

BIOL 321: Ecology, Spring 2009

Instructor: Dr. Christopher J. Paradise

Phone: 2890

Office hours: **Monday** 11:30-12:20; **Wednesday** 11:30-12:20; **Friday** 1-3; or by appt.

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Class meets on Monday, Wednesday, and Friday, 10:30-11:20, Sloan 100

Laboratory meets on Monday 1:30-4:20 (A) or Wednesday 1:30-4:20 (B) either in Watson 247 or, if going in the field, at another announced location.

Prerequisite: Biology 111 and 112; or permission

Textbook: Krebs, Charles (2008) The Ecological World View. University of California Press, Berkeley, CA.

Communication and Technology: Course announcements, reminders, and ecology-in-the-news messages will be conveyed via e-mail. This course uses the internet for assignments and other materials. The course web page is: <http://www.bio.davidson.edu/courses/ecology/ecology.html>. *Please be responsible in your use of paper and printing. I encourage you to read assignments electronically whenever possible; but bring your notes to class!*

Course Description, Philosophy, And Format

Ecology is an interdisciplinary science that examines interactions between organisms and their environment, and the relationship between evolution and these interactions. The interdisciplinary character of ecology allows us to understand nature by placing organisms in the context of their environment. We will explore major concepts and societal concerns addressed by ecology, using lectures, case studies, experiments, and self-directed learning exercises.

By the end of the course you should be able to understand and critically examine many facets of ecology, including (but not limited to): 1) the interrelatedness of the environment, 2) the link between ecology and evolution, 3) population growth and biotic interactions among populations, 4) the ecosystem concept, 5) the links between community stability and diversity, and 6) the ecological impacts of humans on the environment and our place in the world. This course will continue your development of critical thinking, written and verbal communication, quantitative reasoning, and experimental design skills.

Reviews, Written Assignments, Participation

Reviews and Final: There will be two (2) take-home reviews, which will consist of a combination of short answer and short essay questions. Each review will be worth 100 points. No make-up exams will be given. Keys will be posted on the course web page. If you feel that an error was made in grading, you may request in writing that your review be regraded, handing in your review with your argument described on a sheet stapled to the front of your exam. Reviews will cover material presented in lecture, laboratory, and the readings. The second review will be weighted in favor of the material presented after the first review, but will also test comprehensive knowledge. Scores will be available one week (or less) after each review.

Writing Assignments: 1-2 page summaries of papers read. During the semester, you will write two short papers explaining an ecological paper you read in a peer-reviewed journal. Your objective is to summarize a scientific study in a concise fashion, providing a sense of what the objectives and hypotheses were, how the study was performed, what was found, and what the major conclusions were. You will also attach a copy of the abstract of the study. The format will be discussed in class, but the topics will be related to the lecture topics. Each paper will be worth 50 points, equal to 10% of your course grade. All papers must be typed and single-spaced with 2.5 cm margins, two hard-returns between each paragraph, and your name, pledge, date, and title at the top of the first page (**no title page**).

Class Discussions: We will frequently have class discussions on scientific studies related to the textbook and lecture material. I will call on randomly selected (with replacement) students to summarize the study, relate it to the material we are currently covering, relate it to the themes of the course, or answer any number of other questions. Your preparedness for class on these days will count for class participation (see next item). In addition, we will

often have short discussions regarding the textbook reading; this will encourage you to read ahead.

Class Participation and Attendance: Be prepared for each class, whether the format for that day will be lecture, discussion, field trip, or laboratory exercise. Material covered in lecture will supplement the text, and understanding the lecture will depend on your reading before class. Unavoidable absences may occur, and in such cases, will require a legitimate excuse. The first absence for which there is no valid excuse will result in a 10% deduction from your Attendance grade. Each subsequent absence will result in a further 20% deduction.

Tardiness is not acceptable. I start on time, and I expect you to be in class or at a meeting place when I begin; I will **not** wait for anyone for field trips. It's distracting and disrespectful to come in late, and unless you have a valid excuse, it will affect your grade. If you are going to be absent or late and think you have a **valid** excuse, **see or e-mail me** regarding the missed time. This applies to assignments; any assignment not turned in on time, and without a **valid** excuse, will receive an automatic 10% deduction, with another 20% for each additional day it is late.

