A Mobile Classroom Approach to Graduate Education in Forage and Range Sciences

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ABSTRACT

It is becoming increasingly difficult to keep graduate students in forage and range science connected to producers and grazingland resources in the USA. Students must take an integrated systems approach to understanding the complexity of our grazinglands and their role in addressing critical issues. This can best be conveyed to the student by bringing together an array of expertise and providing exposure to diverse sites for these learning opportunities. Thus, a multidisciplinary graduate course was developed for students at U.S. universities that transports students to professionals in different ecoregions, and provides a hands-on approach to grazinglands education. In the first 5 years of the course, 59 students from 12 countries have represented 8 universities in the USA and Mexico. Student responses to the course have been positive. We believe this course fills a niche currently lacking in most graduate programs and provides a unique opportunity for students to interact with experts in every aspect of forage and range science. The personal and professional contacts, cross-cultural interactions, photographs, and potential for career direction are tangible items seldom attained in graduate education.

GRAZINGLANDS occupy more than half of the land area in the USA and play a key role in addressing sustainability issues in agriculture and the environment (Barnes and Nelson, 2003). Grazinglands are central to conservation of soil, clean water, wildlife habitat, recreation, and open space; they provide most of the diets of domesticated ruminants and equines. Graduate education in forage and range science in the USA is becoming increasingly disconnected from producers and the resources. For example, graduate students increasingly participate in distance education and communication via the internet and conduct computer modeling projects of historically field-based research. Additionally, some graduate programs are utilizing a modular format that allows completion of a 3-credit hour course in 2 weeks to accommodate student needs (Gordon, 2002). Although these changes are neither good nor bad in and of themselves, they represent a potential loss of contact with the land. As Aldo Leopold (1966) stated in his essays on The Land Ethic:

> Perhaps the most serious obstacle impeding the evolution of a land ethic is the fact that our educational and economic system is headed away from, rather than toward, an intense consciousness of land.

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Regardless of our specific areas of educational emphasis, each of us is consistently presented with the challenge of keeping our students in contact with the land. Our approach to fostering this new land ethic is to take students to the field. This graduate course was developed by (and could not be possible without input from) faculty and scientists at Auburn University, Chadron State College, Colorado State University, Kansas State University, Oregon State University, the Pennsylvania State University, Southern Utah University, Texas Tech University, the University of Florida, the University of Georgia, the University of Kentucky, the University of Missouri, the University of Nebraska, the University of Tennessee, USDA-ARS, and Virginia Polytechnic Institute and State University.

In education, we often talk about the "teachable moment" and its importance in the learning process. The approach of this class is to immerse students into the "teachable fortnight." We recognize that we are not and cannot be experts in every facet of forage and range management/science/ecology. Consequently, we have developed a field-oriented graduate course that takes participants to experts in diverse ecosystems during a 2-week period (Fig. 1). Students get first-hand information from local experts about the components and functions of grazinglands and how these vary ecologically and culturally in different regions of the USA.

The course, Ecology of Grazinglands Systems, is a 2-week mobile classroom organized at Texas Tech University and is open to graduate students who meet the qualifications listed below. Cooperating institutions define the course internally or offer the course as a special problem. Students register for the 3credit hour course and pay tuition at their home institution. A course fee (currently $300 per student) is paid to Texas Tech University before departure. Students are responsible for transportation to the starting point of the trip and their return home from the ending point of the trip. Transportation, food, and lodging during the trip are provided at no additional cost. Graduate credit is received through the student's home institution and is credited to their program of study. Enrollment is limited to about 15 students and the course is taught annually during the first summer session, usually the last week of May and the first week of June. At least two traveling faculty participate in the field trip in its entirety each time the class is offered. Routes for the field trip are different each time the course is offered, taking students into widely divergent ecosystems. The regions covered during the first 5 years of the course have been the Central, Southwestern, and Eastern USA. Thus, pending available space, a student could enroll in the course more than once. In 5 years of the course, the 59 students from eight universities in the USA and Mexico (Table 1) have traveled to Alabama, Arizona, Colorado, Delaware, Florida, Georgia, Kansas, Kentucky, Maryland, Mississippi, Missouri, Montana, Nebraska, Nevada, New Mexico, Oklahoma, Pennsylvania, South Dakota, Tennessee, Texas, Utah, Virginia, and Wyoming.

