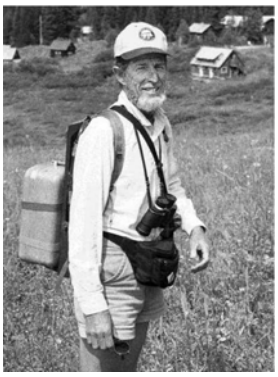
Environmental Biology (ECOL 206)
Syllabus, spring 2009

Introduction

Welcome to Environmental Biology. Our focus will be on the basic principles of environmental biology, ecology, and the relationship between humans and the natural world. This is a course in biology for non-majors, therefore, our discussion will begin broadly, but by the end of the course we hope you will understand and appreciate the natural forces that generate and maintain the diversity of life we see on our planet, as well as the myriad interactions among both biotic and abiotic components of ecosystems. We also hope you will be able to objectively assess the role that humans have played in changing the natural environment, especially during the last few centuries. We hope that this Tier 2 course will be enjoyable and informative. Prerequisites are two courses from Tier One, Natural Sciences (NATS 101, 102, 104). Please talk to the instructors if you have concerns about your previous background.



William A. Calder III, 1934–2002

Bill Calder was the instructor for this course for many years. He lived with a passion and a dedication for science, biology, and the environment.

Bill Calder, Rocky Mountain Biological Station, Gothic, CO. Photograph taken in July 1999 by Lorene Calder.

Course Objectives *are to facilitate understanding of*

1. basic principles of ecology
2. principles of biological evolution and natural selection
3. the process of scientific discovery
4. the intricate nature of relationships among organisms that comprise functioning ecosystems
5. the sources of energy that drive our world
6. basic nutrient cycling
7. how human societies and economies rely on the environment
8. how humans affect their environment
9. how to think critically and creatively

Themes

Evolution & Ecology, Evidence, Energy, Ethics & Equality, Economics

Meeting Times (Please attend the discussion/lab section in which you are enrolled)
Lecture: MWF in BIO W 208 (http://iiewww.ccit.arizona.edu/uamap/staticLarge/88.html) 0900-0950h

Discussion/Lab: in CBS/KOFFL 410 (http://iiewww.ccit.arizona.edu/uamap/staticLarge/KOFFL.html)

Sect. 1	MJ Epps	Tues.	1400-1700h
Sect. 2	MJ Epps	Wed.	1400-1700h
Sect. 3	Tuan Cao	Thurs.	1400-1700h
Sect. 4	Tuan Cao	Fri.	1100-1400h

For several of the labs we will meet at the northwest corner of BioSciencesEast to take a van. We will let you know which meetings these are.

Instructors
Kevin E. Bonine, Ph.D., **kebonine@u.arizona.edu**, tel: 626-0092
Office Hours: BSE 113, Mon 1:10 -2:00 pm, Wed 11:10-noon, and by appointment.

Graduate Teaching Assistants:
Mary Jane Epps, mycota@gmail.com
Office Hour: 10-11am Mondays in BSW302, and by appointment.
Tuan Cao, tuancao@u.arizona.edu
Office Hour: 12-1pm Thursdays in BSW235, and by appointment.

Course Materials
The readings for this course will be available electronically on course website or on reserve in UA science library. Please check course website regularly for updates, changes, and/or additions.

Quinn, Daniel. 1993. *Ishmael*. Bantam Paper.
Purchase optional; 15 copies on reserve in UA Science library.

You should also obtain a small field notebook for lab (details below).

Optional (an Environmental Biology Text Book):
There are several to choose from and a few will be on reserve in the UA Science Library. Purchases on-line or through Antigone Books (411 N. 4th Ave., 792-3715) are suggested. A few examples (more recent versions may be available for many of these):

Botkin, Daniel B. and Edward A. Keller. 2003. Environmental Science: earth as a living planet 4th edition. John Wiley & Sons.
Cunningham, William P., Mary A. Cunningham, and Barbara Saigo. 2005. Environmental Science: A Global Concern 8th edition. McGraw Hill.
Miller, G. Tyler, Jr. 2004. Environmental Science 10th edition. Brooks/Cole-Thomson Learning, Pacific Grove, California.
Miller, G. Tyler, Jr. 2005. *Sustaining the Earth* 7th edition. Brooks/Cole-Thomson Learning, Pacific Grove, California.
Ricklefs, Robert E. 2001. The Economy of Nature 5th edition. W.H. Freeman and Co.
Raven, Peter H. and Linda R. Berg. 2006. Environment 5th edition. John Wiley & Sons.
Wright, Richard T. 2005. Environmental Science. Pearson/Prentice Hall.