Evaluation: Grades will be assigned using the following scale. If you are unsure about your standing, please contact me:

A:	93.0-100%	A-:	90.0-92.9%
B+:	87-89.9%	B:	83.0-86.9%
B-:	80.0-82.9%	C:	73.0-76.9%
C+:	77-79.9%	C-:	70.0-72.9%
C:	70.0-72.9%	F:	< 60%
D+:	65-69.9%		

Final grades will be based on 600 points to be distributed as follows;

Exams (2 @ 100 points each)	200
Papers (2 @ 50 points each)	100
Participation and Attendance (lecture and laboratory)	100
Laboratory (2 oral and 2 written reports)	200
Total	600

Honor Code, Academic Dishonesty, and Plagiarism

You will pledge all assignments in this course under the Honor Code. For writing assignments, it is important that you understand and are aware of proper citation procedures. See the Biology Department's statement on plagiarism at <http://www.bio.davidson.edu/dept/plagiarism.html>. I will also provide instructions for citations and references in handouts and the ecology web page.

Students with Disabilities: I am willing and able to accommodate students with learning or physical disabilities. Please identify yourself to me and have Davidson College provide the appropriate documentation so that I can provide you with the appropriate learning experience.

Schedule – REVISIONS HIGHLIGHTED

Week	Date	Topic	Text reading / notes
1	1/12 1/14 1/16	Introduction; fire ecology as an introduction to themes and concepts Class discussion – fire ecology Natural selection and evolution	Chapter 1 Donovan & Brown 2007 Chapter 4 (sections 1 and 2)
2	1/19 1/21 – 23	NO CLASS; MLK, Jr. Day Geographic ecology and limits to distributions	Chapters 2 & 3
3	1/26 1/28 1/30	Community dynamics: biodiversity Class discussion – response diversity Themes revisited	Chapter 12 Elmqvist et al. 2003
4	2/2 – 6	Population dynamics – abundance in space and time Class discussion – dynamics	Chapters 5 & 6 Search for and read a paper; be prepared to report on the study

Week	Date	Topic	Text reading / notes
5	2/9	How to fish sustainably	Chapters 18 5:30-7:30 – Dr. D. Botkin will speak at Discovery Place (optional) Reading Assigned – TBA
	2/11	Class visit by and discussion with Dr. D. Botkin (UC Santa Barbara)	
	2/13	Population regulation	Chapter 10
6	2/16 – 18	Predation, Herbivory & Competition	Chapter 7
	2/20	Class Discussion – predation or competition	Search for and read a paper; be prepared to report on it Review 1 distributed
7	2/23 – 25	Infection and Parasitism; Disease ecology and epidemiology	Chapter 8 Review 1 DUE in class 2/25
	2/27	CLASS CANCELLED	
8	3/2-3/6	NO CLASS; Spring Break	
9	3/9	Disease Ecology Case Studies	No reading assigned
	3/11	Class Discussion – disease ecology	Search for and read a paper; be prepared to report on it
	3/13	Pest control: why we can't eliminate pests	Chapter 19
10	3/16	Mutualism and commensalism	Chapter 9
	3/18 & 20	Community dynamics – succession & disturbance ecology	Chapters 11 & 14
11	3/23	Class Discussion – succession	Search for and read a paper; be prepared to report on it
	3/25	Community dynamics – food webs	Chapter 13
	3/27	Class discussion – food webs	Whiles et al. 2006
12	3/30 – 4/1	Ecosystem ecology – energy flow and production and nutrient recycling	Chapters 15 & 16
	4/3	Class discussion – nutrient cycling	Compton et al. 2006
13	4/6 – 8	Landscape and metacommunity ecology	Chapter 17; Leibold et al. 2004
	4/10	Class discussion	Breshears 2006
14	4/13	NO CLASS; Easter Break	
	4/15 – 17	Conservation biology: endangered species and ecosystems	Chapter 20; Sklar et al. 2005
15	4/20	Class discussion – conservation biology	Search for and read a paper; be prepared to report on it
	4/22	Ecosystem health and human impacts	Chapter 21
	4/24	Class discussion – human overpopulation	Pimentel et al. 2006; 1 of these 2: Robertson & Swinton 2005 OR Meyerson et al. 2007
16	4/27	Class discussion – global climate change	1 of these 3: Clark 2004 OR Feagin et al. 2005 OR Hannah et al. 2007
	4/29	Class discussion – invasive species	Messing & Wright 2006
	5/1	Final thoughts, course evaluation	Review 2 distributed
17	5/4 – 6	Optional class days – to be used if needed	Review 2 due on 5/4

