



**FOREST AND RANGELAND  
STEWARDSHIP**  
COLORADO STATE UNIVERSITY

**RS 452: Rangeland Herbivore Ecology  
and Management  
COURSE SYLLABUS**

Department of Forest and  
Rangeland Stewardship  
Warner College of Natural Resources

	<b>Instructor</b>	<b>Teaching Assistant</b>
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<b>Office Hours:</b>	Mondays, 8-10 a.m. Tuesdays, 2-3 p.m.	N/A N/A
<b>Term:</b>		Spring 2019
<b>Class Meeting Days:</b>		MWF
<b>Class Meeting Hours:</b>		10:00 – 10:50 a.m.
<b>Class Location:</b>		201 Natural Res.
<b>Course Credits:</b>		3

**Course Overview**

The first part of the class is mostly a series of lectures, supported by assigned readings and opportunities for discussions. These provides students with the foundation necessary to explore rangeland animal – habitat interactions. The remainder of the course will focus on case studies and scenario analyses that will require students to apply concepts and synthesize information covered earlier. There may be guest lectures presented by other faculty members at CSU. This will enrich the educational experience, and expose students to other faculty who are truly experts in their fields.

**Course Goals and Objectives**

The goal of this course is to guide students through a study of a complex variety of factors that determine how large rangeland herbivores interact with their habitat and to help students explore how these interactions translate into challenges and opportunities for natural resource conservation and management. Upon successful completion of this course students will:

1. Correctly describe important linkages between animal performance and plant performance and the major factors that drive each.
2. Analyze interactions between large rangeland herbivores and their habitat and describe how these interactions translate into challenges and opportunities for managers and conservationists.
3. Accurately describe traditional livestock grazing management strategies and the planning process as related to grazing management.
4. Be able to make reasonable predictions about the extent to which management inputs to influence plant and animal performance will meet management and conservation objectives.
5. Have the ability to develop a grazing management plan to meet specific objectives and analyze an existing grazing management plan relative to the likelihood of meeting specific objectives as evidenced by a synthesis assignment addressing the learning objectives above.

**Course Prerequisites**

RS300; LAND220 or LIFE220

## **Required Texts and Materials**

No Required Textbook

The following readings will be posted on the class webpage and assigned throughout the semester.

- Bell, R.H.V. 1971. A grazing ecosystem in the Serengeti. *Scientific American* 225: 86-93
- Briske, D.D., J.D. Derner, J.R. Brown, S.D. Fuhlendorf, W.R. Teague, K.M. Havstad, R.L. Gillen, A.J. Ash and W.D. Willms. 2008. Rotational grazing on rangelands: reconciliation of perception and experimental evidence. *Rangeland Ecology and Management* 61:3-17.
- Briske, D.D., N.F. Sayre, L. Huntsinger, M. Fernandez-Gimenez, B. Budd and J.D. Derner. 2011. Origin, persistence, and resolution of the rotational grazing debate: integrating human dimensions into rangeland research. *Rangeland Ecology and Management* 64:325-334.
- Gordon, I.J. and A.W. Illius. 1996. The nutritional ecology of African ruminants: A reinterpretation. *Journal of Animal Ecology* 65:18-28.
- Hofmann, R.R. 1989. Evolutionary steps of ecophysiological adaptation and diversification of ruminants: A comparative view of their digestive system. *Oecologia* 78:443-457.
- Laca, E.A. 2009. New approaches and tools for grazing management. *Rangeland Ecology and Management* 62:407-417.
- Meiman, P.J., D.R. Tolleson, T. Johnson, A. Echols, F. Price and K. Stackhouse-Lawson. 2016. Usable science for managing animals and rangeland sustainability. *Rangelands* 38:79-84.
- Provenza, F.D. 2003. Twenty-five years of paradox in plant-herbivore interactions and "sustainable" grazing management. *Rangelands* 25 (6):4-15.
- Stuth, J.W. 1991. Foraging behavior. *In: Heitschmidt R.K. and Stuth J.W., editors. Grazing management: An ecological perspective.* Portland, OR, USA: Timber Press. Pp. 65-83.
- Tolleson, D. and P. Meiman. 2015. *(Invited)*. Global effects of changing land-use on animal agriculture. *Animal Frontiers* 5(4):14-23. DOI:10.2527/af.2015-0042.

