

Sul Ross State University Spring 2015
BIOL 5407 Advanced Principles of Ecology (4 credit hours)

Instructor: Anne Marie Hilscher **Office:** WSB 220
Phone: 432-837-8820 **Email:** ahilscher@sulross.edu [BIOL 5407 in subject line]
Lecture: MWF 9:00-9:50am WSB 107 **Lab:** W 3:00-4:50 WSB 107
Office hours: Mon 2-4; Tues/Thurs 11:00-12:30

General Course Information: This course provides a broad introduction to the science of ecology. We will explore interactions between organisms and their abiotic and biotic environments, from the level of individual organisms and populations to communities and ecosystems to global processes. In addition to studying natural history and learning some of the critical experiments, we will address ecological theory. Examples will be drawn from a diversity of organisms and habitats, from both basic and applied research. Laboratories provide the opportunity to investigate ecological questions, and to practice techniques through lab and field activities.

****Required Text:** *Ecology: Concepts and Applications* by Manuel C. Molles (5th or 6th edition)**

THE GENERAL COURSE GOALS AND EXPECTATIONS ARE TO:

- explain the scientific method and cite basic approaches for collecting data for ecological studies,
- explain fundamental ecological processes such as adaptation, nutrient cycling, symbiosis, population growth, competition, and primary production,
- describe abiotic and biotic factors affecting ecological processes at the individual, community, and ecosystem levels, and
- conduct basic field and laboratory techniques in ecology such as habitat sampling and characterization of populations and communities.

PROGRAM LEARNING OUTCOMES (PLOs) FOR GRADUATE STUDENTS IN BIOLOGY:

1. Evolution in
2. Taxonomy
3. Scientific Method
4. Significant People and Events

GRADING:

Comprehension Tests (3 @ 100 pts ea)	300	(33%)
*Discussion Summaries (4 @ 20 pts ea)	80	(9%)
Ecological Footprint	20	(2%)
Final lecture exam	125	(14%)
Term Paper and Presentation	125	(14%)
<u>Lab</u>	<u>250</u>	<u>(28%)</u>
TOTAL	900 points	

The use of books, notes, cell phones, etc. during exams is not permitted. The only thing allowed at your desk during an exam is a writing implement.

I see and I wonder
I hear and I forget
I do and I understand.
 -Confucius

Tentative Schedule (subject to change) **Note: Randomness is rife, so expect changes.**

Week	Date	Topic	Chapters/HW
1	W Jan 21	Intro to Course; Introduction to Ecology	1
	F Jan 23	Introduction to Ecology, cont.	
2	M Jan 26	Life on Land	2
	W Jan 28	Life and Water	3
	F Jan 30	Temperature Relations	3; Ecological Footprint due
3	M Feb 02	Water Relations	6
	W Feb 04	Water Relations, cont.	
	F Feb 06	Energy and Nutrient Relations; Term Paper Topic Due	7
4	M Feb 09	Discussion #1	Discussion Summary due
	W Feb 11	Exam 1 (Chapters 1-3, 5-7)	
	F Feb 13	Population Distribution and Abundance	9
5	M Feb 16	Population Distribution and Abundance, cont.	
	W Feb 18	Population Dynamics	10
	F Feb 20	Population Dynamics, cont.	
6	M Feb 23	Population Growth	11
	W Feb 25	Population Growth, cont.	
	F Feb 27	Life Histories; Term Paper Title and Outline Due	12
7	M Mar 02	Life Histories, cont.	
	W Mar 04	Competition	13
	F Mar 06	Competition, cont.	
8	M Mar 09	Discussion #2	Discussion Summary due
	W Mar 11	Exam 2 (Chapters 9-13)	
	F Mar 13	Mutualism	15
9	NO CLASSES—SPRING BREAK		
10	M Mar 23	Mutualism, cont.;	
	W Mar 25	Species Abundance and Diversity	16
	F Mar 27	Species Abundance and Diversity, cont.	
11	M Mar 30	Species Interactions and Community Structure	17
	W Apr 01	Species Interactions and Community Structure, cont.	
	F Apr 03	Succession and Stability	20
12	M Apr 06	Succession and Stability, cont.	
	W Apr 08	Primary Production and Energy Flow	18
	F Apr 10	Primary Production and Energy Flow, cont.;	April 10 th by 4:00 pm Deadline to drop a class with "W"
		Term Paper Draft Due	
13	M Apr 13	Discussion #3	Discussion Summary due
	W Apr 15	Exam 3 (Chapters 15-18, 20)	
	F Apr 17	Nutrient Cycling and Retention	19
14	M Apr 20	Nutrient Cycling and Retention, cont.	
	W Apr 22	Geographic Ecology	22
	F Apr 24	Geographic Ecology, cont.	
15	M Apr 27	Global Ecology	23
	W Apr 29	Global Ecology; Final Term Paper Draft Due	
	F May 01	Discussion #4	Discussion Summary due
16	M May 04	Graduate Student Presentation(s)	
	W May 06	Wrap-up and Review	
	F May 08	NO CLASSES—STUDY DAY	
17	May 11-14 FINALS (Ecology Comprehensive Final Time TBA)		

***Discussions and Discussion Summaries (4 @ 20 points each = 80 points):**

You will have at least four opportunities to participate in active discussions of assigned readings. Each discussion (n=4) is worth a total of 20 points. **Active participation is essential** for each discussion and accounts for 10 of the 20 points. Each of the assigned readings also will require a **typed summary**—approximately half-page, single spaced hard copy—(worth 10 of the 20 points) due at the beginning of class. The summary should be a brief description of the primary points of the paper, and include *at least one idea or question for discussion*. No late assignments will be accepted without university-approved, officially documented excuses (i.e. medical emergencies, excused campus activities, religious observances or family emergencies).

