University of Nevada, Reno
ECON 309: Natural Resource Economics[†]
Spring 2024 (1/22 - 5/7)

Professor:	Pierce Donovan	pierce.donovan@unr.edu
Lectures:	DMSC 102	TR 3:00 pm - 4:15 pm
Office Hours:	AB 318F	TR 1:00 pm - 2:15 pm

Course Description and Objectives

At its core, economics is a discipline focused on allocating scarce resources. This extends to natural resources, naturally! In fact, a strong foundation in economics is essential for tackling environmental issues, and I'll be using this course to back up my claim. Since the most pressing challenges that humanity faces today concern how we choose to interact with the environment, it's a good thing that you've chosen not to sleep on natural resource economics.

Economics provides a framework for making trade-offs between competing values. Freshwater can be used for irrigation or hydropower, or put in bottles—*or* it can be left alone in its natural state in rivers and aquifers. There are good reasons to allocate water to each "bin." But without a complete understanding of the benefits and costs of each use, we create unnecessary waste.

These trade-offs help identify solutions for natural resource management, but not everyone views these trade-offs in the same way. In this course you'll begin to view the world through the lens of an environmental economist—a lens hyper-focused on identifying the incentives driving sub-optimal behavior and developing policy that confronts the cause of a problem (rather than mitigating its consequences). You'll learn about the history of natural resource management from an economic perspective and become an informed critic of current environmental policy debates concerning land use, fisheries, forestry, oil extraction, pollution control, and many other topics.

Expectations

Principles of Microeconomics (ECON 102) is the only prerequisite, and I expect you to have mastered that material. Additionally, ECON 309 assignments cannot be prepped for and completed solely in the 11^{th}-hour. You should read ahead of schedule and start assignments early—this will make your experience much more enjoyable. And while I want you to become deliberate, thoughtful, and convincing writers and speakers, effective persuasion skills aren't something that develop passively. It takes lots of practice and revision.

Most of the material in this course isn't conceptually-difficult or math-heavy, but it still takes effort to transition from passive lecture bystander to active participant. You'll want to take some time to practice explaining the logic/ideas/graphs from lecture to friends outside of ECON 309—you'll spot any gaps in your understanding and learn how to apply environmental economics more effectively—both in class and in the future.[††]

[†] As the semester goes on, I may change the contents of this syllabus regarding the schedule, grading, or other details.

[††] At a higher-level—both in graduate school and professionally—economists justify their arguments with rigorous mathematical modeling. After ECON 309, you may appreciate the more detailed perspective that the math can provide.

Textbook and Readings

Most of my lecture material will follow the direction of this book:

Markets and the Environment, Second Edition, 2016
- By Nathaniel O. Keohane and Sheila M. Olmstead

The book is required for the course, and it is available online via the University of Nevada, Reno library. Most lessons and assignments will also require readings from other sources. Take a look at them *before* each lecture; the best way to follow along in class is to understand where we're heading in advance. For the reading schedule, see the course outline at the end of this syllabus.

Teaching Assistant

Finn Breuner (fbreuner@unr.edu) is our course TA. He is primarily responsible for grading your assignments. You can ask him about the rest of the course material as well, although to protect his time (he's also a student!), please ask me theory/lecture-based questions first. His office hours will be 10:00 am - 11:00 am on Wednesdays in Ansari 520.

Grading

I don't *give* grades, you *earn* them. Further, I don't judge your performance relative to your peers (i.e. curve your grades) during the term in order for you to have the clearest signal about your performance. I look for a proven understanding of the material via the following:

30%	Homework Assignments (x3, completed in pairs)
25%	Teaching Demonstration (midterm, solo)
40%	Term Project (completed in pairs):
$\sim$ 10%	Topic Proposal
$\sim$ 10%	Peer Review
$\sim$ 20%	Homework Problem (in place of final)
5%	Class Participation (classroom engagement, office hours questions, etc.)

Here is how to interpret my grading scale for our written and teaching assignments:

A ($\sim$90) You demonstrated a strong understanding in the subject at hand. Your answers provide an interesting/personal/insightful/detailed take beyond regurgitating course material.

B ($\sim$80) You connected the dots and answered my questions satisfactorily. Information from lectures, the text, and readings were brought together to build a clear and coherent response.

C ($\sim$70) You missed a bit of low-hanging fruit. Some of your responses didn't quite "get there," and some crucial/expected elements of a correct answer were missing.

