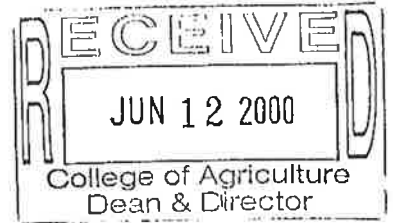


PURDUE UNIVERSITY



DEPARTMENT OF
ANIMAL SCIENCES

JUNE 2, 2000

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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**Montana State University College of Agriculture
Animal and Ranges Sciences Department External Review
2 - 4 March 2000**

<i>Date</i>	<i>Time</i>	<i>Event</i>	<i>Participants</i>	<i>Place</i>
Thursday 2 March	6:30	Breakfast - Committee Charge	Committee, Quisenberry, Kress, Burfening	Grantree Restaurant
	7:45	Escort to meeting	Kress, Burfening	
	8:00	Terry Roark, Interim President	Committee	Administration Conference Room, Montana Hall
		David Dooley, Provost and Tom McCoy, VP for Research		
	9:00	Escort to meeting	Kress, Burfening	
	9:15	David Bryant, Dean of Extension	Committee	Extension Conference Room, Culbertson Hall
	10:00	Peter Burfening, Department Head		110 Linfield Hall
	11:15	Animal and Range Sciences Graduate Students		110 Linfield Hall
	12:00	Lunch	Committee, Kress, Burfening	Habit Restaurant
	1:30	Animal Science Teaching		110 Linfield Hall
	2:30	Range Science Teaching		110 Linfield Hall
	3:30	Undergraduate Students		110 Linfield Hall
	4:00	Ag-related Commodity Groups	Committee, Quisenberry, Kress, Burfening	Board Room, MSU Foundation
	5:30	Social/Reception		Great Room, MSU Foundation
Friday 3 March		Breakfast on your own		
	8:00	Animal Nutrition and Meats		110 Linfield Hall
	9:00	Reproduction and Breeding		110 Linfield Hall
	10:00	Livestock Waste Management/Water Quality		110 Linfield Hall
	11:00	Rangeland Ecology		110 Linfield Hall
	12:00	Lunch	Committee, Quisenberry, Kress, Burfening	Ruperts Restaurant
	1:30	Tour of Facilities		
	3:00	Livestock/Wildlife Interactions		110 Linfield Hall
	4:00	Extension faculty		
	6:00	Dinner	Committee, Quisenberry, Kress, Burfening	The Mint

**Montana State University College of Agriculture
Animal and Ranges Sciences Department External Review
2 - 4 March 2000**

Saturday 4 March		Breakfast on your own		214 Linfield Hall
	8:00	Report Writing		113 Linfield Hall
	11:00	Final Report to Faculty & Admin.	To be determined	To be determined
	12:00	Lunch	To be determined	To be determined
		Free time	To be determined	To be determined (Sir Scott's Oasis)
	6:00	Dinner	To be determined	
Sun. 5 March		Breakfast on your own		
		Hotel shuttle to airport		

**Charge to Animal and Range Sciences Department
Review Committee
March 2, 2000**

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 stagnant. *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, jarmstr5@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. Wettemann, 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.

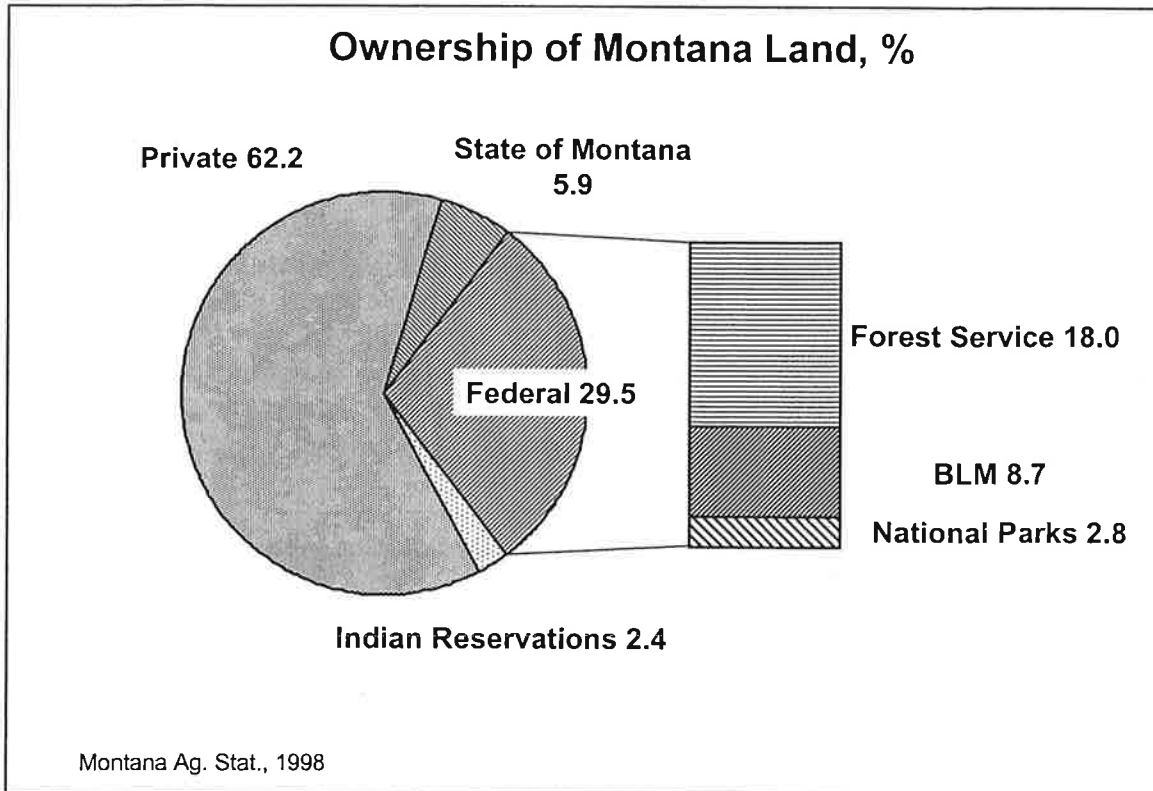
Mr. John Grande, Director Montana Stockgrowers Association, Lennep Route,
Martinsdale, MT 59053, Phone: (406) 572-3335

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.

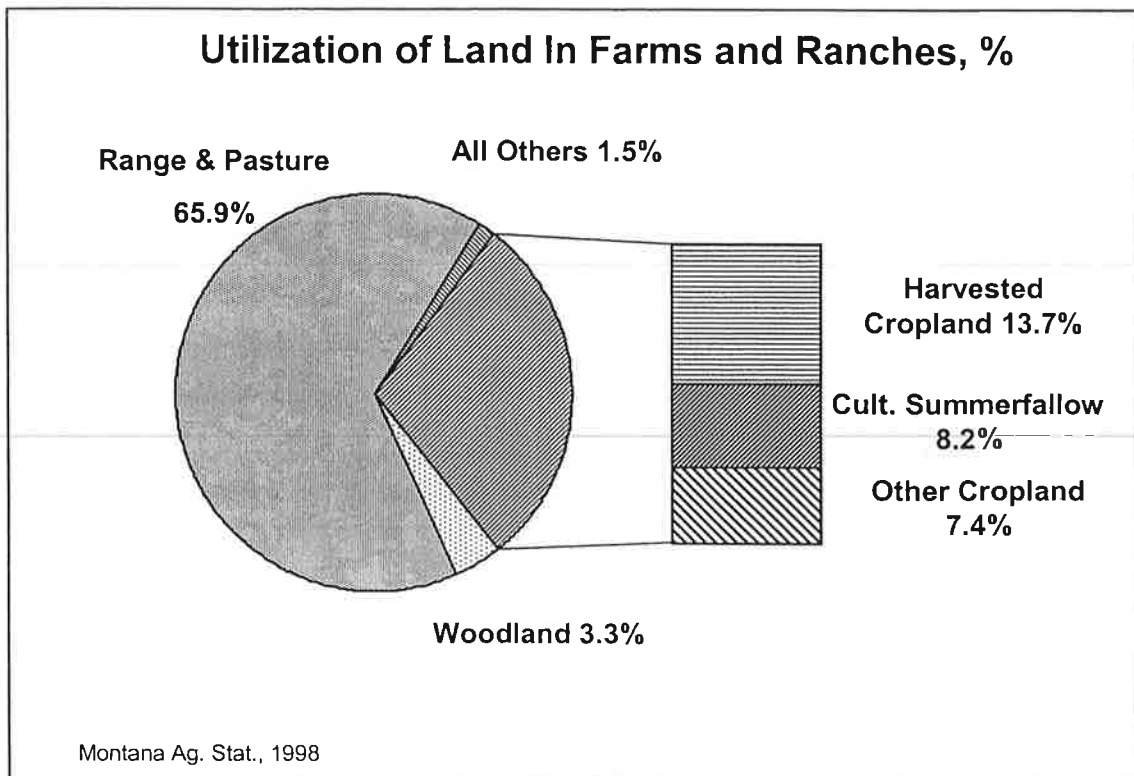
Montana Population		Land and Land Utilization	
Population (1990)	799,065	Total Land Area (sq. miles)	145,388
People per Square Mile	5.5	Total Land Area (mil. acres)	93,000,000
Farm Population	45,718	All Land in Farms and Ranches (acres)	59,642,536
People per Farm	1.9	Proportion of land in Farms & Ranches	64.1%

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).

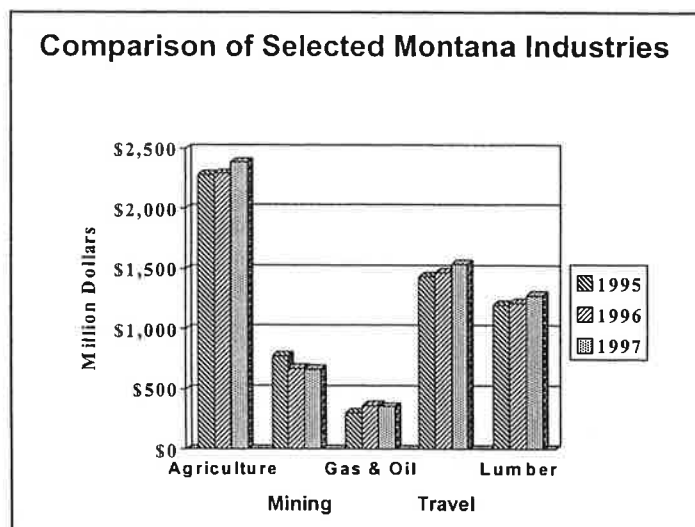


Of the 60 million acres in farms and ranches, 66% is classified as pasture and rangeland. Therefore, Montana has about 40 million acres of the farm and ranch land that is rangeland and pasture. In addition 29.5 percent of the land in

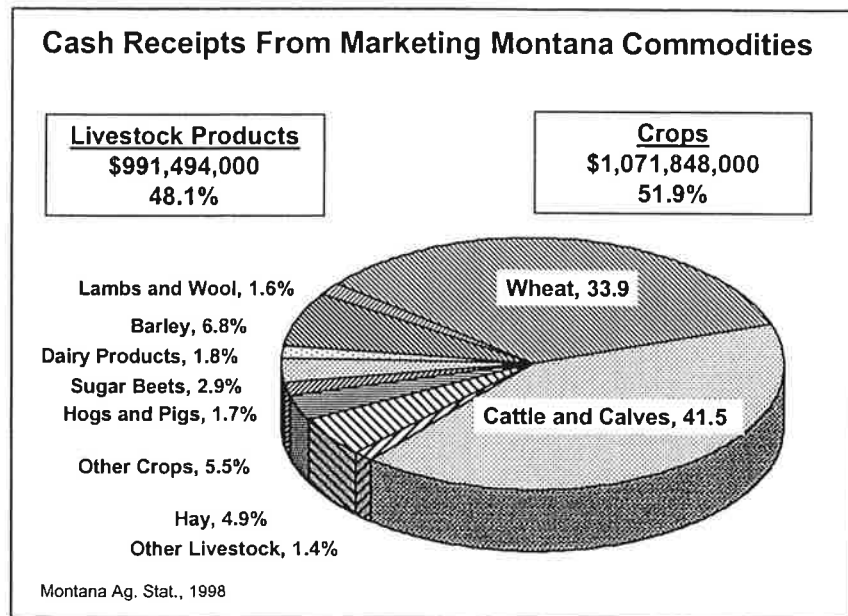
Montana is federal land of which a large percentage is leased for grazing of the state's livestock herds.



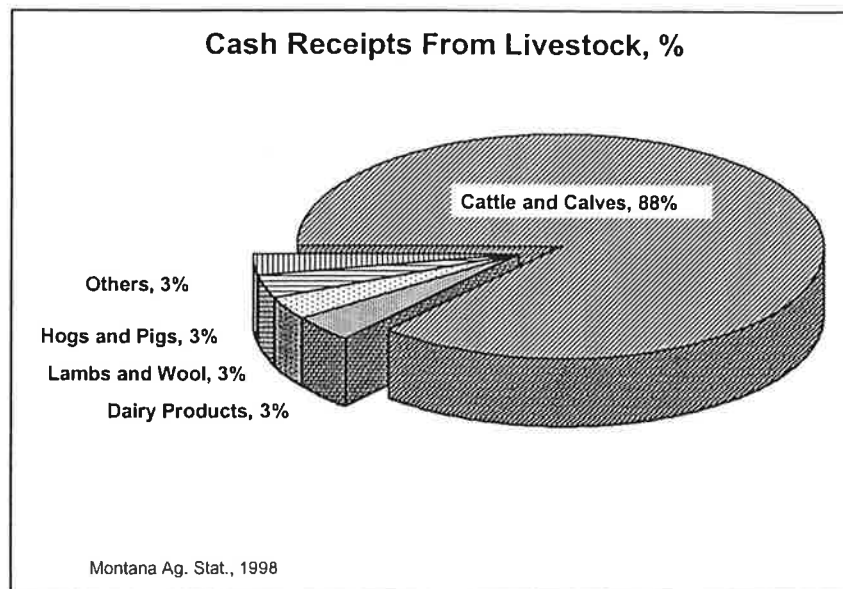
Agriculture is the most important industry in Montana. The figures below portray the importance of agriculture to Montana's economy. A comparison of the farm sector to the other basic industries of tourism (measured by non-resident travel), mining, wood and wood products, and gas and oil show that agriculture 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.



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.



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 Greek, 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:

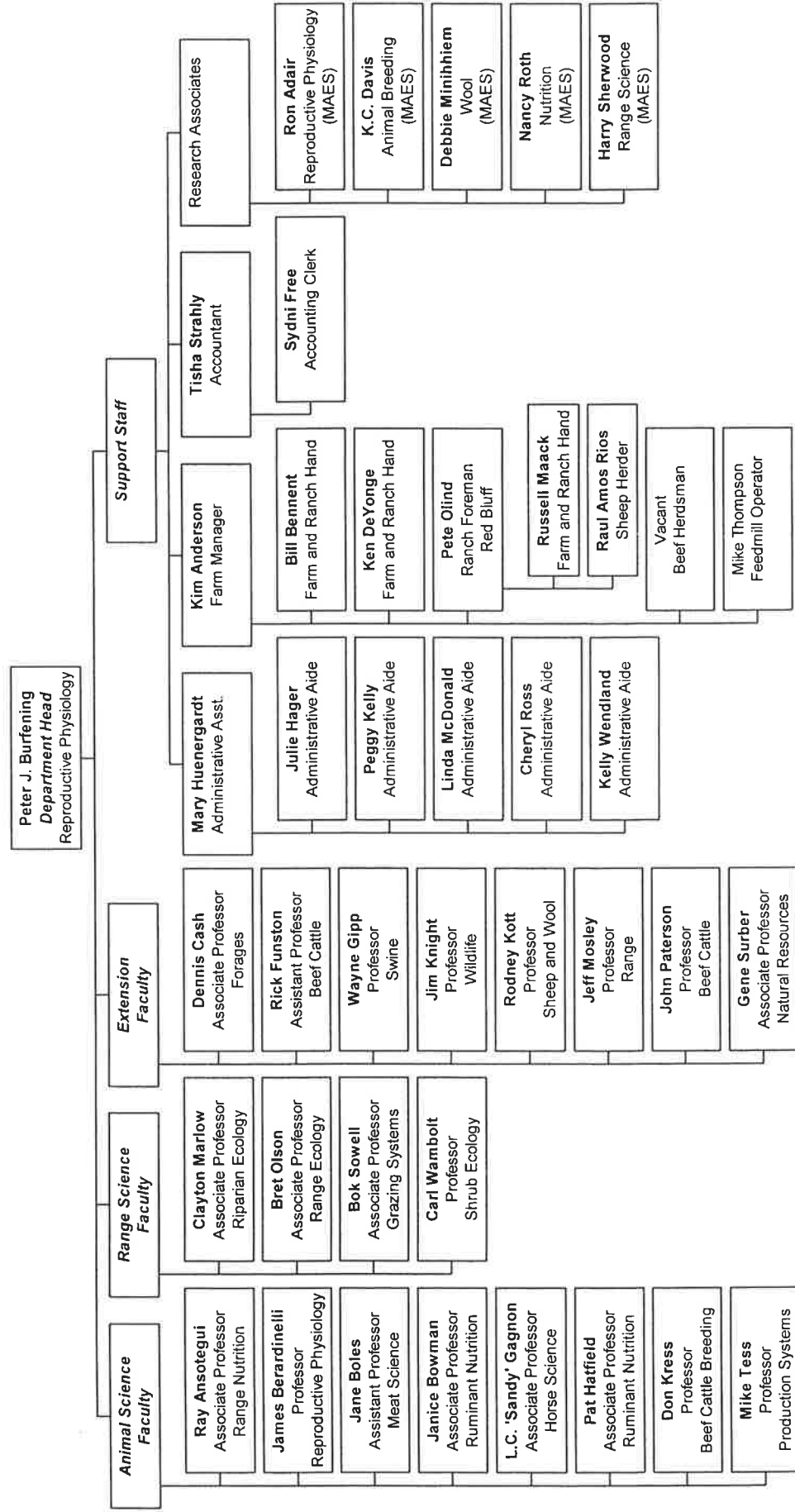
Bandy Experimental Ranch is 3,700 acres and located near Ovando about 200 miles west of Bozeman. Montana Agricultural Experiment Station and the University of Montana own the Bandy Ranch jointly. The ranch has a herd of 200 cows and is used for livestock, riparian, wildlife and forestry research. This 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

ORGANIZATIONAL CHART



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.

FACULTY APPOINTMENT BY FTE SPLIT

Faculty	Discipline/Specialization		CA	MAES	ES	Total
Ansotegui	ANS	Range Nutrition	0.70	0.30	0.00	1.00
Berardinelli	ANS	Reprod. Physiology	0.25	0.75	0.00	1.00
Boles (AY)	ANS	Meats	0.60	0.40	0.00	1.00
Bowman	ANS	Ruminant Nutrition	0.50	0.50	0.00	1.00
Burfening	ANS	Reprod. Physiology	0.40	0.60	0.00	1.00
Cash	RAS	Forages	0.00	0.00	1.00	1.00
Funston	ANS	Reprod. Physiology	0.00	0.00	1.00	1.00
Gagnon	ANS	Horse Science	0.85	0.00	0.15	1.00
Gipp	ANS	Swine Nutrition	0.10	0.00	0.90	1.00
Hatfield	ANS	Ruminant Nutrition	0.30	0.70	0.00	1.00
Knight	RAS	Wildlife	0.00	0.00	1.00	1.00
Kott	ANS	Sheep Science	0.00	0.20	0.80	1.00
Kress	ANS	Animal Breeding	0.40	0.60	0.00	1.00
Marlow	RAS	Grazing Systems	0.60	0.40	0.00	1.00
Mosley	RAS	Grazing Management	0.00	0.20	0.80	1.00
Olson	RAS	Range Ecology	0.45	0.55	0.00	1.00
Paterson	ANS	Ruminant Nutrition	0.10	0.20	0.70	1.00
Sowell (AY)	RAS	Grazing Systems	1.00	0.00	0.00	1.00
Surber	RAS	Riparian Systems	0.00	0.00	1.00	1.00
Tess	ANS	Production Systems	0.25	0.75	0.00	1.00
Wambolt	RAS	Scrub Ecology	0.50	0.50	0.00	1.00
Subtotal by Discipline						
Animal Science			4.45	5.00	3.55	13.00
Range Science			2.55	1.65	3.80	8.00
Total			7.00	6.65	7.35	21.00

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EDUCATION

BS	University of Nevada-Reno	Animal Science	1970
MS	University of Nevada-Reno	Range Nutrition	1973
Ph.D.	New Mexico State University	Ruminant Nutrition	1986

PROFESSIONAL EXPERIENCE

1994-Present	Associate Professor	Animal & Range Sciences	Montana State University
1976-94	Assistant Professor	Animal & Range Sciences	Montana State University
1973-1976	District Sales Manager	American Breeders Service	

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

ZinPro Inc.	Trace Minerals for beef cattle	\$ > 180,000
High Mountain Ranches	Effects of cubing hay on yearling beef heifers	16,500
High Mountain Ranches	Effects of cubing hay on two-year-old beef heifers	8,250
Specialty Vegetable Oils	Rumen kinetics of different protein sources	1,000
Grand Laboratories	Vaccine grants (yearly)	4,000
Producer and Industry	Semen grants (yearly)	3,000

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

Ansotegui, R.P., E.J. Swensson, M.W. Tess, K.S. Bryan, C.K. Clark, and R.M. Brownson. 1995. Effects of cubing alfalfa hay on development of yearling beef heifers and In Situ rate and extent of disappearance. Prof. Anim. Sci. 11:30.

Sprinkle, J.E., D.D. Kress, D.E. Doornbos, D.C. Anderson, M.W. Tess, R.P. Ansotegui, B.E. Olson, and N.J. Roth. 1995. Chronic oxide contamination of forage in pasture previously used in marker studies. J. Range Manage. 48:194.

REVIEWED PUBLICATIONS, ABSTRACTS AND PROCEEDINGS (Previous 3 years)

- Ansotegui, R.P., J.D. Bailey, J.A. Paterson, P.G. Hatfield, and C.K. Swenson. 1999. Effects of supplemental trace mineral form on copper status, estrus, ovulation rate, and fertility in beef heifers. *Proc. West. Sec. Amer. Soc. Anim. Sci.*
- Paterson, J.A., C.K. Swenson, A.B. Johnson, and R.P. Ansotegui. 1999. Life cycle trace mineral needs for reducing stress in beef production. *Proc. 60th Minnesota Nutrition Conf.* pp. 41-58.
- Bailey, J.D., R.P. Ansotegui, J.A. Paterson, J.G. Berardinelli, and A.B. Johnson. 1999. Effects of supplemental trace mineral form on trace mineral status and performance of beef heifers. *Proc. West. Sec. Amer. Soc. Anim. Sci.*
- Paterson, J.A., C.K. Swenson, A.B. Johnson, and R.P. Ansotegui. 1999. Life cycle trace mineral needs for reducing stress in beef production. *Proc. 60th Minnesota Nutrition Conf.* pp. 41-58. *Proc. Mid-South Ruminant Nutrition Conf. TAMU. Proc. Pacific Northwest Animal Nutrition Conf. Proc. Arkansas Veterinary Conf.*
- Swenson, C.K., R.P. Ansotegui, E.J. Swensson, J.A. Paterson, and A.B. Johnson. 1998. Trace mineral supplementation effects on first-calf beef heifer reproduction, milk production and calf performance. *Proc. West. Sec. Amer. Soc. Anim. Sci.* 49:327.
- Anderson, L.P., J.A. Paterson, R.P. Ansotegui, M. Cecava, and W. Schmutz. 1998. The effects of degradable and metabolizable protein supply on performance of first calf heifers. *Proc. West. Sec. Amer. Soc. Anim. Sci.* 49:20.
- Wellington, B.K., J.A. Paterson, C.K. Swenson, R.P. Ansotegui, P.G. Hatfield, and A.B. Johnson. 1998. The influence of supplemental copper and zinc on beef heifer performance and changes in liver copper. *Proc. West. Sec. Amer. Soc. Anim. Sci.* 49:323.
- Green, L. Wayne, A. Bruce Johnson, John A. Paterson, and R.P. Ansotegui. 1998. The role of trace minerals in the cow-calf cycle. *Proc. IRM Producer Education Seminars. Denver, CO.*
- Swenson, C.K., A.B. Johnson, J.A. Paterson, E.J. Swensson, L.M. Schugal and R.P. Ansotegui. 1997. Liver trace mineral status of cow-calf ranches in the western high plains. *Proc. Amer. Assoc. Bovine Practitioners.* 48:137.
- Swenson, C.K., R.P. Ansotegui and J.A. Paterson. 1997. Effect of Trace Mineral Supplementation on Mineral Status, Immune Response and Reproduction of Beef Heifers and Their Calves: Research in Progress. *Proc. Montana Livestock Nutrition Conference.*
- Roeder, B.L., V.M. Thomas, R.W. Kott, D. Burgess, and R.P. Ansotegui. 1997. Effect of protein restriction in the ewe and first colostrum feeding in the lamb on passive immune transfer. *Proc. West. Sec. Amer. Soc. Anim. Sci.* 48:
- Swenson, C.K., R.P. Ansotegui, E.J. Swensson, J.A. Paterson, and A.B. Johnson. 1996. Influence of trace mineral supplementation on immune response, mineral retention and reproduction in first-calf beef heifers. *Proc. West. Sec. Amer. Soc. Anim. Sci.* 47:324.
- Swenson, C.K., R.P. Ansotegui, E.J. Swensson, J.A. Paterson, and A.B. Johnson. 1996. Influence of mineral supplementation on blood serum and liver concentrations in first-calf beef heifers and their calves. *Proc. West. Sec. Amer. Soc. Anim. Sci.* 47:328.
- Swenson, C.K., J.A. Paterson, and R.P. Ansotegui. 1996. Trace Mineral Requirements. *Proc. In-depth cow-calf nutrition program. KSU Hays, KS.*
- Swenson, C.K., Paterson, J., Ansotegui, R.P., 1996. Trace Mineral Requirements for Beef Cows, What Do We Know? **Proc. Governor's Conference on the State of the Cattle Industry.**

James G. Berardinelli

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EDUCATION

BA	University of Connecticut	Biology	1973
MS	West Virginia University	Reproductive Physiology	1976
PhD	West Virginia University	Reproductive Physiology	1979

PROFESSIONAL EXPERIENCES

1979-81	Post-Doctoral Research Fellow	USDA-ARS, USMARC
1982-88	Assistant Professor	Montana State University
1988-93	Associate Professor	Montana State University
1993-Present	Professor	Montana State University

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

1994-00	MAES (per yr)	\$ 5,500
1994-96	NRICGP, USDA Competitive Grant.	\$50,000
1996-99	USDA, CSREES, HECG Program	\$66,888
1999-02	NRICGP, USDA Competitive Grant	\$96,000

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)

- Lewis, A. W. and J.G. Berardinelli. 2000. Gross anatomical and histomorphometric characteristics of the oviduct and uterus during the pubertal transition in the sheep. *J. Anim. Sci.* (Submitted, Dec. 1999).
- Berardinelli, J. G., J. Weng, P. J. Burfening, and R. Adair. 2000. Effect of excess degradable intake protein on early embryonic development, ovarian steroids, and blood urea nitrogen on Days 2, 3, 4, and 5 of the estrous cycle in mature ewes. *J. Anim. Sci.* (Submitted Dec. 1999)
- Ford, J.J., J.G. Berardinelli, R.K. Christenson, L.L. Anderson. 2000. Luteinizing hormone secretion as affected by hypophyseal stalk transection, estradiol-17 β and luteinizing hormone releasing hormone in ovariectomized gilts. *Anim. Reprod. Sci.* (Submitted, Dec. 1999).
- White, D. Jr., J.G. Berardinelli, and K.E. Aune. 1998. Reproductive characteristics of male grizzly bears in the continental United States. *Int. Conf. Bear Res. and Manage.* 10: 497-501.
- Garrott, R. A., J. G. Cook, J. G. Berardinelli, P. J. White, S. Cherry, and D. B. Vagnoni. 1997. Urinary allantoin:creatinine ratios as a non-invasive dietary index for elk. *Canadian J. Zool.* 75:1519-1525.
- Vera-Avila, H.R., T.D.A. Forbes, J.G. Berardinelli, and R.D. Randel. 1997. Effect of dietary phenolic amines on testicular function and luteinizing hormone secretion in male Angora goats. *J. Anim. Sci.* 75:1612-1620.
- Danielson, A.D., R.K. Newman, C.W. Newman, and J.G. Berardinelli. 1997. Lipid levels and digesta viscosity of rats fed a high-fiber barley milling fraction. *Nutrition Research* 17:515-522.
- Fernandez, D.L., J.G. Berardinelli, R.E. Short and R. Adair. 1996. Acute and chronic changes in LH secretion, and postpartum interval to estrus in first-calf suckled beef cows exposed continuously or intermittently to mature bulls. *J. Anim. Sci.* 74:1098-1100.
- Short, R.E., R.A. bellows, R.B. Staigmiller, E.E. Grings, and J.G. Berardinelli. 1996. Management of cows with high reproductive rates. *Beef Improv. Fed 27th Res. Symp.* 1-12.
- White, D., J.G. Berardinelli, and K.E. Aune. 1996. Testicular characteristics and growth rate, and age at sexual maturity in male grizzly bears. 10th Intern. Conf. Bear Res. and Mgmt. (Accepted, Dec. 1995).
- 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
- Custer, E.E, W.E. Beal, S.J. Wilson, A.W. Meadows, J.G. Berardinelli and R. Adair. 1994. Effect of melengestrol acetate (MGA) or progesterone-releasing intravaginal device (PRID) on follicular development, concentrations of estradiol-17 β and progesterone, and luteinizing hormone release during an artificially lengthened bovine estrous cycle. *J. Anim. Sci.* 72:1282-1289.

