

# Environmental Science: ES/Biology 260

M. Elsbeth McPhee

## Course description

A core course that will provide an overview of: 1) scientific principles on which studies of the environment are based; 2) current understandings of environmental problems from a scientific perspective; and 3) evaluation of scientific evidence.

This course will be an intensive survey of a broad range of scientific disciplines. There will be a fair amount of required reading as well as quantitative work. A number of the disciplines we'll cover, such as population biology, are very mathematical in nature. (I am here to help – so don't let that scare you!)

## Specific course objectives

1. Gain a rigorous foundation in various scientific disciplines as they apply to environmental science, such as ecology, evolutionary biology, hydrology, and human behavior.
2. Provide a forum for discussion of current issues in environmental science.
3. Provide each student with a set of tools to use in applied situations such as careers that may involve environmental problems and/or issues.

## Instructor/class information

### *Instructor*

M. Elsbeth (Misty) McPhee  
mcpheem@uwosh.edu  
424-0644

office hours:

Tues 11:00 am – 1:00 pm

Wed 12:40 pm – 1:40 pm

If these don't work for you, I'm happy to set up an appointment at a more convenient time. My schedule is posted on D2L so you can see when I'm available.

office: 3448 Sage

### *Class*

Meeting times/locations:

Monday, Wednesday, Friday

1:50 pm – 2:50 pm

Sage 4212

### *Texts & Materials*

Optional: Enger, Eldon D. and Bradley F. Smith. 2008. Environmental Science: A study of interrelationships, twelfth edition. McGraw Hill, New York.

Other readings as listed in the syllabus; posted on D2L.

\*If you already have an Environmental Science text from another class, come see me – you will probably be able to use it instead.

### *Grading*

Your grades will be based on four things (explanations below):

- |  |     |
|--|-----|
| 1. Class participation                                 | 100 |
| 2. 10 short quizzes (10 pts each)                      | 100 |
| 3. Eight exercise/discussion assignments (20 pts each) | 160 |
| 4. Three exams (100 pts each)                          | 300 |

**Total points: 660**

To figure your grade at any point throughout the term, add the total points earned and divide by the total points possible up to that point. Attendance is expected and that, with participation, can raise a borderline grade.

<u>% of total points</u>	<u>Grade</u>	<u>% of total points</u>	<u>Grade</u>
94-100	A	73-76	C
90-93	A-	70-72	C-
87-89	B+	67-69	D+
83-86	B	63-66	D
80-82	B-	60-62	D-
77-79	C+	≤ 59	F

1. **Class participation** will be graded based on attendance and overall participation and engagement in the course. Obvious signs of engagement are questions and participation in discussion; other signs

are coming to talk to me in office hours or before/after class; and finally, just general attitude and attendance in the classroom.

Participation grades will be given as follows:

- A = participates often and meaningfully
- A- = participates a fair amount
- B = participates some
- B- = participates rarely
- C = in class but doesn't participate

I will take 2 points off of your participation grade for each class missed.

2. I will frequently give a short **quiz** at the beginning of class. These will always be on material from the most recent lectures, so I strongly recommend you go over your notes immediately after each class and immediately prior to the following class.

Quizzes can NOT be made up under any circumstances.

3. There will be eight **assignments** due throughout the semester. Several of them will be written responses to assigned readings.

- The responses will be 1-3 pages (double spaced).
- Each response will begin with at least 3 questions that you can use in class discussion. Your discussion questions will NOT be questions about details of the readings but big-picture questions that foster discussion. For example, do not ask, “How many bushels of corn were harvested in 2004?” but, “What implications does the increase in corn production have on family farms?”
- These responses are just that – your *response* to the reading/movie. Tell me what you think, how it relates, etc. A great reading response refers to each assigned paper but doesn't just regurgitate what they said – it actually shows that you have thought about the topic.
- Though this is not a formal paper, you must correctly cite the papers you read and any other sources you used to formulate your ideas. For example, in text, you will cite a paper in this way

(Smith et al. 2008). At the end of the paper, please use the following format:

Smith, M., P. Jones, and S. Johnson. 2008. Effects on toxins on behavior in children. *Ecotoxicology* 25:54-58.

