UF in Kenya – Field Ecology in Africa (ZOO 4926)

Instructors: Todd Palmer (tmp@ufl.edu), Patrick Milligan (pmilligan@unr.edu)
Office: 411 Carr Hall
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Class hours: Summer A, full time, May 11 – May 30, 2025
Office hours: by appointment
Pre-requisites: Introductory Biology (BSC 2010, 2011) strongly encouraged

Course Textbook: This course has no formal textbook; students will receive a reader at the beginning of the course, consisting of readings from the primary literature.

Website: http://thepalmerlab.com/TMP/field_school.html

Course goals: To provide students with a rigorous and in-depth understanding of the ecology of savanna ecosystems, which cover roughly 20% of the terrestrial earth's surface. Savannas are extraordinarily important ecosystems, harboring rich biodiversity, and supporting much of the world's livestock. As human populations grow and their ecological "footprint" expands accordingly, understanding these threatened ecosystems has become an increasingly urgent priority. In this class, we will explore the savanna ecosystems of Kenya firsthand, learning about their geological history, their biogeochemical cycles, their biodiversity, and their ecology. Hands-on field exercises will be coupled with readings, class discussions, group activities and lectures to gain a grasp of the biological underpinnings of savannas. Armed with this knowledge, students will then design and carry out original small-group research projects at the Mpala Research Centre in Kenya, enter and analyze data, write up results as scientific papers, and create and deliver presentations of their results to scientists at the center. In addition to providing a solid foundation in the theory and practice of savanna ecology, there will be a strong focus on developing skills in the arenas of both critical thinking and scientific writing.

Required readings and assignments: Readings for this course will be drawn from the primary literature [1–24]. Students will be responsible for leading discussions of papers from the primary literature, including written synopses of the work, and an oral presentation at the beginning of the discussion period.

Grading: Grade points will be assigned per UF policy (please see https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/ for full details). You final grade will be determined on the basis of the following points breakdown.

a. participation (10%)
b. independent research project (30%)
c. literature presentation & discussion (20%)
d. mid-term and final exams (40%).

Class attendance policy: You will be expected to come to class and participate for each and every class period, field exercise, and group activity. If you must miss a class or activity, you'll need a valid excuse. Unexcused absences will result in points deducted from your attendance grade (1 pt per class; total of 30 points for 30 class periods). You will be responsible for any material missed in class, and for any assignments given or due on the day of the missed class. GRADES FOR LATE ASSIGNMENTS WILL BE DEDUCTED 10% PER LATE DAY.

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. Th only allowable purposes are (1) for personal education 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 deliver by an 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 presentation 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 guest 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: All students registered at the University of Florida have agreed to comply with the following statement: "I understand that the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University."

In addition, on all work submitted for credit the following pledge is either required or implied: "On my honor I have neither given nor received unauthorized aid in doing this assignment."

If you witness any instances of academic dishonesty in this class, please notify the instructor or contact the Student Honor Court (392-1631) or Cheating Hotline (392-6999). For additional information on Academic Honesty, please refer to the University of Florida Academic Honesty Guidelines at:
http://www.dso.ufl.edu/judicial/procedures/academicguide.html

Course evaluations: Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online. Students can complete evaluations in three ways:

1. The email they receive from GatorEvals,
2. Their Canvas course menu under GatorEvals, or
3. The central portal at https://my-ufl.bluera.com

Guidance on how to provide constructive feedback is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

Accommodations for Students with Disabilities: Students who will require a classroom accommodation for a disability must contact the Dean of Students Office of Disability Resources, in Peabody 202 (phone: 352-392-1261). Please see the University of Florida Disability Resources website for more information at: http://www.dso.ufl.edu/drp/. Note that the student should provide documentation of a requirement for accommodation by the second week of classes. No accommodations are available to students who lack this documentation. It is the policy of the University of Florida that the student, not the instructor, is responsible for arranging accommodations when needed. Once notification is complete, the Dean of Students Office of Disability Resources will work with the instructor to accommodate the student.

Health and Wellness:
U Matter, We Care: If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit U Matter, We Care website to refer or report a concern and a team member will reach out to the student in distress.
Counseling and Wellness Center: Visit the Counseling and Wellness Center website or call 352-392-1575 for information on crisis services as well as non-crisis services.
Student Health Care Center: Call 352-392-1161 for 24/7 information to help you find the care you need, or visit the Student Health Care Center website.
University Police Department: Visit UF Police Department website or call 352-392-1111 (or 9-1-1 for emergencies).
UF Health Shands Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; Visit the UF Health Emergency Room and Trauma Center website.

GatorWell Health Promotion Services*:* For prevention services focused on optimal wellbeing, including Wellness Coaching for Academic Success, visit the GatorWell website or call 352-273- 4450.

