



S F S THE SCHOOL
FOR FIELD STUDIES

Tropical Ecology of the Amazon

SFS 3831

Syllabus
4 credits

The School for Field Studies (SFS)
Center for Amazon Studies (CAS)
Tarapoto, Peru

This syllabus may develop or change over time based on local conditions, learning opportunities, and faculty expertise. Course content may vary from semester to semester.

www.fieldstudies.org

© 2026 The School for Field Studies



COURSE CONTENT SUBJECT TO CHANGE

Please note that this is a copy of a recent syllabus. A final syllabus will be provided to students on the first day of academic programming.

SFS programs are different from other travel or study abroad programs. Each iteration of a program is unique and often cannot be implemented exactly as planned for a variety of reasons. There are factors which, although monitored closely, are beyond our control. For example:

- Changes in access to or expiration or change in terms of permits to the highly regulated and sensitive environments in which we work;
- Changes in social/political conditions or tenuous weather situations/natural disasters may require changes to sites or plans, often with little notice;
- Some aspects of programs depend on the current faculty team as well as the goodwill and generosity of individuals, communities, and institutions which lend support.

Please be advised that these or other variables may require changes before or during the program. Part of the SFS experience is adapting to changing conditions and overcoming the obstacles that they may present. In other words, this is a field program, and the field can change.

Course Overview

Tropical regions are highly biodiverse. Among them tropical forests are the most species-rich biome, and particularly the tropical forests in South America are more species rich than the tropical forests in Africa and Asia. The tropical rainforest in the Amazon biome covers most of the Amazon basin of South America and represents over half of the planet's remaining rainforest.

Like the biodiversity of the Amazon rainforest, where 1 out of 10 known species can be found, the interactions of their organisms are also outstanding. Ecology studies these interactions, the interactions of organisms with other organisms and with their environment. In this course, we will look at the natural history and processes that created and sustained the Amazon's biodiversity at multiple scales: species, community, ecosystem, and landscape.

The goal of this course is to understand the processes that contribute to diversity in the Western Amazon, gain insight into similar processes in tropical areas around the world, and explore how different interacting organisms form a functioning ecosystem. We will explore fundamental principles of ecology by studying diverse ecosystems and the habitats and species found there, including a variety of lowland tropical and high-elevation forests at the headwaters of the Amazon River in the Andes Mountains.

Our exploration is grounded by three themes:

1. What is biodiversity? evolutionary origins, scales, and measurement.
2. Why are the tropics so diverse? ecosystem dynamics, succession.
3. How are tropical ecosystems formed? Interactions, types, and classifications.

Using field methodology and guided by the scientific method, we will focus on learning tools that allow students to measure, describe, and explain biodiversity and its dynamics. This class is focused on field-based and hands-on learning, so come prepared to get your feet wet and hands dirty!

Learning Objectives

In this course students should develop conceptual understandings and practical skills that afford them an appreciation of the diversity and complexity of the natural systems of the Amazon region. Specific learning objectives are the following:

1. Comprehend and apply the concept of biodiversity and its various levels (genetic, functional, species and ecosystem diversity) to promote a better interaction between people and the natural world.
2. Strengthen student's critical thinking in order they can provide informed opinions while debating topics related with ecology and environment.
3. Develop scientific curiosity, observational and questioning skills, field research abilities, and analytical approaches for studying different organisms and ecosystems.
4. Improve student's science communication abilities to make difficult science subjects more understandable and interesting for broader audiences.
5. Discover the tight ties that bind all the different tropical ecosystems (from the Andes to the Amazon), how these ecosystems are linked to economy and society, and how these connections are being threatened in the anthropocene.