Jane Ann Boles

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EDUCATION

B.S.	University of Missouri	Animal Science	1985
M.S.	Iowa State University	Food Technology	1987
Ph.D.	Iowa State University	Meat Science	1990

PROFESSIONAL EXPERIENCE

1999-present	Assistant Professor	Animal and Range Sciences	Montana State University
1996-1999	Pro. Res. Assoc.	Value Added Beef Program	University of Saskatchewan
1994 – 1996	Meat Scientist	Processed Meat Section	Meat Industry Research Institute of New Zealand, Inc.
1991 – 1993	Postdoc. Fellow,	Department of Animal & Poultry Science,	University of Saskatchewan

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 TOTAL \$459,527

New to Montana State - Previous employment research grants included

Canadian Beef Industry Development Fund 1997-1999. Functionality of selected beef cuts for further processing, \$149,177.

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.

Saskatchewan Agricultural Development Fund 1996-1998. Processing procedures for restructured meats. \$30,000.

Saskatchewan Agricultural Development Fund 1996-1998. Utilization of beef bones. \$26,750.

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

- Boles, J.A.**, B.M. Rathgeber and P.J. Shand. 2000. Recovery of proteins from beef bone and the functionality of these proteins in sausage batters. *Meat Science* In Press.
- B.M. Rathgeber, M.D. Pato, **J.A. Boles**, and P.J. Shand. 1999. Rapid post-mortem glycolysis and delay chilling of turkey carcasses cause alterations to protein extractability and degradation of breast muscle proteins. *Journal of Agricultural and Food Chemistry* 47:2529-2536.
- Boles, J.A.** and P.J. Shand. 1999. Effects of raw binder system, meat cut and prior freezing on restructured beef. *Meat Science* 53:233-239.
- Rathgeber, B.M., **J.A. Boles** and P.J. Shand. 1999. Rapid postmortem pH decline and delayed chilling reduce quality of turkey breast meat. *Poultry Science* 78:477-484.
- Boles, J.A.** and Shand, P.J. 1998. Evaluation of comminution method and raw binder system on restructured beef. *Meat Science* 49:297-307.
- Boles, J. A.** and Swan, J.E. 1998. Effects of chopping time, meat source and storage temperature on the colour of New Zealand typed fresh beef sausages. *Meat Science*. 49:79-88.
- Farouk, M., **J.A. Boles**, J.E. Swan. 1997. Effects of ingredients on the color of fresh and cured sausages. *J. Muscle Foods* 8: 383-394.
- Boles, J.A.** and J.E. Swan. 1997. Effects of brine ingredients and temperature on cook yields and tenderness of pre-rigor processed roast beef. *Meat Science* 45:87-97.
- Boles, J.A.** and J.E. Swan. 1996. Effects of post-slaughter processing and freezing on the functionality of hot-boned meat from young bull. *Meat Science* 44:11-18.
- Shand, P.J., **J.A. Boles**, A. McCurdy, J.F. Patience and A.L. Schaefer. 1995. Effect of oral acid or base loading on the processing and sensory properties of hams from stress susceptible pigs. *Journal of Food Science* 60:996-1000.

Jan G.P. Bowman

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EDUCATION

B.S.	University of Missouri	Animal Science	1977
M.S.	University of Missouri	Animal Science	1979
Ph.D.	University of Missouri	Ruminant Nutrition	1986

PROFESSIONAL EXPERIENCE

1998-present	Associate Professor	Animal & Range Sciences	Montana State University
1992-1998	Assistant Professor	Animal & Range Sciences	Montana State University
1988-1992	Assistant Professor	Animal Science	Ohio State University

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 (95 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 Barley Feed for Rangeland Cattle	\$600,000
• USDA - Special Grant, 1998-99 Barley Feed for Rangeland Cattle	\$600,000
• USDA - Special Grant, 1997-98 Barley Feed for Rangeland Cattle	\$500,000
• MT Wheat & Barley Committee, 1997-98 Rapid Feed Quality Analysis Technology for Barley	\$20,000
• Roche Animal Nutrition & Health, 1997-98 Feeding Behavior of Feedlot Cattle	\$5,000
• USDA - Special Grant, 1996-97 Barley Feed for Rangeland Cattle	\$250,000
• American Feed Industry Association, 1996-97 Liquid Supplement Delivery to Cows on Native Range	\$12,500
• MT Wheat & Barley Committee, 1996-97 Rapid Feed Quality Analysis Technology for Barley	\$20,000
• Roche Animal Nutrition & Health, 1996-97 Development of Feedlot Feeding Behavior Technology	\$10,000
• North American Barley Genome Mapping Project, 1996-97 Determination of Genetic Markers Associated with Processing Characteristics of Barley	\$10,000
• MT Wheat & Barley Committee, 1995-96 Development of Rapid Feed Quality Analysis Technology	\$25,000
• 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 \$49,989
- Ruminal Digestion of Barley as Affected by Endosperm Protein Fractions

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

- Bowman, J.G.P., B. F. Sowell, D. L. Boss, and H. Sherwood. 1999. Influence of liquid supplement delivery method on forage and supplement intake by grazing beef cows. *Anim. Feed Sci. Technol.* 78:273-285.
- Earley, A. V., B. F. Sowell, and J.G.P. Bowman. 1999. Liquid supplementation of grazing cows and calves. *Anim. Feed Sci. Technol.* 80:281-296.
- Sowell, B. F., M. E. Branine, J.G.P. Bowman, M. E. Hubbert, H. W. Sherwood, and W. Quimby. 1999. Feeding and watering behavior of healthy and morbid steers in a commercial feedlot. *J. Anim. Sci.* 77:1105-1112.
- Sowell, B. F., J.G.P. Bowman, M. E. Branine, and M. E. Hubbert. 1998. Radio frequency technology to measure feeding behavior and health of feedlot steers. *Appl. Anim. Behav. Sci.* 59:277-284.
- Surber, L.M.M., and J.G.P. Bowman. 1998. Monensin effects on digestion of corn or barley high concentrate diets. *J. Anim. Sci.* 76:1945-1954.
- Bowman, J.G.P., and T. K. Blake. 1997. Building a better feed barley for beef cattle. Presented at the Australian Barley Technical Symposium, Sept. 8-12, 1997, Brisbane, Queensland, Australia
- Bowman, J.G.P., and T. K. Blake. 1997. Building a better feed barley for beef cattle. Presented at the Australian Barley Technical Symposium, Sept. 8-12, 1997, Brisbane, Queensland, Australia.
- Bowman, J.G.P., and B. F. Sowell. 1997. Delivery method and supplement consumption by grazing ruminants: A review. *J. Anim. Sci.* 75:543-550.
- Bowman, J.G.P., and B. F. Sowell. 1997. Feeding the Beef Cow Herd. In: R. O. Kellems, and D. C. Church (Eds.) *Livestock Feeds and Feeding*, 4th Edition, Prentice Hall Publishing, NJ.
- Bowman, J.G.P., and T. K. Blake. 1996. Barley feed quality for beef cattle. In: G. Scoles, and B. Rosnagel (Eds.) *Proc. 5th International Oat Conf. & 7th International Barley Genetics Symp.*, Saskatoon, Saskatchewan. pp. 82-90.
- Boss, D. L., and J.G.P. Bowman. 1996. Barley varieties for finishing steers: I. Feedlot performance, in vivo diet digestion, and carcass characteristics. *J. Anim. Sci.* 74:1967-1972.
- Boss, D. L., and J.G.P. Bowman. 1996. Barley varieties for finishing steers: II. Ruminal characteristics, and rate, site and extent of digestion. *J. Anim. Sci.* 74:1973-1981.
- Bowman, J.G.P., and J. L. Firkins. 1996. In situ particle size reduction as affected by forage species and grinding mesh size. *J. Anim. Sci.* 74:439-446.
- Sowell, B. F., J. D. Wallace, M. E. Branine, M. E. Hubbert, E. L. Fredrickson, and J.G.P. Bowman. 1996. Effects of restricted suckling on forage intake of range calves. *J. Range Manage.* 49:290-293.
- Bowman, J.G.P., B. F. Sowell, and J. A. Paterson. 1995. Liquid supplementation for ruminants fed low-quality forage diets: a review. *Anim. Feed Sci. Technol.* 55:105-138.

Peter J. Burfening

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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.
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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
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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.
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PUBLICATIONS

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

IMPORTANT PUBLICATIONS

Burfening, P. J. and Caprio, M. 1995. Improving Criollo sheep in Peru through crossbreeding. Small Rumin. Res 17:31-35.

Burfening, P. J. and Chavez, J. C. 1996. The Criollo Sheep in Peru. Animal Genetic Resources Information 17:123-136.

Burfening, P. J. and Davis, K. 1997. Effect of service sire on estimated breeding values for reproductive rate in Rambouillet sheep. J. Sheep and Goat Research. 12:89-93.

Burfening, P. J. and Davis, K.C. 1997. Genetic parameter estimates for scrotal circumference in ram lambs and estimated covariances with ewe body weight, fleece traits and reproductive rate. J. Sheep and Goat Research. 14:121-126.

Snowder, G.D., Lupton, C.J., Shelton, J.M., Thomas, V.M., Kott, R.W., Dally, M.R., Bradford, G.E., Knight, A.D., Glimp, W.A., **Burfening, P.J.** and Thompson, P.V. 1998. Comparison of U.S. and fine-wool breeds and Australian Merino F1 crosses: I Wool characteristics and body weight. Sheep and Goat Research Journal 13:108-115.

S. Dennis Cash

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EDUCATION

BS	New Mexico State University	Crop Science	1977
MS	New Mexico State University	Agronomy	1978
Ph.D.	Montana State University	Crop & Soil Science	1983

PROFESSIONAL EXPERIENCE

1998-Present	Associate Professor	Animal & Range Sciences	Montana State University
1992-Present	Extension Forage Specialist	Montana State University Extension Service	
1982-92	Forage Breeder	Northrup King	

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

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

- Bruckner, P. L., S. D. Cash, and R. D. Lee. 1998. Nitrogen effects on triticale grain yield, amino acid composition, and nutritional quality for swine. *J. Prod. Agric.* 11:180-184.
- Cash, S. D., M. E. Majerus, J. C. Scheetz, L. K. Holzworth, C. L. Murphy, D. M. Wiochman, H. F. Bowman, and R. L. Ditterline. 1998. Registration of 'Trailhead' basin wildrye. *Crop Sci.* 38:278.
- Cash, S. D., W. J. Knipe, and M. H. McCaslin. 1998. Registration of 'Parade' alfalfa. *Crop Sci.* 38:536.
- Cash, S. D., W. J. Knipe, and M. H. McCaslin. 1998. Registration of 'Tahoe' alfalfa. *Crop Sci.* 38:536.
- Cash, S. D., D. L. Zamora and A. W. Lenssen. 1998. Viability of weed seeds in feed pellet processing. *J. Range Manage.* 51:181-185.
- Morrill, W. L., R. L. Ditterline, and S. D. Cash. 1998. Insect pests and associated root pathogens of sainfoin in western USA. *Field Crops Res.* 59:129-134.
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- Westcott, M. P., S. D. Cash, J. S. Jacobsen, G. R. Carlson, and L. E. Welty. 1998. Sap analysis for diagnosis of nitrate accumulation in cereal forages. *Comm. Soil Sci. Plant Anal.* 29:1355-1363.

REVIEWED PUBLICATIONS, ABSTRACTS AND PROCEEDINGS

- Blunt, K. and S. D. Cash. 1999. Forage quality of dryland forage grasses in Montana. *Proc. 48th Mont. Livestock Nutrition Conf.* 22-23 Apr. Bozeman.
- Cash, S. D. 1999. Predicting forage quality in first-cutting alfalfa. *Proc. 48th Mont. Livestock Nutrition Conf.* 22-23 Apr. Bozeman.
- Dunn, R., R. L. Ditterline, S. D. Cash, L. Welty, L. Prestbye, D. Wichman, K. Neill, K. Kephart, J. Bergman, J. Eckhoff and G. Harper. 1999. 1999 Alfalfa Variety Performance Summaries. *MSU Coll. Agr. Mont. Agr. Exp. Sta.*
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- MacDonald, T., S. D. Cash and J. Wichman. 1999. Effect of AC 'Grazeland' alfalfa on bloat incidence. *Proc. 48th Mont. Livestock Nutrition Conf.* 22-23 Apr. Bozeman.
- Cash, S. D., R. Carlstrom, K. Lee, and V. Knerr. 1998. Montana hay production. *In: Proceedings of the 1998 Montana Hay Growers Conference.* Mont. St. Univ. Coll. Agr. Spec. Rep. 102.
- Cash, S. D., L. Schmidt, M. King, K. Denny and C. Hill. 1998. Where do I get my hay tested? The 1998 certified laboratories. *In: Proceedings of the 1998 Montana Hay Growers Conference.* Mont. St. Univ. Coll. Agr. Spec. Rep. 102.
- Dunn, R. L., R. L. Ditterline, S. D. Cash, L. E. Welty, L. S. Prestbye, D. M. Wichman, G. R. Carlson, J. W. Bergman, J. L. Eckhoff, G. F. Stallknecht and K. Gilbertson. 1998. Summary of the Montana uniform intrastate alfalfa yield trials. *In: Proceedings of the 1998 Montana Hay Growers Conference.* Mont. St. Univ. Coll. Agr. Spec. Rep. 102.
- King, M., V. Knerr, K. Lee, R. Carlstrom, L. Schmidt, K. Denny, C. Hill and S. D. Cash. 1998. Easy field method for predicting hay quality at first harvest: the Montana HayWatch program. *In: Proceedings of the 1998 Montana Hay Growers Conference.* Mont. St. Univ. Coll. Agr. Spec. Rep. 102.
- Lenssen, A. W., S. L. Blodgett and S. D. Cash. 1998. Early raking reduces alfalfa weevil populations. *In: Proceedings of the 1998 Montana Hay Growers Conference.* Mont. St. Univ. Coll. Agr. Spec. Rep. 102.

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EDUCATION

BS	North Dakota State University	Animal Science	1985
MS	Montana State University	Animal Science	1987
PhD	University of Wyoming	Reproductive Biology	1993

PROFESSIONAL EXPERIENCES

UNIVERSITY

1998- present	Extension Beef Specialist	Animal and Range Sciences	Montana State
1995-1998	Assistant Professor	Animal Science	Chadron State College
1993-1995	Postdoctoral Fellow	Dept. of Physiology	Colorado State

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.
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SOURCES OF RECENT FUNDING TO SUPPORT RESEARCH/TEACHING PROGRAM

1999	American Simmental Association.	\$36,620.
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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.
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MAJOR PUBLICATIONS (last five years)

Bellows, R.A., Lammoglia, M.A., Geary, T.W., Funston, R.N. 1999. Effects of dystocia on cold tolerance and serum glucose and cortisol in newborn calves. J. Anim. Sci. 77 (Suppl. 1).

Bellows, R.A., Simms, D.D., Grings, E.E., Phelps, D.A., Bellows, S.E., Bellows, N.R., Short, R.E., Funston, R.N., Geary, T.W. 1999. Effects of feeding supplemental fat during gestation on reproduction in primiparous beef heifers. J. Anim. Sci. 77 (Suppl. 1).

Bellows, R.A., Lammoglia, M.A., Geary, T.W., Funston, R.N. 1999. Effects of dystocia on cold tolerance in newborn calves. *Proc. West. Sec. Am. Soc. Anim Sci.* 50.

Funston, R.N., G.E. Seidel, Jr. and A.J. Roberts. 1996. Insulin-like growth factor I and insulin-like growth factor binding proteins in bovine serum and follicular fluid before and after the pre-ovulatory surge of LH. *Biol. Reprod.* **55:1390.**

Funston, R.N., D.W. Sanson, D.L. Hixon, D.W. Moore. 1996. Effect of protein level during late gestation on weight change and calving characteristics of first calf heifers. *The Professional Animal Scientist* **12:12.**

Funston, R.N. and G.E. Seidel, Jr. 1995. GnRH Increases Cleavage Rates of Bovine Oocytes Fertilized *In Vitro.* *Biol. Reprod.* **53:541.**

Funston, R.N., G.E. Moss, and A.J. Roberts. 1995. Insulin-like growth factor-I (IGF-I) and IGF-binding proteins in bovine sera and pituitaries at different stages of the estrous cycle. *Endocrinology* **136: 62.**

Funston, R.N., A.J. Roberts, D.L. Hixon, D.M. Hallford, D.W. Sanson, and G.E. Moss. 1995. Effect of acute glucose antagonism on hypophyseal hormones and concentrations of insulin-like growth factor (IGF-I) and IGF-binding proteins in serum, anterior pituitary and hypothalamus of ewes. *Biol. Reprod.* **52:1179.**

L. C. (Sandy) Gagnon

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EDUCATION

BS	Montana State University	Animal Science	1966
MS	Montana State University	Animal Physiology	1969

PROFESSIONAL EXPERIENCE

1999-Present	Associate Professor Equine Extension Specialist	Animal Science	Montana State University
1994-1999	Associate Professor	Animal Science	Montana State University
1998-1999	Acting Farm Manager	Animal & Range Sci.	Montana State University
1993-1994	Office of the Dean	College of Agriculture	Montana State University
	Associate Professor	Animal Science	Montana State University
1990-1993	Acting Department Head	Animal & Range Sci.	Montana State University
	Associate Professor	Animal Science	Montana State University
1984-1990	Associate Professor	Animal Science	Montana State University
1975-1984	Assistant Professor	Animal Science	Montana State University
1969-1975	Instructor	Animal Science	Montana State University

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.

Olson-Rutz, K.M., C.B. Marlow, K. Hansen, L.C. Gagnon, and R.J. Rossi. Recovery of a high elevation plant community after packhorse grazing. *J. Range Management*. 49:541-545.

Olson-Rutz, K.M., C.B. Marlow, K. Hansen, L.C. Gagnon, and R.J. Rossi. Packhorse grazing behavior and immediate impact on a timberline meadow. *J. Range Management*. 49:546-550.

Brownson, R.M., R.B. Staigmler, J. Broesder, B.D. Nisley, L.C. Gagnon, M.W. Tess, C.B. Campbell, and S. Bellows. Reproductive responses of heifers implanted with estradiol benzoate or zeranol. *J. Anim. Sci.* Vol. 48.

Brownson, R.M., B.D. Nisley, L.C. Gagnon, M.W. Tess, R.B. Staigmler, C.B. Campbell, and D.L. Step. Pre-weaning response of estradiol benzoate and zeranol of steers and heifers (Phase I). ASAS meeting abstract in Rapid City, SD.

Gagnon, L.C., C.B. Marlow, H. Sherwood, and A. Miller. Concession grazing management plan and monitoring study for Theodore Roosevelt National Park. Theodore Roosevelt National Park, Medora, ND, United States Dept of Interior.

Gagnon, L.C. and David Barbisan. 1994. Consumption Time of Cubed Rations As Compared To Long-stemmed Hay & Grain.

Gagnon, L.C. and David Barbisan. 1994. Palatability of Safflower Oil As Compared To That of Linseed Oil In Horse Rations.

Gagnon, L.C. and David Barbisan. 1994. Consumption Time of Cubed Rations As Compared To Long-stemmed Hay and Grain In Weanlings.

Olson-Rutz, L.C. Gagnon, C.B. Marlow, K. Hansen and R.J. Rossi. 1994. Behavior and Immediate Impact of Recreational Horses Grazing in an Upper Treeline Meadow. Report to USDA, FS, and submitted to *Journal of Range Management*.

Gagnon, L.C. and David Barbisan. 1993. Comparison of Feeding a Complete Cubed Ration (ALFA 600) Versus Longstemmed Alfalfa Hay and Fortified Grain.

Marlow, C.B., L.C. Gagnon, L.R. Irby and M.R. Rowen. 1992. Feral Horse Distribution, Habitat Use and Population Dynamics in Theodore Roosevelt National Park. Final publication for USDA, National Park Service.

Wayne F. Gipp

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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.
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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 a 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 a means to monitor carcass quality improvement as well as a step 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 REVEIWED JOURNALS

Gipp, W.F., C.K. Swenson. 1996. Influence of full fat canola seed in prestarter and starter pig diets. Proceedings, WSASAS.

Clark, C.K., W.F. Gipp, and K.S. Bryan. 1995. Influence of frost-damaged barley on weight gain performance of swine. Proceedings, WSASAS 46:570-572.

PAPERS PRESENTED AT SCHOLARLY MEETINGS

Gipp, W.F., C.K. Swenson. 1996. Influence of full fat canola seed in prestarter and starter pig diets. Proceedings, WSASAS.

Clark, C.K., W.F. Gipp, and K.S. Bryan. 1995. Influence of frost-damaged barley on weight gain performance of swine. J. Anim. Sci. 73(Suppl 1):312(Abstr.).

Gipp, W.F., C.K. Clark, and K.S. Bryan. 1995. Influence of barley fineness of grind on starter, grower and finisher swine performance. J. Anim. Sci. 73(Suppl 1):179(Abstr.).

Miller, D.C., W.F. Gipp and J.R. Stouffer. 1992. Comparison of Real-Time Ultrasound and Carcass measurements. J. Anim. Sci. 69(Suppl.):246(Abstr.).

SOFTWARE

1993 Swine Symbol of Excellence Software – Version 5.0.

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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.
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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
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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

- Hatfield, P. G., W. S. Ramsey, and J. A. Fitzgerald. 2000. Effect of naloxone on intake, growth hormone, and luteinizing hormone concentrations in lactating and non-lactating ewes. *Small Rum. Res.* 35:21.
- Hatfield, P. G., S. L. Blodgett, G. D. Johnson, P. M. Denke, R. W. Kott, and M. W. Carroll. 1999. Sheep Grazing to Control Wheat Stem Sawfly, a Preliminary Study. *Sheep and Goat Res. J.* 15:159.
- Hatfield, P. G., J. Stellflug, J. W. Walker, and R. W. Kott. 1999. The effects of nutritional management on ewe and lamb body weight and ewe body composition. *Sheep and Goat Res. J.* 15:41.
- Hatfield, P. G., W. A. Head, Jr., J. A. Fitzgerald, and D. M. Hallford. 1999. Effects of level of energy intake and energy demand on growth hormone, insulin, and metabolites in Targhee and Suffolk ewes. *J. Anim. Sci.* 77:2757.
- Ramsey, W. S., P. G. Hatfield, and J. D. Wallace. 1998. Relationships among ewe milk production and ewe and lamb forage intake in Suffolk and Targhee ewes nursing single or twin lambs. *J. Anim. Sci.* 76:1247.
- Hatfield, P. G., J. A. Hopkins, W. S. Ramsey, and A. Gilmore. 1998. Effects of level of protein and type of molasses on digesta kinetics and blood metabolites in lambs. *Small Rum. Res.* 28:161.
- Kott, R. W., V. M. Thomas, P. G., Hatfield, T. Evan, K. C., Davis. 1998. Effects of dietary vitamin E supplementation during late pregnancy on lamb mortality and ewe productivity. *Amer. Vet Med. Assoc.* 212:997.
- Hatfield, P. G., V. M. Thomas, and R. W. Kott. 1997. Influence of energy or protein supplementation during midpregnancy on lamb production of ewes grazing winter range. *Sheep and Goat Res. J.* 13:150.
- Hatfield, P. G., J. A. Hopkins, G. T. Pritchard, and C. W. Hunt. 1997. The effects of level of whole barley, form of roughage, and barley bulk density on feedlot lamb performance, carcass characteristics, and digestive kinetics. *J. Anim. Sci.* 75:3353.
- Kudva, I. T., P. G. Hatfield, and C. J. Hovde. 1997. Characterization of *Escherichia coli* 0157:H7 and other Shiga toxin producing *E. coli* isolated from sheep. *J. of Clin. Microbiology.* 35:892.
- Hatfield, P. G., and J. N. Stellflug. 1996. Comparing performance of pen- and range-mated ewe lambs from different lines of Targhee sheep. *Sheep and Goat Res. J.* 12:105.
- Head Jr., W. A., P. G. Hatfield, D. M. Hallford, J. A. Fitzgerald, M. K. Petersen, and J. N. Stellflug. 1996. Effects of selection for lifetime production of lamb weaned on physiological factors that affect growth in Targhee ewes and lambs. *J. Anim. Sci.* 74:2152.
- Head Jr., W. A., P. G. Hatfield, D. M. Hallford, J. A. Fitzgerald, M. K. Petersen, and J. N. Stellflug. 1996. Effects of selection for lifetime production of lamb weaned on feedlot performance, carcass characteristics, and internal organ weight of Targhee lambs. *Sheep and Goat Res. J.* 12:45.
- Kudva, I. T., P. G. Hatfield, and C. J. Hovde. 1996. *Escherichia coli* 0157:H7 in microbial flora of sheep. *J. of Clin. Microbiology.* 34:431.
- Soder, K. J., V. M. Thomas, R. W. Kott, P. G. Hatfield, and B. Olsen. 1995. Influence of energy or protein supplementation during mid-pregnancy on forage intake of ewes grazing Montana Winter Range. *J. Anim. Sci.* 73:2853.
- Head Jr., W. A., P. G. Hatfield, J. A. Fitzgerald, M. K. Petersen, D. M. Hallford, and J. N. Stellflug. 1995. Effects of lifetime selection for kilograms of lamb weaned per ewe on ewe and lamb feed intake, digestion, and body weight change. *SID Sheep Res. J.* 11:78.
- Kudva, I. T., P. G. Hatfield, and C. J. Hovde. 1995. Effects of diet on the shedding of *Escherichia coli* 0157:H7 in a sheep model. *Appl. and Envir. Microbiology.* 61:1363.
- Hatfield, P. G., G. D. Snowden, W. A. Head Jr., H. A. Glimp, and T. Besser. 1995. The effects of zinc methionine and level of protein during late gestation and early lactation on ewes rearing either single or twin lambs. *J. Anim. Sci.* 73:1227.
- Hatfield, P. G. 1995. Effects of breed and previous grazing location on feedlot lamb performance. *SID Sheep Res. J.* 11:14.

