Natural Resource Economics and Policy (ESM 242)
Bren School of Environmental Science & Management
University of California, Santa Barbara
Fall 2022

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Office Hours: Tuesday 2:00-4:00, Bren 3424

Course Objectives
This course examines the use of natural resources such as fish, forests, and minerals. An emphasis will be placed on how to use resources over time in a way that maximizes their value. We will also consider whether markets for these resources are optimal in this sense or whether policy interventions are warranted. After an introduction to basic concepts, we will study how dynamic problems can be solved numerically using an optimization algorithm in R. This will be the primary tool that students use throughout the class. Specific topics examined with include fisheries, forests, nonrenewable resources, land, and decision-making under uncertainty. In addition to regular homework assignments, students will formulate and solve a dynamic resource problem of their own design.

Course Materials
Most of the readings for the course will be in Resource Economics, Second Edition by Jon M. Conrad (Cambridge University Press, 2010). Additional readings will be made available on the course website.

Course Requirements
Readings: The readings are optional but strongly encouraged. They will help you to better understand the material presented in class and to build a deeper understanding of resource economics.

Homework assignments: There will be six homework assignments. You may work on the assignments in groups; however, you are responsible for writing your own answers, in your own words. Assignments 1-5 will be available on Tuesday and due the following week on Wednesday. The class period on Wednesday will be used to answer any remaining questions about the homework assignment due on that day and to discuss the new homework. Assignment 6 will be based on the group presentations and be made available after the last group presentation.

Mid-term exam: There is a take-home mid-term exam.

Group projects: Students will work in groups on projects of their own design. Each team must identify an interesting dynamic natural resource problem, formulate a research question, develop a mathematical statement of the problem, find a numerical solution to the problem, and report on their findings. There are three deliverables: 1) a one-page description of the problem due on October 12, 2) a presentation to the class during Weeks 9, 10, & 11, 3) a final slide deck due by Wednesday, November 30.

Times and Dates
Class meets Monday and Wednesday, 9:30-10:45 am, in Bren 1424
Homework assignments are due on October 12, October 19, October 26, November 2, November 16, and December 7.
A one-page description of your group project is due on Wednesday, October 12.
The mid-term exam will be handed out on or before Thursday, November 3, and due at the beginning of class on Monday, November 7. There is no final exam. The final slide decks for your group presentation are due on Wednesday, November 30.

Course Grades
Course grades will be based on homework assignments (40%), the mid-term exam (30%), and the group presentation and final slide deck (30%).

Schedule

Week 2 (Conrad, Chapters 1 & 2)

- September 26. Course overview
- September 28. Introduction to basic concepts
  - Natural resources
  - Dynamics
  - Discounting
  - Optimization

Week 3 (Conrad, Chapter 2)

- October 3. Numerical optimization
  - Using nloptr in R
- October 5. Introduction to Homework #1

Week 4 (Conrad, Chapter 3)

- October 10. Fisheries
  - Biological growth
  - Yield-effort relationships
  - Static fisheries models
  - Dynamic fisheries models
  - Fisheries policy
- October 12. Introduction to Homework #2

ONE-PAGE DESCRIPTION OF YOUR GROUP PROJECT - Due today

Week 5 (Conrad, Chapter 4)

- October 17. Forestry
Yield function
Optimal rotations
Non-timber benefits

October 19. Introduction to Homework #3

Week 6 (Conrad, Chapter 5)

October 24. Nonrenewable resources

- Hotelling’s rule
- Price and extraction paths
- Reserve dependent costs
- The Green Paradox

October 26. Introduction to Homework #4

Week 7 (Hartwick and Olewiler, Chapter 2)

October 31. Land use and land value

- Economic rent
- Heterogeneity in land quality
- Price of land
- Land use patterns
- Land-use policy

November 2. Happy City: Transforming Our Lives Through Urban Design (excerpts from the book by Charles Montgomery)

- Classroom discussion of reading

MID-TERM EXAM – A take-home exam will be made available on or before November 3. It is due at the beginning of class on November 7.

Week 8 (No readings this week)

November 7. Water

- Open access use of an aquifer
- Optimal use of an aquifer
- Policy application

November 9. Introduction to Homework #5

Week 9 (Plantinga 2018; Buechi et al. 2021)
November 14. Economics of Wildfire

- Wildfire trends in California
- Fuels treatments
- Fire suppression
- Insurance markets

November 16. Group presentations

**Week 10** (No readings this week)

November 21. Group presentations

November 23. Office Hours

**Week 11** (No readings this week)

November 28. Group presentations

November 30. Group presentations

**FINAL EXAM** – In lieu of a final exam, students will do a final homework assignment that will be based on the group presentations. The assignment will be due on **Wednesday, December 7**.