Assessment

Assessment Item	Value (%)
-----------------	-----------

Natural history exercises	20
Integrated discussion	5
Fieldtrip analysis	10
Field Exercise and presentation	35
Final exam	20
Participation	10
TOTAL	100

Natural History Exercises (20%)

Context: The loss of biodiversity, pollution, and climate change are referred to as the "triple planetary crisis". Many ecologists try to propose solutions based on science, but the gap between people and nature, the public's ignorance and misperception of the environmental services and their threats are also part of the problem. Science needs to be translated for a non-scientific public to influence people's choices and actions and promote a better understanding and respectful coexistence with our natural surroundings. Usually, ecologists use statistics and complex models to understand ecological processes on nature. However, some of those ecologists have never seen the species or communities they model or speculate about. The socio-environmental current problem requires ecologist work and interact with nature and people to help them to reconnect with each other, for that reason integrating natural history is necessary. Dayton & Sala (2001) called the natural history as the sense of wonder, creativity and progress in ecology and they explained that research and review articles are a valuable tool for communication among scientists, but we need to look for different strategies for increasing people bioliteracy.

NHE I: Intro to Amazon/Andean species (5%)

Students will: a) prepare themselves to be ready for exploring a new ecosystem by reading and conveying information about some of the most common species in the visited region, b) summarize the necessary information to identify and understand the ecology and behavior of those common species, and c) look for an alternative way to transmit the most important information to a non-scientific public.

Methodology: each student will choose 3 species from the list of common species observed previously in the fieldtrips. They will work in groups, look for and present orally (40 min) the natural history of each species selected (Family, scientific, Peruvian and English common name, diagnostic characteristic, social structure, food habits, and fun/interesting fact). Detailed instructions will be given after the submission of each assignment.

NHE II: naturalist journal (15%)

Students will: a) explore, observe and describe the different ecosystems we visit during our fieldtrips, b) summarize all the information that capture their attention by drawing and/or writing the species and behaviors they see, c) compare and describe the similarities and differences in forest structure and composition of the ecosystems visited (Premontane forest, agroforestry system, flooded forest, white-sand forest, riparian ecosystem, cloud Forest, Polylepis forest and the Andean grassland).

Methodology: each student will create a field journal based on their trips where they are going to describe the most common and iconic species of each ecosystem visited and compare by observation the forest structure and composition of the ecosystems visited. Detailed instructions will be given after the submission of each assignment.

Integrated discussion (5%)

Context: Interdisciplinarity is important to incorporate levels of cultural and societal context to ecological or biological findings and vice versa. By combining multiple perspectives, the interdisciplinary process creates a holistic idea of a specific study case, instead of a narrow conclusion based on a single discipline. The most pressing effects of anthropogenic climate change are driven by a complex web of ecological, social, and political dynamics, so reducing the scope of conservation study to any one of these aspects excludes the important context needed to address the issues. Restricting the scope of conservation research into just one of these factors leaves out crucial context that is required to address the most urgent effects of anthropogenic climate change, which are driven by a complex web of ecological, social, and political interactions.

Students will: a) analyze a study case based on different perspectives (Tropical ecology, Political ecology and Conservation science), and b) plan and lead the discussion related to topics learned on fieldtrips.

Methodology: students will split into 3 groups. Each group is going to oversee leading the discussion during some fieldtrip debriefing sessions. Professors will provide some general topics that students need to survey during the fieldtrip in order to have enough information for organizing the discussion and provide conclusions.

Field Trip Analysis (10%)

Students will: a) read and summarize a scientific paper, b) identify opportunities in the fieldtrips for applying the concepts read in the paper and explain them to the class, c) design an Instagram post using videos from the fieldtrip where they easily explain the main messages of the paper to a broader audience.

Methodology: students will work in pairs. Professor will assign one topic, one scientific paper and one field trip to each pair. The students will have 10-20min to explain the topic based on the paper and the context of the fieldtrip site. Besides this speech, the outcome of the exercise will be an IG post design by the students with photos and videos taken during the field trip. Detailed instructions will be given after the submission of each assignment.