## **Supplementary (Optional) Texts and Materials**

- Dearing, M.D., W.J. Foley and S. McLean. 2005. The influence of plant secondary metabolites on the nutritional ecology of herbivorous terrestrial vertebrates. *Annual Review of Ecology, Evolution, and Systematics* 36:169-189
- lason, G. 2005. The role of plant secondary metabolites in mammalian herbivory: Ecological perspectives. *Proceedings of the Nutrition Society* 64:123-131.
- Spalinger, D.E. and N.T. Hobbs. 1992. Mechanisms of foraging in mammalian herbivores: New models of functional response. *The American Naturalist* 140(2):325-348.
- Howery, L.D., F.D. Provenza, R.E. Banner and C.B. Scott. 1998. Social and environmental factors influence cattle distribution on rangeland. *Applied Animal Behaviour Science* 55:231-244.
- Heitschmidt, R.K. and J.W. Stuth (eds.). 1991. *Grazing management: An ecological perspective.* Portland, OR, USA: Timber Press. 259 pp.

## **Library & Research Help**

The CSU Libraries Help Desk provides basic research and technical assistance either in person at Morgan Library or by phone at 970-491-1841. Virtual assistance is also available via the Libraries' Ask Us chat and email services (<http://lib.colostate.edu/help/ask-us>). Jocelyn Boice is the librarian supporting the Forest and Rangeland Stewardship Department and this course. Contact her for in-depth assistance at: [jocelyn.boice@colostate.edu](mailto:jocelyn.boice@colostate.edu) / 970-491-3882.

## **Important Dates to Remember**

Last Day to Add/Drop Classes without an Instructor Override: January 27<sup>th</sup> 2019

Registration Closes: February 6<sup>th</sup> 2019

Withdrawal Deadline: March 25<sup>th</sup> 2019

Spring Recess: March 16-24<sup>th</sup> 2019

Last Day to Process a University Withdrawal: May 10<sup>th</sup> 2019  
 Final Examination: Thursday, May 16<sup>th</sup> 4:10 – 6:10 p.m. (Everyone please confirm this at <https://registrar.colostate.edu/academic-resources/final-exams/>)

**Course Schedule and/or Schedule of Assignments**

RS 452 – Rangeland Herbivore Ecology and Management <b>Tentative Schedule – Dates and assignments subject to change at the discretion of the professor</b>	
January 23 (W)	Introduction to course, syllabus, schedule, where it fits in. Overview of interactions among rangeland herbivores and rangelands
January 25 (F)	Challenges – the foraging challenge for herbivores and the resource management challenge for natural resource managers.
January 28 (M)	Plant – Herbivore interactions <b>Assignment Due: Read all 3 articles listed below (available on RamCT):</b> 1) <b>Provenza (2003)</b> 2) <b>Meiman et al. (2016)</b> 3) <b>Tolleson and Meiman (2015)</b> • <b>write a 1-page summary for only one of these, your choice which one (due at the beginning of class). Read all 3, but you only need to write a review for 1.</b>
January 30 (W)	Nutritional and habitat needs of large ungulates with an emphasis on ruminants
February 1 (F)	Nutritional and habitat needs of large ungulates with an emphasis on ruminants
February 4 (M)	Digestive system anatomy and physiology <b>Assignment Due: Read Hofmann (1989) (Available on RamCT)</b> • <b>write a 1-page summary (due at the beginning of class)</b>
February 6 (W)	Nutrients, metabolism and digestibility ( <b>Dr. Shawn Archibeque, Animal Science</b> ) Chemical analysis of Feedstuffs (proximate, in-vitro, in-vivo,)
February 8 (F)	<b>Society for Range Management Meetings, Minneapolis, MN Class Canceled</b>
February 11 (M)	<b>Society for Range Management Meetings, Minneapolis, MN Class Canceled</b>
February 13 (W)	<b>Society for Range Management Meetings, Minneapolis, MN Class Canceled</b>
February 15 (F)	<b>Society for Range Management Meetings, Minneapolis, MN Class Canceled</b>
February 18 (M)	The role of enzymes in nutrition ( <b>Dr. Shawn Archibeque, Animal Science</b> )

