
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<td>December</td>
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</table>

* Outline changes may be announced in class.  
† Additional quizzes may be announced.  
# Students should be prepared to work outdoors regardless of weather conditions.
ARNR 110 ~ Beginning Western Equitation

*The horse knows when you know, and he knows when you don't know....he's a living, breathing, thinking, decision-making animal.*  Ray Hunt

Instructors:  Sandy Gagnon, x7953

**Grading:**

This course is a letter grade course, and students must be able to demonstrate all components below to receive an A. Attendance is an important component of your grade and for every 3 unexcused absences, your grade will be lowered one letter grade.

Mid-term: There will be a short written exam and basic skills check.

Final: The final will consist of a simple riding pattern.

**Course objectives:**

To understand and practice safe methods for handling horses, gain confidence as a rider, and demonstrate correct horsemanship skills. Students that successfully complete the course must demonstrate:

1. basic knowledge of horse behavior, the natural gaits, and general anatomy.
2. how to approach horses safely, halter, lead, tie (with correct knot), and groom.
3. knowledge of western tack, and how it’s used correctly.
4. mounting and dismounting the saddled horse correctly.
5. riding at the walk, trot, lope (with simple changes of leads), and backing with emphasis of proper positioning of horse and rider.
6. mounting bareback with or without assistance.
7. recognizing correct leads.
8. riding bareback at the walk and trot.
9. demonstrating overall improvement in riding skills.
ARNR 200
TODAYS LIVESTOCK INDUSTRY

Objectives: Seminar primarily aimed at sophomore students to help them gain an appreciation of the complexities of today’s modern livestock industry, the issues faced by the industry and stimulate them to plan their future. During the semester each student will prepare his or her course of study leading to a degree in Animal Science. Additionally each student will keep a journal, which will include descriptions of skills, necessary to be competitive in the job market upon graduation.

Format: This course will be taught in a seminar format with a series of guest speakers selected as industry leaders.

Prerequisites: None

Credits: 1

Week Speaker/Topic

1. Introduction and Challenge to Students

2. Dr. Jerry Lipsey, Executive Vice President American Simmental Association. If I Could Only Be a Student Again!

3. Mr. Jim Peterson, Executive Vice President Montana Stockgrowers Association. The Beef Industry Today and Tomorrow.


5. Dr. Jerry Lipsey, Executive Vice President American Simmental Association. The Role Breed Associations Play In the Beef Industry


7. Mr. Eric Moore, Manager Solaris Feeders, Miles City, MT. The Feedlot Industry, How Can I Learn More About this Segment of the Industry

8. Mr. Gary Bishop or Terry O'Neil, Western Beef Alliance. What All This Talk About Beef Alliances and Niche Markets.

9. Mr. Lynn Cornwell, President Montana Stockgrowers Association. Why's a Glasgow Montana Cowboy so Active In MSGA and NCBA
10. Mr. Ray Marxer, Matador Livestock Company. What I Look For in Prospective Employees

11. Mr. Bob Lee The Importance of Natural Resource Management In My Livestock Operation

12. Jenny Stickley. How to be Competitive in the Male Dominated Livestock Business

13. Speaker to be determined. The Sheep Industry – Today and Tomorrow

14. Mr. Clint Peck. Is There A Place For My Skill In The Livestock Communications Business

15. Speaker to be determined The Swine industry – Is there a future in this vertically integrated industry.
ARNR 208
Intermediate Western Equitation

No one ever came to grief - except honourable grief - through riding horses. No hour of life is lost that is spent in the saddle. Sir Winston Churchill

Instructors: Sandy Gagnon, x7953

Grading:

This course is a letter grade course, and students must be able to demonstrate all components below to receive an A. Attendance is an important component of your grade and for every 3 unexcused absences, your grade will be lowered one letter grade.

Mid-term: There will be a short written exam and skills check.

Final: The final will consist of a simple riding pattern.

Course objectives:

To prepare students for the breaking and training classes. Students that successfully complete the course must demonstrate the following:

1. ride at the walk, trot, and lope with emphasis on the practice of proper hand, leg and body positioning.

2. demonstrate correct transitions (i.e. walk to trot, trot to lope, walk to lope).

3. understand and demonstrate lateral flexion.

4. demonstrate and understand rein effects (leading, direct, and indirect).

5. understand and demonstrate correct leads and lead changes.

6. demonstrate advanced maneuvers such as pivots, side pass, two track, leg yields, etc., along with training techniques.

7. ride bareback.

8. demonstrate overall improvement in riding skills.
1. **Ground Work:**
   ① Understand the meaning of "whoa".
   ② Stand quiet while being sacked from all sides.
   ③ Pick up and handle all four feet for cleaning, trimming and shoeing.
   ④ Stand while hobbled.
   ⑤ Back on command or cue.
   ⑥ Lead at the trot.

2. **Riding or Breaking to Ride:**
   A. Gentling colt to the rider
      ① Stand without moving while mounting and dismounting near and off sides.
      ② Stand without moving while the mounted rider sacks the horse.
      ③ Ride bareback.

   B. Reining the colt
      ① To be ridden and trained in snaffle bit or hackamore.
      ② Colt should be taught to flex at the poll and to be light mouthed.
      ③ No tie downs, wire, tight bosals or any gimmicks should be used on colts.
      ④ Draw reins or running martingale may be used.
      ⑤ Use of spurs or whips should be kept to a minimum.

   C. **Performance expected by end of fall semester:**
      ① Walking - Colt should be alert with head up and moving freely.
      ② Loping - Colt should be loped on right and left leads. Simple changes of leads should be made, but not flying changes.
      ③ Slow lope - Colt should move from a walk directly into a slow lope.
      ④ Stopping - Colt should stop straight with head down and chin tucked. Most colts should not be expected to make a sliding stop at this stage.
      ⑤ Backing - The colt should back easily in a straight line for 10-15 feet with his chin tucked and on a light rein.
      ⑥ Turning - The colt should turn easily in small circles or figure eights at the walk and trot.
      ⑦ Each rider will be expected to show his or her colt at the end of the semester.
ARNR 213
Advanced Training Techniques

Instructor: Sandy Gagnon, x7953

Grading: This is a letter grade course, and students must be able to demonstrate all components below to receive an A. Attendance is an important component of your grade and for every 3 unexcused absences, your letter grade will be lowered one letter grade.

Mid-term: There will be an evaluation of the progress you have made with your horse.

Final: The final will be an evaluation of your training results.

Course objectives:

To prepare students for training the stock horse or other specialized training as desired at the start of the semester.

Ex: (a) working cow horse
    (b) cutting horse
    (c) reining
    (d) trail horse
Patrick G. Hatfield
230A Linfield
ph 994-7952 email hatfield@montana.edu

Texts: 
Livestock Feeds and Feeding, ed. 4 by Richard Kellem
Beef Cattle Production, An Integrated Approach by Verl Thomas.

Course Goals:

a) Students learn basic principles of grazing livestock history, production, and management.
b) Student is introduced to basic grazing livestock nutrition
c) Introduce students to the application of scientific principles for efficient grazing livestock management.

Grading:

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<td>90+</td>
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<td>50</td>
<td>Final</td>
<td>80 - 89</td>
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<td>60 - 69</td>
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225 TOTAL

*Quiz content will include reading and lecture material assigned or covered since the last quiz.
*One low or missed lab score will be dropped from final grade.

Missed or late labs, and quizzes:

No make-up quizzes. First quiz missed for any reason is your drop score. Missed assignments (after the first drop) for valid reasons will not be factored into final grade. Valid excuses for missed work or attendance are verified medical and family emergencies, and University functions. University functions (notice must be given in advance) and emergencies must be verified in writing by attending professional (i.e. professor, physician, minister, judge, etc.). Written excuses would include name, title, address and phone number of attending professional.
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<tr>
<td>Jan 12</td>
<td>Intro to class</td>
</tr>
<tr>
<td></td>
<td>Origin and history of sheep</td>
</tr>
<tr>
<td>Jan 14</td>
<td>World, U.S. and Montana grazing sheep industry</td>
</tr>
<tr>
<td>Jan 17</td>
<td>Holiday</td>
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<tr>
<td>Jan 19</td>
<td>Sheep vs cattle advantages and disadvantages</td>
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<tr>
<td>Jan 21</td>
<td>Breeds of sheep and the production and market environment. Quiz</td>
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<tr>
<td>Jan 24</td>
<td>Characteristics of grazing animals</td>
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<td>Jan 26</td>
<td>Anatomy and physiology of grazing animals</td>
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<td>Jan 28</td>
<td>Process and function of intake and digestion</td>
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<td>Jan 31</td>
<td>Process and function of intake and digestion</td>
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<td>Feb 2</td>
<td>Intro to nutrients and water</td>
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<td>Protein and lipids Quiz</td>
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<td>Carbohydrates</td>
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<td>Vitamins and minerals</td>
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<td>Feb 11</td>
<td>Grazing systems and grazing opportunities</td>
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<td>Holiday</td>
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<td>Feb 16</td>
<td>Organization of a grazing sheep enterprise</td>
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<tr>
<td>Feb 18</td>
<td>Physiological cycle of ewe and nutritional requirements Quiz</td>
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<td>Matching forage resources to nutritional requirements</td>
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<td>Feb 23</td>
<td>Mike Tess: Cattle and Elk interactions</td>
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<td>Feb 25</td>
<td>Bok Sowell: co-species grazing</td>
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<td>Feb 28</td>
<td>Bret Olson: grazing livestock for weed control</td>
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<td>Managed vs un-managed grazing systems, John Walker’s Yellowstone Park research</td>
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<tr>
<td>Mar 3</td>
<td>Last quiz and evaluation</td>
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**ARNR 230**  
**Range Livestock Production**  
**Spring 2000**

**Instructors:**  
Patrick Hatfield (sheep)  
230B LinH 994-7952  
Ray Anstotegui (beef)  
235A LinH 994-5569

**Lecture:** M, W, F  9-9:50am - LinH 301

**Final Exam:** Thursday, May 4th, 6:00 pm

**Texts:** *Sheep Production Manual* for ARNR 230 by Verl Thomas.  
*Beef Cattle Production, An Integrated Approach* by Verl Thomas.

**Objectives:**

a) Acquaint students with the biological characteristics of sheep and cattle.  
b) Acquaint students with management skills required for sheep and cattle raising.  
c) Acquaint students with the technical and economical aspects of sheep and cattle production.  
d) Introduce students to the application of scientific principles for efficient sheep and cattle management.

**Exams & Grading:**

12 weekly quizzes @ 50 pts each, on Fridays from Jan. 23 - April 24 (550 pts).  
(one quiz, either lowest grade or missed, may be dropped).

Final exam (including sheep & beef) worth 150 pts.  
Total points possible = 700 points.

<table>
<thead>
<tr>
<th>Grade Percentile</th>
</tr>
</thead>
</table>
| A                | 90+  
| B                | 80-89  
| C                | 70-79  
| D                | 60-69  
| F                | below 60  

**Missed Quizzes:**

All make-ups or exceptions must be communicated and agreed upon in advance. Unexcused missed quizzes will result in a "0" grade. Valid excuses for missed work or attendance are verified medical and family emergencies. Emergencies should be verified in writing by attending professional (i.e. physician, minister, judge, etc.). Written excuses would include name, title, address and phone number of attending professional. **Questions or disagreements concerning weekly quiz grades must be communicated to the instructor no later than one week after the quiz was taken.**
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>February 23</td>
<td>Intro to Cattle Section</td>
</tr>
<tr>
<td></td>
<td>Beef Industry Profile</td>
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<td></td>
<td>Production Systems</td>
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<td>March 1</td>
<td>Production Systems</td>
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<td>Economics</td>
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<td>Breeds</td>
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<td>April  3</td>
<td>Artificial Insemination</td>
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<td></td>
<td>Nutrition</td>
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<td></td>
<td>Nutritional Requirements</td>
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<tr>
<td>April  5</td>
<td>Forage Cycle</td>
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<td>April  7</td>
<td>Supplements</td>
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<tr>
<td>April 10</td>
<td>Creep Feeding</td>
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<td>April 12</td>
<td>Herd Health</td>
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<tr>
<td>April 14</td>
<td>Disease management</td>
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<td>April 17</td>
<td>Parasite control</td>
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<td>April 19</td>
<td>Stockers</td>
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<td>April 21</td>
<td>Winter Management</td>
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<td>April 24</td>
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<tr>
<td>March 20</td>
<td>Selection</td>
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<tr>
<td>March 22</td>
<td>Selection</td>
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<tr>
<td>March 24</td>
<td>Reproduction</td>
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<tr>
<td>March 27</td>
<td>Heifer Management</td>
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<tr>
<td>March 29</td>
<td>Heifer Management</td>
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<tr>
<td>March 31</td>
<td>Cow Management</td>
</tr>
<tr>
<td>March 13 - 17</td>
<td>Spring Break</td>
</tr>
</tbody>
</table>

*Note: The above outline is a lecture plan for ARNR 230.*
ARNR 231- APPLIED TECHNIQUES IN LIVESTOCK MANAGEMENT--SWINE

DESCRIPTION:
Hands-on laboratory to familiarize students with appropriate animal management practices in swine production enterprises.

OBJECTIVES:
The objectives of the course are:

1. Provide each student the experience of handling swine at each stage of production.
2. Provide each student exposure to and knowledge of the facilities, equipment, management practices, and production techniques used in efficient swine production.
3. Provide each student work experience on an efficient swine production unit.

PERFORMANCE GOALS AND OUTCOMES:
At the conclusion of this course students will have:

1. Gained experience with handling swine
2. Assisted with animal management practices for the major phases of production: (Breeding, Gestation, Farrowing, Weaning, Growing - Finishing, Marketing)
3. Gained knowledge of facilities and equipment commonly used in swine production and as possible gained experience with facilities and equipment.

ARNR 231 TENTATIVE OUTLINE – SPRING 2000

<table>
<thead>
<tr>
<th>LAB</th>
<th>DAY</th>
<th>DATE</th>
<th>TOPIC</th>
<th>RESOURCE/ASSIGNMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Jan 17</td>
<td>HOLIDAY—MLK BIRTHDAY</td>
<td></td>
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</tr>
<tr>
<td>M</td>
<td>Jan 24</td>
<td>Pork Production Videos/Swine behavior/Biosecurity</td>
<td>AASP &amp; NCSU Videos</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>Jan 26</td>
<td>Live Animal Evaluation—Ultrasound Evaluation</td>
<td>Instructor</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>Jan 31</td>
<td>Stages of Production/Swine Care/Mating/Swine Reproduction</td>
<td>NPPC Book, Purdue Video</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>Feb 7</td>
<td>Carcass Evaluation/Swine AI/Pregnancy Check</td>
<td>PIH 42; video’s Assignment</td>
<td></td>
</tr>
<tr>
<td>QUIZ</td>
<td>Feb 14</td>
<td>Baby Pig Mgmt/Injection techniques/Farrowing house Mgmt</td>
<td>PIH 18, Video</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>Feb 21</td>
<td>HOLIDAY—PRESIDENT’S DAY</td>
<td>Assignment</td>
<td></td>
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<tr>
<td>QUIZ</td>
<td>Feb 28</td>
<td>Market Herd Management</td>
<td>Assignment</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>Mar 6</td>
<td>Herd health practices</td>
<td>Assignment</td>
<td></td>
</tr>
<tr>
<td>Mar 13-17</td>
<td>SPRING BREAK</td>
<td>Assignment</td>
<td></td>
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<tr>
<td>M</td>
<td>Mar 20</td>
<td>Feed Mixing Practices</td>
<td>Assignment</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>Mar 27</td>
<td>Farm Experience (6 hours)</td>
<td>Assignment</td>
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<tr>
<td>M</td>
<td>Apr 3</td>
<td>Farm Experience (6 hours)</td>
<td>Assignment</td>
<td></td>
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<tr>
<td>M</td>
<td>Apr 10</td>
<td>Farm Experience (6 hours)</td>
<td>Assignment</td>
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<tr>
<td>QUIZ</td>
<td>Apr 17</td>
<td>PQA Certification</td>
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<tr>
<td>EXAM</td>
<td>Apr 24</td>
<td>Lab Final Exam</td>
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</tr>
</tbody>
</table>

GRADES: 90-100 = A  
80-89.9 = B  
70-79.9 = C  
60-69.9 = D  
0-59.9 = F

POINTS: Quizzes 15  
Assignments 25  
Participation/Instructor Evaluation 30  
Final Exam 30  
Total 100

RESOURCES:
NPPC Swine Care Handbook  
Pork Industry Handbook  
Video Tapes  
Internet Swine sites  
Handbook of Livestock Management

FARM EXPERIENCE:
MSU does not maintain a swine herd. Therefore arrangements will be made to cooperate with a local swine producer. This will require clean clothing that has not been near other swine as well a commitment by students to remain away from other swine during the Farm Experience portion of the course. Bio-security is critical to protect the cooperating operation from disease.

INSTRUCTOR: Dr. Wayne Gipp  
235 Linfield Hall; 994-5600; wgipp@montana.edu  
Office Hours: As posted and whenever the door is open
ARNR 232 SHEEP PRODUCTION SPRING 2000
Labs 1:10 to 3:00 Monday and Wednesday

Patrick G. Hatfield
230A Linfield
ph 994-7952 email hatfield@montana.edu

Texts: Sheep Production Manual by Verl M. Thomas

Course Goals:
 a) Student is introduced to the biological characteristics of sheep and how this relates to production and market environments.
 b) Student develops an understanding of basic sheep husbandry and management.

Grading:

<table>
<thead>
<tr>
<th>Points</th>
<th>Source</th>
<th>Grade</th>
<th>Percentile</th>
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<tbody>
<tr>
<td>120</td>
<td>6 lab quizzes including lab participation @ 20 pts each</td>
<td>90+</td>
<td>A</td>
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<td></td>
<td></td>
<td>80 – 89</td>
<td>B</td>
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<td></td>
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<td>70 – 79</td>
<td>C</td>
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<td></td>
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<td>60 – 69</td>
<td>D</td>
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<td>&lt; 60</td>
<td>F</td>
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</table>

120 TOTAL

*Lab quizzes will be conducted in lab and cover reading assignments and material covered in lab that day, as well as previous labs.

*Quizzes will be a balance of short written questions and activities. Good participation and attitude will get you a good grade even if you can not do the physical tasks in the lab.

*One low or missed lab score will be dropped from final grade.

Missed or late labs, and quizzes:

No make-up quizzes or labs. All quizzes and lab activities for grade are due at the end of class. First lab missed for any reason is your drop lab score. Missed assignments (after the first drop) for valid reasons will not be factored into final grade. Valid excuses for missed work or attendance are verified medical and family emergencies and University functions. University functions (notice must be given in advance) and emergencies must be verified in writing by attending professional (i.e. professor, physician, minister, judge, etc.). Written excuses would include name, title, address and phone number of attending professional.
# ARNR 232 SHEEP PRODUCTION PRACTCUM

<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Lab</th>
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<tbody>
<tr>
<td>Jan 12</td>
<td>Wed</td>
<td>Introduction to lab</td>
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<tr>
<td>Jan 17</td>
<td>Mon</td>
<td>Holiday</td>
</tr>
<tr>
<td>Quiz</td>
<td>Jan 19</td>
<td>Sheep handling and moving @Fort Ellis</td>
</tr>
<tr>
<td>Jan 24</td>
<td>Mon</td>
<td>Pregnancy determination @ Fort Ellis</td>
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<tr>
<td>Quiz</td>
<td>Jan 26</td>
<td>Intro to wool @ MSU wool lab</td>
</tr>
<tr>
<td>Jan 31</td>
<td>Mon</td>
<td>Live animal wool evaluation and shearing facilities @ Fort Ellis</td>
</tr>
<tr>
<td>Quiz</td>
<td>Feb 2</td>
<td>Shearing and skirting @ Fort Ellis</td>
</tr>
<tr>
<td>Feb 7</td>
<td>Mon</td>
<td>Breeds and sheep characteristics @ Fort Ellis</td>
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<tr>
<td>Quiz</td>
<td>Feb 9</td>
<td>Intro to lambing, facilities and equipment @ Fort Ellis</td>
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<tr>
<td>Feb 14</td>
<td>Mon</td>
<td>Lambing @ Isbell ranch</td>
</tr>
<tr>
<td>Quiz</td>
<td>Feb 16</td>
<td>Breeding soundness and semen evaluation @ Fort Ellis</td>
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<tr>
<td>Feb 21</td>
<td>Mon</td>
<td>Holiday</td>
</tr>
<tr>
<td>Quiz</td>
<td>Feb 23</td>
<td>Ultra sound backfat and ribeye measurement and body condition scoring @ Fort Ellis</td>
</tr>
<tr>
<td>Feb 28</td>
<td>Mon</td>
<td>Sheep health @ Fort Ellis</td>
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<tr>
<td>Quiz</td>
<td>Mar 1</td>
<td>Sheep health @ Fort Ellis</td>
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</tbody>
</table>

**PREPERATION FOR LAB**

Dress appropriately for outdoor labs. Below zero temperatures to six inches of mud are possible. Bring a clip board, pencil, textbook, and notebook to each lab.

