

Version: January 2, 2016

UNIVERSITY OF OREGON
Program in Environmental Studies

Winter 2016

ENVS 335 – Allocating Scarce Environmental Resources

Your **first assignment** is to take the time to read through this syllabus carefully. Verify that the schedule is consistent with what you expected, given official university schedules. Report any inconsistencies promptly, if present. Enter the key dates and times for all exams into your calendar and verify (or reference the course calendar on Canvas). Review the administrative material, course goals, exam policies, etc. Note that you will need to have an iClicker for the course (or the mobile app).

Lectures: T, Th 10:00-11:50 am, McKenzie 125 (capacity: 80) CRN: 22269 Credits: 4

Midterm Exams: during first hour of lecture, Thursday, January 28, 2016 and Thursday, February 18, 2016 (second hour of class time will be new lecture material)

Final Exam: 8:00 am – 10:00 am Wednesday, March 16, 2016 (no student may take the final *prior* to its scheduled time, so plan any spring break travel accordingly)

Grading options: Graded, for Majors; optional for all other students

Instructor: Trudy Ann Cameron

Office: PLC 430 (Room C inside the Mikesell Lab – fourth floor, main tower, north end of hallway). Office hours: Mondays, 12:30 pm – 2:00 pm; Wednesdays 12:30 pm – 2:00 pm *during weeks when there is a Midterm or a Problem Set due*; Thursday 12:30-2:00 pm when *nothing is due* (see Canvas calendar); and by appointment. Schedule may be revised if this presents too many conflicts for the majority of registered students. Check Canvas calendar for current schedule.

Email: cameron@uoregon.edu

Phone: (541) 346-1242 (Email is much more reliable, but not perfect. Be persistent if necessary. I get a lot of spam.)

GTF: Sonja Kolstoe, Ph.D. student, ESSP

Office: PLC 430 (Room B of the Mikesell Lab) (office hours: TBA and by appointment)

Email: skolstoe@uoregon.edu

Brief Course Description:

Considerations for the design of environmental and natural resources policies and regulations: balancing society's preferences and the costs of environmental protection and resource conservation.

Expanded Course Description:

Earth does not have enough resources to permit humans to have as much of everything as they might want. For better or worse, we are the dominant species; other species currently have standing only insofar as humans care about them. In this capacity, we must often make difficult choices about how the earth's environmental and natural resources are managed. For example, forests can be preserved in their natural state, harvested selectively and sustainably, clear-cut, or turned into farms, housing developments or shopping malls. Lax pollution regulations can permit industry to prosper, allowing higher wages, lower consumer prices and bigger investment returns for people who are saving for their retirements, or pollution can be tightly controlled to improve human health outcomes and protect ecological systems and their services.

Different constituencies have different levels of desire for each of the range of possible management outcomes. The benefits or costs to individual humans under different management scenarios may be modest but widespread, or they may be large and concentrated among fewer people. The benefits may also accrue to very different groups of people than those who bear the costs. There are often benefits and costs from the way resources are managed that spill over onto third parties—people who are not directly involved in the decisions that have been made and who therefore do not have any weight given to their preferences in these choices. Likewise, many resources belong to everyone but no one, and sustainable management is often fundamentally impossible without government intervention in the form of policies and regulations.

We will explore how environmental and natural resource management decisions are made. Given that we need to use at least some natural resources to survive, it is not possible to completely eliminate all mining, fishing, or logging. Likewise, it is not possible to reduce all forms of pollution to zero. But how much of each of these activities is too much? We will examine some pragmatic criteria and some evidence which can be used to help guide decision-makers who are responsible for setting policies and regulations. We will pay particular attention to circumstances when government intervention is essential because private incentives definitely cannot be relied upon to yield socially desirable outcomes.

Position of this course in the UO curriculum:

Environmental Studies majors sometimes have little prior exposure to the principles behind incentive-based strategies for environmental management via government policies and regulations. The academic discipline of economics concerns the allocation of scarce resources among competing uses. But many people with little or no exposure to the discipline tend to confuse economics with some of the behaviors that economists study. Environmentalists often do not distinguish between economists and the owners/managers of profit-maximizing corporations (who are perceived to ignore environmental damages because they only care about the “bottom line”). This is like rejecting the field of criminology because you are opposed to crime.

A basic familiarity with economics is crucial to an understanding of environmental and natural resource policies. However, introductory courses in economics rarely spend more than one or two lectures on applications to the environment or natural resources, and they are designed primarily to equip students with all of the analytical tools needed to continue in the economics major. While EC 333 (Resource and Environmental Economic Issues) is offered at least once each year at the University of Oregon, EC 333 has EC 201 (Introduction to Economic Analysis: Microeconomics) as a prerequisite, and it is taught at a more analytically rigorous level. This course (ENVS 335) is targeted specifically to ENVS majors and covers only the most-relevant material from EC 201 and a portion of the more-accessible material from EC 333, supplemented with policy-related readings and references to current events. This course is intended to function as “just enough economics” for the ENVS undergraduate major. It is not a substitute for EC 201.

Necessary skills:

The course will require no algebra and no calculus. However, it will be important to have a rudimentary understanding of simple graphs and how they can be used to describe how one thing depends on another. For a graph that shows the relationship between y on the vertical axis and x on the horizontal axis, participants will need to be comfortable with the idea that slope = rise/run = the change in y for a one-unit change in x .

