

APPLIED ECOLOGY
(E 527, Spring 2005)

TIME: Monday & Wednesday, 8:00 – 9:15 AM
PLACE: PV 277
CREDITS: 3 hours
INSTRUCTOR: Chris Craft

Applied Ecology is the application of ecological principles to study and evaluate the effects (and consequences) of human activities on communities, ecosystems, landscapes and the biosphere. The first half of the course is a review of general ecology, including interactions among organisms (microbes, plants, animals, humans) and between organisms and their physical (abiotic) environment. The second half of the course explores the human dimensions of ecology, especially the effects of human activities on aquatic, terrestrial and marine ecosystems.

Readings: *Concepts of Ecology* by E.J. Kormondy (1996) available at the IU bookstore. The textbook readings will be supplemented by additional readings and by a course-pak that can be purchased from the IU and TIS bookstores. Some topics will be supplemented by readings placed on reserve.

You will be evaluated on the basis of two quizzes (20% each), a term paper (20%), short (1 page) papers summarizing each of the three ESAP seminars that you attended (10%) a half-day field trip (10%), group discussion of readings (5%) and an end-of-semester position paper (15%). **There are no make-up tests.**

A half-day (8-12) field trip to Morgan-Monroe State Forest is scheduled for Saturday, April 2. Craig Wayson, who works with SPEA Professor J.C. Randolph and others, will discuss the AMERIFLUX CO₂ study and terrestrial carbon cycling.

Grading:	Quizzes (2)	40%	(Feb. 21, April 11)
	Seminar summaries	10%	(due one week after the seminar)
	Term paper	20%	(due Wednesday, March 9)
	Field trip	10%	(Saturday, April 2, 8-12)
	Position paper	15%	(due Wednesday, April 27)
	Discussion of Readings	5%	

You will write a scientific or environmental policy paper on a topic related to Applied Ecology. It is important that you discuss your topic with me prior to writing the paper. **The term paper should be an original piece of work and not something that was submitted for credit in another course.**

Term paper format: double-spaced, 10-15 pages in length including references.
20+ references, at least 80% (16) are from the peer-reviewed literature.
Use a scientific journal (e.g. *Ecology*) as a template for citing and listing references.

- Term paper critique:
1. FOCUS on a specific topic.
 2. Include some visual aides (e.g. tables and figures).
 3. Cite mostly scientific (ecological, environmental policy) literature.
 4. PROOFREAD your paper.

You will write a 1-page summary for each of **three ESAP seminars** that you attend during the semester. The ESAP seminar series meets Thursdays from 4-5 PM in SPEA, room 278. I will announce the seminar schedule after it is finalized. Each position paper is due one week following the seminar. **Be sure to sign the attendance sheet that is circulated on the day of the seminar.**

You will write a 10-page position paper related to the following lectures and associated readings...

- (1) Are genetically modified organisms (GMO's) good or bad for society?...for the environment?
- (2) Can we distinguish between anthropogenic perturbations and natural variability in biogeochemical and climate cycles? How can we best reduce/offset greenhouse gas emissions to thwart global climate change?
- (3) Is biodiversity important to ecosystem functioning? (If so), how can we best protect and preserve biodiversity?
- (4) What is the state of the ocean's fisheries? Is it sustainable? How can we best manage it for future sustainability?
- (5) What make a species a good invader? Are invaders good or bad for society?
- (6) How can we best reduce eutrophication and hypoxia?
- (7) What is/are the cause(s) of coral reef decline? What can be done prevent it?

Additional topics also will be considered. Please see me to discuss whether they may be suitable for this assignment. For the position paper, please use the same format as for the term paper.

NOTES: Email submissions of seminar write-ups, term papers or position papers will not be accepted.

As is the case in all classes, cheating, plagiarism and other forms of academic dishonesty are not acceptable behavior, are morally wrong and will be punished.

