

Syllabus BIEB 174 "Ecosystems and Global Change"  
Fall quarter 2020 Lectures T/Th 2:00-3:20 p.m. (all meetings on Zoom)  
Final exam Friday December 17th 3 p.m.-3:35 p.m.

Please note, while lectures will be given asynchronously, **quizzes will be held during scheduled lecture time, and discussion sections will be synchronous and held during their scheduled times**

Faculty:

Prof. Andrew Barton (he/him/his), Q&A during designated lecture time  
Contact information: email [adbarton@ucsd.edu](mailto:adbarton@ucsd.edu)

Prof. Elsa Cleland (she/her/hers), Q&A during designated lecture time  
Contact information: email [ecleland@ucsd.edu](mailto:ecleland@ucsd.edu)

For this quarter Prof. Barton will maintain grades and records of accommodations, please email him regarding these issues. This course is co-taught by two faculty with complementary expertise, and each faculty member can only answer questions on the lectures they give; IAs can answer questions on all material given in the course.

Instructional Assistants:

Stefan Samu (he/him/his) [ssamu@ucsd.edu](mailto:ssamu@ucsd.edu)  
Section: Wednesday 5 & 6 p.m., Q&A Monday 6-6:30 p.m.

Rio (Aby) Bigasin (they/them/theirs) [abigasin@ucsd.edu](mailto:abigasin@ucsd.edu)  
Section: Wednesday 7 p.m., Q&A Thursday 6-6:30 p.m.

Sarah Villar (she/her/hers) [svillar@ucsd.edu](mailto:svillar@ucsd.edu)  
Section: Friday 1 p.m., Q&A Wednesday 2-2:30 p.m.

Abby Rollison (she/her/hers) [prolliso@ucsd.edu](mailto:prolliso@ucsd.edu)  
Section: Friday 2 p.m., Q&A Friday 10:30-11 a.m.

Adam Grizzle (he/him/his) [agrizzle@ucsd.edu](mailto:agrizzle@ucsd.edu)  
Section: Friday 3 p.m., Q&A Tuesday 6-6:30 p.m.

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 linear 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: Lectures will be pre-recorded and posted in the Media Gallery on Canvas, along with pdfs of the lecture slides, in advance of time window when we suggest you view the lectures (see schedule below). We have found this to be the best way to post high quality lectures, and gives students the opportunity to view the lectures at a time that's convenient for them, with minimal distractions. During the later portion of the scheduled lecture time, faculty will conduct a Q&A session on Zoom focusing on material from the scheduled lecture (you'll see these Q&A sessions in the Canvas Calendar). If this time isn't convenient, you'll see a number of other Q&A sessions available with IAs each week. We recommend students watch the pre-recorded lectures and come to the Zoom Q&A prepared with questions. Material presented in the pre-recorded lectures will be the majority of what appears in exams, and the question and answer sessions during class time are an opportunity to clarify points of confusion and hear questions from other students.

Discussion sections: Discussion sections will be held on Zoom, and are designed so that students have the opportunity to think critically and creatively, communicate ideas both verbally and in writing, and learn through peer-peer interactions. Approximately 5-8 review questions will be assigned each week, and posted on Canvas. To answer these questions, you will usually need to read the chapter in the textbook prior to its corresponding lecture (i.e., you'll need to "read ahead."). The discussion section grade will be equally divided between weekly participation and assignments. You may attend a different section if you cannot attend the one you are enrolled in, but to receive credit for the weekly assignment, full answers to the questions must be submitted prior to the section start time for the section in which a student is enrolled. Please note that we prefer you to attend a consistent section each week. During section, students will go into breakout rooms to discuss an assigned question, and will then present that answer to the group when the breakout room is dissolved. Hence, it's important to come prepared. The submitted questions will not be graded for accuracy, so it is the students' responsibility to make sure they understand the answers by participating in section discussion. A great way to do this is to "correct" your answers during the section. Participation in discussions is critical to doing well in the course. Attendance in sections may be recorded through Zoom polls, so it's important that the email you use to register for the session is your UCSD email and matches your Canvas login (one at the start of the 50 minute section and one at the end, participation in the full section is required for credit).