Field Exercises (35%)

Context: This field exercise is designed to give students practical experience in applying the scientific method to investigate ecological questions. By formulating and testing biological hypotheses in a natural setting, students will deepen their understanding of how scientific knowledge is generated and used to inform environmental decision-making. Working in the field fosters essential critical thinking skills, as students must evaluate evidence, design experiments, analyze complex data, and draw reasoned conclusions. These skills are vital for future professionals who will address environmental challenges using evidence-based approaches. The exercise also promotes interdisciplinary learning, collaboration, and scientific literacy, preparing students for roles in research, environmental management, and policy.

General methodology: students will split in 4 groups, and each group is going to work in one specific project (see project description below). Each project will have the following sections: a) a group meeting with the professor to understand the topic previously and prepare a class for their fellows, b) a class leading by the group where they explain how to analyze the data taken during the fieldtrip, c) a written report following the IMRAD structure, and d) an oral presentation to show the final results of the project (20min/group).

FEX.G1. Biodiversity analysis: species richness vs species diversity

Context: In ecology we try to identify how biodiversity is distributed, we look for patterns, we identify biodiversity hotspots and the reasons behind them. The better we understand those patterns, the better we manage and conserve nature. Altitudinal gradients are natural laboratories where you can observe how changes in environmental conditions along different elevations influence the species

composition of a specific group of organisms. In order to test and visualize those changes in species richness and diversity between different elevations, we will compare the community of bats of Alto Shilcayo (500m a.s.l.) and Chirikyacu Native Community (1000m a.s.l.).

Students will learn: a) to organize and analyze biodiversity data sets, b) to use a GPS for creating waypoints, c) to set one of the most common sampling methods for bats and birds, d) to collect information in the field, and e) to describe and discuss the main characteristics of a biological community and the species distribution pattern along and altitudinal gradient.

Methodology: students will lead a class about biodiversity analysis, set up mist nets for capturing bats, create a database with the information collected, and analyze it later.

FEX.G2. Multivariate analysis: Species-habitat interactions

Context: During this field exercise, students will investigate how microhabitat characteristics and species–species interactions shape animal behavior and distribution, using tent-roosting bats as a model system. By examining the plants selected as roosts and the surrounding neighborhood structure, students will explore how plant traits, spatial arrangement, and ecological interactions influence roost choice, and local bat distributions. This hands-on activity highlights the tight links between habitat structure and animal ecology at fine spatial scales.

Students will learn: a) to use a GPS for creating tracks and waypoints, b) to create plots for measuring plants and microhabitats characteristics, and c) to process the data obtained to describe, analyze and discuss the species distribution pattern.

Methodology: students will lead a class about multivariate analysis, then they will establish plots in the field and learn to measure some structural variables of the microhabitat as DAP, canopy and understory cover and specific plant species density in the forest of Alto Shilcayo, Cordillera Escalera Regional Conservation Area. They will create and organize a data base with the information collected, and analyze it later.

FEX.G3. Activity patterns through bioacoustics

Context: To understand the species distribution patterns, we also need to understand each species natural history, ecology and behavior. This information can provide valuable insights in order to see interactions between species or between species and their surroundings that could be used as bioindicators of ecosystem stability and quality. In the Amazon, one species used as bioindicator is the Great-fishing bat (*Noctilio leporinus*), we will visit Yarapa River in the Peruvian Amazon to study the activity pattern of the Great-fishing bat (*Noctilio leporinus*), and to analyze spatiotemporal changes in its activity pattern.

Students will learn: a) to use a GPS for creating tracks and waypoints, b) to use AudioMoths and Bioacoustic surveys to study animal behavior and distribution, and c) to process the data obtained to describe, analyze and discuss the species distribution pattern.

Methodology: students will lead a class about bioacoustics analysis, configurate the AudioMoths for recording fishing bats, then they will establish and georeference acoustic stations in a systematic way along the Yarapa River. They will take environmental variables related to each point, create a data base with the information collected, and analyze it later.

FEX.G4. Plant-animal interaction network

Context: After ecological disturbances, some of the first changes are not in the species community structure, but in the behavior and interactions of those species. We will create a baseline that describes those interactions to have information for monitoring and detecting perturbation signals in the ecosystem faster than using species richness. We will survey plant-hummingbird interactions in the

cloud forest of Wayqecha. Cloud forest is one of the most threaten ecosystem, that is why we will start monitoring it using the pollination network between hummingbirds and the plants they visit.