Fig. 1. The Ecology of Grazinglands Systems class promotes camaraderie and a cross-cultural experience for all of the graduate students and instructors. This class included students from Mississippi, New Mexico, Tennessee, Texas, West Virginia, Jordan, Kenya, and Algeria.

COURSE OVERVIEW

Objectives

Our primary objective is to provide students with an opportunity to see and to learn first-hand about the ecology of grazinglands in various ecoregions and about techniques to address research needs. Students see research needs and objectives in several geographic and climatic areas, techniques used by different scientists in soil–plant–animal research, forage–livestock ecology and systems that include native and/or introduced forage species, and intensive and extensive management. Students quickly gain an appreciation for the differences in ecosystems and the resultant effects on forage–livestock systems and agriculture in general. This familiarization with different ecosystems will help the students integrate grazing management, watershed management, wildlife, and conservation issues now and later in their careers.

Our secondary objective is to provide students with opportunities to interact with professionals in forage–livestock research, teaching, extension, industry, and production. As a result, students gain a greater appreciation and knowledge of the interdisciplinary nature of forage–livestock research. Students become aware of the importance of forage–livestock systems as an integral component of agriculture and their contribution to productive, economically viable, socially acceptable, and sustainable agricultural systems.

Fig. 2. Students have the unique opportunity to interact with professionals in various fields. Dr. Roger Gates and Dr. Glenn Burton discuss bermudagrass management at Tifton, GA.

Table 1. Universities represented by graduate students taking Ecology of Grazinglands Systems (1998–2003).

University	No. of students	Years
Texas Tech	30	1998, 1999, 2000, 2001, 2003
Virginia Tech	15	1998, 1999, 2000, 2001, 2003
University of Tennessee	7	1998, 1999, 2000, 2003
North Carolina State University	2	2001, 2003
University of Kentucky	2	2003
Iowa State University	1	2001
University of Chipingo, Mexico	1	2001
Universidad Veracruzana, Mexico	1	2001
Total	59	

Grazinglands are central to identifying solutions to the complex issues of maintaining agricultural production while maintaining the environment and our future productive potential. We must provide learning opportunities for students that allow them to comprehend broad principles that extend across ecoregions. Students must take an integrated systems approach to solving problems of agriculture and the environment. This can be accomplished best by bringing together an array of expertise at a broad range of sites and by taking the students to the sites for learning opportunities.

Activities

Each trip provides different activities for the student. In general, each day is dedicated to a specific location, followed by traveling to the next location. A local expert will meet with the group and discuss various aspects of the location such as ecology, geology, soils, vegetation, typical production practices, economics, management challenges, and the history of the area (Fig. 2). Students then discuss specifics with the local instructor. While traveling to the next location, the previous stop is discussed and background on the next location is highlighted. For example, the 2001 course focused on the western Great Plains and Rocky Mountains, and students traveled from the Southern Plains in Lubbock, TX, to the Northern Plains in Miles City, MT. We visited a diversified operation in western Kansas where we discussed their feedlot, dairy, and crop production practices; we then traveled to a diversified family farm in central Nebraska where the financial books were opened in the family's living room and we discussed the economics of production agriculture. Next we went to Chadron State College. We toured with local experts to various sites and discussed the ecology of the Pine Ridge, invasive plants, the impacts of fire on the region, the changing land uses of the area, and a visit to a commercial bison ranch in South Dakota. We visited Mount Rushmore and Custer State Park and spent the following day at the Livestock and Range Research Laboratory in Miles City, MT. We toured the Little Bighorn National Monument the following day and spent the next 3 days in Yellowstone National Park. Yellowstone ecologists took us to the wolf release sites where they discussed the wolf re-establishment program. Then we saw first-hand the impacts and subsequent recovery from the 1988 wildfires. We traveled through the Rocky Mountains to Den-

ver where non-Texas Tech students and faculty flew home, and Texas Tech staff and students departed for Lubbock.

