

## **Biology 3061F/5261F**

### **Communities and Ecosystems**

Professor Pat Lane

3 Hours of Lecture/Week

### **Class Description**

Ecosystems are communities of living organisms and their physical-chemical environments that interact together within the biosphere. With few exceptions, all life, including human life, exists within ecosystems. The class is divided into two parts. In the first part of the course, there is an introduction to ecosystems including their definition, history, and the theory of community structure and stability. Topics include: complex systems, general systems theory, pair-wise and multiple species interactions, the community matrix, descriptors of natural communities, ecological stability theory, food webs and systems theory. Several types of modeling approaches to ecosystems will be explored and compared including conceptual, mathematical and statistical examples. Emphasis will also be given to the community structure controversy and recent evidence for and against the notion that communities are highly structured.

In the second part of the class, several approaches to applied aspects of ecosystem management will be studied including: population and scarcity, markets and commodities, institutions, environmental ethics, risks and hazards, political economy, and social construction of nature. Other concepts like ecosystem health and ecosystem integrity will be explored. Other topics such as ecosystem, approach, ecosystem health and integrity, environmental indicators, ecological footprint, and resilience theory will also be studied. To illustrate the theory and principles, several case studies will be analyzed.

This is a web-based class employing the Blackboard Learning System (BLS) with frequent use of the Internet to study topics, read references, and complete exercises.

## Part I

Textbooks: TIS = Thinking in Systems by D. Meadows

EAS = Environment and Society by P. Robbins, J. Hintz, and S. Moore

WEEK NO.	DAY	LECTURE	WEBSITE VISIT READING	EXERCISE DATE DUE
0	Thursday	Introduction to Communities & Ecosystems Ecosystem Services Class Expectations	Website No. 0 Exploring Some of the Web Resources Reading 0	
1A	Tuesday	Introduction to Systems Thinking, Models, and Middle Number Systems	Website No. 1 Limits to Growth TIS Ch 1-2	
1B	Thursday	Systems Ecology and Computer Simulation	Reading 1 Systems Ecology	
2A	Tuesday	Ecological Complexity	Website No. 2 Ecological Complexity TIS Ch 3-4	
2B	Thursday	Community Descriptors, and the Community Structure Controversy	Reading 2 Natural Communities	
3A	Tuesday	How Systems Work, the Element of Surprise, System Traps and Opportunities	Website No. 3 Community Descriptors TIS Ch 5	Exercise No. 1 Modeling a Fishery Using Systems Thinking
3B	Thursday	Food Webs	Reading 3 Food Webs	
4A	Tuesday	Loop Analysis 1	Website No. 4 Virtual Ecosystems, Food Webs, & Loop Analysis	
4B	Thursday	Loop Analysis 2	Reading 4-5 Stability and the Balance of Nature TIS 6-7	
5A	Tuesday	Stability and the Balance of Nature Living with Systems System Interventions	Website No. 5 Stability and the Balance of Nature	Exercise No. 2 Food Webs and Loop Analysis
5B	Thursday	Test No. 1	Start Reading 2 <sup>nd</sup> Textbook EAS 1-4	

## Part II

WEEK NO.	DAY/ DATE	LECTURE	WEBSITE VISIT and READING	EXERCISE DATE DUE
6A	Tuesday	Introduction to 2 <sup>nd</sup> Textbook: Environment and Society (EAS) Population, Scarcity, Markets, Commodities, Institutions and the Tragedy of the Commons	Website No. 6 Introduction to the Ecosystem Approach, Ecosystem Integrity, and Ecosystem Health	
6B	Thursday	Ecosystem Approach, Watersheds, Ecosystem Integrity and Health	Reading EAS 1-4	
7A	Tuesday	Environmental Indicators and the Environmental Sustainability Index	Website No. 7 Environmental Indicators and Ecological Footprints	
7B	Thursday	Ecological Footprint Analysis	Reading EAS 5-6	
8A	Tuesday	Environmental Ethics	Website No. 8 Environmental Ethics and Resilience Theory	
8B	Thursday	Resilience Theory	Reading EAS 7-8	
9A	Tuesday	Political Economy and Social Construction of Nature	Website No. 9 Political Economy and Social Construction of Nature Reading EAS 9-10-11-12-13-14	Exercise No. 3 Environmental Indicators
9B	Thursday	STUDY DAY NO CLASS		
10A	Tuesday	Textbook Case Studies		
10B	Thursday	Textbook Case Studies		
11A	Tuesday	Graduate Presentations		Exercise No. 4 Analyzing Case Studies
11B	Thursday	Graduate Presentations		
12A	Tuesday	Graduate Presentations		
12B	Thursday	Graduate Presentations		
13A	Tuesday	Test 2		

**Marking and Evaluation:**

Marking for Biology 3061: Undergraduate Students may receive up to a maximum of 100 points as follows:

Components	Details	Marks
Exercises	4 @ 10 pts each	40
Test No. 1	70 multiple choice questions @ ½ pt each	35
Test No. 2	50 multiple choice questions @ ½ pt. each	25
<b>TOTAL</b>		<b>100</b>

**Marking: Graduate Students (Biol 5261)**

Graduate students will be responsible for all of the undergraduate assignments listed above for a total of 80 points (directly prorated). In addition, for 20 points, graduate students will be required to give a presentation on an approved topic in Communities and Ecosystems toward the end of term. The presentation should include a discussion involving critical issues, approaches, methodologies and controversies in Communities and Ecosystems that were not well-developed in the textbooks and lectures. Please submit a one page proposal on your topic by October 20th to Dr. Lane. Regardless of the topic you select, it would be useful to discuss it with the Professor early in the term. A marking sheet will be provided. Note that the presentation should be original and not a talk used in another class or thesis research.

**Faculty of Science Marking Scale**

A+	90-100	C+	62-64.9
A	85-89.9	C	58-61.9
A-	80-84.9	C-	55-57.9
B+	75-79.9	D	50-54.9
B	70-74.9	F	<50
B-	65-69.9		