If you have any questions, please ask me.

- Your responses are due **before** the start of class via the dropbox in D2L.
  - Please turn in documents as **Pdfs**. I can NOT open .wps documents – any document that I can't open will be disregarded.
  - If you are late and the dropbox is closed, put your assignment in the "Late assignments" dropbox. **I WILL NOT ACCEPT ANY ASSIGNMENT VIA EMAIL – EVER.** If it goes into the late dropbox, I don't guarantee it will get graded before the end of the term. Do not complain about timing – if you were late, I have no obligation to be timely. All late submissions are subject to a 10 - 20% penalty and will appear as a 0 until I grade it.
4. There will be three **exams**. I will hold a 1-hour review session for each exam on the following dates:

Sunday, 9 October, 4:00 pm

Wednesday, 9 November, 5:00 pm

Wednesday, 14 December, 5:00 pm

Mark your calendars and try to keep these times open. I understand, however, that some of you will have commitments that you can't change. In that case, please plan to come by my office during office hours or arrange another time for us to go over any questions you might have. *But arrange this in advance!*

There is a fair amount of reading for this course. All of it is fair game for the exams. It is not evenly distributed throughout the semester, however, (i.e., there are some light days and some heavy days) so I suggest you get ahead on light days so the heavy days aren't so bad.

- If you miss an exam due to a University-sponsored activity (e.g. athletics contest), you will know ahead of time and your coach will

have provided you with a letter. Bring a copy of that letter to me ahead of time, to permit a make-up to be arranged.

- If you miss an exam for any other University-accepted reason, provide me with written proof and I'll arrange a make-up.
- **Absolutely NO** late exams will be scheduled for reasons of holiday or end-of-term travel.

5. Extra credit. One thing I highly encourage is participation in campus events and lectures. In October, the University hosts Earth Charter that typically has wonderful speakers and activities. If you attend an event or lecture that is relevant to our discussions in ES 260, I will give you 5-10 points if you write up a one-page description of the event. A basic description will yield 5 points; a well-written description with a critique and discussion of how the topic fit into ES 260 will yield 10 points.

### Miscellaneous – but *important* – comments

1. Cell phone use will NOT be permitted in my classroom. If your cell phone goes off or you text during class, you will be asked to leave and you will receive an F for that day's participation.
2. Laptops: you are more than welcome to use laptops in class to take notes, but you are NOT to use them for any other purpose. If I see you using your laptop for anything other than note-taking, I will ask you to close your computer and you will receive an F for that day's participation.
3. I will NOT tolerate emails or assignments written in shorthand – if you send me anything in shorthand I will consider it unreadable and thus, won't read it. If it is a graded assignment, you will receive a 0 until you hand in a legitimate version (at which point penalties for handing in the work late will apply).
4. If you must print something (versus putting it in D2L), I consider documents printed on both sides of a sheet of paper, or even printed on scratch paper, to be perfectly acceptable! Let's try to keep our resource use down.
5. The syllabus is a general guideline – we might go slower or faster depending on interest and engagement on various topics. Feel free to give feedback on the speed of the class!

7. **STUDENTS WITH DISABILITIES ARE WELCOME IN THIS COURSE.** Please contact your me in the first week of class so that we may arrange all possible accommodation ahead of time.
8. If you need me to sign a form for any reason, do not come to be just before class or right after class. Please come to my office hours instead.
9. **EMAIL COMMUNICATION and D2L** will be used frequently throughout the semester to communicate between Instructors and Students. Emails constitute legal, official University communication. Not checking your email is not an excuse for performance problems in the class. Contact Academic Computing or any Campus Computer Lab supervisor for assistance with email and D2L.
10. **ACADEMIC HONESTY** policies are clearly defined at this University and all students are expected to abide by them. Penalties for violations are severe in this course. Cheating on an exam (including looking at someone else's paper) at a MINIMUM leads to zero on that exam, with no opportunity for a make-up or extra credit. A second offense is an F in the course and a report to Dean of Students.

