

## COURSE SYLLABUS

SPRING, 2017

INSTRUCTOR: JOHN POULSEN

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OFFICE: LSRC A317  
OFFICE HOURS: Mon. 4:00-5:00, Wed. 1:00-2:00  
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CLASS HOURS: 12:00-12:50 Mon., Wed., & Fri. (EH 2102)

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### A. COURSE OVERVIEW

Tropical Ecology is the study of the biotic and abiotic interactions that shape the origin, maintenance, and consequences of species diversity in the tropics. This course is designed to provide a broad overview of tropical ecosystems, natural history, biological communities and their structure and function. Emphasis will be on terrestrial habitats, particularly tropical forests. The course is organized into three major parts. A third of the course focuses on tropical forest structure and distribution, and the abiotic factors that contribute to both. Another third focuses on species diversity, function, and the biotic interactions that define tropical communities. The final third examines the threats to tropical forests and issues related to their conservation and management. The primary goal of this course is to increase knowledge of tropical ecosystems (particularly forests), their importance theoretically and practically, and the potential local and global consequences of their defaunation, degradation, and deforestation. A second goal is to improve the ability of students to critically evaluate scientific literature, understand and participate in the scientific process, and to clearly articulate scientific and management arguments. Students should come away from the course well-versed on the major themes of tropical ecology, having developed an understanding of how the field of study has been shaped and what the outlooks are for the future.

### B. COURSE OBJECTIVES

What should you be able to do at the end of this class? Here are my goals for you:

1. Understand and be able to articulate the fundamental ideas and concepts underlying tropical ecology.
2. Possess knowledge of the major tropical regions, their natural history, and the differences among them.
3. Become comfortable and skilled at reading and critiquing primary scientific literature.
4. Possess improved writing and presentation skills, including stronger skills at writing and reviewing scientific proposals.
5. Understand how and why tropical ecosystems are being degraded and destroyed, and why this matters for species existence, including our own.

## C. TEACHING PHILOSOPHY & COURSE ORGANIZATION

As the Course Objectives suggest, I hope this course will build knowledge and (hopefully) passion for the tropics and sharpen professional skills. To do this, students must be actively immersed in the subject and the class. The following course activities are aimed at doing just that.

During 1-2 classes per week, I will present a lecture to provide background information on course topics. For the remaining weekly meetings, student presenters will lead discussions of recent scientific papers related to the topic-of-the-week.

### Reading and discussion

Students are expected to read all assigned articles and actively participate in classroom discussions. Although we all get busy in the middle of the semester, keeping up on the course readings is essential for success in the course.

### Student-led Presentations

Student teams (usually two students) will lead Friday discussions of 2-3 recent scientific papers related to the week's topic (assigned by me and the TA). The goal is to synthesize material covered in each topic to gain a deeper and more practical understanding of how these themes interact. The presenters should seek to discuss and critique the papers in an interactive way. Student teams are encouraged to be creative and employ novel or teaching techniques.

### Research Proposal

Students will choose a research topic of interest and prepare a short (~3 pages, single spaced, 1-inch margins, 12-point font) proposal requesting funding for their hypothetical study, as by a government agency. Proposals will synthesize current knowledge on the chosen topic, address its significance in a broader context, and make the case for a specific research project. The focus will be on critically evaluating gaps in our knowledge of tropical ecology and proposing a research project to fill those gaps. The proposal should test novel ideas, and should include the following sections: Introduction, Hypotheses, Objectives/Study Questions, Methods, and Broader Significance.

Each proposal will be reviewed by a group of student peers and presented for discussion, critique, and a hypothetical funding decision, in the absence of the student (to make the process anonymous). Students will be graded on (a) the quality of their proposal, (b) their critical review of 3 proposals written by peers, and (c) their written response to the reviews of their own proposal.

After the review of proposals, each student will revise his/her proposal based on the committee's comments and turn in a final draft and a "Response to Reviewers".

## D. GRADING PLAN

The course grade will consist of two mid-term exams, a research proposal (including peer review), a class presentation, and participation. The mid-term exams will be composed of a combination of multiple choice, short answer, and essay questions.

