

BI 270
Managing Rangeland Ecosystems
3 Credits

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Managing Rangeland Ecosystems

Calendar Description

A study of rangeland ecology, this course focuses on soil-plant-animal-water interactions in rangeland ecosystems. Basic factors determining survival and the competitive strategy of range plants are studied in detail. Sound range management strategies designed to ensure ecosystem stability and sustainability are emphasized. Considerable time is spent in lab learning to key and identify native plants.

Rationale

This is a required course for students enrolled in the Environmental Conservation and Reclamation major, the Conservation and Restoration Ecology major and the Applied Environmental Sciences major of the Environmental Sciences Diploma. Rangelands are an important global resource and occupy a large area of Western Canada. Historically, rangelands have provided natural resources such as wood products, water, and wildlife. In addition, the livestock industry continues to depend on rangelands, especially the grassland types, as a major forage source for livestock. The increasing importance of grasslands to society and global biodiversity, as well as the increasing pressure from urbanization, for industry for oil and gas, forest, and clean energy products, has produced an associative increase in the demand for range ecology expertise. Effective rangeland managers and environmental consultants must have a broad understanding of ecology and the processes that interact in rangeland ecosystems. This includes a sound knowledge of interactions among plants, soils, grazing animals, environmental factors and herbivore behavior. Understanding agricultural practises is an asset for integrating other land uses with this traditional land use. Plant identification is also a critical component in the management, reclamation and restoration of rangelands. This knowledge base is critical for assessing range health, performing detailed site assessments, and applying criteria. Such knowledge is fundamental to management that sustains or restores the integrity and quality of rangeland and associated resources.

Prerequisites

BO 120

Co-Requisites

None

Course Learning Outcomes

Upon successful completion of this course, students will be able to

1. identify common native range species, and demonstrate knowledge regarding their provincial classification, habitat and distribution, forage value, grazing response, and potential for reclamation/restoration use.
2. identify invasive, non-native plants and recognize their threat to native species and community dynamics.
3. demonstrate use of a taxonomic guide to identify grass species.
4. describe the major range zones in Alberta and Saskatchewan on the basis of soil, climate and vegetation, and identify the native flora associated with each community.
5. discuss the basic physiology and morphology of range plants, how growth occurs, how plants respond to animal use and how management can benefit or harm plants.
6. describe survival techniques and competitive strategies of rangeland plants in response to the environment, stress, disturbance and grazing.
7. describe grazing behavior of herbivores and manipulation of grazing behavior via management.
8. perform simple resource inventory techniques and choose the correct methodology for the range type and desired community attribute.
9. describe and discuss current rangeland succession theories.
10. apply ecological range succession theories to range condition and health assessment procedures.
11. demonstrate understanding of range management principles and practices used to manage rangelands by applying these to case studies.
12. apply knowledge to range health assessments, detailed site assessments, and criteria application for restoration.

Essential Employability Skills

Essential employability skills are critical for workplace success and lifelong learning. Lakeland College prepares its graduates for the workplace and lifelong learning by integrating and promoting essential employability skills development in its curricula. Each credit course offered at Lakeland College emphasizes one or more of the following five essential employability skills:

- A. **Communication Skills** that enable individuals to listen, interpret, express, and convey knowledge and ideas so that they are received and understood.
- B. **Teamwork Skills** that enable individuals to respect the thoughts and opinions of others as they work together to plan activities, meet deadlines, complete projects, and contribute to an organization's goals.
- C. **Critical Thinking Skills** that enable individuals to conceptualize and analyze issues from various perspectives while rationally evaluating the strengths and limitations of each perspective and deciding what action to take.
- D. **Adaptability Skills** that enable individuals to respond quickly, willingly, and positively to new conditions and changing times.

- E. **Positive Attitude and Behavioural Skills** that enable individuals to be confident about themselves and to deal with people, problems, and situations with honesty, integrity, and personal ethics.

Please refer to the Knowledge/Skills Matrix of this course outline to review the essential employability skills emphasized in this course.

Resource Materials

Required Textbook:

Adams, B.W., G. Ehlert, C. Stone, M. Alexander, D. Sawrence, M. Willoughby, D. Moisey, C. Hincz, and A. Burkinshaw. 2009. Range health assessment for grassland, forest and tame pasture. Public Lands and Forests Division, Alberta Sustainable Resource Development. Pub. No. T/044.