February 20 (W)	Foraging strategies and comparative anatomy
February 22 (F)	Classification of large herbivores <b>Assignment Due: Read Bell (1971) (available on RamCT)</b> <ul style="list-style-type: none"> <li>• <b>write a 1-page summary (due at the beginning of class)</b></li> </ul>
February 25 (M)	Nutrients, metabolism and digestibility
February 27 (W)	Review for Exam I
March 1 (F)	<b>Exam I</b>
March 4 (M)	Plant chemistry and defense; quality and anti-quality components
March 6 (W)	Forage characteristics / controls on intake
March 8 (F)	Go over Exam 1
March 11 (M)	Energy balance and animal production <b>Assignment Due: Read Gordon and Illius (1996) (Available on RamCT)</b> <b>NO summary required for this one, just read it and be ready to discuss</b> <b>JORDAN</b>
March 13 (W)	Diet selection – BEHAVE PRINCIPLES
March 15 (F)	Learning, post-ingestive feedbacks – BEHAVE PRINCIPLES <b>JORDAN</b>
March 18 (M)	NO CLASS – SPRING RECESS
March 20 (W)	NO CLASS – SPRING RECESS
March 22 (F)	NO CLASS – SPRING RECESS
March 25 (M)	Palatability, neophobia, preferences and aversion – BEHAVE PRINCIPLES

March 27 (W)	Foraging theory <b>Assignment Due: Read Stuth (1991) – Chapter 3 (Available on RamCT)</b> <b>NO summary required, just read it and be ready to discuss – fair game for exam questions</b>
March 29 (F)	Foraging theory
April 1 (M)	Foraging theory (Heads up: Start reading all 3 articles due 4/11)
April 3 (W)	Plant growth and response to herbivory
April 5 (F)	Community dynamics and herbivory (Heads up: Continue reading all 3 articles due 4/11)
April 8 (M)	Review for Exam II
April 10 (W)	<b>Exam II</b>
April 12 (F)	Planning and grazing management (Heads up: Continue reading all 3 articles due 4/11)
April 15 (M)	Planning and grazing management
April 17 (W)	(Go over Exam II?) Grazing systems / strategies <b>Assignment Due: <u>Read all 3</u> of the following articles (Available on RamCT)</b> <b>Briske et al. (2008)</b> <b>Laca (2009)</b> <b>Briske et al. (2011)</b> <ul style="list-style-type: none"> <li>• <b>write a 1-page summary for only one of these, your choice which one (due at the beginning of class). Read all 3, but you only need to write a review for 1.</b></li> </ul>
April 19 (F)	Grazing systems / strategies
April 22 (M)	Grazing systems / strategies
April 24 (W)	Vegetation and grazing management tools
April 26 (F)	Vegetation and grazing management tools

April 29 (M)	Vegetation and grazing management tools <b>Assignment Due: <u>Written Grazing Management Plan or Critique</u></b>
May 1 (W)	RS 452 Student Presentations <i>Group Members: TBD</i>
May 3 (F)	RS 452 Student Presentations <i>Group Members: TBD</i>
May 6 (M)	RS 452 Student Presentations <i>Group Members: TBD</i>
May 8 (W)	RS 452 Student Presentations <i>Group Members: TBD</i>
May 10 (F)	Last Day of Classes – Items to review for final; Course surveys
<b>May 13 – 17 Finals</b>	<b>RS 452 Final Exam, Thursday May 16, 4:10 – 6:10 p.m.</b>

**Assignments**

**Article summaries:** Students will be expected to complete 4, 1-page written summaries of selected assigned readings (120 points total). The 1-page summaries of assigned readings must include:

1. A summary of the main points of the reading (75%)
2. The student’s impressions of / opinions about the article (25%)
3. The following statement (CSU Honor Pledge) followed by the student’s signature  
*I pledge on my honor that I have not received or given any unauthorized assistance in this assignment. student’s signature*

**Grazing management plan:** (150 points) Teams of 3-5 students will be expected to develop or critique a livestock grazing management plan. A written plan or written critique of an existing plan (100 points) will be summarized by a class presentation/discussion (50 points; 10-15 minutes per student) summarizing the plan or critique.

**Basis for Final Course Grade**

Assessment	Points
Exam 1	100
Exam 2	100
Written article summaries (4 @ 30 pts. ea.)	120
Written grazing management plan or critique	100
Presentation on grazing management plan or critique	50
Comprehensive final exam	150
	620

Grading will be based on the percentage of total points above earned by each student and on a straight scale of ≥90%=A, 80-89%=B, 70-79%=C, 60-69%=D, <60%=F. The ‘+’ and ‘-’ system will not be used in grading.

## **Course Policies**

### **Late Work Policy:**

Students are expected to complete all assignments according to the instructions and deadlines provided with those assignments and in this syllabus. Assignments turned in late will be assessed a penalty: half of a letter grade if it is one day late, or a full letter grade for 2-7 days late. Assignments will not be accepted if overdue by more than seven days.