**Note: if consistent participation in a section is impossible for you this quarter due to a time zone difference or other significant barrier, please contact Prof. Barton during the first week of classes, and your Discussion section grade will be based solely on the weekly questions. This policy ensures students are not disadvantaged if they cannot participate synchronously in the sections.**

Group work during discussion section: Working in a group is a great way to practice productive professional relationships. You should treat your fellow students in the same way that you would want to be treated in a workplace. Treat everyone with respect, and ask questions rather than make assumptions about shared views or experience. Put your best effort into group work, including listening to everyone's perspectives and ideas. By entering into the class, you have agreed to abide by UCSD's Principles of Community:  
<https://ucsd.edu/about/principles.html>

"Office hours" and email: This quarter we've pivoted away from "office hours" to 20-30 minute Q&A Zoom sessions, where you can submit your questions via chat or voice. When you look in the Calendar on Canvas, you'll see that we have 6-7 opportunities for Q&A per week to facilitate interaction among students, faculty and IAs. The Q&A sessions are where you should have all of your questions answered about course content, and they are scheduled at different times of day to accommodate participation across time zones. We cannot answer content questions via email; this policy is based on years of experience - often times if students have a question their understanding of a topic is "muddy," making the question unclear, and it's hard for us to

know if we've addressed your question via email. Much better to just come to the Q&A! If you need to have a confidential discussion about unavoidable absences or other circumstances that are impacting your learning, or you'd like to discuss graduate school pathways with faculty etc., please email us to set up a one on one Zoom meeting.

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 commitment 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. Our expectations for this course are as follows: You may collaboratively discuss discussion section questions with other students at any time before the final exam, but you must write the answers in your own words (two students may not submit the same written work, this would constitute cheating, and will be monitored by Turnitin plagiarism software). You may not use any resources (online, book, notes, collaboration with other students) during your Canvas quizzes. Your final exam is open book and open notes, but you may not collaborate with anyone on the exam, as this constitutes cheating. Common cheating websites will be monitored during quizzes and exams, and if questions are posted to these sites we will investigate and prosecute the students with associated accounts (exam questions developed by faculty are our intellectual property and may not be shared in any way, allowing us the legal ability to request the account information of persons violating this policy). **Any student caught cheating will fail the course.** In other words, just do your own best work, and be confident that we as faculty and IAs will do our part to maintain a learning environment where academic integrity is supported. 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. Approach lectures 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 quizzes, think about the questions, and figure out if there are areas that you don't understand. These concepts may 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:

#### 70% Quizzes and Exams

There will be 9 total tests during the quarter, 8 quizzes and a final exam (which will be in the same format, so like another quiz). The quizzes will consist of multiple choice and/or short-answer questions. The quizzes will be available at the start of class time, for a 40 minute window (contact Prof. Barton if you are in a time zone that is not conducive to testing during this window). Students will have a time limit of 30 minutes once they have started the quiz. The quizzes are “closed book.” **We will drop the lowest 2 scores among the quizzes and final exam**, such that the remaining 7 assessments are each worth 10% of your final grade. This is to account for events that could cause

you to miss a quiz, or impact your performance, such as illness, power outages, internet outages, social unrest, an extra busy week, etc. If you are happy with the average of your best 7 quizzes, you are not required to take the final.

10% Lecture follow-up questions (think of these as asynchronous clicker questions, or participation points)

There will be a short Canvas quiz associated with each lecture, consisting of multiple choice questions that will serve as practice questions for your graded quizzes. These are meant to encourage you to engage with the lecture. There are unlimited attempts to get these questions correct. The post-lecture follow-up questions must be completed 24 hours prior to the quiz covering the material (that is, one day in advance of the quiz).

20% Discussion Sections

For each discussion section, equal points will be given for A). participation in one discussion section per week (any section, but you must arrive on time and participate for the entire 50 minutes), and B). complete answers to the weeks' questions turned in on Canvas prior to the discussion section in which you are enrolled (i.e. the due date in your Calendar on Canvas).

**What will be on the quizzes/exam?** The assessments 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. You should consider lectures and discussion sections as practice for quizzes and exams.

Make up policy:

**Please note that there will be no make-up quizzes or final exam.** If you miss a quiz or the final exam, you will be assigned zero points for that assessment (remember you can drop the lowest two grades). If you miss a quiz due to a serious illness, emergency or unavoidable absence we recommend you provide documentation to the faculty within 5 days of the assessment, because it allows faculty to advise you on how best to stay current with the material, and ensure you're on track to do well with your remaining assessments. In the unusual event that you miss more than two assessments due to these kinds of serious, unavoidable issues, your grade will be calculated on the basis of the remaining assessments.

If you have a serious and unavoidable issue that causes you to miss the due date for the weekly review questions, or such an issue makes it impossible for you to attend any discussion that week (serious illness, emergency or unavoidable absence), you must submit documentation to your IA, as well as submit your review questions within five days of the missed section to have full credit. Note that IAs keep track of discussion section points.