Expected learning outcomes:

Upon successful completion of this course, students should be able to (use the language of economics and any relevant economic models/graphs to):

- Explain the differences in philosophical perspectives between environmental economists and specialists in other related disciplines;
- Explain how the tradeoffs involved in policy decisions about environmental assets depend on people’s patience/impatience and their attitudes towards risk;
- Explain the conflicts between the goals of “efficient” allocation and “equitable” allocations, given how economists define the concepts of efficiency and equity;
- Explain the economic arguments for why benefit-cost analysis is prudent and can be used to inform (but not to dictate) environmental policy decisions;
- Explain how economists measure both the costs of environmental regulation and the benefits of environmental regulation, and how the concepts of “costs” and “benefits” in economics differ from the way they are understood in other specialties;
- Explain a number of techniques that economists can use to measure environmental benefits in equivalent money terms, so that benefits can be compared to costs in formal benefit-cost analyses used for “evidence-based policymaking”;

- Explain the distinction between “revealed preference” data and “stated preference” data, including when and why one type might be preferred over the other;
- Explain how *human health* benefits from environmental policies (reduced morbidity/mortality) can be measured and quantified in dollar-denominated terms;
- Explain why it is challenging to manage publicly held *exhaustible* resources, such as minerals or fossil fuels, for the maximum benefit to society both now and in the future;
- Explain the unique management problems posed by *renewable* resources such as fish or trees, and how these problems differ from those in most agriculture;
- Explain the advantages and disadvantages of different options for “market-based” management of environmental resources, such as catch shares for fisheries or sulfur allowances or carbon taxes, etc., and demonstrate a full understanding of how these can be used to manage resource use or pollution emissions while reducing information requirements for regulators;
- Explain the extent to which “property rights” and the legal system can be relied upon to help us achieve efficient allocations of environmental goods;
- Explain some of the history of the use of alternative environmental management methods (including command-and-control, liability, and market-based methods) and demonstrate an understanding of how these methods can be expected to perform both now and in the future, under different conditions;
- Explain some of the particular challenges presented by the problem of managing mobile-source emissions, and outline market-based methods that have been proposed for these cases (and explain some distortions produced by the incentives embodied in existing mobile-source regulations);
- Explain “environmental justice/equity” from an economic perspective, and how economic assessments may differ from the approaches taken in related disciplines; etc.

Note: For some students in Environmental Studies, this may be a very different type of course than usual. To get through the above concepts in one course (the only environmental economics course some people will take), we will concentrate on so-called positive issues (i.e. matters of fact; the way economists DO think, the way some basic economic models work). We will spend very little time on so-called normative issues (i.e. matters of opinion; the way economists should or should not think, or whether their way of thinking is “right” or “wrong”). We will not shy away from the weaker aspects of the economic approach to allocating scarce environmental resources. You will need to know about these for future normative arguments you may have with economists. During this course, we will follow ecologist Joan Roughgarden’s advice from her *Guide to Diplomatic Relations with Economists* (see readings):

- Rule 1: Know who economists are;
- Rule 2: Don’t assume the moral high ground;
- Rule 3: Get used to their idea of valuation;
- Rule 4: Don’t underestimate them;
- Rule 5: Explain how ecology promotes economic growth

The last rule is not really necessary, fortunately, when you are talking to an environmental economist.

i>Clickers:

We will use iClicker technology in the course, to incentivize attendance and attention. For-credit i>Clicker questions will start in the second week of class. From the canvas.uoregon.edu instruction pages, here is how to register your i>Clicker within Canvas:

1. Log into Canvas and select your course (ENVS 335)
2. Click the i>clicker link on the left navigation pane.
3. Enter your i>clicker remote number or your GO ID and click “Register” (for dedicated clicker, see side or back of unit).
4. Note: Once you register your i>Clicker remote, you will see the remote ID and registration date listed below the registration field.

For each lecture when i<Clicker questions are used, you will receive 1 point for each correct answer and 1 point for participation if you record at least some answer to 75% of the questions asked that day. I will typically ask about four i<Clicker questions. Each day’s i<Clicker component will be equally weighted across lectures. Total = 5% of your grade.

Textbooks/Readings:

The required reading for this course is from the textbook.

Keohane, Nathaniel O. and Sheila M. Olmstead (2016) *Markets and the Environment*, 2nd Edition. Washington, DC.: Island Press.

Students come into this course with a wide variety of differences in their preparation. Some will find just the textbook to be challenging enough. Others are very well-prepared and have the capacity and interest to go well beyond the basics. I need to accommodate the full spectrum. For students with inquiring minds, I provide extensive supplementary materials on each lecture's topic below. All non-textbook and optional readings are posted in Canvas. (Some of these papers are the original sources for some of the lecture material, should you wish to dig deeper into a topic we cover.) These extra readings are optional unless otherwise stipulated.

Other texts: If you are curious to see alternative treatments of similar material at different levels, you might consider some of the following sources. Some of the more-useful chapters from these books are included as optional readings in Canvas.

Field, Barry C. (2008) *Natural Resource Economics: An Introduction*, 2nd edition, Long Grove, Illinois: Waveland Press.

Field, Barry C. and Martha K. Field (2009) *Environmental Economics: An Introduction*, 2nd edition, New York: Irwin/McGraw-Hill

Stavins, Robert N (ed.) (2005) *Economics of the Environment: Selected Readings*, 5th edition, New York: W.W. Norton and Company

Champ, Patricia A., Kevin J. Boyle, and Thomas C. Brown (eds) (2003) *A Primer on Nonmarket Valuation*, Dordrecht, Netherlands: Kluwer Academic Publishers.

Required readings will be targeted to average roughly 60 pages per week of relatively straightforward prose. See the Student Engagement Inventory at the end of this syllabus.

Tentative course outline:

Topics may be substituted or supplemented according to student demand, at the discretion of the instructor. The following in our intended coverage. Any changes will be announced in lecture.

