

Plant Ecology (PCB3601C) Spring 2016

Lead Instructor:

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Research Interests: Nature conservation; tropical forestry; fire ecology; forest & savanna ecology
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Laboratory Instructors

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Course Website: Go to E-Learning (<http://lss.at.ufl.edu/>) & login to e-learning in Canvas with your Gator Link ID. Reading quizzes must be taken on Canvas BEFORE the class/lab meeting unless otherwise announced during the class. Updates to schedules & supplementary readings will be posted on this website along with copies of other course-related communications sent to you via e-mail. Be sure that you are receiving these messages (several sent even before classes commenced).

Course Description: This course introduces ecology as a scientific discipline with emphasis on Floridian plants & ecosystems. By the end of the course, students should be familiar with ecological principles related to how plant populations & communities interact with their environments at local, regional, & global scales. The labs emphasize the ability to recognize common plants, vegetation types & ecosystems of the region while they introduce students to hypothesis testing and scientific reporting through field experiments, manuscripts and posters, and oral presentations.

Lectures: Mondays & Wednesday, Period 5, 11:45-12:35 in 211 Bartram Hall

Labs: Mondays or Tuesdays (depending on your lab section number), Periods 6-9, 12:50-4:55 PM. 114 Rolf Hall. For field labs specified as Field (van), meet behind Bartram/CARR Hall unless otherwise notified. We will try to return to campus on time, but provisions should be made in case we fail to do so. Weekday field trips depart at 12:50, Saturday trips at 8:30.

NOTE THAT THERE WILL ALSO BE **TWO REQUIRED ALL-DAY SATURDAY FIELD TRIPS** (with optional overnights), one on 30 January & one in mid-March.

Required and Recommended Books, Supplies, and a Tool

REQUIRED: **Plant Ecology Syllabus and Lab Manual** (available at Target Copy on University Avenue for about \$10).

REQUIRED: Gurevitch, Scheiner, and Fox. 2006. **The Ecology of Plants**. 2nd ed. Sinauer Associates, Sunderland, MA. (used copies of this book should be available—order early)

REQUIRED: A bound field notebook specific for this course. We recommend that you obtain a field-book with waterproof paper such as the Elan e-64 soft-cover with 50 pages.

RECOMMENDED HIGHLY: Strunk, W. and E.B. White. 2000. **The Elements of Style**. 4th or 5th Edition by now. Longman Publishers. Other basic grammar books can substitute, but this is

one is inexpensive & perfectly adequate. Note that the focus of this course is on Science, but that focus covers the ability to communicate about Science effectively.

RECOMMENDED: A 10X hand lens (=loope = magnifying glass).

RECOMMENDED: Finding Home in the Sandy Lands of the South by F.E. Putz, available at Amazon, on Kindle, & at the Florida Museum of Natural History Book Store.

Software: The required software packages are CMAP, WORD, POWERPOINT, & EXCEL.

Pedagogical Approach (including reading requirements): This course is designed to reflect current research on learning. For example, this pedagogical research (i.e., studies on the science of teaching) reveals that students (both strong & not-so-strong) learn better when they work in cooperative groups & when they have opportunities to discover information for themselves that is relevant to their own lives. To foster learning, therefore, inquiry-based activities are extensively used in this course. Interestingly enough, inquiry-based learning looks remarkably like the scientific method. Most labs begin before you report for your session—in preparation for each lab, you will typically be asked to answer or reflect on a situation (Pre-Lab Questions to be submitted on-line before your scheduled lab). During most labs, you will formulate hypotheses, design experiments, carry out experiments, analyze data, reach conclusions, & suggest modifications to experiments. Although this creative & iterative process is at the heart of Science, it is too often disregarded to the point that Science seems like boring drudgework and meaningless memorization.

A prerequisite for effective “active learning” is that class participants come to each session prepared. Generally this preparation involves reading of the assigned pages in the textbook or other sources that will be provided. In recognition that all class participants have conflicting demands on their time, in addition to your inherent thirst for ecological knowledge, thorough reading will be motivated by pre-“lecture” quizzes (on-line) that will weigh fairly heavily in the calculation of course grades.

