

## C 153: Ecology

Spring 2022 - 3 Units

### COVID-19 update (12 Jan 2021)

All components of the class will be remote until the end of January and in-person afterwards.

### Prerequisites

Biology 1B or consent of instructor

### Summary

Ecology is a scientific discipline that focuses on the interactions between organisms and their environment (including people). This class will provide an overview of core concepts and applications, and will also provide practice with writing, small-group work, critical thinking, and data analysis.

The class will cover principles of population ecology, illustrated with examples from marine, freshwater, and terrestrial habitats. It will also consider the roles of physical and biological processes in structuring natural communities and ecosystems. Observational, experimental, and theoretical approaches will be discussed. Topics will include quantitative approaches relying on algebra, visual analysis of graphs, and elementary calculus.

### Class meeting times and places

#### Lecture

Day & Time: Tuesdays & Thursdays, 09:30 - 10:59 AM

In-person Location: Social Sciences Building 20

Zoom Location for January:

<https://berkeley.zoom.us/j/98160428879?pwd=eHpuUHVORkZ2YXBVbWc3NjVIYkFJUT09>

#### Discussion - Group 1 (Section 101)

Day & Time: Tuesdays, 2:00 - 2:59 PM

In-person Location: Social Sciences Building 185

Zoom Location for January: <https://berkeley.zoom.us/j/97333473351>

#### Discussion - Group 2 (Section 102)

Day & Time: Thursdays, 1:00 - 1:59 PM

In-person Location: Morgan 109

Zoom Location for January: <https://berkeley.zoom.us/j/92988314835>

### Faculty instructors

Dr. Benjamin Blonder (he/him)

Department of Environmental Science, Policy, and Management

Office hours in Hilgard 112 (Zoom when remote using lecture link)

Office other times in Hilgard 143

Email: [benjamin.blonder@berkeley.edu](mailto:benjamin.blonder@berkeley.edu)

Website: <http://www.benjaminblonder.org>

Office hours: Wed 4-5 PM, during weeks I am lecturing

Dr. Onja Razafindratsima (she/her)

Department of Integrative Biology

Valley Life Science Building, 5085

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Website: <https://www.razafindratsima.org/>

Office hours: Wed 4-5 PM (or by appointment), during weeks I am lecturing

Each faculty instructor will have office hours only during weeks when they are teaching (see detailed schedule below).

### **Contacting the faculty or graduate student instructor**

The GSI is your first point of contact regarding course content, assignments, due dates, technical issues, grades, etc. You can also contact the instructors about these topics, but preferably after discussing with the GSI first. The instructors can also address questions around careers and accommodations related to the course.

Allow 48 hours (or on weekends, until Monday morning) for a response to an email. Please do not wait until the last minute to ask a question, as we may be unavailable to reply. Please be courteous and professional in your writing, as we will be when contacting you.

### **Learning outcomes**

- Apply concepts such as species, population, community, ecosystem, environment, landscape to model natural systems
- Identify the ecological and evolutionary factors that influence population dynamics and determine species' ranges / abundances across environments
- Identify the biophysical processes that determine organisms' relationship to their environment and the flow of energy in ecosystems
- Describe feedbacks between the earth / climate system, human activity, and natural systems
- Evaluate the importance of spatial and temporal scale for ecological patterns and processes
- Assess the role of ecology in making policy around human health, economics, natural resource, and global change issues

### **Skill set outcomes**

- Use systems thinking approaches for conceptualizing models
- Analyze real-world datasets to generate hypotheses and conclusions about ecological pattern and process, using visual inspection or Microsoft Excel
- Become comfortable evaluating evidence from primary sources
- Discover the natural history of at least one local ecosystem through repeated field observations
- Collaborate within a team to solve problems and communicate to a broader audience through written and oral methods
- Use ecological evidence to think critically about the news and about policy issues

### **The big messages you will learn from the class**

- Most parts of an ecosystem are interconnected and change after perturbations
- Ecology depends on spatial and temporal scales
- Physical laws limit ecological growth
- Mathematics and statistical models enable quantitative understandings of ecology
- Humans and nature are closely linked, even in apparently pristine environments

- Ecology is a key part of evidence-based decision making in human societies

### What the course will not cover

- This is an introductory class that must survey a wide set of topics. As such, it will not be able to cover several areas that are important parts of the field of ecology, including
  - Ecological economics
  - Ecological genetics
  - Evolutionary ecology
  - Animal behavior
  - Ecophysiology

*Please consider taking further classes if you are interested in these topics.*

### Overall structure of the class

#### **Lecture:**

The class will be focused on facilitating your learning through active approaches. You will read a set of textbook materials before class, then will get to work in small groups with your peers during classes to synthesize and extend this information.

