

ECOSYSTEMS OF FLORIDA (BOT 5695C: 3 credits)

SPRING 2022 SYLLABUS

Fridays, nominally periods 3-6 (9:35 AM – 1:40 PM)

Actually, on 3 Fridays we'll start earlier and many sessions will go later!

A few classes will be at least partially held in 222 Carr,

but usually we'll muster in the parking lot behind Bartram from whence we will venture forth to wonderful places where we will do ecology.

Instructor: F. E. “Jack” Putz, Distinguished Professor

Research Areas: conservation biology, tropical forest ecology and management, fire ecology, restoration, ethnobotany, sea level rise impacts in Florida, the art-science nexus

Office Hours: Thursdays 1300-1500 h, by appointment, or take a chance and drop by if the door is open

Office: Carr 209; office telephone: 392-1486; cell: 352 665 1486; e-mail: fep@ufl.edu

Course Objectives: To acquaint course participants with major Florida ecosystems and some pressing local environmental issues while helping them develop their research skills. Natural history and field research methods will be stressed along with ways to communicate research results. Mini-lectures in the field, recorded lectures, and readings about Florida ecosystems and ecological methods will supplement field trips and participant-designed field research.

Readings: Most readings for the course are on electronic reserve. Additional materials will be on reserve at Marston Science Library, posted on CANVAS, e-mailed as PDFs, or otherwise made available. Introductions to many of the species, ecosystems, and ecological phenomena to be encountered are found in the instructor's collection of nature essays entitled Finding Home in the Sandy Lands of the South: A Naturalist's Journey in Florida, which is required reading (but provided for free). To help class participants develop a “sense of place” (and to give them an excuse to read something other than science), everyone must also read at least one novel based in Florida (e.g., The Yearling, South Moon Under, Don Juan McQueen, A Land Remembered, River Without End, or two “Cracker westerns” by Lee aab, Jon Wilson, or Rick Tonyan (the instructor abjures any responsibility if participants end up readings >2 Cracker westerns). Libraries stock these novels, used copies are readily available at local shops and from web outlets, and I have a stack of “lenders” in 209 Carr---alternate readings will be entertained.

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. **Fire apparel.** On days we are scheduled to burn (never guaranteed), don't wear synthetic fabrics, which are made from petroleum, ignite readily, and burn hot. Leather boot are also required if you are going to handle a drip torch (but can be borrowed from classmates—no need to purchase).
4. **Water** or dilute Gatorade (and something to carry it in so your hands are free).
5. **Field notebook and pencil** - bound, water proof with half the pages graph paper. Be sure to date every page and note your location. The first pages of the notebook should contain space for a table-of-contents and be labeled with your name and contact information.
6. **Random number table:** extract and write at least 100 on the inside cover of your field book.
7. **Raingear** - a folding umbrella works well.
8. **Bug repellent** – please apply in a well-ventilated place. There **will be** some noxious insects for which we need to prepare ourselves so that we can fully concentrate on the matters at hand.
9. **Food** - blood sugar levels must be maintained for the duration.
10. **Hand lens** - 10X or 15X—reasonably good ones can be purchased for about \$10.

11. Cellphone, with CanopyApp loaded.
12. Binoculars if you have them (some good things to see are far away).
13. Hat and sunscreen.
14. Ruler - also mark the outside of your field book with centimeters.

IMPORTANT CAUTIONARY NOTE: In addition to beautiful landscapes, fascinating ecosystems, and compelling environmental problems, Florida offers us ticks, chiggers, mosquitoes, and poisonous snakes. We will do all we can to assure your safety in the field but you need to dress appropriately, follow instructions, and otherwise being careful so as to minimize risks and unpleasanties.

The following is important information concerning certain hazards of working outside in Florida:

- Chiggers: <http://edis.ifas.ufl.edu/pdffiles/IG/IG08500.pdf> or <http://pherec.org/EntGuides/EntGuide6.pdf>
- Ticks & Lyme Disease: <http://edis.ifas.ufl.edu/pdffiles/MG/MG20400.pdf> or <http://fmel.ifas.ufl.edu/buzz/clticks.shtml>
- Heat: http://solutionsforyourlife.ufl.edu/hot_topics/agriculture/heat_stress.html
- Dehydration: <http://fineinstitute.com/patient-education/?id=11913&lang=English&db=hlt&ebSCOType=static&widgetTitle=Spinal+Links>

Your grade will be calculated as follows: 94-100% A; 90-93% 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

TASK	DUE DATE (under revision)	% FINAL GRADE
Florida time-line	Week 3	8
Sea Level Rise model	Week 4	8
Fire proposal	Week 6	3
Scrub regeneration proposal	Week 7	3
Fire manuscript version 1	Week 10	6
Exotic article summary	Week 10	5
Fire Manuscript version 2	Week 12	17
Fire Oral presentation	Week 12	5
Restoration articles (summaries)	Week 12	5
Florida in fiction analysis	Week 13	4
Sand Pine Scrub Ecology poster	Week 14	16
Plant quiz	Week 14	10
Final examination	Week 15	10

Note on Manuscript Submission: A short paper (3-5 pages) based on a field research project you will fully carry out during class is to be submitted (WORD format) using the formats and style guidelines described in the “Instructions to Authors” for Ecology, as detailed on the Ecological Society of American (ESA) website. A detailed grading rubric (provided) will be used to score multiple drafts of this manuscript.

