

Syllabus BIEB 174 "Ecosystems and Global Change"  
Fall quarter 2017  
Lectures T/Th 2-3:20 p.m. Pepper Canyon Hall 109  
Final exam Thursday December 14th 3-5:59 p.m. location TBA

Faculty:

Elsa Cleland, Associate Professor  
Contact information: email [ecleland@ucsd.edu](mailto:ecleland@ucsd.edu), lab phone: 858-246-0509  
Office hours: Friday 1-2:30 p.m., Muir Biology 1115

Andrew Barton, Assistant Professor  
Contact information: email [adbarton@ucsd.edu](mailto:adbarton@ucsd.edu), lab phone: 858-534-1758  
Office hours: Thursday 10-11:30 a.m., Muir Biology 2165

Instructional Assistants:

Jillian Schat, [jschat@ucsd.edu](mailto:jschat@ucsd.edu)  
Discussion sections: Monday 2-2:50pm, SOLIS 111  
Monday 3-3:50pm. SOLIS 111  
Office hours: Tuesday 4-5:30pm. Muir Biology 2145

Marika Schulhof, [mschulhof@ucsd.edu](mailto:mschulhof@ucsd.edu)  
Discussion sections: Wednesday 6-6:50pm, CENTER HALL 207  
Wednesday 7-7:50pm, CENTER HALL 207  
Office hours: Thursday 4-5:30 pm, 1145A Humanities & Social Sciences (HSS)

Dillon Travis, [dtravis@ucsd.edu](mailto:dtravis@ucsd.edu)  
Discussion sections: Monday 4-4:50pm, SOLIS 111  
Friday 1-1:50pm, SOLIS 111  
Office hours: Tuesday 4-5:30pm, Mandeville coffee cart

Course description: In recent decades human activities have altered ecosystems around the globe, through changes in climate, land use, and nutrient cycling. Understanding the impacts of these global changes requires a background in ecosystem ecology, a field that scales phenomena from physiological processes within organisms to global biogeochemical cycles of carbon, nitrogen and water. "Ecosystems and Global Change," will teach the fundamental concepts of ecosystem ecology, while using examples from current research in the field of environmental science. This course is designed to fulfill two primary goals: providing depth to students who want training in ecosystem science in an upper division course towards their Biology major, and providing breadth in environmental science to students in other science majors.

Prerequisites: BILD 3. This is an upper division course and will build on concepts from the introductory course series. While not required, introductory chemistry and physics courses will be helpful. Basic algebra is also required (simple equations, ratios).

Reference text: The course uses an advanced undergraduate reference text: "Principles of Terrestrial Ecosystem Ecology" by Chapin, Matson & Vitousek (2011), Second Edition, Springer. This version is freely available to students as an e book through the UCSD libraries (<http://roger.ucsd.edu/record=b7225328~S9>). It is also available in an inexpensive paperback edition. Please note: the second edition is substantially revised and the chapter numbering does not correspond to the first edition. Please do not attempt to use the 2002 first edition version of the textbook, it has become outdated.

Lectures: Attendance in lectures is highly recommended to do well in this course; material presented in the lectures will be the majority of what appears in exams. Lecture slides will be posted on TritonED. We will

use i-clickers in class, **Please turn off all cell phones at the start of lecture. Laptops may be used to take notes, but we ask you use them only for this purpose. Other activities (such as visiting websites, checking email etc.) are distracting to other students sitting in the lecture hall.**

**Clickers:** You may purchase an i-clicker from the bookstore (or borrow one from a friend), or you also have the option of downloading the REEF i-clicker app and using your phone as an i-clicker. To register your i-clicker go to the Tools link in the course menu for BIEB 174 on TritonEd, then click i>clicker Remote Registration. Both older and newer iclickers should work with the system, as long as it is the same brand sold in the bookstore. If you're using the REEF app, you need to ensure you sign up for a REEF account using the same email that you use to log into TritonEd, otherwise your responses will not sync. Consider using the REEF app if you do not own an i-clicker or cannot borrow one from a friend, AND you are unlikely to use i-clickers in another class. The cost for the REEF app is about \$15 every 6 months.

Discussion sections: Discussion sections are designed so that students can practice explaining the concepts they are learning in a way that is not possible in a large lecture setting. In discussion sections students will have the opportunity to think critically and creatively, and communicate ideas both verbally and in writing. Approximately 4-6 review questions per week will guide the discussions, which will be posted on TritonEd. **The questions are due at the beginning of section in hard copy format (not electronic) – students that arrive with a sheet of blank paper are welcome to stay to learn and participate, but will not get credit for that week.** The questions are not graded for accuracy, so it is the students' responsibility to make sure they understand the answers by participating in section discussion. While discussion sections offer a chance to ask questions and explore the weekly concepts more deeply, the lecture materials *will not be summarized again in discussion sections*. Discussion sections begin meeting Friday September 29th.

