ENV 200A Environmental Policy and Management

Climate Change Impacts, Mitigation, and Natural Resources Management

Instructors: Eric Post (post@ucdavis.edu) and Mark Schwartz (mwschwartz@ucdavis.edu)

4-unit schedule: Tuesdays and Thursdays, 9:00 – 10:50

Course structure: This course introduces students to major topics in environmental sciences and natural resources management, with emphasis on climate change and policy approaches to mitigating human impacts on natural systems. The course meets twice weekly. Class meetings will typically consist of a lecture (labelled "L" in the schedule) for the first 50 minutes, then a 10-minute break, followed by a student-led roundtable discussion (labelled "D") or activity (labelled "A"). On some occasions, the full meeting time will be devoted to an activity such as student presentations, but on such occasions we will include a 10-minute break at the half-way point. Attendance is mandatory, and constitutes 10% of your grade. Absences will be excused under extenuating circumstances.

Exams: There will be two exams based on lecture materials, each worth 25% of your grade. The format of each exam will be made clear at least one week prior to the exam.

Discussions: Discussions are mainly, but not exclusively, intended to expand upon lecture topics. Discussions will come in a variety of formats designed to engage your thinking on these topics and develop professional skills in public speaking, science translation and presentation. (a) *Roundtable Discussions* will center around key aspects of assigned readings (listed below). You will work in groups of 6-7 to develop one discussion point or question for each roundtable based on the assigned reading(s). Each group will have a turn to present its point or question and solicit responses from the group. Because each discussion section is 50 minutes, we will devote 10 minutes to each group. (b) *Intelligence Squared Debates* will center on a controversial environmental policy proposition. Groups of 5 students will develop arguments for and against the policy proposal. Audience students will be responsible for asking debate participants clarifying questions on their arguments. (c) *Message Box*, (d) *Speed Talk* and (e) *Policy memo* discussions will each include structured formats for student participation on each discussion topic. Everyone will prepare, individually, for presentation in each session, but we will likely not have time for everyone to present each time, but everyone will get the opportunity to present. Students will be evaluated both on their preparation and presentation.

Biome Vulnerability Assessment Project: Throughout the quarter, you will work in groups of 3 on an independent Biome Project (described in detail below) that integrates and applies

concepts encountered throughout the quarter. The biome project constitutes 20% of your grade, and will be evaluated based on your presentation.

Team Projects: There will be three team efforts during the quarter. Biome projects (teams of 3, self-selected) will work through the whole quarter. Policy memo teams (randomly assorted teams of 5) will be assigned early in the quarter, but this is meant to be a 1-3 hour exercise only, based on reading. Finally, we focus the final week of class on radical climate solutions. To focus this, we will use intelligence squared debate format. Two teams of three (randomly assigned) will debate each of five issues. This will be fun, but will take some preparation time. We expect all team members to pull their weight. To facilitate this, individuals, not teams will be evaluated as part of their participation grade.

Writing and References: Writing is a critical skill for work in policy and management. EPM encourages similar writing and referencing expectations across all EPM core courses. Refer to the EPM Guides for Writing and Referencing. Instructors will refer to these guidance documents but may provide additional guidance or variances from the EPM Guides.

Grading:
Mid-term exam: 25%
Final exam: 25%
Biome project: 20% (Described below)
Class exercises: 20% (including participation and professional conduct: see EPM conduct statement herein)
Attendance: 10%

EPM Professionalism Expectation: The graduate program of Environmental Policy and Management (EPM) strives to build a positive and thriving professional culture where qualities of skill, dependability and professional conduct and capacity are preeminent. The nature of policy and management work often involves working in collaborative groups, organizing coalitions, and engaging in contentious conversations. Similarly, EPM courses require working collaboratively and respectfully engaging in discussions and debates about complex issues. Thus, EPM has developed a Professional Code of Conduct that all students and faculty are expected to follow.

The EPM Professional Code of Conduct may be found at
https://epm.ucdavis.edu/sites/g/files/dgvnsk296/files/inline-files/EPM-Conduct8-17-20_0.pdf

Instructors may reduce the course participation score of students whose behavior is inconsistent with the EPM Professional Code of Conduct.