Students will learn: a) to observe and identify different species of hummingbirds, b) to collect and classify pollen samples, and c) to create, describe and discuss interaction networks.

Methodology: students will lead a class about interaction network analysis, they are going to observe hummingbirds visit the flowers in the Wayqecha Gardens, count the number of visits by hummingbird species, compile data, and use interaction networks for analysis afterwards.

Final Exam (20%)

The final exam is open book. Students will have one day to answer several short and long-answer questions related to different ecological topics. You will be examined on what you have been exposed to in class (lectures, discussions, etc.) and in the field, and what you have been asked to read. The exam will ask you to draw on multiple concepts and experiences and synthesize information in response to ecological scenarios.

Participation (10%)

Active participation in all class activities is expected in this course, including promptness and preparedness for field activities. Students are encouraged to engage in class discussion (active listening, constructive contribution by raising or answering questions). Engagement in discussion, contribution to group work during FEXs, timeliness and preparedness for activities throughout the semester are expected for full participation marks. The contribution, listening and attitude during classes will be considered for this item.

Grading Scheme

A	95.00 - 100.00%	B+	86.00 - 89.99%	C+	76.00 - 79.99%	D	60.00 - 69.99%
A-	90.00 - 94.99%	B	83.00 - 85.99%	C	73.00 - 75.99%	F	0.00 - 59.99%
		B-	80.00 - 82.99%	C-	70.00 - 72.99%		

General Reminders

Honor Code/Plagiarism – SFS places high expectations on their students and we hold students accountable for their behaviors. SFS students are held to the honor code below. SFS has a zero-tolerance policy towards student cheating, plagiarism, data falsification, and any other form of dishonest academic and/or research practice or behavior. Using the ideas or material of others without giving due credit is cheating and will not be tolerated. Any SFS student found to have engaged in or facilitated academic and/or research dishonesty will receive no credit (0%) for that activity.

"I approach coursework, fieldwork, and research with integrity and commit to full participation. I do my own work with honesty and give credit where it's due. I use tools and technology responsibly and only as permitted. I speak up when something conflicts with our shared values. I respect the communities we learn from and commit to ethical, non-extractive research that keeps knowledge connected to the places and people who share it with us."

Deadlines – Deadlines for written and oral assignments are instated to promote equity among students and to allow faculty ample time to review and return assignments before others are due. As such,

deadlines are firm; extensions will only be considered under extreme circumstances. Late assignments will incur a penalty of 10% of your grade for each day you are late. After two days past the deadline, assignments will no longer be accepted. Assignments will be handed back to students after a one-week grading period. Grade corrections for any assessment item should be requested in writing at least 24 hours after assignments are returned. No corrections will be considered afterwards.

Content Statement – Every student comes to SFS with unique life experiences, which contribute to the way various information is processed. Some of the content in this course may be intellectually or emotionally challenging but has been intentionally selected to achieve certain learning goals and/or showcase the complexity of many modern issues. If you anticipate a challenge engaging with a certain topic or find that you are struggling with certain discussions, we encourage you to talk about it with faculty, friends, family, the HWM, or access available mental health resources.

Participation – Since we offer a program that is likely more intensive than you might be used to at your home institution, missing even one lecture can have a proportionally greater effect on your final grade simply because there is little room to make up for lost time. Participation in all components of the course is mandatory, it is important that you are prompt for all activities, bring the necessary equipment for field exercises and class activities, and simply get involved.

AI Usage for Assignments – SFS acknowledges the growing role of artificial intelligence (AI) tools in education and professional settings. While AI can be a valuable resource for learning and productivity, its use must align with the learning goals and integrity of each assignment. For this reason, students are encouraged to discuss the acceptable uses of AI for each assignment with the instructor. If you wish to use AI for any part of an assignment, consult with the instructor beforehand to ensure that its use adheres to the academic expectations of the course. Let's work together to navigate this evolving landscape responsibly!

