Tropical Ecology & Conservation Course Info & Schedule Winter Term 2 – 2021

In this course we will explore fundamental ecological and evolutionary principles using tropical landscapes as our geographic template. We will assess the factors that make tropical systems both unique but also vulnerable to degradation, drawing from comparisons across geographic regions. While we learn about the structure, function and biological history of the tropics, we will address the myriad challenges these regions face in biodiversity loss and conservation practice.

This course is best suited for 3rd and 4th year students with a basic background in ecology, evolution and geography. Each week, we will introduce a course theme with a lecture, to provide a sound conceptual foundation, followed by discussion based on studies in the primary literature. Students are expected to read, evaluate and discuss scientific literature relevant to these course topics.

Instructor: Jill Jankowski
Office hours: By appointment online
Email: jankowsk@biodiversity.ubc.ca

Teaching Assistant: Jenny Munoz
Office hours: By appointment online
Email: jmunoz@zoology.ubc.ca

Learning Outcomes in this Course:

Upon successful completion of this course, students will be able to:

1. Apply principles of ecology to understand the structure and function of tropical ecosystems.
2. Understand the fundamental ecological, evolutionary and biogeographic processes that influence patterns of diversity within the tropics, historically and contemporarily.
3. Assess the anthropogenic threats to tropical systems and the conservation initiatives for biodiversity protection.
4. Read and evaluate scientific literature and provide critical reviews and commentary of published studies.
5. Use available data from published studies to test hypotheses generated through discussion of conceptual ideas in tropical ecology and conservation.
6. Integrate findings from research of scientific literature into a written and oral review of a tropical ecosystem and the challenges involved in its conservation.

Marking Breakdown:

1. Intellectual contributions (participation in class and group discussions)	15%
2. Assignments	25%
3. Group presentations	20%
4. Final research paper: review & synthesis	40%

1. Intellectual Contributions & Participation: Peer evaluation and feedback is central to scientific investigation, particularly in the development and refinement of ideas and written projects, reports or assessments. The lectures and the tutorials of this course are geared to allow you to ask questions, explore ideas, constructively criticize, and seek out answers through further investigation and inquiry. This full participation is expected in class. Intellectual contributions, including participation in class and in group discussions, will help you to gain confidence in articulating ideas in front of an audience and in assimilating and making inferences from information in scientific papers. Marking will be based on the guidelines outlined in the rubric for participation shown below. *Addresses learning objectives 1-4*

2. Assignments (journal article discussion and reports): We will read and discuss papers published in the primary literature, which relate directly to the major themes explored in the course. During discussion days, assigned groups will provide a brief overview of the paper, followed by a seminar-style discussion. Students should come to class having read the paper, with at least three of their own questions to facilitate discussion. Following discussion students will submit short assignment answering posted questions or problems developed in the discussion. Students can work on 'Discussion Report' assignments in groups. See the marking rubric below for a breakdown of the assessment criteria. *Addresses learning objectives 1-5*

3. Group Presentation: As part of the final research project, students will assemble a presentation that highlights each of the main components of their review and synthesis (see below). The aim of the presentation exercise is to help students verbally formalize their outlined projects as they write the first complete drafts of their paper. Presenters are offered feedback from their student peers, to evaluate the depth and quality of content for each section of their project, or to identify potential gaps and areas for improvement. The group component of this assignment encourages idea sharing and evaluation of alternative ideas in the design and composition of the oral (and written) project, including the importance of maintaining a supportive environment for group contributions, an important skill for scientific collaboration. Presentations will be assessed following the rubric shown below. *Addresses learning objectives 4-6*

4. Final Research Paper - Review & Synthesis: You will choose a tropical locality to research in a review and synthesis article, following the manuscript style of the journal *Trends in Ecology and Evolution.* In your assessment, you will assimilate information on four components that describe this region: biological diversity, historical biogeography, anthropogenic threats and conservation strategies. This report is designed to be similar to a "Rapid Assessment" style composition, using data and information gathered from published sources and primary scientific literature. Students submit drafts of their research paper to be exchanged for peer-review, with feedback from the teaching team, prior to the final submission. This assessment is centered on developing research and critical thinking skills, as well as sound writing, information assimilation and critique. See the marking rubric below for a breakdown of the assessment criteria. *Addresses learning objectives 1-6*

