

ECOSYSTEMS OF FLORIDA (BOT 5695: Section 1545)

SPRING 2017 SYLLABUS

Wednesdays 1:55-2:45 (period 7) in Room 151 Psychology

Fridays 12:50-4:55 (periods 6-9, may end earlier if we are not field-bound)

Saturday trip (8:00-5:00) and 1 Saturday overnight on Sea Horse Key

Professor Francis E. “Jack” Putz

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

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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, discussion of readings, and other in-class activities related to 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 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.

Assignments: The two 2-3 page research papers will be submitted using the style described in the “Instructions to Authors” for Ecology, as detailed on the Ecological Society of American (ESA) website (grading rubric provided in advance).

Field Trips: Field trips will be held either on Friday afternoons or Saturdays and will depart from behind Bartram Hall. We will leave promptly at 1250 h (Fridays) or 0800 h (Saturdays) unless otherwise specified. Course participants are responsible for assembling in advance all of the required materials for their field work including appropriately accessorized attire and personal safety gear.

TASK	DUE DATE	% FINAL GRADE
Florida time line	20 January	2
Exotic article summary	25 January	2
Coastal change systems model	27 January	5
Fire proposal written	8 February	4
Fire proposal oral	15 February	3
Fire ms version 1	3 March	6
Fire ms version 2	15 March	10
Edge effect proposal written	22 March	5
Restoration articles (summaries)	29 March	2
Edge ms version 1	5 April	8
Florida in fiction analysis	7 April	3
Edge ms version 2	14 April	15
Natural history quiz	14 April	12
Edge oral presentation	19 April	5
Final examination	25 April	18

Recommended Texts: Ecosystems of Florida (EF); The Elements of Style (Strunk and White); a statistics book (almost any will do) or good websites with which you are familiar; and, a plant guide (e.g., Godfrey, R.K. Trees, Shrubs, and Woody Vines of Northern Florida and Adjacent Georgia and Alabama). Many 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: In case you are not familiar with my ideas about learning, it may help you to understand and accept how this class will likely 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.

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.
- Superimposed on this tentative syllabus is a day of fire. Given the vagaries of scheduling controlled burns, we will have to go whenever the burn bosses give the go-ahead—justification to your other instructors will be provided if necessary and they will be invited to participate.

Schedule Simplified

January

4 W: Overview of the course, reflections on field ecology as a Science, and an assessment.

6 F Field: Ecosystems of Alachua County:

11 W: Statistics workshop.

13 F Field: Florida Museum of Natural History

14-15 S-S Field: Yankee Town marshes then off to Seahorse Key.

18 W: Climate of Florida workshop.

20 F: Ecology of fire. First-hand experience with fire, conditions permitting

25 W: Exotic invasives

27 F. No formal class but time to read up on soil science.

February

1 W Field: McCarty Woods: Soil genesis, typing, compaction, and water relations.

3 F. A practice controlled burn if we failed last time or we'll go to San Felasco

8 W. Sand pine scrub ecology, management, and edge effects.

10 F: Attend the PIEE Conference or go to the Paynes Prairie Sheetflow Project.

15 W: Oral presentations of fire project proposals

17 F: Formal fire experiments, weather permitting.

22 W: Sand pine scrub ecology, management, and edge effects.

24 F Field: Controlled burn for formal experiments if it hasn't already happened.

Option 2: McCarty Woods, collect the necessary data to run Markov model

March

1 W: Oral presentations of results of fire research projects.

3 F: No class (if the fire presentations were all completed during the last class)

4-11 No class, *Spring Break*.

15 W: Ecology of flooding.

17 F Field: Swamp ecology.

22 W: Pine workshop,

24 F Field: **McCarty Woods (If not done on 24 February, otherwise, no class)**

25 S Field: Ocala National Forest

29 W: Restoration ecology and practice, Florida style.

31 F Field: Restoration project study tour.

April

5 W: Forest ecosystem management or fiber farming

7F Field: Industrial Forestry Fiber Farming (IFFF) Study Tour

12 W: Models of Florida ecosystems

14 F Classroom then Field: Suburban ecology and final plant quiz.

19 W: Oral presentations of edge effect research projects (poster option available).

FINAL EXAM (take home, due 25 April)

DETAILED SYLLABUS

January

4 W: Overview of the course, reflections on field ecology as a Science, and an assessment.

Assignment: Basic Floridian geography (the Atlas of Florida is a good start or use Google Maps, Google Earth, or etc.)—for now pay attention to the prominent physiographic features (e.g., major rivers, mountains, and lakes).