Required Text: Finding Home in the Sandy Lands of the South by F.E. “Jack” Putz, supplied for free to enrolled students, available on CANVAS, and available for purchase from Amazon and Kindle.

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: Shimel, J. 2012. Writing Science. Alternatively, you can always use Strunk, W. and E.B. White. 2000. The Elements of Style. 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).

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

Recommended Texts: Ecosystems of Florida (EF); Shimel, J. 2012. Writing Science; Strunk and White. The Elements of Style; and, a plant guide (e.g., Godfrey, R.K. Trees, Shrubs, and Woody Vines of Northern Florida and Adjacent Georgia and Alabama). Required readings will be provided to you as PDFs or made available on our e-learning site, but you will also be expected to search the primary literature yourselves.

Pedagogical Philosophy: If you know a bit about my ideas about learning, it may help you to understand and accept how this class will unfold. I claim no particularly inspired insights about education, but I try to act in accordance with the following precepts and otherwise promote participatory, learner-centered activities:

1. The extent to which adults learn new material varies with whether it is simply heard (20%), heard and seen (40%), or experienced (80%).
2. Experiential learning situations in which learners learn from each other and the trainer learns from the learners should be maximized while use of traditional transmission-based approaches should be minimized.
3. Participatory learning is active, not passive.
4. Adult learners prefer to be self-directed or at least to share responsibility for their own learning.
5. Motivation to learn increases when the topic under consideration fills an immediate need.
6. Maximum learning from an experience occurs when there is time to reflect back on it, draw conclusions, and derive principles for application to similar situations in the future.
7. Provide lots of corrective but supportive feedback.
8. Show respect for the learner and otherwise foster trust so as to assist the learning process.
9. Provide a safe, cheery, and comfortable atmosphere for learning.

More Specifically: In keeping with the findings of pedagogical studies, active-learning approaches will be employed as much as possible in this course. Such an approach requires that participants come to each weekly session prepared to participate/contribute/share. To promote cooperative learning, each course participant will be assigned several taxa or ecological processes about which they will teach the rest of us. Details will be provided and initial assignments made during the first class. Accumulation of knowledge sufficient to share about your assigned topic should take no more than a few hours of Googling, reading, and other sorts of intellectual exploration that should be fun and interesting—stop yourself if you start to spin your wheels and ask for guidance. You should start with the relevant section in “Finding Home in the Sandy Lands of the South;” you are also welcome to visit your guide’s office in your quest for additional materials. It might help to bring to the class some pictures or other illustrative material to supplement your verbal presentations (no more than a few minutes each), which will occur at the appropriate time in the field, such as when we first confront your species or process.

Notes:

- This syllabus is a working document that is subject to change, open to negotiation, and otherwise mutable as appropriate for a 5000-level course, especially one with the stated pedagogical philosophy. In other words, adoption of an “adaptive management” approach will require some departures from the pre-supplied syllabus.
- Class participants have a wide variety of backgrounds, interests, and professional aspirations. Efforts will be made to tailor the course to the needs and desires of each participant, but such modifications require a free flow of information and suggestions.
- Given the vagaries of scheduling controlled burns, we need to retain flexibility about the days on which we will experience fire as fire ecologists.

Course Schedule

7 January: Overview of the course, natural history, fire experience, and then **Ecolympics** at Flamingo Hammock Land Trust with reflections on field ecology as a Science. Some species to which you will be introduced include: *Quercus virginiana*, *Q. geminata*, *Q. falcata*; *Q. hemisphaerica*, *Q. nigra*; *Pinus palustris*, *P. taeda*, *P. glabra*; *Gopherus polyphemus*, *Geomys pinetus*; fire ants, leaf cutter ants, harvester ants; *Carya glabra*, *C. tomentosa*; ticks, chiggers; and, mosquitoes. We will also discuss Karst

topography, soils, and the weather. You should start making your reference collections for future reference.

FIRE: We will conduct a very small controlled burn to provide you with some experience with fire ecology to help you get ideas for research you will design and then implement during a future lab. Data from this research project will be analyzed and the results written up in the form of a manuscript suitable for publication in Ecology.

