ECOSYSTEMS OF FLORIDA (BOT 5695C: 3 credits)
SPRING 2020 SYLLABUS
Fridays, periods 3-6 (9:35 AM – 1:40 PM)
(2 hours of "lecture" and 2 hours of lab per week)
(reality: all day on lots of Fridays, but in great places doing 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: Wednesdays 1300-1600 h, by appointment, or take a chance and drop by
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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. Lectures and readings on Florida ecosystems and ecological methods will be supplemented by participant-designed field problems, preparation and submission of manuscripts, and oral presentations of the results of field studies.

Readings: Most readings for the course are on electronic reserve. Additional materials will be on reserve at Marston Science Library, e-mailed as PDFs, or otherwise made available. The instructor's newly published book of nature essays entitled Finding Home in the Sandy Lands of the South: A Naturalist's Journey in Florida is strongly encouraged—if readership is down, he promises to inflict verbal versions of these stories on the class *ad nauseam* (available from Kindle and Amazon). To help class participants develop a "sense of place" (and to give them an excuse to read some Florida fiction), everyone must also read at least one of the following historical novels: The Yearling, Don Juan McQueen, A Land Remembered, River Without End, or two "Cracker westerns" by Lee Gramling, 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 web outlets, and I have a stack of "lenders"---alternate readings will be entertained.

Class Attendance and Make-Up Policy: Class attendance is expected. Each unexcused absence will result in a 10 point reduction in the final grade. Excused absences are consistent with university policies in the undergraduate catalog (https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx) and require appropriate documentation. Assignment submitted late will lose 5% per day.

Grading: 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)

TASK	DUE DATE	% FINAL GRADE
Florida time line	Week 2	10
Sea Level Rise model	Week 4	5
Fire proposal	Week 6	5
Fire manuscript version 1	Week 10	7
Exotic article summary	Week 10	5
Fire Manuscript version 2	Week 12	18
Fire Oral presentation	Week 12	5
Restoration articles (summaries)	Week 12	5
Florida in fiction analysis	Week 13	5
Edge posters	Week 14	5
Plant quiz	Week 14	15
Final examination	Week 15	15

Note on Manuscript Submission: This short paper (3-5 pages) is to be submitted and then resubmitted after review using the style described in the "Instructions to Authors" for Ecology, as detailed on the Ecological Society of American (ESA) website. A detailed grading rubric will be provided.

Recommended Texts: Ecosystems of Florida (EF); Shimel, J. 2012. Writing Science; The Elements of Style (Strunk and White); 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 that end, before each class you will each be assigned topics to "research" in advance; during class you will share your knowledge with the other participants. In many cases, this knowledge will pertain to species chosen for their ecological importance, commonness, usefulness, or any of a variety of peculiarities that tickled the fancy of your guide to the ecosystems of Florida or that help in our quest to read landscapes. Accumulation of knowledge sufficient to share about your assigned topic should take no more than 30-45 minutes of Googling, reading, and other sorts of intellectual exploration that should be fun and interesting—stop yourself if you are spending more than an hour on your research. You should (always) start with the relevant section in "Finding Home in the Sandy Lands of the South;" you are alsowelcome 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

10 January 1: Overview of the course and then Ecolympics at Flamingo Hammock Land Trust with reflections on field ecology as a Science. From the following you will be assigned several to investigate BEFORE class on Friday (see above for an explanation): *Quercus virginiana, Q. geminata, Q. falcate; 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, chigger; Mosquitoes;* Karst topography; Ultisol, Spodosol, Entisol; Today's weather; *Liquidambar styraciflua, Magnolia grandiflora, Ilex opaca.*

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.

Assignment:

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. From the following you will be assigned several to investigate BEFORE class on Friday (see above for an explanation): *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; Crataegus spp.; Ticks, chigger; Mosquitoes;* Karst topography; Ultisol, Spodosol, Entisol; Today's weather; *Liquidambar styraciflua, Magnolia grandiflora, Ilex opaca.*
3. Start making your own reference collection with diagnostic snippets of plants. Reading about "keystone" species would be helpful.

Read:

(1) Finding Home in the Sandy Lands of the South, relevant chapters (of which there are many).
(2) Ecosystems of Florida (edited by Myers and Ewel) pages 3-10 (by Ewel).
(3) Platt, W.J. 1999. Southeastern pine savannas. In, Anderson et al. (editors), 1999. Savannas, Barrens, and Rock Outcrop Community of North America.

Learning Objectives: Increase 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."

17 January*:* Part 1: Statistics workshop (optional). Part 2: Paleocology at FMNH. .

Learning Objective (Part 1): Increased capacity to handle data, think about variance, and understand what statistical tests do and how. This is NOT a statistics course, I am NOT a statistician, and you will NOT be expected to master lots of statistics, but everyone should leave the course with a high comfort level with basic tests such as Student's t, ANOVA, regression, and contingency analysis. Statistics is NOT a formal course prerequisite, but you will nonetheless be expected to graph and analyze your data appropriately. For this 1.5 hour session (first half of class), be prepared to do a lot of graphing---with pencils, rulers not needed.

Assignment: in advance of class, draw graphs 1-3 in the "Statistics from the Hip" workbook to be provided.

Part 2 (van leaves from behind Bartram at 11 AM): Florida Museum of Natural History (FMNH) with emphasis on the paleoecology of Florida.

Assignments:

1. BEFORE CLASS: 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.

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

Read:

(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).

