

# Environmental Science

Instructor: Catherine Chamberlin ([Catherine.chamberlin@duke.edu](mailto:Catherine.chamberlin@duke.edu))

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## Course Description:

Do you like exploring both new and familiar places and discovering how your own environment works? In this course we will do both of those things, learning about environmental science through a focus on local ecology (the study of relationships of organisms with each other and with their environment). Students finishing this course will have an increased appreciation of the places they live, as well as increased confidence in understanding results of scientific research and applying it to their own vocations. This course and the associated lab includes a major field portion in which students are invited to design and conduct an environmental study of their own in a place of interest to them.

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## Course Goals/Learning Objectives:

1. Describe the ecological, political, social, cultural and economic aspects of environmental problems.
  2. Identify sources and magnitude of uncertainty in environmental studies and interpret ecological predictions in light of the uncertainty.
  3. Practice field skills in environmental sciences (e.g. habitat characterization, species counts, soil coring, measuring stream discharge etc.).
  4. Apply core ecological principles to various environmental questions.
  5. Test an ecological hypothesis with a field experiment
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## Course Materials

**LAB MATERIALS:** You will need to purchase a 100 page Lined Notebook as your "Field Notebook".

**FIELD ATTIRE:** You need clothes you can get muddy, wet and dirty (e.g., old long pants, a good pair of sneakers or hiking boots) AND a change of clothes (regular

clothes) for post field work. Please note that if you do not come dressed appropriately for the field, you may not be able to participate and get credit for the day's activities.

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**Assessments:**

<i>Assessment</i>	<i>% of Final Grade</i>	<i>Total Points</i>
Weekly Reading Responses (P/F)	21%	20 pts each up to a total of 240
Daily Exit Tickets (P/F)	24%	10 pts each up to a total of 280
Lab – Field Notebook & Workups (P/F)	15%	25 pts each up to a total of 175
Midterm Oral Exam	9%	100
Research Proposal Presentation	10%	120 (20 pts for drafts submitted on time, 100 pts for final submission)
Research Paper	11%	130 (30 pts for total drafts submitted on time, 100 pts for final submission)
Research Presentation	10%	120 (20 pts for drafts submitted on time, 100 pts for final submission)

**Reading Responses:** You will earn 20 points for each successfully completed reading response up to a total of 240 points. “Readings” in this context mean any assigned reading, viewing or listening for the week, and will be posted on the course website. You can miss up to 2 weeks while still getting full credit. Reading responses should not simply be a summary of the readings, videos and podcasts, but should include your thoughts and reactions to the readings, and any connections you make between assigned readings and other readings from the class or life. Each response should be 200-300 words (about ½ page) and should be emailed to me by 9:00 Wednesday morning. Submitting a response of required length by the required time will result in full credit, late responses receive 0, and short responses (<200) will

receive half credit (10 pts).

**Exit Tickets:** At the end of every class period you will need to fill out an “exit ticket,” answering 2-3 questions based on the material covered in class. This is also a place to write any questions or things you would like me to cover in class. Each ticket is 10 points up to a total of 280. This means you can miss up to 4 exit tickets while still getting full credit. Tickets are graded as “Pass” if you complete them, and “Fail” if you do not, regardless of whether written answers are correct or not.

**Lab Field Notebook & Write Ups:** You will earn 25 points for each successfully completed lab. To successfully complete the lab you must turn in written observations and data in your own personal field notebook, and any additional data analysis that is done using your data. You are expected to come prepared to lab in the following ways: review material and instructions before coming to lab, bring your field notebook and relevant handouts with you to lab, and come wearing appropriate clothing. See **Course Materials** section for a full discussion of field clothes.

**Midterm Oral Exam:** Students will be given a list of 15-20 questions in advance that they could be tested on. On the day of the test, students will meet with me in groups of 4, and each student will be randomly assigned one question that they will be graded on. They will answer the question orally to the group, using the blackboard if necessary. Each student will have 4 minutes to answer, followed by one minute of group discussion.

**Research Paper & Presentation:** Over the course of the semester, you will develop, conduct, and report on an experiment investigating some element of environmental biology. Drafts of each of these elements will be due ahead of the final due date. Drafts are graded under pass/fail, and the final product will be given a grade.

- At midterm you will be required to present on your idea to the class for a grade worth 10% of your final grade. This first presentation should be 3-5 minutes long, and should clearly state what your question is, should clearly list your different hypotheses and predictions, as well as describe the methods you plan to use to investigate your question.
- The final 4-5 page (not including the bibliography) paper will be worth 10% of your grade at 100 points. This paper should state what you did, your results and conclusions, as well as a reasonably thorough review of published literature on that topic. This will require you to explore scientific literature on the topic outside of class, and you are expected to include at least 10 scholarly sources (from an academic journal- not newspapers, magazines, blogs, news websites, or informational websites).
- The final presentation will be based directly on the material covered in your research paper and will be 10-12 minutes long. You are not required to use a Powerpoint presentation and can give a purely oral presentation if you

wish, but ***you are required to use at least 1 visual aid*** (graphs, drawings, diagrams, photos, etc...) that is relevant and benefits the class' understanding of your research project.