ECOLYMPICS: All competitors (including soft scientists) will be held to the highest standard of behavior. While all participants are expected to master each of the specified skills, tools, and techniques, team scores will be tallied according to well-established traditions that are open for neither inspection nor debate. All necessary equipment/tools will be provided (except field notebooks), but feel free to bring your own tapes, rangefinders, GPS units, or etc., but 400-degree compasses not permitted.

Pre-Class Assignments:

1. Learn some basic Floridian geography (the Atlas of Florida is a good start or use Google Maps, Google Earth, or etc.)—be able to draw a quick sketch of Florida showing the prominent physiographic features (e.g., major rivers, mountains, and lakes).
2. Read at least the first 5 chapters in Finding Home (don't worry, they are short).
Read pages 3-10 in Ecosystems of Florida (edited by Myers and Ewel).

Learning Objectives: Increased ability to employ basic field ecology techniques, recognize the dominant arboreal species, know some of their basic natural history, and start to “read local landscapes.” Gain first-hand experience with fire.

14 January: Ocala National Forest: alluvial swamp, sand pine scrub, longleaf pine savanna, pond pine flatwood.

Pre-Class Assignments:

- (1) Chapter 23 in Finding Home.
- (2) Menges, E. 1999. Ecology and conservation of Florida scrub. In, Anderson et al. (editors), 1999. Savannas, Barrens, and Rock Outcrop Communities of North America.
- (3) Platt, W.J. 1999. Southeastern pine savannas. In, Anderson et al. (editors), 1999. Savannas, Barrens, and Rock Outcrop Community of North America.
- (4) View the ZOOM lecture on sand pine scrub.
- (5) Be prepared to teach the rest of us about the species you will be assigned in advance.

Overview of Trip: We will visit an alluvial swamp, a longleaf pine savanna, and a pond pine flatwood but emphasis will be on the ecology and management sand pine scrub. We will visit a patch of old-growth sand pine scrub but also young post-fire and post-logging scrub sites. After learning the dominant species, the big challenge is for you to generate a falsifiable hypothesis related to the regeneration process. Later in the semester, after reading and research design refinement, you will carry out your study during a follow-up lab, analyze your data, and present your results in the form of a research poster.

On-Line Assignment: Submit a falsifiable hypothesis for the sand pine scrub ecology research project you will carry out during a future lab. Support your hypothesis (in the form of a single declarative sentence without elaboration or explanation) with a few sentences of explanation and a graph (can be hand drawn and scanned) depicting the expected results if your hypothesis is supported. Include at least two literature citations of studies related to the hypothesis you plan to test.

Learning Objective: Improved capacity to generate falsifiable hypotheses based on field-experience supplemented by knowledge of the literature.

21 January: Global climate change as related to Florida. Coastal ecosystems and sea level rise. Field trip to Withlacoochee Gulf Preserve (Yankeetown).

Pre-Class Assignments:

- (1) Williams K., M. MacDonald, K. McPherson, and T.H. Mirti. 2007. Ecology of the coastal edge of hydric hammocks on the Gulf Coast of Florida. Chapter.
- (2) Putz, F. E. 2012. Coastal forest retreats as sea level rises. *The Palmetto* 29: 8-11.
- (3) Misra et al. 2011. Climate scenarios: A Florida-centric view. Florida Climate Institute White Paper (scan in its entirety and read the sections of interest).

In-Lab Assignment: Capture in a graphical model depicting what you already knew and learned about coastal ecosystem change.

28 January: Part 1: Florida Museum of Natural History (FMNH) with emphasis on the paleoecology of Florida.

Pre-Class Assignments:

1. Develop enough understanding of one of the following “time-reading” techniques to present an overview to the other class participants. Be sure that everyone comes away from your presentation knowing the time scales for which your technique is appropriate: Oxygen isotopes in glacial ice cores; Carbon-dating; Potassium-Argon, Rubidium-Strontium, Uranium-Lead dating; Dendrochronology; Palynology.
2. DURING CLASS (and afterwards). Draw a basic timeline that starts at the Big Bang and proceeds to the present in reducing order-of-magnitude jumps. Use whatever historical resources you can find (e.g., *The New History of Florida*) to populate your line with >20 Florida-relevant events.

Watch: <https://www.youtube.com/watch?v=rWp5ZpJAIAE>

Read: 1. Watts, W.A. 1980. The late Quaternary vegetation history of the southeastern United States.

Annual *Review of Ecology and Systematics* 11: 387-409.

2. Randazzo and Jones (editors). *The Geology of Florida* Pages 1-12 (by W. Schmidt), pages 57-67 (by Scott), and pages 217-249 (by Upchurch and Randazzo). .