6 F Field: Ecosystems of Alachua County: learn some dominant arboreal species and start to read landscapes.

Read:

(1) Ecosystems of Florida (edited by Myers and Ewel) pages 3-10 (by Ewel).

(2) Platt, W.J. 1999. Southeastern pine savannas. In, Anderson et al. (editors), 1999. Savannas, Barrens, and Rock Outcrop Community of North America.

Assignment: Start making your own reference collection with diagnostic snippets or photos of plants.

Learning Objectives: Recognize the dominant species, learn some more natural history, and improve your capacity to “read” local landscapes.

11 W: Statistics workshop. Be prepared to do a lot of graphing---with pencils, rulers not needed.

Learning Objective: 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. A statistics course is NOT a formal prerequisite, but you will be expected to graph and analyze your data appropriately.

Assignment: Draft a basic timeline that starts at the Big Bang and proceeds to the present in reducing order-of-magnitude jumps. Check out geological timelines on the web for ideas. Use whatever historical resources you can find to populate your line with some Florida-relevant events. You will continue to use this template during lab on Friday at the Florida Museum of Natural History.

13 F Field: Florida Museum of Natural History with emphasis on the paleoecology of Florida.

Read: Watts, W.A. 1980. The late Quaternary vegetation history of the southeastern United States. *Annual Review of Ecology and Systematics* 11: 387-409.

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.

Assignment: Amplify the time line you created in advance of this class to capture the major events in the history of Florida as you learn from the displays in the Hall of Fossils and elsewhere.

14-15 S-S Field: Yankee Town marshes to see sea level rise first hand, then off to Seahorse Key for more coastal ecology, *Ecolympics*, and the night. We will sleep and cook in the 19th Century lighthouse. You need to bring a sleeping bag, a towel, and toiletries. Note that we need to shop and then cook for ourselves, all of which will be governed by the “Moose-Turd Pie” principle (google it if you don’t understand). Be ready to get wet to your knees or boot yourself and hope.

Learning Objectives:

- (1) Master the natural history and field identification of the dominant salt marsh and mangrove species.
- (2) Develop ideas about the dynamics of the salt marsh-mangrove forest interface.
- (3) Understand the natural history underlying sea level rise driven ecosystem shifts.
- (4) Be able to capture in a graphical/conceptual model the process of coastal hammock replacement by salt marsh.
- (5) Improve your field ecology skills (e.g., plot demarcation, tree height measurement, etc.)

18 W: 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.

Assignment: Before class, be sure you have reviewed and understood the basic principles of climatology provided (clarification provided upon request).

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.

20 F: Ecology of fire. First-hand experience with fire, conditions permitting—what exactly we will do depends on the weather, fire permits, and etc. Much time spent brainstorming.

Learning Objectives:

1. Understand the essential physical features of fire and how they relate to the role of fire in shaping ecosystems.
2. Accumulate enough first-hand experience with fire for the conceptualization of an informed fire research project.
3. Improve your field ecology skills (e.g., plot demarcation, tree height measurement, etc.)
4. Learn to identify some common hammock hardwoods based on vegetative characteristics.
5. Recognize the difference between junk hammock and hardwood hammock.

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

Assignment: While still in the field, propose a falsifiable hypothesis related to fire ecology that you could test experimentally. The hypothesis should be in the form of a single declarative statement unencumbered by explanation or justification. Accompany your hypothesis with a labeled graph depicting the expected results if your hypothesis is supported. Do this first in your field book and then revise it upon further reading and consideration. Discuss that revised mini-proposal with your instructor before the next class.

25 W: Exotic invasive species.

Read: Read the notes that will be posted and then browse recent issues of *Biological Invasions* or related journals to select an article about exotic invasive species that interests you—it should be philosophical in focus.

Assignment:

- (1) By 1700 h on the day before class, submit via e-mail a 100-word overview of how the philosophical article you read relates to ecosystem restoration and exotic species control in Florida (be sure to give the complete citations and to attach the PDFs).
- (2) Enrich the class discussion with insights derived from your reading.

27F. No formal class but time to read up on soil science.

Read: Brown et al., “Soils” in *EF* pages 35-69.

February

1 W Field: McCarty Woods: Soil genesis, typing, compaction, and water relations.

Learning Objective: Understand an ultisol.