Bailey, A.W., D. McCartney, and M.P. Schellenberg. 2010. Management of Canadian Prairie Rangelands. Agriculture and Agrifood Canada.

(PLEASE note: The reference is required if it is available in the bookstore only).

Tannis, K. 2003. Common plants of the western rangelands. 2nd ed. Vol 1: Grasses and Grass-like species. Olds College, Olds, AB. Alberta Agriculture, Food and Rural Development, Edmonton, AB.

Articles as requested: Journal of Range Management/Rangelands.

Found in the library on the periodical shelf for the last five years or found on the University of Arizona website.

Web searches as requested.

Fact sheets as provided by the instructor.

Highly Recommended but Optional:

Tannis, K. 2003. Common plants of the western rangelands. 2nd ed. Vol 3: Forbs. Olds College, Olds, AB. Alberta Agriculture, Food and Rural Development, Edmonton, AB.

Hand lens: A hand lens for identification of grasses is highly encouraged.

The lenses are available at the bookstore.

Reference Materials:

Adams, B., and Fitch, L. 1998. Caring for the green zone. Riparian areas and grazing management. 2nd ed. Cows and Fish and Partners.

Heady, H.F., and R.D. Child. 1994. Range ecology and management. Westview Press, Colorado.

Johnson, D., L. Kershaw, A. MacKinnon, and J. Pojar. 2009. Plants of the

Western Boreal Forest and Aspen Parkland. Lone Pine and Canadian Forest

Service, Edmonton, AB.

Holechek, J.L., R.D. Pieper, and C.H. Herbel. 2011. Range management principles and practices.

6th ed. Prentice Hall, New Jersey.

Moss, E.H. 1983. Flora of Alberta. 2nd ed. University of Toronto Press, Toronto.

Stone, C., and D. Lawrence. 2000. Northern range plants. Alberta Agriculture, Food and Rural

Development, Edmonton, Alberta.

Tannis, K. 2003. Common plants of the western rangelands. 2nd ed. Vol 2: Trees and shrubs.

Olds College, Olds, AB. Alberta Agriculture, Food and Rural Development, Edmonton, AB.

Conduct of Course

This 70-hour course consists of 42 hours lecture and 28 hours of lab work. The instructor will discuss this time allocation as it relates to your timetable and expected hours of homework.

The lecture component is a formalized lecture situation where student questions and participation are encouraged to clarify subject areas. Lecture content may be supported by required readings and assignments. Lectures support the lab by explaining methods and providing background information. The lab component focuses heavily on range keying and spot identification of native plants, especially the grasses. If time permits, the lab also includes practical application of theory discussed in lectures. Formative non-graded exercises are occasionally included which give students a high competence in the course material.

Evaluation Procedures

Midterm and final lecture exams contain short-answer, true/false, multiple choice, matching and discussion questions. Some lab content will be included in the theory exams that pertains to plant species information, diagrams, and calculation and inventory lab materials. Lecture quizzes help students focus on main ideas presented in lecture. Laboratory quizzes reflect laboratory exercises mostly related to plant morphology and plant identification.

The final lab exam involves two parts. The keying exam will be held in the regular lab period, while the plant identification will be held as an evening exam. The date will be given in class. Assignments vary but typically include plant species worksheets, and/or a research report. The final grade is an aggregate of the following components:

Lecture and Laboratory

Midterm Exam	20%
Final Exam	25%
Quizzes	5%
Spot ID/Keying exam	30%
Assignment(s)	<u>20%</u>
TOTAL	100%

Note the following requirements in regards to the evaluation and completion of the course.

- Labs are **mandatory** to obtain credit for lab assignments and quizzes related to those labs, while lectures must be attended to complete a quiz during lecture period.
- Credit for this course requires that the assignments must be completed and handed in or an incomplete or a failing grade will be given.
- Late reports, worksheets and assignments are assigned a zero.
- Cheating and plagiarism of any kind, including copying others assignments, reports, lab work, or using another person's ideas for your own are not tolerated. At the very least, a mark of zero is assigned to any assignment or test where this occurs or the student may receive a zero for the whole course.
- **Students who miss lab, excused or unexcused, will be required to complete the lab activity in another lab group or on their own time. In addition, a student may be required to complete another assignment in lieu of the missed lab.**

All reports, assignments and exams are graded on a percentage (%) basis. Then, a total course percentage is calculated using the above weighting values. Finally, the total course percentage is converted to a letter grade basis on the grade scheme below.

