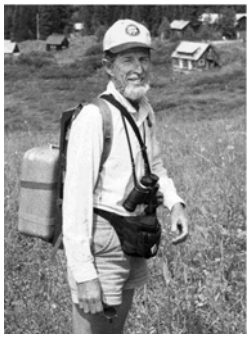
10 January 2007
Environmental Biology Syllabus
ECOL 206, spring 2007, University of Arizona
Kevin Bonine, Ph.D., Anna Tyler - Graduate TA



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.

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.

Meeting Times

Lecture:	MWF	0900–0950h in BSW 219	
Lab/Discussion:	Lab 2.	Wednesday	1400-1700h in CBS/KOFFL 410
	Lab 4.	Friday	1100-1400h in CBS/KOFFL 410

Please attend the lab/discussion section in which you are enrolled.

Instructors
Kevin E. Bonine, Ph.D. (626-0092, kebonine@email.arizona.edu)
Office Hours: TBA in BSE 1D (in the basement) and by appointment.

T.A.: **Anna Tyler** (atyler@email.arizona.edu)
Office Hours: TBA and by appointment

Course Materials
Readings will be provided by the instructors (placed on the course **website**, placed on reserve in the library, or made available for photocopy).

Quinn, Daniel. 1993. *Ishmael*. Bantam Paper.
Purchase optional; 16 copies on reserve in UA Science library (password = 206ecol2007).

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:

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)

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
Current Events Journal (fourteen @ 10 pts each, not accepted late)	140
Creativity Project (10, 25, 70)	105
Lab/Discussion (~15 per lab: lab assignments, lab quizzes, lab attendance)	195
Total Points:	**940**

Grading
Assignments are due *no later than the beginning of class* on the due date. Late assignments will be penalized 10% for each day they are late. (Weekly current event assignments will not be accepted late.) 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:

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

Please re-familiarize yourself with policies against plagiarism, etc., within the UA Student Code of Academic Integrity: http://studpubs.web.arizona.edu/policies/cacaint.htm
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.

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 (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 beginning of 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, each discussion/laboratory session, and the all-day Saturday field trip to Mt. Lemmon. Another potential Saturday field trip will be optional. Be prepared and ready to contribute. 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, 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.

Course Web Site

We will maintain an ECOL206 website (**http://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.

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.

Current Environmental Events Journal (140 pts.)

Each Friday (before lecture) throughout the semester (14 weeks total beginning 19 January) you will be expected to turn in **VIA EMAIL TO ANNA** 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, 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 **19 January**. The last one will be due on 27 April. These assignments should include your name, the date, the course, the article category (local, national, or international), the appropriate complete citation of the article, 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, and the current event category.** We will provide feedback via email on these assignments.

Creativity Project (105 pts.)

You are responsible for developing a substantial, original piece of art or literature that incorporates at least one major theme of environmental biology. 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 natural history 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 three 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 27 April (70 points) at which time we will be displaying all the submissions in a public forum**. Late projects, or those that do not follow the prescribed format, will not be graded.

Intermediate submissions: On **26 February** (10 points) you will turn in a one paragraph description of your creativity project, along with a title for the project. On **02 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 27 April. 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 02 April assignment.

Field Trips and Lab

Attendance and Participation are required for all laboratory/discussion sessions and field trips. These 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. Most labs will be during your 3 hour lab time. There is one mandatory all-day (Saturday) field trip to Mt. Lemmon/Santa Catalina Mountains. An optional Saturday field trip may also be offered.

REQUIRED in the field: sufficient water, hat, lunch/snacks, sun & rain gear, field notebook, etc.
RECOMMENDED in the field: camera, binoculars.
Please DO NOT BRING: MP3 player, ipod, CD player, head phones etc.

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.

Class meeting discussion suggestions:

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

Tentative Lecture Schedule

Reading assignments will be available on the course website unless otherwise noted.

	DATE	LECTURE TOPIC	READINGS	LECTURER
	WEEK 1			
1	10 Jan	Introduction, Syllabus	*Ishmael* (on reserve in library)	Bonine
2	12 Jan	Intro Environmental Science, Discussion, 4-spikes	Withgott & Brennan, Chapter 1	Bonine
	WEEK 2			
	15 Jan	MLK HOLIDAY (no class)	continue reading *Ishmael*	
3	17 Jan	What is Science?	Onion Excerpt, FSM	Bonine
4	19 Jan	Energy and Entropy	Withgott & Brennan excerpt Optional: http://www.2ndlaw.com/	Bonine
	WEEK 3			
5	22 Jan	Geology	Roadside Geology of Arizona - Chapter 1	Bonine
6	24 Jan	Ecosystems, Nutrient Cycling	Ricklefs, Chapter 7	Tyler?
7	26 Jan	Ecosystems and Ecosystem Services	Costanza et al. 1997 (Nature)	Bonine
	WEEK 4			
8	29 Jan	Weather, Climate, Biomes	Sky Islands, El Nino	Bonine
9	31 Jan	Ecology	TBA	Bonine
10	02 Feb	Ecology	TBA	Bonine
	WEEK 5			
11	05 Feb	Succession , Invasion	TBA	Gerst?
12	07 Feb	Evolution	Darwin, Galapagos	Bonine
13	09 Feb	Evolution	Coevolution, Sexual selection	Bonine
	WEEK 6			
14	12 Feb	**EXAM I** (through Invasion lecture)		EXAM
15	14 Feb	Evolution	Drug Resistance	Bonine
16	16 Feb	Biogeography	Song of the Dodo excerpt	Bonine
	WEEK 7			
17	19 Feb	Biodiversity	Hotspots, sea water, soil	Bonine
18	21 Feb	Extinction	Pleistocene Rewilding	Bonine
19	23 Feb	Population Biology	Demography, Metapopulations	Bonine
	WEEK 8			
20	26 Feb	Human Populations	Demographic Transition	Bonine
21	28 Feb	Urbanization and Sprawl	Stoel 1999, Food Conspiracy excerpt 2007	T. Edwards?
22	02 Mar	Conservation and Habitat Reserves	Biosphere Reserves, SDCP	Robichaux?
	WEEK 9			
23	05 Mar	Laws and Regulations	NEPA, ESA, Clean Water, Clean Air	Bonine
24	07 Mar	**EXAM II** (Evolution –> Habitat Reserves)		EXAM
25	09 Mar	The Three-to-Five Rs	2nd Law Thermodynamics	Bonine
	10-18 Mar	SPRING BREAK		
	WEEK 10			
26	19 Mar	Energy, Fossil Fuels, Nuclear	TBA	Bonine