1. [\[Lecture 1, January 5, 2016, Tuesday\]](#) Introduction, terminology
What is economics and how does this diverse field of inquiry differ across business schools and social science economics departments? Environmental economics as basically the study of market failures (externalities and public goods). Different ways to approach the intersection of "economic behavior" and "the environment." Learning how economists think, rather than learning to think like an economist. Resource scarcity and choices; opportunity costs; positive versus normative questions and issues; marginal versus total; benefits as willingness-to-pay; the nature of "economic models"
 - a. **Keohane, Nathaniel O. and Sheila M. Olmstead (2016) "Preface," and "Introduction" Chapter 1 [10 pages, Text]**
 - b. Carver, Thomas N. (1920) "Wealth and Well-Being" Chapter II in *Elementary Economics*. Boston: Ginn and Company; p. 8-15, especially p. 8-9 {motivation for the title of Adam Smith's 1776 *Wealth of Nations*} [2 pages in Canvas (Cn)]
 - c. Roughgarden, J. (2001) "Guide to Diplomatic Relations with Economists," *Bulletin of the Ecological Society of America*, 82, p. 85-88. {An ecologist explains economists} [4 pages Cn]
 - d. Fullerton, Don, and Robert Stavins (1998) "How economists see the environment," *Nature*, 395, p. 433-434 [2 pages Cn]
 - e. OPTIONAL: Segerson, K. (2015). "The Role of Economics in Interdisciplinary Environmental Policy Debates: Opportunities and Challenges." *American Journal of Agricultural Economics* 97(2): 374-389.
2. [\[Lecture 2, January 7, 2016, Thursday\]](#) WTP and demand; philosophical frameworks
Economic concept of "value" as willingness to give up other goods and services. A smattering of philosophy; idealism vs. pragmatism; humans as the dominant species (for better or worse). How can we

measure what humans *are willing to give up* for improved or preserved environmental quality? What about natural human impatience and discounting the future?

[Problem Set #1 will be handed out, due in one week; 5% of course grade]

- a. **Keohane, Nathaniel O. and Sheila M. Olmstead (2016) “Economic Efficiency and Environmental Protection,” Chapter 2 [20 pages-Text]**
 - b. Goulder, Lawrence H. and Robert N. Stavins (2002) “Discounting: An Eye on the Future,” *Nature* (419) p. 673-674. [2 pages Cn]
 - c. *OPTIONAL*: Hackett, Steven C. (1998) *Environmental and Natural Resources Economics: Theory, Policy, and the Sustainable Society*. Armonk, NY: M.E. Sharpe. Chapter 2: “Value Systems and Economic Systems,” p. 17-31 {alternative philosophical frameworks} [16 pages Cn]
 - d. *OPTIONAL*: Grafton, R. Quentin and John C.V. Pezzey (2005) “Economics of the Environment,” Chapter 4 in *Understanding the Environment: Bridging the disciplinary divides*, R. Quentin Grafton, Libby Robin and Robert J. Wasson (eds.) Sydney, Australia: UNSW Press. p. 40-56 {a partial substitute for Jaeger reading below} [17 pages Cn].
 - e. *OPTIONAL*: Jaeger, William K. (2005) “Economic Analysis in Brief,” Chapter 1 in *Environmental Economics: for tree huggers and other skeptics*. Washington: Island Press. p. 1-13 {a partial substitute for the Grafton reading above} [13 pages Cn].
3. [Lecture 3, January 12, 2016, Tuesday] Efficiency, total/marginal, costs of environmental protection, Porter hypothesis
How can we measure what humans *would have to give up* for improved or preserved environmental quality? Engineering costs versus other considerations; principles of welfare assessment
- a. **Keohane, Nathaniel O. and Sheila M. Olmstead (2016) “Economic Efficiency and Environmental Protection,” Chapter 3 [23 pages-Text]**
 - b. **Keohane, Nathaniel O. and Sheila M. Olmstead (2016) “The Efficiency of Markets,” Chapter 4 [11 pages-Text]**
 - c. *OPTIONAL*: Ambec, Stefan, Mark A. Cohen, Stewart Elgie and Paul Lanoie (2013) “The Porter Hypothesis at 20: Can Environmental Regulation Enhance Innovation and Competitiveness?” *Review of Environmental Economics and Policy*, 7(1) 2-22. [20 pages Cn]
4. [Lecture 4, January 14, 2016, Thursday] Efficiency continued; safety standard
Arguments for and against the use of formal benefit-cost analysis as an input to environmental decision-making; environmental regulation in practice in the U.S.; the safety standards, cost-effectiveness, efficiency. Preview next topic: travel-cost valuation of environmental goods (Kolstoe presentation – second half of lecture)

[Problem Set #1 due, in lecture at the beginning of class]

[Problem Set #2 will be handed out, due in one week; 5% of course grade]