Academic Integrity: As a University of California, Davis student, you have agreed to abide by the University's Code of Academic Conduct. It is your responsibility to be familiar with the code. See: https://ossja.ucdavis.edu/code-academic-conduct. All academic work must meet

these standards. Lack of knowledge of the academic honesty policy is not a reasonable explanation for a violation. Everyone is expected to be familiar with the UC Davis Policy on Student Conduct and Discipline, which can be found here: https://ossja.ucdavis.edu/student-conduct-and-discipline-policy. Questions related to course assignments and the academic honesty policy should be directed to the instructor.

Special Accommodation: If you have a learning disability, chronic condition, sensory or physical disability or if English is not your first language and you need special assistance in lecture, reading or writing assignments contact each of your instructors at the beginning of the quarter. Students needing accommodations because of disability must register with UCD's Student Disability Center (SDC) and complete the appropriate SDC forms issued before accommodations can be provided. The SDC is located at 54 Cowell Building. They may be reached by phone at (530) 752-3184. For more information, please see: https://sdc.ucdavis.edu

Course Schedule (subject to minor modification based on the pace of lectures):

Week	Date	Topic
1	10/1 L1	Earth's major biomes: Whittaker's biome classification scheme, temperature/precipitation impacts on biome transitions, major threats to ecosystems and biodiversity, non-analogs.
2	10/6 L2	The physical science of climate change I - current and future change: Representative concentration pathway (RCP) scenarios, expected future climate change.
	10/6 D	Related discussion: Climate Change, shipping, and marine transport. **Reading:** *U.S. Navy Arctic Roadmap*.
	10/8 L3	The physical science of climate change 2 – past change: Paleo-climate change and what it can tell us about current and future change
	10/8 D	Related discussion: Can re-wilding save the planet from climate change? **Readings:** *Welcome to Pleistocene Park*, The Atlantic, April 2017; Bakker & Svenning 2018 Trophic rewilding: impact on ecosystems under global change.
3	10/13 L4	Planetary Boundaries and the Millennium Ecosystem Assessment.
	10/13 D	Related discussion: How should we study, prepare for and mitigate human impacts on natural resources? **Readings:** Houghton & Woodwell 1989 *Global climatic change*; Lovejoy, T.E. and Hannah, L. 2019. *Changing the biosphere*. Ch. 1 in *Biodiversity and climate change.* Yale University Press).
	10/15 L5	Anthropogenic Impact Assessment-Policy Interaction: Intergovernmental Panel on Climate Change (IPCC), Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)
	10/15 D	Related discussion: Antarctic tourism. **Reading:** The Antarctic Treaty and The Committee for Environmental Protection (CEP) 2019 Annual Report.
4	**10/20 A**	**Biome project presentations, Round 1**: Vulnerabilities to Non-Human Stressors and policy-related solutions
	10/22 L6	Carbon dynamics: Major carbon sources and sinks, deforestation, and ecosystem restoration as a climate change mitigation strategy (Ch. 27 Lovejoy & Hannah; Woodwell et al. 1978 The biota and the

		world carbon budget; Woodwell et al. 1983 Global deforestation contribution to atmospheric carbon dioxide).
	10/22 D	Related discussion: Project Drawdown; The timber industry. **Readings:** Project Drawdown Executive Summary *China's Trade in Illegal Timber.*
5	10/27 L7	Conservation and management: International Union for the Conservation of Nature (IUCN) Red List, Endangered Species Act, NEPA, Protected Area management. Case studies: Pacific walrus, California's Pacific fisher.
	10/27 D	Related discussion: Protected Area management, ecosystem-based adaptation, and the importance of scientific messaging to change human behavior. **Readings:** Chs. 22, 23, & 26 Lovejoy & Hannah.
	10/29 A	**Biome project presentations, Round 2**: Vulnerabilities to Human Stressors and policy-related solutions
6	**11/3**	**Mid-term exam**
	11/5 L8	Decision making for adaptation action. From NEPA documents to community-driven conservation, action requires: (a) setting objectives, (b) developing a theory of change, (c) considering evidence and uncertainty, (d) defining measurable measures of success, (e) monitoring plans; (f) action thresholds; and (g) integrating the capacity to manage adaptively. We will do a survey of several models for how natural resource management does this in light of changing climates.
	11/5 D	Related discussion: Considering scientific uncertainty in the social domain of making decisions. **Readings:** *1) Cook, CN et al*. 2013. Achieving Science that bridges the knowledge-action boundary. Conservation Biology. https://doi.org/10.1111/cobi.12050 *2*) *Schwartz et al. 2018*. Decision support frameworks and tools for conservation. Conservation Letters. doi: 10.1111/conl.12385
7	11/10 A	*Live Lecture / Speed Talk Discussion*. Climate change and sustainable ocean management. Part 1. Lecture: I will attempt to cover ~30 issues ocean sustainability, each at ~5 minute intervals. Discussion component: every student will be randomly assigned a different paper to read, one on each of these focal topics (e.g., ocean acidification, over-fishing, coral bleaching). When