Class time will include a range of participatory activities designed to check and extend your understanding, including interactive questions and small readings/discussions/projects. These small projects will be completed in small groups and will be the main type of 'homework', though we believe you can largely complete them during class time. **Your active participation will be critical to your success in the class.**

There will also be a set of in-class exams corresponding to major sections of the class, as well as a natural history journal, and a group final exam. The in-class exams are multiple-choice format and should be straightforward, while the journal and final exam are designed to push your understanding of the subject.

#### **Discussion:**

Discussion section will review recent literature in ecology.

### bCourses

This course will be administered through bCourses. You are responsible for retrieving any materials or information posted on the bCourses site. Each time you log into bCourses, check for Announcements about the course. Announcements will also be sent to your Berkeley email; if you use a different email account you must check your Berkeley email regularly.

### Required class materials

Relyea, R. *Ecology: The Economy of Nature* (9th Edition). You can also purchase the 7th or 8th Edition, which has different authors (Ricklefs & Relyea). eBook or paperback versions are around \$50.

### Name tags

We expect that every day of class you bring a name tag with you and place it on your table in front of you. This should be a folded piece of paper with your name written out in full. We will use these so that everyone can learn each other's name. We will provide you with extra scrap paper if you lose or forget your name tag.

### Grading policy

Your grade will be based on the percentage of points you earn through the semester.

Percentages	Grade
97-100%	A+
93-97%	A
90-93%	A-
87-90%	B+
83-87%	B
80-83%	B-
77-80%	C+
70-77%	C
60-70%	D
0-60%	F (fail)

All grades are final. If you feel you have received a grade in error, you may explain the situation to the instructors. We may choose to take no action (most likely), re-grade your work, or repeat the assessment in an oral examination. You could receive either a higher or a lower score if we re-assess your work.

There are **1000 total points** available for you to earn, **plus 3 'free' points**. You can get 'free' points for completing your group's team contract, a field safety agreement, and the anonymous mid-semester feedback survey. The main points are distributed among several types of assessments with a range of due dates:

Assignment	# of	# lowest dropped	Max. points each	Max. total points	Work type	Date due	How to submit
Reading participation	22	4	10	180	Individual	11:59 PM the day before class	Submit on bCourses
In-class activities	12	2	25	250	Group, but submit as Individual	Friday at 11:59 PM each week, only if assigned (see detailed schedule)	Submit on bCourses
Natural history journal - draft (at least 2 entries)	1	0	50	50	Individual	Friday after last class before spring recess (18-Mar at 11:59 PM)	Submit on bCourses
Natural history journal - final	1	0	100	100	Individual	Friday after last day of class (29-Apr at 11:59 PM)	Submit on bCourses
In-class exams	4	1	70	210	Individual	In class (08-Feb, 24-Feb, 5-Apr, 26-Apr)	Multiple choice exam in class

Final exam	1	0	150	150	Group	Monday at start of exam week (9-May @ 8AM)	Submit on bCourses
Activities in the discussion section	13	3	6	60	Individual	(Refer to the syllabus for Discussion)	(Refer to the syllabus for Discussion)
Team contract	1	0	1	1	Group	25-Jan at 11:59 PM	Submit on bCourses
Field safety agreement	1	0	1	1	Individual	19-Mar at 11:59 PM	Submit on bCourses
Mid-semester survey (anonymous)	1	0	1	1	Individual	31-Jan at 11:59 PM	Submit on bCourses

## Assignment details

### 1. Pre-class reading quiz

You are expected to complete the full set of pre-class readings and answer up to 2 questions about the reading before class. You will receive points for completion, not for correct answers.

#### Rubric

Per quiz: did not start or partially complete (0%); fully complete (+100%).

