

Syllabus BIEB 174 "Ecosystems and Global Change"
Fall quarter 2019
Lectures T/Th 11:00-12:20 p.m. Tata Hall
Final exam Friday December 11th 11:30 a.m. - 2:29 p.m. location TBA

Faculty:

Elsa Cleland
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Office hours: Fridays 9:30-10:30 a.m., 1103 Muir Biology

Andrew Barton
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Office hours: Thursdays 1:30-2:30 p.m., 1104 Muir Biology

Note: This course is co-taught, and each faculty member can only answer questions on the lectures they give, so make sure to check the syllabus below to check who gave each lecture before going to faculty office hours to ask questions. IAs can answer questions on all material given in the course.

Instructional Assistants:

Hank Baker, hkbaker@ucsd.edu
Discussion sections: Monday 10-10:50 pm, Center Hall 217B
Monday 11-11:50 pm, Center Hall 217B
Office hours: Mondays noon-1, Mandeville coffee cart

Vanessa Lundsten, vlundste@ucsd.edu
Discussion section: Monday 5-5:50pm, Center Hall 217B
Office hours: Tuesday 2-3 p.m., Middle of Muir

Quinn Montgomery, qmontgom@ucsd.edu
Discussion sections: Monday 3-3:50 pm, Center Hall 217B
Monday 4-4:50pm, Center Hall 217B
Office hours: Monday 1:30-2:30 pm, Muir 1102

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 is the only pre-requisite. BIEB 174 is an upper division course and will build on introductory ecology concepts presented in BILD 3. While not required, introductory chemistry and physics courses will be helpful. Basic algebra is also required (simple equations, ratios).

Textbook: The course uses an advanced undergraduate 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. **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). 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 i-clickers should work with the system, as long as it is the same brand sold in the bookstore. In order to receive i-clicker credit for participation in a given lecture, you need to respond to at least 75% of questions on that day.

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 without completing the written assignment are welcome to stay to learn and can receive credit for participation, but will not get full credit for the study questions 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 Monday September 30.

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. 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 and section ready to focus on the material. Read the chapter before lecture, and answer the review questions prior to section.
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.
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:

50% Midterms (We will drop the lowest of the three midterms, such that the remaining two are worth 25% each. However, you must attend all exams. If you miss an exam without a justifiable reason, we will weight all three exams equally, including the zero score for the missed exam.)

30% Final exam

5% in class i-clicker participation (full credit given for participation in at least 12 lectures)

15% 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. 10% will be based on the completed questions, 5% on section attendance and participation.

What will be on the exam? The exams will focus on material that has been presented during lectures, and discussed in section. 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 (such as ones we ask in class to promote participation) 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, within one week of exam return, 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 26: Lecture 1: Earth's Physical Climate Part 1 (Barton), Ch. 2

Earth's climate, landforms & vegetation contributions to climate; ecosystems of the globe and their relationships to climate

Oct 1: Lecture 2: Carbon Cycle Part 1 - focus on marine ecosystems (Barton), selections from Ch. 5-7

Oct 3: Lecture 3: 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

Oct 8: Lecture 4: Other Nutrient Cycles (Barton) Ch. 9

Phosphorus, iron, sulfur; interactions among nutrient cycles

Oct 10: Lecture 5: Geology and Soils (Cleland), Ch. 3

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

Oct 15: **Midterm #1, Lectures 1-4**

Oct 17: Lecture 6: 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 22: Lecture 7: 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, CO₂, 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 24: Lecture 8: 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 soil

Oct 29: **Midterm #2, Lectures 5-8**

Oct 31: Lecture 9: Trophic Dynamics (Barton) Ch. 10

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

Nov 5: Lecture 10: Temporal Dynamics 1 (Barton) Ch. 12

Interannual versus long-term fluctuations in ecosystem processes; alternate stable states in terrestrial and aquatic systems

Nov 7: Lecture 11: Anthropogenic Climate Change (Barton)