		lecture arrives at your topic, you will be expected to recognize this and contribute with 90 seconds of synthesis on the topic *after* my introduction. You may read beyond the assignment, but must integrate the reading assignment. Questions will follow for 90 seconds, or until we have used 7 minutes on a topic. This will be a wild ride. **Readings**: there are 30, one assigned to each of you. Please refer to the Canvas folder to find your assigned reading.
	11/12 L9	*Live Lecture / Speed Talk Discussion*. Climate change and sustainable ocean management. CONTINUED –see 11/5 **Readings**: there are 30, one assigned to each of you. Please refer to the Canvas folder to find your assigned reading.
8	11/17 L10	Lecture: Climate change and sustainable working landscapes: Climate impacts on food production, working landscapes, adaptation measures.
	11/17 D	Policy Memo Discussion: Groups of 5 students will develop a 2 page *rough draft* policy statement on an issue of sustaining working landscapes. Topics may include: pollinator management, compliance permit streamlining, land sparing land sharing, soil carbon credits, climate smart agriculture. **Readings**: will depend on topics groups select on Nov 5.
	11/19 L11	Lecture: Land-use planning in changing climates: Multi-criteria objective setting; Stakeholder engagement; planning tools.
	11/19 D	Policy Memo Discussion: Groups of 5 students will develop a 2 page *rough draft* policy statement on land use decisions. Topics may include: cooperative conservation agreements, critical habitat designations, payments for ecosystem services. **Readings**: will depend on topics groups select on Nov 5.
9	11/24 L12	*Lecture*: Wildfire management: Trends in wildfire; forest management and fire resilience; wildland fire management responsibilities and costs.
	11/24 D	*Discussion*: Imagine that the local public radio program has called to talk to you about western wildfire. You politely agree to talk the next day. To focus your thoughts, you write a *message box* in order to manage the interview. All students will develop a message box. Pairs will interview each other for 5 minutes. We will then do a *think-pair –share* exercise to reflect on the experience. **Reading**: The Message Box. https://www.compassscicomm.org/leadership-development/the-message-box/

	11/26	**No class – Thanksgiving**
10	12/1 L13	Radical solutions for climate change adaptation: Seeding the ocean with iron, solar shades, creating more polar ice, and others have been proposed to stop warming. Assisted migration; de-extinction and re-wilding; Gene editing species at climate risk, and others have been proposed as ecological adaptation strategies. These proposed solutions should make us all deeply uncomfortable even if, at the end of the day, we deploy them. We will use a series of Intelligence Squared Debates to tackle five of these issues. We will precede each topic with a brief (5-10 min) pre-recorded lecture on what the intervention proposed entails. Groups of 3 students will be assigned to debate one side, or the other, of a proposal about the intervention. We will follow the debates with a lecture / discussion of each. Short popular articles will be posted prior to the debate. Teams will help select these readings. I^2 Topic 1. Reduce earth's surface albedo by building ice (polar and glacial) now. I^2 Topic 2. Deploy solar shields to reduce solar irradiance through atmospheric resistance now. I^2 Topic 3. We should re-engineer dams and river corridors to cool streams for salmon persistence.
	12/3 A	Continue with Intelligence squared debates, followed by lecture on radical climate change adaptation actions I^2 Topic 4. We should help Florida torreya move north to climatically appropriate locations I^2 Topic 5. We should genetically engineer climatic tolerance for coral reef persistence in the Coral Triangle.
11	**12/8 A**	**Final Biome Project Presentations: Evaluating overall vulnerability and policy solutions**
	12/10	**Final exam**