Prerequisites

Verification of qualification by the student's major professor and permission of the touring faculty is required. Because students come from a number of different institutions with differences in curricula, prerequisites must be in subject matter and not in specific courses. We recommend that students should have completed at least one course in each of the following subject groups before taking this course: Group 1 (forage crop ecology, forage management, range management, range improvement), Group 2 (ruminant nutrition, feeds and feeding, equine nutrition, beef cattle nutrition, dairy cattle nutrition, beef cattle management, sheep management, dairy cattle management, ruminology), Group 3 (soil fertility and fertilizers, soil chemistry, soil management, soil physics, soil genesis and morphology), Group 4 (biochemistry, physiology [plant or animal], toxicology), Group 5 (statistics, biometry), and Group 6 (ecology, economics, farm management, plant taxonomy, agrostology, wildlife management). A course in Group 6 is not required, but can be substituted for a requirement in Groups 1 through 5.

Text

No textbook is required. A core set of reading material provides background information for the specific ecoregion of the trip. The selected readings from publications and technical papers familiarize students with the sites to be visited as well as with the professionals they meet.

Course Requirements

Students must actively participate in the field trip for it to be a successful learning experience (Fig. 3). In addition to participation, students use their own photographic equipment to assemble a photographic collection of at least 50 species of forage plants encountered during the trip. This provides opportunities to collect and recognize species that do not grow in the home areas of the students. The photographs are organized into a three-ring notebook or burned on a CD accompanied by a description of the species and information on the collection site. Each student is required to take notes during the trip and write an "end-of-tour" report to summarize information learned and describe the features of the grazingland systems observed. Questions and topics specifically relating to the current trip are provided for the end-of-tour report. An oral exam is given at the end of the course in a group setting; it serves as a means of summarizing and synthesizing the information.

IMPLICATIONS

Most universities cannot offer such a course because faculty teaching loads are high or they lack the required number of graduate students needed to make the course viable (McClaran, 2000). By making this a multi-university course it is available to students and faculty from cooperating universities, and students can receive 3 hours of graduate credit in their degree program at their home institution. Benefits of this process include the interaction and sharing of knowledge among students and professors from a number of institutions and areas of expertise. Because faculty and students are from various universities, students become more knowledgeable about programs in other areas. Faculty who participate in the course also benefit professionally by increasing their awareness of the forages and livestock systems in the areas visited.

Fig. 3. Tim Caudill, ranch manager, talks to the students about grass-fed beef management in Virginia.

Similar courses such as the Nebraska Range Shortcourse (Vaughn et al., 1997) have been successful for more than 25 years, but are limited to a single location. We believe this course fills a niche currently lacking in most graduate programs. The opportunity to interact with experts in every aspect of forage and range science is valuable. Additionally, the varied student backgrounds and the necessity to live and travel in close quarters for an extended period enhances the multicultural experience (Table 2). The personal and professional contacts, cross-cultural interactions, photographs, and potential for career direction are tangible items seldom attained in the classroom.

Table 2. States and countries represented by graduate students taking Ecology of Grazinglands Systems (1998–2003).

Country/state	No. of students	Years
United States		
Texas	13	1998, 1999, 2000, 2001
Virginia	9	1998, 2000, 2001
Tennessee	4	1998, 1999, 2000
Mississippi	4	1999, 2000, 2001
New Mexico	2	1998, 1999
West Virginia	1	1999
Kentucky	1	2000
Minnesota	1	2000
New York	1	2000
Pennsylvania	1	2000
Delaware	1	2001
Iowa	1	2001
Arkansas	1	2003
Kansas	1	2003
Germany	3	1998, 2001, 2003
Mexico	3	2001, 2003
Jordan	2	1998, 1999
Kenya	2	1999, 2000
South Africa	2	2001, 2003
Bulgaria	1	1998
Tunisia	1	1998
Algeria	1	1999
England	1	2000
Panama	1	2001
Brazil	1	2003

REFERENCES

Barnes, R.F, and C.J. Nelson. 2003. Forages and grasslands in a changing world. p. 3–23. *In* Forages: An introduction to grassland agriculture. 6th ed. R.F Barnes et al. (ed.) Iowa State Univ. Press, Ames.

Gordon, K. 2002. Preserving the heritage of the West. Rangelands 24(6):34–35.

Leopold, A. 1966. A Sand County almanac with essays on conservation from Round River. Ballantine Books, New York.

McClaran, M. 2000. History of the range curriculum: Are there new trails? Rangelands 22(6):23–27.

Vaughn, D.R., A.D. Watson, L.E. Moser, and W.H. Schacht. 1997. Nebraska range shortcourse: A successful approach to continuing education. Rangelands 19(6):24–26.