Withgott, Jay and Scott Brennan. 2007. Essential Environment: the science behind the stories 2nd edition. Pearson/Benjamin Cummings. (shorter paperback)
Withgott, Jay and Scott Brennan. 2007. Environment: the science behind the stories 2nd edition. Pearson/Benjamin Cummings. (longer hardback)

Web Site

We will maintain an ECOL206 website (**http://www.eebweb.arizona.edu/eeb_course_websites.htm**) with readings, assignments, schedules, announcements, etc. Appropriate powerpoint lectures will likely be posted to the website the day after they are given. Check 206 website for updates.

Course Work

Lecture Exams (three midterms @ 100 pts each, cumulative final 150 pts)	450
Participation Grade (attendance, contribution to lecture discussions, lecture quizzes, etc.)	50
Debate Performance (information below)	35
Current Events Journal (13/14 @ 10 pts each, not accepted late)	130
Creativity Project (10, 25, 70; see below for details)	105
Lab/Discussion (~18 per lab: lab assignments, lab quizzes, lab attendance)	230
Total Points:	**1000**

Grading

Assignments are due *no later than the beginning of class* on the due date, unless otherwise noted. Late assignments will be penalized 10% for each day they are late (this includes being late to lecture or lab on the due date). **(Weekly current event assignments will not be accepted late.)** There will be no 'make up' exams or 'extra credit' (but see below for one exception). We realize that you have lives (cars do break down, people die, stuff happens). In exceptional documented cases, and if arrangements are made in advance, we will consider your unique situation.

Grades will generally be distributed as follows (any potential curving of final grades will not "hurt" you, but can only help you):

≥ 90%	A
80-89%	B
70-79%	C
60-69%	D
≤ 59%	F

Any concerns about scores on assignments and exams must be addressed within one week of the graded work being returned to you.

Please re-familiarize yourself with policies against plagiarism, etc. within the UA Student Code of Academic Integrity: **http://dos.web.arizona.edu/uapolicies/**
Students caught cheating may be penalized by failing the relevant assignment or exam, failing the course, or being expelled. Cheating includes plagiarism or copying from another student; everyone involved will receive a zero for the assignment and may be referred for university disciplinary action.

Keep in mind the following, adapted from J.M. Williams (1993, Clarifying grade expectations, The Teaching Professor 7(7):1):

The "A" Student--An Outstanding Student

* Attendance: "A" students have virtually perfect attendance. Their commitment to the class resembles that of the instructor.

* Preparation: "A" students are prepared for class. They always read the assignment. Their attention to detail is such that they occasionally catch the instructor in a mistake.

* Attitude: "A" students have a winning attitude. They have both the determination and the self-discipline necessary for success. They are curious and they show initiative. They do things they have not been told to do.

* Talent: "A" students have something special. It may be exceptional intelligence and insight. It may be unusual creativity, organizational skills, commitment--or a combination thereof. These gifts are evident to the instructor and usually to the other students as well.

* Results: "A" students make high grades on assignments--usually the highest in the class. Their work is a pleasure to grade.

Students with Disabilities:

If you anticipate the need for reasonable accommodations to meet the requirements of this course, you must register with the Disability Resource Center (http://drc.arizona.edu/; Disability Resource Center 1224 East Lowell Street Tucson, Arizona 85721, Phone: (520) 621-3268 V/TTY Fax: (520) 621-9423, E-mail: uadrc@email.arizona.edu) and request that the DRC send the instructor official notification of your accommodation by the 3rd week of class. Please plan to meet with us by appointment or during office hours to discuss accommodations and how the course requirements and activities may impact your ability to fully participate. All related discussions will remain confidential.

Attendance

You are expected to attend each lecture and each discussion/laboratory session prepared and ready to contribute. Your participation consists of attendance, preparedness (Have you read the material? Did you retain enough to do well on a short quiz?) and contribution to class discussion. Some labs will include a written submission either before or after the lab. Quizzes (often unannounced) may be occasionally given to motivate you to attend class and keep up with the material. Please plan to arrive on time and stay until class is over. Please turn off your cell phone, ipod, etc. All holidays or special events observed by organized religions will be honored for those students who indicate affiliation with that particular religion. Absences pre-approved by the UA Dean of Students (or Dean's designee) will be honored.