- a. **Keohane, Nathaniel O. and Sheila M. Olmstead (2016) “Market Failures in the Environmental Realm,” Ch 5 [19 pages-Text]**
- b. Dasgupta, P. S. and P. R. Ehrlich (2013). “Pervasive Externalities at the Population, Consumption, and Environment Nexus.” *Science* 340(6130): 324-328. [5 pages Cn; ignore the bit of math]
- c. Arrow, Kenneth J, Maureen L. Cropper, George C. Eads, Robert W. Hahn, Lester B. Lave, Roger G. Noll, Paul R. Portney, Milton Russell, Richard Schmalensee, V. Kerry Smith, Robert N. Stavins (1996) “Is There a Role for Benefit-Cost Analysis in Environmental, Health, and Safety Regulation?” *Science* (272) p. 221-222 (April 12). [2 pages Cn]
- d. EPA Guidelines (2010) Chapter 2: Statutory and Executive Order Requirements for Conducting Economic Analyses [5 pages Cn; dull, legal, but there you have it]
- e. Daily, Gretchen C., Tore Soderqvist, Sare Aniyar, Kenneth Arrow, Partha Dasgupta, Paul R. Ehrlich, Carl Folke, AnnMari Jansson, Bengt-Owe Jansson, Nils Kautsdy, Simon Levin, Jane Lubchenco, Karl-Goran Maler, David Simpson, David Starrett, David Tilman, Brian Walker, “The Value of Nature and the Nature of Value,” *Science* 289, 21 July 2000, p. 395-396. [2 pages Cn]
- f. Kelman, Steven (1981) “Cost-Benefit Analysis: An Ethical Critique,” *AEI Journal on Government and Society Regulation* Jan/Feb, p. 33-40, replies in Mar/Apr, reprinted as Chapter 14 in Robert N. Stavins (ed.) *Economics of the Environment: Selected Readings*, p. 260-275 including replies [16 pages Cn]

[MLK Holiday, Monday January 18, 2016 – no office hours]

5. [Lecture 5, January 19, 2016, Tuesday] Travel cost method, hedonic property value method
 What costs are we willing to incur to protect ecological systems and their services?
- a. *OPTIONAL*: Parsons, George R. (2003) "The Travel Cost Model," Chapter 9.1-9.2 in Patricia A Champ, Kevin J. Boyle, and Thomas C. Brown (eds) *A Primer on Nonmarket Valuation*, Dordrecht, Netherlands: Kluwer Academic Publishers. p. 269-296. {just skim the more-technical details in section 2.2.8: Estimate the Model, and section 2.2.9: Calculate Access Value} [27 pages]
 - i. *OPTIONAL EXAMPLE*: Kreitler, Jason, Michael Papenfus, Kristin Byrd, William Lablosa (2013) "Interacting Coastal Based Ecosystem Services: Recreation and Water Quality in Puget Sound, WA," *PLOSone*, 8(2), 9 pp. [9 pages]
 - b. *OPTIONAL*: Taylor, Laura O. (2003) "The Hedonic Method," Chapter 10 in Patricia A Champ, Kevin J. Boyle, and Thomas C. Brown (eds) *A Primer on Nonmarket Valuation*, Dordrecht, Netherlands: Kluwer Academic Publishers. Sections 1, 2.0 (skip 2.1), 3, 3.1-3.3, the words in section 4, skim section 6 (VSL estimation), read section 7. [about 30 pages]
 - i. *OPTIONAL EXAMPLE*: Guignet, Dennis (2013) "What do Property Values Really Tell US? A Hedonic Study of Underground Storage Tanks," *Land Economics*, 89(2) 211-226. [15 pages Cn]
 - c. *OPTIONAL*: Dickie, Mark (2003) "Defensive Behavior and Damage Cost Methods," Chapter 11 in Patricia A Champ, Kevin J. Boyle, and Thomas C. Brown (eds) *A Primer on Nonmarket Valuation*, Dordrecht, Netherlands: Kluwer Academic Publishers. {section 1, 3.1-3.2, 3.6; 4-6 (Cost-of-illness method)} [21 pages Cn]

[END OF MATERIAL FOR MIDTERM #1]

6. [Lecture 6, January 21, 2016, Thursday] Stated preference methods, contingent valuation and conjoint choice approaches
 Survey-based methods; the challenges of heterogeneous resources; how *welfare* assessment differs from *impact* assessment.
 [Problem Set #2 due, in lecture at the beginning of class]
- a. Carson, Richard T. (2000) "Contingent Valuation: A User's Guide," *Environmental Science and Technology* (34) p. 1413-1418. [6 pages Cn]
 - b. Kling, Catherine L, Daniel J. Phaneuf, and Jinhua Zhao (2012) "From Exxon to BP: Has Some Number Become Better than No Number?" *Journal of Economic Perspectives* 26(4) 3-26. [23 pages Cn]
 - i. *OPTIONAL EXAMPLE*: NOAA (2011) *Climate Valuation Draft Report*
 - ii. *OPTIONAL EXAMPLE*: Carson, Richard T., Robert C. Mitchell, Michael Hanemann, Raymond J. Kopp, Stanley Presser, Paul A. Ruud (2003) "Contingent Valuation and Lost Passive Use: Damages from the Exxon Valdez Oil Spill," *Environmental and Resource Economics* 25, p. 257-286 [30 pages Cn]
 - iii. *OPTIONAL EXAMPLE*: Mansfield et al. (2012) Klamath River Basin Restoration Nonuse Value Survey; Final Report [many pages; browse if curious]
 - c. *OPTIONAL*: ** Polasky, S., and K. Segerson (2009) Integrating Ecology and Economics in the Study of Ecosystem Services: Some Lessons Learned, vol. 1. Palo Alto, *Annual Review of Resource Economics*, pp. 409-434 [26 pages, Cn]
7. [Lecture 7, January 26, 2016, Tuesday] Benefits from environmental health risk reductions
 Valuation of human health risks (Introduction). What costs are we willing to incur due to regulations designed to reduce *risks* to human life and health? Hazard pay for dangerous jobs, expenditures to avoid or avert health effects, survey methods.
 [Review session: Tuesday, January 26, 5-7 pm; room TBA]
- a. Cameron, Trudy Ann (2010) "Euthanizing the Value of a Statistical Life," *Review of Environmental Economics and Policy* 4(2), 161-178. {A case for changing the misleading terminology used by economists} Browse the supplementary material (quotes) associated with this article [18 pages Cn].
 - b. Hammitt, James K. (2000) "Valuing Mortality Risk: Theory and Practice," *Environmental Science and Technology* 34, p.1396-1400. [5 pages Cn]