Tropical Ecology & Conservation **Schedule** **Winter Term 2 – 2021**

Week	Date	Topic	Tutorial /Tentative Readings
1	Jan 11 (M) Jan 13 (W)	L1: What and Where are the Tropics L2: Structure of Tropical Forests	Mannion et al. TREE paper
2	Jan 18 (M) Jan 20 (W)	L3: How many species? Patterns in biodiversity L4: Biogeography and Evolution in the Tropics	Guest Lecture – Dr. Cameron Ghalambor
3	Jan 25 (M) Jan 27 (W)	L5: Maintenance of diversity – Studies in tree communities 1 L5: Maintenance of diversity – Studies in tree communities 2	Kraft et al. 2008 Science
4	Feb 1 (M) Feb 3 (W)	L6: Rainforest Development and Dynamics 1 L6: Rainforest Development and Dynamics 2	Weir & Schluter 2007 Science
5	Feb 8 (M) Feb 10 (W)	L7: Species interactions and coevolution in the tropics 1 L7: Species interactions and coevolution in the tropics 2	Guest Lecture – Dr. Lesley De Souza
6	Feb 15-19	**WINTER BREAK**	
7	Feb 22 (M) Feb 24 (W)	L8: Trophic dynamics and coevolution in the tropics 1 L8: Trophic dynamics and coevolution in the tropics 2	Final project development
8	Mar 1 (M) Mar 3 (W)	L9: Tropical Dry Forests & Savannas L10: Montane Systems and Phylogenetic community structure	Graham et al. 2009 PNAS; Group activity; collate community structure studies
9	Mar 8 (M) Mar 10 (W)	L11: Carbon flux and climate change L12: Nutrient cycling and tropical soils	Guest Lecture – Dr. Luke Powell
10	Mar 15 (M) Mar 17 (W)	L13: Humans as part of Tropical Systems L14: Forest Fragmentation & Biodiversity	Stouffer et al. 2020 Ecology Letters
11	Mar 22 (M) Mar 24 (W)	L15: Forest Fragmentation & Biodiversity L16: Patterns of extinction and species loss	Guest Lecture – Marianne van Vlaardingen
12	Mar 29 (M) Mar 31 (W)	L17: Emerging pathogens, invasive species, bushmeat L18: Economic development and sustainable use	Student presentations & Project feedback
13	Apr 5 (M) Apr 7 (W)	L19: Climate change effects on tropical systems Presentations and student feedback on projects	Student presentations & Project feedback
14	Apr 12 (M) Apr 14 (W)	L19: Climate change effects on tropical systems L20: Restoration and successes in tropical conservation	

Course Content and Associated Learning Goals by Topic:

Climate, diversity of communities and classification:

- Understand how climates vary across the globe and the factors that determine these patterns – use this to explain why tropical forests are found where they are.
- Describe the diversity of ecosystems within the tropics and identify unique features of different tropical environments across the globe (what are the differences between tropical dry and wet forests, or within tropical montane regions).

Functional Tropics – productivity and biomass:

- Understand what productivity is and how it can be measured
- Become familiar with some of the major factors affecting nutrient cycling in the tropics and some of the key players (e.g., Mycorrhizae, roles of Phosphorus, overview of 'leaf economics')

Community structure and trophic structure:

- Understand how tropical forests are structured and how this may promote diversity
- Explore the complexity of tropical systems based on species interactions and unique relationships – start to reflect on how such interactions can generate and lead to higher diversity in the tropics

Species interactions:

- Review the kinds of species interaction there are, and understand how this relates to concepts such as niche partitioning and negative density dependence.
- Explore some of the interactions that are especially well developed or unique to the tropics (plant-pollinator interactions and networks, frugivory, including seed shadows and animal dispersal)

Biodiversity patterns:

- Understand the different spatial components of diversity and how they are quantified and interpreted (including alpha, beta and gamma diversity)
- Explore how these different aspects of diversity contribute to the latitudinal gradient in diversity
- Consider variation in diversity across tropical systems – why are some areas more or less diverse than others within the tropics?

Rarity in the tropics:

- Identify the different forms of rarity in numerical abundance and distribution on multiple scales, explore the consequences of correlations of rarity (in topics of extinction risk)
- Understand what endemism is and where endemics species are concentrated
- Consider these metrics in developing priorities for conservation.

