

BIOL 117: ENVIRONMENTAL SCIENCE

College of the Holy Cross, Fall 2016

Instructor: K. Wolfe-Bellin

SYLLABUS

The study of environmental science seeks to understand how the natural world works, and how humans and the environment interact to affect one another. Within this study, environmental scientists strive to understand the causes and consequences of environmental change, as well as find solutions to environmental problems. This course will be divided roughly into five units. In the first, we will focus on learning the scientific, ethical, and historical foundations of environmental science. Major topics to be covered include the scientific method, environmental ethics & history, environmental chemistry, population biology, community ecology, ecosystem ecology, and the global biomes.

In the second unit we will study the natural world around us, developing the observational skills to identify common tree species, as well as learning about the history and management of local forests, biodiversity, and issues of urban ecology and sustainability. To reinforce topics in this unit, we will work with the *Arts Transcending Borders* program in partnership with the *Greater Worcester Land Trust* to harvest trees from local conservation areas to be used in constructing an environmental sculpture by internationally renowned artist Patrick Dougherty. We will also partner with the *Worcester Tree Initiative* to assist in a citywide survey of trees planted in an effort to reforest the city.

In the last three units we will focus on three major areas of environmental concern in the modern world, exploring questions of how humans can acquire food, energy, and water sustainably. From this study, it will become apparent that these three major human needs—food, energy, and water— are the ultimate cause of most environmental problems. We will approach each of these topics utilizing a combination of projects, activities, readings, and lectures. Note, in particular, that our study of food and agriculture will include a day working with the *Community Harvest Project*, a local organization committed to feeding the hungry using sustainable agricultural methods.

Instructor:

Kelly Wolfe-Bellin, Ph.D.

Office: O'Neil 326

Phone: 508-793-3781

Email: kwolfe@holycross.edu

Office hours: Mon. 1:00-2:00 p.m.

Wed. 9:00-10:00 a.m.

Thur. 11:00-12:00 noon

Fri. 10:00-11:00 a.m.

Other times by appointment

Meeting time and place: Tuesday, Thursday 2:00-3:15 p.m.
O'Neil 123

Required textbook:

Cunningham, W. P. and M. A. Cunningham. 2015. *Environmental Science: A Global Concern*, 13th ed. McGraw-Hill, New York, NY.

Course objectives:

Upon completion of the course, students will ...

1. understand the scientific method and have an appreciation for how the process of science works
2. know the foundations of environmental science, including basic ecological principles of populations, communities and ecosystems
3. understand the scientific aspects of major environmental issues, as well as potential solutions to those issues
4. be able to critically analyze potential causes of and solutions to environmental problems
5. feel confident that they can contribute substantively to community groups working on environmental issues

Class format and student responsibilities:

Classes will consist of a combination of lecture and learner-centered activities in which students are expected to actively participate. Attendance at all classes is required. Students should *review previous class material* and complete the assigned reading *before each class*. Required readings from the textbook are listed in the schedule; pace your reading so it corresponds to the topic announced during class. Additional readings will also be assigned almost every class. These will be announced in class and will be handed out or posted on the course Moodle website. Other student responsibilities and expectations are as follows:

- Students are responsible for all announcements and material covered in class, even on days when absent.
- Cell phones should be silenced and put away; no texting should occur during class.
- Laptops or other electronic equipment may be used in class, but only for class purposes and only with the instructor's permission.

Exams:

Three exams will be given during the course, two midterms and one final. The midterm exams will each cover material from approximately 1/3 of the semester. The final exam will cover material from the last 1/3 of the semester plus cumulative material from the entire semester.

Make-up exams will be given only under extraordinary circumstances. I must be notified in advance for a make-up exam to be considered. Make-up exams may be in a different format from the original exam.

Community-Based Learning (CBL):

During the semester we will work on three projects that involve four community partners; each project involves a different environmental issue.

The Greater Worcester Land Trust is a small non-profit organization with the mission to purchase, hold, advocate for, or preserve critical open space parcels in the Greater Worcester area..With this group, we will help to remove brushy trees, an important land management tool,

from a local conservation area. The trees will then be used in the construction of a “stickwork” environmental sculpture to be built on campus by artist-in-residence Patrick Dougherty. The stickwork project is being sponsored by the College *Arts Transcending Borders* office in partnership with the Environmental Studies program. Students in Bio 117 are strongly encouraged to participate in the construction of this sculpture.

Community Harvest Project (CHP) is a non-profit farm that engages volunteers to grow fresh fruits and vegetables to provide to those experiencing hunger. We will spend a day working at the CHP farm to observe sustainable agricultural practices and learn more about the social justice issue of hunger.