8. [Lecture 8, January 28, 2016, Thursday] Benefits from environmental health risk reductions, ...continued **Midterm 1 (starting at 10:00 am sharp; 20% of course grade) – one hour long (rather than a full class period), this exam will cover material only to the end of the lecture one week prior; the second half of the period will be a regular lecture. Review rules for exams.**
- Differences in willingness to swap other goods and services for reductions in risks to life and health, by type of risk and characteristics of the affected population; why life insurance and health insurance premiums don't tell us what we need to know.
- U.S. EPA (2010) *Guidelines for Preparing Economic Analyses*, Appendix B: Mortality Risk Valuation Estimates, p. B1-B6 [6 pages Cn]
 - OPTIONAL:** Dickie, Mark and John List (2006) "Economic Valuation of Health for Environmental Policy: Comparing Alternative Approaches. Introduction and Overview," *Environmental and Resource Economics* 34, p.339-346. {overview of papers in a special issue on this topic; VSL versus QALYs} [7 pages Cn]
9. [Lecture 9, February 2, 2016, Tuesday] Dynamically efficient extraction of exhaustible minerals
Managing exhaustible resources; incentives for management of privately owned mines or wells. Mining or drilling operations on public lands; property rights and the fact that extracting and using a ton of ore (drum of oil) now means it won't be there later when you might need it more; the rationale for royalty payments, stumpage charges.
- Keohane, Nathaniel O. and Sheila M. Olmstead (2016) "Managing Stocks: Natural Resources as Capital Assets," Chapter 6 [24 pages-Text]**
 - OPTIONAL:** Field, Barry C. (2008) *Natural Resource Economics: An Introduction*, 2nd edition, Long Grove, Illinois: Waveland Press, Chapter 10: Mineral Economics, p. 169-192 [23 pages Cn]
 - OPTIONAL:** Field, Barry C. (2008) *Natural Resource Economics: An Introduction*, 2nd edition, Long Grove, Illinois: Waveland Press, Chapter 11: Energy, 193-218 [25 pages Cn]
 - OPTIONAL:** Mason, C. F., L. A. Muehlenbachs and S. M. Olmstead (2015). The Economics of Shale Gas Development. *Annual Review of Resource Economics*, Vol 7. G. C. Rausser. Palo Alto, Annual Reviews. 7: 269-289. [20 pages Cn] (ignore the bit of math in the footnotes; skim for the categories of externalities taken into consideration by economists)
10. [Lecture 10, February 4, 2016, Thursday] Forests: Bioeconomic models for efficient rotation
Managing renewable but depletable resources which are spatially fixed; commercial exploitation of forests; slash-and-burn; silviculture and forests as crops.
[Problem Set #3 will be handed out, due in one week; 5% of course grade]
- Keohane, Nathaniel O. and Sheila M. Olmstead (2016) "Stocks that Grow: The Economics of Renewable Resource Management," Chapter 7, p. 98-110 [27 pages-Text]**
 - North, M. P., S. L. Stephens, B. M. Collins, J. K. Agee, G. Aplet, J. F. Franklin and P. Z. Fule (2015). "Reform forest fire management." *Science* 349(6254): 1280-1281. [2 pages Cn]
 - OPTIONAL:** Field, Barry C. (2008) *Natural Resource Economics: An Introduction*, 2nd edition, Long Grove, Illinois: Waveland Press, Chapter 12: Forest Economics, p. 219-238 [20 pages-Pending]
11. [Lecture 11, February 9, 2016, Tuesday] Bioeconomic models for sustainable harvests
Multiple-use management and non-timber values of forests; value of forests as providers of "ecosystem services." Start fisheries economics.
- OPTIONAL:** Mercer, D. E., D. Cooley, and K. Hamilton. (2011) "Taking Stock: Payments for Forest Ecosystem Services in the United States." *Forest Trends/Ecosystem Marketplace*; U.S. Department of Agriculture, Forest Service. {Executive Summary, Sections 1. Introduction, 2. Methodology and Data; 3. Overview; 9. Conclusions, pages iv-9; 35-36; just browse remainder} [12 pages Cn]
12. [Lecture 12, February 11, 2016, Thursday] More on fisheries economics
Managing renewable but depletable (and often open-access) resources: commercial and recreational fisheries; wild fisheries, mariculture and aquaculture; maximum sustained yield.
[Problem Set #3 due, in lecture at the beginning of class]
- Keohane, Nathaniel O. and Sheila M. Olmstead (2016) "Stocks that Grow: The Economics of Renewable Resource Management," Chapter 7, p. 111-124 [14 pages-Text]**

- b. Sampson, G. S., J. N. Sanchirico, C. A. Roheim, S. R. Bush, J. E. Taylor, E. H. Allison, J. L. Anderson, N. C. Ban, R. Fujita, S. Jupiter and J. R. Wilson (2015). "Secure sustainable seafood from developing countries." *Science* **348**(6234): 504-506. [3 pages Cn]
- c. Pauly, D. and A. Charles (2015). "Counting on small-scale fisheries." *Science* **347**(6219): 241-242. [2 pages Cn]
- d. *OPTIONAL*: Field, Barry C. (2008) *Natural Resource Economics: An Introduction*, 2nd edition, Long Grove, Illinois: Waveland Press, Chapter 13: Marine Resources, p. 239-260 [21 pages-Pending]

[END OF MATERIAL FOR MIDTERM #2]

