

# Tropical Ecology and Conservation

Bio 181/ENV 181

Fall 2017, Draft

**Tuesday and Thursdays, 3:00 – 4:30; Location, TBD**

## **Instructor:**

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## **Field instructors:**

Colin Orians

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## **Prerequisites:**

Biology 14 or equivalent and consent. Preference is given to students with prior background in ecology and conservation biology. (Note: this is a **HIGH DEMAND** that requires an application to be completed in the April prior to the course offering the following fall).

## **Course Description:**

Tropical systems are diverse, have many unique features when compared to temperate systems, and are threatened by human activities. This seminar and trip to Costa Rica is designed to provide students with an in depth understanding of tropical ecology and conservation and to enhance student research skills. During the fall semester, students will, in addition to weekly readings and discussions, give oral presentations and complete various writing assignments, including a research proposal. Over winter break students will travel to Costa Rica to carry out their proposed research, and to learn first-hand about conservation challenges and successes.

## **Coarse Objectives:**

- 1) Study the ecology and conservation of the terrestrial tropics
- 2) Learn to generate hypotheses, design experiments and to write a compelling research proposal
- 3) Gain first-hand research experience
- 4) Refine communication skills

## **Description of assignments:**

- Discussion Leader: Student teams will lead a discussion once during the semester. You should plan on using no more than 1 hour of the 1:15 minute class period.
- Reading Reflections: For dates where readings are required, you are expected to post your thoughts on that reading 24 hours in advance of class. Tell us what surprised you and what you would want to study next
- Topic Presentations: In teams of 2, students will give a **30-minute presentation** (20 minutes presentation + 10 minutes for questions). You should start broad but drill down to illustrate with an example or two. In addition you are required to provide a **reading** for the class to read in advance. You should describe: 1) the general problem, 2) the science behind it, and 3) the human dimension. At the time of your presentation, you must provide a **handout** (key points and references cited) and turn in an **annotated bibliography** for six of your sources.

- **Research Proposal & Presentation:** In teams of 2, students will propose a **comparative research project** that can be done at the La Selva Biological Station and at Sirena Research Lab in Corcovado National Park (see suggested topics below). This proposal is not a contract. You are likely to modify the project once you have had a chance to see the sites first-hand. (Please consult the **handout** for further instructions.)
- **Op-Ed article:** As scientists we also need to learn to communicate our science to the general public. How do you convince the public to care enough to take action? You will each write an op-ed on a topic of your choice.
- **Research report and Presentation in Costa Rica:** We will travel to the Atlantic lowlands (La Selva Biological Station), Pacific lowlands (Sirena-Corcovado National Park) and to the highlands (Copey de Dota). At the two lowland locations you will complete and present your independent **research project**. At the highland site you will write your final report and visit local farms.
- **Participation:** This is a seminar and thus its success depends upon class participation. Thus, you are expected to express your thoughts and ideas throughout the class.

**Summary of Assignments and Grading:**

• Discussion leader .....	10%
• Reading reflections.....	10%
• Topic Presentation .....	15%
• Research Proposal & Presentation.....	25%
• Op-Ed article .....	10%
• Research Reports & Presentations (in Costa Rica).....	25%
• Participation.....	5%

\*late assignments are penalized a half-letter grade per day

**Course Text and Materials:**

Forsyth, A. and K. Miyata. 1984. **Tropical Nature**, Simon & Schuster, New York. (**required for course**)

Beletsky, L. 2005. **Travellers' Wildlife Guides: Costa Rica**, Interlink Books, MA. (**optional for Costa Rica trip**)

\*All other readings provided in PDF form at least one week prior to class on TRUNK.

**Academic Conduct:**

Academic integrity, including avoiding plagiarism, is critically important. Each student is responsible for being familiar with the standards and policies outlined in the Tufts University Student Handbook, <http://uss.tufts.edu/studentAffairs/handbook/>. Moreover, it is the responsibility of the student to be aware of, and comply with, these policies and standards. In accordance with Tufts University's policy on academic misconduct, violations of standards of academic conduct will be sanctioned by penalties ranging from grade reduction or failure on an assignment; grade reduction or failure of a course; up to dismissal from the school, depending on the nature and context of any infraction.

Course & Assignment Schedule (to be adapted as necessary):

Class	Date	Topic	Assignment Due
1	T Sept 5	Introduction to course and to biomes of Costa Rica. What is science? Developing Hypotheses in Science	
2	Th 7	Tropical Biodiversity	Discussion of chpts 1, 2, 5, 6, 9-11, and 15 in Forsyth & Miyata's <u>Tropical Nature</u>
3	T Sept 12	<u>Tropical Nature</u> cont.	Book + 3 hypotheses and discussion
4	Th 14	Seasonality and Resource Limitation (D)	
5	T Sept 19	Costa Rican Biodiversity	Guest Lecture: Andres Vega
6	Th 21	Plants: Consequences of Resource Limitation (D)	
7	T Sept 26	Plants Adaptations (D)	
8	Th 28	Tisch Library Session	Meet in <b>ERC</b> room in Tisch Library
9	T Oct 3	Animals: Resource limitation and fluctuation (D)	
10	Th 5	Animals: Why do we care? (D)	
11	T Oct 10	<b>Topic Presentation 1.</b> Impacts of soils on patterns of biodiversity <b>Topic Presentation 2.</b> Why conservation needs community ecology.	Team presentations
12	Th 12	Research Proposal: Paper presentations	10 minute presentation by each team
13	T Oct 17	Why Mountains are Higher in the Tropics: Implications for Conservation (D)	
14	Th Oct 19	<b>Topic Presentation 3.</b> Deforestation: Consequences to climate and conservation. (or does deforestation indirectly impact biodiversity?) <b>Topic Presentation 4.</b> Effects of climate change and habitat fragmentation on conservation	Team presentations
15	T 24	Research Proposal: Hypothesis and Rationale	Peer Review
16	Th Oct 26	<b>Topic Presentation 5.</b> What modern technologies can facilitate rainforest conservation? <b>Topic Presentation 6.</b> Wildlife friendly agriculture: does it exist?	Team presentations
17	T Oct 31	Sustainable Agriculture: Traditional vs. Intensified (D)	
18	Th Nov 2	<b>Topic Presentation 7.</b> Resilience of an agro-ecological system (pick one) <b>Topic Presentation 8.</b> Community-supported conservation: Lessons from marine parks.	Team presentations
19	T Nov 7	Research Proposal Preparation	Sign up for individual consultations
20	Th 9	No Class (Friday's Schedule)	

