AGR 4231 - Forage Science and Range Management – Spring 2025

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Office Hours: Monday, Wednesday, and Friday: 9:30 - 11:00 a.m. (Drop ins welcome, but if you want to be sure I will be there, schedule in advance)

Class Meeting Times:

Lecture – G001 McCarty Period 2 (8:30 - 9:20) M, W, & F
Lab – 2196 McCarty A – Periods 6-7 (12:50 – 2:45) or 8-9 (3:00 – 4:55) Wednesday

General Course Objectives (see specific learning objectives for each unit):

1. Students will be able to define an ecosystem, describe the components of an ecosystem and the concept of an ecosystem service, and give examples of each of the four main categories of ecosystem services provided by grassland agriculture to society.

2. Students will be able to describe the most important factors determining the production potential and production limits of animals grazing rangeland and planted pastures in Florida.

3. Students will be able to name and identify the principal forage legumes and grasses grown in Florida, describe their regions of adaptation and their role in forage-livestock agroecosystems, and formulate model forage systems for various environments and categories of livestock.

4. Students will be able to integrate the concepts of soil (soil texture, drainage, fertility, and chemistry), plant (anatomy, morphology, and physiology), and animal sciences (nutrition, physiology, and anatomy) to describe the conditions and processes required for successful establishment, management, and utilization of forage crops in sustainable and environmentally sound production systems.

Instructional Approach:

Dr. Sollenberger will present nearly all lectures and laboratories. He will be assisted by M.S. candidate Mr. Renan Becker (renanpedrobecker@ufl.edu) who will work primarily with the lab portion of the course and will be available to meet with individuals or groups of students at the greenhouse to assist with plant identification. Dr. Sollenberger will hold office hours most days after lectures (9:30-11:00) and is happy to meet with you by appointment at other times of mutual convenience. He can be reached by email (preferred) or text (352-213-1251) if questions arise.

Students are encouraged to contact the instructor about issues that are impacting your performance in the course. If you are having problems with the course content, personal problems that are interfering with your success in the course, or need assistance in any way, don't wait until late in the semester to establish contact with the instructor. The sooner we begin to address the problem, the more likely a satisfactory outcome can be achieved.

Lectures will focus on concepts in soil, plant, and animal sciences. Most management details for particular forage species will be provided in the laboratory portion of the class. Students are responsible for all material covered in lecture and laboratory sessions. There will be no make-up exams or quizzes without authorized justification of your absence from class. **I do not provide extra credit options in this class**.

Lecture quizzes and exams (except for the third unit exam which will occur in the lab period) will be given during lecture periods as scheduled in your syllabus. Exams will cover material covered in the preceding one-third of the course. Three quizzes will cover lecture material since the last exam (Quizzes 2 and 3) or since the beginning of the semester (Quiz 1). Two laboratory quizzes are scheduled, and a comprehensive plant identification final will be given.

Laptops and Cell Phones:

Instructor experience confirms that active use of laptops and tablets in the classroom often creates distractions and detracts from the learning experience, so **no laptops or tablets may be used in lecture or lab** unless you have received prior approval by the instructor. Cell phones should be silenced and not in use during class except for iClicker exercises.

Grading:

There are a total of 650 points for the class. The first two **lecture unit exams** count 100 points each, and the third unit exam counts 125 points. The total point value of the three **lecture quizzes** is 75 (25 each). The two **laboratory quizzes** contribute 50 points (25 points each). **Laboratory summaries** are worth a total of 25 points (five points each, for five summaries). The laboratory summaries are written responses to questions that will serve as the basis for introductions to lab content during six weeks of the semester (Labs 3-6, 8, and 9). Each student may choose which five laboratory summaries to submit. Summaries are due one week after the discussion in lab. They should be submitted using Canvas (the target length is no more than 1 page, double spaced, 12-point font). These guidelines are simply to help you gauge the appropriate length of a summary because when you cut and paste them into Canvas, it will not maintain your formatting. That is OK. The **sustainability review** is worth 15 points and is your response to one out of the four sustainability review exercises you can view via recordings on Canvas (associated with Laboratories 3, 4, 6, and 9). You also will be given reading material about each sustainability topic. The sustainability review should be longer and more in depth than the lab summaries. They should be ~2 pages of 12-point double spaced text, including at least two citations of any supporting references you used to develop your summary. The sustainability review can be submitted via Canvas, and you can choose which one of the four topics you wish to write about. The **laboratory final** will be worth 100 points and will be exclusively plant and seed identification. **NOTE** that a total of 60 points can be obtained through **classroom participation**. At approximately 32 class meetings (unannounced) throughout the semester, two points will be awarded for your attendance. You are allowed two unexcused misses without penalty.