Expectations: This is an upper division course, and will build on concepts gained in lower division courses. Ideally you will find it challenging but not overwhelming. As a 4 credit course, the expected time requirement is 12 hours per week (4 hours in lecture/discussion section and 8 hours of outside reading/studying). Schedule this amount of time in your weekly schedule so that you feel prepared for lecture/discussion and confident for your exams.

Academic integrity: Academic integrity is taken extremely seriously at all universities, and UCSD is no exception. Any student caught cheating will fail the course. Please note that because i-clickers will be used for formal assessment related to student grades, it is considered a serious infraction to answer i-clicker questions for another student using their i-clicker, and would lead to both students failing the course. For information on academic integrity at UCSD: <http://senate.ucsd.edu/Operating-Procedures/Senate-Manual/Appendices/2>

#### How to do well in the course

1. Focus on the big picture. Ecosystems are dynamic and exciting, if you can cultivate a curiosity about how they work, the material will be more interesting to you, and will “stick in your head.”
2. Attend lecture ready to focus on the material. You may need to skim the chapter to answer the review questions in time for discussion section, but don't try to read it completely as there is much more depth in the reading than will be covered in the lectures. Think of the book as a reference instead of a textbook.
3. After lecture, look again at the review questions associated with the chapter covered, and use your lecture notes to help you answer the questions completely. Schedule 8 hours a week reading, studying, and answering review questions.
4. Participate in discussion section, sharing your answer to the review questions with other students. Note when the IAs or other students add additional aspects to the answer that you didn't think of. Your biggest challenge is to figure out what you don't know. Daily clicker questions will also help you figure out where you need to focus your study.
5. After midterms, think about the questions, and figure out if there are areas that you don't understand. These items might return on the final exam.

Grading & Assessment: Assessment reinforces the ideas presented over the quarter, and allows students to gauge their progress in the subject. Grading will be based proportionally on the following assessments:

20% Midterm exam 1

20% Midterm exam 2

20% Midterm exam 3

25% Final exam

5% Lecture participation

Assessed via i-Clicker questions, full credit will be given if at least 80% of questions are answered in at least 80% of lectures (starting October 3rd), this allows flexibility for late adds, illnesses or other emergencies. Partial credit given proportionally for attendance and participation below this threshold. Answers do not have to be correct to gain these points; however, at the end of the course if you have averaged 25% or below for correct answers (consistent guessing on questions rather than true participation) then you will not receive lecture participation points.

10% Discussion Section

Based on attendance and weekly review questions posted on TritonEd. Written answers to the weekly review questions must be completed before arriving in section, and will be discussed in small groups.

**What will be on the exam?** The exams will focus on material that has been presented during lectures, and material that is the focus of review questions. You do not need to know details from the reading that are not covered in the lectures. The format will consist of a mixture of multiple choice questions (like your clicker questions) and short answer questions (like your weekly review questions). Practice exams are not distributed.

Make up policy:

**Please note that there will be no make-up exams.** If you miss a midterm or final exam, then you will be required to submit documentation of illness, emergency or other unavoidable absence. Without such documentation, you will receive zero points for that assessment. For missed midterms, and with documentation, the proportion of your grade that is based on your final exam will be increased to cover the assessment that was missed. For a missed final exam and with valid documentation, you will be expected to take the final orally or you will receive an incomplete for the course. Students wishing to have questions from exams re-graded need to submit a written request specifying the questions in dispute and the reason for the re-grade, realizing that the entire exam will be re-evaluated.

If you miss discussion section due to a documented illness, emergency or unavoidable absence, you must submit your review questions in person or by email to your IA email by the end of the week to have full credit.

Schedule of lectures, readings, and assessments:

Sep 28<sup>th</sup>: The Ecosystem Concept (Cleland), Ch. 1

Overview and history of ecosystem ecology; controls over ecosystem processes; human-caused changes in Earth's ecosystems, ecosystems of the globe.

Oct 3<sup>rd</sup>: Earth's Physical Climate Part 1 (Barton), Ch. 2

Ecosystem distribution in relation to climate, Earth's energy budget; atmosphere, oceans, landforms & vegetation contributions to climate; temporal variability in climate

Oct 5<sup>th</sup>: Earth's Physical Climate Part 2 (Barton), Ch. 2

Oct 10<sup>th</sup>: Geology and Soils (Cleland), Ch. 3

Controls over soil formation & loss; soil profiles, horizons & classification; soil properties in relation to ecosystem functioning.