## Proposed lecture and assignment schedule

Lecture	Date	Topic	Assignments due
<u>1. Introduction, Human populations and human behavior</u>			
1.1	Wed, 7 Sept	Intro: What is environmental science? Sustainability?	<u>Read:</u> Enger & Smith Chpt 1
1.2	Fri, 9 Sept	Syllabus, Human populations	<u>Read:</u> Enger & Smith Chpt 7, pp 139-143, 149-169
1.3	Mon, 12 Sept	Human behavior 1	<u>Read:</u> Enger & Smith Chpt 2
1.4	Wed, 14 Sept	Human behavior 2	
1.5	Fri, 16 Sept	<i>Discussion of journal articles</i>	<u>Read:</u> Low 2004 <u>Read:</u> Daily & Ehrlich 1992 <b>Due: Reading Response #1 to Low; Daily &amp; Ehrlich</b> <b>Due: Ecological Footprint</b>
<u>2. Biodiversity and extinctions</u>			
2.1	Mon, 19 Sept	Biodiversity	<u>Read:</u> Enger & Smith Chpt 6, pp 115-138; Chpt 11
2.2	Wed, 21 Sept	Extinction 1	<u>Read:</u> Enger & Smith Chpt 5, pp 79-84; 89-107
2.3	Fri, 23 Sept	Extinction 2	<u>Read:</u> Enger & Smith Chpt 5, pp 84-89
<u>3. Asking questions and making predictions</u>			
3.1	Mon, 26 Sept	Hypotheses and predictions	<u>Read:</u> Enger & Smith Chpt 4, pp 61-66 <u>Read:</u> Schick and Vaughan pp 162-182 <u>Read:</u> Barnard 1
3.2	Wed, 28 Sept	Inference and descriptive statistics	<u>Read:</u> Barnard 2
3.3	Fri, 30 Sept	<i>Statistics exercises</i>	<u>Read:</u> Braude & Low Chpt 14 <i>You <b>must</b> read this before class, but don't answer questions yet.</i>
<u>4. Population biology</u>			
4.1	Mon, 3 Oct	Demography, population growth	<b>Due: Statistics exercise</b> <u>Read:</u> Chpt 7, pp 143-149
4.2	Wed, 5 Oct	Small populations 1	
4.3	Fri, 7 Oct	Small populations 2, metapopulations	<u>Read:</u> Webb et al. 2002 <u>Read:</u> Ferrer et al. 2009 <b>Due: Reading Response #2 to Webb et al. and Ferrer et al.</b>
4.4	Mon, 10 Oct	<b>EXAM 1</b>	

<u>5. Population genetics</u>			
5.1	Wed, 12 Oct	Conservation genetics, inbreeding	<u>Read:</u> Cons genetics, pp 23-39, 72-86
5.2	Fri, 14 Oct	Hardy-Weinberg equilibrium	<u>Read:</u> Cons genetics pp 72-86
5.3	Mon, 17 Oct	Genetic drift, effective population size	<u>Read:</u> Cons genetics pp 175-179, 189-191
5.4	Wed, 19 Oct	<i>Genetics exercise</i>	<u>Read:</u> Braude & Low Chpt 10 <i>You must read this before class, and come to class with questions 1-3 answered!</i>
<u>6. Animal behavior</u>			
6.1	Fri, 21 Oct	Invasive species, ecological and evolutionary traps	<u>Read:</u> Schleapfer 2002 <u>Read:</u> Schleapfer 2005 <b>Due: Genetics exercise</b>
6.2	Mon, 24 Oct	Predictability	<u>Read:</u> Dewar & Richard 2007
6.3	Wed, 26 Oct	Captive breeding and reintroduction	<u>Read:</u> McPhee 2003
6.4	Fri, 28 Oct	<i>Discussion of journal articles</i>	<u>Read:</u> Beck et al. 1995 <u>Read:</u> Jule et al. 2008 <u>Read:</u> Britt et al. 2003 <b>Due: Reading response #3 to Beck et al. 1995, Jule et al. 2008, and Britt et al. 2003</b>
<u>7. Hydrology and aquatic ecology</u>			
7.1	Mon, 31 Oct	<i>Movie: Issues in Water Quality</i>	
7.2	Wed, 2 Nov	Hydrologic cycle	<u>Read:</u> Enger & Smith Chpt 15, pp 334-345
7.3	Fri, 4 Nov	Water use	<u>Read:</u> Enger & Smith Chpt 15, pp 346-364
7.4	Mon, 7 Nov	Water pollution	
7.5	Wed, 9 Nov	Water pollution	<u>Read:</u> Morrison 2005 <u>Read:</u> Wu et al. 1999 <b>Due: Reading response #4 to Morrison 2005, Wu et al. 1999, and movie</b>
7.6	Fri, 11 Nov	<b>EXAM 2</b>	