MANUSCRIPTS ACCEPTED

- Hatfield, P. G., R. A. Field, J. A. Hopkins, and R. W. Kott. Palatability of concentrate fed wethers processed at different ages and of yearling wethers grazed on native range. *J. Anim. Sci.*
- Hamadeh, S. K., P. G. Hatfield, R. W. Kott, B. L. Robinson, and B. F. Sowell. Effects of breed, sex, birth type and colostrum intake on body temperature of new born lambs subjected to cold stress. *Sheep and Goat Res. J.*
- Hatfield, P. G., J. T. Daniels, R. W. Kott, D. E. Burgess, and T. J. Evans. Role of supplemental vitamin E in lamb survival and production: A Review. *J. Anim. Sci.*

MANUSCRIPTS IN PRESS

- Daniels, J. T., D. E. Burgess, P. G. Hatfield, and R. W. Kott. 1999. An ELISA method for determining sheep serum IgG concentration. *Sheep and Goat Res. J.*

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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
1971-1981	Wildlife Biologist	Michigan Dept. Natural Resources, Wildlife Division

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

1999	U.S. Fish & Wildlife Service	Prairie Dog Education	\$6,000
1998	NRI Competitive Grant Prgm	Coordinated Elk Management	\$290,000
1994-99	MT. Dept. Fish & Wildlife & Parks	Extension Wildlife Education	\$155,000
1998	U.S. Fish & Wildlife Service	Endangered Species Education	\$10,000
1995-98	USDA SARE	Riparian Education	\$98,000
1995	USDA SARE	Influencing elk & livestock riparian use	\$7,800

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

Swensson, E.J. and J.E. Knight. 1998. Identifying Montana hunter/rancher problems and solutions. J.Range Manage. 51: 432-427.

- Knight, J.E., E.J. Swensson and H. Sherwood. 1998. Elk use of modified fence crossings. *Wildl. Soc. Bul.* 25(4) 819-822.
- Knight, J.E. 1996. Minimizing controversy in wildlife and livestock grazing management. *Trns.* 61st No. Am. Wildl. And Natur. Resourc. Conf. pp. 137-141.
- Knight, James E. 1994. Jackrabbits and other hares. In: *Prevention and Control of Wildlife Damage*. S.E. Hygnstrom, R.M. Timm and G. E. Larson, Eds. University of Nebraska and Great Plains Agriculture Council.
- Knight, James E. 1994. Skunks. In: *Prevention and Control of Wildlife Damage*. S.E. Hygnstrom, R.M. Timm and G. E. Larson, Eds. University of Nebraska and Great Plains Agriculture Council.
- Knight, J. E. 1994. Mountain Lions. In: *Prevention and Control of Wildlife Damage*. S.E. Hygnstrom, R.M. Timm and G. E. Larson, Eds. University of Nebraska and Great Plains Agricultural Council.
- Brence, L.A. and Knight, J.E. 1998. A sportman's guide to landowner relations. *MontGuide* MT 9813.
- Hill, C.A. and Knight, J.E. 1998. Minimizing deer damage to residential plantings. *MontGuide* MT 9814.
- Knight, J.E. 1997. Coping with Snakes in Montana. *MontGuide* 9617 AG.

Rodney Kott

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EDUCATION

BS	Texas A&M University	Agricultural Education	1974
MS	Texas A&M University	Animal Science	1976
PhD	New Mexico State University	Animal Science	1980

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 learders form other states to help facilitate national sheep related programs such as wool classing schools (train certified wool classers) and National Sheep Improvement Program (a genetic record keeping package)
 - Develop and conduct a carcass lamb evaluation program for Montana 4H youth lamb projects
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SOURCES OF FUNDING TO SUPPORT RESEARCH PROGRAM (1995 to present)

2000	USDA	Sheep Competitiveness	\$200,000(pending)
2000	USDA	Wool Research	\$28,043
1999	USDA	Wool Research	\$28,043
1998	USDA	Wool Research	\$28,043
1997	USDA	Wool Research	\$28,043
1996	USDA	Wool Research	\$19,915
1996	Hoffman	Vitamin E & Lamb Survivability	\$5,000
1995	USDA	Wool Research	\$19,915

Publications (1995 to present):

Hatfield, P. G., S. L. Blodgett, G. D. Johnson, P. M. Denke, R. W. Kott, and M. W. Carroll.
Sheep Grazing to Control Wheat Stem Sawfly, a Preliminary Study. (In Press) Sheep
and Goat Res. J.

Hamadeh, S. K., P. G. Hatfield, R. W. Kott, B. L. Robinson, and B. F. Sowell. (In Press)
Effects of breed, sex, birth type and colostrum intake on body temperature of new born
lambs subjected to cold stress.

- Daniels, J. T., D. E. Burgess, P. G. Hatfield, and R. W. Kott. (In Press) An ELISA method for determining sheep serum IgG concentration. *Sheep and Goat Res. J.*
- Roeder, B.L., V.M. Thomas, R.W. Kott, D.Burges and R.P. Ansotegui. (In Press) Effect of short term, prepartum feeding of level and type of protein on subsequent lactation. *Sheep Research Journal.*
- Hatfield, P.G., J. Stellflug, J.W. Walker and R. W. Kott. 1999. The effects of nutritional management on ewe and lamb bodyweight and ewe body composition. *Sheep & Goat Research Journal.* 15:41.
- Kott, R.W., V.M. Thomas, P.G. Hatfield, T. Evans and K.C. Davis. 1998. Effects of dietary vitamin E supplementation during late pregnancy on lamb mortality and ewe productivity. *J AVMA* 212:997.
- Hatfield, P. G., V.M.Thomas and R.W. Kott. 1997. Influence of energy or protein supplementation during midpregnancy on lamb production of ewes grazing winter range. *Sheep & Goat Research Journal.* 13:150.
- Snowder, G.D. C.J. Lupton, J.M. Shelton, V.M. Thomas, R.W. Kott, G.E. Bradford, M.R. Dally, A.D. Knight, H.A. Glimp, P.J. Burfening and P.V. Thompson. 1997. Comparison of U.S. Fine-Wool Breeds and Australian Merino F1 Crosses: I. Wool characteristics and body weight. *Sheep & Goat Research Journal.* 13:108.
- Snowder, G.D., J.M. Shelton, V.M. Thomas, R.W. Kott, M.R. Dally, G.E. Bradford, A.K. Knight, T.D. Willingham, H.A. Glimp, C.J. Lupton and H. Sakul. 1997. Comparison of American fine wool and Australian Merino F1 crosses: II. Growth and carcass characteristics. *Sheep & Goat Research Journal.* 13:116.
- Snowder, G.D., J.M. Shelton, V.M. Thomas, R.W. Kott, G.E. Bradford, C.J. Lupton, M.R. Dally, A.K. Knight, T.D. Willingham, H.A. Glimp and P.V. Thompson. 1997. Comparison of American fine wool and Australian Merino F1 crosses: III. Lamb performance. *Sheep & Goat Research Journal.* 13:122.
- Olson, B.E., R.T. Wallander, V.M. Thomas, R.W. Kott. 1996. Effect of Previous experience on sheep grazing leafy spurge. *Appl. Anim. Behavior Sci.* XXX:1066.
- Kott, R.W., C.M. Shuldt and V.M. Thomas. 1996. The effect of britch removal in Rambouillet fleeces on clip and fleece fiber diameter and its variability. *Sheep & Goat Research Journal.*
- Thomas, V.M. and R.W. Kott. 1995. A review of Montana winter range ewe nutrition research. *Sheep & Goat Research Journal*, Vol. 11, No. 1 p. 17.
- Thomas, V.M., R.W. Kott and R.W. Ditterline. 1995. Sheep production response to continuous and rotational stocking on dryland alfalfa/grass pasture. *Sheep & Goat Research Journal*, Vol. 11, No. 3 p. 122.

Book Chapters

- | | |
|------|--|
| 1999 | Sheep. <i>Encyclopedia of the Great Plains.</i> |
| 1997 | Sheep Nutrition. In <i>Livestock Feeds and Feeding</i> by Richard O. Kellems and D.C. Church. Fourth Edition, Prentice Hall, Upper Saddle River, New Jersey. |
| 1997 | Nutrition Chapter. In <i>Sheep Production Handbook.</i> 1997 ed. Sheep Industry Development Program Inc., Denver, Co. |
| 1997 | Forage Chapter. In <i>Sheep Production Handbook.</i> 1997 ed. Sheep Industry Development Program Inc., Denver, Co. |

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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 with minor in Statistics	1969

PROFESSIONAL EXPERIENCE

FTE = 70% Admin., 30% MAES

1964-69	Research Assistant	University of Wisconsin
1970-80	Asst. & Assoc. Prof. Anim. Sci.	Montana State University
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

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

- Kress, D.D., D. E. Doornbos, D. C. Anderson, and K.C. Davis. 1995. Tarentaise and Hereford breed effects on cow and calf traits and estimates of individual heterosis for traits of calves. *J. Anim. Sci.* 73:2574.
- Snelling, W.M., M.D. MacNeil, D.D. Kress, D.C. Anderson, and M.W. Tess. 1996. Factors influencing genetic evaluations of Linebred Hereford cattle in diverse environments. *J. Anim. Sci.* 74:1499.
- Kress, D.D., K.C. Davis, and M.W. Tess. 1996. Adjusting scrotal circumference of yearling beef bulls in five composites. *Can. J. Anim. Sci.* 76:189.
- Kress, D.D., D. E. Doornbos, D. C. Anderson, and K.C. Davis. 1996. Genetic components for milk production of Tarentaise, Hereford, and Tarentaise x Hereford cows. *J. Anim. Sci.* 74:2344.
- Davis, K.C., D.D. Kress, D.E. Doornbos, and D.C. Anderson. 1998. Heterosis and breed additive effects for Hereford, Tarentaise, and the reciprocal crosses for calf traits. *J. Anim. Sci.* 76:701.
- Kress, D.D. and M.D. MacNeil. 1999. Crossbreeding beef cattle for Western range environments (2nd Ed.). WCC-1 Pub. TB-99-1. The Samuel Roberts Noble Foundation, Ardmore, OK, in coop. with Montana State University, Bozeman.
- Miller, E.T., D.D. Kress, R.P. Ansotegui, D.W. Bailey, and D.C. Anderson. 2000. Fecal output by calves from Hereford, Tarentaise, and Hereford x Tarentaise cows under range conditions. *J. Anim. Sci.* (Submitted).

Clayton B. Marlow

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EDUCATION

BS	University of Wyoming	Range Management	1974
MS	Washington State University	Forest & Range Management	1976
PhD	University of Wyoming	Range Management	1978

PROFESSIONAL EXPERIENCES

1999-Present	Associate Prof.	Range Management	Montana State University
1989-1999	Associate Dean	Resident Instruction	Montana State University
1984-1989	Associate Prof.	Range Management	Montana State University
1980-1984	Assistant Prof.	Range Management	Montana State University

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 Bebb's 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
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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.
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PARTIAL LIST OF PUBLICATIONS

REFEREED ARTICLES

Law, D.J., C.B. Marlow, J.C. Mosley, Steve Custer, Paul Hook and B. Leinard. Accepted. Water table dynamics and soil texture of three riparian plant communities. Northwest Sci.

Olson-Rutz, C.B. Marlow, K. Hansen, L.C. Gagnon and R.J. Rossi. 1996. Packhorse grazing behavior and immediate impact on a timberline meadow. J. Range Manage. 49(6):546-550.

Olson-Rutz, C.B. Marlow, K. Hansen, L.C. Gagnon and R.J. Rossi. 1996. Recovery of a high elevation plant community after packhorse grazing. J. Range Manage. 49(6):541-545.

Rhodes, B.J., C.B. Marlow and H.W. Sherwood. 1995. Monitoring Streambank stability: Grazing Impacts or stream variability? Montana Agresearch 12(2):3-8.

Allen, Douglas R. and C.B. Marlow. 1994. Shoot population dynamics of beaked sedge following cattle grazing. J. Range Manage. 47(1):64-69.

Jeffrey C. Mosley

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EDUCATION

BS	Montana State University	Range Science	1981
MS	University of Idaho	Range Resources	1983
PhD	Texas Tech University	Range Science	1987

PROFESSIONAL EXPERIENCE

FTE = 20% MAES, 80% MCES

1995-present	Associate Professor and Extension Range Management Specialist	Montana State University
1993-1995	Associate Professor	University of Idaho
1989-1993	Assistant Professor	University of Idaho
1987-1989	Research Associate and Lecturer	University of Arizona
1984	Instructor	University of Idaho

Research and Extension Emphasis: *Grazing Ecology of Wild and Domestic Ungulates,
Foraging Behavior, Prescribed Livestock Grazing,
Collaborative Processes for Conflict Management,
Rangeland Monitoring, Riparian Ecology and
Management*

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)

- Hansen, K.V., and J.C. Mosley. 2000. Effects of roundups on behavior and reproduction of feral horses. *Journal of Range Management* (In Press).
- Sowell, B.F., J.C. Mosley, and J.G.P. Bowman. 2000. (Invited review paper). Social behavior of grazing beef cattle: Implications for management. *Journal of Animal Science* (In Press).
- Alpe, M.J., J.L. Kingery, and J.C. Mosley. 1999. Effects of summer sheep grazing on browse nutritive quality in autumn and winter. *Journal of Wildlife Management* 63:346-354.
- Mbabaliye, T., J.L. Kingery, and J.C. Mosley. 1999. Early summer vs. late summer diets of sheep grazing in a conifer plantation. *Sheep and Goat Research Journal* 15:34-40.
- Mosley, J.C., S.C. Bunting, and M.E. Manoukian. 1999. (Invited book chapter). Cheatgrass, p. 175-188. *In: Biology and Management of Noxious Rangeland Weeds* (R. L. Sheley and J. Petroff, eds.), Oregon State University Press, Corvallis.
- Tear, T.H., J.C. Mosley, and E.D. Ables. 1997. Landscape-scale foraging decisions by reintroduced Arabian oryx. *Journal of Wildlife Management* 61:1142-1154.
- Kingery, J.L., J.C. Mosley, and K.C. Bordwell. 1996. Dietary overlap among cattle and cervids in northern Idaho forests. *Journal of Range Management* 49:8-15.
- Mosley, J.C. 1996. (Invited review paper). Prescribed sheep grazing to suppress cheatgrass: A review. *Sheep and Goat Research Journal* 12:74-81.
- Darby, N.W., J.C. Mosley, B.B. Davitt, and G.A. Bohach. 1995. Effects of diet on ungulate excretion of *Enterococcus* spp., *Streptococcus bovis*, and *streptococcus equinus* in feces. *Journal of Environmental Quality* 24:719-724.
- Mosley, J.C. 1994. (Invited review paper). Prescribed sheep grazing to enhance wildlife habitat on North American rangelands. *Sheep Research Journal Special Issue*:79-91.

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EDUCATION

BA	University of California, Berkeley	Botany	1977
MS	University of California, Berkeley	Range Management	1982
PhD	Utah State University	Range Ecology	1987

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)

Wallander RT, Olson BE, Lacey JR (1995) Spotted knapweed seed viability after passing through sheep and mule deer. J Range Manage 48:145-149
Sprinkle JE, Kress DD, Doornbos DE, Anderson DC, Tess MW, Ansotegui RP, Olson BE, Roth NJ (1995) Chromic oxide contamination of pasture previously used in marker studies. J Range Manage 48:194-197

- Soder KJ, Thomas VM, Kott RW, Hatfield PG, Olson BE (1995) Influence of energy or protein supplementation during midpregnancy on forage intake of ewes grazing Montana winter range. *J Anim Sci* 73:2853-2859
- Houseal GA, Olson BE (1995) Cattle use of microclimates on a northern latitude winter range. *Can J Anim Sci* 75:501-507
- Williams KE, Lacey JR, Olson BE (1996) Economic feasibility of grazing sheep on leafy spurge-infested rangelands in Montana. *J Range Manage* 49:372-374.
- Beaver JM, Olson BE, Wraith JM (1996) A simple index of standard operative temperature for mule deer and cattle in winter. *J Therm Biol* 21:345-352
- Olson BE, Wallander RT, Thomas VM, Kott RW (1996) Effect of previous experience on sheep grazing leafy spurge. *Appl Anim Behav* 50:161-176
- Houseal GA, Olson BE (1996) Nutritive value of live and dead components of two bunchgrasses. *Can J Anim Sci* 76:555-562
- Beaver JM, Olson BE (1997) Winter range use by different aged cattle in southwestern Montana. *Appl Anim Behav Sci* 51:1-13
- Olson BE, Wallander RT, Kott RW (1997) Recovery of leafy spurge seed from sheep. *J Range Manage* 50:10-15
- Sheley RL, Olson BE, Larson LL (1997) Effect of weed seed rate and grass defoliation level on diffuse knapweed. *J Range Manage* 50:33-37
- Olson BE, Kelsey RG (1997) Effect of *Centaurea maculosa* on sheep rumen microbial activity and mass in vitro. *J Chem Ecol* 23:1131-1144
- Olson BE, Wallander RT, Lacey JR (1997) Effects of sheep grazing on a spotted knapweed-infested Idaho fescue community. *J Range Manage* 50:386-390
- Olson BE, Wallander RT (1997) Biomass and carbohydrate status of spotted knapweed and Idaho fescue after repeated grazing. *J Range Manage* 50:409-412
- Olson BE, Wallander RT, Fay PK (1997) Intensive cattle grazing of oxeye daisy. *Weed Tech* 11:176-181
- Olson BE, Wallander RT (1998) Effect of repeated sheep grazing on a leafy spurge infested-Idaho fescue range site. *J Range Manage* 51:247-252
- Roberts, J, Olson BE (1999) Effect of *Euphorbia esula* on sheep rumen microbial activity and mass in vitro. *J Chem Ecol* 25:297-314
- Olson BE, Jacobsen JS (1999) Plasticity of high- and low nutrient-adapted grasses to added S and N. *J Plant Nutr* 22:641-655
- Roberts J, Olson BE (1999) Effect of *Euphorbia esula* on growth and mortality of migratory grasshopper nymphs. *J Agric Urban Ento* 16:1-10
- Olson BE, Wallander RT (1999) Carbon allocation by *Euphorbia esula* and neighbours after defoliation. *Can J Bot* 77:1-7
- Olson BE (1999) Impacts of noxious weeds on ecologic and economic systems. In R. Sheley, J. Petroff (eds.) *Biology and management of noxious rangeland weeds*. Oregon State University Press, Corvallis, pp 4-18
- Olson BE (1999) Grazing and weeds. In R. Sheley, J. Petroff (eds) *Biology and management of noxious rangeland weeds*. Oregon State University Press, Corvallis, pp 85-96
- Olson BE, Wallander RT (1999) Oxeye daisy (*Chrysanthemum leucanthemum* L.). In R. Sheley, J. Petroff (eds.) *Biology and management of noxious rangeland weeds*. Oregon State University Press, Corvallis, pp 282-289
- Olson BE (1999) Manipulating diet selection to control weeds. In KL Launchbaugh, KD Sanders, JC Mosley (eds.) *Grazing behavior of livestock and wildlife*. Idaho Forest, Wildlife and Range Stat Bull #70, pp 36-44
- Olson BE, Wallander RT, Paterson JA (2000) Do windbreaks minimize stress on cattle grazing foothill winter range? *Can J Anim Sci* – in press
- Olson BE, Wallander RT, Beaver JM (2000) Nondestructive measures of forage structure. *Can J. Plant Sci* – accepted
- Olson BE, Wallander RT (2000) Sheep grazing of spotted knapweed and Idaho fescue. *J Range Manage* – submitted.

John Paterson

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EDUCATION

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

PROFESSIONAL EXPERIENCES

UNIVERSITY

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

Larson, B.T., M.D. Samford, J.T. Turner, M.S. Kerley and J.A. Paterson. 1995. Effects of endophyte-infected tall fescue, environmental temperature, and prazosin injection on the rate. Compar. Biochem. And Physiol.

Anderson, L., S. Taylor, R. Funston and J.A. Paterson. 1999. Montana Beef Network: Beef Quality Assurance Training Manual. Montana Beef University.

Ansotegui, R.P., J.D. Bailey, J.A. Paterson, P.G. Hatfield, and C.K. Swenson. 1999. Effects of supplemental trace mineral form on copper status, estrus, ovulation rate, and fertility in beef heifers. Proc. West. Sec. Amer. Soc. Anim. Sci.

Bailey, J.D., R.P. Ansotegui, J.A. Paterson, J.G. Berardinelli, and A.B. Johnson. 1999. Effects of supplemental trace mineral form on trace mineral status and performance of beef heifers. Proc. West. Sec. Amer. Soc. Anim. Sci.

Paterson, J.A., C.K. Swenson, A.B. Johnson, and R.P. Ansotegui. 1999. Life cycle trace mineral needs for reducing stress in beef production.

(Invited Presentations)

Proc. 60th Minnesota Nutrition Conf.. (September)

Proc. Mid-South Ruminant Nutrition Conf. TAMU (May)

Proc. Pacific Northwest Animal Nutrition Conf. (October)

Proc. Arkansas Veterinary Conf. (August)

Harris Ranches, Coalinga, CA (February, 2000)

Bok F. Sowell

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82% teaching, 18% research

EDUCATION

BS	New Mexico State University	Wildlife Science	1978
MS	Texas Tech University	Range Science	1981
Ph.D.	New Mexico State University	Animal Science/Range Nutrition	1989

PROFESSIONAL EXPERIENCE

1998-Present	Associate Professor	Animal & Range Sciences	Montana State University
1993-98	Assistant Professor	Animal & Range Sciences	Montana State University
1989-1992	Assistant Professor	Animal & Range Sciences	South Dakota State Univer.

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
1994, 1996, 1998 Who's Who Among America's Teachers

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

- Winslow, S. and **B. F. Sowell**. 2000. Technical Note: A comparison of methods to determine plant successional stages. *Journal of Range Management*. 53:194-198.
- Sowell, B. F.**, M. E. Branine, J. G. P. Bowman, M. E. Hubbert, H. W. Sherwood, and W. Quimby. 1999. Feeding and watering behavior of healthy and morbid steers in a commercial feedlot. *Journal of Animal Science*. 77:1105-1112.
- Earley, A.V., **B.F. Sowell** and J.G.P. Bowman. 1999. Liquid supplementation of grazing cows and calves. *Animal Feed Science Technology*. 80:281-296.
- Bowman, J. G. P., **B. F. Sowell**, D. L. Boss, and H. W. Sherwood. 1999. Influence of liquid supplement delivery method on forage and supplement intake by grazing beef cows. *Animal Feed Science and Technology*. 78:273-285.
- Sowell, B.F.**, J.G.P. Bowman, M.E. Branine, M.E. Hubbert and H.W. Sherwood. 1998. Radio Frequency technology to measure feeding behavior and health of feedlot steers. *Applied Animal Behavior*. 59:275-282.

- Birdsall, J.L., P.C. Quimby, Jr., N.E. Rees, T.J.Svejcar, and **B.F. Sowell**. 1997. Image Analysis of Leafy Spurge (*Euphorbia esula*) Cover. *Weed Tech.* 11:798-803.
- Bowman, J.G.P. and **B.F. Sowell**. 1997. Delivery method and supplement consumption by grazing ruminants: a review. *Journal of Animal Science.* 75:543-550.
- Birdsall, J.L., P.C. Quimby, Jr., N.E. Rees, T.J.Svejcar, and **B.F. Sowell**. 1997. Image Analysis of Leafy Spurge (*Euphorbia esula*) Cover. *Weed Tech.* 11:798-803.
- Sowell, B.F.**, J.D. Wallace, M.L. Branine, E.L.Fredrickson, and J.G.P. Bowman. 1996. Effects of restricted suckling on forage intake of range calves. *Journal of Range Management.* 49:290-293.
- Bowman, J.G.P., **B.F. Sowell**, and J.A. Paterson. 1995. Liquid supplementation for grazing ruminants: a review. *Animal Feed Science and Technology* 55:105-138.
- Fredrickson, E.L., M.L. Galyean, M.E. Branine, **B.F. Sowell**, and J.D. Wallace. 1993. Influence of ruminally dispensed monensin and forage maturity on intake and digestion. *Journal of Range Management.* 46:214-220.
- Sowell, B.F.**, J.D. Wallace, E.E. Parker, and G.M. Southward. 1992. Protein supplementation and 48-hour calf removal effects on range cows. *Journal of Range Management.* 45:123-128.

PEER REVIEWED PUBLICATIONS

- Bowman, J. G. P. and **B. F. Sowell**. 1997. Feedint the Beef Cow Herd. *In: Livestock Feeds and Feeding.* 4th edition. Eds. R. O. Keliems and D. C. Church. Prentice Hall, Upper Saddle River, N.J. pp243-261.
- Glimp, H., D. Ely, J. Gerrish, E. Houston, R. Kott, D. Morrical, C. Taylor, R. Vankeuren and **B.F. Sowell**. 1997 Forage Chapter. *In: Sheep Production Handbook.* American Sheep Industry, Inc., Englewood, CO. pp 103-128.
- Sowell, B. F.** 1997. What Professional and Technical Skills Will Tomorrow's Range Managers Need? *Rangelands*, 19(2):21-22.

Gene Surber

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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 (CSREES-USDA)	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)

Hoffman, L. and Surber, G.W. 1994. Noxious Weed Seed Free Forage manual and reference guide, revised for western America.

Jacobsen, J.S. and Surber, G.W. 1995. Alfalfa/grass Response to Nitrogen And Phosphorus Applications, Commun. Soil Sci. Plant Anal., 26(7&8), 1273-1282.

