

Tropical Ecology and Conservation (Bio181)

Colin Orians

Department of Biology

This seminar and field trip to Costa Rica is designed to provide students with an in depth understanding of tropical ecology and conservation biology. Currently, Tufts University lacks a course focusing on ecology and conservation biology in the tropics. The biology department offers courses that touch on tropical ecology, that introduce the concepts of conservation biology, and that expose students to field research in New England habitats. Other departments offer courses that focus, wholly or partially, on international environmental issues (i.e., international environmental politics, sustainable development, international trade). Tufts University's strength in environmental science attracts high quality graduate and undergraduate students. Many of these students would benefit from this course because it: 1) combines classroom study with field experience, 2) examines the intersection between science and natural resource management, and 3) teaches students field sampling techniques, data analysis approaches, and presentation skills.

The course is designed for advanced undergraduate students and for graduate students from different disciplines (i.e., Biology, Urban and Environmental Policy and Planning and the Agriculture, Food and Environment Program (AFE) within the School of Nutrition, Science and Policy). Eventually, I would like to see Tufts expand its graduate program in conservation – such as a Masters Program in Conservation Science that trains students in biology, management, policy, and economics. Students in this program would be encouraged to take this course.

Currently, Tufts students can graduate with excellent course preparation and with hands-on experience in temperate ecosystems; but they leave without any direct exposure to tropical systems. Tropical ecosystems are unique from temperate systems in many ways. For example, the nutrient dynamics of many tropical forests are distinct. In general, the high rainfall and temperatures in the tropics result in rapid nutrient turnover and would lead to extensive leaching/loss of nutrients if not taken up immediately by the plants. In fact, most of the nutrients in tropical forests are stored within plant tissues, not in the soils as is typical of temperate systems. Such storage has two major effects. First, following deforestation or burning, nutrients are quickly lost and the system becomes unsuitable for agriculture. This is a major barrier to sustainable agriculture in the tropics. Second, the high nutrient content of many plant species would in theory make the plants more susceptible to pests. However, in response to pest pressures, tropical plants have evolved a diversity of plant defense strategies -- including physical (e.g., toughness and thorns), chemical (tannins, alkaloids, etc.), ontogenetic (i.e. synchronized leaf production), and symbiotic (i.e., the attraction of predatory ants that prey on herbivores). Clearly, an understanding of nutrient dynamics in the tropics is essential for sustainable agriculture and forestry.

Course Audience:

As mentioned above, the course is intended for undergraduate and graduate students (n=12 students) interested in conservation biology, tropical ecology and methods in field ecology. I plan to offer this course every other year. Last fall there were 12 students (6 undergraduates and 4 biology graduate students and 2 AFE graduate students). I hope that this year (fall 2003) the course will attract students in other departments and schools.

Course Format:

We will meet once a week for 75 minutes. In addition to weekly readings and discussions students will complete a term paper and each student will present his or her analysis to the class. Thus each student will, by the end of the term, be an expert on one topic and knowledgeable on a whole range of topics. Topics to be covered include 1) conservation biology, 2) plant-animal interactions, 3) community ecology, 4) ecosystem ecology, 5) sustainability, and 6) biodiversity prospecting.

Over winter break we will travel to Costa Rica for an intensive two-week field experience (Dec. 29th to Jan. 13th). As we travel, we will meet with individuals who are involved in natural resource management, with the national park system, in reforestation efforts, and in conservation education. The itinerary takes us to three contrasting habitats (e.g., high elevation cloud forests, mid-elevation forests, lowland rainforest, and mangroves). At each location, students will gain hands-on research experience and learn about conservation issues specific to each site. For example, at the high elevation site, we will travel to coffee plantations and compare the biodiversity in sun- and shade-grown coffee to test the hypothesis that shade-grown coffee promotes biodiversity. At the Wilson Botanical Garden, a mid-elevation site, we will study plant diversity (the Botanical Garden is famous for its palm collection) and examine an ongoing reforestation project. At the low elevation site, Corcovado National Park, students will complete a self-designed group research project and learn about the history of the park. Corcovado National Park nicely illustrates the challenges of creating national parks in the face of local opposition.

A typical 2-day schedule will be a morning hike followed by meetings to design group experiments, data collection in the afternoon, an evening lecture or discussion, further data collection the next morning, data analysis in the afternoon, and oral presentations that evening. A final report will be due at the end of the trip.

Readings: will be taken from

Bowles, I. A., and G. T. Prickett, eds. 2001. *Footprints in the jungle: natural resource industry, infrastructure and biodiversity conservation*. Oxford Press,

Jordan, C.F. 1985. *Nutrient cycling in tropical forest ecosystems: principles, and their application in management and conservation*. Wiley, NY

Kricher, J.C. 1989. *A Neotropical Companion*. Princeton University Press, NJ.

Reid, W. V. et al. 1993. *Biodiversity prospecting: using genetic resources for sustainable development*. World Resources Institute; Instituto Nacional de Biodiversidad, Costa Rica; Rainforest Alliance; African Centre for Technology Studies, Kenya.

Robinson, J. G. and E. L. Bennett. 2000. *Hunting for sustainability in tropical forests*. Columbia University Press, NY.

& Selected primary articles