The all-day Saturday field trip to Mt. Lemmon on 18 April is optional.

Course Work Details

Lecture Exams

There will be three midterm examinations and a fourth, final examination. The final will be cumulative. Topics covered in the formal lecture period, in lab/discussion, by guest speakers, on field trips, and in the assigned readings will be fair game. The exam format will be mixed and may include: matching, fill-in, multiple choice, short answer, and essay. Be prepared to synthesize ideas, rather than just regurgitate information. Portions of exams may rarely be given as 'take-home' assignments. There will be no make-up exams. You will have a week from the time a graded exam is returned to you and the key posted to meet with the instructors about exam scoring questions you may have.

Debate (35 points) The lecture schedule includes four debates. Each of the four lab sections will be assigned one of the debates. Members of the lab section will be assigned roles in the debate and the debate will take place during the first half of the lecture noted in the schedule. The format will be short opening statement by each interest group followed by questions from the other interest groups, the audience, and the instructors. Your grade will be determined by your preparedness, your performance, your poise, and your overall contribution to the debate preparation and execution. More details will be forthcoming.

Current Environmental Events Journal (130 points; drop your lowest score of 14)
Each Friday (before lecture) throughout the semester (14 weeks total beginning 23 January) you will be expected to turn in **VIA EMAIL (see format below) to your LAB TA (MJ or Tuan)** a short summary of a relevant current event (related to scientific aspects of environmental biology – ask us if you aren't clear what is appropriate) reported in a reputable print-media periodical (Arizona Daily Star, New York Times, Newsweek, Christian Science Monitor are but a few examples). Online versions of periodicals are acceptable. By the end of the semester you will need to have covered 4 different articles for each of the following three categories:

1. Local (Southern Arizona or Tucson)
2. National/North America (Canada, Mexico, or the U.S.)
3. International (not Canada, Mexico, or the U.S.)

The remaining two assignments will be more specific and will involve 1) summarizing a scientific article and 2) summarizing a scientific seminar (we will announce relevant seminars on campus throughout the semester). We will give you more details as the semester progresses. These 14 assignments are due before each Friday lecture (even if we have an exam that day – you can turn them in a few days early; no late current events assignments will be accepted or graded) via email, beginning on **23 January**. The last one will be due on 01 May. These assignments should include your name, the date, the course, the article category (local, national, or international), the appropriate complete citation of the article [follow the general citation format of a scientific journal with author, date, article title, name of periodical, and volume (if appropriate) and page number(s)], a paragraph summarizing the article, and a second paragraph explaining the relevance of the article to this class (here you may include your personal opinions). **In the subject line of the email please put 206, your name, the date, the week number, and the current event category. Example: "K. Bonine, 13 Jan 2009, week 1, local."** You can either include the assignment as the text of the email or attach a word document. If you attach a file the format of the file name should be 206.Name.Week#. Example: "206.KBonine.week1.doc" We will provide feedback via email on these assignments.

Creativity Project (105 points)
You are responsible for developing a substantial, original piece of art or literature that incorporates at least one major theme of environmental biology. We will show you some of the work that former students have accomplished. This is your chance to be creative, expressive, artistic, and relate the topics of this course via traditionally non-scientific modes of communication. Examples include painted, sketched, quilted, or sculpted art, photography, poems, songs, plays, and short stories. Performance art is encouraged, but make sure you clear this in advance (so we budget time for it during our public forum). You may work in a group of up to 3 students if 1) your project requires a high level of effort, and 2) you receive

permission from your course instructors. Bear in mind that each person in the group is responsible for understanding each component of the project; therefore, the group must work together and plan well enough in advance to give each member an opportunity to thoroughly review the final project.

Because assessment of art and literature is inherently subjective, projects will be co-graded by students and the instructors.

Among the authors who effectively incorporate environmental themes into literature are Edward Abbey, William Bartram, Wendell Berry, Charles Bowden, John Burroughs, Rachel Carson, Annie Dillard, Marjory Stoneham Douglas, Robinson Jeffers, Joseph Wood Krutch, Aldo Leopold, Barry Lopez, Peter Matthiessen, Simon Ortiz, John McPhee, William Least Heat Moon, Gary Paul Nabhan, David Quammen, Gary Snyder, Henry David Thoreau, David Rains Wallace, Opal Stanley Whiteley, Terry Tempest Williams, and Ann Zwinger. Particularly if you are working on a "literature" project, we encourage you to read several of the works of these authors, and potentially to model your writing efforts after them.

