

Tropical Restoration Ecology Sample Syllabus

This course is divided into two sections: Marine Restoration Ecology and Terrestrial Restoration Ecology. Both sections of the course will include a combination of class discussions, daily field exercises, and an individual or group project. There is a significant fieldwork component to these courses including hiking, snorkeling trips, kayaking, along with class discussions. Students will be asked to keep a detailed field notebook and will collect data for their study project and informal presentation.

Marine Ecology: this section of the course takes place in Panama. Students will explore major themes in Tropical Marine Ecology, using examples from the marine environment and tropical stream systems. Students will observe a gradient of ecosystems, beginning with the input of biological productivity from island forests into streams and mangrove ecosystems.

Terrestrial Ecology: this section of the course takes place in FCRE. Students will explore major themes in terrestrial tropical ecology, using examples from the many different ecosystems within the FCRE's property. Students will observe disturbed ecosystems as well as restored ecosystems within the property.

Tropical Restoration Ecology: Part I Marine Ecology BIO 180L

Bocas del Toro, Panama and Dominical, Costa Rica

schedule subject to change based on weather and boat availability

Topic	Reading
Safety talk while engaging in field work and course introduction from	Maps of Bocas del Toro Map of Bastimentos Island Information about location/host https://itec-edu.org/
Fieldwork: Mangrove Snorkeling at Starfish Beach next to ITEC Lecture: Introduction to Tropical Marine Environments and Introduction to the Bocas Archipelago: Caribbean vs the Pacific	Introductions to tropical Ecosystems readings (#1 on list, HC in manual)
Discussion of Expectations for Class Project Students to set up field notebooks Lecture: Sampling and Experimental Design	Reef Fish ID Keys Reef Organism ID Keys Coral Reef Ecology and Coral Reef Fishes Readings (#2 on list, HC in manual)
Fieldwork: Visit two Drago reefs (Front of Isla Colon, Drago inlet, or Punta Caraco)	

Fieldwork: Snorkeling Lecture: Introduction to Coral Reefs and Coral Reef Fishes	Review information about host/location: http://www.casacayuco.com/
Fieldwork: Visit Bird Island, Final Drago Reef– Front of Isla Colon, Drago inlet, and Punta Caracol	Mangroves and Seagrass communities reading (#3 on list, HC in manual)
Fieldwork: Interpretive Rainforest Hike	
Arrive at Casa Cayuco and receive property orientation Lecture: Welcome and Introduction to Bastimentos Island and the development of Tourism on Bastimentos Island Fieldwork: Snorkel reefs off dock and lionfish at Azul Paradise Set up transect line and practice survey techniques	
Fieldwork: Zapatillas Cayes, Snorkeling, Explore offshore reef, Explore hard coral and seagrass communities, Explore inshore rocky communities, Octopus observation	
Fieldwork: Monkey Island Discussion of trips and previous lectures Determine individual projects **potential for night boat ride if bioluminescence is out**	Wilson, T. Excerpt from How Bioluminescence works (#1 on list, HC in manual)
Fieldwork: Visit Casa Cayuco Mangroove site	
Fieldwork: Trip to Salt Creek Lecture: Current topics in marine ecology/conservation (SLR, warming & OA, regime shifts) Time to work on class projects	Smith 2013. The Ngobe-Bugle of Panama (#1 on list, HC in Manual) Current topics in Marine Ecology readings (#4 on list)
Fieldwork: Travel to Casa Cayuco	Information about host/location http://costarica.jsd.claremont.edu/

Students to arrive and unpack at Firestone Reserve	
Lecture: Into to Pacific Marine Ecosystems Fieldwork: Local plankton sampling	
Lab: Review plankton in lab	
Fieldwork: Cano Island Snorkeling	
Fieldwork: Cano Island Snorkeling	Stream Ecology Readings (#5 on list, HC in manual) Stroud Water Research Foundation, pp. 1-10
Fieldwork: Fishing boat catch survey in Dominical Morning to work on class projects and papers	Finish Current topics in Marine Ecology readings (#4 on list)
Lecture: Conservation of Tropical Streams and Rivers- Why should we study our local water resources? Fieldwork: Water Sampling in stream at Firestone and one closer to town Review of physical properties Bacteria sampling Sample Leaf Packs Identify Macroinvertebrates from streams Sampling from pond by tree house Lab: Continue to run water samples for pH, turbidity	Stream Ecology Readings (#5 on list, HC in manual) Stroud Water Research Foundation, pp. 1-10
Fieldwork: Balleno Marine National Park	
Fieldwork: Balleno Marine National Park Evening- Current topics in marine conservation (pollution, invasive species, designer reefs) Count bacteria from water samples	
Work on class projects	
Final presentations and wrap up	

Tropical Restoration Ecology: Part II Terrestrial Tropical Ecology- Center for Restoration Ecology

Barú, Costa Rica

Course Objectives:

In this course, we will explore major themes in Tropical Restoration Ecology, using examples from the terrestrial lowland rainforest ecosystem at our field station, the Firestone Center for Restoration Ecology (FCRE). We will begin with a discussion of the history of biological research on the Firestone Center for Restoration Ecology and how Pitzer College came to be a steward of the land. We will move through a selection of topics beginning with the natural history of Costa Rica, with a focus on Dominical area, tropical forest structure, and basic principles of ecology. Next, we will learn about principles of Tropical Restoration Ecology, definition, key principles, natural regeneration, seed dispersal, monitoring, adaptive management, scientific method, and standards of practice for planning and implementing ecological restoration projects. We will apply those concepts to the ecosystems present in Firestone Center for Restoration Ecology, learning about key species, their natural history, and interaction with other species.