D ($\sim$60) You didn't demonstrate an adequate understanding of the material. There were erroneous/unsupported statements or incomplete answers in your work.

F (0) You either didn't submit anything, or you *did* but that work didn't address the questions at hand or included plagiarized work.

Homework Assignments

There are three homework assignments, each due near the end of a unit (submitted to `Gradescope`, as a PDF, at 2pm—more instructions on `WebCampus`). I encourage you to discuss the assignments together or with me, and you must submit each assignment with a different partner. Late assignments will be accepted for two additional days, with a ten percentage point penalty per day.

I use these early assignments to nudge you toward "thinking like an environmental economist," which is a bit more focused than merely explaining that there are issues with how we currently manage our natural resources. As it turns out, the problem is usually self-evident. We want to write policy to fix it—which requires an understanding of the underlying [economic] incentives at work. This will set you up for the term project, which is meant to complete your transition from "student in an intro environmental economics class" to "person who can explain what environmental economics is to your extended family"—if that's something you wanted to attempt, anyway.

Exams

You will participate in a teaching demonstration roughly halfway through this course. In it, you will have ten minutes to walk through roughly a slide's worth of material from one of my lectures. The goal of this active learning assessment is to have you move beyond the boring and passive educational framework of "memorize—regurgitate" and facilitate a more thoughtful and fulfilling learning experience. This exam is self-scheduled, and the exam prompt is located on `WebCampus`.

Term Project

This project is a deeper exploration into a related question of your choosing. We build up to the final product in stages. Below is the general progression, and a separate *Term Project Timeline* document can be found on `WebCampus`. The goal of this assignment is to apply what you've learned in class to a new environmental issue and come up with a policy solution consistent with economic principles.

1. With a partner, find a particular environmental issue and setting of interest and write a summary of the issue. Why is it important? Who/what is involved? How could you apply the content from my lectures to your story?

2. Discuss the nature of the issue using what you've learned (so far) about environmental economics. Is there a behavioral problem? An issue with institutions/market failure? A lack of research or incomplete policy? What policy solutions might be available?

3. Present your thoughts to your peers. It's important to talk about your work; expressing your thoughts to a captive audience is helpful for testing out ideas and finding future direction.

4. Consider a potential "homework problem" that would help another student understand your environmental issue—and how to address it. A good question doesn't just cover the material; it delivers its own lesson. Use my homework assignments as a guiding framework.

5. Reflect on your analysis. Think about how your thoughts regarding environmental management have changed since starting this course. Use that to write something accessible to someone outside of this class (perhaps your parents).

Course Conduct

- Missing lecture isn't the end of the world. If you feel sick, please stay home, take the time to recover, and get notes from a friend. I don't need an excuse, but be in touch if you will be out for multiple days. Chronic *undocumented* absences may result in course failure.
- Come to office hours! They're there for you! Asking clarifying questions about my material or assignments and talking with me about your interests beyond my courses are both good habits to start and can greatly improve your college experience (or a recommendation letter).
- When asking for help outside of class, the best students show me how they have approached a problem and their progress up to that point. Simply asking for an answer is not a productive use of our time. I hope to facilitate critical thinking, and that takes effort on everyone's part.
- While I'll be accessible by email, I strongly prefer communicating during class/office hours. Regarding boundaries, I do not plan on answering emails late at night or on the weekend.
- I will not tolerate academic dishonesty. You can review University of Nevada, Reno's Honor Code [`here`]. I will report any suspected cheating, plagiarism, manipulation, or other misconduct.
- You do not have permission to make any form of recording during class or office hours. You also do not have permission to share or publish my course materials (lecture notes, homework answers, exams)—or any derived content like your responses to homework and tests.
- You are responsible for your technology problems. Submit assignments well ahead of the due date if you want to be sure that your submission is received/in the proper format/etc.
- Please be respectful to your classmates. Refrain from talking during class if it is not relevant to lecture or discussion. Cell phone or tablet use should not detract from your ability to follow along with class. No activity on your part should undermine the efforts of other students.
- In my contribution towards an inclusive and intellectually-vibrant community, I aim to reflect the ideals presented in the Principles of Good Practice for Student Affairs (`link`) in my capacity as a professor at University of Nevada, Reno. I hope you will too.