If you complete a project that involves written materials, we will expect you to demonstrate excellent writing skills. Purely written projects must be typewritten and double-spaced. Please use no binders, folders, or fasteners except a staple in the upper left-hand corner.

Each project can be reviewed as many times as you would like before final submission. You must allow 2 weeks for each review (i.e., it will take us 2 weeks to return your submission); therefore, no projects will be reviewed less than 2 weeks before the due date. We will review draft projects for content, but we will not provide editorial reviews of drafts. We encourage you to seek editorial reviews from your peers.

Your project will be graded based on four categories: link to environmental biology (30%), creativity (30%), effort (30%), and artistry (i.e., is it evocative, aesthetic? 10%). Everyone in the class, including you, will grade your project based on these criteria.

Projects will be co-graded: the grade you and your peers assign your project will be used, in addition to the grade assigned by the instructors, to come up with your final creativity project grade. Projects are due at the beginning of the lecture on **Friday 01 May (70 points) at which time we will be displaying all the submissions in a public forum until NOON**. Late projects, or those that do not follow the prescribed format, will not be graded.

Intermediate submissions: On **06 March** (10 points) you will turn in a one paragraph description of your creativity project, along with a title for the project. On **06 April** (25 points), you will turn in evidence of progress on your project along with a typed narrative (one page) of what you attempted to do, what obstacles you have encountered, and what you have left to do before 01 May. Valid evidence of progress could be a rough draft of a short story, lyrics for an original song, a few photos of the sculpture or painting you are working on, etc. Convince us that you have been working diligently on this project and you will receive a good grade for the 06 April assignment.

Lab and Field Trips

Attendance and Participation are required for all laboratory/discussion sessions, many of which involve field trips. All sessions have been designed with specific objectives, so there

are no suitable "make-ups" for missed labs or trips. The UA van will leave for field trips promptly; we often have host experts waiting for us. There is one optional all-day (Saturday) field trip to Mt. Lemmon/Santa Catalina Mountains. Sign-ups for this trip will take place in February/March.

REQUIRED in the field: sufficient water, hat, snacks, sun & rain gear, field notebook, etc.
RECOMMENDED in the field: camera, binoculars.
Please DO NOT BRING: MP3 player, ipod, CD player, etc. **Turn cell phones off during lab.**

We are going to ask that you dedicate a small (e.g., 4" x 6") **field notebook** to your 206 lab experience. In the field, you will use your small notebook to record observations, data, thoughts, sketches, maps, etc. Always include name, date, time, and location. Be as neat and tidy (and artistic) as you can. Some questions on quizzes and/or exams will allow you to use your field notebook. The better your notes, the better the answers you can provide.

Class meeting suggestions:
In addition to paying attention and turning off electronic devices such as iPod and cell phone, please consider employing these suggestions (borrowed from Guy McPherson) during class discussions:

1. Listen carefully to others before speaking
2. Challenge and refute ideas, not people
3. Focus on the best ideas, not on being the best, or "winning"
4. Before adding your own contribution, practice listening by trying to formulate in your own words the point that the previous speaker made
5. Speak whenever you wish (without interrupting!) even though your ideas may seem incomplete
6. Avoid disrupting the flow of thought by waiting until the present topic reaches its natural end before introducing a new issue
7. If you wish to introduce a new topic, warn the group that what you are about to say will address a new topic and that you are willing to wait to introduce it until people are finished commenting on the current topic
8. Give encouragement and approval to others

Please be aware of the UA policies against threatening behavior by students:
http://policy.web.arizona.edu/~policy/threaten.shtml

Extra Credit (15 points; you can do this once) for environmentally themed songs. Sign up with your TA in your lab section to present at the beginning of lecture for 5 minutes. You should have the song playing on the computer when the 9am bell rings. Projected on the screen should be the lyrics. Give a brief biography of the artist, explain the lyrics (defining any unclear or important terms) and any specific environmental references, and explain the social context of the time during which the song was written and first performed. Are the environmental issues discussed in the song still relevant/important today? If you have trouble finding an appropriate song your instructors have some suggestions. If you are not prepared to present at the beginning of lecture on the day you signed up then you will lose 15 points from your overall grade.