Course Content

Type: L - Lecture, FL - Field Lecture, FEX - Field Exercise, LAB - Lab Exercise, D – Discussion

***Readings in bold are required**

No	Topics Covered	Hours	Type	Required Readings
01	Course Introduction	1.0	L	
02	What is Biodiversity? This lecture will review the different definitions of biological diversity ranging from genetic to landscape scales. We will introduce classic methods and indices used to quantify and analyze data. Biodiversity analysis meeting with group 1.	2.0	L	Morton and Hill (2015).
03	FEX.G1-G2 Planification We will introduce the process of doing science through scientific methods. Students will practice the process of observation, questioning, hypothesis formulation and hypothesis testing by organizing the first two FEX projects.	1.0	L; D	
04	The Tropics...Why Are They So Biodiverse? We will introduce the high biodiversity of tropical regions and the Western Amazon in a global context (e.g., species distribution patterns and speciation processes).	2.0	L	Gentry (1988). Kricher (2011). Rahbek (1995).
05	FEX.G1 Biodiversity and FEX.G2 Multivariate Analysis Data Collection After students plan methodology for biodiversity analysis exercise, we will collect the data in the forest of Alto Shilcayo, Cordillera Escalera Regional Conservation Area.	2.0	FEX	
06	Intro to Amazon Ecosystem: Premontane Forest We will explore a premontane forest in a Sub-Andean mountain range close to CAS. In the Cordillera Escalera Regional Conservation Area (ACR-CE) we will have an orientation walk, while the students participate in a bat-roost monitoring survey.	2.0	FL	Dayton and Sala (2007).
07	Biodiversity Data Analysis Session (FEX.G1) We will introduce data analysis through R program. Students will learn to analyze the data collected during ACR-CE fieldtrip, and they will learn to perform rarefaction curves and dendrograms to analyze biological data through statistical tests.	1.5	FEX; LAB	
08	FEX.G3 Planification Students will use the scientific method to plan the methodology for studying the Great Fishing Bat in the Yarapa River during the Iquitos fieldtrip.	1.0	L; D	

No	Topics Covered	Hours	Type	Required Readings
09	Intro to Amazon Ecosystem: Flooded Forest, Upland Forest and White-Sand Ecosystems We will describe the origin of the Amazon and the main characteristics of some of the most representative ecosystems to be visited during our Iquitos fieldtrip. Students will introduce some iconic species of plants and animals, describing their morphology, behavior & ecology.	1.5	L	
10	Fauna Survey Techniques: Rio Amazonas Research Station We will travel through the Amazon River to arrive in a floating biological station to learn different survey techniques and collect data on different groups of animals (seashore birds, frogs, bats, and arboreal and terrestrial mammals) for the monitoring projects implemented by Río Amazonas Field Station Boat.	8.0	LAB	Bodmer, et al. (2024). Bodmer, et al. (2017).
11	Bioacoustics: Studying Biodiversity Through Sound (FEX.G3 Data Collection) We will learn what bioacoustics is and how we can use it to know about the ecology of different organisms. We will also learn how to use AudioMoths and how to analyze the data collected by them through an experimental exercise with the Greater Fishing Bat (<i>Noctilio leporinus</i>) in the Yarapa River. Bioacoustics analysis group meeting (FEX.G3).	2.0	FL; FEX	Penar, et al. (2020). Teixeira, et al. (2019).
12	From the Flooded to the Upland Amazonian Forest We will visit, explore and compare the similarities and differences between the flooded forest around the Amazon River and the upland forest of the Allpahuayo-Mishana National Reserve.	2.0	FL	Adeney, et al. (2016).
13	Scientific Writing IMRAD Structure We will learn the basic components of a paper and discuss strategies to improve the scientific writing process.	2.0	L	
14	Multivariate Data Analysis Session (FEX.G2) We will introduce data analysis through R program. Students will learn to explore and describe the data collected during Iquitos fieldtrip, and they will learn when and how to perform correlation and PCAs to analyze biological data through statistical tests.	1.5	FEX; LAB	
15	QGIS Workshop Students will learn how to create a map using QGIS. They will create a map to visualize the study area of their specific FEX project.	1.5	LAB	