There will be no lab cancellations because of weather unless the University is closed. If roads to Fort Ellis or other off campus locations are impassable, an alternative indoor lab will take place. Students are responsible for getting to and from all labs except the lambing lab at Isbell’s ranch. Labs at Fort Ellis will start promptly at 1:15. All other labs will start at 1:10.
ARNR 232 lab handout

Title: Animal Handling and Facilities

Goal:
Learn proper methods of handling, restraining and moving sheep. Become familiar with working facilities.

Reading:
* Text pp 1-6 (not body condition scoring)
* Text pp 40-45
* Text pp 98-105

Activities:
* Introduction to Fort Ellis
* Review working facilities for handling
* Move sheep from field to pens
* Work sheep in alley way
* Restrain and manually move a sheep
* Confinement feeding facilities

Materials/equipment/personnel needed:
* 2 groups of sheep

Quiz:
Participation in sheep handling and moving
Written quiz on reading assignment and information presented in today’s lab
Title: Pregnancy Determination

Goal:
Learn principles of and conduct an ultrasound and visual pregnancy evaluation

Reading:
* Handouts
* Text p 11

Activities:
* Ultrasound one ewe
* Participate in other methods of pregnancy determination

Materials/equipment/personnel needed:
* TA gets 2 to 4 ewes from Red Bluff
* TA gets 2 to 4 of Jim B. ewes
* Ultrasound machine
* Rodney Kott
Title: Introduction to Wool

Goal:
Introduction to basic “wool”

Reading:
* Text pp 35 (wool)-39
* Text pp 95-97
* Extension pubs

Activities:
* Watch Montana Wool videos
* Display of coarse, fine, short wools
* Display of final products (woolens, worsted, felts)
* Display of wool contaminants, damage to final product

Quiz:
Written questions on reading and video, identify contaminants, and questions from pregnancy testing lab
ARNR 232 lab handout

Title: Live Animal Evaluation for Wool Traits

Goal:
Learn basic principles of wool evaluation and preparation for shearing

Reading:
*Extension pubs

Activities:
*Evaluation of a set of sheep for coarse and fine wool
*Evaluation for yield and contaminate
*Shear a side sample

Materials/equipment/personnel needed:
*Data sheet with list of rams
*Electric clippers, combs, cutters, oil, brush, screw driver, extension cords, paper sacks, stapler, staples, sharpies, plastic bag with labeling tag, chalk, staple-length rulers, pencils, clip board
ARNR 232 lab handout

Title: Shearing and Managing the Wool Clip

Goal:
Learn basic shearing principles and fundamentals of managing the clip

Reading:
*Extension pub

Activities:
*Set up the shearing facility and floor maintenance
*Observe and discussion on shearing with professional shearer
*Work at the skirting table
*ID contaminates, black fibers, and hair

Materials/equipment/personnel needed:
Debbie Minikhiem
David Kinsey from Museum of Rockies
Brooms, bale packs with clips, bale stands, scale platform with head and base to rest
skirting table, skirting table, bolts, sharpies, paper for ear tag numbers, wool bag
marker, weigh sheets, extension cord, baskets

Quiz:
Skirt a fleece
Grade a fleece (fine or coarse)
Written questions from lab and reading
ID a set of sheep for fine and coarse wool
ID a set of sheep for high and low yield
ARNR 232 lab handout

Title: Basic Breed and Sheep Characteristics

Goal:
Know sheep body parts, capable of basic breed and type (i.e. meat, wool, dual purpose) identification, capable of determining animal age.

Reading:
* Text pp 27-35
* Handouts

Activities:
* Review characteristics of sheep (diagram in text and handouts)
* Observe 5 different breeds of sheep (Targhee, Suffolk, Columbia, and terminal crossbred lamb) use hand-out with short description of each breed
* Age determination (using a variety of sheep and handout), review characteristics of each age and have each student mouth at least one sheep
* Observe breed differences in hoof and hoof health

Materials/equipment needed:
* Handouts and representatives of different breeds and ages of sheep from Fort Ellis
* Old rams
* Rams with different hoof growths
Title: Lambing

Goal:
Introduction to facilities and equipment needed in a shed lambing operation

Reading:
* 12-20
* Text pp 46-54

Activities:
* Review lambing facilities at Fort Ellis
* Proper sanitation
* Set out and discuss lambing equipment

Materials/equipment/personnel needed:
* Lambing "box"

Quiz:
* Written and ID of equipment
* From previous lab, ID the breed of 3 rams, estimate the ages of 2 sheep and questions from reading assignment
* Written quiz on reading assignment and information presented in today’s and previous lab
ARNR 232 lab handout

Title: Lambing II

Goal:
Introduction to a pure-bred shed lambing operation

Reading:
* Review

Activities:
* Field trip to Isbell’s

Materials/equipment/personnel needed:
* 2 Motor pool vans
Title: Breeding Soundness and Semen Evaluation

Goal:
Learn principles and conduct a basic (male) breeding soundness exam
Learn principles of semen evaluation

Reading:
*Text pp 24-27

Activities:
*Evaluate soundness (feet, legs, eyes, teeth, etc)
*Palpate testes and penis area
*Measure scrotal circumference
*Collect semen sample and evaluate for sperm motility

Materials/equipment/personnel needed:
*Set of rams
*Electro ejaculator

Quiz:
*Written portion on reading and lab
*Conduct a breeding soundness exam
*Participate in semen collection and evaluation
*Information from previous lab
Title: Ultra sound estimates of ribeye area and backfat and sheep body condition scoring

Goal:
* Learn the importance and potential variation in important carcass traits
* Learn importance and how to body condition scoring sheep

Reading:
* Handouts on body condition
* Text pp 6-8
* Handouts

Activities:
* Body condition score rams
* Use ultrasound to estimate backfat and ribeye area

Materials/equipment/personnel needed:
* Ram test rams
* Mark King

Quiz:
* Written portion on reading and lab
* Body condition score a set of 3 to 5 rams
* Use ultrasound to estimate backfat and ribeye area
Title: Sheep Health and Management

Goal:
Learn characteristics of a healthy, well cared for sheep

Reading:
* Handout
* Text pp 61-90

Activities:
* Review of basic sheep diseases, vaccinations and treatment programs
* Discuss role of vet and diagnostic lab in flock health management
* Take rectal temperature
* Trim hoofs
* Eartag sheep

Materials/equipment/personnel needed:
*
Title: Sheep Health

Goal:
Learn and perform basic activities associated with sheep treatments

Reading:
Text: pp 8-11
Text pp 17-18
Text pp 55-60

Activities:
* Have on hand typical “vet ranch supplies”
* Discuss crutching, fly strike, bloat, and external parasites
* Discuss proper location for injection
* Give a SQ and IM shot
* Drenching
* Oral bolusing
* Fecal sample for parasite evaluation
* Review types of drugs (have on hand)
* Calculate a proper dosage (estimate animal wt and use drug recommendation)

Materials/equipment/personnel needed:
* As needed for activities

Quiz:
* Drench a sheep
* Calculate dosage, fill syringe, restrain and give injection
* Written on reading and lab discussion
Instructor: Sandy Gagnon, x7953

Grading: Weekly 10 point quizzes.

Course objectives:

To expose student to practical application of handling and management of horses.

Labs on:

1. Knots and rope equipment
2. Safety around horses
3. Teeth and aging
4. Restraint methods
5. Injections
6. Health considerations
7. Progeny testing
8. Weaning
9. Saddles
10. Head gear
11. Packing
12. Trailering
13. Shoeing
The following topics will be addressed. Dates will be assigned depending on availability of cattle and current weather conditions. Exact locations will be announced in ARNR 230 lecture the day of the lab.

Breed and Breed Cross Identification
Restraint (Physical and Chemical)
Handling Techniques and Equipment
Calving (Normal and Assisted)
Neonatal Care
Milking/Tubing/Grafting
Condition Scoring and Aging
Ultra-sound Carcass Evaluation
Injections: IM, SC, IV/Bolusing including label interpretation and dose calculations
Branding/De-horning/Castration
Internal and External Parasite Control
Eye and Hoof Care
Replacement Heifer Selection
Reproduction Measurements: Tract Scores/Pelvic Measurements
Sire Selection/Breeding Soundness Evaluation

Grades will be determined by class participation and quizzes given at the conclusion of each class period.
PRINCIPLES OF NATURAL RESOURCE ECOLOGY
ARNR 240 - Fall 1999

Lecture - Tuesday, Thursday 10:00-10:50 Johnson Hall 346
Laboratory - Friday 10:00-11:50 or 12:00-2:00 Linfield Hall 231

Instructor: Bret E. Olson
Office: 114 Linfield Hall, 994-5571
Office hours: M, W, F 9-10, TR 4-5, or by appointment

Course Description: This course will emphasize the major principles and concepts
regarding the ecology of our natural resources.

Course Objectives: After finishing this course, you should be able to:
1) identify how physical processes affect ecosystem function,
2) describe the role of various biotic processes on ecosystem
function, and
3) define processes and responses of managed ecosystems.

Textbook: None. For reference the following ecology book will be on
reserve in the library:

- Individuals, Populations, and Communities. Sinauer,
Associates, Inc. Massachusetts

Periodically, assigned readings will be on reserve in the library. Material from assigned readings will be incorporated
into quizzes and exams.

Grading: Grades will be based on two midterms, two quizzes, a final
examination, and laboratory exercises. The final grades will
be determined using the following weighting:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>2 quizzes</td>
<td>20%</td>
</tr>
<tr>
<td>2 midterms</td>
<td>40%</td>
</tr>
<tr>
<td>final examination</td>
<td>30%</td>
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<tr>
<td>laboratory exercises</td>
<td>10%</td>
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<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

where:

88-89% = B+  78-79% = C+  68-69% = D+  <60% = F
92-100% = A  82-87% = B  72-77% = C  62-67% = D
90-91% = A-  80-81% = B-  70-71% = C-  60-61% = D-
<table>
<thead>
<tr>
<th>Topic</th>
<th>Begon et al. 1986</th>
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<tr>
<td><strong>August</strong></td>
<td></td>
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<tr>
<td>31 Introduction</td>
<td></td>
</tr>
<tr>
<td><strong>September</strong></td>
<td></td>
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<td>2</td>
<td>Temperature</td>
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<tr>
<td>3</td>
<td>Temperature</td>
</tr>
<tr>
<td>7</td>
<td>Moisture, climate-weather-atmosphere</td>
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<tr>
<td>9</td>
<td>Topography, factor gradients</td>
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<td>10</td>
<td>Field lab 1</td>
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<td>14</td>
<td>Radiation</td>
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<td>16</td>
<td>Energy - trophic levels</td>
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<td>17</td>
<td>Field lab 2</td>
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<td>21</td>
<td>Inorganic molecules - carbon dioxide, water, minerals</td>
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<tr>
<td>23</td>
<td>Nutrient cycling, decomposers - detritivores</td>
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<td>24</td>
<td>Field lab 3</td>
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<td>28</td>
<td>Organisms as resources for other organisms</td>
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<tr>
<td>1</td>
<td>Soils, roots</td>
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<tr>
<td>5</td>
<td>Natural selection, ecotypes, populations</td>
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<td>Midterm</td>
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<td>Competition</td>
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<td>Predation</td>
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<td>19</td>
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<td>5</td>
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<td>16</td>
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<td>23</td>
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<tr>
<td>30</td>
<td>Uplands - bottomlands</td>
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<td><strong>December</strong></td>
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<tr>
<td>2</td>
<td>Riparian systems</td>
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<td>3</td>
<td>Weeds</td>
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<td>7</td>
<td>Disturbed ecosystems</td>
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<td>9</td>
<td>Ecosystem management</td>
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<tr>
<td>10</td>
<td>Discussion - review</td>
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<tr>
<td>13</td>
<td>Final - 2:00-3:50 Leon Johnson 346</td>
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</tbody>
</table>
I. Natural Resources - Ecology

II. Conditions
   A. Temperature
   B. Moisture
   C. Climate - weather - atmosphere
   D. Topography
   E. Factor gradients

III. Resources
   A. Radiation
      1. energy
      2. trophic levels
   B. Inorganic molecules
      1. carbon dioxide
      2. water
      3. minerals
         nutrient cycling
         decomposers-detritivores
   C. Organisms
      1. availability
      2. C:N ratios
   D. Space - patchiness
   E. Soils, root systems

IV. Organisms
   A. Natural selection, ecotypes, populations
   B. Movement - migration, dispersal, dormancy
   C. Interactions
      1. competition
      2. predation
      3. functional response

V. Communities
   A. Concepts
   B. Causes of communities
      1. differences in environmental tolerances
      2. environmental heterogeneity
      3. competition
C. Succession
   allogenic, autogenic
   primary, secondary
D. Flux of energy and matter through communities

VI. Ecosystems
   A. Resistance/resilience
   B. Processes - responses of plants and animals to:
      1. grazing
      2. fire
      3. drought
   C. Natural ecosystems
      1. rangelands
      2. forests
      3. watersheds
      4. weeds
   D. Disturbed ecosystems
      1. causes
      2. regulations
      3. rehabilitation
   E. Ecosystem management
      1. values - goals
      2. ecosystem health
      3. agency perspectives
      4. addressing natural resource problems
ARNR 316 Meat Science
Spring 2000

Lecture: Tuesday and Thursday 8:00 – 9:15 Linfield Hall 113
Laboratory: Wednesday 1:10-3:00 Farm and Meat Lab

Instructor: Dr. Jane Ann Boles
Meat Scientist
230-B Linfield Hall
994-7352
jboles@montana.edu

Assistant: Vicki Reisenauer
19 Linfield Hall
994-5596
vreisena@hotmail.com

COURSE OBJECTIVES:

1. To acquaint the student with live animal and carcass evaluation
2. To introduce the student to growth and development of livestock
3. To acquaint the student with the chemical and physiological principles involved in the conversion of muscle to meat
4. To introduce the student to the properties of meat

REQUIRED TEXTBOOKS


GRADING SYSTEM

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
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<tbody>
<tr>
<td>Lecture Quizzes (8 given, count 7 @ 25 pts)</td>
<td>175</td>
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<tr>
<td>Midterm (March 9 comprehensive)</td>
<td>75</td>
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<tr>
<td>Final (Comprehensive)</td>
<td>100</td>
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<tr>
<td>HACCP Plan (due April 25)</td>
<td>50</td>
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<tr>
<td>Paper (due April 11)</td>
<td>100</td>
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<tr>
<td>Lab Questions (13 given, count 12 @ 5 pts)</td>
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<tr>
<td>Lab Exams</td>
<td>100</td>
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<td><strong>Total</strong></td>
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Grades are based on the total points earned as a percentage of total points possible.

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<th>Percentage</th>
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<tbody>
<tr>
<td>90-100%</td>
<td>A</td>
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<tr>
<td>80-89%</td>
<td>B</td>
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<tr>
<td>70-79%</td>
<td>C</td>
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<tr>
<td>60-69%</td>
<td>D</td>
</tr>
<tr>
<td>&lt;60%</td>
<td>F</td>
</tr>
</tbody>
</table>
GROUND RULES AND SUGGESTIONS

1. It is helpful to use a 3-ring notebook to keep handouts, quizzes and exams organized.
2. Quizzes will be given after certain subjects have been covered the dates are listed below. Quizzes will be given at the beginning of class. Eight quizzes will be given, only 7 scores will count. **No make-up quizzes will be given, missed quizzes will score a 0.**
3. Questions will be given out in lab every week and will be due at the beginning of lab following lab period the exception is the lab on March 8 (week before spring break) those questions are due by the end of the day Friday March 10. **Questions not turned in at the beginning of lab will not be graded.** No homework assignment will be given March 15, 2000 (spring break). Thirteen lab questions will be given, only 12 will count. Students not attending class will not get the lab questions. **No make up labs will be done.**
4. All answers must be shown in a neat and legible fashion for lab questions, quizzes and exams.
5. If you miss a class, it is your responsibility to copy any missed notes from other students in the class, and to pick up any missed assignments from the instructor.
6. If you feel that a quiz or exam was not graded fairly or correctly, you must bring it to the instructor’s attention for re-grading within one week of receiving the graded assignment. **All answers will be re-graded not just the one in question.**
7. Two written assignment will be given and will be due April 11, 2000 and April 25 respectively. **No late papers will be accepted.** Papers should be printed using a 12-point font with margins between 1.0 and 1.25 inches. Proper reference styles should be used. Journal of Animal Science, Journal of Food Science or Meat Science Styles are acceptable. **Plagiarism will not be tolerated.** Make sure to reference papers and if quoting directly from the paper use quotation marks.

ABSENCE POLICY

Students are allowed to drop one each of quizzes and lab questions during the semester. The first quiz or lab questions that you miss for any reason, will receive a zero score and be dropped. For any additional absences, the only valid excuses where students will be allowed to make up the work will be:

1. **A verified medical or family emergency.** A physician, minister, judge, etc must verify emergencies in writing.
2. **A University-sponsored event.** Students must notify the instructor of the absence in writing, at least 1 week prior to the event.

Students who miss assignments should notify the instructor as soon as possible. Work must be made up within 2 weeks of the absence or full credit will be lost.
**ARNR 316 Meat Science**

**Spring 2000**

**Lecture Schedule**

January 13  Introduction to the US Meat Industry
January 18  Meat Production in other Countries
January 20  Growth and Development
January 25  Hormones affecting growth
January 27  Slaughter Process
February 1  Meat Inspection and Grading
February 3  Yield Grade Calculations, Pork % yield
February 8  Muscle structure - skeletal, smooth and cardiac
February 10  Muscle Proteins
February 15  Muscle Contraction
February 17  Muscle Contraction and Energy for Contraction
February 22  Conversion of Muscle to Meat
February 24  Stress and Meat Quality (PSE, DF)
February 29  Pre and Post-slaughter factors affecting tenderness
March 2  Alternatives to grading
March 7  Food Safety
March 9  Midterm
March 14-16 Spring Break
March 21  HACCP (Guest Lecturer)
March 23  Basic Meat Microbiology
March 28  Meat Micro con’t
March 30  Fresh Meat Color
April 4  Meat Lipids
April 6  Tenderness and Cookery
April 11  Meat Flavor
April 13  Sensory Evaluation
April 18  Meat Packaging
April 20  Meat By-products
April 25  Meat in the Diet
April 27  Value-Added Products
May 5  2:00-3:50 Finals

**Lab Schedule**

January 12  No Class
January 19  Library Training
January 26  Live animal evaluation – pigs
February 2  Carcass evaluation – pork
February 9  Cut Identification – pork
February 16  Live animal evaluation – lambs
February 23  Carcass evaluation and Cut Identification – lambs
March 1  Lab Practical
March 8  Live animal evaluation – cattle
March 15 Spring Break
March 22  Carcass evaluation – beef
March 29  Cut Identification – beef hindquarter
April 5  Cut Identification – beef forequarter
April 12  Safe Handling/Tenderness
April 19  Fresh Meat Color / Packaging
April 26  Lab Final
ARKR 320 - Animal Nutrition  
Fall 1999

CLASS TIME AND LOCATION: M-T-W-R 10:00-10:50 am, Room 109 Linfield Hall

Instructor: Dr. Jan Bowman  
Beef Cattle Nutritionist  
230-C Linfield Hall  
994-5563

Teaching assistants: Tanya Daniels  
Graduate Research Assistant  
Room 5 Linfield Hall  
994-7942  
Travis Blackhurst  
Graduate Research Assistant  
Room 16 Linfield Hall  
994-3727

COURSE OBJECTIVES

1. To develop an understanding of the basic nutrients (carbohydrates, proteins, lipids, water, vitamins and minerals), their characteristics and primary functions in animal nutrition.

2. To develop an understanding of digestive anatomy and physiology and their relationship to digestion, absorption, and animal feeding management.

3. To develop an understanding of the nutritive value of feeds, methods of feed analysis, basic ration balancing and practical animal feeding.

REQUIRED TEXTBOOK


GRADING SYSTEM

Quizzes (12 given, count 11 @ 30 pts)  
330 pts
Homework problems (13 given, 12 count @ 20 pts)  
240 pts
Nutrition Challenge (7 given, 6 count @ 30 pts)  
180 pts
TOTAL 750 pts

Grades are based on the total points earned as a percentage of total points possible.

90-100% = A  
80-89% = B  
70-79% = C  
60-69% = D  
< 60% = F
GROUND RULES & SUGGESTIONS

1. It is helpful to use a 3-ring notebook to keep handouts, homework problems, nutrition challenges and quizzes organized.

2. **Always** bring the textbook and a calculator with you to class!

3. Weekly quizzes will be given at the **beginning of the class period on Thursdays**.
   - No quiz on: 9-2-99 (1st Thursday), 11-11-99 (Veterans’ Day Holiday) or 11-25-99 (Thanksgiving Holiday)
   - Twelve quizzes will be given, only 11 scores will count. **No make-up quizzes will be given**, missed quizzes will score a 0.