Surber, G. (1999). Stream and Riparian Area Management: A Home Study Course for Managers – An Overview. RT 19:35. Feb 16. (video)

Surber, G. and Ehrhart, B. 1998. Stream and Riparian Area Management: A Home Study Course for Managers, (4 videos and manual). MSU Extension Service, EB 4446. Bozeman, MT

Surber G. & Porter S. (1999). Grass Roots Range Management Education with a High Tech Twist. People and Rangelands: Building the Future, International Rangeland Congress (Invited) Proc. Vol 1, pp 358-362, July 19-23, Townsville, Australia.

Surber, G., Williams, K. and Manoukian, M. 1998. Drinking Water Quality for Beef Cattle: An Environment Friendly and Production Management Enhancement Technique. Rangeland Management and Water Resources, Proceedings AWRA Specialty Conference, Reno, NV.

Michael W. Tess

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EDUCATION

BS	California State Polytechnic College	Animal Science	1971
MS	Montana State University	Animal Science	1978
PhD	University of Nebraska	Animal Science	1981

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. Ansotegui)	\$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	Montana Beef Council	(With D. D. Kress & J. P. Paterson)	\$5,260
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

Tess, M. W. 1995. Production Systems and Profit. In: The Genetics of Body Composition in Beef Cattle, S. K. DeNise, editor. NC-196 Regional Publication, National Cattlemen's Association Cattlemen's College, QC 101.

Sprinkle, J. E., D. D. Kress, D. E. Doornbos, D. C. Anderson, M. W. Tess, R. P. Ansotegui, B. E. Olson, and N. J. Roth. 1995. Chronic oxide contamination of forage in a pasture previously-used-in-marker studies. *J. Range Manage.* 48:194.

Ansotegui, R. P., E. J. Swensson, M. W. Tess, K. S. Bryan, C. K. Clark, and R. M. Brownson. 1995. Effects of cubing alfalfa hay on development of yearling beef heifers and In situ rate and extent of disappearance. *Prof. Anim. Sci.* 11:30.

Snelling, W. M., M. D. MacNeil, D. D. Kress, D. C. Anderson, and M. W. Tess. 1996. Factors influencing genetic evaluations of linebred Hereford cattle in diverse environments. *J. Anim. Sci.* 74:1499.

Kress, D. D., K. C. Davis, and M. W. Tess. 1996. Adjusting scrotal circumference of yearling beef bulls in five composites. *Can. J. Anim. Sci.* 76:189.

Almahdy, H., M. W. Tess, E. El-Tawil, E. Shehata and H. Mansour. 2000. Evaluation of Egyptian sheep production systems. I. Breed crosses and management systems. *J. Anim. Sci.* (accepted).

Almahdy, H., M. W. Tess, E. El-Tawil, E. Shehata and H. Mansour. 2000. Evaluation of Egyptian sheep production systems. II. Breeding objectives for purebred and composite breeds. *J. Anim. Sci.* (accepted).

Tess, M. W. and B. W. Kolstad. 2000. Simulation of cow-calf production systems in a range environment. I. Model development. *J. Anim. Sci.* (accepted).

Tess, M. W. and B. W. Kolstad. 2000. Simulation of cow-calf production systems in a range environment. I. Model evaluation. *J. Anim. Sci.* (accepted).

Tess, M. W. 2000. Genetic aspects of replacement heifers in current and future production systems. *J. Anim. Sci.* (accepted).

Carl L. Wambolt

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EDUCATION

BS	University of Idaho	Range & Wildlife Management	1967
MS	University of Wyoming	Range Science	1968
PhD	University of Wyoming	Range Science	1971

PROFESSIONAL EXPERIENCES FY appointment: 50% Instruction and 50% research (MAES)

1965-1966	Range Aide	Bureau of Land Management
1967-1970	Research Fellow	University of Wyoming
1970-1980	Range Management Specialist (MCES)	Montana State University
1980-present	Professor of Range Science	Montana State University

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.	\$ 37,500
Sagebrush ecology	
BLM, FW&P, & Foundation for North American Wild Sheep	122,000
Bighorn habitat relationships – Cooperator	
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

- Wambolt, C.L. and H.W. Sherwood. 1999. Sagebrush response to ungulate browsing in Yellowstone. *J. Range Manage.* 52:363-369.
- Wambolt, C.L., T.L. Hoffman, and C.A. Mehus. 1999. Response of shrubs in big sagebrush habitats to fire on the Northern Yellowstone Winter Range. USDA Forest Serv. Gen. Tech. Rep. RMRS-P-11. Ogden, Utah.
- Wambolt, C.L. 1998. Sagebrush and ungulate relationships on Yellowstone's northern range. *Wildlife Soc. Bull.* 26(3):429-437.
- Wambolt, C.L., R.S. White, and T.P. Walton. 1998. An effective method of measuring seed dissemination. *Intermountain J. Sciences.* 4:27-32.
- Wambolt, C.L., W.W. Fraas, and M.R. Frisina. 1998. Bitterbrush (*Purshia tridentata* Pursh) growth in relation to browsing. *Great Basin Naturalist.* 58:28-37.
- Wambolt, C.L., M.R. Frisina, K.S. Douglass, and H.W. Sherwood. 1997. Grazing effects on nutritional quality of bluebunch wheatgrass for elk. *J. Range Manage.* 50:503-506.
- Hoffman, T.L. and C.L. Wambolt. 1996. Growth response of Wyoming big sagebrush to heavy browsing by wild ungulates. p. 242-245. *In:* J.R. Barrow, E.D. McArthur, R.E. Sosebee, and R.E. Rausch, compilers, Proc. – Symposium on shrubland ecosystem dynamics in a changing environment. USDA Forest Serv. Gen. Tech. Rep. INT-GTR-338. Ogden, Utah.
- Wambolt, C.L. 1996. Mule deer and elk foraging preference for 4 sagebrush taxa. *J. Range Manage.* 49:499-503.
- Wambolt, C.L., W.W. Fraas, and M.R. Frisina. 1996. Variation in bitterbrush (*Purshia tridentata* Pursh) crude protein in southwestern Montana. *Great Basin Naturalist.* 56:205-210.
- Wambolt, C.L. and M.J. Watts. 1996. High stocking rate potential for controlling Wyoming big sagebrush. p. 148-150. *In:* J.R. Barrow, E.D. McArthur, R.E. Sosebee, and R.E. Rausch, compilers, Proc. – Symposium on shrubland ecosystem dynamics in a changing environment. USDA Forest Serv. Gen. Tech. Rep. INT-GTR-338. Ogden, Utah.
- Watts, M.J. and C.L. Wambolt. 1996. Long-term recovery of Wyoming big sagebrush after four treatments. *J. Environmental Manage.* 46:95-102.
- Wagner, F.H., R.B. Keigley, and C.L. Wambolt. 1995. Ungulate herbivory of willows on Yellowstone's northern winter range. *J. Range Manage.* 48:475-477.

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.

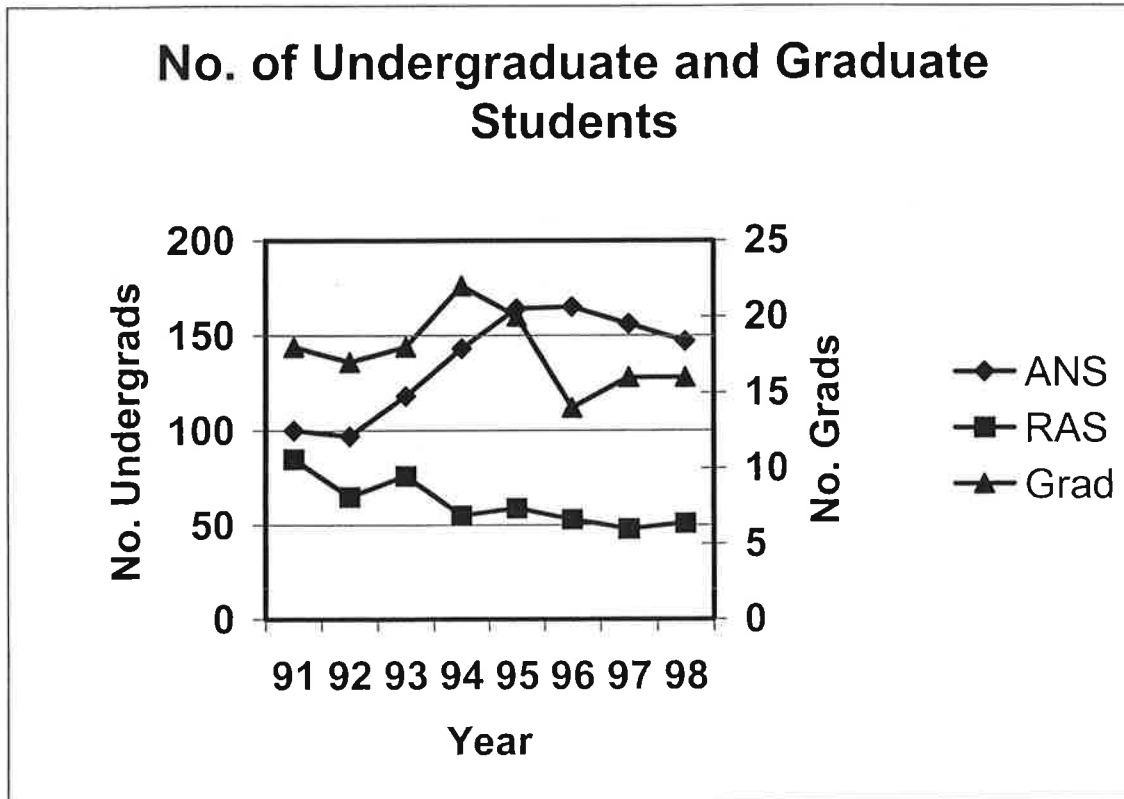
IFTE for Individual Teaching Faculty by Academic Year

Faculty	FTE	Acad. Yr. 95-96	Acad. Yr. 96-97	Rolling Avg	Acad. Yr. 97-98	Rolling Avg	Acad. Yr. 98-99	Rolling Avg	Acad. Yr. 99-00	Rolling Avg
Ansotegui	0.70	20.8	24.0	22.4	23.3	23.7	14.3	18.8	15.7	15.0
Berardinelli	0.26	20.0	20.0	20.0	22.7	21.4	25.8	24.3	13.8	19.8
Bowman	0.50	26.0	24.0	25.0	18.0	21.0	11.0	14.5	12.0	11.5
Burfening	0.40	43.3	32.5	37.9	15.8	24.2	31.7	23.8	35.6	33.7
Gagnon	0.86	12.9	22.4	17.6	22.4	22.4	29.8	26.1	29.8	29.8
Gipp	0.10	0.0	0.0	0.0	30.0	15.0	0.0	15.0	40.0	20.0
Hatfield	0.30	16.7	14.0	15.3	15.5	14.8	18.3	16.9	13.3	15.8
Kress	0.40	20.0	12.5	16.3	17.5	15.0	12.5	15.0	10.0	11.3
Marlow	0.05	57.5	57.5	57.5	34.5	46.0	38.3	36.4	9.2	23.7
Olson	0.45	28.9	15.6	22.2	28.9	22.2	17.4	23.1	24.1	20.7
Paterson	0.10	11.3	20.0	15.6	20.0	20.0	20.0	20.0	0.0	10.0
Sowell	1.00	17.0	15.0	16.0	17.0	16.0	18.0	17.5	13.0	15.5
Tess	0.25	16.0	16.0	16.0	16.0	16.0	16.0	16.0	28.0	22.0
Wambolt	0.50	16.0	12.0	14.0	16.0	14.0	16.0	16.0	16.0	16.0
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

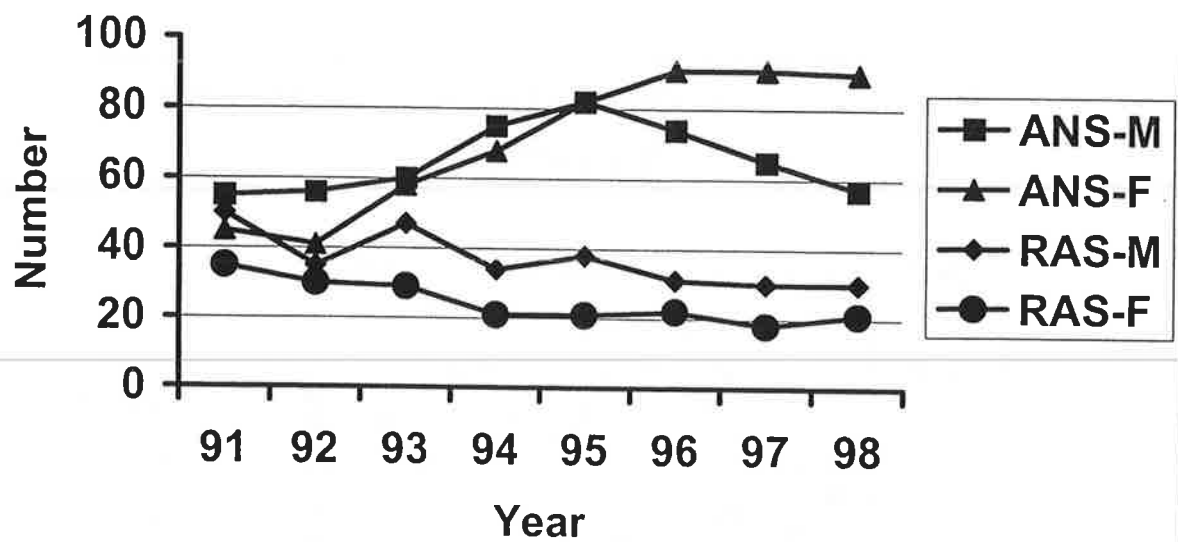
The figure below shows the enrollment trends for both undergraduate and graduate students since 1991. Students in animal science have decreased by about 20 students from a high of 165 in 1996 to 147 in 1998. Part of this change



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.

Undergraduates by Major and Gender



Class/Enrollment	1995-96		1996-97		1997-98		1998-99		1999-00	
	Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr
RNR 100 Intro Animal Sci		182		186		153		142		143
RNR 101 Prin Rngland Mgmt	184		169		169		154		121	
ARNR 102 Prin Rngland Mgmt Lab	151		140		144	98	135		102	
ARNR 105 Intro Anml Sci Lab		117		115	Course cancelled					
ARNR 110 Western Equit	28	30	28	30	27	32	46	30	56	30
ARNR 201 World Food		46		27	Course cancelled					
ARNR 208 Intermed West Equit							16	33	15	30
ARNR 211 Colt Break & Train	14	46	13		14		14		15	
ARNR 213 Spec Horse Train		15		9		19		15		16
ARNR 214 Inter West Equit		12	13	15	18	14				
ARNR 220 Feeds & Feeding		47		37	Course cancelled					
ARNR 230 Rng Lvst Prod	Revised from ARNR 330							93		69
ARNR 231 Lvst Mgmt Swine (Practicum)	New Course									9
ARNR 232 Lvst Mgmt Sheep (Practicum)	New Course							14		18
ARNR 233 Lvst Mgmt Horse (Practicum)	New Course								14	
ARNR 234 Lvst Mgmt Beef (Practicum)	New Course							20		18
ARNR 235 Lvst Mgmt Range (Practicum)	New Course									
ARNR 240 Prin Natrl Res Ecol	71		69		79		75		62	
ARNR 263 Rngland Field Ecol & Mgmt	New Course to be offered in the fall of 2000									
ARNR 316 Meat Sci	New Course									16
ARNR 320 Animal Nutrition	49		59		46		42		60	
ARNR 321 Phys Reprod	33		36		55		43		47	
ARNR 322 Prin Anml Breed		47		59		45		39		40
ARNR 330 Rng Lvst Prod		73		83		67	Became ARNR 230			
ARNR 331 Swine Prod	Revised from ARNR 431									21
ARNR 345 Riparian Ecol & Mgmt	New Course									19
RNR 350 Range Vegetation		20		7		21		7		14
ARNR 351 Range Biomes		17				22		9		14
ARNR 353 Rngland Res Measure	25		26		29					
ARNR 363 Range Develop & Improve								20		
ARNR 400 Seminar	New Course Spring 2000									6
ARNR 401 Plan & Prog Analys I		57		55		59	34		29	
ARNR 402 Plan & Prog Analys II								32		27
ARNR 420 Endocrine Phys	7				6	Course cancelled				
ARNR 421 Assist Reprod Tech	30		31		36		35		22	
ARNR 422 Topics in Beef Ctl Nutr										11
ARNR 430 Horse Science		17		49		32		29		34
ARNR 431 Pork Prod & Mgmt	8				7	Became ARNR 331				
ARNR 432 Sheep Mgmt		24		23		21		10		12
ARNR 434 Beef Cattle Mgmt	17		17		21		21		18	
ARNR 435 Feedlot Mgmt (480)			13		22			26		
ARNR 437 Graz Mgmt & Improve		36		24		30	19		19	
ARNR 438 Rng-Wildlife Rel		24		22		20		13		21
ARNR 440 Natrl Res Policy	36		38		29		24		24	
ARNR 453 Rngland Res Measure	Revised from ARNR 353						20		28	
ARNR 456 Conflict Res Natrl Res Mgmt	New Course						11		8	
ARNR 480 Lvst Health Mgmt						35		14		
ARNR 507 Research Methods (Seminar)	3	9	5	6	5	8	5	8	4	6
ARNR 520 Adv Anml Nutr	8				10					
ARNR 521 Adv Rum Nutr			5				10			
ARNR 522 Rng Nutr Tech		6				10		6		
ARNR 523 Adv Phys Reprod				5				7		
ARNR 524 Adv Anml Breeding		4				9				7
ARNR 540 Rng Ecosystem Measure			5							
ARNR 541 Rng Ecophysiology		7				4				4
ARNR 542 Adv Natrl Res Ecol	10				10				5	

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?

	Excellent (1)	Good (2)	Fair (3)	Poor (4)	Very Poor (5)
Ability to Teach					
Knowledge					
Interest in Students					

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
- _____ Horseman's 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.

Overall Assessment Of Quality Of Education At MSU						
	Animal Science			Range Science		
Semester/year	F98	S99	F99	F98	S99	F99
No.	7	10	3	1	2	2
Excellent	1	1	0	1	1	0
Very Good	2	7	2	0	1	2
Good	4	2	1	0	0	0
Poor	0	0	0	0	0	0
Very Poor	0	0	0	0	0	0

Comments:

Animal Science Replies:

Fall98

- 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 y 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

Semester/year No.	Animal Science			Range Science		
	F98	S99	F99	F98	S99	F99
Excellent	2	3	1	1	1	1
Very Good	6	5	2	0	1	1
Good	0	2	0	0	0	0
Poor	0	0	0	0	0	0
Very Poor	0	0	0	0	0	0

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:

Fall98

- 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.

Courses In Major That Contributed Most To Professional Development

Semester/year	Animal Science				Range Science		
	F98	S99	F99		F98	S99	F99
ARNR 100	-	-	1	ARNR 240	-	1	-
ARNR 211	-	1	-	ARNR 341	-	1	-
ARNR 240	-	-	1	ARNR 342	-	1	-
ARNR 320	3	3	1	ARNR 350	-	1	-
ARNR 321	3	1	1	ARNR 351	-	-	1
ARNR 322	1	1	-	ARNR 353	1	-	1
ARNR 330	1	1	-	ARNR 363	-	1	1
ARNR 401	1	1	-	ARNR 401	1	1	-
ARNR 420	1	-	-	ARNR 437	-	1	2
ARNR 421	5	5	1	ARNR 440	-	1	2
ARNR 430	1	2	1	ARNR 453	-	1	-
ARNR 432	2	1	1	ARNR 454	1	-	-
ARNR 434	4	4	2				
ARNR 435	-	1	-				
ARNR 437	1	-	-				

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.
- All 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

Score	Ability to teach			Knowledge			Interest in students		
	F98	S99	F99	F98	S99	F99	F98	S99	F99
Excellent	3	2	1	8	7	4	4	3	3
Good	5	7	2	0	2	0	3	2	1
Fair	0	0	0	0	0	0	1	0	0
Poor	0	0	0	0	0	0	0	0	0
Very Poor	0	0	0	0	0	0	0	0	0

Range Science

Score	Ability to teach			Knowledge			Interest in students		
	F98	S99	F99	F98	S99	F99	F98	S99	F99
Excellent	0	2	1	0	1	1	0	2	0
Good	1	0	1	1	1	1	1	0	2
Fair	0	0	0	0	0	0	0	0	0
Poor	0	0	0	0	0	0	0	0	0
Very Poor	0	0	0	0	0	0	0	0	0

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.



**College of Agriculture
Department of Animal and Range Sciences**

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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,

A handwritten signature in cursive script, appearing to read "Peter J. Burfening".

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+
3. Your age when attending MSU: 1. 18-22 2. 22-26 3. 26-29 4. Older
4. Marital Status while at MSU: 1. Single 4. Widower
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)

	Excellent	Average	Poor		
	1	2	3	4	5
Focused on topics in detail.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pointed out contributions from other cultures.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improved analytical thinking.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Encouraged thinking, speaking and writing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Promoted creative thinking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Promoted problem solving.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Explained hypothesis testing and research methods.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Explained basic and applied aspects of science.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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):

Excellent		Average		Little or None	
1	2	3	4	5	

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

	Excellent	Average	Poor		
1. With the people skills for success in your career?	1	2	3	4	5
2. Successfully function within a business environment?	1	2	3	4	5
3. To organize projects and manage people?	1	2	3	4	5

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.

	<u>Excellent</u>		<u>Average</u>		<u>Poor</u>
	1	2	3	4	5
MSU's campus stimulates learning.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Library holdings and collections.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Access to computer facilities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Classrooms.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Laboratories in general.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Animal & Range Science Livestock facilities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Animal & Range Sciences Laboratories.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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:

	<u>very effective efforts</u>			<u>no help or no effective help</u>	
	1	2	3	4	5
Advisor:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Individual Professor(s):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Department of Animal and Range Sciences	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
College of Agriculture (Dean's Office) Placement Efforts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MSU Career Services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (List and Rate) _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

30. Rank the following attributes which **MOST** helped you acquire the job you now have.

	<u>Very Important</u>		<u>Important</u>		<u>Not Important</u>
	1	2	3	4	5
Work experience (outside of college)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Technical training (outside college)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Work experience gained through college					
(Worked in a lab, on the Towne Farm, etc)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Technical knowledge gained through degree work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

SEX

FEMALE 1

Q10-1

Q10-2

Q10-3

Q10-4

Summary for 'SEX' = FEMALE (101 detail records)

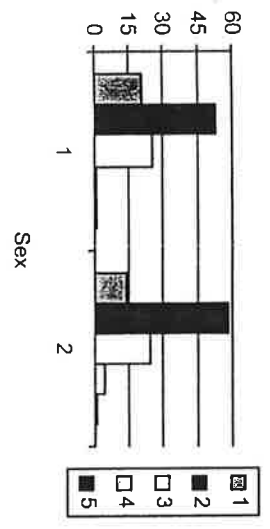
Avg 2.1 3.5 2.3 2.1

MALE 2

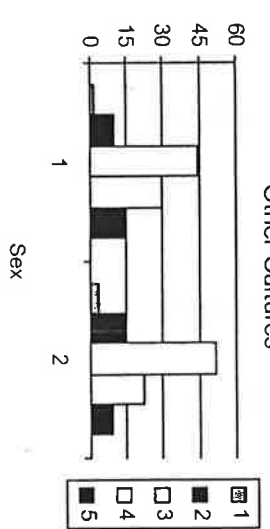
Summary for 'SEX' = MALE (101 detail records)

Avg 2.2 3.2 2.1 2.1

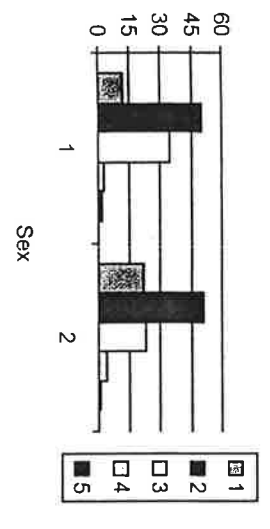
10-1 Focused on Topics in Detail



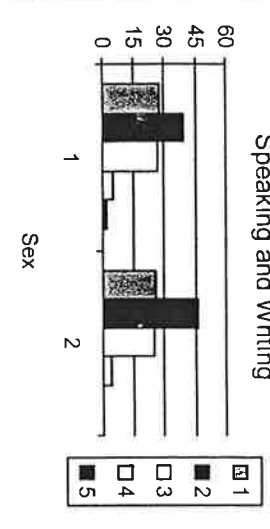
10-2 Pointed out Contributions from Other Cultures



10-3 Improved Analytical Thinking



10-4 Encouraged Thinking, Speaking and Writing



Rate the curricula in Animal and Range Science to meet these general education and science goals -All students

SEX

Q10-5

Q10-6

Q10-7

Q10-8

FEMALE

1

Summary for 'SEX' = FEMALE (98 detail records)

Avg

2.4

2.4

2.4

2.2

MALE

2

Summary for 'SEX' = MALE (99 detail records)

Avg

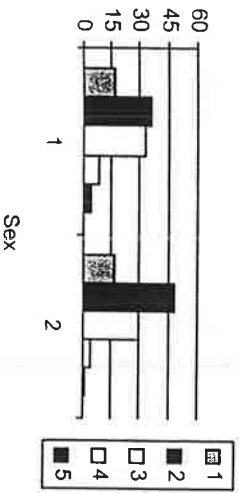
2.2

2.1

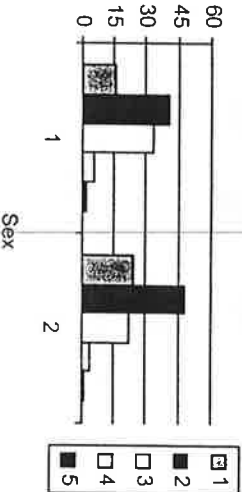
2.3

2.2

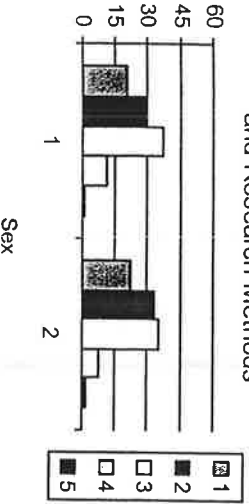
10-5 Promoted Creative Thinking



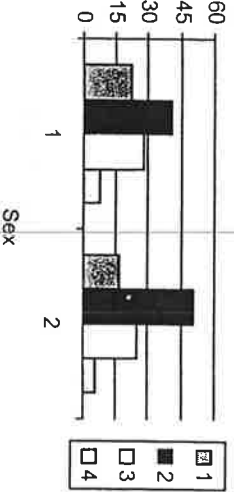
10-6 Promoted Problem Solving



10-7 Explained Hypothesis Testing and Research Methods



10-8 Explained Basic and Applied Aspects of Science



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 *ALL STUDENTS*

SEX

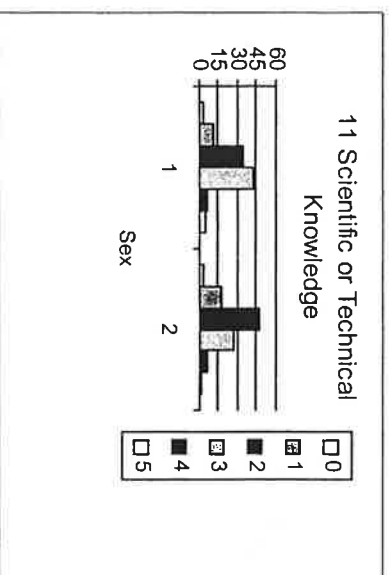
FEMALE 1

Q11

Summary for 'SEX' = FEMALE (101 detail records)
Avg 2.5

MALE 2

Summary for 'SEX' = MALE (102 detail records)
Avg 2.2



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

ALL STUDENTS

SEX	Q12-1	Q12-2	Q12-3
FEMALE	1		
Summary for 'SEX' = FEMALE (101 detail records)			
Avg	2.6	2.8	2.6
MALE	2		
Summary for 'SEX' = MALE (102 detail records)			
Avg	2.6	2.7	2.6