13. [Lecture 13, February 16, 2016, Tuesday] Fisheries management alternatives
Efficient fisheries management versus free-for-all exploitation; high-grading, by-catch, costly enforcement; gear restrictions, taxes on fishing effort, individual transferable quotas (ITQs), individual transferable share quotas (ITSQs)
- [Review session for Midterm 2: Tuesday, February 16, 5-7 pm; location TBA]
- a. Grafton, R. Q., R. Arnason, T. Bjorndal, D. Campbell, H. F. Campbell, C. W. Clark, R. Connor, D. Dupont, R. Hannesson, R. Hilborn, J. E. Kirkley, T. Kompas, D. E. Lane, G. R. Munro, S. Pascoe, D. Squires, S. I. Stenshamn, B. R. Turriss & Q. Weninger (2006) "Incentive-based approaches to sustainable fisheries," *Canadian Journal of Fisheries and Aquatic Sciences*, **63**, 699-710. [12 pages Cn]
 - b. Costello, Christopher, Steven D. Gaines, and John Lynham (2008) "Can Catch Shares Prevent Fisheries Collapse?" *Science* **321**, 1678-1681. [4 pages Cn]
 - c. Heal, Geoffrey, and Wolfram Schlenker (2008) "Sustainable Fisheries," *Nature* **455**, 23 October, 1044-1045. [2 pages Cn]
 - d. *OPTIONAL*: National Ocean Economics Program non-market values inventory [website, Cn]
14. [Lecture 14, February 18, 2016, Thursday] Market-based environmental policies
Managing pollution: external costs; legal rights and the potential for negotiated solutions; liability; why compensatory damages in natural resources lawsuits don't necessarily tell us what we need to know; getting the most "bang for the buck" in efforts to clean up the environment;
Midterm 2 (starting at 10:00 am sharp; 20% of course grade) – one hour long (rather than a full class period), covering material to end of the lecture one week prior; second hour of the class period will be a regular lecture. Review rules for exams.
- a. **Keohane, Nathaniel O. and Sheila M. Olmstead (2016) "Principles of Market-Based Environmental Policy," Chapter 8, p. 125-152 [28 pages-Text]**
 - b. *OPTIONAL*: Field, Barry C. and Martha K. Field (2009) *Environmental Economics: An Introduction*, Chapter 10 "Decentralized Policies: Liability Laws, Property Rights, Voluntary Action," p. 194-211. [17 pages Cn]
15. [Lecture 15, February 23, 2016, Tuesday] Command-and-control (standards) and taxes
Command-and-control methods for pollution control; market-based methods, e.g. green taxes (and the potential for a double dividend).
- a. *OPTIONAL*: Field, Barry C. and Martha K. Field (2009) *Environmental Economics: An Introduction*, Chapter 11 "Command-and-Control Strategies: The Case of Standards," p. 212-231. [20 pages Cn]
 - b. *OPTIONAL*: Field, Barry C. and Martha K. Field (2009) *Environmental Economics: An Introduction*, Chapter 12 "Incentive-Based Strategies: Emission Charges and Subsidies," p. 232-254. [19 pages Cn]
 - c. [PENDING: Chapter on carbon taxes from http://www.routledge.com/books/details/9781138825369/?utm_source=adestra&utm_medium=emil&utm_campaign=sbu1_je_4mx_1em_3eco_64088_envlecon]
16. [Lecture 16, February 25, 2016, Thursday] Marketable pollution permits in theory
Managing stationary sources of pollution; tradable permits (e.g. cap-and-trade), emissions permits versus ambient permits; emission reduction credits; pricing pollution in general.
[Problem Set #4 will be handed out, due one week later; 5% of course grade]