Lab quizzes and the lab final will be graded by the course TA. Lecture exams and quizzes, laboratory summaries, and the sustainability review will be graded by Dr. Sollenberger. All graded items will be returned to students within one week of their submission date and often sooner. Grades will also be posted on Canvas.

Item	Points
First exam	100
Second exam	100
Third exam	125
Lecture quizzes (3)	75
Lab quizzes (2)	50
Lab summaries (5)	25
Sustainability review	15
Lab final	100
Participation	60
Total	650

Students attaining the following percentages are guaranteed at least these grades. The actual scale used at the end of the semester is often slightly lower than that shown below.

A : 91%	A- : 89%	B^+ : 87%	B : 84%	B- : 82%	C^+ : 79%
C : 77%	C- : 75%	D^+ - 72%	D : 69%	D- : 67%	E : < 67%

Required Handout Packets (Available at the Campus Bookstore in the Reitz Union)

Lecture outlines - $20.50; Lab outlines - $13
Laboratory notebook

Make-up Exams/Quizzes:

Make-ups can be scheduled in the case of illness and conflicting academic/professional activities. The instructor should be notified well in advance for academic/professional conflicts, and prior to the start of the class for illness. The instructor reserves the right to require documentation of the reason for the absence.

Grades and Grade Points:

For information on current UF policies for assigning grade points, see
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Online Course Evaluation Process:

"Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens. Evaluations can be completed using the email information they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/."

In-Class Recording:

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited.

Specifically, students may not publish recorded lectures without the written consent of the instructor. A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform,

including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

Academic Honesty:

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity." You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment."

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code

Use of Library, Personal References, PC Programs, and Electronic Data Bases:

These items are university property and should be utilized with other users in mind. Never remove, mark, modify nor deface resources that do not belong to you. If you're in the habit of underlining text, do it only on your personal copy. It is inconsiderate, costly to others, and dishonest to use common references otherwise.

Software Use:

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Campus Helping Resources:

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, www.counseling.ufl.edu/cwc/
- Counseling Services
- Groups and Workshops
- Outreach and Consultation
- Self-Help Library
- Wellness Coaching

Career Resource Center, First Floor JWRU, 392-1601, www.crc.ufl.edu/

U Matter, We Care

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Services for Students with Disabilities:

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation

0001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc/

Student Complaint Process:

https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf

AGR 4231 - Forage Science and Range Management
Lecture Schedule (Mon., Wed., and Fri., Period 2)