<p>12-1 People Skills</p> <p>Sex</p>	<p>12-2 Function within Business Environment</p> <p>Sex</p>
<p>12-3 Organize Projects and Manage People</p> <p>Sex</p>	

Rate the learning environment at MSU and in the Animal -Range Science Dept. *All Students*

SEX

FEMALE

1

Q15-5

Q15-6

Q15-7

Summary for 'SEX' = FEMALE (101 detail records)

Avg

2.5

2.2

2.5

MALE

2

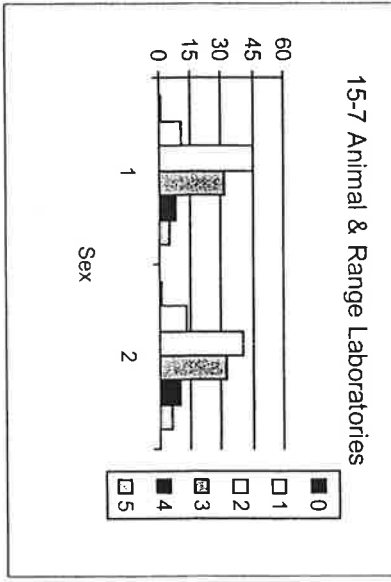
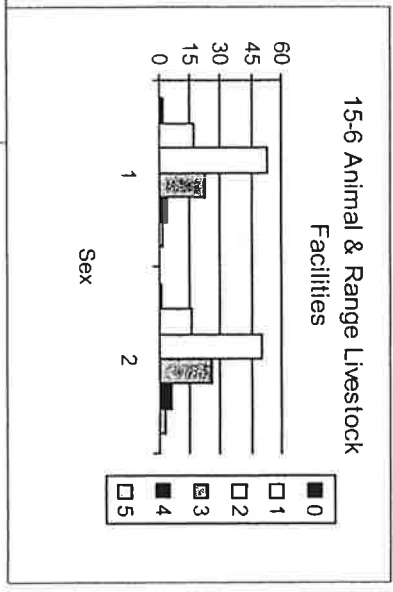
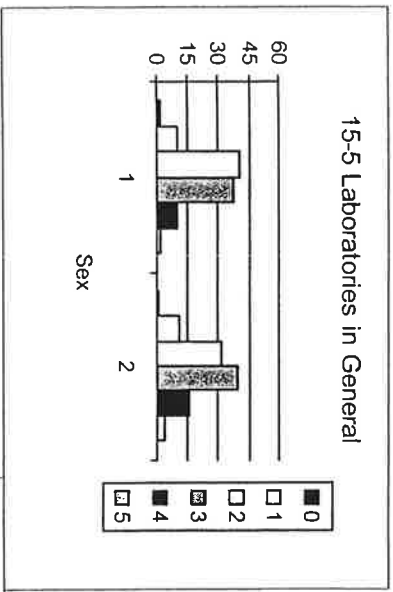
Summary for 'SEX' = MALE (102 detail records)

Avg

2.7

2.3

2.5



Rate each of the following for effort and effectiveness in helping you find employment in your chosen field *ALL STUDENTS*

SEX	Q29-1	Q29-2	Q29-3	Q29-4
FEMALE 1				
Summary for 'SEX' = 1 (101 detail records)				
Avg	3.0	2.8	3.2	3.8
MALE 2				
Summary for 'SEX' = 2 (102 detail records)				
Avg	2.6	2.5	2.9	3.4

29-1 Advisor	29-2 Individuals Professor(s)	29-3 Dept. of Animal & Range	29-4 College of Agriculture

Rate each of the following for effort and effectiveness in helping you find employment in your chosen field *All students*

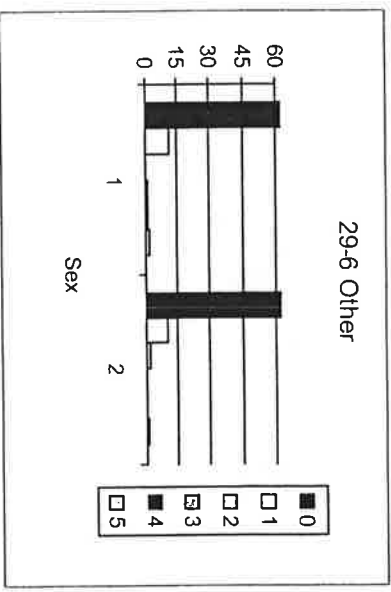
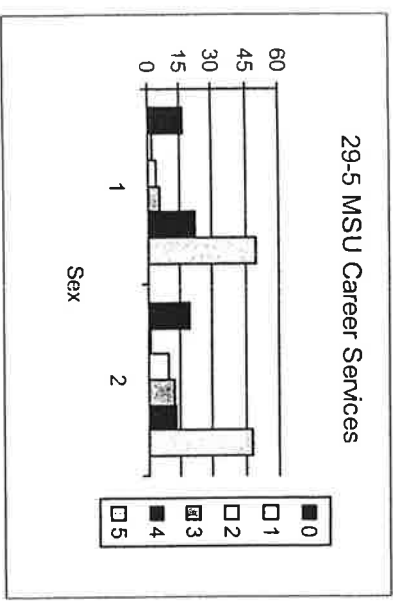
SEX

FEMALE 1

Q29-5

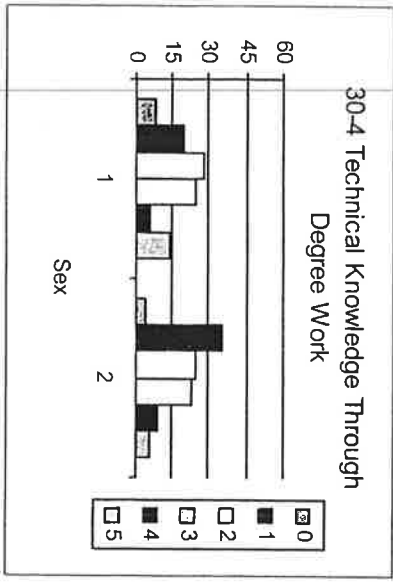
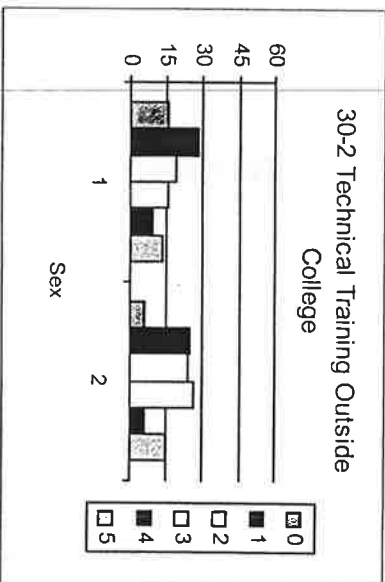
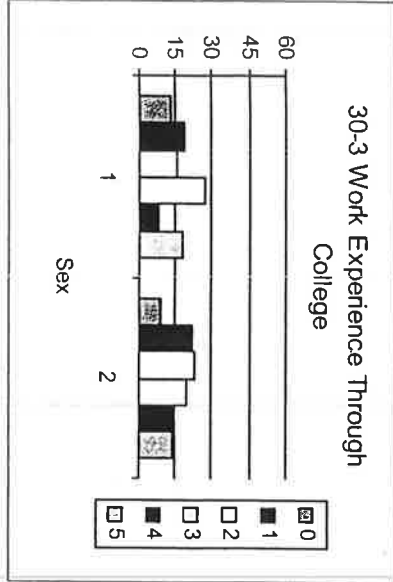
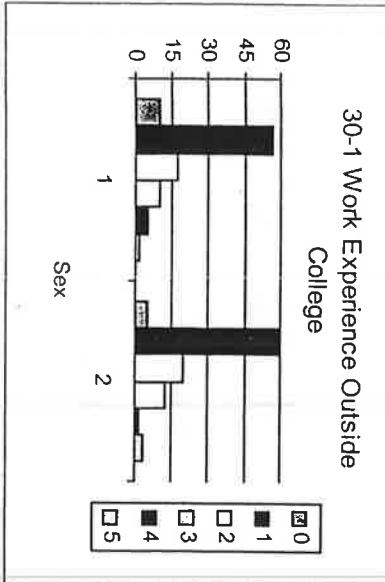
Q29-6

MALE 2



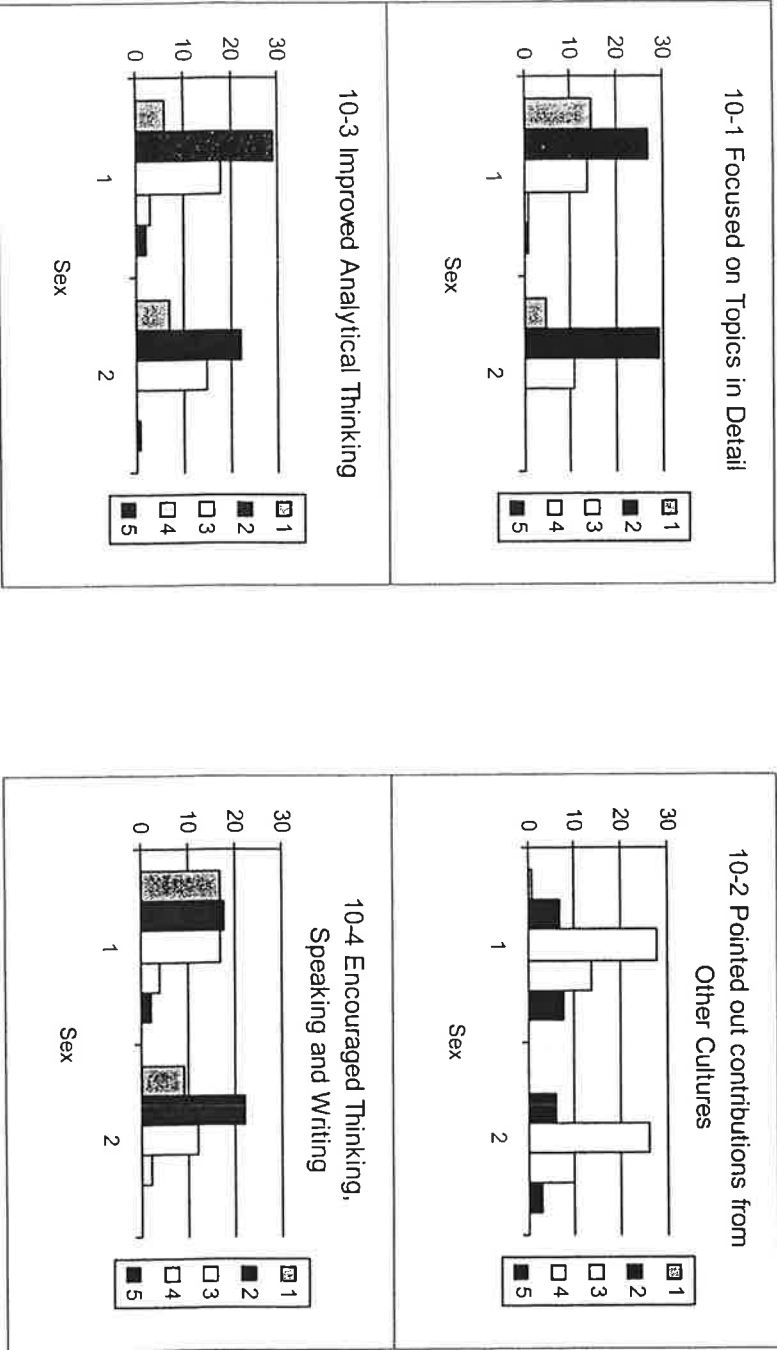
Rank the following attributes which most helped you acquire the job you now have *ALL STUDENTS*

SEX	Q30-1	Q30-2	Q30-3	Q30-4
FEMALE	1			
Summary for 'SEX' = FEMALE (101 detail records)				
Avg	1.5	2.1	2.5	2.4
MALE	2			
Summary for 'SEX' = MALE (102 detail records)				
Avg	1.6	2.5	2.5	2.2



Rate the curricula in Animal and Range Science to meet these general education and science goals - Animal Science

SEX	Q10-1	Q10-2	Q10-3	Q10-4
FEMALE	1			
Summary for 'SEX' = FEMALE (58 detail records)				
Avg	2.1	3.4	2.4	2.2
MALE	2			
Summary for 'SEX' = MALE (45 detail records)				
Avg	2.1	3.2	2.2	2.2



Rate the curricula in Animal and Range Science to meet these general education and science goals - Animal Science

SEX

FEMALE 1

Q10-5

Q10-6

Q10-7

Q10-8

Summary for 'SEX' = FEMALE (58 detail records)

Avg

2.5

2.4

2.4

2.2

MALE 2

Summary for 'SEX' = MALE (45 detail records)

Avg

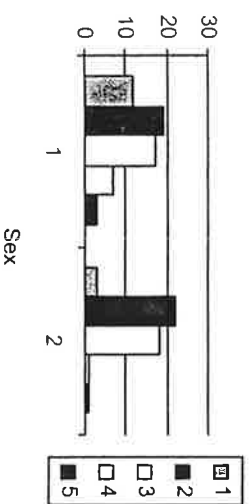
2.4

2.3

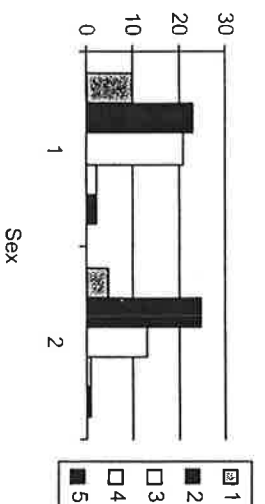
2.6

2.3

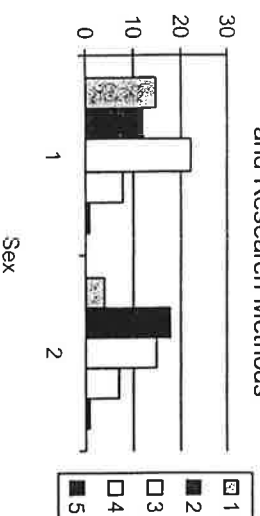
10-5 Promoted Creative Thinking



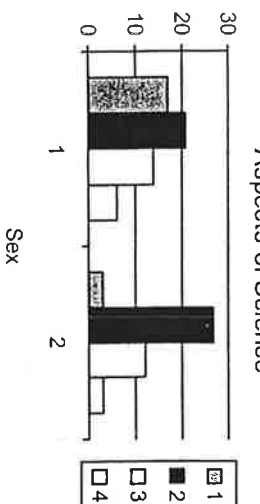
10-6 Promoted Problem Solving



10-7 Explained Hypothesis Testing
and Research Methods

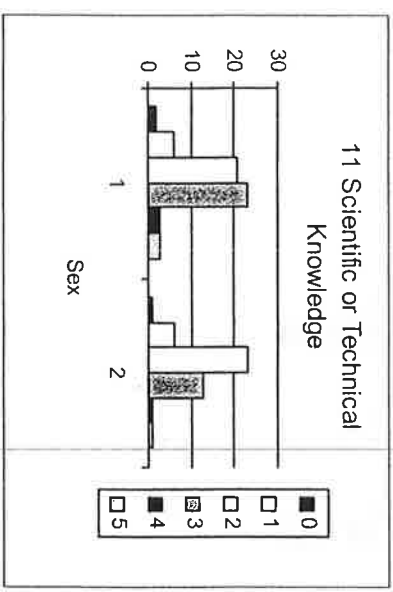


10-8 Explained Basic and Applied
Aspects of Science



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 - Animal Science

SEX	Q11
FEMALE	1
Summary for 'SEX' = FEMALE (58 detail records)	
Avg	2.5
MALE	2
Summary for 'SEX' = MALE (45 detail records)	
Avg	2.2



How well did the curricula you followed prepare you for the following? Animal Science

SEX

FEMALE 1

Q12-1

Q12-2

Q12-3

Summary for 'SEX' = FEMALE (58 detail records)

Avg

2.5

2.7

2.5

MALE 2

Summary for 'SEX' = MALE (45 detail records)

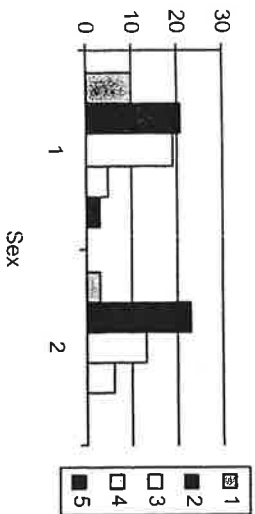
Avg

2.5

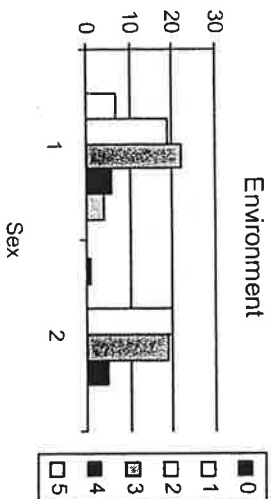
2.6

2.6

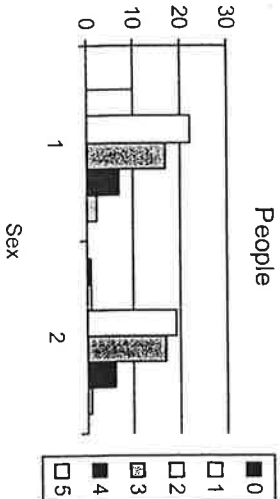
12-1 People Skills



12-2 Function within Business Environment



12-3 Organize Projects and Manage People



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

SEX

FEMALE 1

Summary for 'SEX' = FEMALE (58 detail records)

Avg

2.1

2.6

2.9

2.4

MALE 2

Summary for 'SEX' = MALE (45 detail records)

Avg

2.2

2.5

2.9

2.6

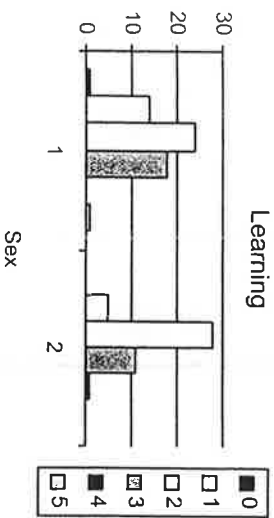
Q15-1

Q15-2

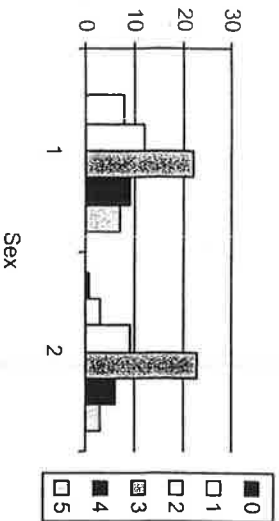
Q15-3

Q15-4

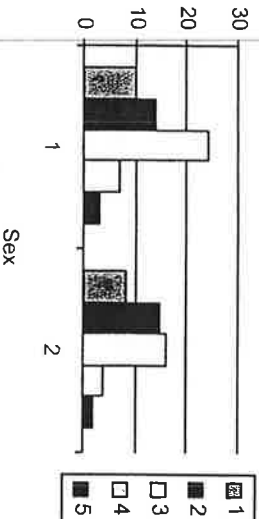
15-1 MSU's Campus Stimulates Learning



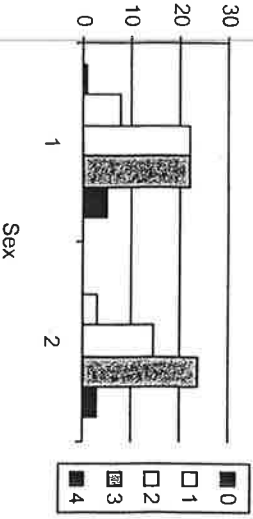
15-3 Access to Computer Facilities



15-2 Library Holdings and Collections



15-4 Classrooms



Rate the learning environment at MSU and in the Animal and Range Science Dept. - Animal Science

SEX

FEMALE

1

Q15-5

Q15-6

Q15-7

Summary for 'SEX' = FEMALE (58 detail records)

Avg

2.4

2.2

2.4

MALE

2

Summary for 'SEX' = MALE (45 detail records)

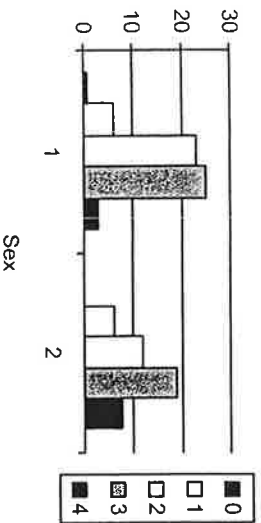
Avg

2.6

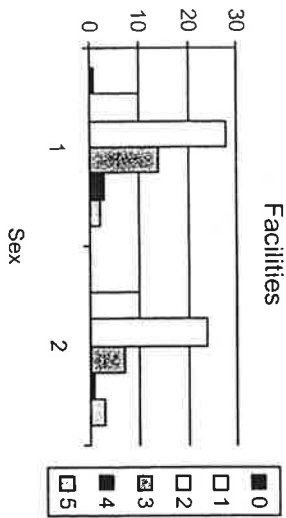
2.2

2.5

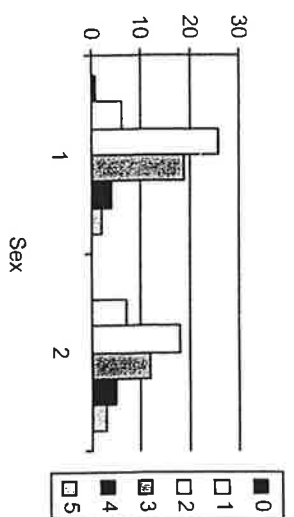
15-5 Laboratories in General



15-6 Animal & Range Livestock Facilities



15-7 Animal & Range Laboratories



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

SEX	Q29-1	Q29-2	Q29-3	Q29-4
FEMALE 1				
Summary for 'SEX' = 1 (58 detail records)				
Avg	3.2	2.7	3.1	3.7
MALE 2				
Summary for 'SEX' = 2 (45 detail records)				
Avg	2.6	2.5	2.9	3.4

29-1 Advisor	29-2 Individuals Professor(s)	29-3 Dept. of Animal & Range	29-4 College of Agriculture

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

SEX

FEMALE 1

Q29-5

Q29-6

Summary for 'SEX' = 1 (58 detail records)

Avg

3.6

0.4

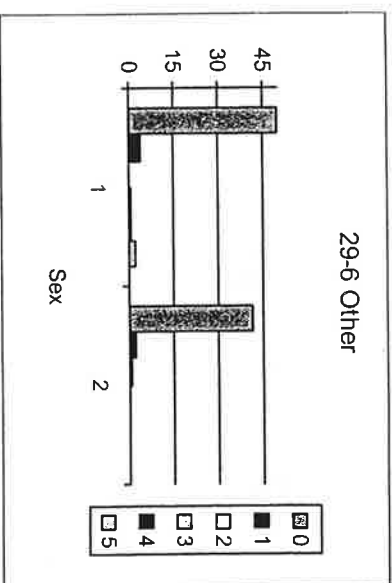
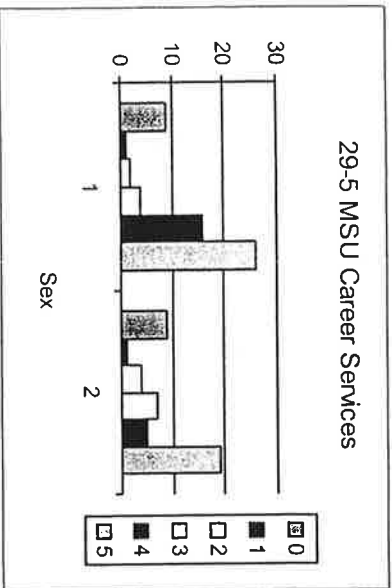
MALE 2

Summary for 'SEX' = 2 (45 detail records)

Avg

3.2

0.1



Rank the following attributes which most helped you acquire the job you now have - Animal Science

SEX

FEMALE

1

Summary for 'SEX' = FEMALE (58 detail records)

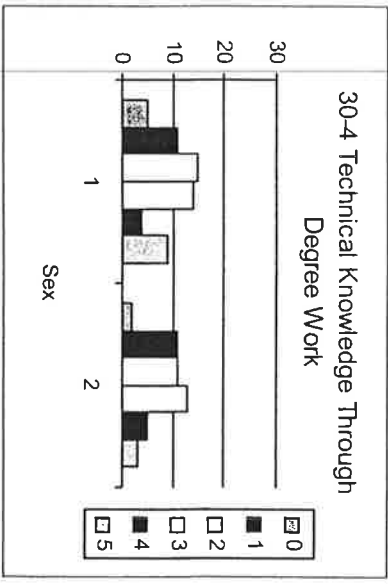
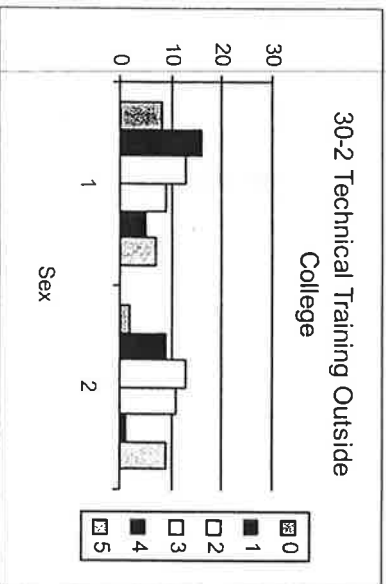
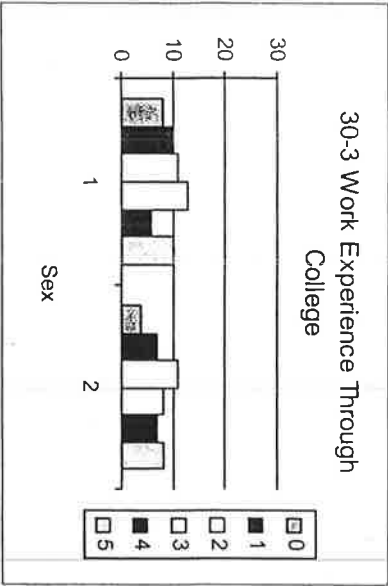
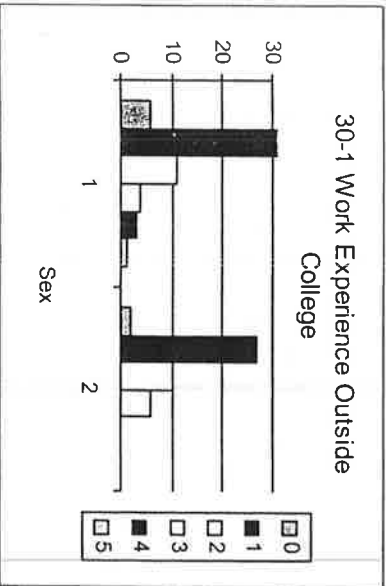
Avg

