



THE SCHOOL
FOR FIELD STUDIES

Principles of Resource Management

SFS 3740

Syllabus
4 credits

The School for Field Studies (SFS)
Center for Tropical Island Biodiversity and Conservation Studies (CTIBCS)
Isla Colón, Bocas del Toro, Panama

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.

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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

The Principles of Resource Management (PRM) course in the Tropical Island Biodiversity Studies (TIBS) program introduces students to the tools required to understand and manage tropical forest ecosystems. The course covers basic principles in forest structure and dynamics, biodiversity patterns, relationships between different organisms, interactions between biotic and abiotic factors and the importance of neotropical forests worldwide. These concepts will set the fundamentals to understanding the ecological processes in soil productivity, nutrient recycling, tropical biodiversity and climatic cycles. This component of the academic program links some principles of tropical ecology and resource management with the Tropical Coastal Ecology (TCE) course as well. Conceptual material focuses on biodiversity, tropical resources, evaluation of water and soil resources, habitat modification, terrestrial protected areas and pollution.

Throughout the course, lecture materials, extensive field activities and laboratories will present local issues in resource use, resource exploitation, and resource management, which are important to the environmental and social well-being of the Bocas del Toro region. Gaining an appreciation for the ecology, resource management, and environmental policies of the Bocas del Toro region should provide students with a working knowledge on a broad range of approaches to conservation and research of tropical natural resources. During the semester, discussions and analyses will then be framed by two major subjects, each of which will address using specific local examples: 1) Principles of tropical ecology and 2) Principles of resource management.

Learning Objectives

During this course, students will be able to:

1. Learn the basic ecological principles for understanding natural resources within the tropics and their management.
2. Observe and identify patterns and interactions in tropical ecosystems.
3. Understand how resources within the Bocas del Toro region and the country of Panama have historically been utilized and determine which actions should be taken to balance biodiversity conservation and natural resource use for human development.
4. Gain knowledge on how to develop good quality research as a tool for conservation of natural resources.

Assessment

Assessment Item	Value (%)
Quizzes	10
Laboratory Exercises	10
Frog Report	25
Midterm Exam	20
Webpage Entry	10
Final Exam	20
Participation	5
TOTAL	100

Quizzes (10%)

An undefined number of quizzes related to topics discussed in class will be conducted to evaluate the understanding of classroom and the field lectures. These quizzes will be performed only in some cases and at the beginning of the corresponding class, sometimes without previous notification.

Laboratory exercises (10%)

Laboratory exercises will gather some of the important results on the observations made in field activities or in experiments performed in the laboratory and/or the answers to some previously provided questions that will stimulate discussion on the results. Specific indications for each laboratory report will be given in each activity.

Frog report (25%)

The research report will be based in a particular topic relevant to the archipelago. Poison-dart frogs are well known to possess a dramatic variation in their body coloration. A group project on the "Population Ecology and behavior of *Oophaga pumilio*" will be conducted throughout two field trips. After collecting data on the frogs' morphometric, coloration, and behavior at Isla Solarte and Isla Colón, students will hand in a written report answering a research questions regarding these particular species of poison-dart frog. Students will be provided with lectures and guidelines to follow in order to provide a written report, which should consist on a comprehensive, well-written, and well- organized document in the form of a scientific short communication, comprising the following elements: title, authors, introduction, materials and methods, results, discussion, conclusions, and references. During these Field Exercise students will gain experience for field observation, data collection, report writing and scientific research.

Web page entry (10%)

The purpose of this writing assignment is to practice a critical exploration of questions and issues relevant to the Bocas del Toro region. Students will be required to write a web page entry of up to 300 words on Forest modification and degradation, answering questions regarding macro vs. agro ecological plantations based on several field trips: a cacao (chocolate/multicrop) farm in Finca "La Magnita" in Changuinola, or a visit to the San San Pon Sac National Park. Students will be required to ask questions during these fieldtrips so they can collect information for this assignment.

Exams (40%)

Two exams, a mid-term and a final, will be given based on material covered in lectures, readings, and field exercises and experiences. Each exam is worth 20% of the final grade.

Participation (5%)

Active participation includes constructive engagement with the full range of course activities, respectful awareness of cultural context, and responsible behavior as a group member who is involved in others' learning.

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

Readings - Optional readings are to provide students with a background of each topic in class. All readings are available on PDF format. The purpose of using PDFs is to avoid printing and reduce impact on the environment and more particularly on the center's resources. **Readings might be updated or changed during the course of the semester.** Please, review the course outline on a regular basis.

Plagiarism – Using the ideas and material of others without giving due credit is cheating and will not be tolerated. A grade of zero will be assigned if anyone is caught cheating or aiding another person to cheat actively or passively (e.g., allowing someone to look at your exam). All assignments unless specifically stated should be individual pieces of work.