Date	Topic
Jan. 13	Course outline and introduction
Jan. 15	Grassland-livestock ecosystems and ecosystem services
Jan. 17	Contribution of grasslands to agriculture, society, and the environment
Jan. 20	**No class - Martin Luther King Day**
Jan. 22	Potential and limitations of Florida grassland-livestock systems
Jan. 24	Forage plant growth and development
Jan. 27	Forage plant growth and development (continued)
Jan. 29	**Quiz 1**; Nitrogen fixation and legume inoculation
Jan. 31	Environmental factors affecting forage production
Feb. 03	Environmental factors affecting forage production (continued)
Feb 05	Soil characteristics and plant nutrient requirements
Feb. 07	Soil characteristics and plant nutrient requirements (continued)
Feb. 10	Principles of liming
Feb. 12	Principles of fertilization
Feb. 14	Soil testing to guide pasture fertilization practices
Feb. 17	**First lecture exam (Covers lectures 1-11)**
Feb. 19	Forage quality and forage testing
Feb. 21	Forage quality and forage testing (continued)
Feb. 24	Florida rangeland: Characteristics and contributions
Feb. 26	**Quiz 2;** Florida rangeland: Management for cattle production
Feb. 28	Development and distribution of new forages
Mar. 03	Pasture establishment: Site selection and seedbed preparation
Mar 05	Pasture establishment: Seeding and vegetative planting into prepared seedbeds
Mar. 07	Pasture establishment: Seeding and vegetative planting into prepared seedbeds
Mar. 10	Pasture establishment: Sod or no-till seeding of grasses and legumes
Mar. 12	Principles of weed control in forage crop systems
Mar. 14	Insect pests and their control in forage crop systems

Monday, March 17 through Friday, March 21 - Spring Break

Mar. 24	Fitting forages to the cow/calf system in North Florida
Mar. 26	Fitting forages to the cow/calf system in North Florida (cont.)
Mar. 28	**Second lecture exam (Covers lectures 12-20)**
Mar. 31	Fitting forages to the cow/calf system in South Florida
Apr. 02	Fitting forages to dairy systems in Florida
Apr. 04	Fitting forages to equine systems in Florida
Apr. 07	Effects of grazing on forage plants
Apr. 09	**Quiz 3;** Effects of grazing on forage plants (continued); Principles of grazing management
Apr. 11	Principles of grazing management (continued)
Apr. 14	Principles of hay production
Apr. 16	Principles of hay production (continued); Principles of silage and haylage production
Apr. 18	Principles of silage and haylage production (continued)
Apr. 21	Supplementation of livestock grazing Florida pastures
Apr. 23	**No lecture - NOTE: Third Unit Exam given in afternoon lab period (Lecture 21-29; Labs 10, 12, and 13)**

4231C - Forage Science and Range Management

Laboratory Schedule

Lab Number	Date	Topic
1	January 15	Forage plant morphology
2	January 22	Discussion 1: Relationships of morphology with plant competitiveness and persistence; importance of N fixation
3	January 29	Warm-season grasses used for forage in Florida (Sustainability Review 1 – Greenhouse gas emissions)
4	February 05	Other warm-season grasses and pasture weeds (Sustainability Review 2 – Soil carbon sequestration and soil quality)
5	**February 12**	**Lab Quiz 1**; Cool-season grasses
6	February 19	Cool-season legumes (Sustainability Review 3 – Wildlife habitat and pollinators)
7	February 26	Forage Evaluation Laboratory (**2088 McCarty B**)
8	**March 05**	**Lab Quiz 2; Range Grasses**
9	March 12	Warm-season and tropical legumes (Sustainability Review 4 – Soil erosion, water runoff, and water quality)
	March 19	**Spring Break**
10	March 26	Discussion 2: Developing year-round forage systems adapted to various Florida environments
11	**April 02**	**Lab ID Final**
12	April 09	Toxic plants and disorders of cattle on pasture (Word document provided on Canvas; Powerpoint provided on Canvas)
13	April 16	Discussion 3: Persistence and growth responses of different types of forages following defoliation
14	**April 23**	**Third Unit Exam (Covers lectures 21-29 and Labs 10, 12, and 13; given in lab period; no lecture class this day)**

Lecture Units and Unit Learning Objectives

MATERIAL FOR EXAM 1

Unit 1 - Introduction to Forage and Grassland Agroecosystems (Lectures 1 - 4)