These discussion summaries should always be in your own words. Do not plagiarize the authors of the articles (or each other!) in your summaries.

Graduate Student Project (Term Paper and Presentation): Ecology of the Food-shed

The primary food-shed is the area from which we obtain our food. There is a secondary food shed that grows food for livestock. Food-sheds are always changing, but recent concern over global warming has promoted the development of local food-sheds. Positive and negative changes are expected in the use of energy, water, and fertilizer. Emerging issues include biodiversity, natural pollinators, honeybees, genetically modified organisms, and watershed health due to the conversion of conservation land to corn for biofuel. Ecologically, the food-shed entails issues related to individuals, populations, ecosystems, landscapes, and the global market for food and energy.

- A. **TERM PAPER (75 points):** You should focus on a specific food-shed topic. Suggestions include: urban farming, natural pollinators, beneficial insects, ecological consequences of GMOs, the ecological tradeoffs from growing food v. fuel, soil health, responses of bird populations to land use practices, population genetics of wild populations in managed landscapes, ecological aspects of organic farming, effects of pesticides on wild species, biodiversity in farmscapes, sustainable farming and ranching systems, ecosystem services that benefit agriculture, grass-fed ranching, ecological consequences of industrial farming, water resources in farmscapes, approaches in other countries, emerging technologies, environmental and ecological consequences of fish farming, effects of global warming on the distribution of crops. Your presentations will allow the entire class to get a glimpse of many relevant issues that are beyond the scope of the course.

Guidelines for term paper:

1. Title page that identifies the section addressed and gives a compelling title, along with your name and date.
2. Pages 12-15, double spaced. Start by giving background information from the literature to motivate your topic. Clearly state what is known about the topic and what controversy exists. On or about page 2, *clearly state a nontrivial hypothesis that you will argue for or against*. In the remainder of the paper, relate evidence (e.g., documented facts, graphs and tables that you compile from the literature) to support your argument. Clearly explain to the reader precisely how the evidence supports your argument.
3. Literature cited section that lists the papers cited in your paper, using the standard format found in the journal *Ecology*. You are required to use eight or more references from the

published scientific literature as sources. Suggested journals include *Ecology*, *The American Naturalist*, *Ecology Letters*, *Oikos*, *Functional Ecology*, *Science*, *Nature*, *PNAS*, *Proceedings of the Royal Society*, and *Landscape Ecology*. Many of these journals are available in the library and online. Do not use popular or nonscientific magazines, text books, or web sites.

4. Any tables that you create or reproduce from the literature; each with a legend at the top.
5. Any figures, each with a legend below.

Milestones for the term paper:

1. Hand in topic selection and tentative paper title – by Friday, Feb 6th
2. Title and rough outline – Friday, Feb 27th
*Outline Length: Outlines are not to exceed 2 typed, double-spaced pages using 1 inch margins. The outline **MUST BE TYPED AND DOUBLE SPACED**. Include no cover page or report covers. Simply staple the pages together and put your name at the top. The content counts, not the appearance.*
3. Draft for friendly review – Friday, Apr 10th
4. Final version – Wednesday, Apr 29th

B. PRESENTATION (50 points): Your presentation should be at least 20 minutes, but no longer than 30 minutes. During your presentation, you should demonstrate mastery of the subject in your term paper. The presentation must be accurate and must present the topic in a clear manner. It should reflect the **current state of knowledge** about that topic, including something about what is not yet understood. Never keep a presentation so general that you do not go into a particular case in detail. In other words, present to us what the conclusions were, what data has been gathered about the issue, and perhaps how are the data analyzed in order to support the conclusions. Use visual aids if you would like. No matter whether you use PowerPoint, make your own slides, make transparencies, make posters, or read a paper; you must have a Literature Cited page, transparency, poster, or slide. On it, you must list the citations for all sources used.

****Pay attention to all the due dates/milestones listed above.****

Presentation Grading Rubric

Criteria	Possible Pts.	Actual Pts.
Content of the presentation - accuracy and depth of communication	10	
Clarity of presentation - ability to communicate the material	10	
Understanding - relative level of appreciation for the material	8	
Stimulate questions - ability to generate discussion about the paper	6	
Handle questions - ability to explain the material clearly	6	
Handout - quality of handout given to the class as a summary	6	
Other material - use of other relevant papers, visual or other aids	4	
TOTAL	50	