4. Homework problems will be assigned on Tuesday each week, and will be **due at the beginning of class on the following Tuesday**.
   - No homework assignment given on: 11-9-99 (prior to Thanksgiving Holiday) or 12-9-99 (last week of Fall semester).
   - Thirteen homework problems will be given, only 12 scores will count. **Any homework turned in after the beginning of class on the due date will not be graded.** The TA’s will have office hours during the week, if you need help with homework etc. please see the TA’s.

5. Nutrition Challenges will be assigned throughout the semester, and will be due at the end of the class period on Thursdays as indicated in the Due Dates handout.
   - Seven Nutrition Challenges will be given, only six scores will count. **Any Nutrition Challenges turned in after the end of class on the due date will not be graded.**

6. All work must be shown in a neat and legible fashion for homework problems and quizzes. **Please circle your answer on the homework problems. Credit will not be given unless the method of calculation is shown for each problem.**

7. If you miss a class, it is **your** responsibility to copy any missed notes from other students in the class, and to pick up any missed assignments from the instructor.

8. If you feel that a quiz, homework problem or Nutrition Challenge was not graded fairly or correctly, you must bring it to the instructor’s attention for regrading within one week of receiving the graded assignment.

ABSENCE POLICY

Students are allowed to drop one each of quizzes, homework and Nutrition Challenges during the semester. The first quiz, homework or Nutrition Challenge that you miss for any reason, will receive a zero score and be dropped. For any additional absences, the only valid excuses where students will be allowed to make up the work will be:

1. **A verified medical or family emergency.** Emergencies must be verified in writing by a physician, minister, judge, etc.
2. **A University-sponsored event.** Students must notify the instructor of the absence in writing, at least 1 week prior to the event.

   Students who miss assignments should notify the instructor as soon as possible. Failure to make up work in a timely fashion will result in partial or full loss of credit.
NUTRITION CHALLENGE
Throughout the semester practical nutrition problems will be assigned. The solution to the problem is due on Thursday during class, as indicated in the Due Dates handout. The typed solution is worth 30 pts, and participation in discussion and handwritten material added to the solution are also evaluated. However, if you don’t have the typed solution prepared when you come to class on the due date, your score is 0.

Format: Typed, double-spaced, font size 12, 1 page maximum (not including sources cited). If your paper doesn’t follow this format you will score a 0.

Text: 1. Brief restatement of the problem in your own words.
2. Your solution/conclusion, and your basis or evidence for the solution/conclusion.
3. Any assumptions being made, or additional information needed.
4. Sources used (you must have at least two sources). If you don’t have at least two sources, you will score a 0.

Sources: You must cite the sources you used for each idea or statement within the body of text. Citations of sources used at the end of the paper should be complete enough so that someone else could find the same information. If you have specific questions - ask the instructor.

Personal interview:
Within the text: (John Paterson, personal communication)

Information from a textbook:
Within the text: (Bowman and Sowell, 1998)

NRC requirements books:
Within the text: (NRC, 1989)

Journal article:
Within the text: (Patterson et al., 1985)

Extension publications:
Within the text: (Wagner et al., 1973)

World Wide Web sites:
Within the text: (FDA, 1998)
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<tr>
<th>Chapter</th>
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<td>II</td>
<td>Nutrients</td>
<td>16-32, 164-176</td>
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<td>III</td>
<td>Factors Affecting Animal Requirements</td>
<td>32-35</td>
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<tr>
<td>IV</td>
<td>Feedstuff Classification &amp; Nutritive Value</td>
<td>39-42, 45-53</td>
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<td>V</td>
<td>Roughages</td>
<td>59-103</td>
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<td>VI</td>
<td>High-Energy Feeds</td>
<td>105-133</td>
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<td>VII</td>
<td>Protein Sources</td>
<td>135-162</td>
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<td>VIII</td>
<td>Feed Processing</td>
<td>191-213</td>
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<td>IX</td>
<td>Feed Additives and Growth Promotants</td>
<td>177-190</td>
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<td>X</td>
<td>Feeding Horses</td>
<td>412-430</td>
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<td>XI</td>
<td>Feeding Sheep</td>
<td>308-333</td>
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<tr>
<td>XII</td>
<td>Feeding Dairy Cattle</td>
<td>281-295</td>
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<td>XIII</td>
<td>Feeding Beef Cattle</td>
<td>243-279</td>
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<td>XIV</td>
<td>Feeding Swine</td>
<td>354-389</td>
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<td>Thursday, Sept. 16</td>
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<td>Thursday, Sept. 23</td>
<td><em>Nutrition Challenge 2 due</em>, <strong>Quiz 3</strong></td>
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<td>Thursday, Sept. 30</td>
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<td>Thursday, Oct. 7</td>
<td><em>Nutrition Challenge 3 due</em>, <strong>Quiz 5</strong></td>
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<td>Tuesday, Oct. 12</td>
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<td>Thursday, Oct. 14</td>
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<td>Thursday, Oct. 28</td>
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<td>Thursday, Nov. 18</td>
<td><em>Nutrition Challenge 6 due</em>, <strong>Quiz 10</strong></td>
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<tr>
<td>Tuesday, Nov. 23</td>
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<td>Thursday, Nov. 25</td>
<td>THANKSGIVING HOLIDAY</td>
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<td>Tuesday, Nov. 30</td>
<td>Homework 12 due</td>
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<td>Thursday, Dec. 2</td>
<td><em>Nutrition Challenge 7 due</em>, <strong>Quiz 11</strong></td>
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<tr>
<td>Tuesday, Dec. 7</td>
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<tr>
<td>Thursday, Dec. 9</td>
<td><strong>Quiz 12</strong></td>
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**ARNR 320 - Animal Nutrition**

**Homework Topics**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Pages</th>
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<tbody>
<tr>
<td>As Fed/Dry Matter Conversions, Unit Conversions</td>
<td>pp. 60-63, 537-538</td>
</tr>
<tr>
<td>Animal Requirements, Feed Identification &amp; Composition</td>
<td>pp. 75-76</td>
</tr>
</tbody>
</table>

**Feed Composition**

- DM, CP, CF, EE, Ash, ADF, NDF: Table 3-2A, pp. 89-101
- TDN, DE, ME, NE: Table 3-2B, pp. 102-125
- Minerals: Table 3-2C, pp. 126-147
- Vitamins: Table 3-2D, pp. 148-163
- Amino acids: Table 3-2E, pp. 164-175
- Mineral supplements: Table 3-2F, pp. 174-175

**Animal Requirements**

- Swine: pp. 322-325
- Beef Cattle: pp. 353-365
- Dairy: pp. 412-417
- Sheep: pp. 435-441
- Horses: pp. 463-464

**Feed Sampling & Analysis**

- pp. 55-60, Fig. 2-1

**Digestibility, TDN, Energy**

- pp. 63-68, Fig. 2-2

**Balancing for One Nutrient, Pearson's Square**

- pp. 235-239

**Balancing for Two Nutrients, Simultaneous Equations**

- pp. 240-241

**Balancing for Calcium & Phosphorus**

- pp. 243-245

**Substitutions in Diets**

- pp. 239-240

**Swine Diets**

**Sheep Diets**

**Horse Diets**

**Feedlot Diets, NEm & NEg for Beef Cattle**

- pp. 69-72, Table 2-3, 2-4, 2-5, 2-6, 2-7, 2-8

**Supplements for Beef Cows**

**Dairy Cow Diets**
ARNR 321
PHYSIOLOGY OF REPRODUCTION

COURSE OBJECTIVES: To provide the student with a broad understanding of reproductive processes in domestic animals and their relationship to improving the efficiency of production.

You should, during this course, gaining an understanding of how domestic animals reproduce and how that reproductive process can be altered to either improve the management of the reproductive process or the efficiency of reproduction. Thus improving the overall efficiency of livestock production.

MEETING OBJECTIVES: These objectives will be met by lectures, assigned readings, and writing on subjects related to reproductive physiology, and class discussions. Class participation will be expected of all students and will be a part of your grade.

INSTRUCTOR: Peter Burfening

OFFICE: 119 Linfield Hall

OFFICE HRS: By Appointment

TESTING

QUIZZES: will be given weekly on the computers in Room 231 beginning the week of September 15th. All quizzes will be cumulative which I will explain in lecture when I show you how to use the testing program.

Each of you may take each quiz twice and I will use the highest of the first two scores that you have on each week's test.

FINAL EXAM: Final Exam will be given via computer and can be any time during final week under the same rules as the weekly quizzes.

WRITING ASSIGNMENTS:

Reasons for: One the things that prospective employers are constantly telling us is that student need better communication skill when they start to work. Farm Land Industries sent a list of skills that they feel undergraduates need to improve their employability. High on Farm Land's list was writing and their rational was: "Writing is often the primary means of communicating policies, procedures and concepts; the initial contact with customers or machines, and the first step in launching new ideas." Thus writing assignments will be given to help you develop your writing skills. You will be asked to research (Using the World Wide Web)
an assigned subject relating to the reproductive process and then relate your research on reproductive processes to me in written form.

Due on:

Assignment 1 Due September 29, 1999
Assignment 2 Due November 5, 1999

READING ASSIGNMENTS:


Reasons for: Again Farm Land Industries tell us that students need to constantly improve their reading skill. "Reading: Improve reading comprehension; experts estimate most workers spend up to two hours each day reading forms, charts, graphs, manuals and computer screens." Part of your performance in class will be based on reading the text, which some of you will find to be very difficult; however, part of the questions on each exam will be based on reading no covered in lecture.

GRADING:

40% Weekly quizzes
15% Writing assignments (@ 7.5% for each assignment)
15% Final Exam
10% Class participation
20% Laboratory/discussion

A= 90 - 100
B= 80 - 89.9
C= 70 - 79.9
D= 60 - 69.9
F= < 60

Lecture outline and reading assignments

<table>
<thead>
<tr>
<th>Lecture Topic</th>
<th>Reading Assignment</th>
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<table>
<thead>
<tr>
<th>Topic</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction and Needs to Improve Reproductive Rate.</td>
<td>1-7</td>
</tr>
<tr>
<td>Embryonic development of reproductive tract.</td>
<td>58-76</td>
</tr>
<tr>
<td>Endocrinology of reproduction.</td>
<td>78-99</td>
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<td>Pituitary gland</td>
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<td>Control of pituitary by hypothalamus</td>
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<td>Gonads</td>
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<td>Other hormones of reproduction</td>
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<td>The Estrous Cycle</td>
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<td>Puberty and factors affecting puberty</td>
<td>100-115</td>
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<tr>
<td>The estrous cycle</td>
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<td>Follicular Phase</td>
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<td>Luteal Phase</td>
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<td>Oogenesis</td>
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<td>Endocrinology of the Male</td>
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<tr>
<td>Spermatogenesis</td>
<td>168-187</td>
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<td>Gamete Transport and Fertilization</td>
<td>206-219</td>
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<td>Embryo Manipulation</td>
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<td>IVM and IVF</td>
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<td>Cloning</td>
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<td>The Gestation Period</td>
<td>220-231</td>
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<td>Early Embryo Development</td>
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<td>Maternal Recognition of Pregnancy</td>
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<td>Hormones of pregnancy</td>
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<td>Parturition and the postpartum period</td>
<td>232-248</td>
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<td>Hormonal regulation of the parturition process</td>
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<td>Induced parturition</td>
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<td>Stages of labor</td>
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<td>Dystocia</td>
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<td>The postpartum period</td>
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<td>1</td>
<td>Introduction and Expectations</td>
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<td>2</td>
<td>Pituitary and Neural Anatomy</td>
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<td>3</td>
<td>Gross Female Anatomy</td>
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<td>Gross Female Anatomy</td>
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<td>5</td>
<td>Female Micro Anatomy</td>
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<td>6</td>
<td>Reproductive Case Study</td>
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<td>7</td>
<td>Reproductive Case Study</td>
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<td>8</td>
<td>Male Anatomy</td>
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<td>9</td>
<td>Male Micro Anatomy</td>
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<td>10</td>
<td>Semen Evaluation</td>
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<td>Semen Evaluation</td>
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<td>12</td>
<td>Embryo Collection</td>
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<td>13</td>
<td>Pregnant Reproductive Tracts</td>
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<tr>
<td>14</td>
<td>Review and Wrap-up</td>
</tr>
<tr>
<td>15</td>
<td>Lab Final/Practical</td>
</tr>
</tbody>
</table>

BIOL 301, and STAT 216 or equivalent

Dr. D.D. Kress, Room 226, Linfield Hall, Phone 994-5576.

Jeff Stevens, Room 101, Linfield Hall, Phone 994-3728.

February 17, March 24, April 21

May 3, (Monday) 4:00-5:50 p.m. (Required for all students except those with an "A" average at end of semester).

Hour Exams = 51%  Overall Average & Letter Grade
Problems = 19%  90 & above = A  60 to 69 = D
Final Exam = 30%  80 to 89 = B  59 & below = F
70 to 79 = C

Make-ups or exceptions to assigned work or scheduled exams must be communicated and agreed upon in advance. The only valid excuses for missed work or attendance will be verified medical and family emergencies. Emergencies must be verified in writing by an attending professional (i.e., physician, minister, judge, etc.). Written excuses must include the name, title, address and phone number of the attending professional.

The course covers the basic principles of genetic improvement of farm animals. The goal is for each student to understand these principles so that they can be successfully applied to farm animals.

I. Introduction (Preface of book)

II. Animal Breeding from the Top Down (Overview of course)
   A. Ch. 1 - What is the "best" animal?
   B. Ch. 2 - How are animal populations improved?
III. Animal Breeding from the Bottom Up
   A. Ch. 3 - Mendelian Inheritance
      1. Livestock examples
      2. Genetic defects
      3. Test matings (Ch 6, pp. 70-74)
   B. Ch. 4 - Genes in Populations
   C. Ch. 5 - Simply-Inherited and Polygenic Traits

IV. Performance Testing

V. Selection
   A. Ch. 6 - Selection for Simply-Inherited Traits
   B. Ch. 7 - The Genetic Model for Quantitative Traits
   C. Ch. 8 - Statistics and Their Application to Quantitative Traits
   D. Ch. 9 - Heritability and Repeatability
   E. Ch. 10 - Factors Affecting the Rate of Genetic Change
   F. Ch. 11 - Genetic Prediction
   G. Ch. 12 - Large-Scale Genetic Evaluation
   H. Ch. 13 - Correlated Response to Selection
   I. Ch. 14 - Multiple-Trait Selection

VI. Mating Systems
   A. Ch. 15 - Mating Systems for Simply-Inherited Traits
   B. Ch. 16 - Mating Strategies Based on Animal Performance Random and
      Assortative Mating
   C. Ch. 17 - Mating Strategies Based on Pedigree Relationship:
      Inbreeding and Outbreeding
   D. Ch. 18 - Hybrid Vigor
   E. Ch. 19 - Crossbreeding Systems

VII. New Techniques, Old Strategies
   A. Ch. 20 - Biotechnology and Animal Breeding
   B. Ch. 21 - Commonsense Animal Breeding
ANS 313 / ARNR 322
Principles of Animal Breeding
Spring 2000

10am Monday, Wednesday, and Friday
University of Arizona: Harvill Building, Room 211
Montana State University: EPS Building, Room 126 (in April room moves to 234 Linfield Hall)

Text: Understanding Animal Breeding, 2nd Edition
Author: Richard M. Bourdon

Instructor: Dr. Mark Enns
Office: Room 231, Shantz Building
Phone: (520)626-7266
Email: menns@ag.arizona.edu
Office hours: 9-10am MW, or by appointment only.

Teaching Assistants:
David Auhl
Phone: (520)621-7627
Email: dauhl@ag.arizona.edu
Office hours: 9am-10am WF, or by appointment.
133 Shantz

Jeff Stevens
Phone:
Email: JSTEVENS@trex2.oscs.montana.edu
Office hours: TBA.
TBA

Prerequisites: ANS 213 (Animal Genetics), MATH 110 (Collegiate Algebra, previously 117R/S), and UDWPE (Upper division writing proficiency examination) or equivalents. Students not meeting prerequisites should submit a written notice of the lack of prerequisites to me and schedule a meeting with me before the end of the second week of class. At this meeting the student should be ready to discuss dropping the class and/or a waiver of prerequisites as described in the "University of Arizona Record 1999-2000 General Catalog". Students failing to see me will be administratively dropped from the class. ARNR 322 students should have completed BIOL 301, and either STAT 216 or STAT 332 or PSES 318. Those with concerns about these prerequisites should also contact me via email before the end of the second week of class.

Catalog Description: Basic concepts involved in the improvement of economically important traits of livestock through application of genetic principles.

Teaching Methods: Primarily lecture but will include readings from text, homework problems, term paper, guest lectures, exams and quizzes.

Grading Procedures: There will be three announced exams (100 points each) during the semester. The lowest exam score will be dropped but there will be NO make-up exams. If you do miss a single exam, the missed exam will be the score that is dropped. If you have a University-sponsored conflict (e.g. field trip with another class) with more than one exam date, you must let me know in writing no later than January 28 to discuss testing options.

Six unannounced quizzes (10 points each) will be given during the semester with the lowest quiz score
dropped. There are **NO** make-up quizzes.

There will be one term paper (125 points) and a comprehensive final exam (125 points). Homework will account for 75 points of your final grade and class participation will account for 25 points.

In summary, the final grade will be based on the following:

\[
\begin{align*}
2 & \quad 100 \text{ point exams} = 200 \text{ points} \\
5 & \quad 10 \text{ point quizzes} = 50 \text{ points} \\
\text{Homework} & = 75 \text{ points} \\
\text{Class participation} & = 25 \text{ points} \\
\text{Term Paper} & = 125 \text{ points} \\
\text{Final exam} & = 125 \text{ points} \\
\text{Total} & = 600 \text{ points}
\end{align*}
\]

The following percentages will assure you of at least the corresponding letter grade: 100-90=A, 89-80=B, 79-70=C, 69-60=D; below 60=Fai. A curved grading scale may be applied at the end of the semester if appropriate.

**Homework:** Homework will be assigned and collected throughout the semester. The due dates for assignments will be announced when homework is assigned. Selected problems will be graded for a total of 75 points.

**Text Readings:** Readings from the text should be completed by the date indicated on the course schedule. The dates for associated readings on the course schedule indicate the day that the text readings will be discussed. Quizzes given at the beginning of class may cover readings from the text assigned for that day.

**Late Policy:** Any assignment handed in late will have the grade reduced in value 10 percent for every day late.

**Academic integrity:** This course operates under the UA Code of Academic Integrity, page 18 of the "University of Arizona Record 98-99 General Academic Manual" for University of Arizona students and the STUDENT ACADEMIC AND GRIEVANCE PROCEDURES & CONDUCT GUIDELINES for ARNR 322 students.

Students are encouraged to share intellectual views and to discuss freely the principles presented in class but exams, quizzes and term papers are expected to be the work of the individual.

**Attendance:** Regular attendance is expected as material presented will be on exams.

**Special Needs:** Students needing special accommodations of special services should contact the Learning Disabilities Program/SALT, Old Main Bldg., Rm 117 (621-1242) and/or the Center for Disability Related Resources/CDRR, 2nd and Cherry Streets (621-5227). ARNR 322 students should contact the appropriate centers at Montana State University. The needs for specialized services must be documented, verified by the student's respective units, and presented to me before the end of the second week of class. I will do everything I can to enhance your learning experience.

**Writing Emphasis:** Students will be expected to meet a minimum writing standard. In accordance with the University of Arizona Catalog's guidelines "at least half the grade awarded is determined by written work appropriate to the academic discipline." To meet these requirements all quizzes and a portion of all exams will be in essay format. Ten percent of the total point value for each essay question and quiz, and the term paper will be used to evaluate writing skills.
All essay questions and quiz answers should be written in complete sentences with proper grammar and usage.

**Course Withdrawal:** Students withdrawing from this course must notify the instructor prior to nonattendance and execute withdrawal procedures in accordance with the "University of Arizona Record 98-99 General Academic Manual" (ANS 313) or in accordance with "Drop/Add Regulations and Procedures" (ARNR 322).

**Incomplete Grade Policy:** Incomplete grades will be given only in special circumstances as outlined in the university policy as stated on page 27 of the "University of Arizona Record 98-99 General Academic Manual" (ANS 313) or in "Courses, Credit, and Grades" (ARNR 322).

**Course Notes and Outline:** An outline for all lectures in a given week will be available no later than 48 hours prior to lecture through the hyperlinks below. The lecture notes are listed by date of the lecture. Many of the hyperlinks contain the notes for more than a single class period.