<u>8. Soil, agriculture, and land use</u>			
8.1	Mon, 14 Nov	Soil	<u>Read:</u> Enger & Smith Chpt 13
8.2	Wed, 16 Nov	Agriculture	<u>Read:</u> Enger & Smith Chpt 14, pp 311-314
8.3	Fri, 18 Nov	Pest management	<u>Read:</u> Enger & Smith Chpt 14, pp 315-333
8.4	Mon, 21 Nov	<i>No class: watch movie "Farm for the Future"</i>	Go to grinningplanet.com and select movies; scroll down to "Farm for the Future."
8.5	Mon, 28 Nov	Pest management	<u>Read:</u> Lewis et al. 1997 <u>Read:</u> Francis & Madden 1993 <b>Due: Reading response #5 to Lewis et al. 1997, Francis &amp; Madden 1993, and movie <i>Farm for the Future</i></b>
8.6	Wed, 30 Nov	Landscapes	<u>Read:</u> Enger & Smith Chpt 12
8.7	Fri, 2 Dec	<i>Land-use planning exercise</i>	
<u>9. The atmosphere and climate change</u>			
9.1	Mon, 5 Dec	Atmosphere, pollution	<u>Read:</u> Enger & Smith Chpt 16, pp 365-378 <u>Read:</u> Kolbert 2005 – Part I <u>Peruse:</u> Schneider & Sarukhan 2001
9.2	Wed, 7 Dec	Climate change	<u>Read:</u> Enger & Smith Chpt 16, pp 378-391 <u>Read:</u> Kolbert 2005 – Part II
9.3	Fri, 9 Dec	Climate change	<u>Read:</u> Kolbert 2005 – Part III
9.4	Mon, 12 Dec	<i>Climate change discussion</i>	<u>Read:</u> Telemeco et al. 2009 <u>Read:</u> Figueres et al. 2002 <b>Due: Reading response #6 to Telemeco et al. 2009, Figueres et al. 2002, and Kolbert 2005 parts I, II, and III</b>
<u>10. People, again: Turning science into action</u>			
10.1	Wed, 14 Dec	Human behavior, economics, and policy	<u>Read:</u> Enger & Smith Chpts 3 & 19
10.2	Fri, 16 Dec	<b>EXAM 3</b>	

## Bibliography for ES 260, fall 2010

M. Elsbeth McPhee

Barnard, Chris, Gilbert, F., & McGregor, P. (2001). *Asking Questions in Biology: Key Skills for Practical Assessments and Project Work* (2nd ed.). Benjamin Cummings.

Beck, B. (1995). Reintroduction, zoos, conservation, and animal welfare. In *Ethics on the Ark: Zoos, Animal Welfare, and Wildlife Conservation* (pp. 155-163). Washington, D.C.: Smithsonian Institution Press.

Daily, G., & Ehrlich, P. (1992). Population, sustainability, and Earth's carrying capacity. *BioScience*, 42(10), 761-771.

Britt, A., Welch, C., & Katz, A. (2003). Can small, isolated primate populations be effectively reinforced through the release of individuals from a captive population? *Biological Conservation*, 115, 319-327.