Watch: Go to http://gulfmex.coastalresilience.org/ and play around for 30 minutes or so.

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

31 January:

Part 1: 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 convectional 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.

Part 2: Ecology of fire. At Flamingo Hammock. Experience with fire—what exactly we will do depends on the weather, fire permits, and etc. Much time spent brainstorming.

Learning Objectives: Understand the essential physical features of fire and how they relate to the role of fire in shaping ecosystems. Accumulate enough first-hand experience with fire for the conceptualization of an informed fire research project.

Read: Handouts and pages 1-56 in R.J. Whelan (1995) The Ecology of Fire.

Assignment: Hand in a single declarative statement in the form of a falsifiable hypothesis accompanied by a graph depicting the expected results if your hypothesis is supported.

7 February:

Read: Brown et al., "Soils" in EF pages 35-69.

Learning Objective: Recognize and implement the recommendations in the "Grading Rubric for Oral Presentations."

Part 2: McCarty Woods---long pants and closed-toed shoes recommended. Topic: Soil infiltration, data handling, minimum sample sizes. Small group "thought projects" on soil compaction

Read: Brown et al., "Soils" in EF pages 35-69.

Learning Objectives: Develop experience with handling data (i.e., graphing), dealing with variance, generating falsifiable hypotheses based on field observations, designing manipulative experiments to test those hypotheses, and thinking through the statistical analysis of the resulting data. Also understand ultisols.

Assignment: Hand in a 2-3 page research proposal for your fire ecology project. Use the format of an NSF Dissertation Improvement Grant along with the Instructions for Authors for the journal Ecology. Some of the sections will be VERY short, but they should all be included. Be sure to have >3 references from the primary literature (i.e., websites and textbooks do not constitute acceptable citations). Also include a graph of the expected results if your hypothesis is supported. Note that you are likely to employ some of the prose in this proposal in the write up of your fire experiment.

14 February:

Part 1: Oral presentations of fire project proposals, 2 minutes each (timed). No more than 3 powerpoint slides permitted. Grading rubric available on e-learning site.

(20 February: Hand in a 2-3 page research proposal for your fire ecology project. Use the format of an NSF Dissertation Improvement Grant along with the Instructions for Authors for the journal Ecology. Some of the sections will be VERY short, but they should all be included. Be sure to have >3 references from the primary literature (i.e., websites and textbooks do not constitute acceptable citations). Also include a graph of the expected results if your hypothesis is supported. Note that you are likely to employ some of the prose in this proposal in the write up of your fire experiment.

27 February: Sand pine scrub ecology, management, and edge effects. (Ocala National Forest)

Read:

(1) Menges, E. 1999. Ecology and conservation of Florida scrub. In, Anderson et al. (editors), 1999. Savannas, Barrens, and Rock Outcrop Communities of North America.

(2) Browse through the provided selection of papers on edge effects and then read a few (>2) to get ideas for an edge effect research project that you will conduct in sand pine scrub in Ocala National Forest. We will hold a workshop on edge proposals, so be sure to read in advance and come to class with ideas for research projects.

Learning Objective: Improved capacity to generate falsifiable hypotheses based on knowledge of the literature and ecological insights.

27 February:

Part 1: Pine workshop.

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

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

Part 2: 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.

13 March: Fire Experiments **OR** Ecology of Flooding. Swamp ecology at Cypress Highlands and thereabouts. Be prepared to get wet. A virgin cypress strand and a bayhead 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 why droughts kill wetland trees.

20 March: Fire experiments **OR** 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.
Part 2: Exotic invasive species workshop.

27 March: Sand pine scrub ecology, management, and edge effects. (Ocala National Forest)
Read:
(1) Menges, E. 1999. Ecology and conservation of Florida scrub. In, Anderson et al. (editors), 1999. Savannas, Barrens, and Rock Outcrop Communities of North America.
(2) Browse through the provided selection of papers on edge effects and then read a few (>2) to get ideas for an edge effect research project that you will conduct in sand pine scrub in Ocala National Forest. We will hold a workshop on edge proposals, so be sure to read in advance and come to class with ideas for research projects.

Learning Objective: Improved capacity to generate falsifiable hypotheses based on knowledge of the literature and ecological insights.

3 April: Part 1: Oral presentations of fire ecology research results.
Learning Objectives: This presentation will be graded on the basis of the rubric provided on our e-learning site, the recommendations of which should be reflected in the structure of the talks, any slides presented, and the mode of presentation.
***Part 2*:** 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.

10 April:. Models of Florida ecosystems: zonation, succession, and ordinations.
Part 1: Markov modelling in San Felasco.
Read: Horn, H.S. 1975. Forest succession. Scientific American 232: 90-98.
Part 2: Sucession/zonation in Florida.
Read: Duever, M.J. and R. E. Roberts. 2013. Successional and transitional models of natural South Florida, USA, plant communities. Fire Ecology 9: 110-123.
Learning Objectives: Improved modeling skills though development of conceptual models of the ecosystems of Florida.

18 April:
Part 1: Edge Poster presentations
Activity: During the class you will also each present an analysis of the use of the ecosystems of Florida in the Florida-based novel you read.
Part 2*:* PLANT QUIZ: Tests your ability to recognize the species on which we focused this semester and relate pertinent aspects of their natural history.
FINAL EXAM: Cumulative, heavily based on the assigned readings, open book, starts in class, submit on paper in (or under the door of) 209 Carr Hall.