### **Extra Credit Policy:**

Extra credit questions may appear on the exams. Aside from that, no extra credit is available.

### **Grades of "Incomplete"**

Per university policy, an instructor may assign temporary grade of Incomplete to a student who demonstrates that he or she could not complete the requirements of the course due to circumstances beyond the student's control and not reasonably foreseeable. A student must be passing a course at the time that an Incomplete is requested unless the instructor determines that there are extenuating circumstances to assign an Incomplete to a student who is not passing the course. When an instructor assigns an Incomplete, he or she shall specify in writing using the Department Incomplete Grade Form the requirements the student shall fulfill to complete the course as well as the reasons for granting an Incomplete when the student is not passing the course. The instructor shall retain a copy of this statement in his or her grade records and provide copies to the student and the department head or his or her designee. (Section I.6 of the *Academic Faculty and Administrative Professional Manual*)

### **Disability Access**

Colorado State University is committed to providing reasonable accommodations for all persons with disabilities. Students with disabilities who need accommodations must first contact Resources for Disabled Students before requesting accommodations from the professor. Resources for Disabled Students (RDS; <http://rds.colostate.edu/home>) is located in room 100 of the General Services Building. Their phone is (970) 491-6385 (V/TDD). Students who need accommodations in this course must contact the professor at the beginning of the semester to discuss needed accommodations.

### **Attendance Policy**

*Students are expected to attend all scheduled lectures and exams. Class performance is highly correlated with attendance. Assignments will be announced in class. In general, exams and assignments cannot be made up if missed. Accommodations will be made for students with a University excused absence and those participating in University-sanctioned extracurricular/co-curricular activities. Students must inform their instructors prior to the anticipated absence and take the initiative to make up missed work in a timely fashion. For the purposes of this regulation, University-sanctioned activities include competitions, events and professional meetings in which students are officially representing the institution. Appropriate sanctioned activities include:*

- a. Intercollegiate athletics;*
- b. Collegiate club sports and competitions;*
- c. Conferences and workshops recognized by the University not related to academics;*
- d. Commitments on behalf of the University (ASCSU, band, etc.); and*
- e. Professional activities recognized by the University related to academics.*

*Department heads or their designated representatives must approve sanctioned professional and departmental activities. Other sanctioned activities must be approved by the appropriate program director on record with the Division of Student Affairs offices or the Department of Athletics.*

### **Religious Accommodation**

Participation in official University activities, e.g., an out-of-town athletic event, or special religious observances may provide a legitimate reason for an excused absence. The student is responsible for discussing this with the instructor at the beginning of the semester.

### **Final Exam Policy**

Final examination week is part of the regular semester. Student attendance shall be consistent with University policy.

If a student has three or more final examinations (not classes) scheduled for the same day or if conflicts of examination times occur, the student may negotiate a time change with the instructors involved. If the parties involved cannot find a mutually agreeable time, the Registrar's Office indicates which courses must be changed. **Note:** The Registrar's Office must be notified at least one week prior to Final Examination Week to allow instructors time to make appropriate accommodations. It is the student's responsibility to initiate negotiations.

Any student who has a conflict with the examination schedule must inform the instructor as soon as possible before the examination. If an agreement cannot be reached between the instructor and student as to the appropriateness of a make-up examination the student should appeal to the department head.

<http://www.registrar.colostate.edu/final-exams>

### **Professionalism Policy**

Per university policy and classroom etiquette; mobile phones, iPods, etc. must be silenced during all classroom and lab lectures. Those not heeding this rule will be asked to leave the classroom/lab immediately so as to not disrupt the learning environment. Please arrive on time for all class meetings. Students who habitually disturb the class by talking, arriving late, etc., and have been warned may suffer a reduction in their final class grade.

Students are expected to conduct themselves in a professional manner at all times in this course and on all work completed for the course. The use of offensive language, images or actions will not be tolerated. The instructor expects all students to help maintain an inclusive educational environment in which all members of the class (students and instructor) respect one another.

### **Academic Integrity**

The Department of Forest and Rangeland Stewardship takes academic integrity seriously. At minimum, academic integrity means that no one will use another's work as their own. The CSU writing center defines plagiarism this way:

Plagiarism is the unauthorized or unacknowledged use of another person's academic or scholarly work. Done on purpose, it is cheating. Done accidentally, it is no less serious.