Deadlines – Deadlines for assignments are instated for several reasons: they are a part of working life to which students need to become accustomed and promote equity among students. Deadlines allow faculty ample time to review and return assignments before others are due. **Late assignments will incur a 10% penalty for each day that they are late.** No assignment will be accepted after three days.

Participation and topic discussions – Active participation during classes, discussions and hikes is expected. Every student should be prepared for each academic session; these include not only lectures but field trips and field exercises. This implies reading the materials for each session with enough detail to be able to ask relevant questions; and to participate in analytical discussions about the key issues. Active participation during classes, discussions and hikes is expected.

Since SFS program is an intensive course in depth, missing even one lecture can have a proportionally greater effect on the final grade simply because there is little room to make up for lost time. Participation in all components of the program is mandatory because actions can significantly affect the learning experience. Therefore, it is important to be prompt for all activities, bring the necessary equipment for field exercises, field trips, workshops, and lab work, and simply get involved.

Course Content

D: Discussion, **E:** Exam, **RR:** Research Exercise, **FL:** Field Lecture, **FT:** Field Trip, **L:** Lecture, **Lab:** Laboratory Work, **W:** Workshop.

Code	Lecture Title and Description	Type	Time (hrs.)	Readings
MODULE 1 – Principles of Tropical Ecology				
PRM 01	Course Intro Walk - Introduction to Tropical Forests What, where and which are the principal characteristics of the rainforest, forest structure, primary vs. secondary forest.	FT	2:00	Welcome to the Torrid zone. In Kricher, J. 2017.
PRM 02	Course Intro Course structure, objectives, assignments, calendar for weeks 1 and 2.	L	0:30	
PRM 03	Rainforest Structure and Dynamics Recap of forest structure, disturbance dynamics, sunlight and stratification, sunflecks, humidity and temperature characteristics of the rainforests.	L	1:00	Sunlight and Stratification. In Terborgh, J. 1992. If a Tree Falls ... Rainforest Disturbance Dynamics. In Kricher, J. 2017.

PRM 04	Fairy tales of the rainforests Presentations by students of stories about rainforest interactions and its ecological importance.	W	3:00	
PRM 05	Why is it hot, humid and rainy in the rainforest? Plant Diversity in the Tropics		1:00	Why is it Hot, Humid and Rainy in the Tropics? In Kricher, J. 2017. Rain Forest: The Realm of the Plants. In Kricher, J. 2017.
PRM 06	Long Forest Walk A 3 hour walk through the Isla Colón reserve to assess Animal Diversity: Insects and their kin. A field walk and exercise regarding the insect and arthropod world in general; with special attention to the ecological role and the diversity of this group.	FT	3:00	Introduction to Arthropods. In Hanson, P & Nishida K. 2016.
PRM 07	Soils and Nutrient Cycling Soil characteristics and nutrient cycling in wet tropical systems, the paradox of tropical luxuriance	L	1:00	Sun Plus Rain Equals Rainforest. In Kricher, J. 2017. Essential Dirt: Soils and Cycling. In Kricher, J. 2017. The Paradox of Tropical Luxuriance. In Terborgh, J. 1992. Turner, et al. 2018.
PRM 08	Soil Lab Collect soil samples in the rainforest around the SFS Center to see the physicochemical characteristics of the samples	Lab	2:00	
PRM 09	Night walk A unique experience walking through the rainforest at night to observe mostly arachnids, but also insects and vertebrates active at night.	FT	1:30	
PRM 10	Mangrove Ecology and Exploration Walk A walk through a mangrove island in the Bocas del Toro Archipelago to observe first-hand the characteristics of this particular type of forest and to collect data on mangrove bio-indicators.	FT	1:30	
PRM 11	Prep for Field exercise (Frog report) A class to address all the guidelines, field work, hypotheses and predictions of the frog report.	L	1:30	
PRM 12	Epiphyte Life and Bromeliad Walk Lecture in the field about the introduction to fundamental concepts and definitions of epiphytes and their relevance to the rainforest, and the ecological niche.	FT	1:00	Introduction. In Zotz, G. 2016. Meunier, F., et al. 2022.
PRM 13	Frog Research Exercise I Students will collect data in the field observing red Poisson dart frog behavior for their research report.	FT	2:30	Pröhl, H., Willink, B., & Hauswaldt, S. 2013.
PRM 14	Frog Research Exercise II Students will collect data in the field observing green Poisson dart frog behavior for their research report.	FT	3:00	