### Grading Scheme:

Participation (reading, discussion, Forum questions)	10%
Class Presentation	10%
Exam 1	15%
Exam 2	15%
Research Proposal	20%
Review of Research Proposals	15%
Response to Reviewers	15%
<b>Total</b>	<b>100%</b>

### Important Dates

Exam 1	February 10, 2017
Exam 2	March 10, 2017
Proposal Due	March 24, 2017
Group Review of Proposals	April 10 – 19, 2017
Revised Proposal/Response to Reviewers	April 28, 2017

## E. DUKE UNIVERSITY HONOR CODE

In all assignments and exams, don't forget the honor code...

Duke University is a community dedicated to scholarship, leadership, and service and to the principles of honesty, fairness, respect, and accountability. Citizens of this community commit to reflect upon and uphold these principles in all academic and nonacademic endeavors, and to protect and promote a culture of integrity.

### The Pledge

Students affirm their commitment to uphold the values of the Duke University community by signing a pledge that states:

#### To uphold the Duke Community Standard:

I will not lie, cheat, or steal in my academic endeavors;  
I will conduct myself responsibly in all my endeavors; and  
I will act if the Standard is compromised.

## F. COURSE TOPICS

### Part One: Tropical Ecosystems and Abiotic Factors

- 1/11, W Introduction to the Tropics**  
Topics: Course overview & expectations; why are the tropics special?
- 1/13, F Life Zones and Biomes**  
Topics: Biome overview; influence of climate and topography on life zone distribution  
*Murphy et al. 2012. Ecology Letters 15: 748-759.*
- 1/16, M HOLIDAY – Martin Luther King, Jr. Day**
- 1/18, W Biogeography and Evolution in the Tropics**  
Topics: Speciation, endemism, refugia, latitudinal diversity gradient  
*Ghazoul and Sheil. 2010. Chapter 6, pp. 120-127.*
- 1/20, F (1) DISCUSSION: Speciation and biogeography**  
*Mittelbach et al. 2007. Ecology Letters 10:315-331.*  
*Smith et al. 2013. Proc. R. Soc. B. 279: 3520-3526*
- 1/23, M The Structure of Tropical Rainforest**  
Topics: Plant forms, structural complexity, sunflecks, gaps  
*Chazdon and Pearcy. 1991. BioScience 41: 760-766.*
- 1/25, W Primary Productivity and Carbon**  
Topics: Carbon cycle, gross and net primary productivity
- 1/27, F (2) DISCUSSION: Tropical forest structure**  
*Malhi. 2010. J. Ecol. 100: 65-75.*  
*Lewis et al. 2013. Proc. R. Soc. B. 368(1625): 20120295*
- 1/30, M Drivers of Forest Biomass and Carbon Stocks**  
Topics: Carbon pools, determinants of carbon stocks, policy  
*Burton et al. 2016 Conservation Letters*
- 2/1, W Mineral Cycles and Tropical Soils**  
Topics: nutrient cycling, soil types and influence
- 2/3, F (3) DISCUSSION: Phenology**  
*van Schaik et al. 1993. Ann Rev. Eco. Syst. 24:353-377*  
*Curran and Leighton. 2000. Ecol. Monographs 70:101-128.*
- 2/6, M Tropical Plant Succession**  
Topics: Gaps, primary and secondary succession, plant growth, life-history trade-offs
- 2/8, W (4) DISCUSSION: Plant succession**  
*Ghazoul and Sheil. 2010. Chapter 11, pp. 240-246.*  
*Poorter and Bongers. 2006. Ecology 87(7):1733-1743.*
- 2/10, F EXAM 1**