Maintenance of diversity:

- Understand and evaluate different hypotheses that may maintain local diversity in tropical communities (including Janzen – Connell effects, negative density dependence)
- Discuss the fragility or stability of mutualistic relationships in the tropics, and explore the spectrum of biotic interactions in tropical systems that may influence diversity
- Evaluate patterns of niche partitioning in tropical systems and the evidence that this mechanisms maintains diversity in the tropics

Coevolution in the tropics:

- Explore some of the complex biotic interactions that make tropical systems unique (e.g., fig-wasp systems, leafcutter ant societies, specialized frugivory and seed dispersal)
- Discuss how these relationships can influence evolutionary patterns, and how this can in turn influence tropical diversity

Historical biogeography:

- Review major geological events and their potential impacts on biodiversity patterns (e.g., continental drift, mountain building
- Understand how such events have generated a diversity of ecosystems within the tropics

Origins of diversity:

- Assess rates of speciation and extinction across latitudes, and explore the evidence for how this may contribute to the diversity of tropical systems.
- Explore how the high diversity of the tropics relates to geological periods of time. Discuss how regional or continental-level factors might be important for the origins of diversity in the tropics (e.g., patterns of drift, mountain building, refugia and isolation).

Extinction and species loss:

- Step through different threats to tropical forests (e.g., deforestation, invasive species, bushmeat, pathogens), and how these vary across geopolitical boundaries and geographic regions. Explore this using different case studies.
- Evaluate threats to tropical systems with climate change. What are the forecasts (and uncertainty surrounding predictions) for species loss and how tropical communities will respond to climate change?
- Discuss synergistic effects of climate change and anthropogenic pressures on tropical systems.

Sustainable use in the tropics:

- Explore different ecosystem services in the tropics and their local, regional and global implications.
- Investigate REDD and PES programs and their potential successes and pitfalls

Successes in tropical conservation:

- Discuss cases of restoration or rehabilitation for tropical systems
- Review the history of protected areas in the tropics, including their establishment and maintenance, and the cases that have generated successful (or unsuccessful) conservation practice.

Selected chapters and reading materials from the following edited volumes and textbooks will be provided for classes and discussion:

Kricher, J. (2011) Tropical Ecology. Princeton University Press, Princeton, NJ

Laurance, W. F., & Peres, C. A. (Eds.). (2006). Emerging threats to tropical forests. University of Chicago Press.

Terborgh, J., van Schaik, C., Davenport, L., & Rao, M. (Eds.). (2002). Making parks work: strategies for preserving tropical nature. Island Press.

Malhi, Y., & Phillips, O. (Eds.). (2005). Tropical forests and global atmospheric change. Oxford University Press on Demand.

Plagiarism: There is zero tolerance for plagiarism in any form. Writing will be a major component of work in this course, through your assignments and term paper. It is critical that you generate your own ideas and give proper credit for the ideas of others. Please refer to the following UBC website for information regarding plagiarism and academic integrity: http://learningcommons.ubc.ca/resource-guides/avoiding-plagiarism/

Rubric for assessing Intellectual Contributions & Participation

	Exemplary (>80%)	Proficient (60%-80%)	Developing (50%-60%)	Unacceptable (<50%)
Frequency of participation in class	Student initiates contributions more than once in each discussion.	Student initiates contributions once in each discussion.	Student initiates contribution in at least half of the discussions.	Student does not initiate contribution and needs instructor to solicit output.
Quality of comments	Comments are consistently insightful and constructive. Balanced between general impressions, opinions and specific, thoughtful criticisms. Uses appropriate terminology.	Comments are mostly insightful and constructive. Occasionally comments are too genera or not relevant to the discussion. Mostly uses appropriate terminology.	Comments are sometimes constructive, with occasional signs of insight. Comments are not always relevant to the discussion. Student does not use appropriate terminology.	Comments are uninformative, lacking in appropriate terminology. Heavy reliance on opinion and personal taste, and lacks logical supported reasoning.
Listening skills	Student listens when other present materials and perspectives, as indicated by comments that build on others' remarks.	Student is mostly attentive when other present ideas, materials, as indicated by comments that reflect and build on others' remarks. Occasionally needs encouragement or reminder for focus or comment.	Student is often inattentive and needs reminder of focus of class. Occasionally makes disruptive comments while others are speaking.	Does not listen to others; regularly talks while other speak or does not pay attention while others speak; detracts from discussion; sleeps, etc.