### 2. In-class group activities

Each week you will work with your group on a set of activities that may include analysis of data, interpretation of case studies, etc. Exact assignments will be available on bCourses starting during class time. You will be responsible for submitting a group response each week, which may take the form of a completed analysis, short paragraph response, or other written document. We anticipate that you should be able to mostly or fully complete each assignment in available class time but are welcome to work on it after class as well.

#### Rubric

Per assignment: did not participate (0%); some but incomplete effort (50%); complete effort but mostly incorrect answer (80%); complete effort and mostly correct answer (100%). Note that there may be multiple correct answers to an open-ended assignment.

### 3. Natural history journal

We are asking you to complete a semester-long independent journal chronicling your repeated observations of a particular community or ecosystem. The intent of this exercise is to encourage your powers of observation, and to connect you to the field in a way we cannot achieve in a lecture-only class.

You will find an outdoor site that is safe and convenient for you to regularly visit over the course of the semester. Examples might include a nearby park, a wash, the landscaping in front of an

apartment complex, your backyard, or even the UC Berkeley main campus. Semi-natural and human-modified ecosystems are fine. Students with disabilities that may prevent them from doing this activity should get in touch with the instructors for an alternative activity.

We are asking you to make at least **5 total entries over the semester**, each representing a visit of approximately one hour in length. You should write while you are visiting your site. During each visit, we would like you to make an entry in your natural history journal, including the following information:

- The date and time you were at the site;
- A 2-3 sentence description of the weather (you choose what variables you think are important, and try to report the same variables across visits)
- A photo (phone camera OK) or drawing documenting your visit;
- A response (double spaced, 12 pt Times New Roman font, 1" margins, ≥1 page long) to one of the following prompts (you choose):
  - Describe an aspect of the environment at the site.
  - Identify (to genus and species) and describe an organism at the site, focusing on e.g. its habitat, behavior, or life history. You can use iNaturalist (<https://www.inaturalist.org/>) or any other resource to get help with identification.
  - Describe an interaction between two or more organisms that you have observed (also identify the species to genus and species).
  - Make a drawing of a particular organism that you have identified (to genus and species), labeling parts with ecologically relevant terms.
  - Make a drawing of the entire site, labeling parts with ecologically relevant terms.
  - Describe a change in the site that you noticed between visits.
  - Write about how something you noticed is linked to a concept covered in class.
  - Describe how you have observed human activities influencing the ecology of the site.
  - Describe how you think the weather affects the organisms at the site, comparing between visits.
  - Describe how you could adapt the site, so it becomes more inhabitable for some of its current occupants, and how this would negatively affect other species.
  - Describe how you think global change will affect the site, with and/or without human interventions.
  - Write down a few ecology-related questions you are curious about related to this site.
  - (A possible final journal entry) How has your thinking about this site changed over your visits?

You can answer the same prompt more than once (e.g. if the organisms at the site change from visit to visit). You can also choose your own prompt so long as it is broadly related to interpreting your observations about the organisms and environment at the site. If you include drawings, you can take a phone camera picture and submit the image in a word processor document.

We welcome creative and thoughtful approaches to this project. You will get as much out of this journal as you put in - it will be easy to earn participation points through this project, but the aim goes beyond your grade - we are hoping you will also learn to observe, and to reflect.

The final submission should be a Word document, with one entry per section. There are examples of high-quality submissions on bCourses.

Rubric

*First draft* – no site chosen or minimal effort put into entries (+0%); site chosen and reasonable effort put into at least 2 entries (+100%).

*Final submission* – contains at least 5 one-page entries following requested format (+50%); quality of observation skills (+20%); entries linked to class concepts (+10%); entries creative and thoughtful (+10%); grammar and language accurate and precise (+10%).

#### 4. In-class individual exams

There will be four exams, each occurring in-class after we complete a major section of the course. They will cover material primarily from the course section, but may also require you to demonstrate mastery of material covered in prior sections, as concepts in the class are all interlinked. Format will be multiple-choice. Some questions will have basic factual answers, while others will require more critical thinking. If you have mastered the class and textbook material, you should do well on the exams.

#### Rubric

Evenly-weighted per multiple choice question: for each, incorrect (+0%); correct (+100%).

