Biology 3460: Global Environmental Issues

Fall 2024 – JTB 310

Instructors: William Anderegg, Jaycie Fickle

Welcome to Global Environmental Issues. Global changes are occurring that impact biological systems. In this course, we will study the impacts of globalization, climate change, altered hydrologic and nutrient cycles, land-use changes, introductions of non-native and invasive species, and other human-related activities on the Earth's biological and ecological systems. Emphases are placed on evaluating information; understanding linkages between biological and physical processes; the impacts of humans on the functioning of ecosystems; and consideration of both impacts and solutions to the challenges of global changes. Current global issues, such as climate, biodiversity, sustainability, and ecosystem goods and services are examined from a scientific basis with the goals of understanding impacts and proposed solutions that will influence both natural systems as well as human societies in the 21st century and beyond. I hope that this course will be enjoyable and informative to you.

The course is 3 credits. This class has no pre-requisites. It fulfills the University of Utah International Requirement (IR), and Sustainability (SUS) course attributes.

Aims

We aim for students to develop skills in:

Critical thinking: Learn to think critically about environmental issues, develop a toolbox of techniques to critically evaluate evidence and multiple perspectives, understand the scientific method and its importance

Agency: Get engaged in the community and help improve your community's environment

Vision: Get inspired and think deeply about what a sustainable and positive future would look like and develop strategies to implement that future

Lectures

This course does not use a book because of the broad spectrum of topics. Educational information is based on what you learn in class; therefore, it is necessary to attend. If you do not come to class, you will miss the learning component and opportunities to enhance your critical thinking through interactive activities. The lecture slides will be posted on Canvas following the lecture. ***Required readings are posted online and should be read prior to class.*** Exams and in-class activities will cover the material in readings. Lectures will include active-learning, such as small group discussions, think-pair-share, and

numerous opportunities for participation.

Expected Learning Outcomes

As an interdisciplinary biology course, the learning objectives of this course are:

1. To reinforce student knowledge of concepts in ecology, so they can describe how the principles of natural selection and mechanisms of genetic change led to the observed diversity of life and how these processes influence ongoing biological responses to rapid environmental change.
2. To reinforce student knowledge of systems-level concepts, including interactions within ecological cycles, so that students can explain how natural systems function and how humans and global changes impact organisms and ecosystems
3. To increase student knowledge of the societal impacts of environmental problems, so that students can explain how environmental impacts are distributed in space and time and the manifold implications this has for fairness and opportunity
4. To further develop collaboration skills through group projects, presentations, and exam preparation so that students can apply concepts and subdisciplinary knowledge from within and outside of biology to interpret biological phenomena, communicate, and work collaboratively to solve problems
5. To further expose students to the interactions between science and society, including the application of ecological knowledge to evaluate those interactions
6. To further develop writing skills through scientific writing assignments and feedback

Meeting Times

Lecture: Tuesdays and Thursdays, 9:10 – 10:30 a.m., JTB 310

Breakouts: 12/5 rooms: TBD

Instructors

William Anderegg, Ph.D., **anderegg@utah.edu**. Office hours: Tuesdays 10:30 – 11:00 a.m. (please email before if you plan to attend) or by appointment, in Crocker Science Center (CSC) room 214. I will be available and respond to emails between 8 AM – 4 PM weekdays.

Jaycie Fickle, Ph.D. Candidate, **jaycie.fickle@utah.edu**. Office hours: Thursdays 1-2 PM, or by appointment, in Aline Skaggs Biology (ASB) room 510B. I will be available and respond to emails between 8 AM – 4 PM weekdays.

Teaching Assistants

Purna Post-Leon (Annapurna.post-leon@utah.edu)
Gaby Karakcheyeva (GKarakcheyeva@union.utah.edu)
Bitia Robles (u1184060@utah.edu)

- TAs can also be reached via class Canvas page

Course Materials

This class is based on material presented in lecture and required readings posted on Canvas. There is no textbook. Grades will be posted on Canvas.

For your participation grade, we will pass attendance sign in sheets around at each lecture.

Course Work
Mid-term Exams 30% (15% each)
Final Exam 20%
Class Participation 20%
Database of Hope assignments 20%
Environmental Solution Assignment 10%

Grading
Assignments are due *no later than the beginning of class* on the due date, unless otherwise noted. Late assignments will be penalized 10% for each day they are late (this includes being late to class on the due date). Any concerns about scores on assignments and exams must be addressed within ONE WEEK of the graded work being returned to you or posted on Canvas. Course grades will not be curved, but the percentage point cutoffs for letter grades will be determined at the conclusion of the semester based on student performance. Cut-offs will be no greater than the following:

A+ 97-100%, A 93-96, A- 90-92, B+ 87-89, B 83-86, B- 80-82, C+ 77-79, C 73-76, C- 70-72, D+ 67-69, D 63-66, D- 60-62, E/F <60%

Course Work Details
Lecture Exams
There will be three exams throughout the semester. They will not be cumulative. Topics covered in the formal lecture period will be used to create the exams. The majority of the questions will be multiple choice. Be prepared to think critically and synthesize ideas and concepts, rather than just regurgitating information. There will be no make-up exams. All exams will be on Canvas only during the class period, and thus can be taken from anywhere with internet access, and will be open-note. You will have one week from the time a graded exam is returned to discuss its scoring with the instructor.