Knowledge/Skills Matrix

Students apply and demonstrate their knowledge and skills to use

A. Communication Skills

A1. by listening, reading, interpreting information, and communicating effectively
Evaluation(s)/Goal(s): Midterm and Final exam/Goal 1, 4, 5, 6, 7, 8, 9, 10, 11; Assignment 1/ Goal 1, 2; Assignment 2/Goal 4, 5, 6, 7, 9, 10, 11, 12
A2. by using written, spoken, and/or visual formats and media to communicate and meet needs of each particular audience
Evaluation(s)/Goal(s): Assignment 2/ Goal 4, 5, 6, 7, 9, 10, 11
A3. by using libraries, internet, technical publications, journals and other sources to find pertinent information
Evaluation(s)/Goal(s): Assignment 1/ Goal 1, 2; Assignment 2/Goal 4, 5, 6, 7, 9, 10, 11

B. Teamwork Skills

B1. by using interpersonal skills to create an atmosphere that maximizes the strengths of group members to accomplish tasks
Evaluation(s)/Goal(s): NA

B2. by using interpersonal skills to resolve conflict, relate to others, and assist others
Evaluation(s)/Goal(s): NA
B3. by contributing and listening to others as group determines realistic objectives, prioritizes tasks, and identifies resources and timelines
Evaluation(s)/Goal(s): NA
B4. by treating other members of the group open-mindedly and fairly
Evaluation(s)/Goal(s): NA
B5. by developing tactics/strategies to accomplish tasks
Evaluation(s)/Goal(s): Spot ID/Keying exams and quizzes/ Goal 1, 2, 3

C. Critical Thinking Skills

C1. by seeing critical thinking as a lifelong process of self assessment
Evaluation(s)/Goal(s): Midterm and Final exam/Goal 1, 4, 5, 6, 7, 8, 9, 10, 11; Assignment 2/Goal 4, 5, 6, 7, 9, 10, 11, 12
C2. by examining problems closely
Evaluation(s)/Goal(s): Final exam/Goal 1, 4, 5, 6, 7, 8, 9, 10, 11, 12
C3. by examining beliefs, assumptions, and opinions, and weigh them against the facts
Evaluation(s)/Goal(s): NA
C4. by seeking out the truth
Evaluation(s)/Goal(s): NA
C5. by finding solutions; make decisions
Evaluation(s)/Goal(s): Final exam/Goal 1, 4, 5, 6, 7, 8, 9, 10, 11, 12; Keying exam/ Goal 3
C6. by incorporating new ideas that may not necessarily agree with previous thought on the topic
Evaluation(s)/Goal(s): Assignment 2/Goal 4, 5, 6, 7, 9, 10, 11, 12
C7. by seeing connections between topics and use knowledge from other disciplines to enhance reading and learning experiences
Evaluation(s)/Goal(s): Assignment 2/Goal 4, 5, 6, 7, 9, 10, 11, 12

D. Adaptability Skills

D1. by working independently or as part of team
Evaluation(s)/Goal(s): Spot ID/Keying exams and quizzes/ Goal 1, 2, 3
D2. by carrying out multiple tasks or projects
Evaluation(s)/Goal(s): Assignment 1/ Goal 1, 2; Assignment 2/Goal 4, 5, 6, 7, 9, 10, 11, 12
D3. by being innovative and resourceful: identify and suggest alternative ways to get the job done
Evaluation(s)/Goal(s): Assignment 1/ Goal 1, 2; Assignment 2/Goal 4, 5, 6, 7, 9, 10, 11, 12
D4. by being open and respond constructively to change and uncertainty
Evaluation(s)/Goal(s): NA

E. Positive Attitude and Behavioural Skills

E1. by dealing with people, problems, and situations with honesty, integrity, and personal ethics
Evaluation(s)/Goal(s): NA
E2. by showing interest, initiative, and effort
Evaluation(s)/Goal(s): Spot ID/Keying exams and quizzes/ Goal 1, 2, 3: Assignment 1/ Goal 1, 2; Assignment 2/Goal 4, 5, 6, 7, 9, 10, 11

E3. by affirming the need for positive solutions and encourage positive interaction and feedback
Evaluation(s)/Goal(s): NA
E4. by balancing personal and family activities with job-related activities
Evaluation(s)/Goal(s): NA

Grade Equivalents and Course Pass Requirements

A minimum grade of D (50%) (1.00) is required to pass this course.