Given that every group of learners is different & our approach to teaching constantly evolves, often in a saltatory manner, the syllabus is not specific about the number of assignments nor the natures of all of them. This vagueness will allow the instructors to respond to perceived needs in an adaptive manner. For example, if many class members are struggling with a topic or concept, additional time & possibly assignments will be devoted until the learning impediments are removed or circumvented.

Over-Arching Learning Goals: To understand how local plant populations & communities are affected by natural & anthropogenic environmental factors through lectures, discussions, & hands-on experience with the scientific processes of hypothesis formulation, experimental design, data analysis, & written & oral presentation of research results.

Underlying Theme: Importance of plants for sustainable resource use & maintenance of hospitable environments for humans & other organisms.

Key Concepts & Learning Objectives (also see the “word-cloud” on the cover page)

1. **Biogeography:** geological history of the biosphere (with local emphasis); global & regional patterns of plant species & life form diversity; phenological adaptations to seasonality. (Chapters 18, 19, 20)

- *Learning objective assessment:* Ability to describe global & local biogeographical regions as well as the major paleoecological events (e.g., continental drift & climate change) responsible for their development.

2. **Climate & Climate Change:** physics of climatological phenomena; global climate drivers; climate diagrams; past & on-going climate change. (Chapters 17 & 18)
 - *Learning objective assessment:* Ability to explain regional climate patterns from basic physical principles, global atmospheric circulation patterns, ocean currents, & distributions of continents & major mountain ranges.
3. **Resources & Productivity:** above & below ground resource acquisition & use; mycorrhizae; photosynthetic light utilization by leaves, whole plants, & vegetation; CO₂ limitation on photosynthesis; O₂ limitations on respiration; water-use efficiency. (Chapters 2 & 3)
 - *Learning objective assessment:* Ability to explain how environmental factors influence net photosynthesis & ecosystem productivity using graphs & concept maps.
4. **Populations, Communities, & Landscapes:** structures & dynamics of plant populations & communities; life histories; competition; disturbance (especially fire); stress (especially fire suppression & flooding); succession; regeneration; invasive exotic species. (Chapters 5-13)
 - *Learning objective assessment:* Ability to explain how population & community dynamics of plants are influenced by disturbance, stress, & species interactions.
5. **Biogeochemistry (Nitrogen, Phosphorus, Carbon, & Water Cycles):** soil structure & formation; nutrient cycles; anthropogenic effects (e.g., increased nitrogen deposition); mitigation & adaptation to climate change. (Chapters 4, 14, 15, 16)
 - *Learning objective assessment:* Ability to explain natural & anthropogenic factors that influence soil types, mineral nutrient availability, & plant community characteristics.
6. **Global Change, Biodiversity & Conservation:** climate-change impacts, land-use change, fragmentation & edge effects, conservation strategies, biofuels, urban ecology, & human “footprints.” (Chapter 21)
 - *Learning objective assessment:* Ability to explain trade-offs involved in biodiversity conservation, economic development, & mitigation of climate change.
7. **Scientific Method:** formulation of falsifiable hypotheses, experimental design, data graphing & basic statistics (mean & variance), avoidance of bias, benefits of replication, minimum detectable difference, power.
 - *Learning objective assessment:* Ability to formulate novel hypotheses, design experimental protocols to falsify those hypotheses, graph/analyze/interpret results, and present studies in oral and written forms in manners appropriate for science.

Grading:

“Lecture” (including exams, in class assignments, take-home assignments): 60%

Lab (including weekly assignments, research papers, plant collection, poster, lab practical, etc.): 40%

A large portion of your lab grade will be based on your independent research on fire ecology (an oral presentation and a several submissions of a written report) and edge effects (a poster presentation).

Your grade will be calculated as follows:

93-100% A; 90-92% A-; 87-89% B+; 83-86% B; 80-82% B-; 77-79% C+;

73-76% C; 70-72% C-; 67-69% D+; 63-66% D; 60-62% D-; & 0-59% E

Grades will be rounded to the nearest whole point (e.g. 89.5 = 90, 89.49 = 89)

Information on current UF grading policies for assigning grade points can be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

*Remember that the time to improve your grade is during the semester, not after final grades are calculated. Grades will only be changed at the end of the semester if there were calculation errors.