PRM 15	Introduction to Jamovi and Stats An introduction to the statistical software Jamovi, which would be used during the Frog report and DR. This would also be time to address any questions related to the frog report, about the data entry, statistics or writing a short communication.	L; W	1:30	
PRM 16	Protected Areas Design & Management Introduction to key concepts, types of PAs and a look at the role and effectiveness in the face of human population growth & climate change.	W; D	2:30	
PRM 17	Birdwatching Trip to the Soropta Canal near mainland to observe the bird biodiversity in the tropics and birdwatching activity as a low impact touristic alternative.	FT	3:00	
PRM 18	Review for the Midterm exam	L	1:00	
PRM 19	Midterm	E	0:00	
MODULE 2 – Principles of Resource Management				
PRM 20	Intro to Natural Resource Management Key concepts in natural resource management, including categories of resources, approaches to resource management, and discussion of goals for management of natural resources.	L	0:30	Rockström, J., et al, 2009.
PRM 21	Island Biogeography and Conservation Intro to key concepts in island biogeography and illustrate major global trends in terrestrial and marine biodiversity and its application on conservation related to the Bocas del Toro area.	W	2:30	MacArthur, R.H., Wilson, E.O. 1967.
PRM 22	Waste management and Ecological and Carbon Footprint: Estimating Personal Carbon Budgets Students will estimate their own personal carbon emissions and discuss lifestyle changes to reduce personal emissions.	L	0:30	
PRM 23	Waste tour A visit to the local dump and Waistless world (a local recycling facility) to understand how trash is managed in Bocas del Toro.	FT	2:00	
PRM 24	Habitat Modification & Soil Resources and Management Explore the disconnection between soil health, nutrient cycling and human activity with particular attention to agricultural practices. We will also discuss key concepts and major broad-scale trends in habitat modification and degradation.	L	1:00	Fahrig, L. 2003.
PRM 25	Visit to a RAMSAR site: San Pond Sac Wetland A field trip to a protected area to look for manatees and discuss the importance of protected areas in the tropics.	FT	4:00	
PRM 26	Night Walk - Frog tour		2:00	

PRM 27	Forest Modification and Management - Orlando's Farm A field trip to an agroforestry Finca to discuss habitat modification and land use in the tropics.	FT	4:00	
PRM 28	Plastics and Pollution - Beach cleanup Students will clean up the nearest beach to campus and classify the types of trash found	FT; W	3:00	
PRM 29	Final Exam Review	L	1:00	
PRM 30	Final Exam	E	2:00	
	Total contact hours		55	

Reading List

1. Essential Dirt: Soils and Cycling. In Kricher, J. 2017. The new neotropical companion. Princeton University Press.
2. Fahrig, L. 2003. Effects on habitat fragmentation on Biodiversity. *Annu. Rev. Ecol. Evol. Syst.* 2003. 34:487–515.
3. If a Tree Falls ... Rainforest Disturbance Dynamics. In Kricher, J. 2017. The new neotropical companion. Princeton University Press.
4. Introduction to Arthropods. In Hanson, P & Nishida K. 2016. Insects and other arthropods of tropical America. Cornell University Press.
5. Introduction. In Zotz, G. 2016. Plants on Plants – The Biology of Vascular Epiphytes. Springer International Publishing.
6. MacArthur, R.H., Wilson, E.O. 1967. The Theory of Island Biogeography, Princeton University Press.
7. Meunier, F., Visser, M. D., Shiklomanov, A., Dietze, M. C., Guzmán Q, J. A., Sanchez-Azofeifa, G. A., ... & Verbeeck, H. 2022. Liana optical traits increase tropical forest albedo and reduce ecosystem productivity. *Global Change Biology*, 28(1), 227-244.
8. Pröhl, H., Willink, B., & Hauswaldt, S. 2013. Geographic variation in sexual signals and behaviour in two species of poison frogs. *Evolutionary Ecology Research*, 15(6), 667-6.
9. Rain Forest: The Realm of the Plants. In Kricher, J. 2017. The new neotropical companion. Princeton University Press.
10. Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin, F.S., Lambin, E.F., ... & Foley, J.A. 2009. A safe operating space for humanity. *Nature*, 461(7263), 472-475.
11. Sun Plus Rain Equals Rainforest. In Kricher, J. 2017. The new neotropical companion. Princeton University Press.
12. Sunlight and Stratification. In *Diversity and the Tropical Rain Forest*. Terborgh, J. 1992. Scientific American Library.
13. The Paradox of Tropical Luxuriance. In *Diversity and the Tropical Rain Forest*. Terborgh, J. 1992. Scientific American Library.
14. Turner, et al. 2018. Pervasive phosphorus limitation of tree species but not communities in tropical forests. *Nature*, 2018, vol. 555, no 7696, p. 367-370.
15. Welcome to the Torrid zone. In Kricher, J. 2017. The new neotropical companion. Princeton University Press.
16. Why is it Hot, Humid and Rainy in the Tropics? In Kricher, J. 2017. The new neotropical companion. Princeton University Press.