The course will include a combination of lectures, readings, and assignments, including a brief project on a study case that includes a written report and a presentation to the class. Your participation and interaction with other students allow you to make a significant contribution to the class. The more we are engaged in discussion, the more benefit we receive from the course. Your participation also helps you arrive at your own answers to the observations and concepts we will be addressing in the class.

Learning Outcomes:

Listed below are those concepts that you will learn and understand when you walk away from the class. Some are aspirational in nature.

1. Costa Rica Natural History

- ✓ Understand why Costa Rica is so Biodiverse
- ✓ Biodiversity and species richness

2. The ability to identify major concepts in tropical ecology.

- ✓ Tropical forest structure (canopy, subcanopy, understory)
- ✓ Organization of ecology, population ecology, community ecology, ecosystem ecology.

3. The ability to identify major concepts in tropical restoration ecology
 - ✓ Definition of tropical restoration
 - ✓ Understand the key principles that underpin ecological restoration
 - ✓ Standards of practice for planning and implementing ecological restoration projects
 - ✓ Study cases in the tropics
4. A college-level fieldwork experience, which will provide practice in restoration projects, from planning to implementation.
5. An appreciation for the unique diversity of tropical systems and why they should be conserved.

Assessment:

The Learning Outcomes listed above will be assessed in the following ways:

1. The Field Notebook (30/100 points)

Keeping a journal is an important tool used by scientists to record observations in nature. The date, time, and location should always be recorded so you can go back and know when and where observations were made. You can describe things in great detail (or not), draw pictures; collect feather or plant samples, etc., you can be creative, but an entry of every activity in the field will be expected to be included in your journal. This is your record and memoir of your time at the Firestone Center for Restoration Ecology (FCRE)!

2. Project Write-Up (45/100 points)

At the beginning of the course, a series of forest restoration studies will be provided for the students. Each student will choose one study, from the ones provided or another suggested by the student, and will elaborate a study case. The write-up will synthesize the key restoration principles applied and learned lessons.

3. Project Presentation (15/100 points)

The student will prepare a 10-15 min presentation of the project that will be presented to the students and professor at the end of the course. In this presentation, you can be as creative as you want to express your findings and discuss them with the class.

4. Informal Discussion (10/100 points)

During the course, the professor will assign to each student different topics of interest of which the student needs to make quick research. The topics could be species, ecological process, or any other topic that may arise during the field activities. An informal oral presentation will be given about the assigned topics.

Type of activity	Topic	Goals	Suggested readings
Outdoors	Walk FCRE's trails to identify features of the tropical rainforest	Students learn about the FCRE	
Classroom	Introduction to the course <ul style="list-style-type: none"> • The FCRE • Syllabus • Assessment • Safety 		
Classroom	Costa Rica Natural History: Understand why Costa Rica is so Biodiverse Tropical rain forest structure and functionality	Introduce students to Costa Rica Natural History, as important information to understand the ecosystems on site.	Chapter 2. Rainforest Structure and Diversity. A Neotropical Companion, J. Kricher 1997.
Classroom	Tropical Restoration Ecology <ul style="list-style-type: none"> • Definition of tropical restoration • Key principles • Practices for planning and implementing ecological restoration projects 	Teach students major concepts in tropical ecology.	Gann et al 2019. International principles and standards for the practice of ecological restoration. 2ed. Society for Restoration Ecology.
Outdoors	Restoration at FCRE	Introduce students to fieldwork on tropical forest restoration	Ahumada et al 2019. Community structure and diversity of tropical forest mammals: data from a global camera trap network
Outdoors	Night walk (optional)	Give the students the opportunity to discover nocturnal wildlife	
Fieldwork	Restoration at FCRE	Introduce students to fieldwork on tropical forest restoration	

Field activity	Visit to CloudBridge Nature Reserve	Introduce students to fieldwork on tropical forest restoration	
Fieldwork	Visit to Hacienda Barú		Jack Ewing (2005) Monkeys are made of chocolate. Chapter 16. Deforestation, reforestation, and regeneration.
Lecture	Data analysis		
Lecture	Students presentations Case studies and short assignments		
Field activity	Visit to Villas Alturas Wildlife Sanctuary	Learn about wildlife sanctuaries, soft release, etc.	