MALE

2

Summary for 'SEX' = MALE (45 detail records)

Q30-1	Q30-2	Q30-3	Q30-4
1.4	2.1	2.5	2.5
1.4	2.6	2.7	2.4



Rate the curricula in Animal and Range Science to meet these general education and science goals - Range Science

SEX

FEMALE 1

Summary for 'SEX' = FEMALE (27 detail records)

Avg

2.1

3.4

2.1

1.9

MALE 2

Summary for 'SEX' = MALE (22 detail records)

Avg

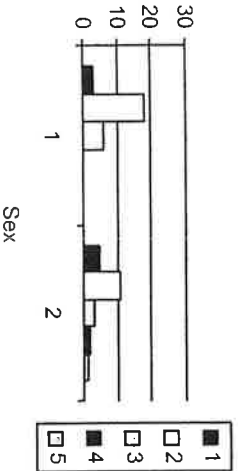
2.2

2.8

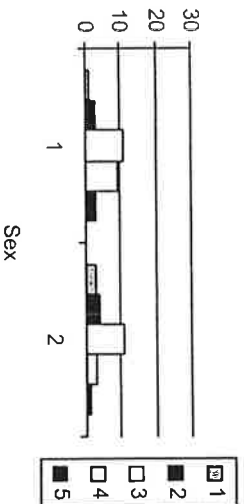
2.0

2.1

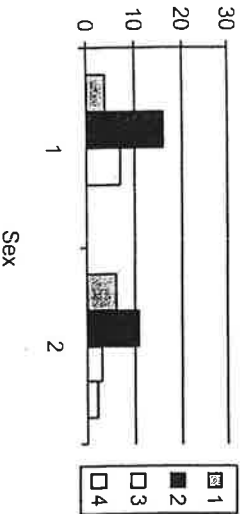
10-1 Focused on Topics in Detail



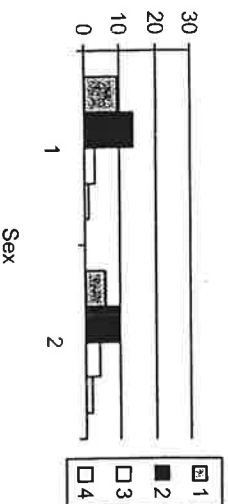
10-2 Pointed out Contributions from
Other Cultures



10-3 Improved Analytical Thinking



10-4. Encouraged Thinking,
Speaking and Writing



Rate the curricula in Animal and Range Science to meet these general education and science goals - Range Science

SEX

Q10-5

Q10-6

Q10-7

Q10-8

FEMALE

1

Summary for 'SEX' = FEMALE (27 detail records)

Avg

2.3

2.2

2.3

2.1

MALE

2

Summary for 'SEX' = MALE (22 detail records)

Avg

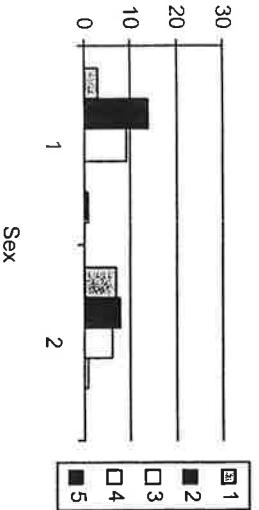
2.0

2.1

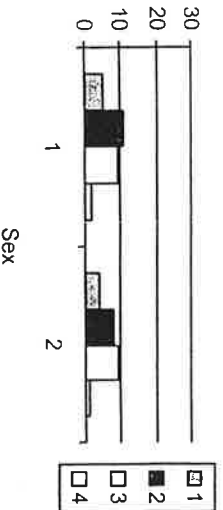
2.3

2.2

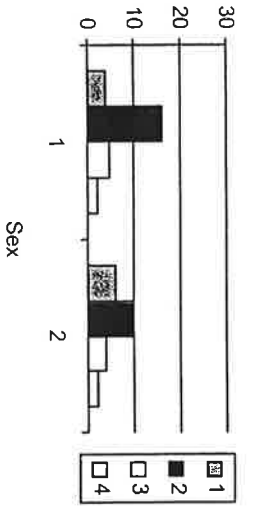
10-5 Promoted Creative Thinking



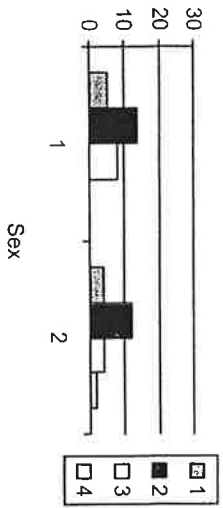
10-7 Explained Hypothesis Testing and Research Methods



10-6 Promoted Problem Solving



10-8 Explained Basic and Applied Aspects of Science



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 - Range Science

SEX

FEMALE 1

Summary for 'SEX' = FEMALE (27 detail records)

Avg

2.4

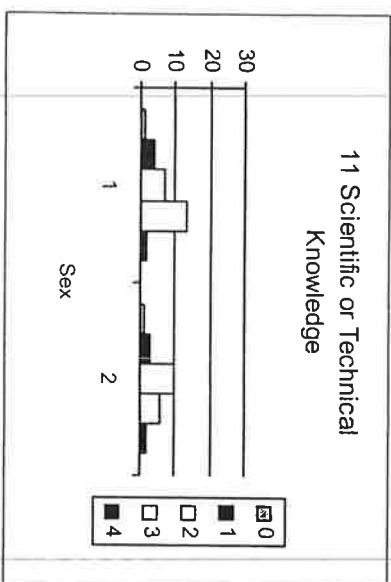
MALE 2

Summary for 'SEX' = MALE (22 detail records)

Avg

2.2

Q11



How well did the curricula you followed prepare you for the following? Range Science

SEX

FEMALE 1

Q12-1

Q12-2

Q12-3

Summary for 'SEX' = FEMALE (27 detail records)

Avg

2.8

3.0

3.0

MALE 2

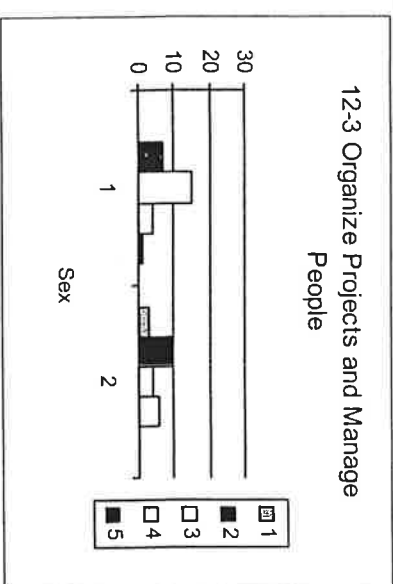
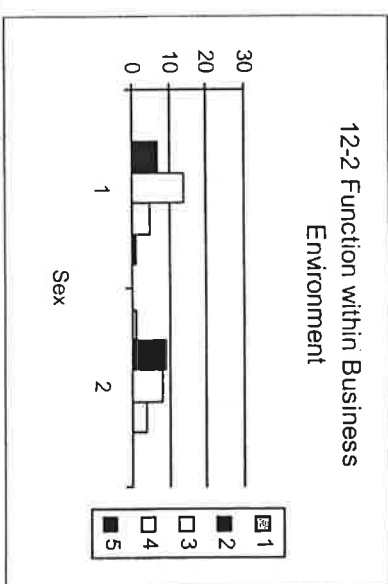
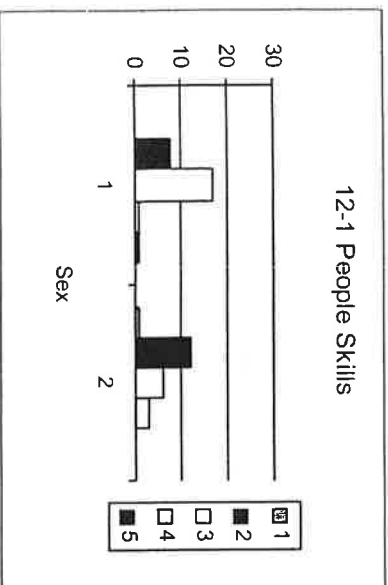
Summary for 'SEX' = MALE (22 detail records)

Avg

2.5

2.7

2.6



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

SEX	Q15-1	Q15-2	Q15-3	Q15-4
FEMALE 1				
Summary for 'SEX' = FEMALE (27 detail records)				
Avg	2.2	2.3	3.1	2.6
MALE 2				
Summary for 'SEX' = MALE (22 detail records)				
Avg	2.4	2.4	2.9	2.8

<div>15-1 MSU's Campus Stimulates Learning</div>	<div>15-2 Library Holdings and Collections</div>
<div>15-3 Access to Computer Facilities</div>	<div>15-4 Classrooms</div>

Rate the learning environment at MSU and in the Animal and Range Science Dept. - Range Science

SEX

Q15-5

Q15-6

Q15-7

FEMALE 1

Summary for 'SEX' = FEMALE (27 detail records)

Avg

2.4

2.1

2.4

MALE 2

Summary for 'SEX' = MALE (22 detail records)

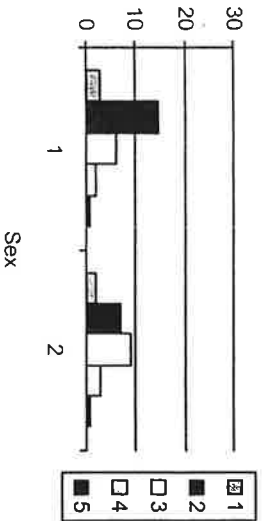
Avg

2.7

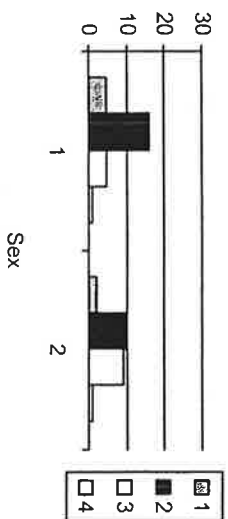
2.4

2.5

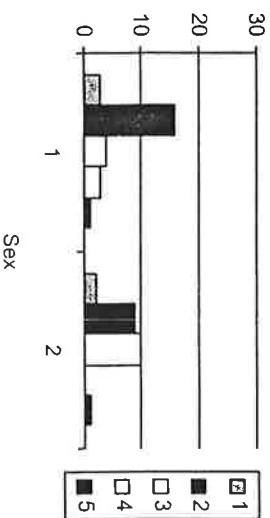
15-5 Laboratories in General



15-6 Animal and Range Livestock Facilities

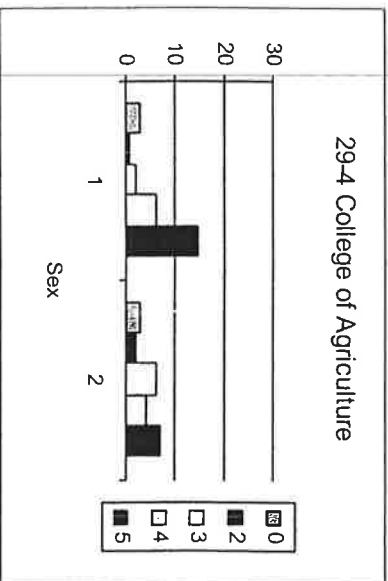
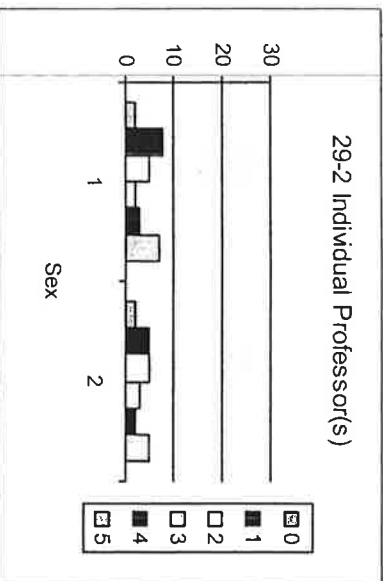
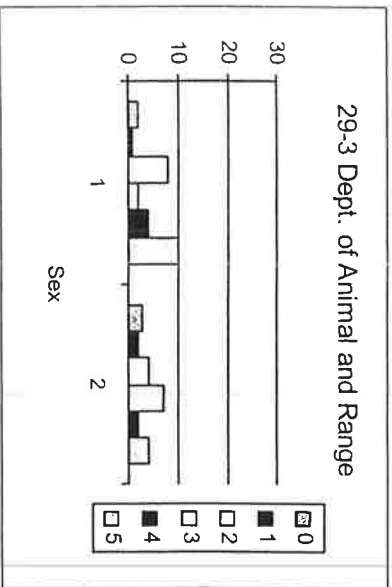
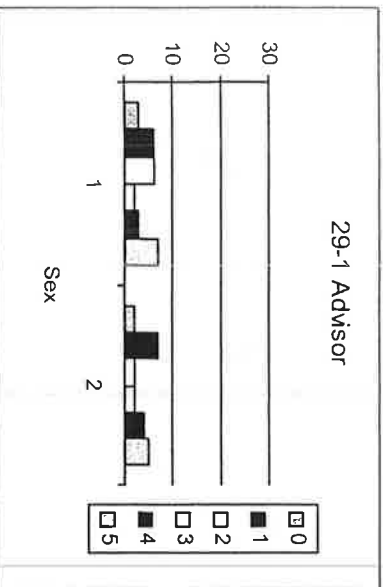


15-7 Animal and Range Laboratories



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

SEX	Q29-1	Q29-2	Q29-3	Q29-4
FEMALE 1				
Summary for 'SEX' = 1 (27 detail records)				
Avg	2.6	2.6	3.3	4.0
MALE 2				
Summary for 'SEX' = 2 (22 detail records)				
Avg	2.6	2.6	2.7	3.3



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

SEX

FEMALE 1

Q29-5

Q29-6

Summary for 'SEX' = 1 (27 detail records)

Avg

3.4

0.2

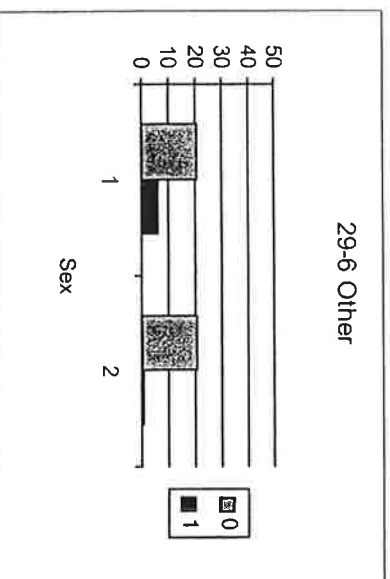
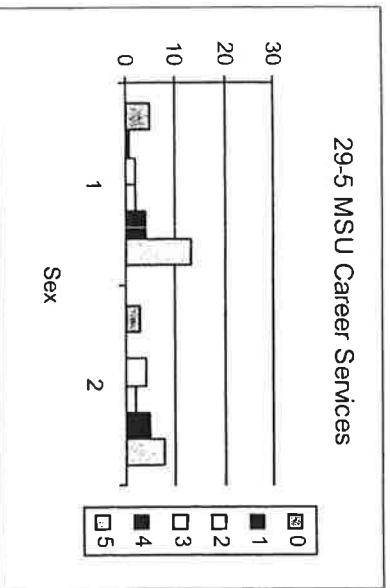
MALE 2

Summary for 'SEX' = 2 (22 detail records)

Avg

3.4

0.0



Rank the following attributes which most helped you acquire the job you now have - Range Science

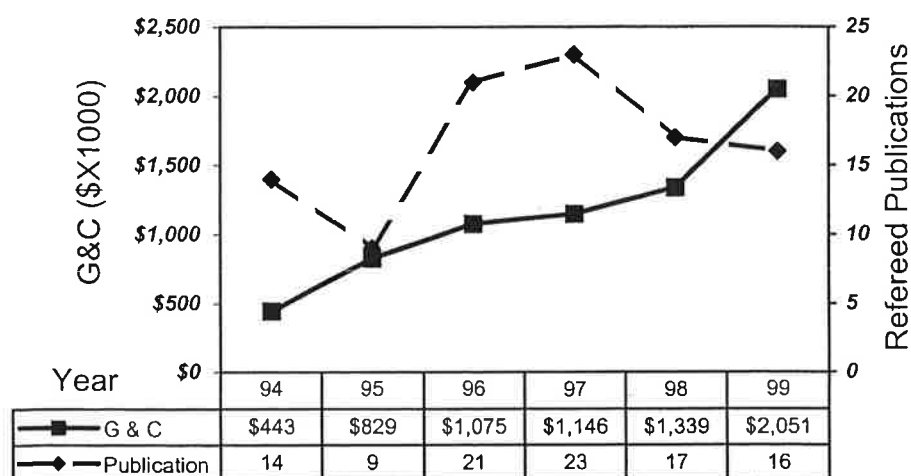
SEX	Q30-1	Q30-2	Q30-3	Q30-4
<div>FEMALE1</div>				
Summary for 'SEX' = FEMALE (27 detail records)				
Avg	1.5	2.3	2.7	2.3
<div>MALE2</div>				
Summary for 'SEX' = MALE (22 detail records)				
Avg	1.5	2.2	2.6	2.3

30-1 Work Experience Outside College	30-2 Technical Training Outside College	30-3 Work Experience Through College	30-4 Technical Knowledge Through Degree Work																																																																																	
<table><tr><th>Sex</th><th>0</th><th>1</th><th>2</th><th>3</th><th>4</th></tr><tr><td>1</td><td>1</td><td>15</td><td>5</td><td>2</td><td>1</td></tr><tr><td>2</td><td>1</td><td>15</td><td>15</td><td>5</td><td>1</td></tr></table>	Sex	0	1	2	3	4	1	1	15	5	2	1	2	1	15	15	5	1	<table><tr><th>Sex</th><th>0</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th></tr><tr><td>1</td><td>1</td><td>10</td><td>5</td><td>2</td><td>1</td><td>1</td></tr><tr><td>2</td><td>1</td><td>10</td><td>10</td><td>5</td><td>1</td><td>1</td></tr></table>	Sex	0	1	2	3	4	5	1	1	10	5	2	1	1	2	1	10	10	5	1	1	<table><tr><th>Sex</th><th>0</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th></tr><tr><td>1</td><td>1</td><td>5</td><td>10</td><td>5</td><td>1</td><td>1</td></tr><tr><td>2</td><td>1</td><td>5</td><td>10</td><td>5</td><td>1</td><td>1</td></tr></table>	Sex	0	1	2	3	4	5	1	1	5	10	5	1	1	2	1	5	10	5	1	1	<table><tr><th>Sex</th><th>0</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th></tr><tr><td>1</td><td>1</td><td>10</td><td>5</td><td>2</td><td>1</td><td>1</td></tr><tr><td>2</td><td>1</td><td>10</td><td>10</td><td>5</td><td>1</td><td>1</td></tr></table>	Sex	0	1	2	3	4	5	1	1	10	5	2	1	1	2	1	10	10	5	1	1
Sex	0	1	2	3	4																																																																															
1	1	15	5	2	1																																																																															
2	1	15	15	5	1																																																																															
Sex	0	1	2	3	4	5																																																																														
1	1	10	5	2	1	1																																																																														
2	1	10	10	5	1	1																																																																														
Sex	0	1	2	3	4	5																																																																														
1	1	5	10	5	1	1																																																																														
2	1	5	10	5	1	1																																																																														
Sex	0	1	2	3	4	5																																																																														
1	1	10	5	2	1	1																																																																														
2	1	10	10	5	1	1																																																																														

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.

CURRENT ANIMAL AND RANGE SCIENCES RESEARCH PROJECTS

Project Fund/Type	Investigators	Title	Start/term Dates	Status
MONB00170 Competitive Grant	Olson, B. B., Paterson, J. A.	DO WINDBREAKS MINIMIZE STRESS ON CATTLE GRAZING WINTER RANGE	09/01/1996 to 08/31/1999	Extended \$59,000
MONB00172 Competitive Grant	Olson, B. B.	SUCCESS OF SPOTTED KNAP WEED: COMPETITION OR SITE ALTERATION	07/15/1999 to 07/31/2002	New \$167,000
MONB00173 Hatch	Hatfield, P. G., Kott, R., Burgess, D.	REDUCING NEONATAL LOSSES IN SHEEP PRODUCTION SYSTEMS	10/01/1998 to 09/30/2001	New
MONB00174 Hatch	Burfening, P. J.	SELECTION FOR REPRODUCTIVE RATE: EVALUATION OF PHYSIOLOGICAL PARAMETERS	10/01/1994 to 09/30/2000	New
MONB00175 Hatch	Tess, M. W., Kress, D. D., Knight, J. E.	SYSTEMS ANALYSIS OF LIVESTOCK ENTERPRISES	10/01/1996 to 09/30/2001	Revised
MONB00176 Hatch	Olson, B. E.	WINTER GRAZING TN MONTANA	10/01/1994 to 09/30/2000	Extended
MONB00179 Hatch W-166	Bowman, J. G.	EVALUATION AND IMPROVEMENT OF BARLEY FOR FOOD AND FEED	10/01/1995 to 09/30/1999	Extended
MONB00180 Special Grant	Bowman, J. G.	BARLEY FEED FOR RANGELAND CATTLE	09/15/1999 to 09/30/2000	New \$560,000
MONB00181 Special Grant	Kott, R. W., Hatfield, P. G., Minikhiem, D.	WOOL RESEARCH - MONTANA	01/15/1996 to 01/31/2000	Extended \$28,000/year
MONB00182 Hatch	Kress, D. D., Anderson, D. C., Tess, M. W.	GENETICS OF BEEF EFFICIENCY AND TENDERNESS	10/01/1996 to 09/30/2001	Revised
MONB00183 Hatch W-112	Berardinelli, J. G., Burfening, P. J., Adair, R.	REPRODUCTIVE PERFORMANCE IN DOMESTIC RUMINANTS	10/01/1996 to 09/30/2001	Revised
MONB00184 Hatch	Wambolt, C. L.	SHRUB ECOLOGY AND FORAGE RELATIONSHIPS	10/01/1998 to 09/30/2003	Revised
MONB00185 Special Grant	Kott, R. W., Hatfield, P. G., Minikhiem, D. L.	WOOL RESEARCH - MONTANA	06/15/1999 to 06/30/2001	New \$28,000/year
MONB00186 Hatch	Marlow, C. B., Callan, N. W., Sherwood, H. W.	CHARACTERIZATION OF SUCCESSIONAL PROCESSES IN WESTERN MONTANA RIPARIAN ZONES	10/01/1997 to 09/30/2000	New
MONB00188 State	Tess, M.	EXPLORATORY RESEARCH IN ANIMAL AND RANGE SCIENCES	07/01/1988 to 06/30/2000	Extended
MONB00194 Hatch	Bowman, J., Blake, T., Sowell, B.	NUTRITIONAL MANAGEMENT OF RANGE BEEF COWS AND CALVES	10/01/1997 to 09/30/2002	New

MONB00195 Hatch	Kott, R. W.	SHEEP NUTRITION AND LAMB MORTALITY	10/01/1994 to 09/30/1999	Revised
MONB00196 Hatch	Sowell, B., Bowman, J. G., Grings, E.	LIVESTOCK BEHAVIOR AND PERFORMANCE	10/01/1997 to 09/30/2000	Revised
MONB00197 Hatch	Gagnon, L. C., Newman, W.	EQUINE NUTRITION AND FEEDS	10/01/1996 to 09/30/2000	Extended
MONB00198 Hatch	Knight, J. E.	WILDLIFE AND LIVESTOCK INTERACTIONS	10/01/1999 to 09/30/2004	Revised
MONB00200 Hatch	Ansotegui, R. P.	INFLUENCE OF TRACE MINERAL SUPPLEMENTATION ON RANGE BEEF CATTLE PRODUCTION	10/01/1999 to 10/01/2004	Revised
MONB00204 Competitive Grant	Tess, M. W., Knight, J. E., Mosley, J. C., Griffith, D. A.	COORDINATED ELK 11/01/1998 MANAGEMENT FOR SUSTAINABLE BEEF CATTLE	11/01/1998 to 10/31/2001	New \$290,000
MONB00206 Hatch	Mosley, J. C.	INFLUENCE OF SOCIAL HIERARCHY ON DISTRIBUTION OF RANGELAND CATTLE	10/01/1997 to 09/30/2000	New \$59,000
MONB00207 Hatch	Paterson, J. A., Ansotegui, R. P.	COPPER AND ZINC FOR WEANED CALF PRODUCTION	10/01/1997 to 09/30/2000	New
MONB00210 Special Grant	Mosley, J. C.	RIPARIAN HABITAT USE BY RANGELAND CATTLE: INFLUENCE OF SOCIAL HIERARCHY	09/15/1997 to 09/30/2000	New
MONB00213 Competitive Grant	Berardinelli, J.	BULLS-COW INTERACTIONS ATTENUATES THE COW-CALF BOND REGULATING ANESTRUS	09/01/99 to 08/31/02	New
MONB 00216 Hatch W-166	Gipp, W. F.	EVALUATION AND IMPROVEMENT OF BARLEY FOR FOOD AND FEED	10/01/1993 to 09/30/1999	Extended
MONB00219 Special Grant	Paterson, J.A. Burfening, P.J.	MONTANA BEEF NETWORK: AN INTEGRATED APPROACH TO PRODUCING QUALITY BEEF CATTLE	03/01/99 to 02/28/00	New \$437,000
MONB00219 Special Grant	Paterson, J.A. Burfening, P.J. Funston, R.	MONTANA BEEF NETWORK: AN INTEGRATED APPROACH TO PRODUCING QUALITY BEEF CATTLE	03/01/00 to 02/28/01	New \$596,381

M.S. GRADUATES From 1995 through 1999

Student	Major	Advisor	Graduation date
Employment, Location			
Refereed Publications from MS research			
SUSAN RAE WINSLOW	RAS	Sowell	June 1995
Plant Specialist at the NRCS Plant Materials Center in Bridger, MT. Winslow , S. and B.F. Sowell. A comparison of methods to determine plant successional stages. Journal of Range Management (Accepted with revisions.)			
JOHN MICHAEL BEAVER	RAS	Olson	July 1995
Westech (environmental consulting firm) Helena, Montana Beaver JM, Olson BE, Wraith JM (1996) A simple index of standard operative temperature for mule deer and cattle in winter. J Therm Biol 21:345-352. Beaver JM, Olson BE (1997) Winter range use by different aged cattle in southwestern Montana. Appl Anim Behav Sci 51:1-13			
CHRIS ALLEN MEHUS	RAS	Wambolt	December 1995
unknown Wambolt, C.L., T.L. Hoffman, and C.A. Mehus . 1999. Response of shrubs in big sagebrush habitats to fire on the Northern Yellowstone Winter Range. USDA Forest Serv. Gen. Tech. Rep. RMRS-P-11. Ogden, Utah.			
THOMAS SCOTT HIRSCH	ANS	Kress	December 1995
Nutritional Consultant, Danville, CA (No Publication)			
JENNIFER LEE BIRDSALL	RAS	Sowell	December 1995
Research Associate, US Forest Service, Bozeman, MT Birdsall , J.L., P.C. Quimby, Jr., N.E. Rees, T.J. Svejcar, and B.F. Sowell. 1997. Image Analysis of Leafy Spurge (<i>Euphorbia esula</i>) Cover. Weed Tech. 11:798-803.			
LISA MARIE MCKINLEY SURBER	ANS	Bowman	December 1995
Research Associate, Animal and Range Sciences Department, Bozeman, MT Surber , L.M.M., and J.G.P. Bowman. 1998. Monensin effects on digestion of corn or barley high-concentrate diets. J. Anim. Sci. 76:1945-1954.			
JOANNA L. ROBERTS	RAS	Olson	May 1996
Wildlife Biologist - U.S. Fish and Wildlife Service, Galena, Alaska Roberts , J, Olson BE (1999) Effect of <i>Euphorbia esula</i> on sheep rumen microbial activity and mass in vitro. J Chem Ecol 25:297-314. Roberts , J, Olson BE (1999) Effect of <i>Euphorbia esula</i> on growth and mortality of migratory grasshopper nymphs. J Agric Urban Ento - in press.			
BURK JAY RHODES	RAS	Marlow	May 1996
Instructor, Sheridan College (WY) Rhodes , B.J., C.B. Marlow and H. Sherwood. 1995. Monitoring Streambank Stability: Grazing Impacts of stream Variability? Mont. Ag Research. Fall 1995 pp. 3-8.			
TRISTA LYNN HOFFMAN	RAS	Wambolt	May 1996

USFS – Gardiner, MT

Wambolt, C.L., T.L. **Hoffman**, and C.A. Mehus. 1999. Response of shrubs in big sagebrush habitats to fire on the Northern Yellowstone Winter Range. USDA Forest Serv. Gen. Tech. Rep. RMRS-P-11, Ogden, Utah.