Learning Objective: Develop your sense of time as it relates to Florida and improve your thinking about the sorts of data we will collect this semester.

Part 2: Climate of Florida workshop. Bring to class a printout of a Florida weather map from some interesting date.

Read: Chen and Gerber, “Climate,” in *Ecosystems of Florida*.

Learning Objective: Be able to use first principles to explain the main climatological patterns affecting Florida.

Assignments:

1. Before class, be sure you have reviewed and understood the basic principles of climatology provided (clarification provided upon request).
2. Research and be prepared to present to the rest of us an explanation (with graphics if helpful) of the topic you were assigned from the following: vapor pressure deficit and relative humidity; fronts; cyclones/hurricanes; Coriolis Effect; adiabatic rates and convective rain; water (specific heat, energy of phase changes); albedo; wind; inversions.
3. Select and start to read your Florida-based novel. Make note of important passages in which the author represents, misrepresents, or otherwise employs the ecosystems of Florida.

On-Line Assignment: Submit a falsifiable hypothesis for the fire ecology research project you will carry out during a future lab. Support your hypothesis (in the form of a single declarative sentence without elaboration or explanation) with a few sentences of explanation and a graph (can be hand drawn and scanned) depicting the expected results if your hypothesis is supported. Include at least two literature citations of studies related to the hypothesis you plan to test.

4 February: Fire ecology research at Flamingo Hammock.

Pre-Class Assignments:

1. Watch the recorded ZOOM lecture on fire ecology.
2. Handouts and pages 1-56 in R.J. Whelan (1995) *The Ecology of Fire*.

3. Read fire literature relevant to the hypothesis you will test.

In Class Assignment: Carry out your field experiment. One requirement is that your sample size (N, for each treatment) be >14. Assistance in streamlining your field methods will be provided but it is your responsibility to design your study such that this sample size requirement can be met.

Learning Objectives: Experience with fire and improved capacities to design and implement field research.

ALTERNATIVE CLASS (if the weather is not cooperative): Paynes Prairie State Preserve

11 February: Pine and oak workshop.

Assignment: Bring samples of three species of pines with cones of both genders if possible.

Pine Reading: Keeley and Zedler 1998. Evolution of life histories in *Pinus*. Pages 3-40 in, Richardson, D.M. (editor). The Ecology and Biogeography of *Pinus*.

Oak Readings:

1. Hipp, A.L., P.S. Manos, and J. Cavender-Bares. 2020. Ascent of the oaks. Scientific American.
2. Cavender-Bares, J., K. Kitajima, and F.A. Bazzaz. 2014. Multiple trait associations in relation to habitat differentiation among 17 Floridian oaks. Ecological Monographs 74: 635-662.

18 February: Fire ecology research. Alternative trip to Paynes Prairie State Preserve.

25 February: Swamp ecology at Cypress Highlands and thereabouts. Be prepared to get wet. A virgin cypress strand and a bayhead with the world's largest slash pine are featured.

Read: (1) Relevant chapters from plant physiology books or appropriate websites on anaerobiosis.

(2) Ewel, K.C., 1990. Swamps. Pages 281-323 in *EF*.

Learning Objectives: Why plants drown, why histosols are wet (and can burn when they're not), and why droughts kill wetland trees.

4 March: Ocala National Forest. Carry out research projects on sand pine scrub regeneration.

18 March: Austin Cary Forest: Forest ecosystem management or fiber farming, Florida style. Austin Cary Forest and elsewhere.

Read: Jokela et al. 2004. Production dynamics of intensively managed loblolly pine stands...Forest Ecology and Management 192: 117-130. While you're at it, skim through the other articles in this special issue.

25 March: Exotic invasive species workshop.

1 April: Restoration ecology and practice, Florida style.

Read: Browse recent issues of Restoration Ecology and read two articles, at least one of which should be of a philosophical nature and neither should be about Florida or longleaf pine.

Assignment: Submit via e-mail as a Word File by 1700 h on the day before class a 100-word essay about each article in which you explore the relevance of the articles to Florida. Be sure to include the complete citation and send the PDF. Enrich the class discussion with insights derived from your reading.

8 April: San Felasco Hammock: Hammocks and Hardwoods with emphasis on invasive exotic species.

Part 1: Hammocks and hardwoods.

Read: Platt, W.J. and M.W. Schwartz. Temperate hardwood forests. Pages 194-229 in *EF*.

Learning Objective: Identification of the major hammock hardwoods based on vegetative characteristics.

Recognize distinctiveness of the gap-phase mode of regeneration of many hammock tree species.

Suburban Ecology with an emphasis on lawns.

15 April: Part 1: Suburban Ecology with an emphasis on lawns.

Part 2: Lab Practical with fresh material.