Academic Resources:
1. E-learning technical support: Contact the UF Computing Help Desk at 352-392-4357 or via e-mail at helpdesk@ufl.edu.
2. Career Connections Center: Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services.
3. Library Support: Various ways to receive assistance with respect to using the libraries or finding resources. Call 866-281-6309 or email ask@ufl.libanswers.com for more information.
4. Teaching Center: 1317 Turlington Hall, Call 352-392-2010, or to make a private appointment: 352- 392-6420. Email contact: teaching-center@ufl.edu.
5. General study skills and tutoring. Writing Studio: Daytime (9:30am-3:30pm): 2215 Turlington Hall, 352-846-1138 | Evening (5:00pm-7:00pm): 1545 W University Avenue (Library West, Rm. 339). Help brainstorming, formatting, and writing papers.
6. Academic Complaints: Office of the Ombuds; Visit the Complaint Portal webpage for more information.
Enrollment Management Complaints (Registrar, Financial Aid, Admissions): View the Student Complaint Procedure webpage for more information.

Course schedule: Lecture topics for this course are listed below. This is a tentative schedule; the dates and coverage of specific topics are subject to change.

Lecture #	Chapter	Topic
1	1	Savanna overview & climate
2	1	Soils: the basis of the system
3	1	Field exercise: a tale of two soil types
4	1	Nutrient cycling in savanna ecosystems: 1
5	2	Nutrient cycling in savanna ecosystems: 2
6	2	Factors regulating savanna ecosystems
7	2	The plants: morphology and life history
8	2	Field exercise: tree ID and the use of keys
9	2	Trees
10	2	Grasses
11	2	Field exercise: grass ID
12	2	Plant defense in theory
13	2	Field exercise: plant defensive adaptations
14	2	The tree grass mixture
15	3	The problem of cellulose
16	3	Ruminant physiology and digestion
17	3	The herbivores of savannas
18	4	Population biology and dynamics 1
19	4	Population biology and dynamics 2
20	4	Field exercise: mammal ID
21	4	Field exercise: dung transects

22	4	Field exercise: the “Distance” method
23	5	Species interactions 1: Competition
24	5	Field exercise: competition
25	5	Species interactions 2: Predation
26	5	Species interactions 3: Mutualism
27	5	Field exercise: ant-Acacia mutualism 1
28	5	Field exercise: ant-Acacia mutualism 2
29	5	Species interactions 4: Interaction networks
30	6	Community ecology of savannas 1
31	6	Community ecology of savannas 2
32	6	Community ecology of savannas 3

***Note:** additional readings accompanying the above lecture schedule will be drawn from the primary literature.

References

1. Bond, W. J. What limits trees in C-4 grasslands and savannas? *Annual Review of Ecology Evolution and Systematics* **39**, 641–659 (2008).
2. Bond, W. J. & Midgley, J. J. Ecology of sprouting in woody plants: The persistence niche. *Trends in Ecology & Evolution* **16**, 45–51 (2001).
3. Palmer, T. M. & Young, T. P. Integrating ecological complexity into our understanding of ant-plant mutualism: ant-acacia interactions in African savannas. in *Ant-plant interactions in a changing world* (eds. Oliveira, P. S. & Koptur, S.) 200–222 (Cambridge University Press, Cambridge, 2017).
4. Palmer, T. M. *et al.* Synergy of multiple partners, including freeloaders, increases host fitness in a multispecies mutualism. *Proceedings of the National Academy of Sciences of the United States of America* **107**, 17234–17239 (2010).
5. Palmer, T. M., Pringle, E. G., Stier, A. C. & Holt, R. D. Mutualism in a community context. in *Mutualism* (ed. Bronstein, J. L.) 159–180 (Oxford University Press, Oxford, 2015).
6. Scholes, R. J. & Archer, S. R. Tree-grass interactions in savannas. *Annual Review of Ecology and Systematics* **28**, 517–544 (1997).
7. Sankaran, M. *et al.* Determinants of woody cover in African savannas. *Nature* **438**, 846–849 (2005).
8. Coley, P. D., Bryant, J. P. & Chapin, F. S. Resource availability and plant anti-herbivore defense. *Science* **230**, 895–899 (1985).
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11. Goheen, J. R. & Palmer, T. M. Defensive plant-ants stabilize megaherbivore-driven landscape change in an African savanna. *Current Biology* **20**, 1768–1772 (2010).

12. Pringle, R. M., Prior, K. M., Palmer, T. M., Young, T. P. & Goheen, J. R. Large herbivores promote habitat specialization and beta diversity of African savanna trees. *Ecology* **97**, 2640–2657 (2016).
13. Riginos, C. & Young, T. P. Positive and negative effects of grass, cattle, and wild herbivores on Acacia saplings in an East African savanna. *Oecologia* **153**, 985–995 (2007).
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15. Holdo, R. M., Anderson, T. M. & Morrison, T. Precipitation, fire and demographic bottleneck dynamics in Serengeti tree populations. *Landscape Ecology* **29**, 1613–1623 (2014).
16. Young, T. P., Chase, J. M. & Huddleston, R. T. Community succession and assembly--comparing, contrasting and combining paradigms in the context of ecological restoration. *Ecological Restoration* **19**, 5–18 (2001).
17. Young, T. P., Palmer, T. A. & Gadd, M. E. Competition and compensation among cattle, zebras, and elephants in a semi-arid savanna in Laikipia, Kenya. *Biological Conservation* **122**, 351–359 (2005).
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19. Kamaru, D. N. *et al.* Disruption of an ant-plant mutualism shapes interactions between lions and their primary prey. *Science* **383**, 433–438 (2024).
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