Worcester Tree Initiative (WTI) is a private, non-profit organization whose mission is to promote urban forestry and tree stewardship in the City of Worcester and surrounding communities. Recently the WTI started a Volunteer Urban Tree Stewards Program to care for and maintain the 6,000 public trees planted on Worcester’s streets in the past six years. We will participate in one day of surveying trees in the city as part of this program. In addition, each student will write a research paper on some environmental aspect of the WTI mission.

***Reacting to the Past* Role-Immersion Game:**

We will play a role-immersion game called *Climate Change in Copenhagen*. This exercise will require approximately two weeks of class time: one class period to introduce the topic and game, two class periods to play the game, and one class period for final wrap-up. This exercise will require a significant amount of reading and preparation by each student, small group meetings outside of class time, and active participation in the game by each student. Students will be graded on the exercise based on participation and a written paper.

This exercise is part of the unit on energy.

Research papers:

A number of papers and projects will be assigned that involve using published scientific literature. These will give students experience with searching for relevant literature as well as reading and interpreting scientific articles. We will work with the staff of the Science Library to learn how to use the resources of the Holy Cross Libraries to access primary scientific literature.

Homework:

Homework assignments will be assigned periodically throughout the semester. These may include any of the following, but are not limited to: problem sets; reflection papers; short research papers; and a tree identification quiz. In an effort to conserve paper, all assignments to be handed in should be printed *double-sided*.

Late assignment policy:

All assignments are due at the beginning of class on the date announced. Ten percent of the assignment grade will be deducted for each day the assignment is late. After ten days, the student will receive no credit for the assignment.

Grading:

The following is the approximate breakdown to be used for calculating the final grade (subject to change based on the number of homework assignments given):

Midterm exams (2 @ 100 pts each)	200
Final exam	125
<i>Community Harvest Project</i> reflection paper	25
<i>Worcester Tree Initiative</i> research paper	50
<i>Reacting to the Past: Climate Change in Copenhagen</i>	
Participation	10
Paper	50
Fracking research & project	50
Homework	100
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Total	610 points

Students with special needs:

Every effort will be made to meet the individual needs and various learning styles of students in this course. It is of the utmost importance that you inform me at the beginning of the semester of your particular needs. If your concerns are about a learning disability or another specific need, please make an appointment with the Disability Services Office. All information is strictly confidential.

Academic honesty policy:

Students are responsible for generating their own work. All sources of intellectual property must be appropriately cited. Any plagiarized or unreferenced work that is not the creation of the student will receive a grade of zero. This includes work copied from another student or a student allowing another student to copy part or all of his/her work. Any plagiarized work will receive a zero for the assignment and the Class Dean will be notified. Students are encouraged to read the Academic Honesty Policy of the College for a thorough description of plagiarism.

Textbook affordability:

It is expected that Holy Cross students will have textbooks and other required class materials in order to achieve academic success. If you are unable to purchase course materials, please consult with the Financial Aid office where a staff member will be happy to provide you with information and assistance.

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Schedule of topics and textbook reading assignments

Topic	Textbook reading*
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UNIT 1: FOUNDATIONS OF ENVIRONMENTAL SCIENCE

Topics & textbook readings:

Introduction to environmental science	Ch. 1, 2
Environmental ethics & history	Ch. 1
Matter, energy, and life	Ch. 3
Evolution, biological communities, and species interactions	Ch. 4
Global biomes	Ch. 5; pp. 324-329
Population biology	Ch. 6
Human population	Ch. 7

UNIT 2: THE NATURAL WORLD AROUND US

Projects/partners:

Greater Worcester Land Trust (community partner) - land management

Arts Transcending Borders (campus partner) - stickwork environmental sculpture

Worcester Tree Initiative (community partner) - urban forestry

Topics & textbook readings:

Observing our local environment	
Biodiversity	Ch. 11, 12
Urban ecology and sustainability	Ch. 22

UNIT 3: FOOD

Projects/partners:

Community Harvest Project (community partner) - hunger; sustainable agriculture

Topics & textbook readings:

Food and agriculture	Ch. 9, 10
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UNIT 4: ENERGY

Projects & partners:

RTTP game (project): Climate Change in Copenhagen

Fracking debate (project) - energy sources

Topics & textbook readings:

Air pollution	Ch. 16
Climate change	Ch. 15
Energy sources	Ch. 19, 20

UNIT 5: WATER

Projects & partners:

InTeGrate (project): Environmental Justice & Freshwater Resources

Topics & textbook reading:

Water use and management	Ch. 17
Water pollution	Ch. 18

***Textbook reading:**

Cunningham and Cunningham. 2015. *Environmental Science: A Global Concern*, 13th ed.

Additional readings will be assigned most classes.

These will be distributed in class or posted to the course Moodle site.