### Course Schedule
(subject to modification)

<table>
<thead>
<tr>
<th>Month</th>
<th>Day</th>
<th>General Topic</th>
<th>Associated readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>12</td>
<td>Introduction to the course</td>
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<tr>
<td></td>
<td>14</td>
<td>Basic terminology and What is &quot;best&quot;?</td>
<td>1 to 14</td>
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<td>19</td>
<td>System analysis</td>
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<td></td>
<td>21</td>
<td>Industry Structure and breeding objectives</td>
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<td>24</td>
<td>Selection</td>
<td>17 to 28</td>
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<td></td>
<td>26</td>
<td>Mating and mating systems</td>
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<td></td>
<td>28</td>
<td>Crossbreeding systems</td>
<td>393 to 425</td>
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<td>31</td>
<td>Crossbreeding systems (cont.)</td>
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<td>February</td>
<td>2</td>
<td>Crossbreeding systems (cont.)</td>
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<td>4</td>
<td>Mendelian genetics</td>
<td>31 to 42</td>
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<td>7</td>
<td>Mendelian genetics (cont.)-- Modes of gene expression</td>
<td>42 to 53</td>
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<td>9</td>
<td>Genes in populations</td>
<td>56 to 69</td>
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<td></td>
<td>11</td>
<td>Simply-inherited and polygenic traits</td>
<td>71 to 79</td>
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<td></td>
<td>14</td>
<td>Simply-inherited and polygenic traits (cont.)</td>
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<td>16</td>
<td>Discussion, Review of concepts</td>
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<td>18</td>
<td>Exam 1</td>
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<td>21</td>
<td>Selection for simply-inherited traits</td>
<td>77 to 98</td>
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<td>23</td>
<td>Selection for simply-inherited traits (cont.)</td>
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<td>25</td>
<td>The genetic model--breeding value</td>
<td>102 to 110</td>
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<td>28</td>
<td>The genetic model--gene combination value</td>
<td>110 to 114</td>
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<td>March</td>
<td>1</td>
<td>Producing Ability. Threshold traits</td>
<td>114 to 119</td>
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<td>3</td>
<td>Statistics and application to quantitative traits--variation</td>
<td>123 to 136</td>
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<td>6</td>
<td>Statistics and application to quantitative traits--covariation, correlations</td>
<td>137 to 158</td>
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<td>8</td>
<td>Heritability</td>
<td>161 to 172</td>
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<td>10</td>
<td>Repeatability</td>
<td>172 to 179</td>
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<td>13 to 17</td>
<td>Spring Break</td>
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<tr>
<td>20</td>
<td>Ways to improve heritability and repeatability</td>
<td>179 to 194</td>
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<td>22</td>
<td>Factors affecting the rate of genetic change</td>
<td>198 to 223</td>
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<td>24</td>
<td>Factors affecting the rate of genetic change (cont.)</td>
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<td>27</td>
<td>Jerry Lipsey or Exam II</td>
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<tr>
<td>29</td>
<td>Jerry Lipsey or Exam II</td>
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<tr>
<td>31</td>
<td>Genetic Prediction--the selection index</td>
<td>227 to 245</td>
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<td>April</td>
<td>Genetic Prediction--BLUP</td>
<td>245 to 254</td>
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<tr>
<td>5</td>
<td>Large Scale Genetic Evaluation</td>
<td>258 to 273</td>
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<td>7</td>
<td>Large Scale Genetic Evaluation (cont)</td>
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<td>10</td>
<td>Correlated response to selection</td>
<td>275 to 291</td>
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<tr>
<td>12</td>
<td>Multiple-trait selection</td>
<td>294 to 309</td>
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<td>14</td>
<td>Multiple-trait selection (cont.)</td>
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<td>17</td>
<td>Mating systems for simply-inherited traits</td>
<td>313 to 322</td>
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<td>19</td>
<td>Random and assortative mating</td>
<td>325 to 331</td>
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<td>21</td>
<td>Inbreeding</td>
<td>333 to 367</td>
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<td>24</td>
<td>Outbreeding</td>
<td>362 to 367</td>
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<td>26</td>
<td>Exam III</td>
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<td>28</td>
<td>Hybrid Vigor</td>
<td>371 to 378</td>
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<tr>
<td>May</td>
<td>Hybrid Vigor-- loss and retention and review</td>
<td>379 to 390</td>
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<td>3</td>
<td>Selection for health characteristics, and biotechnology and animal breeding</td>
<td>429 to 448</td>
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<td>10</td>
<td>Final Exam</td>
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<td>(11am to 1pm)-- University of Arizona</td>
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<td>(TBA)-- Montana State University</td>
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ARNR 331 - Spring 2000
POUR PRODUCTION AND MANAGEMENT

INSTRUCTOR: Dr. Wayne F. Gipp
Extension Swine Specialist
235 Linfield Hall
406-994-5600
e-mail: Wgipp@montana.edu

Secretary: Peggy Kelley
221 Linfield Hall
406-994-3415

Office Hours: Office hours will be posted. I am normally in the office from approximately 8 AM until 5:30 PM Monday through Friday. I am out of town on Extension business at some times, but have tried to schedule my Spring meetings to minimize conflicts with the ARNR 331 class schedule. You are welcome to stop in when ever I am in the office. If I cannot visit with you at that time I will indicate that and set up an alternative time. My secretary also knows my schedule and can set up an appointment or take a message from you. You can also leave a note on the bulletin strip on my office door. Finally, there is voice mail on my phone and e-mail on my computer, where you can leave a message.

Class Attendance: Lecture attendance is a requirement of the class. There will be random oral questions asked of individual students during class period. I realize that you are all busy adults with a variety of responsibilities. If there are times when you must miss class for a valid reason please visit with me ahead of time. Invalid absences in excess of three will impact final grade.

Personal behavior: Students are expected to act in a responsible and professional manner that contributes to a positive learning environment for fellow students. Each student is expected to contribute independently to the class and to provide their fair share to group activities. Copying, cheating or other indications of claiming credit for work not your own will not be tolerated and can be grounds for failure.

Special requirements: If there are special requirements or considerations that are necessary for you to attend lecture and to successfully complete the requirements for this class please bring them to my attention.
Grading:

- A: 92.5-100
- A-: 90.0-92.4
- B+: 87.5-89.9
- B: 82.5-87.4
- B-: 80.0-82.4
- C+: 77.5-79.9
- C: 72.5-77.4
- C-: 70.0-72.4
- D+: 67.5-69.9
- D: 62.5-67.4
- D-: 60.0-62.4
- F: <60.0

COURSE OBJECTIVE:

The objective of this course, Pork Production and Management, is to provide understanding, awareness, and appreciation of the U.S. swine industry including:

1. Knowledge of contemporary production practices and technologies
2. The economics and efficiencies of swine production
3. Domestic and international trends in production and marketing
4. Issues and challenges faced by the industry and individual producers including Environmental issues, Waste Management issues, Food Safety issues
5. Pork as a food
6. Employment opportunities in the swine industry and necessary skills for employment.
7. Computer and Internet resources applicable to the swine industry

FORMAT:

LECTURE: Monday, Wednesday, Friday, 12:00 –12:50 PM

SUBJECT MATTER COVERED:

My intent is to provide a basic level of knowledge about swine production and the swine industry in a manner that tailors the class to the background of the students. I would like to facilitate the acquisition and application of knowledge while minimizing the rote memorization of facts and information. Attached is a list of topics covered in previous semesters. We will formalize the precise topics to be covered this year following the initial class meetings.

CLASS PROJECT:

One or more group projects will be completed during the semester. The precise nature and size of the project(s) will depend upon the background and abilities of the students in the class. The concept is to develop a project which will enable students to gain knowledge and
professional growth while developing a product that will be useful to some sector of the Montana Swine industry. Ideas for the project(s) will be discussed at the first class period and the structural organization of the class to complete the project will be discussed at the second class meeting.

DETERMINATION OF GRADE:

The precise grading scheme will be determined after the initial organizational class meetings and development of the class project. You will be provided this during the second week of class. The detailed lecture schedule will also be provided at that time.

TEXT:

None to purchase. Contemporary print and electronic media resources will be utilized to develop lectures and provide background information. These will be made available for student use. The information on how and where to purchase will be made available.

The National Pork Producers Council makes a large amount of educational materials available. These materials are prepared by committees of University swine professors and tend to be more current than textbooks.
TOPICS/CONCEPTS TO BE COVERED:

MONTANA AND NATIONAL SWINE INDUSTRY STRUCTURE AND STATISTICS
STAGES OF PRODUCTION AND DESIGN OF FACILITIES FOR EACH STAGE
PERFORMANCE GUIDELINES
BREEDING AND FARROWING MANAGEMENT
PRODUCTION & FINANCIAL STANDARDS FOR THE PORK INDUSTRY
CONCEPTS AND REASONS FOR PRODUCTION SCHEDULES AND PLANNING ANIMAL FLOW THROUGH FACILITIES
ANALYSIS OF ENTERPRISE AND PRODUCTION EFFICIENCY RECORDS, COST OF PRODUCTION, TROUBLESHOOTING POOR EFFICIENCY

ENVIRONMENTAL AND OTHER INDUSTRY ISSUES
PRODUCTION TRENDS AND NEW TECHNOLOGIES IN THE SWINE INDUSTRY; “INDUSTRIALIZATION” OF PRODUCTION
MARKETING CONSIDERATIONS FOR MONTANA SWINE PRODUCERS
GENETICS, SELECTION INDEXES, BREED CHARACTERISTICS
CARCASS EVALUATION, MEAT QUALITY CONSIDERATIONS, MONTANA CARCASS TRAITS
PORK QUALITY ASSURANCE
PRINCIPLES FOR TOTAL HERD HEALTH MANAGEMENT; BIOSECURITY CONCEPTS AND PRACTICES, DISEASE RECOGNITION AND MANAGEMENT
MOLDS AND MYCOTOXINS
NUTRIENTS REQUIRED BY SWINE; REQUIREMENT SPECIFICATION BY PRODUCTION CHARACTERISTICS, (“MODELING”)
RATION FORMULATION AND ANALYSIS
LIFE-CYCLE FEEDING PROGRAMS FOR SWINE; PHASE FEEDING
FEEDING FOR LEAN GAIN; SPLIT SEX FEEDING
COMPUTER PROGRAMS TO AID DECISION MAKING IN SWINE PRODUCTION

STUDY RESOURCES:
CLASS HANDOUTS (PORK INDUSTRY HANDBOOK, NPPC CONFERENCE PROCEEDINGS, MAGAZINES)
PORK INDUSTRY HANDBOOK FACTSHEETS, NPPC PROCEEDINGS, ETC., (AVAILABLE IN MY OFFICE)
VIDEOTAPES (AVAILABLE FOR LOAN FROM MY OFFICE)
NOTEBOOKS ON DISEASES AND NUTRITION (ASSEMBLED BY INSTRUCTOR AND AVAILABLE FOR LOAN)
SPECIALIZED REFERENCE BOOKS (SOME IN LIBRARY, ALL AVAILABLE FROM MY OFFICE)
WORLD WIDE WEB (ACCESS IN COMPUTER LAB OR MY OFFICE)
COMPUTER PROGRAMS (AVAILABLE FOR PREVIEW IN MY OFFICE)
<table>
<thead>
<tr>
<th>Class</th>
<th>Day</th>
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<td>Swine Industry Today: Nutrition, Health, Bio-security</td>
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<td>Cost Analysis/Pork Production Chart of Accounts</td>
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<td>PIH 58, 106; Internet</td>
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<td>New Stock &amp; AI: Selection/Introduction/Management</td>
<td>PIH 9, 27, LCI</td>
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<td>Breeding: Mating systems/Facilities/Gilt Mgmt/Boar Mgmt</td>
<td>PIH 69, 74</td>
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<td>Breeding: Estrus detection/AI</td>
<td>PIH 8, 137; Video</td>
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<td>Gestation: Pregnancy Check/Condition Score/Facilities/Management</td>
<td>PIH 96; handout</td>
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<td>Farrowing: Facilities/Mgmt/Parturition-normal and abnormal</td>
<td>PIH 10, slides, video</td>
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<td>Baby pig management</td>
<td>PIH 18, Video</td>
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<td>Weaned Pig: Facilities/Management/Ventilation</td>
<td>PIH 20, 60, 84, 111</td>
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<td>Grow-Finish Hog: Types of Facilities/Management/Ventilation</td>
<td>PIH 32, 116, 138; MPPS32.7</td>
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<td>Nutrition: Protein/Amino Acids/Lean Gain</td>
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<td>Nutrition: Energy/Vitamins/Minerals</td>
<td>PIH 2,3,52</td>
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<td>Nutrition: NRC Nutrient Estimation Model</td>
<td>NRC Publication</td>
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<td>Nutrition: Ration Formulation</td>
<td>PIH 7; SOFTWARE ASSIGNMENT</td>
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<td>Health and Diseases: Reproductive</td>
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<td>Health and Diseases: Respiratory</td>
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<td>Apr 3</td>
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<td>Herd Health Program</td>
<td>PIH 68, 80</td>
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<td>Molds, Mycotoxins and Ergot</td>
<td>PIH 128, Ergot Factsheet</td>
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<td>Apr 6</td>
<td>UNIVERSITY DAY</td>
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<td>Apr 7</td>
<td>Pork Quality Assurance Certification/Injection techniques</td>
<td>PQA book; Video</td>
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<td>Computer and Internet Programs for Swine Production</td>
<td>Handout, PigWin SOFTWARE</td>
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<tr>
<td>Final Exam</td>
<td>Fri</td>
<td>May 5 8 AM</td>
<td>SENIORS GRADUATING MAY 2000 HAVE THE OPTION OF WAIVING THE FINAL IF COURSE GRADE IS ABOVE A “D +”</td>
<td>Handout, PigWin SOFTWARE</td>
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</table>

POINTS: MIDTERM = 20; FINAL = 20; QUIZZES = 20; ASSIGNMENTS = 20; CLASS PROJECT = 20; TOTAL PTS = 100
ARNR 331

PROJECTS

1. Create and post web page for small scale/beginner producers.
   a. Considerations for production
   b. Production practices
   c. Sources of breeding and/or market hog stocks
   d. Facility plans—specific, photos of?
   e. Costs, returns, budget
   f. Rations and feeding programs
   g. Web resources and links
   h. Other resources
   i. "pig list"?

   END PRODUCT: ACTIVE WEB PAGE

2. Create and publish a small scale producer record and management handbook
   a. Printed handbook containing much or similar material as the web site.
   b. Designed for hands on actual use with specific plans, diets, feeding programs, photos, etc.
   c. Includes list of available resources for further information.

   END PRODUCT: 40 – 60 PAGE 4" X 6" SPIRAL BOUND HANDBOOK.

3. Marketing Handbook:
   a. List of packing plants in Montana and the west with contacts.
   b. Recommendations for developing a marketing plan
   c. Discussion of Niche Market development
   d. Discussion of Pork Quality Considerations.
   e. Other Resources.

   END PRODUCT: 40 – 60 PAGE Spiral Bound Marketing Handbook.

4. MSU Student Swine Program
   a. Justification and needs for swine herd at MSU for teaching purposes
   b. Detailed plan for operation of a swine herd
   c. Estimated costs and returns for a swine herd
   d. Description of potential educational programs using swine at MSU

   END PRODUCT: DETAILED WRITTEN PROPOSAL FOR PRESENTATION TO msu ADMINISTRATION.
ARNR 345
Riparian Ecology and Management
Course Syllabus

Instructor: Clayton B. Marlow, Rm 230 Linfield Hall, email cmarlow@montana.edu


Course Outline:

A. Introduction - Role of riparian areas in ecosystem and watershed function

B. Physical Processes – What forms and maintains riparian areas?

C. Biological Processes – How do riparian areas interact with other parts of the ecosystem?

D. Water Quality – How do riparian areas protect water quality?

E. Management Strategies – How do we manage riparian areas for long term ecological sustainability?

F. Monitoring riparian areas – How do we know when “enough” use has occurred?

Grading:

Quizzes (1 following each unit) 67%
Laboratory quizzes and write ups 33%

Grades
A= 90+%
B= 80-89%
C= 70-79%
D= 60-69%
F< 60%
Course Syllabus
ARNR 350
RANGE VEGETATION

Instructor: Carl Wambolt
116 Linfield Hall

Course Objectives:

1. To identify 200 of the most important plant species of the western range region.

2. To learn management-related characteristics of the same species.

3. To serve as a basis for understanding relationships in other courses and the literature.

Text:

North American Range Plants Linfield 119
Department Packet Linfield 119

Grading:

Exams will be given weekly. The final grade will be determined on the basis of total points earned (or percentage) over the semester.

Standards are: Grade %
A > 93
A- > 90 - < 93
B+ > 87 - < 90
B > 83 - < 87
B- > 80 - < 83
C+ > 77 - < 80
C > 73 - < 77
C- > 70 - < 73
D+ > 67 - < 70
D > 63 - < 67
D- > 60 - < 63
F < 60

Prerequisites:

ARNR 240, BIOL 230, BIOL 434.
To be taken concurrently with ARNR 351,
OBJECTIVE:

1) To identify the 200 most important plant species of the western range region.
2) To learn important management related characteristics of the same species.
3) To serve as a basis for understanding relationships in other courses and the literature.

CLASS MEETINGS:

1. Introduction to course and Tall Grass Prairie
2. Sandhills
3. Exam and plant characteristics
4. Mixed Grass Prairie
5. Exam and plant characteristics
6. Desert Grassland
7. Exam and plant characteristics
8. Southern Desert Shrub
9. Exam and plant characteristics
11. Exam and plant characteristics
12. Coniferous Forest
13. Exam and plant characteristics
14. Pinyon-Juniper Woodland
15. Exam and plant characteristics
16. Palouse Bunchgrass
17. Exam and plant characteristics
18. California Annual Grassland
19. Exam and plant characteristics
20. Chapparal Oakbrush
21. Exam and plant characteristics
22. Review of all plants
23. Exam and plant characteristics
24. Review of all plants
25. Exam and review
26. Review of all plants
27. Exam
## VEGETATION --- 2000

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<td></td>
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<td>13 Intro &amp; Tall Grass</td>
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<tr>
<td>18</td>
<td>Sandhills</td>
<td>20 – 15</td>
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<td>8</td>
<td>So. Desert Shrub</td>
<td>10 – 35</td>
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<td>S R M *****</td>
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<td>2 ----35</td>
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<td>Pinyon-Juniper</td>
<td>9 ----35</td>
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<td>14</td>
<td>SPRING BREAK</td>
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<td>21</td>
<td>Palouse Bunchgrass</td>
<td>23 – 35</td>
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<td>28</td>
<td>California Annual</td>
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<td>11</td>
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<td>13 – 50</td>
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<td>18</td>
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<td>20 – 50</td>
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<td>25 – 50</td>
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</table>
OBJECTIVE:

To be familiar with western rangelands and the climatic factors and landscapes that influence the region.

CLASS MEETINGS:

1. Course introduction with important dates and test schedule. Explanation of map project. Introduction to climate
2. Solar radiation
3. Temperature
4. Pressure systems and winds
5. Precipitation
6. Exam 1 (1 hour)
7. Climatic types of the world and summary of climate section with maps
8. Geomorphology of the Western Range region in general terms
9. Geomorphology of the Great Plains
10. Geomorphology of the Southern Rocky Mountains and Middle Rocky Mountains
11. Geomorphology of the Northern Rocky Mountains and ½ hour exam
12. Geomorphology of the Colorado Plateau and introduction to the Columbia Plateau
13. Conclusion of geomorphology of the Columbia Plateau and the geomorphology of the Basin and Range
14. Tall grass prairie
15. Exam (1 hour)
16. Sandhills
17. Mixed grass prairie
18. Desert grassland
19. Southern desert shrub and ½ hour Exam
20. Southern desert shrub
21. Northern cold desert
22. Northern cold desert
23. Coniferous forest
24. Pinyon-juniper woodland
25. Exam (1 hour)
26. Palouse bunchgrass and California annual grassland
27. Chapparal oakbrush
28. Final Exam
Course Syllabus
ARNR 351
Range Biomes

Instructor: Carl Wambolt
116 Linfield Hall

Objective:

To be familiar with western rangelands and the climatic factors and landscapes that influence the region.

Prerequisites:

ARNR 240, BIOL 230, BIOL 434.
To be taken concurrently with ARNR 350.

Course Outline:

I. Climate
   A. Atmospheric elements
   B. Climatic controls
   C. World and regional climatic types

II. Western (US) range geomorphology
   A. Structure, process, and stage
   B. Geomorphic Units (provinces and sections)

III. Biological relationships in western biomes
   A. Tall grass prairie
   B. Sandhills prairie
   C. Mixed grass prairie
   D. Desert grassland
   E. Southern desert shrub
   F. Northern cold desert
   G. Coniferous forest
   H. Pinyon-juniper
   I. Palouse bunchgrass
   J. California annual grassland
   K. Chaparel-oak brush

Grading:

Grading will not exceed the standard 60-70-80-90 scale for letter grades of D-C-B-A respectively. Grades will include the plus and minus system.
# BIOMES --- 2000

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<td>Pressure &amp; Winds</td>
<td>20 Temperature</td>
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<td>24 Geomorphology</td>
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<td>SPRING BREAK</td>
<td>9 Sandhills</td>
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<td>SDS &amp; Exam (40 pts)</td>
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<td>13 Pinyon-Juniper</td>
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ARNR 401 and 402
Program Planning and Analysis (A Senior Capstone Experience)

This course is a senior capstone course. The objective of the capstone experience is one that requires seniors to integrate principles, theories, and methods learned in courses required throughout the major. Students creatively analyze, synthesize, and evaluate learned knowledge in a project having a professional focus and communicate the results of the project effectively at a professional entry level by a method appropriate to the discipline.