Letter	F	D	D+	C-	C	C+	B-	B	B+	A-	A	A+
Percent Range	0-49	50-52	53-56	57-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-100
Points	0.00	1.00	1.30	1.70	2.00	2.30	2.70	3.00	3.30	3.70	4.00	4.00

Students must maintain a cumulative grade of C (GPA - Grade Point Average of 2.00) in order to qualify to graduate.

Attendance

Classroom and laboratory attendance is considered vital to the learning process and as significant to the students' evaluation as examinations and reports, therefore absenteeism is recorded.

- a. Students having a combination of excused and/or unexcused absence of 20 percent or higher for the scheduled course hours can be required to withdraw and would then automatically receive a "RW" (required withdrawal) for the course, regardless of any other evaluation results. (RW is a failing grade).
- b. An excused absence is one that is verified with your instructor. Verification should be prior to the absence or the next class day following the absence. Verification of the absence may take the form of a note from your doctor/College nurse regarding illness, or a note from another instructor regarding a field trip or other activity, or authorization by your instructor following an in-person meeting. Be sure to contact your instructor and ask what they will require from you as verification of each absence. An unexcused absence is anything NOT verified by the instructor prior to the absence or the next class day following the absence.

NOTE: Any exceptions to the above attendance policy (e.g. timetable conflicts, work-related issues) must be approved in writing by the Department Chair prior to the beginning of the course.

It is the students' responsibility to know their own absentee record.

Normal hours are 8:30 a.m. to 6:30 p.m., with potential for evening courses, exams or extended field trips. Students are expected to be available for classes during these times.

Course Units/Topics

Lectures:

Unit 1 - Rangelands

1. Rangeland definition and importance
2. Rangeland history and use
3. Rangeland types in Alberta and Saskatchewan
4. Status of rangelands, their sustainability, and current use

Unit 2 - Rangeland Ecology and The Relationship to Grazing and Other Disturbances

1. Structure and function of rangeland ecosystems
2. Plant-herbivore relationships
4. Plant succession and disturbance
5. Range health assessments
6. Vegetation assessments for the 2010 Reclamation Criteria (introduction)

Unit 3 - The Range Plant

1. Range plant physiology
 - a. basic concepts
 - b. photosynthesis
 - c. carbohydrates
 - d. carbohydrate cycle
2. Range plant morphology and growth - grasses
 - a. the phytomer, tillers and growth habits
 - b. growth and reproduction
 - c. pattern and timing of plant growth and productivity
3. Grazing Resistance
4. Grazing impacts

Unit 4 - Range Management Principles and Practices

1. Range Management
2. Grazing Factors
 - a. timing
 - b. intensity of grazing
 - c. frequency of grazing
3. Management principles and practices
 - a. avoiding grazing during sensitive time periods

- b. providing effective rest
 - c. balancing forage requirements with forage available
 - d. distributing livestock evenly over the range
4. Grazing systems described
 5. Other management techniques (special topics)
 - drought
 - managing problem plants
 - managing woodlands - grazing and controlling, restoring
 - prescribed fire and patch burning
 - riparian zones
 - wildlife management
 - park management
 - restoration

Unit 5 - Ecological Management: Range Inventory and Monitoring

1. Range Inventory and Monitoring
2. Measurable Vegetation Attributes
3. Tools for Ecological Management (with emphasis on restoration/reclamation) activities

Laboratory topics may include any of the following dependent on time:

1. Keying and identifying Poaceae species
2. Keying and identifying Fabaceae species
3. Adaptations, use and value of selected species
4. Forb and woody plant identification
5. Vegetative grass identification
6. Rangeland inventory and methods, and range health assessments
7. Carrying capacity calculations
8. Field Trip (weather and time permitting) (hours are partially included in the above topics)

Note: The order of presentation of the lecture units may change during the semester to account for labs and field condition. Lab content may vary with available material and lab sections.



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