[Highlighted] Student Resources

- I can't recommend our University Tutoring Services (`link`) enough. And the Writing and Speaking Center (`link`) is available to help you work on clear and coherent communication. Focused writing takes practice, and college is a great time to put in the hours. The same goes for math! The University Math Center (`link`) provides drop-in tutoring for math help.
- If you have a learning disability or a physical disability that requires accommodation, please let me know as soon as possible. For more information, or to arrange accommodations, contact the Disability Resource Center (`link`).
- If you have any issues within or outside this course that are affecting your work, and you lack someone to talk to, I will do my best to help. Keep in mind that I am a mandatory reporter under Title IX and may need to report what you share with me. In cases where I'm not the appropriate resource, please seek support from Downing Counseling Clinic (`link`).
- The University of Nevada, Reno is committed to providing a safe learning and work environment for all. If you believe you have experienced discrimination, sexual harassment, sexual assault, domestic/dating violence, or stalking, whether on or off campus, or need information related to immigration concerns, please contact the University's Equal Opportunity & Title IX office (`link`).

Course Outline

Fundamentals of Natural Resource Economics

The role of economics in environmental management ..... Tuesday, 1/23

Book: Chapter 1, pp. 9-10
Reading: *The role of environmental economics in U.S. environmental policy*, McCarthy
Concepts: stewardship, transparency, systematic decision-making

Economic efficiency and environmental policy ..... Thursday, 1/25

Book: Chapter 2
Reading: *When value judgements masquerade as science*, Reinhardt
Concepts: maximizing net benefits, equimarginal rule, constraints, scarcity, trade-offs

The benefits and costs of environmental protection ..... Tuesday, 1/30

Book: Chapter 3, pp. 35-55
Reading: *The value of a statistical life and coronavirus, with Alan Krupnick*, Raimi
Concepts: willingness-to-pay, revealed/stated preference methods

Critiques of benefit-cost analysis ..... Thursday, 2/1

Book: Chapter 3, pp. 55-68
Reading: *Protecting the scientific integrity of benefit-cost analysis*, McGartland
Concepts: inputs to policy, efficiency vs equity, discounting, uncertainty

Markets–and market failure ..... Tuesday, 2/6

Book: Chapter 4, Chapter 5, pp. 80-91
Reading: *Why the markets need a strong government hand*, Frank
Concepts: market completeness, unintended/uncompensated effects, social costs/benefits

Externalities and public goods ..... Thursday, 2/8

Reading: *New York City steps up*, McConnell and Krupnick
Reading: *Shifting sands: Using taxes to build the best beaches, with Megan Mullin*, Raimi
Reading: *China limited the Mekong's flow. Other countries suffered a drought.*, Beech
Reading: *Whiskey fungus fed by Jack Daniel's encrusts Tennessee town*, Levenson
Concepts: rivalry and excludability, competing values, free-riding, public amenities

The tragedy of the commons ..... Tuesday, 2/13

Book: Chapter 5, pp. 91-98
Reading: *Barbed wire entrepreneurship*, Benjamin
Reading: *The great goat war of Southern France*, Porter
Reading: *Are unauthorized foreign vessels deterred from fishing inside EEZs?*, Englander
Concepts: selfishness, institutions, property rights, Coase theorem

Integrated assessment modeling ..... Thursday, 2/15

Reading: *The strategic costs of carbon emissions*, Wichman
Reading: *The new social cost of carbon*, Auffhammer
Reading: *World carbon pricing database*, Dolphin
Concepts: intergenerational utility, social damage, social cost of carbon
Homework #1 due.

Foundations discussion day ..... Tuesday, 2/20

Reading: *Widening highways doesn't fix traffic. So why do we keep doing it?*, Weingart

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Non-Renewables and Energy

What is land worth? ..... Thursday, 2/22

Reading: *How New Zealand's climate fight is threatening its iconic farmland*, Solomon
Reading: *Why Galesburg has no money*, Hicks
Concepts: scarcity, rents, land use, opportunity cost, asset value

Pollution ..... Tuesday, 2/27

Book: Chapter 10, pp. 200-207, 208-210, 217-220
Reading: *Learning from thirty years of cap and trade*, Schmalensee and Stavins
Reading: *A new tax on greenhouse gases*, Andreoni
Concepts: cost-effective emissions reduction, distributional impacts

Command-and-control policies ..... Thursday, 2/29

Book: *Skim* Chapters 8-10
Reading: *Upending conventional wisdom on carbon pricing in the power sector, with Ryan Kellogg*, Raimi
Reading: *Cap and Trade-Offs*, Johnson
Concepts: deadweight loss, Pigou, marginal damage, cost-effectiveness, flexibility, validity
Term Project Proposal due.