Synthesizing Project

You will be required to solve one large problem which is presented in an unstructured manner, i.e., the problem is presented and your team must then determine what kind of information you need, ask the cooperating rancher to provide the information to them, sift through the information to begin to address the perceived problem and arrive at a solution or solutions. Many times the perceived problem that the rancher has is not the real problem and the students must discover what is the real problem.

Communications Skills

You will work in teams of 5 or 6 students. Each team will have expertise from the animal area, range area, and watershed area. You must learn how to resolve conflict within your group, work together to bring all of your expertise to bear on the subject and communicate effectively among your peers. Each team will be required to write an extensive report. The report begins with a draft that is presented to the instructors and orally to the class. A final document is prepared and given to the cooperator.

Our expectations for students are that they will develop the following levels of communication skills and will not pass this course unless you have achieved this level.

a. Students must demonstrate the ability to participate effectively in a conversation with professional content.
   1) They must be able to converse in a language appropriate to the audience.
   2) They will have to demonstrate the ability to listen and understand the views of another in a one-to-one conversation.

b. Students are expected to participate in small group professional-analytical discussions on topics related to their discipline.
   1) This discussion characteristically involves outside investigation and preparation.
   2) The individual is expected to move the subject discussion to a conclusion in a professional setting.

c. Students must be able to work as part of a team.
   1) They must be able to put together a unified effort as a result of teamwork, with each individual being a contributing member of that team.
   2) The team must be capable of developing measurable outcomes for their plan. Skill development and evaluation of team work will be accomplished and by each member using a standardized form.

d. Students must be able to write effectively and produce a formal profession document suitable to the intended audience, in this case the private operator.
Team Behavior Appraisal

Name of team member: ____________________________
Group number: ____________________________ Date: ____________

In order to receive a grade in the class you must turn in this form!

Fill in the rankings below for yourself and each of your team members. Also add a short narrative on each team members participation, including your own, below and on the back.

The participation rating scale ranks your performance on the criteria found below:
4 = Outstanding: Consistently exceeds what is expected.
3 = Above average: Frequently exceeds what is expected.
2 = Average: Consistently achieves what is expected.
1 = Below average: Occasionally fails to achieve what is expected.
0 = Unacceptable: Consistently fails to achieve what is expected.

<table>
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<th>Leadership Support (behavior that enhances feelings of self worth, influence and importance among team members)</th>
<th>Team Members Name</th>
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<tbody>
<tr>
<td>Team Facilitation (encourages members of team to develop close, mutually satisfying work relationships)</td>
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</tr>
<tr>
<td>Work Facilitation (help achieve goal attainment by doing things such as scheduling, attending meetings, planning, and providing resources such as tools, materials, and technical advice and knowledge)</td>
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<tr>
<td>Goal emphasis (stimulates enthusiasm for meeting the teams' goals, helps establish priorities and promotes achievement of excellence)</td>
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<tr>
<td>Influence (advances the status of the group by acquiring needed resources, eliminating barriers)</td>
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<tr>
<td>Raw Score</td>
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</table>

Comments:
I. TITLE PAGE

II. TABLE OF CONTENTS

III. EXECUTIVE SUMMARY (no more than three pages not in outline form)
   A. Brief introduction—describes where the unit is and type of operation
   B. Background and resources of unit
   C. Goals
   D. Limitations in reaching the goals
   E. Solutions to the limitations
   F. Measures of expected response

IV. PROPOSALS DETAILS
   A. Introduction
   B. Background and resources (put details as to livestock, range and ranch inventories in an appendix)
      1. Range resources
      2. Livestock resources
      3. Other ranch resources
   C. Proposal goals
   D. Limitations in reaching goals
      1. Limitations
      2. Effect each limitation has on present production
   E. Solutions (put details in appendix tables and charts)
      1. How each proposed solution will effect productivity
      2. How you will measure or monitor their impacts
      3. Costs of solutions
   F. Implementation of the plan
      1. Time table
      2. Cost/benefit analysis

V. REFERENCES

VI. APPENDICES

VII. TEAM RESUMES
ARNR 401C
Planning and Program Analysis
Fall 1999

30 Aug   Introduction and Course Goals
13 Sept  Team Organization
20 Sept  National Park Service Presentation
25 Sept  Field Trip to Grant-Kohrs (Leave campus at 7:00A, return at 7:00P)
27 Sept  Team Building Exercise
  4 Oct   Work in Class
  11 Oct  Work in Class
  18 Oct  Work in Class
23 Oct   Field Trip to Grant-Kohrs to do range survey (lv 7:00A, ret 7:00P)
25 Oct   Work in Class
  1 Nov   Work in Class
  8 Nov   Team Presentation
  15 Nov  Team Presentation
  22 Nov  Team Presentation
  29 Nov  Team Presentation
  6 Dec   Team Presentation
  13 Dec  Finals Week – no class

*Draft Plan due the day of Team Presentation
ARNR 421
ASSISTED REPRODUCTIVE TECHNOLOGIES
SYLLABUS
Fall Semester

Credits: 4
Sec. 01: Lecture MW 9:00 to 9:50 a.m.
Sec. 02: Laboratory MW 1:15 to 2:50 p.m.
Sec. 03: Laboratory MW 3:15 to 4:50 p.m.

Instructors:
Dr. James G. Berardinelli
Office: 229 Linfield Hall
Lab: 123 Linfield Hall
Telephone: 994-5574 (office) or 994-5566 (lab)
Office hours: 10:00 to 11:00 am MTWTF
e-mail: jgb@montana.edu

Dr. Raymond P. Ansotegui
Office: 235A Linfield Hall
Telephone: 994-5596
Office Hours: 10:00 to 11:00 am MWF
e-mail: raymonda@montana.edu

COURSE OBJECTIVES:

1. The student will have a working knowledge of the anatomy of the reproductive tract, and physiology and endocrinology of the estrous cycle and pregnancy of domestic females.

2. The student will have a basic understanding of the current techniques used to synchronize estrus in female cattle and of the management required to implement these technologies.

3. The student will have a general working knowledge of embryological development and understand the importance fetal membrane fluid and fetal structure as it relates to pregnancy diagnosis in domestic cattle.

4. The student will have a working knowledge of the techniques involved in rectal palpation and ultrasonography of the reproductive tract of the female bovine and understand the basis for emerging technologies used in pregnancy diagnosis in domestic animals, i.e., pregnancy specific protein assays.

5. The student will have a working knowledge of the techniques employed for superovulation and embryo transfer in domestic ruminants.

6. The student will be able to distinguish, at least 90% of the time, the difference between pregnant and non-pregnant female cattle by rectal palpation and ultrasonography.

7. The student will be able to detect and discuss the differences of an early, mid, and late pregnant female by using fetal size and fetal fluid volume, and size of placentomes.

8. The student will have a working knowledge of the techniques required for artificial insemination of female farm animal species and specific knowledge of those techniques for insemination of female cattle.

9. The student will be able to handle and manipulate frozen semen for optimizing artificial insemination in female cattle.
10. The student will be able to successfully inseminate a minimum of 50 cows during the course and be exposed to the technique employed to successfully transfer embryos in female cattle.

METHODS:

1. Lectures and discussion.
2. Handouts, diagrams, and videotapes.
3. Laboratory materials (hands-on materials)
   a) reproductive tract (pregnant and non-pregnant)
   b) tools of rectal palpation and other technical devices, i.e., ultrasound
   c) exposure to materials and methodologies for embryo transfer
5. Rectal palpation of female cattle at different stages of pregnancy.
6. Evaluating temporal changes in individual cows to demonstrate how the tactile properties of the uterus change as pregnancy progresses (if at all possible).
7. Written and practical examinations to be given twice during the semester to assess student progress and allow instructor to evaluate methods of instruction.

STUDENT EVALUATION (GRADING):

1. Grades will be assigned by Drs. James G. Berardinelli and Raymond P. Anstegui. Fifty percent of the grades in this course will be assigned by each instructor derived from the following evaluations:

   A. Written examination of materials and knowledge presented to the student in the classroom and laboratory.

      1. Results of examination will count for 40% of the final grade.
      2. Examinations will include:
         a. a written mid-term exam (20%)
         b. a final exam (20%)
      3. Laboratory quizzes and performance (50%) to include:
         a. palpation, ultrasonography, and embryo transfer (25%)
         b. artificial insemination and semen handling (25%)
B. Attendance.
   1. Will count as 10% of grade
      a. attendance will be taken for each lab period.
      b. each lab will count as 10 points; attending all labs will yield 100% of the
         points for the 10% of the attendance grade.

C. Willingness to participate.
   1. Subjective in nature and will be given at discretion of instructor.
   2. Designated as either a "+" or "-".
   3. Based upon an individual's attempt to participate in discussion, ask pertinent
      questions, works cooperatively with other students, and attempts to learn more
      about the advantages and disadvantages of the techniques used in class.
   4. This evaluation will not count in your final grade; however, it will be placed in our
      class record book that I will be able to refer to when writing letters of
      recommendation or answering questions concerning the abilities of students to
      perform in a particular job by prospective employers.

II. Grades will be based upon the lettering system, A, B, C and F.

   A = 90 to 100%
   B = 80 to 89%
   C = 70 to 70%
   F = less than 70%

Note: there will be no "D" grades assigned, if you cannot do "C" work you cannot palpate or inseminate cows!!!
ARNR 421
ASSISTED REPRODUCTIVE TECHNOLOGIES

Fall 1999

Sec. 02: Monday and Wednesday, 1:15 to 2:50 p.m.
Sec. 03: Monday and Wednesday, 3:15 to 4:50 p.m.

Instructor: Drs. Raymond P. Ansotegui and James G. Berardinelli

TEACHING ASSISTANTS

<table>
<thead>
<tr>
<th>Name</th>
<th>Status</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harv Wagoner</td>
<td>Graduate Student</td>
<td>GTA</td>
</tr>
<tr>
<td>Dave Kirschten</td>
<td>Graduate Student</td>
<td>GTA</td>
</tr>
<tr>
<td>Brian</td>
<td>Undergraduate</td>
<td>Assistant</td>
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<tr>
<td>Mitch McKamey</td>
<td>Undergraduate</td>
<td>Assistant</td>
</tr>
<tr>
<td>Justin Davies</td>
<td>Undergraduate</td>
<td>Assistant</td>
</tr>
<tr>
<td>Jason Enneberg</td>
<td>Undergraduate</td>
<td>Assistant</td>
</tr>
<tr>
<td>Date</td>
<td>Activity</td>
<td>Location</td>
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<tr>
<td>Sept. 3 Wednesday</td>
<td>Introductory Remarks J.G. Berardinelli &amp; Ray Anotegui No Laboratory</td>
<td>109 LH</td>
</tr>
<tr>
<td>Sept. 8 Monday LAB (p.m.)</td>
<td>Introductory Lecture 1 (JB) Reproductive Tract Anatomy (JB)</td>
<td>109 LH 122H LH</td>
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<td>Sept. 12 Wednesday (NO LAB PM)</td>
<td>Introductory Lecture 2 (JB)</td>
<td>109 LH</td>
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<td>Sept. 15 Monday</td>
<td>Palpation Exercises</td>
<td>North Beef Barn</td>
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<td></td>
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<td>Bozeman Livestock Center</td>
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<td>Sept. 22 Monday</td>
<td>Palpation Exercises</td>
<td>North Beef Barn</td>
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<td>Sept. 29 Monday</td>
<td>Palpation Exercises</td>
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<td>Oct. 6 Monday</td>
<td>Palpation Exercises</td>
<td>North Beef Barn</td>
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<tr>
<td>Oct. 13 Monday</td>
<td>Palpation Exercises</td>
<td>North Beef Barn</td>
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<tr>
<td>Oct. 20 Monday</td>
<td>MID-TERM EXAM</td>
<td>North Beef Barn</td>
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<td>Oct. 27 Monday</td>
<td>Palpation Exercises</td>
<td>North Beef Barn</td>
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<td>Nov. 4 Monday (a.m.)</td>
<td>Lecture 3 Palpation Exercises</td>
<td>109 LH</td>
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<td>LAB (p.m.)</td>
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<td>Nov. 10 Monday</td>
<td>NO CLASS</td>
<td>Veteran’s Day</td>
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<td>Nov. 17</td>
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<td>Nov. 24 Monday</td>
<td>Palpation Exercises</td>
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<td>Dec. 1 Monday</td>
<td>Palpation Exercises</td>
<td>North Beef Barn</td>
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<tr>
<td>Dec. 8 Monday</td>
<td>FINAL EXAM</td>
<td>North Beef Barn</td>
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ARNR 422 - Topics in Beef Cattle Nutrition  
Spring 2000

PREREQUISITE: ARNR 320 - Animal Nutrition

CLASS TIME AND LOCATION: T-R, 11:00-11:50 am, Room 231, Linfield Hall  
(We also have the Ag Computer Lab available.)

INSTRUCTOR: Dr. Jan Bowman  
Beef Cattle Nutritionist  
230-C Linfield Hall  
994-5563

COURSE OBJECTIVES

1. To provide relevant information about current topics in Beef Cattle Nutrition.

2. To integrate decision making, problem solving, and issue management as applied to Beef Cattle nutritional requirements, by using currently available computer software.

3. To provide experience in critically evaluating the scientific literature in Beef Cattle Nutrition and its application to practical feeding management.

4. To study nutrient utilization as influenced by the unique aspects of digestion and fermentation in ruminants.

REQUIRED TEXTBOOK


GRADING SYSTEM

Homework problems (10 to 12 @ 40 pts)  
400 to 480 pts

Attendance, participation (28 classes @ 5 pts)  
140 pts

Announced short assignments (5 given @ 10 to 20 pts)  
50 to 100 pts

TOTAL  
590 to 720 pts

Grades are based on the total points earned as a percentage of total points possible.

<table>
<thead>
<tr>
<th>Percentage</th>
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<tbody>
<tr>
<td>90-100%</td>
<td>A</td>
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<td>80-89%</td>
<td>B</td>
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<td>70-79%</td>
<td>C</td>
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<tr>
<td>60-69%</td>
<td>D</td>
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<tr>
<td>&lt; 60%</td>
<td>F</td>
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GROUND RULES & SUGGESTIONS

1. Always bring the textbook, a calculator and a computer disk with you to class.
2. Homework problems will be assigned a week in advance, and will be due at the beginning of class on the due date. Any homework turned in after the beginning of class on the due date will not be graded.
3. All work must be shown in a neat and legible fashion for homework problems. Credit will not be given unless the method of calculation is shown for each problem.
4. If you miss a class, it is your responsibility to copy any missed notes from other students in the class, and to pick up any missed assignments from the instructor.
5. If you feel that a homework problem was not graded fairly or correctly, you must bring it to the instructor’s attention for regrading within one week of receiving the graded assignment.

ABSENCE POLICY

Students are allowed to drop one of the homework assignments during the semester. The first homework that you miss for any reason, will receive a zero score and be dropped. For any additional absences, the only valid excuses where students will be allowed to make up the work will be:

1. A verified medical or family emergency. Emergencies must be verified in writing by a physician, minister, judge, etc.
2. A University-sponsored event. Students must notify the instructor of the absence in writing, at least 1 week prior to the event.

Students who miss assignments should notify the instructor as soon as possible. Failure to make up work in a timely fashion will result in partial or full loss of credit.
MSU Barley Feedlot Experiment

Diet formulation, management, cost of gain, intake, digestibility

Kansas State University

Balancer - Beef Cow Ration Balancer
Grower - Growing Cattle Ration Balancer

1996 Beef NRC Computer Model

Feedlot Case Study
Cow-Calf Ranch Case Study

Oklahoma State University Computer Programs

AUTONRCA and AUTONRCD - Calculating complete diets, checking for nutrient balance, and estimating gain for growing beef cattle.

Beefgain - Performance of feedlot cattle.

BEFLCALC - Program to estimate feedlot breakeven purchase price.

Cowculator - Beef cow nutrition evaluation software.

FLCALC - Program to estimate feedlot cost of gain.

NewPasture - Stocker planner

PRECON2 - Spreadsheet for evaluating preconditioning programs for weaned calves.

PROGFED2 - Limit feeding light-weight cattle high nutrient density diets - Programmed feeding for calves.

Ranch Calculator - A spreadsheet to aid in planning for cow/calf and cow/calf-stocker operations.
ARNR 422 - Homework Problem 1

You have been given the following information:

1. One of the four MSU feedlot diets fed in 1999, expressed as amount of each feed ingredient fed per head per day, and on a percentage basis (both on an as-fed and dry matter basis).
2. Feed composition values of the MSU feedlot feed ingredients on a dry matter basis.
3. Average body weight at the beginning and ending of each of the five 28-day periods during the experiment for each of the four feedlot pens that consumed your diet.
4. Average DM intake during each of the five 28-day periods for each of the four feedlot pens that consumed your diet.
5. Average ADG during each of the five 28-day periods for each of the four feedlot pens that consumed your diet.

Use the Kansas State University ration analysis program “Grower” to do the following:

1. Enter the conditions of your animals into the program (do each of your four pens individually since the weights will differ).
2. You will need an average environmental temperature and windspeed (MPH) for each of the five 28-day periods.
3. Add the MSU feed ingredients and their DM composition to the program (you can only use a maximum of 7 feed ingredients in this program, so first use the feeds that supply energy, protein, Ca, and P).
4. Add a realistic price for each of your feed ingredients.
5. Based on the percentage each feed ingredient makes up of your diet, and the DM intake in each period, calculate how much of each feed ingredient is being consumed in each period. Convert these to an as-fed basis, and use these numbers as the feed ingredient intake values.
6. Predict the ADG of each of your pens of calves for each of the five 28-day periods, and compare these ADG values with the actual values. What could be causing any differences between the predicted ADG and the actual ADG? Can you change the animal conditions and/or the feed intake and make the predicted ADG match the actual ADG?

Include a computer printout from the “Grower” program for each of the 28-day ADG predictions for each of your pens. (If you need paper for the printer in the Computer Lab, come and see me, or you can get additional paper from Lynn in the Dean’s office.)

7. What effects does using a colder environmental temperature and increased windspeed, and a warmer environmental temperature and slower windspeed, have on the predicted ADG?
8. What effects does the frame size, and initial body condition of the calves have on the predicted ADG?
9. Use the Beef 1996 NRC values for protein, NEm and NEg for Barley Grain, Heavy, instead of the values for MSU Barley 1999, and demonstrate the effect it has on your prediction of ADG (You only need to show one example). Which feed composition values for barley give a predicted ADG that more closely matches the actual ADG?
**Horse Science**  
**ARNR 430**

**Instructor:** Sandy Gagnon  
228 Linfield Hall  
994-6623

**Lecture:** M,W,F 11:00-11:50 am, LinH 234  
**Lab:** T 1:10-3:00 pm, LinH 234

**Graduate TA:** Ross MacDonald

**FINAL EXAM:** 8:00 - 9:50 pm May 2, 2000

**No Classes:** Jan 17 (M), Feb 21 (M), March 13-17 Spring Break, April 21 (F)

<table>
<thead>
<tr>
<th>Lectures</th>
<th>Labs</th>
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<tbody>
<tr>
<td>January 12-21</td>
<td>Equine Psychology and Behavior</td>
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<td>January 24-February 11</td>
<td>Anatomy and Physiology</td>
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<tr>
<td>February 11</td>
<td>Exam I (100 pts)</td>
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<td>February 16-29</td>
<td>Conformation and Gaits</td>
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<td>March 1-March 24</td>
<td>Unsoundness, Blemishes and Lameness</td>
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<tr>
<td>March 27</td>
<td>Exam II (100 pts)</td>
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<td>March 29-April 12</td>
<td>Diseases and Parasites</td>
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<td>April 14-April 19</td>
<td>Reproduction &amp; Breeding</td>
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<tr>
<td>April 24</td>
<td>Exam III (100 pts)</td>
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<tr>
<td>April 26-April 28</td>
<td>Nutrition &amp; Management</td>
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<tr>
<td>May 2</td>
<td>Final Exam (100 pts)</td>
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ARNR 432 SHEEP PRODUCTION SPRING 2000
Class: 8:00 to 8:50, Tuesday and Thursday, Linfield 231
Labs 1:10 to 3:00 Thursday
Eight hour lambing shift at Redbluff

Patrick G. Hatfield
230A Linfield
ph 994-7952 email hatfield@montana.edu


Course Goals:
  a) Student learns the biological characteristics of sheep and how this relates to production and market environments.
  b) Students develop an understanding of basic husbandry, fiscal, and management skills required for sheep production.
  c) Introduce students to the application of scientific principles for efficient sheep management.
  d) Students further develop their written, oral, and investigative skills.