The information contained in the course syllabus, other than the grade and attendance policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor.

	DAY	2009 DATE	TOPIC
	WEEK 1		
	LAB1		No Lab This Week Begin reading *Ishmael* – on reserve in science library
1	WED	14 January	Introduction, Syllabus, Themes
2	FRI	16 January	Ecology
	WEEK 2		
	LAB2		Introduction, Campus Plant Walk
	MON	19 January	MLK HOLIDAY
3	WED	21 January	Evolution
4	FRI	23 January	Biodiversity & Biogeography
	WEEK 3		
	LAB3		Plant IDs, Dichotomous key, Library scavenger hunt
5	MON	26 January	What is a Biome? What is a Species?
6	WED	28 January	Ecology, Evolution, Extinction (symbioses, predator-prey)
7	FRI	30 January	What is Science? Evidence? (Geology)
	WEEK 4		
	LAB4		*Ishmael* (we are discussing the whole book; it is a quick read); Culture & Advertising
8	MON	02 February	How do Science, "Truth", and Ethics Intersect?
9	WED	04 February	Energy, 2nd Law of Thermodynamics
10	FRI	06 February	EXAM ONE
	WEEK 5		
	LAB5		Aerial View of Tucson
11	MON	09 February	Energy & Nutrient Cycling?
12	WED	11 February	Food Webs
13	FRI	13 February	Population Growth
	WEEK 6		
	LAB6		Ecological Footprint, Data Analysis & Graphing
14	MON	16 February	Human Population Growth, IPAT
15	WED	18 February	Ecological Footprint (Consumption v. Population Debate)
16	FRI	20 February	Aquatic Ecosystems
	WEEK 7		
	LAB7		Tumamoc Hill (VAN – meet NW corner BSE)
17	MON	23 February	Marine vs. Freshwater
18	WED	25 February	Nutrients &Threats to Aquatic Environments
19	FRI	27 February	Water
	WEEK 8		
	LAB8		Roger Road Sewage Plant (VAN – meet NW corner BSE)
20	MON	02 March	EXAM TWO
21	WED	04 March	Water
22	FRI	06 March	Soil & Nutrients
	WEEK 9		
	LAB9		BioControl
23	MON	09 March	Food Production (GM Foods Debate)

24	WED	11 March	Pollution, Pests, Pesticides
25	FRI	13 March	Disease Transmission & Evolution (Worobey guest?)
		14-22 March	SPRING BREAK
	WEEK 10		
	LAB10		Los Reales Landfill (VAN – meet NW corner BSE)
26	MON	23 March	No Class Meeting. Work on Creativity Project
27	WED	25 March	Invasives & Disease
28	FRI	27 March	Power Consumption and Sources, Peak Oil
	WEEK 11		
	LAB11		Energy Lab
29	MON	30 March	Power Alternatives? (Oil Drilling Debate)
30	WED	01 April	Urbanization
31	FRI	03 April	Human Quality of Life
	WEEK 12		
	LAB12		Greasewood Park (VAN – meet NW corner BSE)
32	MON	06 April	Human Needs, Wants, Desires
33	WED	08 April	El Niño
34	FRI	10 April	Climate Change
	WEEK 13		
	LAB13		No Lab this week
35	MON	13 April	Climate Change (Climate Change Debate)
36	WED	15 April	EXAM THREE
37	FRI	17 April	Economics
	SATURDAY	18 April	OPTIONAL: Mt. Lemmon field trip. Sign up in Feb/Mar. Leave campus 0700h, return to campus 1800h
	WEEK 14		
	LAB14		Meat Production (VAN – meet NW corner BSE)
38	MON	20 April	Economics
39	WED	22 April	Tragedy of the Commons
40	FRI	24 April	Choices of Societies, Equality
	WEEK 15		
	LAB15		Cane Toads etc.
41	MON	27 April	Individual Choices
42	WED	29 April	Environmental Laws & Treaties
43	FRI	01 May	CREATIVITY EXHIBIT (9-noon)
	WEEK 16		
	LAB16		No Lab This Week
44	MON	04 May	Reactive vs. Proactive; Think Globally, Act Locally?
45	WED	06 May	Wrap Up
	FRI	15 May (8 – 10 am)	CUMULATIVE FINAL EXAM (held in regular lecture room)