#### 5. Group take-home project

Instead of a final exam, your group will work collaboratively on a written project. You will be given background information on a contemporary issue related to ecology, and then sent several questions meant to test your understanding of the subject.

You will work with your group to answer several questions related to this issue using the concepts you have learned in the class. You will be expected to provide answers in paragraph form using precise language and appropriate grammar. You are not expected to find or cite scholarly references in your answers. Some questions may have factual answers while others will be open-ended.

You are permitted to consult any materials (including course materials, websites, library books) but are **NOT** allowed to discuss the project with people outside of your group, e.g. other students in the class, professors in your other classes, or internet mailing lists / discussion groups. We expect that you can successfully answer all questions using **ONLY** knowledge obtained in class.

The project will be made available on bCourses on the last day of class.

#### Rubric

Evenly weighted per question: arguments based on concepts learned in class (+30%); Answers factually correct or in case of open-ended questions, plausibly could be supported by evidence (+50%); Writing clear and precise, and of appropriate length (+20%).

#### 6. Discussion section activities

Please refer to the Discussion section syllabus for grading details.

#### In-class questions

We will also assess your understanding of material in class using questions answered by hand-raising. You will almost always get to discuss and report your answer as a small group before answering, so that you will not be singled out for correct or incorrect answers. These questions are intended to stimulate your thinking and test your understanding - your answers will not be formally graded.

### Out of class discussion

You are encouraged to discuss class material with your peers. We will use Piazza for discussions, and the instructors may also provide responses.

### Class schedule

Exams are shown in **red**. Assignment deadlines are shown underlined.

Day	Date	Topic	Pre-class reading (9th ed.)	(8th ed.)	Instructor
Tue	18-Jan	Introduction to the class, scope of ecology, meeting classmates			Blonder, Razafindratsima
<b>Organisms</b>					
Thu	20-Jan	1: Adaptations to terrestrial environments ( <u>in-class work due next day</u> )	Ch 1.1, 1.2, 1.3, Ch 4	3	Blonder
Tue	25-Jan	2: Adaptations to variable environments	Ch 5	4	Blonder
Thu	27-Jan	3: Life histories ( <u>in-class work due next day</u> )	Ch 7	8	Blonder
Tue	01-Feb	4: Reproductive strategies	Ch 8	9	Blonder
<b>Populations</b>					
Thr	03-Feb	5: Population distributions ( <u>in-class work due next day</u> )	Ch 10	11	Blonder
Tue	08-Feb	<b>Exam 1 - Organisms</b>			Blonder
Thu	10-Feb	6: Population growth and regulation I ( <u>in-class work due next day</u> )	Ch 11.1, 11.2	12	Blonder
Tue	15-Feb	7: Population growth and regulation II	Ch 11.3	12	Blonder
Thu	17-Feb	8: Populations over space and time I ( <u>in-class work due next day</u> )	Ch 12.1, 12.2	13	Blonder
Tue	22-Feb	9: Populations over space and time II	Ch 12.3, 12.4	13	Blonder
Thu	24-Feb	<b>Exam 2 - Populations</b>			Blonder
<b>Species interactions</b>					
Tue	01-Mar	10: Predation and herbivory	Ch 13	14	Razafindratsima
Thu	03-Mar	11: Competition ( <u>in-class work due next day</u> )	Ch 15	16	Razafindratsima
Tue	08-Mar	12: Mutualisms	Ch 16	17	Razafindratsima