Readings

Breshears DD (2006) The grassland–forest continuum: trends in ecosystem properties for woody plant mosaics? *Frontiers in Ecology and the Environment* 4(2):96-104.

<http://www.bio.davidson.edu/courses/ecology/articles/landscape2006.pdf>

Clark D (2004) Tropical forests and global warming: slowing it down or speeding it up? *Frontiers in Ecology and the Environment* 2(2):73–80. <http://www.bio.davidson.edu/courses/ecology/articles/clark.pdf>

Compton JE, Andersen CP, Phillips DL, Brooks JR, Johnson MG, Church MR, Hogsett WE, Cairns MA, Rygielwicz PT,

- McComb BC, Shaff CD (2006) Ecological and water quality consequences of nutrient addition for salmon restoration in the Pacific Northwest. *Frontiers in Ecology and the Environment* 4(1):18-26.
<http://www.bio.davidson.edu/courses/ecology/articles/comptonetal2006.pdf>
- Donovan GH, Brown TC (2007) Be careful what you wish for: the legacy of Smokey Bear. *Frontiers in Ecology and the Environment* 5(2):73-79. <http://www.bio.davidson.edu/courses/ecology/articles/firesuppression2007.pdf>.
- Elmqvist T, Folke C, Nystrom M, Peterson G, Bengtsson J, Walker B, Norberg J (2003) Response diversity, ecosystem change, and resilience. *Frontiers in Ecology and the Environment* 1(9):488-494.
<http://www.bio.davidson.edu/courses/ecology/articles/elmqvist.pdf>
- Feagin RA, Sherman DJ, Grant WE (2005) Coastal erosion, global sea-level rise, and the loss of sand dune plant habitats. *Frontiers in Ecology and the Environment* 3(7):359-364.
<http://www.bio.davidson.edu/courses/ecology/articles/coastalerosion2005.pdf>
- Hannah L, Midgley G, Andelman S, Araújo M, Hughes G, Martinez-Meyer E, Pearson R, Williams P (2007) Protected area needs in a changing climate. *Frontiers in Ecology and the Environment* 5(3):131-138.
<http://www.bio.davidson.edu/courses/ecology/articles/protectedareas2007.pdf>
- Leibold MA, Holyoak M, Mouquet N, Amarasekare P, Chase JM, Hoopes MF, Holt RD, Shurin JB, Law R, Tilman D, Loreau M, and Gonzalez A (2004) The metacommunity concept: a framework for multi-scale community ecology. *Ecology Letters* 7:601-613. <http://www.bio.davidson.edu/courses/ecology/articles/metacommunity.pdf>
- Messing RH, Wright MG (2006) Biological control of invasive species: solution or pollution? *Frontiers in Ecology and the Environment* 4(3):132-140. <http://www.bio.davidson.edu/courses/ecology/articles/messingwright2006.pdf>
- Meyerson FAB, Merino L, Durand J (2007) Migration and environment in the context of globalization. *Frontiers in Ecology and the Environment* 5(4):182-190.
<http://www.bio.davidson.edu/courses/ecology/articles/humanmigration2007.pdf>
- Pimentel D, Cincotta RP, Longman P, Oglethorpe J, Gelman N, Lutz W, and Bilbrough RE (2006) Forum: Overpopulation and sustainability. *Frontiers in Ecology and the Environment* 4(3):155-161.
<http://www.bio.davidson.edu/courses/ecology/articles/pimenteletal2006.pdf>
- Robertson GP & Swinton SM (2005) Reconciling agricultural productivity and environmental integrity: a grand challenge for agriculture. *Frontiers in Ecology and the Environment* 3(1):38-46.
<http://www.bio.davidson.edu/courses/ecology/articles/agriculture2005.pdf>
- Sklar FH, Chimney MJ, Newman S, McCormick P, Gawlik D, Miao SL, McVoy C, Said W, Newman J, Coronado C, Crozier G, Korvela M, and Rutchey K (2005) The ecological-societal underpinnings of Everglades restoration. *Frontiers in Ecology and the Environment* 3(3):161-169.
<http://www.bio.davidson.edu/courses/ecology/articles/sklaretal2006.pdf>
- Whiles MR, Lips KR, Pringle CM, Kilham SS, Bixby RJ, Brenes R, Connelly S, Colon-Gaud JC, Hunte-Brown M, Hury AD, Montgomery C, Peterson S (2006) The effects of amphibian population declines on the structure and function of Neotropical stream ecosystems. *Frontiers in Ecology and the Environment* 4(1):27-34.
<http://www.bio.davidson.edu/courses/ecology/articles/amphibfoodweb2006.pdf>