### **Late or Missed Work**

Late work will be accepted up until the time that the assignments have been graded and returned. After assignments have been graded and returned, no credit will be given. Thus, by turning in assignments late, students incur increasing risk of being given no credit at all for the assignment. ***There are no exceptions to this policy, please plan ahead.***

### **Honor Code for this Class**

By completing this class, you are signifying to others a certain level of proficiency in the subject matter. Other people may in the future rely on you to use this knowledge to do a job that they themselves could not do. Therefore, it is important that students in this class take responsibility for their own ***learning***, which cannot occur if students simply cheat on various assignments. By enrolling in this class you agree that the work you submit will be your own work, written by you, and containing ideas by you. Any references to others' writings or ideas must be properly cited. Plagiarism in final drafts of submitted work may result in a failing grade among other penalties. Each submitted assignment must contain a written or electronic signature signifying that the work you submit is your own.

**Course Schedule:**

This class meets for lectures Mondays and Wednesdays 11:00 – 12:15 and for lab Mondays 12:30 – 3:10. Frequently, we will use the Monday lecture time as part of lab, with a lunch break built in. Labs may be in inside or in the field. Wednesdays will be primarily used for discussion and group activities. Lecture videos and reading assignments will be posted on Sakai for each week’s unit.

<b>Week of:</b>	<b>Topic</b>	<b>Monday</b>	<b>Wednesday</b>	<b>Reading Assignments</b>
1 August 11	Course Introduction, Scientific method, Metric System Review	LAB 1: How to find and read scientific literature	Lecture/ Discussion  <i>DUE: Reading Response</i>	Course syllabus; Cunningham & Cunningham (C&C) ch 2; Kuhn ch 2
2 August 18	Species Interactions and Evolution	LAB 2: Forest communities/ plant diversity  <i>DUE: Lab 1 report</i>	Lecture/ Discussion  <i>DUE: Reading Response</i>	C&C ch 4
3 August 25	Biomes	Lecture/ Discussion  <i>DUE: Lab 2 report</i>	Lecture/ Discussion  <i>DUE: Reading Response</i>	C&C ch 5; Davidson et al 2012
4 September 1	Ecosystems	<del>LABOR DAY - NO CLASS</del>	Lecture/ Discussion  <i>DUE: Reading Response</i>	Watch “What is an Ecosystem?”; O’Neill 2001
5 September 8	Biodiversity	LAB 3: Soil biodiversity	Lecture/ Discussion  <i>DUE: Reading Response</i>	Tilman et al 1996; C&C ch 11

6 September 15	Population Biology	LAB 4: Loggerhead turtle sim  <i>DUE: Lab 3 report</i>	Lecture/ Discussion  <i>DUE: Reading Response</i>	C&C ch 6
7 September 22	Geology	LAB 5: Soil Analysis  <i>DUE: Lab 4 report</i>	Lecture/ Discussion  <i>DUE: Reading Response</i>	Schlesinger & Bernhardt ch 4 (Rock Weathering & Soil Development)
8 September 29	Midterm Review  <i>DUE: Paragraph- length research proposal</i>	Midterm Review  <i>DUE: Lab 5 report</i>	<b>MIDTERM EXAM</b>	
9 October 6	Climate and Air Pollution	Lab 6: Audubon bird count	<del>(NO SCHEDULED CLASS – MAKE UP DAY)</del>	
10 October 13	Human Population	TRIP: Tour Duke Campus Farm  <i>DUE: Lab 6 report</i>	<b>PROJECT PROPOSAL PRESENTATIONS</b>  <i>DUE: Reading Response</i>	C&C ch 7
11 October 20	Farming and Food	Lecture/ Discussion	Lecture/ Discussion  <i>DUE: Reading Response</i>	C&C ch 10
12 October 27	Water, and Water Pollution	TRIP: Waste water treatment  <i>DUE: Draft of Final Paper Introduction</i>	Lecture/ Discussion  <i>DUE: Reading Response</i>	Vannote 1980; Allen & Castillo ch 13
13 November 3	Ecosystem Services	TRIP: Aquatic Macroinvertebr ates	Lecture/ Discussion	Mace et al 2011; Salzman 2005

			<i>DUE: Reading Response</i>	
14 November 10	Economics	LAB 7: Water Quality <i>DUE: Draft of Final Paper</i>	Lecture/ Discussion <i>DUE: Reading Response</i>	Dietz et al 2003; Sagoff 2015
15 November 17	Invasive Species and Conservation	Lecture/ Discussion <i>DUE: Lab 7 report</i>	Lecture/ Discussion <i>DUE: Reading Response</i>	Strauss 2014
16 November 24	Energy	Lecture/ Discussion <i>DUE: Final Paper</i>	<del>THANKSGIVING HOLIDAY - NO CLASS</del>	
17 December 1	Restoration	TRIP: Eno River outing mini bioblitz <i>DUE: draft of final project presentation</i>	Lecture/ Discussion <i>DUE: Reading Response</i>	C&C13
18 December 8	Final Project Presentations	<b>FINAL PROJECT PRESENTATIONS</b>	<del>SEMESTER OVER - NO CLASS</del>	