27	21 Mar	Energy, Alternative (Debate?)	Who killed the electric car?	Bonine
28	23 Mar	Pollution, Air	Smog and asthma	Bonine
	WEEK 11			
29	26 Mar	Climate Change, Ozone	Ozone	Bonine
30	28 Mar	Climate Change	National Geographic excerpt	Bonine
31	30 Mar	Climate Change	Walther et al. 2002 (Nature)	Swetnam?
	WEEK 12			
32	02 Apr	Food Production, Green Revolution	TBA	Bonine
33	04 Apr	Food Production	TBA	Bonine
34	06 Apr	Pesticides and Pseudoestrogens	Carson, Colborn	Bonine
	WEEK 13			
35	09 Apr	Water, Limnology	Dams	Bonine
36	11 Apr	Water, Pollution, Eutrophication	Water tainted by petroleum, Yaqui valley child development	Bonine
37	13 Apr	**EXAM III** (Laws & Regulations --> Pseudoestrogens)		EXAM
	WEEK 14			
38	16 Apr	Pollution, Water (Marine)	Ocean plastic, mercury	Mangin?
39	18 Apr	Solid and Hazardous Waste	Superfund Sites	Bonine
40	20 Apr	Earth Day, Environmental Justice	EDN link, Obama excerpt	Bonine
	WEEK 15			
41	23 Apr	Economics, Politics, Taxes	TBA	Bonine
42	25 Apr	Economics	Herman Daly	Bonine
43	27 Apr	Creativity Exhibition		Students
	WEEK16+			
44	30 Apr	Sustainability	TBA	Bonine
45	02 May	Wrap Up (Last Day of Class)	TBA	Bonine
	11 May (Fri)	**FINAL EXAM in same lecture room** (8-10am; cumulative)		EXAM

Tentative Lab/Discussion and Field Trip Schedule

Short readings and assignments available on your course website.

Date	Topic	Readings etc.	Meeting Location
Week 1 (10-12 Jan)	No Lab	*Ishmael,* (Library Book Reserves)	
Week 2 (15-19 Jan)	Introduction, Campus Plant Walk	http://arboretum.arizona.edu/plantwalks.html	Meet in Lab, then depart
Week 3 (22-26 Jan)	*Ishmael* (we are discussing the whole book; it is a quick read), culture, advertising	*Ishmael*	Meet in Lab
Week 4 (29 Jan – 02 Feb)	Ecological Footprint, Video	Footprint Calculator	Meet in Lab
Week 5 (05-09 Feb)	Aerial View of Tucson	See web link	Meet in Lab, then depart
Week 6 (12-16 Feb)	Data Analysis, Graphing	See web link	Meet in Lab
Week 7 (19-23 Feb)	Plant IDs, dichotomous key, Library scavenger hunt	See web link	Meet in Lab, then depart
Week 8 (26 Feb- 02 Mar)	Tumamoc Hill	See web link	Meet **S side BSE** (van)
Week 9 (05-09 Mar)	No Lab	work on creativity project	
Spring Break			
Week 10 (19-23 Mar)	Energy Lab	See web link	Meet in Lab
Saturday 24 March Rex Adams?	Mt. Lemmon **both lab sections**	See web link	Meet **S side BSE**, 7am return ~ 6pm (van)
Week 11 (26-30 Mar)	Data analysis and summary Mt. Lemmon	See web link	Meet in lab
Week 12 (02-06 Apr)	Population Modelling	See web link	Meet in **Computer Lab**
Week 13 (09-13 Apr)	Sweetwater Waste Treatment	See web link	Meet **S side BSE** (van) (Joaquim Delgado?)
Week 14 (16-20 Apr)	Los Reales Landfill	Lomborg 2001	Meet **S side BSE** (van) (Wilson Hughes?)
Week 15 (23-27 Apr)	Greasewood Park?	See web link	Meet **S side BSE** (van)
Week 16	No Lab	Prep for Final Exam	