No	Topics Covered	Hours	Type	Required Readings
16	Landscape Ecology We will talk about landscape parameters and analyze them (forest fragments, forest cover, forest perimeter, agricultural cover and urbanized cover) around Las Nuwas Project and Chirikyacu Native Community to understand how important land management and planning is.	2.0	L; LAB	Laurance, et al. (2018).
17	Fieldtrip Debriefing and Integrated Discussion G1: How Ecology Can Make Subsistence Hunting Sustainable? We will discuss the present and future of the Amazon. How can ecology provide valuable information for managing the landscape and natural resources in a more sustainable way?	1.0	D	
18	Angiosperm Origin, Evolution and Diversity We will learn about the plant diversity in the tropics, particularly the diversity of Peruvian angiosperms.	2.0	L; LAB	Boyce, et al. (2010).
19	Bioacoustic Data Analysis Session (FEX.G3) Students will analyze the data extracted from the recorders and learn when and how to perform an ANOVA to analyze biological data through statistical tests.	1.5	FEX	
20	Intro to Amazon Ecosystems: Wetlands We will visit Santa Elena Reserve where we will analyze the concept of wetlands; we will observe the organisms around the wetlands and discuss their importance and threats.	1.0	L	Kingsford, et al. (2016).
21	Interactions Behind Diversity Hotspots Why are ecological interactions so important? We will deeply understand their role in biodiversity and their importance at various levels: for the species, for their ecosystems, and for us humans. We will further discuss how biotic interaction can be translated into ecological services which impact directly the well-being and resilience of the people and the entire ecosystem.	2.0	L	Dellinger (2020). McConkey, et al. (2012). Fine, et al. (2004).
22	FEX.G4 Planification We will plan the methodology to survey plant-hummingbird interactions in the cloud forest of Wayqecha.	1.0	LAB	
23	Bat Ecology We will talk about the remarkable diversity of bat species, highlighting their wide range of diets, behaviors, and habitats across the globe. The discussion emphasized the vital ecosystem services bats provide. We will also address common myths about bats and how they are often fueled by misinformation or misinterpretation of scientific data.	2.0	L; FL	Vera, et al. (2019). Clement, et al. (2003).

No	Topics Covered	Hours	Type	Required Readings
24	Fieldtrip Debriefing G2: Forest Concept, Perception and Conservation (Land Management) We will analyze and compare the concept of forest given by a) the government, b) indigenous communities, and c) the ecology. We will also study how life perception influences the landscape management.	1.0	D	Chazdon, et al. (2016).
25	Intro to Amazon Ecosystems: Tropical Montane and Alpine Ecosystems We will describe the main characteristics of some of the most representative ecosystems to be visited during our Cusco field trip. Besides, students will introduce some iconic species of plants and animals by describing their morphology, behavior and ecology.	1.5	LAB	
26	FEX.G4 Interaction Networks Data Collection Students are going to observe hummingbirds visit the flowers in the Wayqecha Gardens, count the number of visits by hummingbird species, compile data, and use interaction networks for analysis afterwards. Interaction network analysis meeting Group 4.	3.0	FEX	
27	Tropical Cloud Forest: From the Ground to the Canopy How does the forest environment change vertically and how do organisms use this structure? We will use a canopy walkway to explore the vertical structure of a mature rainforest and observe how light and temperature varies with height, and how organisms such as epiphytes and birds change along this gradient.	1.0	FL	Metcalf, et al. (2024). Madigosky and Vatnick (2000). Nadkarni and Solano (2002).
28	Andean-Amazon Connectivity: From the Andean Grassland to the Amazon Flooded Forest We will visit El Manu National Park to observe how the Andes Mountain range relates to the Amazon forest.	1.0	FL	
29	Polylepis Forest in the High Andes We will visit forests in high elevations dominated by Polylepis. These forests are of high conservation concern. We will discuss their distribution and ecology importance.	1.0	FL	Kessler, et al. (2014).
30	Fieldtrip Debriefing G3: Climate Change Impact in Water and Biodiversity Global warming, uncommon rain patterns, increasing number of sunny days...All of them are affecting biodiversity, but also the ecosystem services we obtained from the forest. We will discuss those climate change effects and propose ideas to improve ecosystem health.	1.0	D	Zhao, et al. (2024).