Rubric for assessing Group Presentations

	Exemplary (>80%)	Proficient (60%-80%)	Developing (50%-60%)	Unacceptable (<50%)
Delivery	Holds attention of audience with use of direct eye contact, seldom looking at notes. Speaks with fluctuation in volume and inflection to maintain audience interest. Emphasizes key points.	Consistent use of direct eye contact with audience, but still returns to notes. Speaks with satisfactory variation and volume and inflection.	Displays minimal eye contact with audience, while reading mostly from the notes. Speaks in uneven volume with little or no inflection.	Holds no eye contact with audience, as entire report is read from notes. Speaks in low volume and/or monotonous tone, which causes audience to disengage.
Content/ Organization	Demonstrates full knowledge by answering all class questions with explanations and elaboration. Provides clear purpose and subject; pertinent examples, facts and/or statistics; supports conclusions/ideas with evidence	Is at ease with expected answers to all questions, without elaboration. Has somewhat clear purpose and subject; some examples, facts, and/or statistics that support the subject; includes some data or evidence that supports conclusions.	Is uncomfortable with information and is able to answer only rudimentary questions. Attempts to define purpose and subject; provides weak examples, facts, and/or statistics, which do not adequately support the subject; includes very thin data or evidence.	Does not have a grasp of information and cannot answer questions about subject. Does not clearly define subject; gives insufficient support for ideas or conclusions.
Enthusiasm/ Audience Awareness	Demonstrates strong enthusiasm about topic during presentation. Significantly increases audience understanding and knowledge of topic; convinces an audience to recognize the validity and importance of the subject.	Shows some enthusiastic feelings about the topic. Raises audience understanding and awareness of most points.	Shows little or mixed feelings about the topic being presented. Rasises audience understanding and knowledge of some points.	Shows no interest in topic presented. Fails to increase audience understanding and knowledge of topic.

Rubric for assessing Assignments and Final Research Paper

	Exemplary (>80%)	Proficient (60%-80%)	Developing (50%-60%)	Unacceptable (<50%)
Integration of knowledge	Paper/assignment demonstrates the student fully understands and has applied concepts learned in the course. Provides concluding remarks that show analysis and synthesis of ideas.	Paper/assignment demonstrates the student, for the most part, understands and has applied concepts learned in the course. Some of the conclusions, however, are not supported in the body of the paper.	Paper/assignment demonstrates that the student, to a certain extent, understands and has applied concepts learned in the course.	Paper/assignment does not demonstrate that the student has fully understood and applied concepts learned in the course.
Depth of discussion	In-depth discussion and elaboration in all sections of the paper.	In-depth discussion and elaboration in most sections of the paper.	The student has omitted pertinent content.	Cursory discussion in all the sections of the paper or brief discussion in only a few sections.
Cohesiveness	Ties together information from all sources. Paper flows from one issue to the next. Writing demonstrates an understanding of the relationship among material.	For the most part, ties together information from all sources. Paper flows with only some disjointedness. Author's writing demonstrates an understanding of the relationship among material.	Sometimes tied together information from all sources. Paper does not flow – disjointedness is apparent. Authors' writing does not demonstrate an understanding of the relationship among material.	Does not tie together information. Paper does not flow and appears to be created from disparate issues. Writing does not demonstrate understanding any relationships.
Spelling and grammar	No spelling and/or grammar mistakes.	Minimal spelling and/or grammar mistakes.	Noticeable spelling and grammar mistakes.	Unacceptable number of spelling and/or grammar mistakes.
Sources	More than minimum required current sources, of which at least two-thirds are peer-reviewed journal articles or scholarly books. Sources include both general background sources and specialized sources.	Minimum required current sources, of which half are peer-reviewed journals articles or scholarly books.	Fewer than minimum required current sources, and fewer than half are peer-reviewed journal articles or scholarly books.	Fewer than required current sources, and almost none are peer-reviewed journal articles or scholarly books.
Citations	Cites all data obtained from other sources. Consistent citation style is used in both text and bibliography.	Cites most data obtained from other sources. Consistent citation style is used in both text and bibliography.	Cites some data obtained from other sources. Citation style is inconsistent.	Does not cite or rarely cites sources. Citations are largely incomplete and inconsistent.