3 F. A practice controlled burn if we failed last time or we’ll go to San Felasco to see a good hardwood hammock.

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

Learning Objectives:

1. Learn to identify some common hammock hardwoods based on vegetative characteristics.
2. Recognize the difference between junk hammock and hardwood hammock.

8 W. Sand pine scrub ecology, management, and edge effects.

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) Harper et al. (Conservation Biology 2005)
- (3) Browse through a few other articles on edges to get ideas for an edge effect research project that you will conduct in sand pine scrub in Ocala National Forest. Most of the class will be dedicated to 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.

10 F: Attend the PIEE Conference or help me lead a bunch of young artists through the Paynes Prairie Sheetflow Project. It would be great to “bring alive” for them the biogeochemistry involved, and to introduce them to some of the startling avifauna that frequents the area.

Assignment: Submit as a WORD document 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.

15 W: Oral presentations of fire project proposals, 2 minutes each (timed). 1-3 power-point slides permitted recommended to help you to describe your methods and experimental design.

Learning Objective: This presentation will be graded on the basis of the rubric provided, the recommendations of which should be reflected in the structure of the talks, any slides presented, and the mode of presentation.

17 F: Formal fire experiments, weather permitting.

22 W: Sand pine scrub ecology, management, and edge effects.

Read:

- (4) Menges, E. 1999. Ecology and conservation of Florida scrub. In, Anderson et al. (editors), 1999. Savannas, Barrens, and Rock Outcrop Communities of North America.
- (5) Harper et al. 2005 (Conservation Biology)
- (6) Browse through a few other articles on edges to get ideas for an edge effect research project that you will conduct in sand pine scrub in Ocala National Forest. Most of the class will be dedicated to 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.

24 F Field: Controlled burn for formal experiments if it hasn't already happened.

Option 2: McCarty Woods, collect the necessary data to run Markov model representing transitions in the species composition of canopy trees.

Read:

- (1) Distributed notes on forest succession and matrix algebra.
- (2) Horn, H.S. 1975. Forest succession. Scientific American 232: 90-98.

Learning Objectives:

- (1) Understand the workings of about the simplest possible simulation model for predicting changes in forest composition over time.
- (2) Recognize the powers and weaknesses in this approach.

March

1 W: Oral presentations of results of fire research projects.

Learning Objectives: As for the proposal presentations, this presentation will be graded on the basis of the rubric provided. The expectation is for improvement, which is always possible. New mistakes or deficiencies will be accepted, but be sure to not err in the same ways as in the first presentation.

3 F: No class (if the fire presentations were all completed during the last class), we earned a break

4-11 No class, Spring Break.

15 W: Ecology of flooding.

Read: Relevant chapters from plant physiology books or appropriate websites on plant adaptations to flooding, effects of flooding on soils, and general issues related to anaerobiosis.

Learning Objectives: Understand why plants drown, what a black soil might indicate, why histosols are wet, and why extreme droughts kill so many wetland trees.

17 F Field: Swamp ecology at Cypress Highlands and thereabouts. Be prepared to get wet. A virgin cypress strand and a bayhead are featured.

Read: Ewel, K.C., 1990. Swamps. Pages 281-323 in EF.

22 W: Pine workshop,

Assignment: Bring samples of 3 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.

24 F Field: McCarty Woods Markov Model (if not done on 24 February, otherwise, no class)

25 S Field: Ocala National Forest

Assignment: Conduct your edge-effect research.

Learning Objectives:

1. Learn the natural history of sand pine scrub and understand its management.
2. Increase your insights into experimental design.

29 W: 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.

31 F Field: Restoration project study tour.

April

5 W: Forest ecosystem management or fiber farming, Florida style.

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.

7F Field: Industrial Forestry Fiber Farming (IFFF) Study Tour, Austin Cary Memorial Forest.

Activity: During the field trip you will also each present an analysis of the use of "Florida" in your fiction novel.

12 W: Models of Florida ecosystems: succession and ordinations.

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: Be able to use graphically depict the imagined ecosystem states and important driving factors in Florida.

14 F Classroom then Field: Suburban ecology and final plant quiz.

19 W: Oral presentations of edge effect research projects (poster option available).

FINAL EXAM (take home, distributed on last day of classes): Cumulative, heavily based on the assigned readings, starts in class, submit on paper in (or under the door of) 209 Carr Hall by 1200h Tuesday, 25 April.