No	Topics Covered	Hours	Type	Required Readings
31	Anthropocene and Biodiversity Loss This last geological era is characterized for the 6th largest biodiversity extinction event, driven by human being. We are going to discuss the hypothesis behind this association and determine if human being is the real responsible of this biodiversity loss.	1.0	L	Lewis and Maslin (2015). Johnson, et al. (2017).
32	Interaction Networks Data Analysis Session (FEX.G4) Students will learn to create, describe and discuss biotic interaction networks.	2.0	FEX; LAB	
33	Urban Ecology: Looking for Green Cities and Better Human-Nature Coexistence Most of the investigation and conservation efforts have been focused on protected areas, but conservation needs to start from the cities. We will see some examples about how to connect cities with nature.	2.0	L; D	McPhearson, et al. (2016).
34	Students Presentations Students will introduce the projects (justification, objectives, hypotheses, methodology, results, discussion and conclusions) developed during the FEXs in a symposium modality.	1.0	FEX	
35	Course Review	1.0	D	
	Total	60		

**[UMN defines](#) an instructional hour as a 50-minute block. SFS syllabi are written in full 60-minute hours for programming purposes. Therefore 50 full hours = 60 UMN instructional hours (for four credit courses) and 25 full hours = 30 UMN instructional hours (for two credit courses).*

Reading List

*Readings in bold are required

1. **Adeney, J.M., Christensen, N.L., Vicentini, A. and Cohn-Haft, M. (2016).** White-sand ecosystems in Amazonia. *Biotropica*, 48(1), 7-23.
2. Bodmer R., Fang, T., Antunez, M., Puertas, P., Chota, K., et al. (2017). Impact of recent climate fluctuations on biodiversity and people in flooded forests of the Peruvian Amazon in: The Lima Declaration on Biodiversity and Climate Change: Contributions from Science to Policy for Sustainable Development. CBD Technical Series No. 89. (eds. Rodriguez, L. and I. Anderson). Secretariat of the Convention on Biological Diversity, Montreal. pp. 81-90.
3. **Bodmer, R.E., Puertas, P., Fang, T., et al. (2024).** Management of Subsistence Hunting of Mammals in Amazonia: A Case Study in Loreto, Peru. In *Amazonian Mammals: Current Knowledge and Conservation Priorities* (pp. 275-297). Springer.
4. Boyce, C. K., Lee, J. E., Feild, T. S., Brodribb, T. J., & Zwieniecki, M. A. (2010). Angiosperms helped put the rain in the rainforests: the impact of plant physiological evolution on tropical biodiversity1. *Annals of the Missouri Botanical Garden*, 97(4), 527-540.
5. **Chazdon, R. L., Brancalion, P. H., Laestadius, L., Bennett-Curry, A., Buckingham, K., Kumar, C., ... & Wilson, S. J. (2016).** When is a forest a forest? Forest concepts and definitions in the era of forest and landscape restoration. *Ambio*, 45(5), 538-550.
6. Clement, C.R., McCann, J.M. and Smith, N.J. (2003). Agrobiodiversity in Amazonia and its relationship with dark earths. In *Amazonian Dark Earths: Origin Properties Management*, 159-178.
7. **Dayton, P.K. and Sala, E. (2007).** Natural history: the sense of wonder, creativity and progress in ecology. *Scientia Marina*, 65(S2), 199-206.
8. Dellinger, A. S. (2020). Pollination syndromes in the 21st century: where do we stand and where may we go?. *New Phytologist*, 228(4), 1193-1213.
9. Fine, P.V.A, Mesones, I., and P.D. Coley (2004). Herbivores promote habitat specialization by trees in Amazonian Forests. *Science* 305:663-665.
10. Gentry, A. (1988). Tree species richness of upper Amazonian forests. *Proceedings of the National Academy of Sciences* 85: 156-159.
11. Johnson, C. N., Balmford, A., Brook, B. W., Buettel, J. C., Galetti, M., Guangchun, L., & Wilmschurst, J. M. (2017). Biodiversity losses and conservation responses in the Anthropocene. *Science*, 356(6335), 270-275.
12. **Kessler, M., Toivonen, J.M., Sylvester, S.P., Kluge, J. and Hertel, D. (2014).** Elevational patterns of Polylepis tree height in the high Andes of Peru. *Frontiers in Plant Science*, 5, 194.
13. **Kingsford, R. T., Basset, A., & Jackson, L. (2016).** Wetlands: conservation's poor cousins. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 26(5), 892-916.
14. Kricher, J. C. (2011). What and where are the tropics? *Tropical Ecology*, pp. 7-25. Princeton UP, Princeton, NJ.
15. **Laurance, W. F., Camargo, J. L., Fearnside, P. M., Lovejoy, T. E., Williamson, G. B., Mesquita, R. C., ... & Laurance, S. G. (2018).** An Amazonian rainforest and its fragments as a laboratory of global change. *Biological reviews*, 93(1), 223-247.
16. Lewis, S. L., & Maslin, M. A. (2015). Defining the anthropocene. *Nature*, 519(7542), 171-180.
17. Madigosky, S.R. and I. Vátnick (2000). Microclimatic characteristics of a primary tropical Amazonian rain forest, ACEER, Iquitos, Peru. *Selbyana* 21: 165-172.