Grading:

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<th>Points</th>
<th>Source</th>
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<td>175</td>
<td>7 quizzes @ 25 pts each</td>
<td>90 +</td>
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<td>350</td>
<td>14 homework or lab assignments or lab quizzes @ 25 pts each</td>
<td>80 – 89</td>
<td>B</td>
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<tr>
<td>50</td>
<td>Breed paper and class presentation</td>
<td>70 – 79</td>
<td>C</td>
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<tr>
<td>50</td>
<td>Health paper and class presentation</td>
<td>60 – 69</td>
<td>D</td>
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<td>625 TOTAL</td>
<td>- 60</td>
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*Quiz content will include reading and lecture material assigned or covered since the last quiz.
*Homework assignments will cover a number of topics from synthesis of reading and lab material to example production problems.
* Lab assignments or quizzes will be conducted in lab and cover reading assignments, material covered in lab that day, as well as previous labs with similar subject matter.
*Unsatisfactory performance lambing at RedBluff = minus half your final letter grade.
*Non-attendance for lambing at RedBluff = minus a whole final letter grade.

Missed or late Homework, quizzes, labs, and projects:

No make-up quizzes, homework, or labs. You may drop one quiz score and one homework/lab score from your final grade. First quiz missed for any reason is your drop score. First homework/lab assignment missed for any reason is your drop score. If you do not miss any quizzes or homework/lab assignments, your lowest score on each will be dropped. Missed assignments (after the first drop) for valid reasons will not be factored into final grade. Valid excuses for missed work or attendance are verified medical and family emergencies, and University functions. University functions (notice must be given in advance) and emergencies must be verified in writing by attending professional (i.e. professor, physician, minister, judge, etc.). Written excuses would include name, title, address and phone number of attending professional.
<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture</th>
<th>Quiz</th>
<th>Homework or Lab assignment</th>
<th>Lab</th>
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<tbody>
<tr>
<td>Jan 13</td>
<td>Thur - Introduction Genetics and Reproduction</td>
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<td></td>
<td>Breeding project assignment @ Linfield 231</td>
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<td>Jan 18</td>
<td>Tues - Genetics and Reproduction</td>
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<td>NSIP @ Linfield 231</td>
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<td>Thur - Genetics and Reproduction</td>
<td>X</td>
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<td>Tues - Economic tools</td>
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<td>Feb 3</td>
<td>Thur - Economic tools</td>
<td>X</td>
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<td>Intro to computer lab @ comp. lab</td>
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<td>Feb 8</td>
<td>Tues - Nutrition</td>
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<td>Feb 10</td>
<td>Thur - Nutrition</td>
<td>X</td>
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<td>Feb 15</td>
<td>Tues - Grazing Nutrition</td>
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<td>Economic evaluation of breeding program @ comp. lab</td>
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<td>Thur - Lamb finishing</td>
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<td>Computer based ration formulation @ comp. lab</td>
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<td>Feb 22</td>
<td>Tues - Lamb finishing/quality research</td>
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<td>Feb 24</td>
<td>Thur - Carcass quality</td>
<td>X</td>
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<td>Tues - Wool</td>
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<td>Wool @ MSU wool lab</td>
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<td>Mar 2</td>
<td>Thur - Wool</td>
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<td>X</td>
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<td>Mar 7</td>
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<td>X</td>
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<td>Mar 11</td>
<td>Tues - Break</td>
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<td>Mar 16</td>
<td>Thur - Break</td>
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<td>Mar 18</td>
<td>Tues - Wool</td>
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<td>Mar 23</td>
<td>Thur - Wool</td>
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<td>Tues - Wool</td>
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<td>Mar 30</td>
<td>Thur - Student presentations on health/lamming</td>
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<td>Student presentations on health/lamming @ Linfield 231</td>
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<td>Apr 1</td>
<td>Tues -</td>
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<tr>
<td>Apr 6</td>
<td>Thur - Lambing</td>
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<td>X</td>
<td>Intro to lambing @ RedBluff</td>
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<td>Tues - Lambing</td>
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<td>Farm flock economic evaluation @ comp. lab</td>
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<td>Thur - Management</td>
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<td>Tues - Management</td>
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<tr>
<td>Apr 20</td>
<td>Thur - Management</td>
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<tr>
<td>Apr 22</td>
<td>Tues - Integrated crop/livestock systems</td>
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<tr>
<td>Apr 27</td>
<td>Thur - Integrated crop/livestock research and Evaluation</td>
<td>X</td>
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<td>Meat evaluation @ Fort Ellis</td>
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NR 432 labs

Goal: Students learn appropriate breed for production environment and management/market goals

Reading:
*One internet source
*One scientific/peer reviewed journal article
*SID manual
*Other source of students choosing

Activities:
*student prepares written and oral presentation

Materials/equipment/personal needed:
*none

Quiz:
Graded written and oral presentation

NSIP lab

Goal: Students learn how to use NSIP to aid in ram selection

Reading:
*SID 14-18, 52-56, 1129
*Extension publication
*Rodney??

Activities:
*Review and understanding NISP report format
*Example selection of rams for different management objectives

Materials/equipment/personal needed:
*NSIP records for 1998 Targhee ram lambs

Quiz:
*Select rams for two total different management goals
*Written questions on reading assignment
Title: Ram selection at Fort Ellis

Goal: Student learns and uses visual characteristics to select replacement rams

Reading:  
*SID 928-937

Activities:  
*Discuss, describe and demonstrate principles of visual ram selection and principles of breeding soundness  
*Each student will conduct a breeding soundness exam on a set of rams

Materials/equipment/personal needed:  
*Targhee ram lambs

Quiz:  
*Successful completion of a breeding soundness exam on a number of rams  
*Written questions on reading assignment
Time: Breed presentations

Goal: Student develop written and oral skills to teach the class about their assigned breed

Reading:
* see first lab

Activities:
* see first lab

Materials/equipment/personal needed:
* student needs for presentation

Quiz:
* graded written and oral presentation
* presented and written material will be included in next lecture quiz
Title: How to tell the "good" from the "bad"

Goal: Visually determine coarse vs. fine wool, high vs. low yields, good vs. poor quality.

Reading: "Wool Evaluation and Fleece Judging" from SID

Activities:
- Demonstrate OFDA
  - Show a fleece with a break.
  - Show low and high yielding fleeces, and fleeces with different grades.
  - Display fleeces of different breeds
  - Make staple cards.
  - Practice grading 10 fleeces.

Materials/equipment/personnel needed:
- Broken fleece, high and low quality fleeces, fabric, grading fleeces, stapler, 10 fleeces to grade

Quiz:
- Rank three fleeces finest to coarsest
- Rank three fleeces highest to lowest yielding (only on basis of grease and dirt for now)
- Rank four fleeces best to worst according to market value

---

Title: Wool contamination and inherent qualities

Goal: Be able to recognize different parts of the fleece and its contaminants.

Reading: "Nutrition" and "Management" from SID

Activities:
- Visually demonstrate different types of wool contamination
  - Demonstrate skirting
  - Show offsords
  - Practice grading 10 fleeces

Materials/equipment/personnel needed:
- Skirting table, offords, cotted fleece, contaminated fleece, two sets of 10 fleeces to grade

Quiz:
- Rank four fleeces lowest to highest yielding (keeping in mind all possible contaminants)
- Identify most common offords
- Identify contaminants
- Grade 10 fleeces
Title: Comparative wool evaluation

Goal: Be able to rank a class of wool and give reasons.

Reading: "Wool Evaluation and Fleece Judging" from SID

Activities:
- Evaluate four fleeces to rank them most to least valuable. This activity incorporates everything covered, from inherent qualities, to contamination, to classing.

Materials/equipment/personnel needed:
- Four or five sets of fleeces, forms, examples to follow

Quiz: Write up reasons
Title:  Ration formulation lab in computer lab

Goal:  Introduction to computer based ration formulation

Reading:
  *hand-out on K state sheep ration formulation
  *In conjunction with reading assignment from lecture

Activities:
  *Hands on use of computer based ration formulation program
  *Run formulations for late gestation and early lactating ewes in confinement with different feed resources
  *Develop supplementation strategy for grazing ewe

Materials/equipment/personal needed:
  *K state software

Quiz:
  *lab and homework combination
Title: Ration formulation lab in computer lab

Goal: Formulate receiving and finishing ration for feedlot lambs

Reading:
  * In conjunction with reading assignment from lecture

Activities:
  * Run formulations for receiving and finishing diets with different feed resources

Materials/equipment/personal needed:

Quiz:
  * Two formulations due in class
Title: Meat lab

Goal: Student learns basic of lamb grading system and assessing carcass quality

Reading:
*handouts on grading and sheep grading systems

Activities:
*Evaluation of 5 lamb carcasses
*Determine maturity, dressing percent, calculate ribeye area, measure actual ribeye area, measure backfat thickness, determine adjusted backfat thickness, determine yield grade, determine cutability and quality grade

Quiz:
*Carcass evaluation
True: Red Bluff field trip

Goal: Introduction to 8 hour lambing shift at Red Bluff

Reading:
  *In conjunction with lecture reading assignments

Activities:
  *Trip to Red Bluff, Pete or Marian outline student participation in lambing

Materials/equipment/personal needed:
  *Motor pool Van

Quiz:
  Points for attending
Title: Red Bluff lambing

Goal: Student becomes exposed to a shed lambing operation through work experience

Reading:
   *In conjunction with lecture

Activities:
   Whatever the day dictates

Materials/equipment/personal needed:
   *Student needs to transport self to Red Bluff

Quiz:

Note: failure to participate in 8 hour lambing at Red Bluff will result in a course 1 letter grade reduction
<table>
<thead>
<tr>
<th>Title:</th>
<th>Introduction to financial software programs</th>
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<tr>
<td>Goal:</td>
<td>Work with Duane to establish goals, reading, activities, and quizzes for this lab and following 2 labs</td>
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<td>Activities:</td>
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<td>Materials/equipment/personal needed:</td>
<td>*Dwane's software</td>
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Title: Lamb quality evaluation

Goal: Students recognize the quality potential of lamb

Reading:
  *In conjunction with lecture

Activities:
  *Taste evaluation lab at fort ellis

Materials/equipment/personal needed:
  *lamb carcasses from carcass evaluation lab
  *Taste panel evaluation form from Ray Field at UW

Quiz:
  *Taste panel evaluation
ARNR 434
BEEF CATTLE MANAGEMENT
Fall 1999

CATALOG DESCRIPTION:
Integration of the principles of nutrition, genetics, physiology, range ecology, and economics into practical and profitable ranch management and business plans. Utilization of performance and financial records, budgeting, feed resource planning, marketing strategies, breeding plans, computer applications, and case studies.

INSTRUCTOR: Mike Tess
117 Linfield Hall
994-5610

Office Hours: 10:00 - 11:45 Tuesday & Thursday
Unscheduled visits are welcome.

ASSISTANT: Bruce Shanks
101 Linfield
994-3728

LECTURE: Tuesday, Thursday 9:00 - 9:50 AM
234 Linfield Hall

LAB: Tuesday 1:10 - 3:00 PM, Thursday 3:10 - 5:00 PM
234 Linfield Hall, or as announced.

REQUIRED PREREQUISITES:
ARNR 230 Range Livestock Production
ARNR 100 Introduction to Animal Science
ARNR 101 Principles of Rangeland Management
ARNR 240 Principles of Natural Resource Ecology
ARNR 320 Animal Nutrition
BIOL 102 Molecular & Cellular Biology
BCHM 122 Organic & Biochemical Principles
ARNR 321 Physiology of Reproduction
VTMB 271 Functional Anatomy of Domestic Animals
ARNR 322 Principles of Animal Breeding
STAT 216 Elementary Statistics
AGEC 341 Farm & Ranch Management
ECON 201 Introductory Microeconomic Theory
ECON 101 Economic Way of Thinking

RECOMMENDED PREREQUISITES:
ARNR 234 Applied Techniques in Livestock Management – Beef Cattle
ARNR 235 Applied Techniques in Livestock Management – Range
ARNR 421 Assisted Reproductive Technologies
ARNR 437 Grazing Management
ARNR 480 Livestock Health Management
AGEC 321 Economics of Agricultural Marketing
AGEC 345 Agricultural Finance & Credit Analysis
P&S 342 Forages
REQUIRED:
- Two 3.5" computer diskettes (available from the bookstore).
- One 3-ring binder with dividers
- Calculator
- Sincere interest in the livestock industry
- Strong desire to learn
- Commitment to work

RECOMMENDED:
- Beef Production and Management Decisions 3rd Edition
  by Robert E. Taylor and Thomas G. Field

REFERENCES:
- Montana Beef-Cow-Calf Handbook
  MSU Extension Service Publication
- Beef Cattle Production: An Integrated Approach
  by Verl Thomas
- Farm Management
  by Boehlje and Eidman
- Nutrient Requirements of Beef Cattle
  NRC, 7th edition - 1996
- Grazing Management
  by Valentine

OBJECTIVES: Students successfully completing ARNR 434 will:

1. Be able to identify and analyze technical problems in beef cattle production systems.

2. Be capable of integrating facts and concepts from nutrition, genetics, physiology, range ecology, and economics into practical and profitable ranch management plans.

3. Be familiar with current issues and problems facing the beef cattle industry.

4. Be able to prepare budgets and financial statements using simple computer spreadsheets.

5. Be familiar with information resources available on Internet.

6. Have developed a satisfactory detailed management and business plan for a commercial cattle ranch.
GRADING:

- Exams: 30%
- Ranch Project: 50%
- Homework & Labs: 20%

100%

Due date for completed ranch project = 5:00 PM Dec 3 (Friday)

Exams = Sept 30, Nov 4

Final Exam = 12:00 - 1:50 PM Dec 17

***** Anyone that has special learning or testing needs should consult with me during the first week of class.

Copies of old exams will be made available through the computer folder "Mike Tess". Exams will be graded on accuracy and completeness of answers, and depth of thought. Project and case problem grading will emphasize depth of thought, clarity of explanations, neatness of presentation, plus spelling and grammar. Labs not connected with case problems or the ranch project will be graded on completeness, neatness, and correctness. Some homework assignments may take the form of team projects.

Final course grades will be curved if necessary, however course grades will generally be assigned as follows:

- $\geq 90\% = A$
- $80 - 89\% = B$
- $70 - 79\% = C$
- $60 - 69\% = D$
- $\leq 59\% = F$

MAKE-UP POLICY:

Make-ups or exceptions to assigned work or scheduled exams must be agreed upon in advance. The only valid excuses for missed work or attendance will be medical and family emergencies, which are verified in writing by an attending professional (i.e., physician, minister, judge, etc.). Written excuses must include the name, title, address and phone number of the attending professional. I will judge work missed for all other reasons on an individual basis. Unless excused in advance, assignments turned in late will be penalized 5% for each day (calendar day, Monday through Friday) late. Work due on Tuesday will not be accepted after the following Friday, and work due on Thursday will not be accepted after the following Monday.
MODE OF INSTRUCTION:

Ranch management skills cannot be mastered by memorizing a set of facts. Certainly, knowledge is required in order to successfully manage a ranch; however, experience also plays an extremely important role. Management includes setting goals, evaluating alternative decisions, predicting outcomes, integrating facts and concepts from many disciplines of learning, working with people, budgeting time, dealing with uncertainty. A college class can help you develop several, but not all of the necessary skills required for success in the ranching business. In ARNR 434 I will attempt to:

1. Provide you with some practical management tools and skills (knowledge).

2. Challenge you to integrate facts and concepts from previous course material, practical experience, and common sense.

3. Simulate some practical management situations in order to allow you to experience developing management plans and making decisions.

In an attempt to provide more meaningful experiences, a portion of the course will involve the case method of teaching. I will present a description of a problem along with the constraints and limited information available when decisions have to be made. You will be asked to place yourself in the position of a manager, to perform analyses, calculate predictions, make decisions and defend them. Sometimes, we will discuss these problems in class. My desire is for each one of you to actively participate in these discussions - weighing relevant factors, identifying underlying issues, and suggesting alternative solutions. I will ask questions and make comments to help keep us on track and stimulate discussion. I expect you to be prepared for class. Prerequisite course material will be very important and will not be repeated in lecture. Obviously, you cannot participate in discussions if you do not attend class. Management is not an exact science; many problems will have several "correct or acceptable" solutions. Hence, I will not be looking for a single solution to each problem. Thinking "out loud" is encouraged.

If you are confused, have questions, or would just like to discuss your ideas with me, please come by my office. I will do my best to make this course valuable to you.

Mike Tess
August 31, 1999
ARNR 434
Fall 1999
LECTURE TOPICS

I. INTRODUCTION (Chapter 3)

II. MARKETING – I (Chapter 1, 2, 15, 17)
    U.S. production/marketing systems
    Market classes and grades
    Market cycles
    Price risk
    Futures and Options

III. NUTRITION - REQUIREMENTS VS RESOURCES (Chapters 12, 13)
    Life-cycle nutrient requirements -- range resources, common stored forages
    Ration Balancing
    Winter feeding plans
    Range resources -- grazing impacts
    Grazing systems
    Ration Balancing
    Grazing plans
    Range monitoring

IV. HERD HEALTH (Chapter 14)
    Management decisions
    Diseases, parasites, poisons, and ailments common to Montana
    Example herd-health programs
    Pre-conditioning programs
    Certification programs

V. GENETICS - HERD COMPOSITION AND BREEDING VALUE (Chapters 10, 11)
    Culling vs. selection
    Identifying breeding value & National Cattle Evaluation
    Crossbreeding and breed evaluation
    Breeding plans

VI. MATCHING GENETIC AND NUTRITIONAL RESOURCES, AND MONITORING PERFORMANCE
    (Chapters 9, 15)
    Resource constraints and ranch management
    Efficiency and profit
    Records and record systems
    Breeding seasons
    Calving sequence analyses
    Integrating breeding, feeding, and grazing plans
VII. MARKETING – II (Chapters 6, 7, 8, 17)
   Price discovery
   Transportation and shrink
   Forward contracts
   Auction markets
   Retained ownership
   Custom feeding arrangements
   Marketing formulas and grids
   Alliances

VIII. FINANCIAL INFORMATION STATEMENTS
   Balance sheets
   Income statements
   Cash Flow statements
   Standard Performance Analysis (SPA)

IX. BUDGETS (Chapter 5)
   Cash Flow budgets
   Enterprise budgets
      Cow-calf
      Retained Ownership
   Partial budgets
   Breakeven prices
   Cash and non-cash expenses
   Ownership and Operating expenses
   Machinery expenses

X. LEASES AND PARTNERSHIPS
   Types of lease and rental arrangements
   Partnerships
   Share arrangements
   Budgets for partnerships and share arrangements

XI. PERSONNEL MANAGEMENT
   Personality differences
   Incentives and rewards

XII. INDUSTRY ISSUES

XIII. CASE STUDIES
LAB TOPICS & ACTIVITIES

Exams - dates = Sept 30, Nov 4

Ranch project field trip - this will take all of one afternoon,

Ration formulation and feeding plans

Grazing plans

Financial statements

Enterprise budgets

Machinery budgets

Marketing alternatives

Futures and Options

Retained ownership

Discussions of case problems

Discussions of ranch project

Some lectures given in lab
Knowledge expected of students entering ARNR 434 – Beef Cattle Management.

1. Production systems
   a. Fundamental production segments of beef industry: seedstock, cow-calf, stocker, feeder, packer, processor, broker, retailer, etc.
   b. Market classes and grades

2. Cow-calf management
   a. Annual production cycle.
      Management groups
   b. Husbandry and care of:
      replacement heifers
      cows during breeding season
      cows during calving season
      newborn calves
      bulls
   c. Condition and frame scoring
   d. Growth implants
   e. Corrals and facilities
   f. Hands-on experience with cattle behavior, etc.

      Heritability
      Genetic correlation
      Selection differential
      Genetic and phenotypic variance
      Direct and correlated response
   b. Genetic evaluation of animal raised in different contemporary groups
      National cattle evaluation
      EPD
   c. Records and recording systems
      Adjustment of records
      MPPA
      205-d weight
   d. Inbreeding, crossbreeding and heterosis
   e. Crossbreeding systems – advantages and disadvantages
   f. Traits of importance.
   g. Major breeds in the U.S.