## **Part Two: Diversity, Function, and Biotic Interactions**

- 2/13, M**      **Tropical Plant Diversity: Large-Scale Patterns**  
Topics: Patterns of diversity, gradients, Neotropics vs. Paleotropics  
*Givnish. 1999. J Ecology 87, 193-210.*
- 2/15, W**      **Paradox of the Trees: How is Tropical Diversity Maintained?**  
Topics: Neutral Theory, Gaps, and Disturbance Dynamics
- 2/17, F**      **(5) DISCUSSION: Patterns of species diversity**  
*ter Steege et al. 2013. Nature 342: 325-334.*  
*Brokaw and Busing. 2000. TREE 15: 183-188*
- 2/20, M**      **Maintaining Tropical Diversity II**  
Topics: Niche Differences, Competitive Exclusion, Niche Partitioning, etc.  
*Wright. 2002. Oecologia 130: 1-14.*
- 2/22, W**      **Maintaining Tropical Diversity III**  
Topics: Janzen-Connell Hypothesis, and wrapping it up  
*Janzen 1970. Am. Nat. 104, pgs. 501-504.*
- 2/24, F**      **(6) DISCUSSION: Mechanisms of species diversity**  
*Terborgh. 2012. Am Nat. 179: 303-314.*  
*Hubbell. 2005. Functional Ecology 19:166-172.*
- 2/27, M**      **Frugivory, Seed Dispersal, and Tree Recruitment**  
Topics: mutualisms, pollination, frugivory, seed dispersal  
*Wang and Smith. 2002. TREE 17: 379-385.*
- 3/1, W**      **Seed Predation**  
Topics: patterns and implications of seed predation, secondary dispersal
- 3/3, F**      **(7) DISCUSSION: Plant-animal interactions**  
*Harms et al. 2000. Nature 404: 493-495.*  
*Asquith et al. 1997. Ecology 78(3):941-946.*
- 3/6, M**      **Predation, the “Green World,” and Trophic Cascades**  
Topics: Trophic cascades, indirect food web interactions, compensatory responses  
*Terborgh et al. 2001. Science 294: 1923-1926.*
- 3/8, W**      **(8) VISIT TO DUKE GREENHOUSE**
- 3/10, F**      **EXAM 2**
- 3/13-17**      **SPRING BREAK**
- 3/20, M**      **Tropical Savannas**  
Topics: Savanna ecosystem plant-animal interactions and determinants of vegetation structure  
*Goheen et al. 2010. J. Anim. Ecol. 79: 372-382.*  
*Hopcraft et al. 2010. TREE 25: 119-128.*

- 3/22, W (9) VISIT TO LEMUR CENTER
- 3/24, F Tropical Coral Reefs – Visiting lecturer  
PROPOSAL DUE

**Part Three: Conservation and Development in the Tropics**

- 3/27, M **Wholesale Threats to Tropical Forests**  
Topics: Forest loss; timber, ranching, agriculture, mining, plantations, etc.
- 3/29, W **Fragmentation, Habitat Modification, and Climate Change**  
Topics: Ecological consequences of deforestation, fragmentation, habitat modification, fire, climate change, and defaunation  
*Wright. 2003. PPEES 6/1,2 pp. 73-86.*
- 3/31, F **(10) DISCUSSION: Anthropogenic Threats to the Tropics**  
*Wright and Muller-Landau. 2006. Biotropica 38(3): 287-301*  
*Malhi et al. 2008. Science 319: 169-172.*
- 4/3, M **Strategies for Biodiversity Conservation in the Tropics**  
Topics: ecotourism, community-based management, natural forest management and industry partnerships, parks.  
*Putz et al. 2012. Conservation Letters 0: 1-8.*  
*Peres and Terborgh. 1995. Cons. Bio. 9: 34-46.*
- 4/5, W **Conservation: Case study of Gabon**  
Land use management, tourism, low emissions development  
*Poulsen et al. 2017. Current Biology.*
- 4/7, F **(11) DISCUSSION: Strategies for Conservation**  
*Soulé. 1985. BioScience 35: 727-734.*  
*Kareiva and Marvier. 2012. BioScience 62: 962-969.*  
*Butler and Laurance. 2008. TREE 23(9).*
- 4/10, M **Proposal Review (in class)**
- 4/12, W **Proposal Review (in class)**
- 4/14, F **No Class (MP Symposium)**
- 4/17, M **Proposal Review (in class)**
- 4/19, W **Proposal Review (wrap-up)**