Special Assignments (note there will be many more):

Self-portrait with plant: To help your instructors to learn the names of class participants, submit a digital photograph of yourself with a plant you feel represents you. Your picture should include your selected plant species either as a sample in your hand or as the backdrop to your portrait and a legible sign with your name. You will submit your portrait to Canvas and include a message in which you identify the species portrayed (common names will suffice this early in the semester but not afterwards), why you feel it represents you, and one natural history observation about that species. For example, you might have your picture taken in front of a camphor tree (*Cinnamomum camphorum*) and point out in your message that its crushed leaves smell like a mentholated chest poultice (e.g., Vick's Vapo-rub).

Plant collection: Learning to “read” a landscape requires knowledge about the principal species. To foster your ability to recognize plant species and interpret their status in communities, you are required to prepare and submit a collection of 50 native plant species and 2 invasive exotics. The collections can be predominantly digital (i.e., photographs), analogue (i.e., physical collections of small but recognizable samples of each species), or artistic (e.g., recognizable line drawings, ink impressions, or etc.), but each depiction or collection must be your own (and identifiable as such)—no downloaded images will be accepted. Each sample should be identified to species (Latin binomial and vernacular name), its taxonomic family noted, its growth form described (at least tree, shrub, vine, herb, or graminoid), its habitat briefly described, and two distinctive characteristics noted. Included in the 50 should be two complete herbarium specimens (in newspaper, not mounted) with labels prepared as instructed.

Notes on Attendance and Related Issues:

1. Quizzes will be administered on our e-learning site and due 2 hours before the scheduled class. No makeups will be allowed, but the two lowest scores will be dropped.
2. Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>).
3. All late assignments will result in 3 percentage points lost per day.
4. Make-up exams will be administered to students with legitimate and documented excuses submitted to the instructor in advance (or at the earliest date possible in case of serious illness). The makeup exam will be given only at a later date, likely with more challenging content and in a different format.
5. If you miss a lab for an acceptable reason (e.g., health issues or course conflict), arrange with your instructor for a make-up activity in advance or as soon as possible afterwards to receive credit.
6. Students with disabilities requesting classroom accommodation should register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/), which will provide documentation that should be given to the instructor when requesting accommodation. Please follow this procedure as early as possible in the semester.

Academic Honesty: All students registered at the University of Florida have agreed to comply with the Honor Pledge, which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code”. Furthermore, on all work submitted for credit by students 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.” The Honor Code (<http://www.dso.ufl.edu/sccr/process/student-conduct-honor->

code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. You are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class. Written assignments will be assessed using the internet-based anti-plagiarism software Turnitin, a web-based program that is able to identify matching and partially altered phrases from web content and Turnitin databases, allowing for the evaluation of proper and improper citation as well as for dishonest plagiarism.

Online Course Evaluation Process: Students should provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu>. Evaluations are typically open during the last week of the semester. Summary results of these assessments are available at <https://evaluations.ufl.edu/results/>.

Field Trip Preparation:

Listed below are the tools required (1-6) or recommended (7-13) every time we go to the field in lab.

1. **Long pants** (first line of defense against catbrier vines, snakes, chiggers, and ticks), preferably light in color so that “seed ticks” show up like a patch of pepper.
2. **Boots or sturdy closed-toed shoes.** We will visit wet places with catbrier vines, snakes, chiggers, burning embers, smoldering duff, and ticks. Rubber boots are fine, except for controlled burns. NO SANDALS.
3. **Water** or dilute Gatorade (and something to carry it in so your hands are free).
4. **Field notebook and pencil** - bound, water proof with half the pages graph paper. Be sure to number and label every page with the date and project location. The first pages of the notebook should contain space for a table-of-contents and be labeled with your name and contact information. Always bring it; your instructor may announce a surprise notebook check.
5. **Random number table:** write at least 100 on the inside cover of your field book.
6. **Raingear** - a folding umbrella works well.
7. Bug repellent – please apply in a well-ventilated place.
8. Food - blood sugar levels must be maintained for the duration.
9. Hand lens - 10X or 15X—reasonably good ones can be purchased for about \$10
10. Calculator
11. Binoculars
12. Hat and sunscreen
13. Ruler - also mark the outside of your field book with cm divisions.