- a. **Keohane, Nathaniel O. and Sheila M. Olmstead (2016) “The Case for Market-Based Instruments in the Real World,” Chapter 9, p. 153-181 [28 pages-Text]**
 - b. Sandel, Michael J. (1997) “It’s Immoral to Buy the Right to Pollute,” editorial in the New York Times, December 15, p. A29, and replies printed December 17, 1997. Reprinted as Chapter 18 in Robert N. Stavins (ed.) *Economics of the Environment: Selected Readings*, p. 355-358 including replies. [4 pages Cn]
 - c. **OPTIONAL:** Tietenberg, T. H. (2013). "Reflections-Carbon Pricing in Practice." *Review of Environmental Economics and Policy* 7(2): 313-329. [13 pages Cn]
17. **[Lecture 17, March 1, 2016, Tuesday]** Marketable pollution permits in practice
The history of the sulfur allowance program to control acid rain; the RECLAIM program in Los Angeles; climate and carbon trading.
- a. **Keohane, Nathaniel O. and Sheila M. Olmstead (2016) “Market-Based Instruments in Practice,” Chapter 10, p. 182-206 [24 pages-Text]**
 - b. **OPTIONAL:** Field, Barry C. and Martha K. Field (2009) *Environmental Economics: An Introduction*, Chapter 13 “Incentive-Based Strategies: Transferable Discharge Permits,” p. 255-271. [17 pages Cn]
 - c. **OPTIONAL:** Fowlie, M., L. Goulder, M. Kotchen, S. Borenstein, J. Bushnell, L. Davis, M. Greenstone, C. Kolstad, C. Knittel, R. Stavins, M. Wara, F. Wolak and C. Wolfram (2014). "An economic perspective on the EPA's Clean Power Plan." *Science* 346(6211): 815-816. [2 pages Cn]
 - d. **OPTIONAL:** Revesz, R. L., P. H. Howard, K. Arrow, L. H. Goulder, R. E. Kopp, M. A. Livermore, M. Oppenheimer and T. Sterner (2014). "Improve economic models of climate change." *Nature* 508(7495): 173-175. [3 pages Cn]
18. **[Lecture 18, March 3, 2016, Thursday]** Mobile source environmental management
Managing mobile sources of pollution; why vehicle-miles travelled tend to be greater than socially optimal; CAFE standards; fuel economy versus safety arguments; emissions standards; MTBE, ethanol, biofuels and unintended consequences.
[Problem Set #4 due, in lecture at the beginning of class]
- a. **OPTIONAL:** Anas, A., and R. Lindsey (2011) “Reducing Urban Road Transportation Externalities: Road Pricing in Theory and in Practice,” *Review of Environmental Economics and Policy*, 5 (1), 66-88. [22 pages Cn]
 - b. **OPTIONAL:** Anderson, S. T., I. W. H. Parry, J. M. Sallee, and C. Fischer (2011) “Automobile Fuel Economy Standards: Impacts, Efficiency, and Alternatives,” *Review of Environmental Economics and Policy*, 5 (1), 89-108. [20 pages Cn]
19. **[Lecture 19, March 8, 2014, Tuesday]** Green GDP and/or Environmental Justice in Economics
Green GDP: Accounting for changes in environmental quality when building an index of social well-being
- a. **Keohane, Nathaniel O. and Sheila M. Olmstead (2016) “Sustainability and Economic Growth,” Chapter 11 [23 pages-Text]**
 - b. Boyd, James (2007) “Nonmarket benefits of nature: What should be counted in green GDP? *Ecological Economics*, 61, 716-723. [8 pages, Cn]
- Environmental Justice: Environmental equity from an economic perspective (overview; distributional consequences of environmental regulations).
- c. **OPTIONAL:** Fowlie, Meredith, Stephen P. Holland and Erin T. Mansur (2012) “What Do Emissions Markets Deliver and to Whom? Evidence from Southern California’s NOx Trading Program,” *American Economic Review* 102(2) 965-993. [28 pages Cn, skim]
 - d. **OPTIONAL:** Wolverton, A. (2009) “Effects of Socio-Economic and Input-Related Factors on Polluting Plants' Location Decisions,” *B E Journal of Economic Analysis & Policy*, 9 (1) {Sections 1 and 2, p.1-8, Conclusions, p. 27} [9 pages Cn]
20. **[Lecture 20, March 10, 2016, Thursday]** Overflow/make-up and/or review session

[Review Session #3. Monday, March 14, 5-7 pm, location TBA]

[Final Exam: 8:00 am – 10:00 am Wednesday, March 16, 2016. No student may take the final prior to its scheduled time, so plan any spring break travel accordingly. Review rules for exams.]

Final Exam: 40% of course grade) – 2 hours long; about 1:20 on material from the final third of the course, and about 0:20 each on material from each of the first two thirds of the course.

Requirements and Grading:

Best 3 of 4 problem sets @ 5 %	= 15%
i<Clicker participation and scores	= 5%
Two in-class midterms @ 20%	= 40%
Final exam	= 40%

	100%

Problem Sets must be turned in, in hard copy form, when they are due. This minimizes the chance that any paper will go astray during the grading process or be missed in an email in-basket. We will grade only an arbitrarily selected subset of the questions on any given problem set, so there is some opportunity to gamble on a particular question not being graded. Late problem sets will sometimes be accepted, but *only if* the answer key has not yet been posted and the answers have not yet been discussed in class. In lieu of make-ups for missed assignments, we will automatically drop your single lowest problem set score, which may include zeros for missing or late assignments. However, if you receive a zero grade on a problem set due to a violation of academic integrity (e.g. if we determine that your answer is not expressed in your own words), you may NOT drop that zero.

Classroom exams are closed-book. It may take us up to one week to complete the grading process. Exams must be written as scheduled. There will be no make-up midterm exams; with a legitimate documented excuse, scores on the other course requirements will be reweighted. *No one may write an exam prior to its scheduled time. Please plan accordingly for any travel over the quarter break.*

In a sufficiently large introductory class at the 300 level where students display a typical distribution of effort levels, I generally try to respect the Department of Economics guidelines of roughly 55-60% A's and B's, although I will check with ENVS to determine their current guidelines. I reserve the grade of A+ for distinctly exceptional performance relative to the rest of the class and I have rarely given more than one or two such grades in any class, regardless of size. Unfortunately, a few students typically earn rather low grades, too, in some cases because they underestimate the amount of attention the course requires. As an economist, however, I am entirely sympathetic that students have many different demands on their time, and different priorities for this class relative to their other coursework. To a certain extent, I view course grades as reflective of the amount of time and effort that students have decided to devote to the course, in whatever manner is optimal for them personally. Remember that help is available during office hours or by appointment with either the GTF or the professor.

My grading rubric is generally as follows:

- A = Shows strong understanding of almost all of the big ideas introduced in the course (although these students might not have picked up on every one of the more esoteric points)
- B = Shows good understanding of a majority of the biggest ideas in the course, but may display some gaps in understanding for a few of them
- C = Shows good understanding of some ideas, but reveals a worrisome cause for concern about their understanding of other ideas
- F = Relatively little evidence that enrollment in the course has produced much value-added in terms of the student's understanding of the issues; inability to invoke the ideas introduced in the course in the relevant contexts.

Student Engagement Inventory

It comes as a surprise to some students, but at UO, “student engagement” hours must total **120 hours per term** for a 4-credit course. This means that for the median UO student, there is an expectation that to succeed in a 4-credit course, you should be able to devote an average of 12 hours per week to the material. That is 8 hours each week outside of your attendance at lectures. (Remember that only 50% of UO students are above the median, by definition. Weaker students may need to spend more time on the material.)