1. Learn the definitions of forage terms to provide the needed foundation for understanding course content
2. Be able to describe the major contributions of forages to agriculture, society, and the ecosystem
3. Understand the relative importance of forages in the diets of different classes of livestock
4. Be able to define ecosystem and to identify the key components of a grassland-livestock ecosystem.
5. Understand the most important interactions among the components of a grassland-livestock ecosystem and how management activities affect these interactions
6. Be able to define ecosystem services
7. Know the categories of ecosystem services and an example of each
8. Know how preserving grassland ecosystems will help preserve the environment and contribute to the wellbeing of humans by providing ecosystem services
9. Be able to describe the general characteristics of the beef, dairy, and equine industries in Florida and the forage systems on which they are based
10. Know the favorable and unfavorable characteristics of Florida's environment (weather, soils, pests, and human population) that influence forage production

Unit 2 - Plant Processes and Plant Responses to the Environment (Lectures 5 - 7)

1. Be able to start with a seed or a vegetative plant part of a grass or legume and describe the process of germination and subsequent plant growth
2. Understand photosynthesis in terms of the two phases in the process
3. Know the two major carbon fixation pathways for forage plants
4. Learn the general categories of plants which are C_3s and C_4s
5. Understand the major differences between C_3 and C_4 plants (anatomically and physiologically) and how these differences affect plant productivity, nutritive value, and competitiveness
6. Know how plants prioritize energy for growth and storage
7. Understand where nitrogen exists in the environment and why it is in short supply to plants
8. Know the bacteria that can fix atmospheric nitrogen, their relationship with plants, and the process involved in nitrogen fixation
9. Have a general idea of how much nitrogen legumes fix in a year and the factors that affect the amount fixed
10. Know what is meant by inoculation and how it happens
11. Understand how water stress affects forage plant photosynthesis, growth, morphology, and nutritive value
12. Know the effects of temperature on plant growth, chemical composition, and nutritive value
13. Know the effects of light on plant growth and nutritive value

Unit 3 - Soil Characteristics, Soil Testing, and Fertilization (Lectures 8 - 11)

1. Know the components of soil and what they contribute to plants
2. Understand the factors that influence the ability of a soil to provide and store nutrients
3. Be able to describe Liebig's Law of the Minimum
4. Understand the mechanisms whereby plants take up nutrients from the soil
5. Integrate your understanding of the properties of major nutrients in soils, plant requirements for nutrients, and characteristics of Florida's soils so that you can propose a rational approach to forage fertilization

6. Understand the effect of soil pH on plants
7. Know the factors that affect liming rate
8. Understand the factors that determine if fertilizer is needed, how much, and what type
9. Be able to read a fertilizer label and determine the most economical source of nutrients
10. Know why and how to soil test
11. Know the limitations of soil tests and the possible conflicts of interest of testing labs

MATERIAL FOR EXAM 2

Unit 4 – Digestive Anatomy and Processes, Forage Quality, and Forage Analyses (Lecture 12)

1. Be able to describe the important digestion-related processes that go on in the rumen
2. Understand the differences between equine and ruminant digestive processes in terms of the major location of fermentation and digestion
3. Be able to define forage quality
4 Learn the primary laboratory assays used to estimate forage quality, how they are done, and how the results should be interpreted
5. Understand what factors affect forage quality and the general nature of that effect (positive, negative, none)

Unit 5 - Characteristics and Management of Native Rangeland (Lectures 13 - 14)

1. Know the general characteristics of rangelands?
2. Know the specific range **type** that is most common in Florida?
3. Be able to describe characteristics and uses of different Florida range **sites** that occur within the longleaf-slash pine-wiregrass range **type**.
4. From an ecological perspective, be able to explain why rangeland is dominated by grasses and in some cases by specific grasses (e.g., wiregrass).
5. Florida rangeland traditionally has been used for cattle production, but today it makes many different contributions to society. Be able to describe several of these.
6. Understand how native range (both flatwoods and freshwater marsh **sites**) is used today in beef cattle production systems.
7. Compare and contrast the yield and nutritive value of planted pasture and native grasslands.
8. Compare and contrast the characteristics of Florida pasture and native range and the management options that are practical for the two systems.
9. Understand how palmetto control, burning, supplementation, and grazing are used to improve cattle performance on native range.