Hoffman, T.L. and C.L. Wambolt. 1996. Growth response of Wyoming big sagebrush to heavy browsing by wild ungulates. USDA Forest Serv. Gen. Tech. Rep. INT-GTR-338. Ogden, Utah.

ERIK JASON ENEBOE	RAS	Sowell	May 1996
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Land Management Specialist, Montana Department of Natural Resources.
(No Publications)

ERIK JON SWENSSON	RAS	Knight	May 1996
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Nutri-lix as a sales rep in Billings, MT.

Swenson, E.J. and J.E. Knight. 1998. Identifying Montana hunter/rancher problems and solutions. J. Range Manage. 51:423-427.

BRENT LYLE ROEDER	ANS	Thomas	December 1996
--------------------------	-----	--------	---------------

Sheep Foreman, Seiben Livestock, Inc, Cascade, MT

Roeder, B.L., V.M. Thomas, R.W. Kott, D.Burges and R.P. Ansotegui. Effect of short term, prepartum feeding of level and type of protein on subsequent lactation. Sheep Research Journal. (In Press).

TRACIE-MARIE M. BERNARDINI (ROEDER)	ANS	Kress	December 1996
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Housewife Seiben Livestock, Inc, Cascade, MT
(No Publications)

KENDAL SCOTT WALHOF	RAS	Wambolt	May 1997
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Unknown at present – Manhattan, MT

Wambolt, C.L., K.S. **Walhof**, M.R. Frisina, A comparison of prescribed burned and unburned big sagebrush communities. J. Range Manage. Submitted.

WENDY LEA FULLER	ANS	Tess	September 1997
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Research Associate, Animal and Range Sciences Department, Montana State University, Bozeman
No Publications

DEBRA JEAN JULIEN	ANS	Tess	September 1997
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Data Base Manager, Leachman Cattle Company, Billings, MT
No Publications

JIE WENG	ANS	Berardinelli	January 1998
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Graduate Student, Ontario, CA

Berardinelli, J. G., J. **Weng**, P. J. Burfening, and R. Adair. 2000. Effect of excess degradable intake protein on early embryonic development, ovarian steroids, and blood urea nitrogen on Days 2, 3, 4, and 5 of the estrous cycle in mature ewes. J. Anim. Sci. (Submitted Dec. 1999).

JEFFREY ALAN GROSS	RAS	Knight	April 1998
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Wildlife Biologist, MT Dept. Fish, Wildlife and Parks, Dillon, MT

Gross, J. A. and J. E. Knight. 2000. Elk presence inside various-sized cattle exclosures. J. Range Manage. (accepted for publication in May 2000 issue).

ADAM JAY GROVE	RAS	Wambolt	May 1998
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Natl. Res. Cons. Ser. – Wall, South Dakota

Grove, A.J., C.L. Wambolt, M.R. Frisina, G. Hammond. Effects of Douglas Fir establishment on mountain big sagebrush communities. J. Range Manage. In review.

ERIC THOMAS MILLER	ANS	Kress	May 1998
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County Extension Agent,

Miller, E.T., D. D. Kress, R.P. Ansotegui, D.W. Bailey, and D.C. Anderson. 2000. Fecal output by calves from Hereford, Tarentaise, and Hereford x Tarentaise cows under range conditions. J. Anim. Sci. (Submitted).

ALLISON VIRGINIA EARLEY	ANS	Sowell	August 1998
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Research Associate, South Dakota State University in Brookings, SD.

Earley, A.V., B.F. Sowell and J.G.P. Bowman. Liquid supplementation of grazing cows and calves. Animal Feed Science Technology. 80: 281-296.

LISA PRAHARANI	ANS	Burfening	August 1998
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Returned to Indonesia (No Publication)

LEIF PAUL ANDERSON	ANS	Paterson	November 1998
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Research Associate Montana Beef Network, Animal and Range Sciences, Bozeman, MT

No Publication

Darin, Law	RAS	Marlow	May 1999
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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).

JOHN D. BAILEY	ANS	Ansotegui	September 1999
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To begin a Ph.D. U of KY in January 2000

No Publications

J. TODD DANIELS	ANS	Hatfield	October 1999
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Altech, Lexington, KY (Located in Montana)

Hatfield, P. G., J. T. Daniels, R. W. Kott, D. E. Burgess, and T. J. Evans. Role of Supplemental Vitamin E in Lamb Survival and Production: A Review. J. Anim. Sci. (In Review).

Daniels, J. T., D. E. Burgess, P. G. Hatfield, and R. W. Kott. An ELISA method for determining sheep serum IgG concentration. Sheep and Goat Res. J. 15 (in press).

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BRUCE SHANKS	ANS	Tess	December 1999
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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 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

Faculty	CA	MAES	ES	
Ansotegui, Ray (FY)	.70	.30		Ruminant Nutrition
Berardinelli, Jim (FY)	.25	.75		Physiology
Boles, Jane (AY)	.60	.40		Meat Science
Bowman, Jan (FY)	.50	.50		Ruminant Nutrition
Burfening, Pete (FY)	.40	.60		Physiology/Genetics
Cash, Dennis			1.00	Forage Crops
Funston, Rick (FY)			1.00	Physiology/Breeding
Gagnon, Sandy (FY)	.85		.15	Equine Nutrition
Gipp, Wayne (FY)	.10		.90	Swine Management
Hatfield, Pat (FY)	.30	.70		Sheep Management
Knight, Jim (FY)			1.00	Wildlife Management
Kott, Rodney (FY)		.20	.80	Sheep Management
Kress, Don (FY)	.40	.60		Genetics
Marlow, Clayton (FY)	.05	.05		Riparian Ecology
Mosley, Jeff (FY)		.20	.80	Range Management
Olson, Bret (FY)	.45	.55		Range Ecology
Paterson, John (FY)	.10	.20	.70	Beef Cattle Management
Sowell, Bok (AY)	1.00			Range Nutrition
Sowell, Bok (summer)		.22		
Surber, Gene (FY)			1.00	Natural Resource Mgt.
Tess, Mike (FY)	.25	.75		Production Systems
Wambolt, Carl (FY)	.50	.50		Shrub Ecology
Total	7.00	6.65	7.35	

Potential Vacant Positions from retirements within 10 years (retire at age 63 or 30 years of service)

Faculty	FTE	Area of Specialization
Ansotegui, Ray	.70 CA .30 MAES (FY)	Ruminant Nutrition
Burfening, Peter	.40 CA .60 MAES (FY)	Reproductive Physiology and Department Head
Gipp, Wayne	.10 CA .90 ES (FY)	Swine Extension
Kress, Don	.40 CA .60 MAES (FY)	Animal Breeding
Gagnon, Sandy	.85 CA .15 MAES (FY)	Horse Science
Surber, Gene	1.0 ES	Natural Resources Mgt.
Wambolt, Carl	.50 CA .50 MAES (FY)	Shrub Ecology

ARNR 100
Introduction to Animal Science
Spring 2000

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

Instructors:

Dr. Ray Ansotegui
235 Linfield Hall
994-5569

Dr. Jane Ann Boles
230 B Linfield Hall
994-7352

Textbook: Scientific Farm Animal Production: Taylor, R.E. 1995 (5th Edition)

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 February 11th	Chapters 1 - 9 Introduction, Animal Products, Allied Industries EXAM 1
February 14 - March 1 March 3rd	Chapters 10 - 14 Artificial Insemination Estrous Synchronization and Embryo Transfer, Genetics, Selection, Mating Systems EXAM II
March 6 - April 5 April 7th	Chapters 15 - 21 Nutrients, Digestion, Absorption, Growth and Development, Environment, Health 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

ARNR 101
Principles of Rangeland Management
Course Syllabus and Outline*
FALL 1999

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)

1. Range Management Principles and Practices, 1989. Holecheck, Piper & Herbel. Prentice Hall, Englewood Cliffs, NJ 07632. \$58.85.
2. The Range. 1990. Sherm Ewing. Mountain Press Publishing Co. Missoula. \$12.00.
3. This House of Sky. Ivan Doig.

Grades:

Four exams of 100 one-point questions. <u>(NO DROPPED EXAMS!!!)</u>	400
Practice Exam	<u>30</u>
	Total Points 430
A = 360	
B = 320	
C = 280	
D = 240	

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

Schedule of Events for
ARNR 101

IMPORTANT DATES!		TOPICS/PAGES
August 30	Classes Begin	Introduction, Rangelands, Climate, History
September 6	HOLIDAY - No Classes	Legislation, Biomes, Soils
September 10	Practice Exam 7:00-9:00am	30 Points
Sept. 13	LAST DAY TO ADD	
Sept. 20	LAST DAY TO DROP W/O GRADE	
Sept. 24	EXAM 1 7:00 - 9:00 AM	
		Plant Growth, Soils, Grazing Effects, Vegetative Types, Hydrology, Land Ownership, Range Sites, Range Condition
October 22	EXAM 2 7:00 - 9:00 AM	
		Range Inventory, Plant Physiology, Stocking Rates, Livestock Distribution, Animal Nutrition, Ecology, Structure, Energy Flow
November 11	HOLIDAY - No Classes	NO ARNR 102 LABS
Nov. 12	EXAM 3 7:00 - 9:00 AM	
Nov. 25-26	HOLIDAY - No Classes	NO ARNR 102 LABS - - ALL WEEK - -
		Ungulate Feeding, Forage Intake, Livestock Production, Grazing Systems, Wildlife Management, Forage Quality, Multiple USE, Distribution
December 14	EXAM 4 4:00 - 5:50 PM	NOT COMPREHENSIVE!

* 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
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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 <u>150 pts</u> TOTAL 550 pts	A = 495 B = 440 C = 385 D = 275
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Plant Identification Exams must be taken in registered sections.
Incorrect spelling will be graded as wrong.

	LAB DATES			TOPICS	
	WED	THURS	FRI		
September	1	2	3	Introduction* - Grasses - 20 species	
	8	9	10	Field Trip # 1	Quiz+
	15	16	17	Field Trip # 2	Quiz
	22	23	24	Field Trip # 3	
	29	30	Oct. 1	GRASS EXAM	EXAM
October	6	7	8	Forbs - 20 species	Quiz
	13	14	15	Range Condition - Utilization	
	20	21	22	Stocking Rates	Quiz-Homework
	27	28	29	FORB EXAM	EXAM
November	3	4	5	Shrubs - 20 species	Quiz
	10	11	12	NO CLASSES - Holiday on Thursday	
	17	18	19	Evaluation of Improvements	Homework
	25	26	27	NO LABS - HOLIDAY	
December	1	2	3	SHRUB EXAM	EXAM
	8	9	10	LAB FINAL	FINAL EXAM

- * 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.
4. Charlene Schuster, Executive Director Montana Beef Council. What the Montana Beef Council Does for the Beef Industry
5. Dr. Jerry Lipsey, Executive Vice President American Simmental Association. The Role Breed Associations Play In the Beef Industry
6. Internships - how they can help shape my future. Presented by returning student interns.
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.

ARNR 211

Colt Breaking

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

ARNR 230 GRAZING LIVESTOCK PRODUCTION SPRING 2000

Lecture: 9:00 to 9:50, Monday, Wednesday, and Friday, Linfield 301

Patrick G. Hatfield

230A Linfield

ph 994-7952 email hatfield@montana.edu

Texts: Texts: .

Livestock Feeds and Feeding, ed. 4 by Richard Kellem

Beef Cattle Production, An Integrated Approach by Verl Thomas.

Course Goals:

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

Grading:

Points	Source	Grade	Percentile
175	7 quizzes (Hatfield and Ansotegui) @ 25 pts each	90 +	A
50	Final	80 – 89	B
		70 – 79	C
		60 – 69	D
		- 60	F
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.

ARNR 230 CLASS SCHEDULE

Date		Lecture
Jan 12	Wed	Intro to class Origin and history of sheep
Jan 14	Fri	World, U.S. and Montana grazing sheep industry
Jan 17	Mon	Holiday
Jan 19	Wed	Sheep vs cattle advantages and disadvantages
Jan 21	Fri	Breeds of sheep and the production and market environment. Quiz
Jan 24	Mon	Characteristics of grazing animals
Jan 26	Wed	Anatomy and physiology of grazing animals
Jan 28	Fri	Process and function of intake and digestion
Jan 31	Mon	Process and function of intake and digestion
Feb 2	Wed	Intro to nutrients and water
Feb 4	Fri	Protein and lipids Quiz
Feb 7	Mon	Carbohydrates
Feb 9	Wed	Vitamins and minerals
Feb 11	Fri	Grazing systems and grazing opportunities
Feb 14	Mon	Holiday
Feb 16	Wed	Organization of a grazing sheep enterprise
Feb 18	Fri	Physiological cycle of ewe and nutritional requirements Quiz
Feb 21	Mon	Matching forage resources to nutritional requirements
Feb 23	Wed	Mike Tess: Cattle and Elk interactions
Feb 25	Fri	Bok Sowell: co-species grazing
Feb 28	Mon	Bret Olson: grazing livestock for weed control
Mar 1	Wed	Managed vs un-managed grazing systems, John Walker's Yellowstone Park research
Mar 3	Fri	Last quiz and evaluation

ARNR 230
Range Livestock Production
Spring 2000

Instructors:

Patrick Hatfield (sheep)
230B LinH 994-7952
Ray Ansotegui (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.

Grade Percentile

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.**

ARNR 230 Lecture Outline

February	23	Intro to Cattle Section-----
	25	Beef Industry Profile
	28	Production Systems
March	1	Production Systems
	3	Economics
	6	Breeds
	8	Breeds
	10	Breeding Systems
	<i>March 13 - 17 Spring Break</i>	
	20	Selection
	22	Selection
	24	Reproduction
	27	Heifer Management
	29	Heifer Management
	31	Cow Management
April	3	Artificial Insemination
	5	Nutrition
	7	Nutritional Requirements
	10	Forage Cycle
	12	Supplements
	14	Creep Feeding
	17	Herd Health
	19	Disease management
	21	Parasite control
	24	Stockers
	26	Winter Management
	28	Winter Management

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

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

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:

Points	Source	Grade	Percentile
120	6 lab quizzes including lab participation @ 20 pts each	90 +	A
		80 – 89	B
		70 – 79	C
		60 – 69	D
		- 60	F
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

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

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

ARNR 232 lab handout

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

ARNR 232 lab handout

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 contaminates
- *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 hands outs)

- *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

ARNR 232 lab handout

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

ARNR 232 lab handout

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

ARNR 232 lab handout

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

ARNR 232 lab handout

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:

- *

ARNR 232 lab handout

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

ARNR 233
Livestock Management - Equine

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

ARNR 234 Livestock Management-BEEF

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:

Begon, M., J.L.Harper and C.R.Townsend. 1986. Ecology - 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:
- | | |
|----------------------|------------|
| 2 quizzes | 20% |
| 2 midterms | 40% |
| final examination | 30% |
| laboratory exercises | <u>10%</u> |
| | 100% |
- where:
- | | | | | |
|-------------|-------------|-------------|-------------|----------|
| 92-100% = A | 88-89% = B+ | 78-79% = C+ | 68-69% = D+ | <60% = F |
| 90-91% = A- | 82-87% = B | 72-77% = C | 62-67% = D | |
| | 80-81% = B- | 70-71% = C- | 60-61% = D- | |

PRINCIPLES OF NATURAL RESOURCE ECOLOGY

	<u>Topic</u>	<u>Begon et al. 1986</u>
August		
31	Introduction	
September		
2	Temperature	48-49
3	Temperature	
7	Moisture, climate-weather-atmosphere	61-63
9	Topography, factor gradients	
10	<i>Field lab 1</i>	
14	Radiation	43-44, 76-84
16	Energy - trophic levels	652-654
17	<i>Field lab 2</i>	
21	Inorganic molecules - carbon dioxide, water, minerals	85-96
23	Nutrient cycling, decomposers - detritivores	101-107, 386-415
24	<i>Field lab 3</i>	
28	Organisms as resources for other organisms	98-101
30	Space as a resource	117-118
October		
1	Soils, roots	68, 88-93
5	Natural selection, ecotypes, populations	5-7, 30-32
7	Movement	167-196
8	<i>Field lab 4</i>	
12	Midterm	
14	Competition	203-241
15	Predation	300-303
19	Functional responses	322-328
21	Communities	591-609
22	Environmental tolerances	
26	Environmental heterogeneity	27
28	Succession	610-628
29	Flux of energy	650-659
November		
2	Flux of matter	660-669
4	Ecosystems	
5	Grazing	
9	Drought	
11	Veterans Day - No class	
12	Fire	
16	Midterm	
18	Rangelands	
19	Forests	
23	Watersheds	
25	Thanksgiving Holiday	
26	" "	
30	Uplands - bottomlands	
December		
2	Riparian systems	
3	Weeds	
7	Disturbed ecosystems	
9	Ecosystem management	
10	Discussion - review	
13	Final - 2:00-3:50 Leon Johnson 346	

PRINCIPLES OF NATURAL RESOURCE ECOLOGY

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

Principles of Meat Science, 1989 H.B. Hedrick, E.B. Aberle, M.D. Judge, and R.A. Merkel, Kendall / Hunt Publishing Company, ISBN 084038470X

Livestock and Carcasses: An Integrated Approach to Livestock Selection, 1998 D.L. Boggs and R.A. Merkel, Kendall / Hunt Publishing Company, ISBN 0787245690

GRADING SYSTEM

Lecture Quizzes (8 given, count 7 @ 25 pts)	175
Midterm (March 9 comprehensive)	75
Final (Comprehensive)	100
HACCP Plan (due April 25)	50
Paper (due April 11)	100
Lab Questions (13 given, count 12 @ 5 pts)	60
Lab Exams	100
Total	660

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 316 Meat Science

Spring 2000

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. **PLAGERISM 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	Quiz 1
January 25	Hormones affecting growth	
January 27	Slaughter Process	Quiz 2
February 1	Meat Inspection and Grading	
February 3	Yield Grade Calculations, Pork % yield	
February 8	Muscle structure - skeletal, smooth and cardiac	Quiz 3
February 10	Muscle Proteins	
February 15	Muscle Contraction	
February 17	Muscle Contraction and Energy for Contraction	
February 22	Conversion of Muscle to Meat	Quiz 4
February 24	Stress and Meat Quality (PSE, DFD)	
February 29	Pre and Post-slaughter factors affecting tenderness	
March 2	Alternatives to grading	Quiz 5
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	Quiz 6
March 30	Fresh Meat Color	
April 4	Meat Lipids	
April 6	Tenderness and Cookery	
April 11	Meat Flavor	PAPER DUE
April 13	Sensory Evaluation	Quiz 7
April 18	Meat Packaging	
April 20	Meat By-products	
April 25	Meat in the Diet	HACCP DUE
April 27	Value-Added Products	Quiz 8
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

**ARNR 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	Travis Blackhurst
	Graduate Research Assistant	Graduate Research Assistant
	Room 5 Linfield Hall	Room 16 Linfield Hall
	994-7942	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

Livestock Feeds & Feeding, 1998 (4th edition), Richard O. Kellems and D. C. Church
Prentice Hall, Inc., ISBN 0-13-241795-2

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)	<u>180 pts</u>
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)
Paterson, John. 1998. Personal communication, Beef Cattle Extension Specialist, 217 Linfield Hall, MSU, 994-5562, Oct. 20, 1998.

Information from a textbook:

Within the text: (Bowman and Sowell, 1998)
Bowman, Jan, and Bok Sowell. 1998. Feeding the beef cow herd. In: Richard O. Kellems and D. C. Church (Ed.) Livestock Feeds & Feeding. p. 245.

NRC requirements books:

Within the text: (NRC, 1989)
NRC. 1989. Nutrient Requirements of Horses (5th Ed.). National Academy Press, Washington, DC.

Journal article:

Within the text: (Patterson et al., 1985)
Patterson, P. H., C. N. Coon, and I. M. Hughes. 1985. Protein requirements of mature working horses. J. Anim. Sci. 61:187-196.

Extension publications:

Within the text: (Wagner et al., 1973)
Wagner, Donald G., Robert Totusek, and Donald R. Gill. 1973. Grain processing for feedlot cattle. In: Beef Cow-Calf Handbook. Cooperative Extension Service - Great Plains States. GPE-2000.

World Wide Web sites:

Within the text: (FDA, 1998)
FDA. 1998. Food and Drug Administration home page. Available at: <http://www.cfsan.fda.gov/aplrd/sodium.txt>. Accessed Sept. 5, 1998.

**ARNR 320 - Animal Nutrition
Syllabus**

Livestock Feeds & Feeding

I. Digestive Anatomy & Physiology	Pp. 6-15
II. Nutrients	Pp. 16-32, 164-176
III. Factors Affecting Animal Requirements	Pp. 32-35
IV. Feedstuff Classification & Nutritive Value	Pp. 39-42, 45-53
V. Roughages	Pp. 59-103
VI. High-Energy Feeds	Pp. 105-133
VII. Protein Sources	Pp. 135-162
VIII. Feed Processing	Pp. 191-213
IX. Feed Additives and Growth Promotants	Pp. 177-190
X. Feeding Horses	Pp. 412-430
XI. Feeding Sheep	Pp. 308-333
XII. Feeding Dairy Cattle	Pp. 281-295
XIII. Feeding Beef Cattle	Pp. 243-279
XIV. Feeding Swine	Pp. 354-389

ARNR 320 - Animal Nutrition - Fall 1999

Due Dates

Monday, Sept. 6	LABOR DAY HOLIDAY
Tuesday, Sept. 7	Homework 1 due
Thursday, Sept. 9	<i>Nutrition Challenge 1 due, Quiz 1</i>
Tuesday, Sept. 14	Homework 2 due
Thursday, Sept. 16	Quiz 2
Tuesday, Sept. 21	Homework 3 due
Thursday, Sept. 23	<i>Nutrition Challenge 2 due, Quiz 3</i>
Tuesday, Sept. 28	Homework 4 due
Thursday, Sept. 30	Quiz 4
Tuesday, Oct. 5	Homework 5 due
Thursday, Oct. 7	<i>Nutrition Challenge 3 due, Quiz 5</i>
Tuesday, Oct. 12	Homework 6 due
Thursday, Oct. 14	Quiz 6
Tuesday, Oct. 19	Homework 7 due
Thursday, Oct. 21	<i>Nutrition Challenge 4 due, Quiz 7</i>
Tuesday, Oct. 26	Homework 8 due
Thursday, Oct. 28	Quiz 8
Tuesday, Nov. 2	Homework 9 due
Thursday, Nov. 4	<i>Nutrition Challenge 5 due, Quiz 9</i>
Tuesday, Nov. 9	Homework 10 due
Thursday, Nov. 11	VETERAN'S DAY HOLIDAY
Thursday, Nov. 18	<i>Nutrition Challenge 6 due, Quiz 10</i>
Tuesday, Nov. 23	Homework 11 due
Thursday, Nov. 25	THANKSGIVING HOLIDAY
Tuesday, Nov. 30	Homework 12 due
Thursday, Dec. 2	<i>Nutrition Challenge 7 due, Quiz 11</i>
Tuesday, Dec. 7	Homework 13 due
Thursday, Dec. 9	Quiz 12

ARNR 320 - Animal Nutrition Homework Topics

As Fed/Dry Matter Conversions, Unit Conversions	pp. 60-63, 537-538
Animal Requirements, Feed Identification & Composition	pp. 75-76
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 weeks 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:

Text: Senger, P.L. 1997. Pathways to Pregnancy and Parturition.

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 not 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

<i>Lecture Topic</i>	<i>Reading Assignment</i>
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	<i>Pages</i>
Introduction and Needs to Improve Reproductive Rate.	1-7
Embryonic development of reproductive tract.	58-76
Endocrinology of reproduction.	78-99
Pituitary gland	
Control of pituitary by hypothalamus	
Gonads	
Other hormones of reproduction	
The Estrous Cycle	
Puberty and factors affecting puberty	100-115
The estrous cycle	116-129
Follicular Phase	130-147
Luteal Phase	148-167
Oogenesis	
Endocrinology of the Male	168-187
Spermatogenesis	
Gamete Transport and Fertilization	206-219
Embryo Manipulation	
Embryo Transfer and Twinning	
IVM and IVF	
Cloning	
The Gestation Period	220-231
Cleavage	
Early Embryo Development	
Maternal Recognition of Pregnancy	
Hormones of pregnancy	
Parturition and the postpartum period	232-248
Hormonal regulation of the parturition process	
Induced parturition	
Stages of labor	
Dystocia	
The postpartum period	

Tentative Laboratory/discussion Schedule

Week	Topic	Assignment
1	Introduction and Expectations	
2	Pituitary and Neural Anatomy	
3	Gross Female Anatomy	Chapter 2
4	Gross Female Anatomy	Chapter 2
5	Female Micro Anatomy	Chapter 2
6	Reproductive Case Study	
7	Reproductive Case Study	
8	Male Anatomy	Chapter 3
9	Male Micro Anatomy	Chapter 3
10	Semen Evaluation	
11	Semen Evaluation	
12	Embryo Collection	
13	Pregnant Reproductive Tracts	Chapter 14
14	Review and Wrap-up	
15	Lab Final/Practical	

ARNR 322
Principles of Animal Breeding
Course Syllabus
1999

TEXT: Understanding Animal Breeding by Richard M. Bourdon. 1997.
Prentice-Hall, Inc., Upper Saddle River, New Jersey.