SCHEDULE

Date	Topic
Jan. 10	Origins of Life
Jan. 12	Introduction / Ecology and the Nature of Ecosystems
Jan. 17	MLK holiday
Jan. 19	The Abiotic Environment (Limiting Factors, Tolerance)
Jan. 24	The Abiotic Environment (Climate) <i>Reading: Human appropriation of renewable fresh water</i>
Jan. 26	Soils
Jan. 31	Soils (continued)
Feb. 2	Energy Flow (Photosynthesis / Primary Producers)
Feb. 7	No class
Feb. 9	Readings and Discussion: <i>Agricultural intensification and ecosystem properties</i> <i>Soil fertility and biodiversity in organic farming</i> <i>Ecological risks and benefits of genetically engineered plants</i> <i>Yield effects of GM crops in developing countries</i> <i>Transgenic crops in natural habitats</i> <i>Forest biotech edges out of the lab</i>
Feb. 14	Energy Flow (Consumers / Secondary Producers)
Feb. 16	Energy Flow (continued)
Feb. 21	Quiz #1
Feb. 23	Global Biogeochemical Cycles
Feb. 28	Global Biogeochemical Cycles (continued) <i>Reading: Human alteration of the global nitrogen cycle...</i>
Mar. 2	Global Biogeochemical Cycles & Climate Change

Readings and Discussion

Trends of measured climate forcing agents

Uncertainties in projections of human-caused...

The global carbon cycle: A test of our knowledge...

Terrestrial ecosystems and the carbon cycle

Net primary production of a forest ecosystem...

Soil carbon sequestration to mitigate climate change

Impact of nitrogen deposition on the species richness of grasslands

Grassland responses to global environmental changes...

Mar. 7 Ecosystem Biogeochemical Cycles
Reading: Periodical cicadas as resource pulses in North American forests

Mar. 9 Ecological Communities
(Term Papers due)

Mar. 14 **SPRING BREAK**

Mar. 16 **SPRING BREAK**

Mar. 21 Readings and Discussion
Global patterns in biodiversity
Diversity and productivity in a long-term grassland...
Biodiversity and ecosystem functioning...
Biodiversity effects on soil processes explained by interspecific...
Comparative losses of British butterflies, birds and plants...
Conservation conflicts across Africa
Global biodiversity scenarios for the year 2100

Mar. 23 Succession & Ecosystem Development/ Disturbance
Reading: The strategy of ecosystem development

Mar. 28 SPECIAL LECTURE: Linking Ecosystem Science and Restoration
Ecology: Making the Whole Greater than the Sum of the
Parts
*Reading: The pace of ecosystem development of constructed Spartina alterniflora
marshes*

Mar. 30 Population Ecology

April 2 **Saturday AM Field Trip to Morgan-Monroe State Forest**

April 4 Population Ecology (continued)

April 6 Readings and Discussion

Historical overfishing and the collapse of coastal...
The impact of United States recreational fisheries on marine fish...
Whose fish are they anyway?
Trajectories and correlates of community change in no-take reserves
Engineered fish: Friend or foe of the environment
Ecological predictions and risk assessment for alien fishes...
Will Black Carp be the next Zebra Mussel?

April 11 **Quiz 2**

April 13 Ecosystems of the World (Biomes) / Ecosystem valuation

Readings and Discussion

The value of the world's ecosystem services...
Global trajectories of the long-term decline of coral reef ecosystems
Long-term region-wide declines in Caribbean corals
Coral reef death during the 1997 Indian Ocean dipole linked to Indonesian wildfires
Climate change, human impacts and the resilience of coral reefs
Spatial resilience of coral reefs

April 18 Wetlands

April 20 Eutrophication

Readings and Discussion

Trends expected in stressed ecosystems
Long-term responses of the Kuparuk River ecosystem to Phosphorus...
Historical changes in species composition and richness...
Keeping the Stygian waters at bay
Chesapeake Bay anoxia...
Marine eutrophication case studies in Sweden
Reducing nitrogen loading to the Gulf of Mexico...

April 25 SPECIAL LECTURE: Eutrophication, Water Management and the Everglades

April 27 SPECIAL LECTURE: Yangtze River Flooding, Wetland Restoration and Three Gorges Dam
(Position Papers due)