Schedule of lectures, readings, and assessments: including a suggested date range to watch each pair of lectures, before their topics are discussed for the first time in discussion sections. Depending on your section you may have additional days before the lectures are discussed in your section:

**Oct 1-2: 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

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

**Oct. 8: Canvas quiz #1, available 2-2:40 p.m. Lectures 1-2**

**Oct 7-9: 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

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

Phosphorus, iron, sulfur; interactions among nutrient cycles

**Oct 15: Canvas quiz #2, available 2-2:40 p.m., Lectures 3-4**

**Oct 15-21: Lecture 5:** Geology and Soils (Cleland), Ch. 3

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

**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. 27: Canvas quiz #3 available 2-2:40 p.m., Lectures 5-6**

**Oct 22-28: 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, 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

**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

**MONDAY Nov 2nd: Canvas quiz #4 available 2-6 p.m., Lectures 7-8 (note: moved to facilitate voting on election day, contact Prof. Cleland if this special Monday quiz time doesn't work for you**

**Nov 3rd: U.S. Elections, VOTE!**

**Oct 30-Nov 4: Lecture 9:** Trophic Dynamics (Barton) Ch. 10

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

**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. 10: Canvas quiz #5 available 2-2:40 p.m., Lectures 9-10**

**Nov 10-13: Lecture 11:** Anthropogenic Climate Change (Barton)

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

**Lecture 12:** Geoengineering (Barton)

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

**Nov 19: Canvas quiz #6 available 2-2:40 p.m., Lectures 11-12**

**Nov 18-Nov 20: 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

**Lecture 14:** Temporal Dynamics2 (Cleland) Ch. 12

Disturbance in terrestrial ecosystem, successional processes

**Dec 3: Canvas quiz #7 available 2-2:40 p.m., Lectures 13-14**

**Dec 1-4: 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

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

Optional reading: excerpts from the Fourth California Climate Assessment

**Dec 10: Canvas quiz #8 available 2-2:40 p.m., Lectures 15-16**

**Dec 17: Final exam in the form of a 9th Canvas quiz, integrated questions from across the quarter**

Schedule for discussion sections: Questions for the discussion sections will be posted on Canvas a minimum of one week before your section meets. Note some sections are on Wednesdays, others on Fridays, hence each section will have a slightly different schedule. The topics for sections meeting on the following dates are as follows (Ch. = Chapters in your textbook):

Wednesday Section Schedule:

Oct 7 - Lecture 1 & 2 (Ch. 2, also the parts of Ch. 5-7 focused on marine ecosystems)

Oct 14 - Lectures 3 & 4 (Ch. 8 & 9)

Oct 21 - Lectures 5 & 6 (Ch. 3 & 4)

Oct 28 - Lectures 7 & 8 (Ch. 5-7 focused on terrestrial ecosystems)

Nov 4 - Lecture 9 & 10 (Ch. 10 & 12)

Nov 11 - Veterans Day Holiday, no section

Nov 18 - Lectures 11 & 12 (IPCC summary report, reading on Geoengineering)

Nov 25 - day before Thanksgiving, optional day for Wednesday sections

Dec 2 - Lecture 13 & 14 (Ch. 11 & 12)

Dec 9 - Lecture 15 & 16 (Ch 15), review for final

Friday Section Schedule:

Oct 2 - Lecture 1 & 2 (Ch. 2, also the parts of Ch. 5-7 focused on marine ecosystems)

Oct 9 - Lectures 3 & 4 (Ch. 8 & 9)

Oct 16 - catch up day, no section for Friday sections

Oct 23 - Lecture 5 & 6 (Ch. 3 & 4)

Oct 30 - Lecture 7 & 8 (Ch. 5-7 focused on terrestrial ecosystems)

Nov 6 - Lectures 9 & 10 (Ch. 10 & 12)

Nov 13 - Lectures 11 & 12 (IPCC summary report, reading on Geoengineering)

Nov 20 - Lecture 13 & 14 (Ch. 11 & 12)

Nov 27 - Thanksgiving holiday, no section

Dec 4 - Lectures 15 & 16 (Ch.15)

Dec 11 - review for final, optional day for Friday sections

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>

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:

**Links to information about remote learning for Fall**, including the loaner laptop program and updated links to available campus computer labs: <https://returntolearn.ucsd.edu/return-to-campus/fall-2020-plan/index.html>

**Academic Success**, including advising, tutoring, mentoring, research opportunities etc.: <https://ucsd.edu/academics/academic-success.html>

**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/>

Resources for **Students with Dependents**: <https://students.ucsd.edu/well-being/wellness-resources/student-parents/index.html>

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>