BIOEE 478. Ecosystem Biology **Spring 2007**

Tuesday/Thursday 10:10 – 12:05, Whittaker Room (A409) Corson Hall

Instructors: Christy Goodale (E215 Corson Hall; 254-4211; clg33@cornell.edu)
Office hours: By appointment (Tues & Thurs. afternoons recommended).

Bob Howarth (E309 Corson Hall; 255-6175; rwh2@cornell.edu)
Office hours: By appointment (Thurs. and Friday afternoons recommended).

T.A.: April Melvin (E447 Corson Hall; 254-4239; amm243@cornell.edu)
Office hours: To be determined.

Date	Lecture Topic	Due Dates
Jan. 23	Introduction and overview of ecosystem approach (RWH)	
Jan. 25	The state factor model: climate, biomes, and soils (CLG)	
Jan. 30	Primary production: definitions & measurements - terrestrial (CLG)	
Feb. 1	Primary production: definitions & measurements - aquatic (RWH)	Prob. Set 1 out
Feb. 6	Nutrient limitation in aquatic ecosystems (RWH)	
Feb. 8	A closer look at nutrient cycling, pt. 1: N fixation in lakes & estuaries (RWH)	Prob. Set 1 due
Feb. 13	A closer look at nutrient cycling, pt. 2: N, P, and Fe in oceans (RWH)	
Feb. 15	Light, temperature & water controls on NPP (CLG/RWH)	
Feb. 20	Nutrient limitation in terrestrial ecosystems (CLG)	
Feb. 22	Decomposition, and nutrient mineralization - terrestrial (CLG)	Prob. Set 2 out
Feb. 27	Respiration, decomposition, and nutrient mineralization - aquatic (RWH)	
Mar. 1	Stable isotopes in ecosystem science (CLG)	Prob. Set 2 due
Mar. 6	Diversity and ecosystem function (CLG)	
Mar. 8	**Exam # 1 [content through Mar. 1]**	
Mar. 13	Trophic cascade (RWH)	
Mar. 15	Detrital food webs (RWH)	Topics due
SPRING RECESS		
Mar. 27	Hubbard Brook and watershed studies (CLG)	
Mar. 29	Disturbance, succession, and ecosystem development (CLG)	
Apr. 3	Oil and biotic impoverishment (RWH)	
Apr. 5	Acid rain and lake acidification (RWH)	
Apr. 10	Acid deposition, N saturation, and terrestrial response (CLG)	Ref. list due
Apr. 12	Alteration of the global carbon cycle (CLG)	Prob. Set 3 out
Apr. 17	Rising atmospheric CO2 (CLG)	
Apr. 19	Climate change: evidence and consequences (CLG)	Prob. Set 3 due
Apr. 24	Global and regional alteration of N cycle: a look into the future (RWH)	
Apr. 26	Policy and technical approaches for addressing nitrogen pollution (RWH)	
May 1:	**Exam #2**	
May 3:	DISCUSSION: Ecosystem feedbacks from climate change (CLG/RWH)	

Overview and Course Goals:

Ecosystem ecology is the study of the cycles of energy, organic matter, and nutrients through organisms and the environment. Why are these processes important? Ultimately, they maintain life on Earth; they provide food and fresh water for humans and other animals; they are the core means to understanding environmental problems such as global warming, air pollution, invasive species, and pollution of fresh and coastal waters.

In this course we provide an understanding of:

- Fundamentals and measurements of the core processes of primary productivity, decomposition, and nutrient cycling in both terrestrial and aquatic ecosystems;
- Regulation of these processes by abiotic and biotic factors, such as light, water, and nutrient supply, community structure, and disturbance;
- Approaches for studying ecosystem processes, and key uncertainties and debates within the field; and
- Impact on ecosystem processes from human-induced environmental change.

Throughout the course, we aim to provide context on both current understanding and historical development of the field.

Course materials:

The majority of class readings will be drawn from various book chapters and from the primary literature to be handed out in class. There is no text available that covers both terrestrial and aquatic ecosystem ecology in sufficient depth. There is an excellent book on terrestrial ecosystem ecology that we will draw on frequently, but in no way exclusively. Students will be responsible for completing all assigned readings.

Required text:

Chapin, F. Stuart, Pamela A. Matson, and Harold A. Mooney. 2002. Principles of Terrestrial Ecosystem Ecology. Springer-Verlag, New York. 436 pages.

A copy of this text will be available on reserve at the library.

Grading and Assignments:

Take-home, open-book exercises (3):	30%
In-class exams (2):	30%
Term project (annotated bibliography):	30%
Attendance & participation in class discussions:	10%

Exercises: There will be 3 take-home problem sets assigned throughout the term, each worth 10% of your final grade. Assignments are due one week later at the start of class. These problem sets will help you synthesize lecture material through qualitative and relatively simple quantitative exercises, some of which may appear later on in-class exams.

Exams: Exams will largely consist of short-answer questions covering lecture material and readings, and simple problems. Do not assume that all of the information will be contained in Powerpoint lectures posted on Blackboard. Each exam is worth 15% of your final grade.

Participation: Class attendance is expected. Although we have not scheduled many formal discussions, there will be frequent opportunities to ask questions and engage with the material.

Term Project: The annotated bibliography will require you to review and summarize literature on a topic of your choice in ecosystem science. Typically, these bibliographies consist of an overall synthesis of no more than 1 page, followed by ~1 paragraph summaries of the key ideas and results from about a dozen specific papers from the primary literature. These papers should include a balance of both classic and recent literature. Use lecture material, class readings, or reading on your own to select a topic in ecosystem ecology that you would like to delve into further. Then start reading. Use references in one paper to lead to others, until you have assembled what you believe to be the best set of papers available on your topic.

Recommended Journals:

> In particular: *Ecosystems* (Springer-Verlag).
>
> Others: *Ambio, Biogeochemistry, BioScience, Ecology, Ecological Applications, Frontiers in Ecology & the Environment; Global Change Biology; Limnology & Oceanography.*

There are three tasks to take note of:

First, you will be required to turn in a brief statement indicating the topic that you have selected for your term project. This statement will not be graded, but will provide you with an opportunity to receive feedback and guidance. If you would like examples from past projects, please contact the instructors.

Approximately a month later, you will be required to turn in a preliminary list of current and classic references for papers you have assembled toward your annotated bibliography.

The full annotated bibliography will be due a week after the last class.

Task	**Date Due**
Turn in topic statement	Mar. 15
Preliminary Reference list due	Apr. 10
Full annotated bibliography due	May 10