Oct 12<sup>th</sup>: Water and Energy Balance (Cleland), Ch. 4

Ecosystem water inputs and losses; water movements among soil, roots, leaves, canopies; evapotranspiration and the energy balance

Oct 17<sup>th</sup>: Carbon Cycle Part 1 - focus on marine ecosystems (Barton), selections from Ch. 5-7

Oct 19<sup>th</sup> **Midterm #1, Chapters 1-4**

Oct 24<sup>th</sup>: Carbon Cycle Part 2 - focus on terrestrial plant carbon budgets (Cleland), Ch. 5-6

Photosynthetic pathways (C3, C4, CAM); net photosynthesis in the leaf; limitation by light, CO<sub>2</sub>, water and nitrogen Plant respiration; net primary production (NPP); allocation of growth to different tissues; tissue turnover; global distribution of biomass and NPP; net ecosystem production (NEP) and controls

Oct 26<sup>th</sup>: Carbon Cycle Part 3: Decomposition (Cleland) Ch. 7

Biological breakdown of litter by bacterial, fungi and animals; litter breakdown through chemical and physical processes; environmental and enzymatic controls over decomposition; long-term carbon storage in soils

Oct 31<sup>st</sup>: Nitrogen Cycle (Barton) Ch. 8

Nitrogen (N) inputs to ecosystems, biological N-fixation, N mineralization and pathways of loss. Human-caused N deposition, causes & consequences

Nov 2<sup>nd</sup>: **Midterm #2, chapters 5-8**

Nov 7<sup>th</sup>: Other Nutrient Cycles (Barton) Ch. 9

Phosphorus, iron, sulfur; interactions among nutrient cycles

Nov 9<sup>th</sup>: Trophic Dynamics (Barton) Ch. 10

Plant-based trophic systems versus detritus-based trophic systems; assimilation efficiencies; food webs and trophic cascades

Nov 14<sup>th</sup>: Species Effects on Ecosystem Processes (Cleland) Ch. 11

The functional trait concept; species-effects on ecosystems, climate and disturbance regimes; relationship between biodiversity and ecosystem function

Nov 16<sup>th</sup>: Temporal Dynamics (Barton) Ch. 12

Inter-annual versus long-term fluctuations in ecosystem processes; disturbance cycles, successional processes, and alternate stable states in terrestrial and aquatic systems

Nov 21<sup>st</sup>: **Midterm #3, chapters 9-12**

Nov 23<sup>rd</sup> Thanksgiving Holiday, no class

Nov 28<sup>th</sup>: Managing and Sustaining Ecosystems (Cleland) Ch. 15

Concepts in ecosystem management: natural variability, resilience, stability; application for managing forests, fisheries, endangered species; ecological restoration; valuation of ecosystem goods and services

Nov 30<sup>th</sup>: Special topic: Geoengineering (Barton)

Dec 5<sup>th</sup>: Special topic: Climate Change, Policy, and Southern California Ecosystems (Cleland)  
Reading: San Diego Focus 2050 report, pages 1-26, Summary for policy makers, IPCC Fifth Assessment Report

Dec 7<sup>th</sup>: exam review in class - bring your questions

Dec 14<sup>th</sup>: 3 p.m. **Final exam**, Ch. 15 and special topics, plus integration of concepts across the quarter

Podcasts: The lectures will be podcast, go to [podcast.ucsd.edu](http://podcast.ucsd.edu) to hear the lectures, they should be posted within 2 hours of the end of the lecture.

Schedule for discussion sections: Questions for the discussion sections will be posted on TritonEd a minimum of one week before your section meets. You will always have an opportunity to discuss material in sections before it appears on a midterm or the final. The topics for sections meeting on the following dates are as follows:

Sept 29-Oct. 4 - Ch. 1 plus syllabus

Oct 6-11 - Ch. 2

Oct 13-18 Ch. 3 & 4

(Oct. 19th midterm covering Ch. 1-4)

Oct. 20-25 - Ch. 5 & 6

Oct. 27-Nov. 1 - Ch. 7 & 8

(Nov. 2th midterm covering Ch. 5-8)

Nov. 3-8 - Ch. 9 & 10

**No discussion Nov.10th**

Nov. 13-17 - Ch. 11 & 12

(Nov. 21st midterm covering Ch. 9-12)

**No discussion sections Nov. 20-24**

Nov. 27- Dec. 1 - Ch. 15 + geoengineering

Dec. 4-8 - local climate change + final review

(Dec. 14th Final exam covering Ch. 15 & special topics, plus main ideas from the quarter)

Students with disabilities: Students requesting accommodations and services due to a disability for this course need to provide a current Authorization for Accommodation (AFA) letter issued by the Office for Students with Disabilities (OSD), prior to eligibility for requests. Receipt of AFAs in advance is necessary for appropriate planning for the provision of reasonable accommodations. For more information, email the OSD at [osd@ucsd.edu](mailto:osd@ucsd.edu), visit their office at University Center 202 8-4:30 M-F, or go online at <http://disabilities.ucsd.edu/about/index.html>