Activity	Elaboration	Expected Hours
Course participation	Verified periodically (i.e. when graded exams and/or problem sets are not picked up during lectures on days when they are returned); iClicker responses to the day's questions if iClicker technology is used.	40 hours (~4 hours per week)
Assigned readings	Textbook, Canvas-archived items and journal articles; news items; supplementary instructor notes	60 hours (~6 hours per week)
Homework sets	Mixed formats: short answers (up to a couple of paragraphs, relevant diagrams); non-trivial multiple choice questions to conserve on grading hours	20 hours (~5 hours for each of four assignments)

Academic honesty

Academic dishonesty (ranging from plagiarizing problem sets to cheating on exams) will not be tolerated. Please acquaint yourself with the Student Conduct Code, published in the Schedule of Classes each term. If I have reason to believe that a student is violating the Student Conduct Code, I will involve the Student Judicial Affairs Office.

Any violations of academic integrity will result in a failing grade for the course. In addition, an incident report will be filed with the University's Hearing Board. It is a violation of Oregon state law to create and offer to sell part or all of an assignment to another person (ORS 165.114) or to falsify the authorship of a work product (ORS 165.037). Any such action will be held in violation of these statutes and reported to the appropriate authorities.

Our associate dean has encouraged faculty to be very specific about expectations of academic honesty and fairness, as well as exam-room policies. All of the written work you turn in for credit must be your own. If we detect plagiarism in problem sets or cheating on exams, we will pursue penalties to the full extent of the university's codes of academic conduct. If you are stuck on a problem set question, you are permitted to talk over the problem with classmates, the professor and/or GTF, although the professor and GTF will expect you to have first figured out what it is that you don't understand. You may not simply come to office hours to have us do your problem set for you. You must write up your answers *independently*. Be prepared to show ID at midterms and the final exam. The standard rules for exams include:

- Multiple exam versions will be employed and different seating is to be expected on exam days, compared to regular lectures.
- If necessary, take a minute to use the restroom before you receive the midterm or final exam. In the past, we have occasionally discovered copies of the course text or lecture notes from the class in local restrooms. Local restrooms will be checked during the exams. No more than one person will be permitted to visit a restroom at the same time. While you are out of the exam room, you must leave your cell phone on the desk at the front of the room, with the exam proctor. There are too many ways to cheat by using a smartphone.
- No one will be permitted to leave the exam room during the first 20 minutes, and no one arriving after the first person has left will be permitted to take the regular exam.
- Electronics off and away (phones, calculators, etc.).
- No brimmed hats or sunglasses (or wear them backwards so we can see your eyes).
- Bags and back-packs must be closed and stored out of the aisles and walkways so proctors can patrol the room quietly without disturbing anyone.
- We will occasionally ask people to move to a more open seat. This does not imply a suspicion of cheating. It is an effort to reduce the appearance of opportunities to cheat that may create resentment or a perception of unfairness on the part of other students.
- The best way to minimize any perception that you might be cheating is to choose a seat on exam days that is as far away as possible from your friends and/or *usual* seat-mates.
- If you are suspected of cheating on an exam—e.g. observed to be talking to your neighbors, looking at your phone or other electronics, viewing another person's exam paper or any other unauthorized materials, or displaying your answers to someone else, etc.—you will be asked to cease this activity immediately, but you will be permitted to finish writing the exam. However, your exam paper will be confiscated when "time" is called and you will be informed that proceedings will be initiated against you.
- Dependence on electronic translators is strongly discouraged. Since proctors are not likely to be able to read what students are displaying on the screens of these devices, there is no way to reassure other students

that no cheating is taking place. If you do not understand the meaning of a word or expression on an exam, feel free to ask. Definitions will be provided to the student who raises the question and/or written on the board or explained to the entire class, as deemed necessary by exam proctors.

- Headphones with any kind of electronic input are prohibited, but earplugs or unconnected *non*-electronic noise-muffling ear protectors are permitted, if these help you minimize distractions during exams.
- Although certainly not classed as academic dishonesty, if you have a cough or a cold, please be considerate of your neighbors and bring tissues or use cough suppressants as needed. Your symptoms will certainly bother you, but they will also have negative externalities for those around you. If your neighbor is inflicting any kind of negative externalities upon you, or if you feel that that someone is attempting to look at your exam paper, feel free to ask to be reseated to another open seat. You are not required to suffer from somebody else's symptoms or other noisy/distressing behavior for the entire exam period.

Students with Disabilities: If you have a documented disability and anticipate needing accommodations in this course, please make arrangements with me immediately. Please request that the counselor for students with disabilities (164 Oregon Hall) send me a letter verifying your disability.

Bias: The University of Oregon Bias Response Team wants you to know that if you are either a target or a witness of bias, they are available to help: <http://bias.uoregon.edu/>

Harassment, assault, etc.: The UO is committed to providing an environment free of all forms of discrimination and sexual harassment, including sexual assault, domestic and dating violence and gender-based stalking. If you (or someone you know) has experienced or experiences gender-based violence (intimate partner violence, attempted or completed sexual assault, harassment, coercion, stalking, etc.), know that you are not alone. UO has staff members trained to support survivors in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, helping with legal protective orders, and more.

Please be aware that all UO employees are required reporters. This means that if you tell me about a situation, I may have to report the information to my supervisor or the Office of Affirmative Action and Equal Opportunity. Although I have to report the situation, you will still have options about how your case will be handled, including whether or not you wish to pursue a formal complaint. Our goal is to make sure you are aware of the range of options available to you and that you have access to the resources you need.

If you wish to speak to someone confidentially, you can call 541-346-SAFE, UO's 24-hour hotline, to be connected to a confidential counselor to discuss your options. You can also visit the SAFE website at safe.uoregon.edu.