PREREQUISITES: BIOL 301, and STAT 216 or equivalent

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

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

HOURLY EXAMS: February 17, March 24, April 21

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

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

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.

GOAL: 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:

2	100 point exams	=	200 points
5	10 point quizzes	=	50 points
	Homework	=	75 points
	Class participation	=	25 points
	Term Paper	=	125 points
	Final exam	=	125 points
	Total	=	600 points

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=Fail. 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)

Month	Day	General Topic	Associated readings
January	12	Introduction to the course	
	14	Basic terminology and What is "best"?	1 to 14
	19	System analysis	
	21	Industry Structure and breeding objectives	
	24	Selection	17 to 28
	26	Mating and mating systems	
	28	Crossbreeding systems	393 to 425
	31	Crossbreeding systems (cont.)	
February	2	Crossbreeding systems (cont.)	
	4	Mendelian genetics	31 to 42
	7	Mendelian genetics (cont.)-- Modes of gene expression	42 to 53
	9	Genes in populations	56 to 69
	11	Simply-inherited and polygenic traits	71 to 75
	14	Simply-inherited and polygenic traits (cont.)	
	16	Discussion, Review of concepts	
	18	Exam I	
	21	Selection for simply-inherited traits	77 to 98
	23	Selection for simply-inherited traits (cont.)	
	25	The genetic model--breeding value	102 to 110
	28	The genetic model--gene combination value	110 to 114
March	1	Producing Ability. Threshold traits	114 to 119
	3	Statistics and application to quantitative traits--variation	123 to 136
	6	Statistics and application to quantitative traits--covariation, correlations	137 to 158

	8	Heritability	161 to 172
	10	Repeatability	172 to 179
	13 to 17	Spring Break	
	20	Ways to improve heritability and repeatability	179 to 194
	22	Factors affecting the rate of genetic change	198 to 223
	24	Factors affecting the rate of genetic change (cont.)	
	27	Jerry Lipsey or Exam II	
	29	Jerry Lipsey or Exam II	
	31	Genetic Prediction--the selection index	227 to 245
April	3	Genetic Prediction--BLUP	245 to 254
	5	Large Scale Genetic Evaluation	258 to 273
	7	Large Scale Genetic Evaluation (cont)	
	10	Correlated response to selection	275 to 291
	12	Multiple-trait selection	294 to 309
	14	Multiple-trait selection (cont.)	
	17	Mating systems for simply-inherited traits	313 to 322
	19	Random and assortative mating	325 to 331
	21	Inbreeding	333 to 367
	24	Outbreeding	362 to 367
	26	Exam III	
	28	Hybrid Vigor	371 to 378
May	1	Hybrid Vigor-- loss and retention and review	379 to 390
	3	Selection for health characteristics, and biotechnology and animal breeding	429 to 448
	10	Final Exam	
		(11am to 1pm)-- University of Arizona	
		(TBA)-- Montana State University	

ARNR 331 - Spring 2000
PORK 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.

ARNR 331 – PORK PRODUCTION AND MANAGEMENT
SPRING 2000

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, TROUBLE SHOOTING 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 HANDOUT, 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)

ARNR 331 LECTURE OUTLINE -- SPRING 2000

Class	DAY	DATE	TOPIC	RESOURCE
1	W	Jan 12	Discussion: student introductions-experience-expectations	
2	F	Jan 14	Class Project Discussion	
	M	Jan 17	HOLIDAY—MLK BIRTHDAY	
3	W	Jan 19	Pork Production Videos/Swine behavior	AASP & NCSU Videos
4	F	Jan 21	The Swine Industry Today: Production stages and terminology	Class Handout
5	M	Jan 24	History; The Swine Industry Today: Facilities, prices, marketing	Class Handout
6	W	Jan 26	Live Animal Evaluation—Ultrasound Evaluation	
7	F	Jan 28	Hog Numbers US & MT; The Swine Industry Today (Cont'd)	Power-point slide handout
8	M	Jan 31	Swine Industry Today: Nutrition, Health, Bio-security	Power-point slide handout
9	W	Feb 2	Types of Facilities, Facility Considerations, Elements of change	Instructor Overheads
10	F	Feb 4	Producer traits-production technologies-pros & cons for MT	Instructor Slides
11	M	Feb 7	View carcasses; Carcass evaluation	NPPC; PIH 42 ASSIGNMENT
12	W	Feb 9	Hog situation and outlook/Cost of production/Production Goals	Class Handouts, PIH 48
13	F	Feb 11	Cost Analysis/Pork Production Chart of Accounts	NPPC handout, SOFTWARE
14 QUIZ	M	Feb 14	Return on Equity Model – managerial accounting	NPPC, Demo SOFTWARE ASSIGNMENT
15	W	Feb 16	Genetics/Selection/Crossbreeding systems	PIH 58, 106; Internet
16	F	Feb 18	New Stock & AI: Selection/Introduction/Management	PIH 9, 27; LCI
	M	Feb 21	HOLIDAY—PRESIDENT'S DAY	
17	W	Feb 23	Breeding: Mating systems/Facilities/Gilt Mgmt/Boar Mgmt	PIH 69, 74
18	F	Feb 25	Breeding: Estrus detection/AI	PIH 8, 137; Video
19	M	Feb 28	Gestation: Pregnancy Check/Condition Score/Facilities/Management	PIH 96; handout
XAM	W	Mar 1	EXAM	
20	F	Mar 3	Farrowing: Facilities/Mgmt/Parturition-normal and abnormal	PIH 10, slides, video
21	M	Mar 6	Baby pig management	PIH 18, Video
22	W	Mar 8	Weaned Pig: Facilities/Management/Ventilation	PIH 20,60,84,111
23	F	Mar 10	Grow-Finish Hog: Types of Facilities/Management/Ventilation	PIH 32,116,138; MPPS32.7
	Mar	13-17	SPRING BREAK	
24	M	Mar 20	Wean to Finish Technology	
25 QUIZ	W	Mar 22	Farrowing Schedules and Pig flow	PIH 113; SOFTWARE ASSIGNMENT
26	F	Mar 24	Waste Management: Safety/Handling Systems	PIH 104; NPPC-EAP material
27	M	Mar 27	Waste Management: Comprehensive Nutrient Mgmt Plan	UNL SOFTWARE- ASSIGNMENT
28	W	Mar 29	Nutrition: Protein/Amino Acids/Lean Gain	PIH 5; NRC publication
29	F	Mar 31	Nutrition: Energy/Vitamins/Minerals	PIH 2,3,52
30	M	Apr 3	Nutrition: Feeds and Feeding Programs	PIH 23; Neb-SDSU Nutr. Guide
31	W	Apr 5	Nutrition: NRC Nutrient Estimation Model	NRC Publication
32 QUIZ	F	Apr 7	Nutrition: Ration Formulation	PIH 7; SOFTWARE ASSIGNMENT
33	M	Apr 10	Health and Diseases: Reproductive	Disease Handout
34	F	Apr 12	Health and Diseases: Respiratory	Disease Handout
35	F	Apr 14	Health and Diseases: Enteric	Disease Handout
36	M	Apr 17	Herd Health Program	PIH 68, 80
37 QUIZ	W	Apr 19	Molds, Mycotoxins and Ergot	PIH 128, Ergot Factsheet
	F	Apr 21	UNIVERSITY DAY	
38	M	Apr 24	Pork Quality Assurance Certification/Injection techniques	PQA book; Video
39	W	Apr 26	Computer and Internet Programs for Swine Production	Handout; PigWin SOFTWARE
40	F	Apr 28	Marketing Hogs	PIH 12
Final Exam	Fri	May 5 8 AM	SENIORS GRADUATING MAY 2000 HAVE THE OPTION OF WAIVING THE FINAL IF COURSE GRADE IS ABOVE A "D +"	

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” SPRIRAL 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

Text: *Stream and Riparian Area Management. A Home Study Course for Managers.* G. Surber and B. Ehrhart. Montana State University Cooperative Extension Service, Montana State University, Bozeman, MT

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:	<u>Grade</u>	<u>%</u>
	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.

ARNR 350 - Range Vegetation

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
10. Northern Cold Desert.
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

JAN.	<u>TUESDAY</u>	<u>THURSDAY</u>
		13 Intro & Tall Grass
	18 Sandhills	20 – 15
	25 Mixed Grass	27 – 25
FEB.	1 Desert Grassland	3 ----25
	8 So. Desert Shrub	10 – 35
	15***** S R M *****	17 – 35
	22 No. Cold Desert	24
	29 Coniferous Forest	
MARCH		2 ----35
	7 Pinyon-Juniper	9 ----35
	14 SPRING BREAK	16
	21 Palouse Bunchgrass	23 – 35
	28 California Annual	30 – 35
APRIL	4 Chap.-Oak	6 --- 35
	11 Review	13 – 50
	18 Review	20 – 50
	25 – 50	

ARNR 351 - Range Biomes

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

JAN.

TUESDAY

18 Solar Radiation
25 Pressure & Winds

THURSDAY

13 Intro-Gen Clim-Impt Dates
20 Temperature
27 Precipitation

FEB.

1 Exam – 70 pts
8 Geomorphology
15 ***S R M ***
22 ½ Exam-1/2 Geom.
29 Geomorphology

3 Clim Types & Summ(Maps)
10 Geomorphology
17
24 Geomorphology

MARCH

7 Exam(Geom) 60pts
14 **SPRING BREAK**
21 Mixed Grass
28 SDS & Exam (40 pts)

2 Tall Grass
9 Sandhills
16
23 Desert Grassland
30 Southern Desert Shrub

APRIL

4 Northern Cold Desert
11 Coniferous Forest
18 Exam (50 pts)-P-J slides
25 Chap.- Oak & Review

6 Northern Cold Desert
13 Pinyon-Juniper
20 Palouse & Calif. Ann.
27 Final

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.
- e. 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.

	Team Members Name					
Leadership Support (behavior that enhances feelings of self worth, influence and importance among team members)						
Team Facilitation (encourages members of team to develop close, mutually satisfying work relationships)						
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)						
Goal emphasis (stimulates enthusiasm for meeting the teams' goals, helps establish priorities and promotes achievement of excellence)						
Influence (advances the status of the group by acquiring needed resources, eliminating barriers)						
Raw Score						

Comments:

FORMAT FOR FINAL REPORT

- 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 ^a
15 Nov	Team Presentation
22 Nov	Team Presentation
29 Nov	Team Presentation
6 Dec	Team Presentation
13 Dec	Finals Week – no class

^aDraft Plan due the day of Team Presentation

1

**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 11:00am
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
4. Handling and manipulating reproductive tracts of pregnant and non-pregnant cattle in situ.
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):

- I. Grades will be assigned by Drs. James G. Berardinelli and Raymond P. Ansotegui. 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

Harv Wagoner	Graduate Student	GTA	
Dave Kirschten	Graduate Student	GTA	
Brian	Undergraduate	Assistant	
Mitch McKamey	Undergraduate	Assistant	
Justin Davies	Undergraduate	Assistant	
Jason Enneberg	Undergraduate	Assistant	

**ARNR 421
ASSITED REPRODUCTIVE TECHNOLOGIES
SCHEDULE OF EVENTS**

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.

Date	Activity	Location
Sept. 3 Wednesday	Introductory Remarks J.G. Berardinelli & Ray Ansotegui No Laboratory	109 LH
Sept. 8 Monday LAB (p.m.)	Introductory Lecture 1 (JB) Reproductive Tract Anatomy (JB)	109 LH 122H LH
Sept. 12 Wednesday (NO LAB PM)	Introductory Lecture 2 (JB)	109 LH
Sept. 15 Monday	Palpation Exercises	North Beef Barn Bozeman Livestock Center
Sept. 22 Monday	Palpation Exercises	North Beef Barn
Sept. 29 Monday	Palpation Exercises	North Beef Barn
Oct. 6 Monday	Palpation Exercises	North Beef Barn
Oct. 13 Monday	Palpation Exercises	North Beef Barn
Oct. 20 Monday	MID-TERM EXAM	North Beef Barn
Oct. 27 Monday	Palpation Exercises	North Beef Barn
Nov. 4 Monday (a.m.) LAB (p.m.)	Lecture 3 Palpation Exercises	109 LH North Beef Barn
Nov. 10 Monday	NO CLASS	Veteran's Day
Nov. 17	Palpation Exercises	North Beef Barn
Nov. 24 Monday	Palpation Exercises	North Beef Barn
Dec. 1 Monday	Palpation Exercises	North Beef Barn
Dec. 8 Monday	FINAL EXAM	North Beef Barn

**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

Nutrient Requirements of Beef Cattle, 1996 (7th Revised Edition), National Research Council, National Academy Press, Washington, D.C., ISBN 0-309-05426-5

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)	<u>50 to 100 pts</u>
TOTAL	590 to 720 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. 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.

**ARNR 422 - Topics in Beef Cattle Nutrition
Spring 2000**

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.

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)

Lectures		Labs	
January 12- January 21	Equine Psychology and Behavior	January 18	1 hour lecture LinH 234
January 24- February 11	Anatomy and Physiology	January 25 February 1 February 8	Restraint and Handling of Horses Anatomy Hoof Dissection
February 11	Exam I (100 pts)		
February 16- February 29	Conformation and Gaits	February 15 February 22	Hoof Care and Shoeing Conformation Analysis
March 1 - March 24	Unsoundness, Blemishes and Lameness	February 29 March 7 March 21	Gait Analysis Corrective Shoeing Unsoundnesses
March 27	Exam II (100 pts)		
March 29 - April 12	Diseases and Parasites	March 28 April 4	First Aid & Injury Care Nutrition & Rations
April 14- April 19	Reproduction & Breeding	April 11 April 18	Breeding, Soundness, Castration, & Artificial Insemination
April 24	Exam III (100 pts)		
April 26 - April 28	Nutrition & Management	April 25	Lab Exam I (50 pts)
May 2	Final Exam (100 pts)		

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

Texts: *Sheep Production Handbook, 3rd Ed. Pub. By Sheep Industry Development. Denver, Co.*

Course Goals:

- Student learns the biological characteristics of sheep and how this relates to production and market environments.
- Students develop an understanding of basic husbandry, fiscal, and management skills required for sheep production.
- Introduce students to the application of scientific principles for efficient sheep management.
- Students further develop their written, oral, and investigative skills.

Grading:

Points	Source	Grade	Percentile
175	7 quizzes @ 25 pts each	90 +	A
350	14 homework or lab assignments or lab quizzes @ 25 pts each	80 – 89	B
50	Breed paper and class presentation	70 – 79	C
50	Health paper and class presentation	60 – 69	D
		- 60	F
625	TOTAL		

*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.

ARNR 432 SHEEP PRODUCTION CLASS AND LAB SCHEDULES

Date		Lecture	Quiz	Home work or Lab assignment	Lab
Jan 13	Thur	Introduction Genetics and Reproduction			Breeding project assignment @ Linfield 231
Jan 18	Tues	Genetics and Reproduction			
Jan 20	Thur	Genetics and Reproduction		X	NSIP @ Linfield 231
Jan 25	Tues	Genetics and Reproduction			
Jan 27	Thur	Genetics and Reproduction	X	X	Breed presentations @ Linfield 231
Feb 1	Tues	Economic tools			
Feb 3	Thur	Economic tools		X	Intro to computer lab @ comp. lab
Feb 8	Tues	Nutrition			
Feb 10	Thur	Nutrition	X	X	Economic evaluation of breeding program @ comp. lab
Feb 15	Tues	Grazing Nutrition			
Feb 17	Thur	Lamb finishing		X	Computer based ration formulation @ comp. lab
Feb 22	Tues	Lamb finishing/quality research			
Feb 24	Thur	Carcass quality	X	X	Carcass evaluation @ meat lab
Feb 29	Tues	Wool			
Mar 2	Thur	Wool		X	Wool @ MSU wool lab
Mar 7	Tues	Wool			
Mar 9	Thur	Wool	X	X	Wool @ MSU wool lab
Mar 11	Tues	Break			
Mar 16	Thur	Break			
Mar 18	Tues	Wool			
Mar 23	Thur	Wool		X	Wool @ MSU wool lab
Mar 25	Tues				
Mar 30	Thur	Student presentations on health/lambing	X	X	Student presentations on health/lambing @ Linfield 231
Apr 1	Tues				
Apr 6	Thur	Lambing		X	Intro to lambing @ RedBluff
Apr 8	Tues	Lambing			
Apr 13	Thur	Management	X	X	Farm flock economic evaluation @ comp. lab
Apr 15	Tues	Management			
Apr 20	Thur	Management		X	Range flock economic evaluation @ comp. lab
Apr 22	Tues	Integrated crop/livestock systems			
Apr 27	Thur	Integrated crop/livestock research and Evaluation	X	X	Meat evaluation @ Fort Ellis

NR 432 labs

True: Breed project

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

Topic: 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 offsorts
- Practice grading 10 fleeces

Materials/equipment/personnel needed:

Skirting table, offsorts, 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 offsorts
- 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

Time: 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

Time: 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

Title: Introduction to financial software programs

Goal: Work with Duane to establish goals, reading, activities, and quizzes for this lab and following 2 labs

Reading:

Activities:

Materials/equipment/personal needed:

*Dwane's software

Quiz:

Title: Cash Flow

Goal:

Reading:

Activities:

Materials/equipment/personal needed:

Quiz:

Title: Budgeting

Goal:

Reading:

Activities:

Materials/equipment/personal needed:

Quiz:

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	<u>20%</u>
		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.
3. Breeding and Genetics.
 - a. Principles of selection and genetic improvement.
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.

Required Text: *Grazing Management*. J.F. Vallentine. Academic Press.

Suggested Texts:

- ① *Ecological Implications of Livestock Herbivory in the West*. 1994.
Edited by Vavra Laycock and Pieper. Society for Range Management (SRM).
- ② *Grazing Management an Ecological Perspective*. 1991.
Edited by R.K. Heitschmidt and J.W. Stuth. Timber Press.
- ③ *Intensive Grazing Management: Forage , Animals, Men, Profits*. 1986. B.Smith,
P. Leung, G. Love. The Graziers Hvi, PO Box 1944 Kamuela, Hawaii 96743
- ④ *Sacred Cows at the Public Trough*. 1983. Denzeal and Nancy Ferguson.
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 = √

ARNR 437 - Fall 1999

TOPIC	VALLENTINE TEXT	READINGS
Section 1		
History & Policy	1	Pederson
Ecological Perspectives	3	Walker, USFS
Morphology	2	Caldwell
Community Level Processes	2	Graz. Opt. Theory, Papers
Hydrology & Erosion	11	
Riparian & Watersheds, Utilization	10	
Range Conditions & Trends	3, 7	Lacey, Hart
Stocking Rates	9	Lacey, Hart
October 71st		
Section 2		
Nutrition	5	Launchbaugh, Adams
Intake Control	9	Allison
Foraging Behavior	6	
Distribution	4	
Wildlife	8	
Planning		
Grazing		
November 5th		
Section 3		
Economics	12	
Planning	13	
Grazing Systems	14	Galt, Rogler, Smoliak, Savory, Skovlin, Holechek, Barker, Bryant, Peiper, Owensby, Nyren
December 14th		

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 - $\geq 90\%$ 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.

ARNR 438

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.

ARNR 438 Range - Wildlife Relationships

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 inversivity.
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.

Textbook:

Committee on Rangeland Classification (1994) Rangeland Health - New Methods to Classify, Inventory, and Monitor Rangelands, National Research Council, National Academy of Sciences.

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

For reference, the following book will be on reserve in the library:
Bonham, C.D. (1989) Measurements for Terrestrial Vegetation. John Wiley and Sons. New York.

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	5%
1 statistical exercise	10%
laboratory exercises	5%
2 midterms	30%
1 project assignment	25%
final	<u>25%</u>
	100%

where

92-100% = A	88-89% = B+	78-79% = C+	68-69% = D+	<60% = F
90-91% = A-	82-87% = B	72-77% = C	62-67% = D	
	80-81% = B-	70-71% = C-	60-61% = D-	

RANGELAND RESOURCE MEASUREMENTS

AUGUST		Topic	Reading	
31		Introduction	134-146	
31		Units for measurement		
SEPTEMBER				
2		Field sampling	66-75, 82-85	
7		Mapping		
7		Field Lab 1		
9		Vegetation measurements		
		Frequency		
14		Cover		
14		Field Lab 2		
16		Density		
21		Biomass		
21		Field Lab 3		
23		Soil measurements		
28		Watersheds, GIS/GPS		
28		Field Lab 4		
30		Vegetation - baseline measures		
		Range site/Ecological site		
OCTOBER				
5		Midterm	98-114	
5		Field Lab 5		
7		Habitat type		
12		Riparian classification		
12		Field Lab 6		
14		Watershed - baseline measures		
19		Soils - baseline measures		
19		Large herbivore use		
21		Large herbivore use		
26		Range condition and trend		
26		Range condition and trend		
28		Rangeland health		
NOVEMBER				
2		Rangeland health		97-133
2		Parametrics		
4		Midterm		
9		Parametrics		
9		Parametrics		
11		Veteran's Day - No class		
16		Parametrics		
16		Parametrics		
18		Non-parametrics		
23		Non-parametrics		

25 Holiday - Thanksgiving
30 Sampling design
30 Biodiversity

DECEMBER

2 USDA Forest Service 147-156
7 Montana Dept. Fish, Wildlife and Parks
7 USDA Natural Resources Conservation Service
9 USDI Bureau of Land Management
17 **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 and 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.
4. Thesis Proposal or Thesis Summary, 50 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	<u>100 pts</u>
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 ($\mu\text{mol} \cdot \text{min}^{-1} \cdot \text{g tissue}^{-1}$) as related to postnatal rumen development.

Liver enzyme	Milk-fed calves	Early-weaned calves	Finished steers
Glucose-6-phosphate dehydrogenase	2.71	2.01	.98
6-phosphogluconate dehydrogenase	3.51	1.59	1.34
Hexokinase	.71	1.30	.41
Phosphofructokinase	30	6.8	3.0
Glyceraldehyde-3-phosphate dehydrogenase	91	58	54
Glucose-6-phosphatase	.74		15
Acetyl-CoA synthetase	.12	.50	.10
Malate dehydrogenase	.20	.44	.13

3. Use the data in the following table to discuss the effects of diet on carbohydrate metabolism in ruminants.

Dietary effects on enzyme activities ($\mu\text{mol}\cdot\text{min}^{-1}\cdot\text{g tissue}^{-1}$) of carbohydrate metabolism in sheep liver.

Enzyme	Roughage diet	Concentrate diet	Duodenal infusion of glucose
Glucose-6-phosphate dehydrogenase	.90	1.76	Not determined
6- phosphogluconate dehydrogenase	11.59	13.79	16.15
Hexokinase	.33	.27	.29
Phosphofructokinase	4.73	6.96	7.18
Pyruvate kinase	6.67	15.51	24.29
ATP-citrate lyase	.062	.149	.056
Malate dehydrogenase	.18	.49	.32

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 boxy, and why it cannot occur if there is a O in the box.

Metabolite	Pyruvate	Palmitic acid	α -glycerol phosphate	Alanine
Leucine				
Arachidonic acid				
Threonine				
Glucose				
Valeric acid C ₄ H ₉ COOH				

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%

ARNR 523
ADVANCED PHYSIOLOGY OF REPRODUCTION
Spring Semester

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

ARNR 523
ADVANCED PHYSIOLOGY OF REPRODUCTION
Spring Semester 1999

Class Schedule

Day	Date	Activity	Day	Date	Activity
TR	Jan. 14	1 st Class Meeting	T	Mar. 23	Lecture
F	Jan. 15	Lecture ^a	TR	Mar. 25	Lecture
T	Jan. 19	Lecture	F	Mar. 26	Lecture
TR	Jan. 21	Lecture	T	Mar. 30	Lecture
F	Jan. 22	Lecture	TR	Apr. 1	Lecture
T	Jan. 26	Lecture	F	Apr. 2	No Class - Univ. Day
TR	Jan. 28	<i>Exam 1</i>	T	Apr. 6	Lecture
F	Jan. 29	Lecture	TR	Apr. 8	Lecture
T	Feb. 2	Lecture	F	Apr. 9	<i>Exam 3</i>
TR	Feb. 4	Lecture	T	Apr. 13	Lecture
F	Feb. 5	Lecture	TR	Apr. 15	Lecture
T	Feb. 9	Lecture	F	Apr. 16*	Lecture; <i>Paper due</i>
TR	Feb. 11	Lecture	T	Apr. 20	Lecture
F	Feb. 12	Lecture	TR	Apr. 22	<i>Oral Presentations**</i>
T	Feb. 16	Lecture	F	Apr. 23	<i>Oral Presentations**</i>
TR	Feb. 18	Lecture	T	Apr. 27	Lecture
F	Feb. 19	Lecture	TR	Apr. 29	Lecture
T	Feb. 23	Lecture	F	Apr. 30	Lecture; Last Class
TR	Feb. 25	Lecture	M	May 3	<i>Final Exams begin</i>
T	Feb. 26	Lecture	T	May 4	
TR	Mar. 2	Lecture	W	May 5	
F	Mar. 4	<i>Exam 2</i>	TR	May 6	
T	Mar. 5	Lecture	F	May 7	Last Day of FINALS
TR	Mar. 9	Lecture			
F	Mar. 11	Lecture	*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		
T	Mar. 16	Spring Break			
TR	Mar. 18	Spring Break			
F	Mar. 19	Spring Break			

^a Lecture, demonstration, or laboratory. Demonstrations or laboratories will be announced in advance for next class meeting.

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

- I. Some statistics for animal breeding - Handout, Becker (1984)
- 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

ARNR 524 - Advanced Animal Breeding
Spring 2000

INSTRUCTOR

M. W. Tess
117 Linfield Hall
994-5610
mwteess@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	<u>25%</u>
		100%

***** *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:

$\geq 90\%$ = 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 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.

ARNR 524
TENTATIVE LECTURE AND DISCUSSION TOPICS
Spring 2000

- 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

ARNR 541 - RANGE ECOPHYSIOLOGY

Spring 2000

Tuesday, Thursday 12:45 - 2:00

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	<u>40%</u>
	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:

Campbell, G.S. and J.M. Norman. 1998. An Introduction to Environmental Biophysics. Second Edition. Springer. New York.

Lambers, H., F.S. Chapin III, and T.L. Pons. 1998. Plant Physiological Ecology. Springer. New York.

Louw, G. 1993. Physiological Animal Ecology. John Wiley and Sons. New York.

Oke, T.R. 1978. Boundary Layer Climates. Metheun and Co., Ltd., London.

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!