BIOL 321: Ecology Laboratory

MATERIALS: Paradise (2008) Bio 321: Ecology Laboratory & Field Manual; calculator; proper clothes for field (shoes, not sandals; hat; etc.)

ASSIGNMENTS, PARTICIPATION & EVALUATION

Evaluation: The laboratory portion of your grade will be based on a total of 200 points to be distributed as follows; 1) two group oral reports (80 points total); 2) two ecology journal reports (120 points); and 3) participation and attendance (included in overall P&A).

Laboratory and Field Schedule		
Dates	Exercise	Notes
1/12 & 14	Safety in the laboratory and field, overview of laboratory portion of course; developing ecological hypotheses in the field	<ul style="list-style-type: none"> • Sign laboratory and field agreements • Read Sections 1 and 2 • Dress for the field
1/19 & 21	Martin Luther King, Jr. Day	<ul style="list-style-type: none"> • NO laboratory this week
1/26 & 28	Patterns, processes, and observational ecology	<ul style="list-style-type: none"> • Read Section 3 • Develop protocol to measure density & distribution of a plant or animal • Turn in protocol by Friday, 1/30
2/2 & 4	Patterns, processes, and observational ecology	<ul style="list-style-type: none"> • Carry out protocol • Meet @ Dana loading dock
2/9 & 11	Patterns, processes, and observational ecology	<ul style="list-style-type: none"> • Analyze data and discuss • Group oral report assigned
2/16 & 18	Forest succession data collection	<ul style="list-style-type: none"> • Read Section 4 • Meet @ Dana loading dock
2/23 & 25	Forest succession data analysis	<ul style="list-style-type: none"> • Ecology journal report assigned
3/2 & 4	Spring Break	<ul style="list-style-type: none"> • NO class this week
3/9 & 11	Patterns, processes, and observational ecology	<ul style="list-style-type: none"> • Presentations on density and distribution
3/16 & 18	Modeling ecological processes	<ul style="list-style-type: none"> • Read Section 5 • Form groups, brainstorm model development using STELLA • Individually work through Excel versions of classic theoretical models • Work on constructing models
3/23 & 25	Modeling ecological processes	<ul style="list-style-type: none"> • Work on constructing models • Complete summaries and models
3/30 & 4/1	Diversity of stream insects: data collection	<ul style="list-style-type: none"> • Read Section 6 • Meet @ Dana loading dock
4/6 & 8	Diversity of stream insects: data sorting and identification of specimens	<ul style="list-style-type: none"> • Ecology journal report assigned
4/13 & 15	Easter break	<ul style="list-style-type: none"> • NO laboratory this week
4/20 & 22	Diversity of stream insects: data analysis	<ul style="list-style-type: none"> • Finishing touches on models, if needed • Work on report or presentation
4/27 & 29	Modeling ecological processes	<ul style="list-style-type: none"> • Presentations on models; class discussion