The Biome Vulnerability Project: Assessment of Stressors and Policy Solutions

You will select a biome early in the quarter, and will work in groups of 3 throughout the quarter to identify the vulnerability of that biome at a defined geographic scope to non-human and human-related stressors, as well as evaluate policy solutions to such stressors. You must be clear about identifying the geographic scope of the biome under assessment. This is crucial because biome sensitivity to stressors and policy solutions addressing that sensitivity likely depend on geographic scale and locale (e.g., alpine tundra in the Brooks Range of Alaska likely faces different pressures and mitigating solutions than does alpine tundra in the Italian Dolomites). On each of three occasions, one member of your group will make a brief presentation **(~ 7 minutes long)** on your biome. The first of these presentations will focus on your biome's non-human stressors in your locale. The second of these presentations will focus on your biome's human stressors. The third presentation will focus on the overall vulnerability of your biome to intersections between non-human and human stressors, as well as the potential efficacy of policy solutions in addressing those intersections. The objective for the class as a whole is to determine which biomes are most likely to be adversely affected by non-human stressors, human stressors, and their interactions, and which are least likely to be affected. To make these determinations, you will work outside of class to rank your biome according to several variables provided below.

Unit I: Vulnerability to non-human stressors (presented Oct. 20)

Rank your biome according to:

1. Vulnerability to changes in precipitation: 1 = strongly adverse; 2 = moderately adverse; 3 = insensitive; 4 = moderately beneficial; 5 = strongly beneficial
2. Vulnerability to fire: 1 = strongly adverse; 2 = moderately adverse; 3 = insensitive; 4 = moderately beneficial; 5 = strongly beneficial
3. Vulnerability to changes in sea level: 1 = strongly adverse; 2 = moderately adverse; 3 = insensitive; 4 = moderately beneficial; 5 = strongly beneficial
4. Vulnerability to changes in temperature: 1 = strongly adverse; 2 = moderately adverse; 3 = insensitive; 4 = moderately beneficial; 5 = strongly beneficial
5. Vulnerability to changes in snow cover: 1 = strongly adverse; 2 = moderately adverse; 3 = insensitive; 4 = moderately beneficial; 5 = strongly beneficial
6. Policy solutions to non-human stressors: 1 = lacking; 2 = in place, but likely ineffective; 3 = uncertain; 4 = likely moderately effective; 5 = likely very effective

Unit II: Vulnerability to human stressors (presented Oct. 29)

Rank your biome according to:

1. Vulnerability to agricultural development: 1 = strongly adverse; 2 = moderately adverse; 3 = insensitive; 4 = moderately beneficial; 5 = strongly beneficial
2. Vulnerability to fragmentation: 1 = strongly adverse; 2 = moderately adverse; 3 = insensitive; 4 = moderately beneficial; 5 = strongly beneficial
3. Vulnerability to urban development: 1 = strongly adverse; 2 = moderately adverse; 3 = insensitive; 4 = moderately beneficial; 5 = strongly beneficial

4. Vulnerability to human transport: : 1 = strongly adverse; 2 = moderately adverse; 3 = insensitive; 4 = moderately beneficial; 5 = strongly beneficial
5. Vulnerability to human resource extraction: : 1 = strongly adverse; 2 = moderately adverse; 3 = insensitive; 4 = moderately beneficial; 5 = strongly beneficial
6. Policy solutions to human stressors: 1 = lacking; 2 = in place, but likely ineffective; 3 = uncertain; 4 = likely moderately effective; 5 = likely very effective

Unit III: Evaluating overall vulnerability (presented Dec. 8)

Here you will present a synthesis of the above rankings in the following matrix format. You will attempt to identify the most critical combinations of vulnerability for your biome. You will also categorize your biome overall as: critically vulnerable, highly vulnerable, less vulnerable, or least vulnerable to interacting stressors on the basis of existing policy solutions to mediating or mitigating interacting stressors. The manner in which **you arrive at your conclusion is up to you to decide, but be sure you can explain your thinking.**

Stressors	1: Precipitation	2: Fire	3: Sea level	4: Temperature	5: Snow	6: Policy solutions
1: Agricultural development						
2: Fragmentation						
3: Urban development						
4: Transport						
5: Resource extraction						
6: Policy Solutions						