Dewar, R. E., & Richard, A. F. (2007). Evolution in the hypervariable environment of Madagascar. *Proceedings of the National Academy of Sciences*, 104(34), 13723-13727.

Ferrer, M., Newton, I., & Pandolfi, M. (2009). Small populations and offspring sex-ratio deviations in eagles. *Conservation Biology*, 23(4), 1017-1025.

Figueres, C., & Ivanova, M. (2002). Climate Change: National Interests or a Global Regime? In *Global Environmental Governance, Options and Opportunities*. Yale School of Forestry and Environmental Studies.

Francis, C. A., & Madden, J. P. (1993). Designing the future: sustainable agriculture in the US. *Agriculture, Ecosystems & Environment*, 46(1-4), 123-134.

Frankham, R., Ballou, J., & Briscoe, D. (2002). *Introduction to Conservation Genetics*. New York: Cambridge University Press.

Jule, K., Leaver, L., & Lea, S. (2008). The effects of captive experience on reintroduction survival in carnivores: A review and analysis. *Biological Conservation*, 141(2), 355-363.

Kolbe, J. J. (2010). Hardy-Weinberg: Evaluating disequilibrium forces. In *An Introduction to Methods and Models in Ecology, Evolution, and Conservation Biology* (pp. 107-116). Princeton, NJ: Princeton University Press.

Kolbert, E. "The climate of Man - I." The New Yorker, April 25, 2005.

———. "The climate of Man - II." The New Yorker, May 2, 2005.

———. "The climate of man - III." The New Yorker, May 9, 2005.

Lewis, W. J., van Lenteren, J. C., Phatak, S. C., & Tumlinson, J. H. (1997). A total system approach to sustainable pest management. *Proceedings of the National Academy of Sciences of the United States of America*, 94(23), 12243-12248.

Low, B. (2004). Human behavior and conservation. *Endangered Species UPDATE*, 21(1), 14-22.

McPhee, M. (2003). Generations in captivity increases behavioral variance: Considerations for captive breeding and reintroduction programs. *Biological Conservation*, 115(1), 71-77.

Morrison, J. (2005, March). How much is clean water worth? *National Wildlife*, 24, 26-28.

Schick, T., & Vaughn, L. (2002). Science and its pretenders. In *How to Think about Wierd Things: Critical thinking for a new age*. Toronto: Mayfield Publishing Company.

Schlaepfer, M., Runge, M., & Sherman, P. (2002). Ecological and evolutionary traps. *Trends in Ecology and Evolution*, 17(10), 474-480.

Schlaepfer, M., Sherman, P., Blossey, B., & Runge, M. (2005). Introduced species as evolutionary traps. *Ecology Letters*, 8(3), 241-246.

Schneider, S, Sarukhan, J, Adejuwon, J., Azar, C., Baethgen, W., Hope, C., Moss, R., Leary, N., Richels, R., Van Ypersele, J-P., Kuntz-Duriseti, K., Jones, R.N. (2001). Overview of impacts, adaptation, and vulnerability to climate change. In *Climate Change 2001: Impacts, Adaptation, and Vulnerability: Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change* (pp 75-103), IPCC.

2001. Sparks-Jackson, B., & Silverman, E. (2010). Understanding descriptive statistics. In *An Introduction to Methods and Models in Ecology, Evolution, and Conservation Biology* (pp. 155-178). Princeton, NJ: Princeton University Press.

Telemeco, R. S., Elphick, M. J., & Shine, R. (2009). Nesting lizards (*Bassiana duperreyi*) compensate partly, but not completely, for climate change. *Ecology*, 90(1), 17-22.

Webb, J.K., B.W. Brook, and R. Shine. "What makes a species vulnerable to extinction? Comparative life-history traits of two sympatric snakes." *Ecological Research* 17 (2002): 59-67.

Wu, C., Maurer, C., Wang, Y., Xue, S., & Davis, D. L. (1999). Water pollution and human health in China. *Environmental Health Perspectives*, 107(4), 251-256.