18. McConkey, K.R., Prasad, S., Corlett, R.T., et al. (2012). Seed dispersal in changing landscapes. *Biological Conservation*, 146(1), 1-13.
19. McPhearson, T., Pickett, S. T., Grimm, N. B., Niemelä, J., Alberti, M., Elmqvist, T., ... & Qureshi, S. (2016). Advancing urban ecology toward a science of cities. *BioScience*, 66(3), 198-212.
20. **Metcalfe, D.B., Galiano Cabrera, D.F., Alvarez Mayorga, L.M., et al. (2024).** The Wayqecha Amazon Cloud Curtain Ecosystem Experiment. *Methods in Ecology and Evolution*.
21. Morton, S.R. and Hill, R. (2015). What is biodiversity, and why is it important. *Biodiversity, Science and Solutions for Australia*. CSIRO Publishing.
22. Nadkarni, N.M. and Solano, R. (2002). Potential effects of climate change on canopy community in a tropical cloud forest: an experimental approach. *Oecologia* 131:580-586.
23. **Penar, W., Magiera, A. and Klocek, C. (2020).** Applications of bioacoustics in animal ecology. *Ecological Complexity*, 43, 100847.
24. Rahbek, C. (1995). The elevational gradient of species richness: a uniform pattern?. *Ecography*, 200-205.
25. Teixeira, D., Maron, M. and van Rensburg, B.J. (2019). Bioacoustic monitoring of animal vocal behavior for conservation. *Conservation Science and Practice*, 1(8), e72.
26. **Vera, V., Cota-Sánchez, J.H. and Grijalva Olmedo, J.E. (2019).** Biodiversity, dynamics, and impact of chakras on the Ecuadorian Amazon. *Journal of Plant Ecology*, 12(1), 34-44.
27. Zhao, B., Russell, J. M., Blaus, A., Nascimento, M. D. N., Freeman, A., & Bush, M. B. (2024). Tropical Andean climate variations since the last deglaciation. *Proceedings of the National Academy of Sciences*, 121(34), e2320143121.