4. Nutrition
   a. Digestive anatomy, physiology, metabolism
   b. Energy and protein feeding systems
      GE, DE, ME, NE
      CP, MP
   c. Vitamins, macro minerals, and trace minerals
      deficiencies
      toxicity
      natural sources
   d. Ration balancing
      Hand calculations – balancing for one nutrient
      Computer software – balancing for several nutrients
e. Physiological state and nutrient requirements
   maintenance, gestation, growth, lactation, fat-stores
   critical temperature
      heat, cold, wind, wet, etc.
f. Feedstuffs and feed processing
   forages – native and domestic
   concentrates
   supplements

g. Feed additives
   antibiotics
   ionophores
   bloat inhibitors, etc.
h. Feeds and rations common to MT production systems
   frequent concerns

5. Reproduction
   a. Reproductive anatomy, physiology
   b. Normal reproduction – physiology and behavior
      puberty, estrus, ovulation, copulation, conception, gestation, parturition, anestrus
   c. Management strategies to optimize reproductive success
      AI
      Estrus synchronization
      Pregnancy diagnosis
      Embryo transfer
d. Breeding seasons
e. Cow/bull ratios

6. Range Management
   a. Basic range types
      major regions
      riparian vs upland sites
   b. Grasses, forbs, shrubs
      Cool- vs warm-season grasses
      life cycles
   c. Requirements for plant (community) success
   d. Range condition, succession
   e. Basics of grazing impacts
      stocking rate
   f. Basics of grazing systems
      rest
      differment
      rotation
   g. Social issues relevant to MT
   h. Basic ecological concepts
      interactions among
      livestock
      wildlife
      range plants
      insects
      climate, weather
      ecosystems
      measures of ecosystem health
ARNR 435
Feedlot Management
John Paterson, Professor of Animal Science, 994-5562, 215 Linfield Hall

A. Course Description:

1. Goals of Course. Application of techniques in beef cattle nutrition and feedlot management. Emphasis is placed upon the following topics: Cattle Feeding in the United States; Feedyard Management Principles; Receiving and Processing of Feedlot Cattle; Waste Management Practices; Ration Balancing; Feed Additives and Regulations; Diseases and Health Programs, Food Safety and Indepth Computer Usage.

2. Course Content Outline
   This is a two credit course offered through the Department of Animal & Range Sciences and will be taught for two periods each week (T and R). The outline of this course is the following.
   a. Cattle Feeding Enterprise in the United States (1 lecture)
   b. General Management of the Feedyard Enterprise (8 lectures)
      1. the feedyard manager
      2. feedyard management principles
      3. feedlot safety
      4. beef quality assurance
      5. receiving feeder cattle
      6. handling and processing of feeder cattle
      7. feedlot waste management principles
   c. Feeding and Nutritional Principles
      1. feeds and ration balancing
      2. what is a stepup ration
      3. feedmill operation and grain processing
      4. feedbunk management
      5. feed additives and implants
   d. Animal Health Issues
      1. diseases of feedlot cattle and health programs
      2. processing, handling and morbidity management
   e. Economics
      1. factors affecting feedyard performance
      2. managing for profit
      3. financing

3. Required Test: None
   Optional reading: Cattle Feeding: A Guide to Management (Albin and Thompson)
   The Feedlot (Thompson and O'Mary)
   Feeding Beef Cattle (Matsushima)

4. The course has 300 points:
   2 hour exams 100 points
   Several quizzes 50 points
   4 computer assignments 100 points
   Final exam 50 points
ARNR 437
Grazing Management
Fall 1999

Instructor:  
Bok Sowell  994-5558  
231A Linfield Hall

Class:  
M, W, F  10:00 - 11:50 am  
231 Linfield Hall

Office Hours:  
M  4:00-5:00 PM  
T, TH  8:00-10:00 AM

Course Objectives:

❖ Students should be able to calculate stocking rates and complete forage balance sheets.
❖ Students should become familiar with individual plant, community and animal responses to grazing.
❖ Emphasis will be placed on ecological principles and how those principles apply to grazing management problems.
❖ Students will be expected to read current scientific literature and evaluate information in written and oral form.

Field Trips:

❖ Field trips are required - If you cannot attend, an alternative assignment will be given.

❖ September 6th-7th :: Boone & Crockett Ranch, Dupuyer, Montana. Bring a sleeping bag and food. We will be leaving Labor Day at 10:00 am and returning midnight Sept. 7th. Dress for hiking in bad weather.

© No Classes: Sept 9, Nov. 11, Nov. 25, Nov 27.

Suggested Texts:

   Edited by Vavra Laycock and Pieper. Society for Range Management (SRM).
   Maverick Publications. Drawer 5007, Bend, Oregon 97708.

Additional Readings: On reserve in the Renne Library.

★ This class will require that you keep up with the reading assignments.
★ Two hours of outside reading will be required for every class hour.
★ Additional assignments, formats and due dates will be given in class.

The class will be divided into 3 sections.

Section 1: Aug. 30 - Oct. 1  Plant Responses to Grazing
Section 2: Oct. 4 - Nov. 5  Animal Responses to Grazing
Section 3: Nov. 8 - Dec. 14  Grazing System Review

Grading:

Question Responses: 9 @ 35 points = 315 points
Homework: 50 points
Forage Balance Sheets: 3 @ 25 points = 75 points
Quizzes: 10 @ 25 points = 250 points

Total Points: 690 points

A = 621   B = 552   C = 483   D = 414   F = ✗
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<tr>
<th>TOPIC</th>
<th>VALLENTINE TEXT</th>
<th>READINGS</th>
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<tr>
<td><strong>Section 1</strong></td>
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<tr>
<td>History &amp; Policy</td>
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<td>Ecological Perspectives</td>
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<td><strong>December 14th</strong></td>
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Examinations will be used throughout the semester to evaluate class performance. These exams may be given during any class period.* Their value will be designated on each exam and may vary with the material included and specific nature of the questions. Total points for exams given before the final will be approximately 345 points (see exam below).

The final examination will be comprehensive and worth approximately 90 points. All students will be required to take the final.

If any other assignments are made throughout the semester, the class will be notified as to its point value for purposes of determining the final course grade.

*Tentative exams dates are:  
Jan. 28 (50 pts)  
Feb. 25 (70 pts)  
Mar. 03 (with plant ID) (70 pts)  
Mar. 31 (65 pts)  
Apr. 28 (90 pts)

Maximum requirements for letter grades are as follows  
(The letter grades will be evenly broken into + and - grades):

A - ≥ 90% of all possible points assigned to tests and assignments

B - 80-89% of all possible points assigned to tests and assignments

C - 70-79% of all possible points assigned to tests and assignments

D - 60-69% of all possible points assigned to tests and assignments

F - < 60% of all possible points assigned to tests and assignments

If the grade distribution is low these standards may be lowered.

Field trip: Field trips are scheduled for April 3 and April 17 (Alternate date is April 19). It will be necessary to participate on this trip to complete the class. No excuses accepted.
Make-Up Policy

Make-ups or exceptions to assigned work or scheduled exams must be communicated and agreed upon in advance. The only valid excuses for missed work or attendance will be verified medical and family emergencies. Emergencies must be verified in writing by an attending professional (i.e., physician, minister, judge, etc.). Written excuses must include the name, title, address and phone number of the attending professional. Excuses based on reasons other than medical and family emergencies will be judged on an individual basis by Dr. Wambolt.
OBJECTIVE:
To integrate range science principles with the life requirements of wildlife populations for the synthesis of management alternatives.

CLASS MEETINGS:

1. Introduction to course with important dates for tests and field trips, outline of course, field trip requirements.
2. "One year plan" - an introduction to wildlife population dynamics.
3. Annual turnover of wildlife species, life expectancy curves, and their use for management and the concepts of carrying capacity for wild vs domestic animals with consideration of grazing capacities and stocking rates.
4. Saturation points in wild populations and the principal of inversity.
5. "Boom and bust" and summary of population dynamics in wild animals.
6. Introduction of the survival triangle concept beginning discussions on "cover" and concepts of plant succession as related to wildlife habitat.
7. Exam #1
8. Security and thermal cover for wildlife defined and discussed. The importance of cover in management examples.
9. The distributions of wildlife species in Montana and their relative differences or similarities in habitat.
10. Discussion of research paper dealing with plant succession and the processes relationship to wildlife.
11. Introduction of important browse species for wildlife considerations including the important taxonomic characteristics and the use of a plant key constructed for winter characteristics.
12. Vegetative pattern and its importance to wildlife. The law of interspersion and examples from several studies dealing with wildlife use of vegetative patterns and manipulation of vegetative pattern by logging, burning, etc.
13. Effects of vegetative manipulation of vegetative pattern for wildlife "edge" and "law of dispersion" with management examples.
14. The use of edge in determining the value of wildlife territories, the use of a diversity index for edge, and summary of cover for wildlife with slides.
15. Water considerations with slides.
16. Exam #2
17. Plant identification characteristics with practice test.
18. Forage relationships, including historical use of AU, PU, and grazing systems.
19. Exam #3 with plant ID.
20. The implications of traditional range improvements for livestock on wildlife.
21. The use of forage conversion factors, diet overlap, discussion of viewpoint papers in JRM, and nutritional considerations for wildlife.
22. Protein and digestibility tables for important wildlife forages and discussion of nutrition paper from JRM dealing with theoretical wildlife needs.
23. Terms relating to forage for wildlife, food, habit, study methods, and presentation of form class usage for browse plants with slides.
24. Diets of important wildlife species and interpretation of data from dietary studies, etc.
25. Land use competition (forage and social).
26. The concept of key species as they relate to wildlife habitat.
27. Sagebrush research as it applies to wildlife species.
28. **Exam #4**
29. Background information on the Northern Yellowstone Winter Range controversy.
30. Gallatin Canyon field trip with Fish, Wildlife & Parks biologist.
31. Continuation of Northern Yellowstone Winter Range information.
32. Effects on wildlife and wildlife habitat from fire in the Yellowstone ecosystem.
33. Guest lecture from Forest Service biologist dealing with moose studies in the Yellowstone ecosystem.
34. Field trip to the Northern Yellowstone Winter Range.
35. Guest lecture from National Biological Service researcher on browsing effect on vegetation of Yellowstone National Park.
36. Slide presentation to emphasize important points covered throughout the semester.
37. Guest lecture by Montana Fish, Wildlife & Parks biologist in charge of wildlife ranges in the state of Montana.
38. Guest lecture by Montana Fish, Wildlife & Parks biologist regarding foreign experiences and opportunities in range-wildlife management.
39. **Final Exam.**
ARNR 440 - NATURAL RESOURCE POLICY

Instructor: Dr. Clayton B. Marlow
Office: 204 Linfield Hall
Phone: 994-5744

Course Objectives
At the conclusion of this course, students should be able to:

- Explain the role of technological and social changes in the creation of policy regulating the use of natural resources.

- Describe the policy set forth in the major Federal legislation; list the agency or agencies responsible for implementation.

- Outline the effect of the various regulations on the use of natural resources.

Course Option
Policy
What is it?
How is it used?

Development of the American Natural Resource Ethic
Homestead Acts
Land Grants

Development of the Conservation Movement
Forest Service Organic Act
Taylor Grazing Act
Multiple Use and Sustained Yield Act

Growth of Environmentalism
National Environmental Policy Act
Wilderness Act
Threatened and Endangered Species Act
Wild Free Roaming Horse and Burro Act
Federal Land Management and Policy Act

Sustainability
Food and Security Act
Clean Water Act

Grading Policy
Exams 50%     A = 90%
Classroom microthemes 20%     B = 80%
Final 30%     C = 70%

D = 60%
Rangeland Resource Measurements
ARNR 453 - Fall 1999
Lecture - Tuesday, Thursday 9:00-9:50 Linfield Hall 231
Laboratory - Tuesday 1:10-3:00 Linfield Hall 231

Instructor: Bret E. Olson
Office: 114 Linfield Hall, 994-5571
Office hours: M,W,F 9-10, TR 4-5, or by appointment

Course Description: This course will cover why and how we measure our rangeland resources.

Course Objectives: Once you have finished this course, you should be able to:
1) explain why we measure our rangeland resources,
2) describe and compare methods to measure vegetation, animal use, soils, and watersheds, and
3) identify appropriate monitoring and evaluation techniques for a given situation.


Periodically, assigned readings will be on reserve in the library. Material from assigned readings may be incorporated into exams.


Grading: Grades will be based on a writing exercise, a statistical exercise, laboratory exercises, two midterms, one writing assignment/project, and a final examination. Final grades will be determined using the following weighting:

1 writing exercise 10%
1 statistical exercise 10%
laboratory exercises 5%
2 midterms 30%
1 project assignment 25%
final 25%

where 88-89% = B+ 78-79% = C+ 68-69% = D+ <60% = F
92-100% = A 82-87% = B 72-77% = C 62-67% = D
90-91% = A- 80-81% = B- 70-71% = C- 60-61% = D-
## Rangeland Resource Measurements

### August

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
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<tbody>
<tr>
<td>31</td>
<td>Introduction</td>
<td>134-146</td>
</tr>
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<td>31</td>
<td>Units for measurement</td>
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### September

<table>
<thead>
<tr>
<th>Date</th>
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<tbody>
<tr>
<td>2</td>
<td>Field sampling</td>
</tr>
<tr>
<td>7</td>
<td>Mapping</td>
</tr>
<tr>
<td>7</td>
<td>Field Lab 1</td>
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<tr>
<td>9</td>
<td>Vegetation measurements</td>
</tr>
<tr>
<td>14</td>
<td>Frequency</td>
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<td>14</td>
<td>Cover</td>
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<tr>
<td>16</td>
<td>Field Lab 2</td>
</tr>
<tr>
<td>21</td>
<td>Density</td>
</tr>
<tr>
<td>21</td>
<td>Biomass</td>
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<tr>
<td>23</td>
<td>Field Lab 3</td>
</tr>
<tr>
<td>28</td>
<td>Soil measurements</td>
</tr>
<tr>
<td>28</td>
<td>Watersheds, GIS/GPS</td>
</tr>
<tr>
<td>30</td>
<td>Field Lab 4</td>
</tr>
<tr>
<td></td>
<td>Vegetation - baseline measures</td>
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<tr>
<td></td>
<td>Range site/Ecological site</td>
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<td></td>
<td>66-75, 82-85</td>
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### October

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<tr>
<td>5</td>
<td>Midterm</td>
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<td>Field Lab 5</td>
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<tr>
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<td>Habitat type</td>
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<td>12</td>
<td>Riparian classification</td>
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<tr>
<td>12</td>
<td>Field Lab 6</td>
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<tr>
<td>14</td>
<td>Watershed - baseline measures</td>
</tr>
<tr>
<td>19</td>
<td>Soils - baseline measures</td>
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<tr>
<td>19</td>
<td>96-114</td>
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<td>19</td>
<td>Large herbivore use</td>
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<td>Large herbivore use</td>
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<td>26</td>
<td>Range condition and trend</td>
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<td>51-65, 75-82</td>
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<td>Range condition and trend</td>
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<td>85-96</td>
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<td>Rangeland health</td>
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### November

<table>
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<th>Topic</th>
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<tr>
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<td>Midterm</td>
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<td>Parametrics</td>
</tr>
<tr>
<td>9</td>
<td>Parametrics</td>
</tr>
<tr>
<td>11</td>
<td>Veteran's Day - No class</td>
</tr>
<tr>
<td>16</td>
<td>Parametrics</td>
</tr>
<tr>
<td>16</td>
<td>Parametrics</td>
</tr>
<tr>
<td>18</td>
<td>Non-parametrics</td>
</tr>
<tr>
<td>23</td>
<td>Non-parametrics</td>
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</table>
25
30
30

Holiday - Thanksgiving
Sampling design
Biodiversity

DECEMBER
2
7
7
9
17

USDA Forest Service 147-156
Montana Dept. Fish, Wildlife and Parks
USDA Natural Resources Conservation Service
USDI Bureau of Land Management
Final - 12:00-1:50 Linfield 231
RANGELAND RESOURCE MEASUREMENTS

I. Introduction - measuring rangeland resources, inventory vs. monitoring
II. Units for Measurement
III. Field Sampling
IV. Vegetation Measurements
   A. Frequency
   B. Cover
   C. Density
   D. Biomass
V. Soil Measurements
VI. Watershed Measurements

VII. GIS/GPS
VIII. Monitoring and Evaluation
   A. Baseline
      - vegetation
      range site, habitat types, riparian classification
      - soil
      - watersheds
   B. Large herbivore use
   C. Range condition and trend
   D. Rangeland health

IX. Statistical Concepts for Field Sampling
   A. Parametrics
   B. Nonparametrics
   C. Sampling design
   D. Interpretation

X. Biodiversity

XI. Agency Methods
   A. USDA Natural Resources Conservation Service
   B. USDA Forest Service
   C. Montana Department of Fish, Wildlife and Parks
   D. USDI Bureau of Land Management
ARNR 507 ~ Research Methods  
Syllabus

Instructor:  
Bok Sowell  
231 E Linfield Hall  
994-5558  
Office Hours: Tues, Thurs: 2 - 3 pm

Location:  
Linfield Hall  
Room 231  
3:10 pm Tuesdays

General Description:

Application of the scientific method and research techniques, including design of experiments and use of appropriate statistical methods.

Objectives:

1. Provide a forum for graduate students to present a thesis proposal early in their graduate program.
2. Provide a forum for graduate students to present thesis results near the end of their graduate program.
3. Improvement of communication skills in a scientific context, including the following:
   - Clear presentation of ideas, proposals and results
   - Organization of presentations
   - Interpretations of results
   - Presentation of hypothesis, literature, design, conduct, analysis, and results of a research project
   - Defense of ideas and results in a professional manner
4. Development of appreciation an understanding of the scientific method, professional expectations, and
5. Development of skills in critical review of research plans and results.

Grading System:

Requirements:
1. Attendance and participation every week. Grade will be reduced one letter for each unexcused absence, lack of participation or assignment not turned in on time. Please see instructor in advance concerning absences. Students are expected to ask questions in seminars. **Instructor will review written summaries and presentations if they are submitted 1 week before due date.**
2. Students are expected to produce their own work, but work may be reviewed by others prior to submission for grading.
3. 30 minute presentation, 100 points.
5. Grading: 135 = A, 120 = B, 105 = C
ARNR 520 – Nutrient Metabolism of Domestic Animals

GENERAL DESCRIPTION

The biochemistry of animal nutrition with emphasis on the integration of biochemical information to animal production systems. Nutrients emphasized are proteins, carbohydrates and lipids, with minor emphasis on vitamins and minerals.

INSTRUCTOR, CLASS TIME AND LOCATION

Lecture M-W-F 9:00-9:50 am, Room 233 Linfield Hall

Dr. Jan Bowman, Assistant Professor
Beef Cattle Nutrition
230-C Linfield Hall
994-5563

COURSE OBJECTIVES

1. To understand intermediary metabolism of carbohydrates, lipids, and amino acids, including the control of pathways, and their relation to nutrition.
2. To understand the interrelationships among nutrients.
3. To understand metabolic disorders related to animal nutrition.

GRADING SYSTEM

1. Quizzes 300 pts
2. Final exam 200 pts
3. Class exercises/problems 100 pts

TOTAL 600 pts

Grades are based on the total points earned as a percentage of total points possible.

90-100% = A
80-89% = B
70-79% = C
60-69% = D
< 60% = F
ARNR 520 – Nutrient Metabolism of Domestic Animals

Selected Topics in Comparative Digestive Physiology

Carbohydrate Metabolism

Sources of Glucose
Metabolic Fates of Glucose
Gluconeogenesis
Glycolysis
Reversal of Glycolysis
Glycogenesis
Glycogenolysis
Pentose-Phosphate Shunt
Fates of Pyruvate
Citric Acid or TCA Cycle

Lipid Metabolism

Metabolic Fates of Lipids
Fatty Acid Oxidation
Fatty Acid Synthesis
Lipogenesis & Esterification
Ketogenesis
Lipolysis
VFA Metabolism

Protein Metabolism

Metabolic Fates of Amino Acids
Absorption/Transport
Amino Acid Synthesis
Transamination, deamination
Ammonia Fixation, Fates of Ammonia
Urea Cycle
Amino Acid Catabolism
Gluconeogenesis

Summary of Metabolism & Nutrient Interrelationships

Metabolic Abnormalities
ARNR 520 - Advanced Animal Nutrition
Carbohydrate Metabolism Exam

This exam is open book and is worth 100 points. You may use any reference materials that you wish, class notes, textbooks, research papers, etc. However, I expect that you do your own work on the exam, and do not collaborate with your colleagues.

1. Summarize the differences in carbohydrate metabolism between ruminants and nonruminants (indicating differences in appropriate pathways and enzymes), and explain how these differences relate to glucose conservation in the ruminant.

2. Use the data in the following table to discuss the effect of the development of the ruminant digestive system on carbohydrate metabolism.

Activities of liver enzymes (umol-min⁻¹-g tissue⁻¹) as related to postnatal rumen development.

<table>
<thead>
<tr>
<th>Liver enzyme</th>
<th>Milk-fed calves</th>
<th>Early-weaned calves</th>
<th>Finished steers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose-6-phosphate dehydrogenase</td>
<td>2.71</td>
<td>2.01</td>
<td>.98</td>
</tr>
<tr>
<td>6-phosphogluconate dehydrogenase</td>
<td>3.51</td>
<td>1.59</td>
<td>1.34</td>
</tr>
<tr>
<td>Hexokinase</td>
<td>.71</td>
<td>1.30</td>
<td>.41</td>
</tr>
<tr>
<td>Phosphofructokinase</td>
<td>30</td>
<td>6.8</td>
<td>3.0</td>
</tr>
<tr>
<td>Glyceraldehyde-3-phosphate dehydrogenase</td>
<td>91</td>
<td>58</td>
<td>54</td>
</tr>
<tr>
<td>Glucose-6-phosphatase</td>
<td>.74</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Acetyl-CoA synthetase</td>
<td>.12</td>
<td>.50</td>
<td>.10</td>
</tr>
<tr>
<td>Malate dehydrogenase</td>
<td>.20</td>
<td>.44</td>
<td>.13</td>
</tr>
</tbody>
</table>
3. Use the data in the following table to discuss the effects of diet on carbohydrate metabolism in ruminants.