21	T	Nov 14	Linking deforestation, climate and agriculture	Guest Lecture: Avery Cohn
22	Th	16	Communicating Science	Guest Lecture: TBD
23	T	Nov 21	Op-Ed (bring draft)	Op-Ed Peer review Draft Research Proposal due by 11:55pm to TRUNK (optional but required if you want feedback)
	Th	23	Thanksgiving Break - No Class	
24	T	Nov 28	Evolution in the Tropics (D)	
25	Th	Nov 30	Tropical Forests & Forestry (D)	Final Op-Ed due
26	T	Dec 5	<b>Research Proposal Presentations</b>	List of required supplies for project
27	Th	7	<b>Research Proposal Presentations</b>	Final Research Proposal due 11:55 pm Wed Dec 13 to TRUNK

### Possible Research Topics that focus on seasonality or nutrients

(Topics in bold and example questions below)

*Below are some general ideas and a list of previous projects is on the next page*

- **Biodiversity of plant types (shrubs, vines, epiphytes, bromeliads, ant plants, trees with buttresses, etc.)**  
e.g., Are understory shrubs more dominant at one location or the other? Does the ratio of epiphytes to vines differ?  
Is the density of high alkaloid sap trees different and how does this affect patterns of herbivory?
- **Biodiversity of animals (ants, wasps, moths, herbivores, spiders, soil invertebrates, herps, insectivorous birds, etc.)**  
e.g., Does seasonality affect patterns of herbivory/herbivore abundance? Does predator abundance follow a similar pattern?  
Is the composition of wasps similar at the two sites?  
Does the abundance of herps differ in abandoned cacao plantations at the two sites and how does this differ from the adjacent forest?
- **Frequency of stress adaptations in plants (thick succulent leaves, long-lived leaves, drip tips, sunken stomata, bark that repels vines, wood anatomy, etc.)**  
e.g., Are thick (or succulent) leaves more common at either site?
- **Behavioral ecology**  
e.g., Does resource limitation influence interactions among ant species? Are ants at resource-limited sites more omnivorous?  
How do baits differ in their attractiveness to flies, butterflies, rodents, etc. between the two sites?  
How do the foraging activities of vertebrates differ at the two sites?

- **Plant-animal interactions**

e.g., Are hummingbirds or hummingbird-pollinated plants less common at either site?

Does the availability of nectar resources differ and does this correlate with the abundance of nectar feeding ants? Are ant-plant mutualisms more common at one site?

- **Plant defense strategies**

e.g., Are leaves/plants more heavily defended at La Selva or Sirena? Do juvenile trees suffer more damage at one site?

**To develop an idea above or come up with your own you could also consult one of the books below or browse a recent issue of Biotropica, Journal of Tropical Ecology or other ecological journals:**

Carson, W.P. and S.A. Schnitzer. 2008. Tropical forest community ecology. Wiley-Blackwell.

Chazdon, R. and T.C. Whitmore, 2002. Foundations of tropical forest biology. University of Chicago Press.

Forsyth, A. 2008. Nature of the rainforest: Costa Rica and beyond, Cornell University Press, New York

Janzen, D.H. 1984. Costa Rican Natural History. University of Chicago Press.

Kricher, J. 2011. Tropical Ecology, Princeton University Press.

Leigh, E. G., Jr. 2002. A Magic Web: The tropical forests of Barro Colorado Island. Oxford University Press.

Losos E.C. and E.G. Leigh, Jr. 2004. Tropical forest diversity and dynamism. University of Chicago Press.

McDade, L.A., K.S. Bawa, H.A. Hespenehede, G.S. Hartshorn, eds. 1994. La Selva: Ecology and natural history of a neotropical rain forest. University of Chicago Press.

Montagnini F., C.F. Jordan. 2005. Tropical forest ecology: the basis for conservation management. Springer Berlin

Richards, P.W. 1996. The tropical rain forest, 2<sup>nd</sup> Edition. Cambridge University Press.

Terborgh, J. 1992. Diversity and the Tropical Rainforest. Scientific American Library. W.H. Freeman, New York

Terborgh, J., ed. 2002. Making parks work: strategies for preserving tropical nature. Island Press, Washington, DC.

Whitmore, T.C. 1998. An introduction tropical rain forests, 2<sup>nd</sup> edition. Oxford University Press.