Reading: Summary for policy makers, IPCC Working Group 1, Fifth Assessment Report

Nov 12: Lecture 12: Geoengineering (Barton)

Reading: Royal Society report on geoengineering "Geoengineering the climate: Science, governance, and uncertainty"

Nov 14: Lecture 13: 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 19: Midterm #3, Lectures 9-12

Nov 21: Lecture 14: Temporal Dynamics2 (Cleland) Ch. 12

Disturbance in terrestrial ecosystem, successional processes

Nov 26: Lecture 15: Managing and Sustaining Ecosystems (Cleland) Ch. 15

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

Nov 28: Thanksgiving Holiday, no class

Dec 3: Lecture 16: Climate change impacts on California Ecosystems (Cleland)

Optional reading: excerpts from the Fourth California Climate Assessment

Dec 5: review session in class - bring your questions!

Dec 11: **Final exam: Lectures 13-16, plus review of major concepts that were covered multiple times across the quarter**

Podcasts: The lectures will be podcast, go to 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. The topics for sections meeting on the following dates are as follows:

Sep 30 - Lecture 1 & pre-test (graded only for effort, make sure to attend!)

Oct 7 - Lectures 2 & 3

Oct 14 – Midterm #1 review, Lecture 4

Oct 21 – Go over Midterm #1 answers, Lectures 5 & 6

Oct 28- Midterm #2 review. Lectures 7 & 8

Nov 4 – Go over Midterm #2 answers. Lectures 9 & 10

No discussion section Nov 11

Nov 18 – Midterm #3 review, Lectures 11 & 12

Nov 25 – Go over Midterm #3 answers, Lectures 13 & 14

Dec 2 - Lectures 15 & 16

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, visit their office at University Center 202 8-4:30 M-F, or go online at <http://disabilities.ucsd.edu/about/index.html>

Resources for student support: A college education teaches you to identify solutions to tough problems. These are skills that future employers will value. University students often encounter non-academic issues as well, and UC San Diego has invested in a variety of resources to help students. You can and should use these resources to ensure your success, here's a partial list that may be useful to you:

Basic Needs refers to the most essential resources required to thrive as a student, which includes access to nutritious food, stable housing, and financial wellness resources. **The Hub** is a new UC San Diego space that offers students the opportunity to engage in and link to Basic Needs resources. This includes the Triton Food Pantry: <https://basicneeds.ucsd.edu/>

The **Campus Community Centers** at UC San Diego build community among our diverse population of students, faculty and staff members. Each provides a forum to increase awareness of social issues, encourage dialogue, build community, improve retention, increase outreach and yield, and foster academic success. For a list of the many campus community centers, as well as other resources to support students, go to: <https://diversity.ucsd.edu/centers/index.html>

Counseling and Psychological Services (CAPS) provides free, confidential, psychological counseling and crisis services for registered UCSD students. CAPS also provides a variety of groups, workshops, and drop-in forums. For more information, please visit our Counseling Services page: <https://caps.ucsd.edu/>

CARE at the Sexual Assault Resource Center is the UC San Diego confidential advocacy and education office for sexual violence and gender-based violence (dating violence, domestic violence,

stalking). CARE provides free and confidential services for students, staff and faculty impacted by sexual assault, relationship violence and stalking.

The **Undocumented Student Services Center** is committed to serving our undocumented students and their families through holistic services. We also advocate for generating a sense of community for all students that are undocumented or come from mixed immigration-status families. <https://students.ucsd.edu/sponsor/undoc/>

The **Student Veterans Resource Center (SVRC)** is committed to ensuring that military affiliated students successfully make the transition from the military environment to campus life, and are assisted in their progress toward completing their academic degree. In collaboration with other University partners, the SVRC seeks to identify and mitigate the barriers to academic success that are specific to the military affiliated student community. <https://students.ucsd.edu/sponsor/veterans/index.html>