Regardless of how it occurs, plagiarism is a theft of intellectual property and a violation of an ironclad rule demanding "credit be given where credit is due."

Source: (Writing Guides: Understanding Plagiarism.

<http://writing.colostate.edu/guides/guide.cfm?guideid=17>)

If you plagiarize in your work you could lose credit for the plagiarized work, fail the assignment, or fail the course. Each instance of plagiarism, classroom cheating, and other types of academic dishonesty will be addressed according to the principles published in the CSU General Catalog (under "Academic Integrity/Misconduct: <http://catalog.colostate.edu/general-catalog/policies/students-responsibilities/> .)

Of course, academic integrity means more than just avoiding plagiarism. It also involves doing your own reading and studying. It includes regular class attendance, careful consideration of all class materials, and engagement with the class and your fellow students. Academic integrity lies at the core of our common goal: to create an intellectually honest and rigorous community. Because academic integrity, and the personal and social integrity of which academic integrity is an integral part, is so central to our mission as students, teachers, scholars, and citizens, we will ask to you sign the CSU Honor Pledge as part of completing all of our major assignments. While you will not be required to sign

the honor pledge, we will ask each of you to write and sign the following statement on your papers and exams:

**"I have not given, received, or used any unauthorized assistance."**

### **Title IX Information**

CSU's Student Sexual Harassment and Violence policy, following national guidance from the Office of Civil Rights, requires that faculty follow CSU policy as a "mandatory reporter" of any personal disclosure of sexual harassment, abuse, and/or violence related experiences or incidents shared with the faculty member in person, via email, and/or in classroom papers or homework exercises. These disclosures include but are not limited to reports of personal relational abuse, relational/domestic violence, and stalking. While faculty are often able to help students locate appropriate channels of assistance on campus (e.g., see the CSU Health Network link below), disclosure by the student to the faculty member requires that the faculty member inform appropriate CSU channels to help ensure that the student's safety and welfare is being addressed, even if the student requests that the disclosure not be shared.

For counseling support and assistance, please see the CSU Health Network, which includes a variety of counseling services that can be accessed at: <http://www.health.colostate.edu/>. And, the Sexual Assault Victim Assistance Team is a confidential resource for students that does not have a reporting requirement and that can be of great help to students who have experienced sexual assault. The web address is <http://www.wgac.colostate.edu/need-help-support>.

Source: <http://oeo.colostate.edu/title-ix-sexual-assault>

### **Non-Discrimination Statement**

Colorado State University does not discriminate on the basis of race, age, creed, color, religion, national origin or ancestry, sex, gender, disability, veteran status, genetic information, sexual orientation, gender identity or expression, or pregnancy. The University complies with the Civil Rights Act of 1964, as amended, related Executive Orders 11246 and 11375, Title IX of the Education Amendments Act of 1972, Sections 503 and 504 of the Rehabilitation Act of 1973, Section 402 of the Vietnam Era Veterans' Readjustment Assistance Act of 1974, as amended, the Age Discrimination in Employment Act of 1967, as amended, The Pregnancy Discrimination Act of 1978, Americans with Disabilities Act of 1990, the Civil Rights Act of 1991, the ADA Amendments Act of 2008, the Genetic Information Nondiscrimination Act of 2008, and all civil rights laws of the State of Colorado.

Accordingly, equal opportunity of employment and admission shall be extended to all persons. The University shall promote equal opportunity and treatment in employment through a positive and continuing affirmative action program for ethnic minorities, women, persons with disabilities, and veterans. The Office of Equal Opportunity is located in 101 Student Services. Source:

<http://oeo.colostate.edu/non-discrimination-statement>

### **Land Acknowledgement Statement**

*Colorado State University acknowledges, with respect, that the land we are on today is the traditional and ancestral homelands of the Arapaho, Cheyenne, and Ute Nations and peoples. This was also a site of trade, gathering, and healing for numerous other Native tribes. We recognize the Indigenous peoples as original stewards of this land and all the relatives within it. As these words of acknowledgment are spoken and heard, the ties Nations have to their traditional homelands are renewed and reaffirmed.*

*CSU is founded as a land grant institution, and we accept that our mission must encompass access to education and inclusion. And, significantly, that our founding came at a dire cost to Native Nations and peoples whose land this university was built upon. This acknowledgment is the education and inclusion we must practice in recognizing our institutional history, responsibility, and commitment.*