Electricity ..... Tuesday, 3/5

Reading: *The next energy battle*, Penn
Reading: *It's official: Stores can no longer sell most incandescent lights*, Tabuchi
Concepts: utilities, energy generation, energy efficiency

Optimal extraction of a non-renewable resource ..... Thursday, 3/7

Book: Chapter 6
Reading: *Why gas prices are so high*, Koeze and Krauss
Concepts: dynamic efficiency, intertemporal arbitrage, marginal user cost, Hotelling rule

Causes and consequences of sub-optimal extraction ..... Tuesday, 3/12

Reading: *Surging U.S. oil production brings down prices and raises climate fears*, Krauss
Reading: *In a shaky oil market, OPEC has bitter decisions to make*, Reed
Reading: *America is using up its groundwater like there's no tomorrow*, Rojanasakul et al.
Reading: *The economic impacts of agricultural groundwater markets*, Bruno
Concepts: market power, non-excludability, protection/stability

Teaching Demonstrations until Spring Break ..... Thursday, 3/14

Homework #2 due.

No class (Spring Break) ..... Tuesday, 3/26

No class (Spring Break) ..... Thursday, 3/28

Western water ..... Tuesday, 4/2

Reading: *The Colorado river is shrinking. See what's using all the water.*, Shao
Reading: *Wall Street eyes billions in the Colorado's water*, Howe
Reading: *The largest dam-removal in US history*, Matthews
Concepts: CA water management, settlement, irrigation, theft

Non-renewables discussion day ..... Thursday, 4/4

Reading: *The U.S. has billions for wind and solar projects. Good luck plugging them in.*, Plumer
Reading: *Renewable energy certificates, explained*, Roberts

Renewables and Bioeconomics

A little bioeconomics ..... Tuesday, 4/9

Book: Chapter 7, pp. 128-138
Concepts: fisheries, open-access, logistic model, carrying capacity, steady-state

Regulated open-access fisheries ..... Thursday, 4/11

Reading: *The texture of rents*, Wilen, pp. 1-12
Reading: *The world can't keep fishing like this*, Allgeier and Punke
Concepts: rent-dissipation, derbies, over-capitalization
Peer review due.

Individual fishing quotas ..... Tuesday, 4/16

Book: Chapter 10, pp. 207-214
Reading: *The texture of rents*, Wilen, pp. 12-29
Reading: *A famed fishing port shudders as its Codfather goes to jail*, Bidgood
Concepts: IFQ/ITQs, wealth creation, cost-minimization, new market generation

Introduction to forestry ..... Thursday, 4/18

Book: Chapter 7, pp. 114-118
Concepts: quasi-renewable, mean/current annual increment, Wicksell rotation

Optimal forest rotation ..... Tuesday, 4/23

Book: Chapter 7, pp. 118-122
Reading: *Thousands of Southerners planted trees for retirement. It didn't work.*, Dezember
Concepts: Faustmann rotation, site value, dynamic efficiency

Non-timber values ..... Thursday, 4/25

Book: Chapter 7, pp. 122-128
Reading: *Can a nation replace its oil wealth with trees?*, Searcey
Concepts: ecosystem management, carbon sequestration, foraging

Endangered species protection ..... Tuesday, 4/30

Book: Chapter 10, pp. 224-229
Reading: *Carving out some space*, Boyd, Caballero, and Simpson
Reading: *Is your electric car worth the extinction of a species?*, Semuels
Concepts: the ESA, tradable development rights, mitigation/conservation banking

Viability objectives and the value of preservation ..... Thursday, 5/2

Reading: *The economics of biodiversity*, Dasgupta
Reading: *As temperatures rise, Melbourne's bats get their own sprinkler system*, Frost
Concepts: shadow valuation, well-being, safety in numbers, tipping points
Homework #3 due.

Renewables discussion day ..... Tuesday, 5/7

Reading: *As the Great Salt Lake dries up, Utah faces An 'Environmental Nuclear Bomb'*, Flavelle
Reading: *What if farmers had to pay for water?*, Davenport

Term Project: Homework Assignment due. ..... Thursday, 5/9