Thu	10-Mar	13: Parasitism and infectious disease (in-class work due next day)	Ch 14	15	Razafindratsim a
<b>Communities</b>					
Tue	15-Mar	14: Community structure I	Ch 17.1, 17.2	18	Razafindratsim a
Thu	17-Mar	15: Community structure II (in-class work due next day) (journal draft due next day)	Ch 17.3, 17.4	18	Razafindratsim a
Tue	22-Mar	Spring break			-
Thu	24-Mar	Spring break			-
Tue	29-Mar	16: Community succession	Ch 18	19	Razafindratsim a
<b>Ecosystems</b>					
Thu	31-Mar	17: Movement of energy in ecosystems (in-class work due next day)	Ch 19	20	Razafindratsim a
Tue	05-Apr	<b>Exam 3 - Species interactions &amp; communities</b>			Razafindratsim a
Thu	07-Apr	18: Movement of elements in ecosystems (in-class work due next day)	Ch 20	21	Blonder
Tue	12-Apr	19: Climate system and biomes	Ch 2	5, 6	Blonder
<b>Global ecology</b>					
Thu	14-Apr	20: Landscape ecology and global biodiversity (in-class work due next day)	Ch 21	22	Razafindratsim a
Tue	19-Apr	21: Conservation of global biodiversity	Ch 22	23	Razafindratsim a
Thu	21-Apr	22: Global change: community & ecosystem effects (in-class work due next day)	-	-	Razafindratsim a
Tue	26-Apr	<b>Exam 4 - Ecosystems and global ecology</b>			Razafindratsim a
Thu	28-Apr	Summaries, feedback, questions (journal due). Final exam made available on bCourses.			Razafindratsim a, Blonder
Mon	9-May	<b>(Final project due)</b>			-

### Attendance policy

You are expected to be present for all class meetings. Arriving on time is important because the majority of your learning will occur through participation in individual and group exercises during class. There are also graded assignments related to this class work that you will not receive credit for if you miss class.

If you need to miss class because of personal circumstances (e.g. religious / military obligations, medical situation, family emergency), please let one of the instructors know, and an alternate deadline for work can be arranged. It is your responsibility to contact the instructors or the GSI to obtain any missed course materials.

### Computer policy

Please bring a laptop or tablet to class if possible - this will let you submit work on bCourses, and work on interactive simulations / data analyses with your group. The screen on a smartphone is probably too small to let you work productively in Google Sheets or other platforms.

Please let us know confidentially by email if you are unable to bring a computer and we will make other arrangements for you. It is critical that each four-person group has access to at least two computers each class session.

### Late work policy

If you have a personal circumstance that prevents you from handing in work on time, please let one of the instructors know. An alternate due date can be arranged.

You have three passes, with no question asked and no excuse required, for turning in late assignments but not more than three days after the due date. Late work outside these passes will lose 10% of the total point value per day. In the case of group assignments handed in late, all group members will be penalized similarly.

Technical issues with bCourses are not a valid excuse for late assignments. If you are unable to submit your work through the course website, you must instead email it to the GSI or instructors before the due date.

The **final exam must be handed in on time, with no exceptions**, due to grade submission deadlines.

### Missed work policy

We will automatically drop your lowest score on several assignments, as indicated in the point totals section. This policy is intended to give you some flexibility if you have personal circumstances that prevent you from attending class. You do not need to provide an excuse or reason to drop/skip one of these assignments. However, we will **not** accept non-emergency excuses for missed deadlines beyond these limits.

There are NO make-up assignments except in cases of religious obligations. Vacations, sports, other exams, and work conflicts are not considered valid emergencies. You can contact the instructors if you want to discuss rescheduling an assignment for these reasons. Late assignments will be penalized, as described above; otherwise, missed exams will be given a zero score.

If you miss an in-class exam due to an emergency, you must contact the instructors immediately. In these cases, the instructor will determine whether you will drop your score for that exam or take an alternate exam at a later date, which may be an in-person oral examination.

### Group work policy

You will be working in small groups throughout the semester. To ensure you get to know your peers, and to expose you to a diverse set of viewpoints, **we will be assigning group membership randomly at the beginning of the second week of class (Lecture #3)**. We expect that you will sit with your group during class times - we will provide a seating chart to facilitate this. We hope that working with the same peer group will help give this large class a more interactive, seminar-style feel.

After each group has been determined, you will develop and sign a team contract with your peers to clarify expectations, preferred method of being contacted, and other related topics.

You will be expected to work with your peers during class and potentially outside of class, in case you do not finish your in-class contributions during class time. We have allocated an extra day after each class before submissions are due, in order to allow you to potentially coordinate schedules with other group members.

**You must include a short author contribution statement at the end of each submitted group assignment (< 1 paragraph; a few sentences are more than sufficient). You will lose 10% of the assignment score if you do not include an author contribution statement.** This statement should clarify which people contributed to each component of the project. For example: "PersonA ran the simulation. PersonB made the graph. PersonC wrote the response. Everyone discussed the question together." or "PersonA and PersonB contributed equally but PersonC did not participate".