Dietary effects on enzyme activities (umol·min⁻¹·g tissue⁻¹) of carbohydrate metabolism in sheep liver.

<table>
<thead>
<tr>
<th>Enzyme</th>
<th>Roughage diet</th>
<th>Concentrate diet</th>
<th>Duodenal infusion of glucose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose-6-phosphate dehydrogenase</td>
<td>.90</td>
<td>1.76</td>
<td>Not determined</td>
</tr>
<tr>
<td>6- phosphogluconate dehydrogenase</td>
<td>11.59</td>
<td>13.79</td>
<td>16.15</td>
</tr>
<tr>
<td>Hexokinase</td>
<td>.33</td>
<td>.27</td>
<td>.29</td>
</tr>
<tr>
<td>Phosphofructokinase</td>
<td>4.73</td>
<td>6.96</td>
<td>7.18</td>
</tr>
<tr>
<td>Pyruvate kinase</td>
<td>6.67</td>
<td>15.51</td>
<td>24.29</td>
</tr>
<tr>
<td>ATP-citrate lyase</td>
<td>.062</td>
<td>.149</td>
<td>.056</td>
</tr>
<tr>
<td>Malate dehydrogenase</td>
<td>.18</td>
<td>.49</td>
<td>.32</td>
</tr>
</tbody>
</table>
ARNR 520 - Advanced Animal Nutrition  
Lipid and Protein Metabolism and Final Exam

This exam is open book and is worth 200 points. You may use any reference materials that you wish, class notes, textbooks, research papers, etc. However, I expect that you do your own work on the exam, and do not collaborate with your colleagues.

1. Can a net gain of carbohydrate be obtained from fatty acids? Why or why not?

2. Can triglycerides be converted to non-essential amino acids? If so, show how; if not, explain why not.

3. Can saturated fatty acids be converted to non-essential amino acids? If so, show how; if not, explain why not.

4. Glycerol-P used in triglyceride synthesis can come from two sources, what are they?

5. How can increased fat intake lead to increased cholesterol synthesis?

6. How are lipolysis and lipogenesis (includes fatty acid synthesis and esterification) controlled by insulin? (Include pathways and enzymes, and how they are affected)

7. Assume you have an unlimited supply of the metabolite on the left, and all the necessary enzymes, vitamins, minerals, ATP, CO₂, NH₃, etc., but no other metabolites. Treat each line from left to right as a separate problem. If the metabolite on the left, or any part of it, can be used as the sole source or the compound on the right, place an X in the box. If not, place a O in the box. Show how the synthesis occurs if there is an X in the box, and why it cannot occur if there is a O in the box.

<table>
<thead>
<tr>
<th>Metabolite</th>
<th>Pyruvate</th>
<th>Palmitic acid</th>
<th>α-glycerol phosphate</th>
<th>Alanine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leucine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arachidonic acid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threonine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glucose</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valeric acid C₆H₆COOH</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ARNR 522
Range Nutrition Techniques
Outline and Syllabus
Spring 1999

Instructor: Bok Sowell
Office: 231A Linfield Hall
Phone: 5558
Office Hrs: Monday, Wednesday, Friday: 9:00-10:00
Tuesday, Thursday: 9:15-10:15
or by appointment

Class Time:
Tuesday - Thursday
8:00 - 9:15 a.m.
233 Linfield Hall

GOALS:

• Introduce students to the theory and techniques used in range nutrition with emphasis on livestock and wildlife production.

• Graduate students should be able to evaluate scientific papers and communicate those findings in written and oral form.

• Students should have some practical experience with range nutrition techniques.

TEXT: Assigned readings will be provided.

NUTRITION CENTER CLASSES: January 21, January 28, March 2, April 8, April 15, April 22.

GRADES: Students will be expected to be prepared for each class by evaluating the reading material. Oral questions will be given in each class. Written assignments will also be required. No formal exams are scheduled, unless students fail to be prepared for class.

A = exceeds expectations  B = meets expectations  C = below expectations
ARNR 523
ADVANCED PHYSIOLOGY OF REPRODUCTION
Spring Semester
Syllabus

Sec 01: TR 1:10 p.m. to 2:00 p.m. F 2:10 p.m. to 3:00
Room: Rooms 231 (Range Lab) and 122G Linfield Hall (Student's Lab)

Instructor: James G. Berardinelli, Ph.D.
Professor
Office: 229 Linfield Hall
Lab: 123 Linfield Hall
Telephone: 994-5574 (office) or 994-5566 (lab)
E-mail: jgb@montana.edu
Office Hrs.: TR 9:00 to 11:00 a.m.

COURSE DESCRIPTION:

Lecture based course regarding basic concepts of reproductive processes of mammals with special emphasis on cellular and molecular technologies for solving reproductive problems. Topics range from the biology of sex to molecular aspects of sexual determination. Special reference will be given to domestic animals where models for these species are known; otherwise models from other species will be used to support concepts.

COURSE OBJECTIVES:

1. The student will have a general working knowledge of the reproductive system of mammals.

2. The student will have specific knowledge pertaining to the gross and microscopic anatomy of the reproductive tract of mammals.

3. The student will have a working knowledge of the neuroendocrine and endocrine systems that affect reproductive processes.

4. The student will have a working knowledge of general and specific factors that alter reproductive function in mammals.

5. The student will be able to apply the knowledge gained in this course to solve problems associated with reproductive cycles and fertility in male and female mammals.
6. The student should be able to discuss and or answer questions of a specific nature related to the course material and literature pertaining to the field of reproductive physiology.

**METHODS FOR ATTAINING OBJECTIVES:**

1. Lecture and discussion either in class or from the INTERNET
2. Handouts, diagrams, models, video tapes, and the Internet
3. Specific readings from the scientific literature
4. Brief sessions on laboratory methods and hands-on laboratory material
5. A term paper on selected (current) topics in reproductive physiology
6. A 20-min presentation, given to the class, regarding the central problem of the term paper, and discussion of the methods and conclusions of the paper
7. Written and oral examinations throughout the semester

**STUDENT EVALUATION (GRADING):**

Letter grades will be assigned in this class: A, B, C, D, and F. The assignment of a letter grade will be based upon the student’s performance in the following exercises:

A. Written Examinations (worth 60% of grade):

   1. **Three** 1hr exams during term
   2. **One** 2 hr oral exam

B. Term Paper (worth 20% of grade):

   1. **Must** follow the Style and Form of Journal of Animal Science, including reference cited in body of text.
   2. At least 10 double-spaced pages, excluding Title Page and References.
   3. **Must** be readable, in idiomatic English, and syntactically accurate.
   4. Must include a statement of the problem.
   5. References to literature must be clear and concise and in appear in the appropriate order in the text.
   6. **Must** show that student has some understanding of contrast and comparison of data and conclusions.
   7. **Must** come to a conclusion.
C. **Oral Presentation of Term Paper Material (worth 15% of grade)**

1. *Must* present central issues of term paper to class and instructor.
2. *Must* show that one has thought about subject material and become familiar with it to present to audience and answer questions regarding the topic or technical questions regarding method or procedures important to the conclusions.
3. May use visual aids to enhance presentation of material.
4. *Must* not be longer than 30 minutes in length.
5. *Must* show that the student can synthesize and condense important aspects of topic.

D. **Willingness to Participate and Use Resources to Accomplish Tasks (worth 5% of grade)**

1. Based upon an individual’s attempt to participate in class discussion, ask pertinent questions, turn in assignments on time, work with others in class, and attempt to learn more than what is presented as lecture.

Assignment of Grade will be based upon the student’s performance in the four categories given in the above section of this document:

- **A** = 90 to 100%
- **B** = 80 to 89%
- **C** = 70 to 79%
- **D** = 60 to 69%
- **F** = less than 60%
OUTLINE OF GENERAL TOPICS

A. Introduction to the Biology of Sex
   1. Genetic and Phenotypic Variation – essence of adaptive evolution
   2. Overview of Reproductive System in Economy of Individual and Species
   3. Overview of Reproductive Endocrine-Neuroendocrine System – Hormones-Neurohormones and Their Actions – the engines of reproduction
   4. Overview of the Molecular Biology of Reproductive Processes

B. Gametes, Fertilization, and Early Embryogenesis
   1. Sex Determination
   2. Spermatozoa
   3. Ova
   4. Gamete and Zygote Transport
   5. Fertilization
   6. Early Embryonic Development

C. Female Reproductive System
   1. Gonads and Ducts
   2. Follicles, Steroidogenesis, and its Control
   3. Follicular Development and its Control
   4. Ovulation
   5. The Corpus Luteum
   6. Actions of Ovarian Steroids

D. Male Reproductive System
   1. Anatomy and Fluids of Male Tract
   2. Anatomy of Testis
   3. The Sertoli Cell
   4. Testicular Steroidogenesis
   5. Regulation of Spermatogenesis

E. Role of Pituitary and Hypothalamus
   1. Introduction
   2. Hypothalamo-Hypophyseal Complex
   3. Gonadotropin-Releasing Hormone
4. Other factors Involved in System

F. Control of Reproductive Processes

1. Puberty
2. Seasonality
3. Biostimulation
4. Maternal Recognition of Pregnancy
5. Pregnancy
6. Lactation

G. Reproductive Behavior and Its Control

1. Pheromones and mammalian Reproduction
2. Maternal Behavior

H. Reproductive Technologies

1. Artificial Insemination
2. Synchronization of mating and ovulation
3. Superovulation
4. Embryo transfer
5. In vitro fertilization
6. Sexing spermatozoa
7. Cloning

Note: We may not cover every topic in this list in great depth but I will try to accommodate those topics that have special interest to the group if time becomes a limiting factor
**Class Schedule**

<table>
<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Activity</th>
<th>Day</th>
<th>Date</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
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* Lecture, demonstration, or laboratory. Demonstrations or laboratories will be announced in advance for next class meeting.

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*Term Paper due in my Office by 5 p.m. on the afternoon of Apr. 16th. Thank you.

** 15- to 18-min presentation of Term Paper material
ARNR 524 OUTLINE
Advanced Animal Breeding
1998

INSTRUCTOR: Dr. D. D. Kress, 226 LinH, 994-5576

BOOK: Falconer - Introduction to Quantitative Genetics (4th Ed)  1996


II. Population genetics (Chs. 1-5)
    Ch. 1 : Miller
    Ch. 2 : pp 23-32 (end at # gen’s), J Daniels
    Ch. 2 : pp 32 (start at # gen’s) - 47, Praharani
    Ch. 3 : pp 45-57 (end at inbreeding), Wellington
    Ch. 3 : pp 57 (start at inbreeding) - 64, Anderson
    Ch. 4 : T Daniels
    Ch. 5 : Bailey

III. Mating systems
    A. Inbreeding and crossbreeding
       Ch. 14 : Early
       Ch. 15 : Shanks
       Ch. 16 : Schafer
    B. Crossbreeding results and systems - Crossbreeding Bulletin
    C. Theory crossbreeding and heterosis - Spain paper

IV. Theory - Ch. 6, 7, 8, and 9

V. Heritability - Ch. 10

VI. Selection - Ch. 12

VII. Genetic correlation - Ch. 19

VIII. Genetic components and maternal effects - Kress et al. (1990) paper

IX. Application of biotechnology to animal breeding - Dr. Tess?

X. Path coefficients - Willham (1972) paper

XI. Breeding values (BV)
    A. From relatives - Handouts and notes
    B. Interbreed EPD's

XII. National Sire Evaluation - Dr. Tess
INSTRUCTOR
M. W. Tess
117 Linfield Hall
994-5610
mwtess@montana.edu

1998-2000 CATALOG DESCRIPTION
Quantitative genetics applied to the improvement of animals. Biometrical relationships among relatives, methods of estimating genetic parameters, application of crossbreeding systems and selection techniques.

REVISED DESCRIPTION
Genetic characterization and improvement of populations. Biometrical relationships among relatives, genetic evaluation, and breeding strategies. Emphasis placed on cattle.

PREREQUISITES
ARNR 322 – Principles of Animal Breeding
STAT 401 – Applied Linear Statistical Models

TEXT
Introduction to Quantitative Genetics, 4th Ed.
By Falconer & MacKay

OBJECTIVES
Students successfully completing ARNR 524 will:
1. Demonstrate a basic understanding of:
   a. Gene frequency, and the forces that change gene frequencies in populations.
   b. The concepts of average gene effect, breeding value, inbreeding depression, and heterosis.
   c. Phenotypic variance and its subdivision into genetic and environmental components.
   d. Current methods of genetic evaluation, including national cattle evaluation, and emerging molecular techniques.
2. Possess a working knowledge of practical breeding strategies for the genetic management and improvement of livestock.
3. Be familiar with a cross-section of scientific literature relative to the genetics of cattle.
GRADING:

2 Exams  50%
Review paper  25%
Homework & Discussion  25%

Anyone that has special learning or testing needs should consult with me during the first week of class.

Final course grades will be curved if necessary, however course grades will generally be assigned as follows:

\[
\begin{align*}
\geq 90\% & = A \\
80 - 89\% & = B \\
70 - 79\% & = C \\
60 - 69\% & = D \\
\leq 59\% & = F
\end{align*}
\]

MAKE-UP POLICY:

Make-ups or exceptions to assigned work or scheduled exams must be negotiated in advance. The only valid excuses for missed work or attendance will be medical and family emergencies, which are verified in writing by an attending professional (i.e., physician, minister, judge, etc.). Written excuses must include the name, title, address and phone number of the attending professional. I will judge work missed for all other reasons on an individual basis. Unless excused in advance, assignments turned in late will be penalized 5% for each day (calendar day, Monday through Friday) late. Work turned in more than 3 days late will not receive any credit.
Gene frequency (Chapter 1)
    Hardy-Weinberg Equilibrium

Systematic changes in gene frequency (Chapter 2)
    Migration
    Recurrent mutation
    Selection

Random changes in gene frequency (Chapters 3 & 4)
    Inbreeding
    Population size
    Drift

Pedigreed Populations (Chapter 5)
    Inbreeding
    Coancestry

Variation, values and means (Chapters 6, 7 & 8)
    Average effect
    Breeding value
    Variance components
    Heritability
    Repeatability

Covariance among relatives (Chapter 9)
    Genetic covariance
    Environmental covariance
    Maternal effects

Path coefficients
    Correlation
    Regression

Heritability and selection response (Chapters 10, 11 & 12)
    Sib analyses
    Selection experiments

Inbreeding and crossbreeding (Chapter 14 & 15)
    Inbreeding depression
    Heterosis
    Mating types
    Composite breeds

Genetic evaluation within contemporary groups (Chapter 13)
    Predicted breeding value and EPD
    Individual selection
    Information from contemporary relatives
    Selection index – I
- Genetic evaluation across contemporary groups
  - Least squares ANOVA
  - Least squares and selection index
  - BLUP – I

- Multi-trait genetic evaluation (Chapter 19)
  - Genetic correlation
  - Correlated response to selection
  - Information from correlated traits
  - Selection Index – II
  - BLUP – II

- Multi-breed genetic evaluation
  - Breeding value
  - Heterosis
  - Across-breed EPD
  - BLUP-III

- Quantitative trait loci (Chapter 21)
  - Candidate genes
  - Markers and genetic maps

- Breeding objectives
  - Profit equations
  - Systems analysis
  - Physiological breeding value

- Threshold characters (Chapter 18)

- Biotechnology and animal breeding
  - MOET
  - Cloning
  - Sexed semen
  - Marker assisted selection

- Genotype x environment interaction (Chapter 19)
  - Implications for breeding plans
INSTRUCTOR:
Bret E. Olson  994-5571
114 Linfield Hall
Office hours: Any time my door is open

COURSE OBJECTIVES
To increase your understanding of plant and animal responses (behavioral and physiological) to changes in their environment. Processes at the organism level will be emphasized.

METHOD OF PREPARATION
About 85% lecture, about 15% discussion of assigned readings.

GRADING
Two midterms 30%
Final 20%
Discussion 5%
Two reviews 5%
Two papers 40%
100%

Exams will be predominantly short answer style. The first paper will be due March 10th. The second will be due April 28th. Late papers will not be accepted. Grades will be assigned based on the following scale:
92-100% = A, 90-91% = A-
88-89% = B+, 82-87% = B, 80-81% = B-
78-79% = C+, 72-77% = C, 70-71% = C-
<70% = D.

SOURCE MATERIALS
There will be several assigned readings from research and review articles. I will be using the following source materials:


COURSE CONTENT

I. Introduction
   A. International Units
   B. Stress, strain
   C. Laws governing heat transfer, gain and storage
   D. Resistance

II. The Physical Environment
   A. Radiation
   B. Air temperature
   C. Soil temperature
   D. Wind

III. Response Mechanisms
   A. Physiological
   B. Behavioral

IV. Maintenance of Optimum Temperature
   A. Process of heat gain
   B. Process of heat loss

V. Water Conservation
   A. Physiological
   B. Behavioral

VI. Water Uptake
   A. Water potential
   B. Soil-plant-atmosphere gradient

VII. Nutrient use and cycling
SYLLABUS

ARNR 542 Advanced Natural Resource Ecology
Fall 1999, 11:00 - 12:15 Tuesday and Thursday, 233 Linfield Hall
Instructors: Bret Olson and Paul Hook

Focus and format: This class will focus on several ideas central to ecologically based management of renewable natural resources. The first half of the semester (weeks 1-7) will be coordinated by B. Olson. The second half of the semester (weeks 8-14) will be coordinated by P. Hook.

During the first five weeks of each half of the semester, we will evaluate concepts through reading and discussion of primary scientific literature. In the final week of each half, students will integrate concepts in the context of two "real world" decisions (decision cases) faced recently by natural resource managers in southwestern Montana.

Review of scientific literature: Discussions and written summaries during weeks 2-6 and 8-13 will be based on scientific articles. We will select a focal article, and each student will choose two related articles, at least one of which is not cited in the focal article. Each Tuesday a different student will lead a discussion of the focal paper. On Thursdays we will continue to discuss ideas raised by the focal paper, drawing on information from related articles selected by students. Then a written synthesis, based on the focal paper, the two related articles, and group discussion will be due by Friday 2:00 p.m. Your papers must not exceed two pages of double-spaced print. Each synthesis should integrate key ideas and/or results presented in the focal article, relevant information from related articles, and salient points discussed by the group. The three articles (focal, two related) should be cited using the Journal of Range Management format.

Decision cases: Discussion of decision cases (weeks 7 and 14) will draw on written descriptions of a specific dilemma, the responsible decision maker, the context, and supporting documents that provide essential information available to the decision maker. In the final discussion of each case, students will attempt to reach a decision, which does not need to agree with the actual decision. Before the final discussion, each student will submit an essay (5 pages maximum, double-spaced) describing and supporting his or her decision with literature.

Grading: Grading will be based on writing assignments, participation in discussions, and a final essay examination. Course grades will use the +/- system.

- 9 synthesis papers, 5% each* 45% of grade
- 2 decision case essays, 15% each 30%
- discussion participation 10%
- discussion leadership 5%
- final examination 10%

* 11 summaries will be submitted. The lowest grade for each half of the class will be dropped.

One objective of the class is to promote effective professional communication. Brevity, clarity, relevance, organization, and sound logic will be considered in evaluations. Written assignments will be graded for content (80%) and writing (20%).
ARNR 543
Riparian Process and Function
Course Syllabus

Course Content:

1. Concepts of Condition, Stability and Proper Function
2. Outcomes based on scale, stream reach versus watershed
3. Erosion and the formation of stream substrates and bank material
4. Channel morphology, stream substrate and bank material, gradient and climate (hydrograph)
5. Streamside vegetation, sediment entrapment and bank armor.
6. Floodplain development
7. Over bank flows, soil water recharge and nutrient enrichment/loss
8. Plant species germination and establishment requirements
9. Plant species response to disturbance, ice flows, flow modification and herbivory
10. Plant community succession
11. Channel stability and plant community type (herbaceous, shrub, tree)
12. Stasis vs. recovery potential
13. System succession vs. plant community succession
14. Expectations vs. System Potential

Expectations:

A. Student Lecture (30% of Grade) – Each student will be responsible for a full lecture on one of the topics in the course outline; responsibility will include visual or laboratory demonstrations necessary to promote deeper understanding of the topic.
B. Class Participation (10% of Grade) – Each student will be responsible for having read the assigned chapter/paper and enter into class discussion
C. Exams (60%) – 3 announced, competency exams (student must score at least 80% or retake exam); student may not move on to the next exam until she/he has passed the previous exam

Grading:

A = 90+%
B = 80+%
C = 70%
< 70% OOPS!