Class Participation
Class attendance and participation is crucial for succeeding in this course and thus constitutes 20% of your final grade. Class participation will be graded via sign-in sheets circulated during the class period. Your clicker participation grade will be based on your 10 best participation assignments; however, more than 10 will be collected. Thus, you can still get full participation credit if you miss one lecture. **There are no options for making up missed participation points.** If you are present but for some reason do not sign in for a given day, come to me

that day after class, show me your notes from class, and send me an email that you were present. **Class attendance/participation will be graded on guest lecture days.**

Database of Hope
Due every Friday at midnight, you will submit a 1-2 paragraph write-up of an exciting solution to an environmental challenge that we discussed in class that week. This should describe 1) what is the solution, 2) a group of people (e.g. community, non-governmental organization, company, government) working to implement the solution, and 3) how someone who is interested could get involved. Include at least two hyperlinks about the approach and group and providing a graphic – e.g. graph, picture, video link – is encouraged but not required. We encourage you to focus on solutions that go beyond 'raising awareness' and education about the issue – find powerful ideas and motivated groups that are out in the world and *doing* something impactful. The TAs will select the top 4 solutions for a given week and the class will vote on the top one. These top solutions and an additional ~12-16 'honorable mentions' per week will go into the class 'Database of Hope' on Canvas. Grading will be full, partial, or no-credit (10/5/0 points) and will be based on your ten best assignments.

Environmental Solution Assignment
As an individual or in small groups (up to 5), you will develop a 3 page, single-spaced paper and 3-minute presentation about an exciting and potentially impactful environmental solution. Further details and rubric will be posted on Canvas. If you choose to propose a climate solution, we encourage you to submit your idea to the Wilkes Center for Climate Science and Policy's "Student Innovation Prize". In order to encourage collaboration, if you work as a group, you will receive a 1/3 grade bump on the assignment (e.g. a B- score would instead receive a B). Individuals in groups will each provide an assessment of who did what in the project. Presentations of these solutions will happen the final day of class in break-out rooms. This assignment is worth 10% of your final grade.

Sustainability Course Attribute
This course fulfills the University of Utah requirements for the sustainability course attribute. Specially, the four UN Sustainable Development Goals (SDGs) / Sustainability Topics that will be explored in this course are:

- Goal 13: Climate Action
- Goal 15: Life on Land
- Topic Area 1: Greenhouse Gases and Human Modification
- Topic Area 3: Ecological and Environmental Change

Because the topics covered in this course are all related to the land, ocean, and atmosphere as a coupled system, this course also aligns with the UN SDG integration.

The Student Learning Objectives and Learning Outcomes describe above are linked to these SDGs. Learning objectives 1 and 2 are linked to SDGs 13 and 15 and Topic Areas 1 and 3. The first learning objective is to understand how ecological principles govern the response of biological systems to climate change and other environmental change. This covers fundamental background of global ecology and climate change and is critical to understanding land use and other human impacts to life on land (Goal 15), climate change science (Goal 13), Earth's energy budget (Topic Area 1), and how land and ocean ecosystems are changing (Topic Area 2). Learning objective 6 (develop scientific writing skills) and the Final Solution Assignment further connect to SDGs because students research and synthesize key topics in the SDGs articulated above.

Classroom Environment

Classroom belonging policy: I aim to create a learning environment for my students that supports all perspectives, backgrounds, and experiences, and ensures that all students can succeed. To help accomplish this: 1) If you have a name and/or set of pronouns that differ from those that appear in your official University/Canvas records, please let me know! 2) If you feel like your performance in the class is being impacted by your experiences outside of class, please don't hesitate to come and talk with me. 3) Like many people, I am continually learning about and working to better support all students. If something was said in class that made you feel uncomfortable, please talk to me about it. For all of these, anonymous feedback is always an option.

The Americans with Disabilities Act: The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.

University Safety Statement: The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu.

Addressing Sexual Misconduct: Title IX makes it clear that violence and harassment based on sex and gender (which Includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).

Student wellness: Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc., can interfere with a student's ability to succeed and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness at www.wellness.utah.edu or 801-581-7776.

Lecture Outline Fall 2024 (current)

Date	Lecture	Exams/Assignments
Setting the Stage for the Anthropocene		
20-Aug	Introduction and Course Overview	
22-Aug	Human migration and megafauna extinctions	
27-Aug	Two revolutions: Rise of agriculture and the industrial revolution	
29-Aug	Scientific revolution and systems science	
3-Sep	Drivers of global change	
5-Sep	Environmental science communication	
Environmental Changes on the Land		
10-Sep	Biodiversity loss and extinction	
12-Sep	Land-use change and deforestation	
17-Sep	Invasive species	
19-Sep	Land management and urban planning	
24-Sep	Exam 1	Exam 1
Environmental Changes in the Water		
26-Sep	Over-fishing and pollution in oceans	
1-Oct	Ocean acidification	
3-Oct	Global water resources	
15-Oct	Colorado River in the 21st century	
17-Oct	Saving Utah's Great Salt Lake	
Environmental Changes in the Atmosphere		
22-Oct	Climate change science	
24-Oct	Plant physiology and climate change	
29-Oct	Climate change impacts on ecosystems	
31-Oct	Exam 2	Exam 2
5-Nov	Climate change impacts on western US forests and agriculture	
7-Nov	Climate change impacts on society	
12-Nov	Geoengineering	
14-Nov	Carbon markets/Nature-based climate solutions	
19-Nov	and how this affects human health (Profs Kerry Kelly & Robert Paine)	
Future Earth: Strategies and solutions		
21-Nov	Strategies to address climate change	
3-Dec	Integrated strategies for wicked problems	Solution Assignment
5-Dec	In-class Solution presentations	
	FINAL EXAM: Mon, Dec 9th 8-10 AM	Final exam