UNIT 6 - Developing New Pasture Plants and Planting of Pastures (Lectures 15 - 18)

1. Be aware of the relatively limited time span during which forage improvement efforts have been underway in warm climates
2. Know whether most forages in use in Florida were introduced from somewhere else, are native, or are native forages improved by breeding.
3. Understand why persistence is a key objective for a forage breeder and how selection for persistence impacts the rate at which new forage cultivars can be developed
4. Know the factors that affect seed quality
5. Know under what environmental conditions seed should be stored and why
6. Be able to explain what the seed certification process is and why it is needed
7. Be able to describe a rational sequence of questions that ranchers should ask themselves before deciding to plant a pasture on a particular site
8. Be able to name primary and secondary tillage implements and describe what they are used to do

9. Understand the characteristics of a well-prepared seedbed
10. Know what factors affect choice of seeding rate and planting depth
11. Be able to describe, compare, and contrast the various planting methods
12. Know the important steps in the processes of growing and planting vegetative planting material
13. Be able to discuss why these steps are important in terms of plant biology
14. Know the differences between sod seeding and seeding into a prepared seedbed
15. Learn what forages are sod seeded in Florida and when seeding occurs
16. Be able to discuss management practices for sod-seeded pastures that will minimize competition to the developing seedling and maximize likelihood of success

Unit 7 – Common Pests of Florida Pastures & Hayfields and Their Management (Lectures 19 - 20)

1. Understand what a weed is and the impact that weeds have on forage-animal systems
2. Understand the role that people play in the spread of weeds and how to avoid this spread
3. Be able to describe the weed control methods that are used in pastures and hay fields
4. Learn the most important weed species in Florida pastures and hay fields and how they can be controlled
5. Learn the most important insect and related pests and how they affect forages
6. Describe strategies for controlling these pests or for minimizing the damage they cause

MATERIAL FOR EXAM 3

Unit 8 - Forage-Livestock Systems (Lectures 21 - 24)

1. Develop an understanding of climate, soil fertility, and soil drainage characteristics throughout the state of Florida.
2. Be able to match forage species to environmental characteristics, to seasons of the year when the forages grow, and to the requirements of different classes of livestock in beef, dairy and equine systems
3. Know the size of the beef, dairy, and equine industries in Florida and the extent to which they contribute to the state's economy
4. Understand how and why intensively grazed pastures fit into beef, dairy, and equine enterprises
5. Be able to describe why forages have become more important on Florida dairies during the past five years.
6. Understand the relative importance of imported hay, Florida-produced hay, and pasture for horses in Florida

Unit 9 – Grazing Management and Effects of Grazing Animals on Pastures (Lectures 25 - 26)

1. Know how defoliation affects regrowth and longevity of pasture plants.
2. Be aware of the importance of treading on pasture productivity, especially of legumes
3. Be able to discuss the degree to which plant nutrients are removed from pastures in animal products, the degree to which they are returned to the pasture in animal waste, and the factors affecting distribution of nutrients from animal wastes
4. Know pasture management practices that can enhance the efficiency of utilization of nutrients from animal wastes
5. Learn how grazing management is defined and be able to discuss the most important grazing management decisions
6. Know how and why plant growth habit and plant type (grass vs. legume) affect tolerance of grazing
7. Be able to discuss continuous and rotational grazing in terms of what they are, their advantages and disadvantages, and when and for which forages they should be used

Unit 10 - Forage Conservation and Supplementation of Forage Diets (Lectures 27 - 29)

1. Know how hay, silage, and haylage are preserved and their typical moisture concentration
2. Be able to compare the size of dry matter and nutrient losses for hay, silage, and haylage, and know when these losses are most likely to occur
3. Know the implements that are used in hay-making operations and be able to describe the purpose for which they are used
4. Know the stages in the ensiling process
5. Be able to describe the primary silage storage structures and their advantages and disadvantages
6. Know the characteristics of high-quality, well-preserved hay and silage
7. Be able to define supplementation and know several supplement feeds used in Florida
8. Be able to define associative effects and to explain the different types of associative effects
9. Be able to give examples of practical supplementation systems in Florida