IMPORTANT CAUTIONARY NOTE: In addition to beautiful landscapes, fascinating ecosystems, and compelling environmental problems, Florida offers us ticks, chiggers, mosquitoes, and poisonous snakes. Furthermore, given that our controlled burns involve open flames and smoke, they involve some small risks as well. Your instructors will do all they can to assure that you are safe and comfortable when in the field. By dressing appropriately, following instructions, and otherwise being careful, these risks and unpleasanties will be minimized.

LECTURE SCHEDULE

DATE TOPIC

1/6 Course introduction and the science of plant ecology
1/11 Paleoecology
1/13 Climatology workshop
1/15 Global climate change and sea level rise
1/18 **No class**
1/20 Fire ecology
1/25 More fire

READINGS

Chapter 1
Chapter 20
Chapter 17
Chapter 21+

Lab Manual

1/27	Plant carbon relations (photosynthesis and respiration)	Chapter 2
2/1	More carbon	
2/3	Plant water relations	Chapter 3
2/3	More water	
2/8	Exam 1	
2/10	Soil genesis and ecology	Chapter 4
2/10	Nutrient cycling	Chapter 14
2/15	Disrupted biogeochemical cycles	Chapter 21
2/17	Nitrogen and carbon cycles	Chapter 14+
2/22	Lawn ecology, pollution, evil empires, and culture	TBA
2/24	TBA	
SPRING BREAK		
3/7	Landscape ecology	Chapter 15
3/9	Landscape ecology	Chapter 16
3/14	Plant life histories and tradeoffs	Chapter 8
3/16	Community ecology	Chapter 9
3/21	Competition and tradeoffs	Chapter 10
3/24	Herbivory and tradeoffs	Chapter 11
3/28	Exam 2	
3/30	Population ecology	Chapter 5
4/4	Disturbance, succession, and community dynamics	Chapter 12
4/4	Invasive exotics and novel ecosystems	Chapter 13
4/6	More invasives	
4/11	Restoration ecology	TBA
4/13	Restoration ecology	TBA
4/18	Global ecology	TBA
4/20	Diversity— Final exam (takehome) distributed	Chapter 19
4/26	Final exam due	

LAB SCHEDULE

Lab	Date	Title	Meeting place*
1	1/6-7	Self-directed plant ecology activities on campus	On your own
2	1/11-12	Geological and biological history of Earth and Florida Self-portrait with plant due (e-mail)	FMNH and NATL
	1/18	<i>Martin Luther King, Jr. Holiday</i> - No Lab	
3	1/19	Statistics Workshop with EXCEL	Computer Lab
4	1/25-26	Phylogeny, functional morphology, and plant keying	Lab
5	1/30 (SAT)	Coastal ecology	Yankeetown
6	2/1-2	Fire 1 (Lab 6) or Paynes Praire (Lab 7)	Paynes Prairie
8	2/8-9	Sandhills, flatwoods, and cypress domes or Fire 1	Morningside
9	2/15-16	Fire 2 (or Lab 3 on Statistics for Monday's Group)	Field
9	2/24-25	Fire 2 (or Lab 3 on Statistics for Monday's Group)	Field
	<u>2/27-3/6</u>	<u>Spring Break</u>	
	3/7-8		
10	3/12 (SAT)	Edge effects in Ocala National Forest	Field
11	3/14-15	Oral presentations of fire research	Lab
	3/21-22		

12	3/28-29	Tree communities and carbon	NATL
13	4/4-5	Forest dynamics and matrix models	McCarty Woods
14	4/11-12	Edge poster presentations	Lab
	4/18-19	Lab Practical, plant collections due	Lab

* **“Field”** means meeting promptly at 12:50 in the parking lot behind Bartram/Carr Hall. Note that when we go to the Campus Natural Area and Teaching Laboratory (NATL) or the Florida Musuem of Natural History (FMNH), you are welcome to meet us at those venues, but do not arrive late. If you do plan to travel in the course vans, be prepared to watch them fade into the distance if you arrive after 12:50. For the lab in McCarty Woods, meet the class at the picnic tables in the Woods just across the street from Dickinson Hall on Museum Drive. For the two Saturday labs, we will depart from behind Bartram Hall at 8:30 AM.