We will also seek your confidential feedback on your own contribution to the group, as well as the contributions of your peers. If any group member is clearly not contributing, we will intervene, and if necessary, mediate the situation and/or move the student to another group (possibly with no other group members to work with).

In the case of an isolated situation where a group member misses contributing to an assignment, notify the GSI by email (cc'ing all group members) detailing the situation. If a group member has clearly not participated, they will receive no points for the assignment but all other group members will.

If a group is unable to work together productively over the course of the semester, we will meet with all students in the group together. Outcomes may include a plan to improve group dynamics, separation of one or more students from the group (e.g. a student who does not contribute is put in a group of one and no longer has peers to share work with), or combination of multiple groups. We strongly hope to resolve conflicts through improvements in existing groups rather than splitting of groups and usually have been able to do so in the past.

### Classroom behavior policy

We expect you to come to class having completed the pre-class readings. Class will not be a review of material covered by the textbook, but rather will involve activities designed to test and extend your understanding of the material. We will also spend some time revising material and

will always take time to address questions around understanding. Your active participation in the out-of-class work is key to your success with the in-class work.

We expect that you will participate in discussions and will ask questions and share opinions. If you don't understand, someone else may not either. You will get as much out of the class as you invest.

We are all responsible for creating a learning environment that is welcoming, inclusive, equitable, and respectful. The expectation in this class is that we all live up to this responsibility, even during vigorous debate or disagreement, and that we will intervene if exclusionary or harassing behavior occurs. If you feel that these expectations are not being met, you can consult your instructors or seek assistance from campus resources.

### **Disability resources**

UC Berkeley is committed to creating a learning environment that meets the needs of its diverse student body including students with disabilities.

The purpose of academic accommodations is to ensure that all students have a fair chance at academic success. Disability, or hardships such as basic needs insecurity, uncertain documentation and immigration status, medical and mental health concerns, pregnancy and parenting, significant familial distress, and experiencing sexual violence or harassment, can affect a student's ability to satisfy particular course requirements. Students have the right to reasonable academic accommodations, without having to disclose personal information to instructors. For more information about accommodations, scheduling conflicts related to religious creed or extracurricular activities, please see the Academic Accommodations hub website:

[https://evcp.berkeley.edu/programs-resources/academic-accommodations-hub#accommodation\\_s](https://evcp.berkeley.edu/programs-resources/academic-accommodations-hub#accommodation_s). This website also provides a range of helpful campus resources.

If you anticipate or experience any barriers to learning in this course, please feel welcome to discuss your concerns with us. If you have a disability, or think you may have a disability, you can work with the Disabled Students' Program (DSP) to request an official accommodation. The Disabled Students' Program (DSP) is the campus office responsible for authorizing disability-related academic accommodations, in cooperation with the students themselves and their instructors. You can find more information about DSP, including contact information and the application process here: <http://dsp.berkeley.edu/>. If you have already been approved for accommodations through DSP, please meet with us so we can develop an implementation plan together.

### **Academic integrity policy**

Class assignments are structured around critical examination of your own ideas and synthesizing ideas and skills within your group. Please use this opportunity to develop your thinking. All assignments also will be automatically checked for plagiarism. You must be original in composing the writing assignments in this class. To copy text or ideas from another source (including your own previously, or concurrently, submitted course work) without appropriate reference is plagiarism and will result in a failing grade for your assignment and usually further disciplinary action. For additional information on plagiarism, self-plagiarism, and how to avoid it, see, for example: <http://www.lib.berkeley.edu/instruct/guides/citations.html#Plagiarism>

UC Berkeley's honor code states "As a member of the UC Berkeley community, I act with honesty, integrity, and respect for others." Anyone caught cheating on a quiz or exam will

receive a failing grade and will also be reported to the University Office of Student Conduct. In order to guarantee that you are not suspected of cheating, please keep your eyes on your own materials and do not converse with others during the quizzes and exams.

### **Classroom climate**

We are all responsible for creating a learning environment that is welcoming, inclusive, equitable, and respectful. If you feel that these expectations are not being met, you can consult your instructor(s) or seek assistance from campus resources (see <https://evcp.berkeley.edu/programs-resources/academic-accommodations-hub#accommodations>).