

Natural Resource Economics

AAE / ECON / FOREST 531

Fall 2008

Instructor: Prof. David Lewis
Department of Agricultural and Applied Economics
422 Taylor Hall
Email: dlewis2@wisc.edu; Ph: 2-5905

Class Meetings: 2:30-3:45 (TR) 351 Moore.

Office Hours: TR 4:00-5:00; W 2:30-3:45

Course Website: www.aae.wisc.edu/lewis/531

Course Description:

This course studies how society allocates scarce natural resources over time. The emphasis is on fisheries, forests, land use, water resources, non-renewable resources, uncertain decisions, resource scarcity, and sustainability. Microeconomic tools are developed and complemented by extensive use of contemporary spreadsheet software. Students will develop economic intuition for dynamic problems along with an ability to solve and interpret numerical allocation problems. Students will also develop skills using the spreadsheet software Excel.

A central goal of this course is to develop insights into how and why humans manage natural resources the way they do. Once we've built an understanding of the incentives that drive human decision-making, we can propose and analyze policies aimed at conserving natural resources. The course will analyze a range of contemporary natural resource policies such as tradable fishery quotas, forest certification, land conservation purchases, water conservation policies, renewable energy incentives, and endangered species protection.

Prerequisites:

Required prerequisites are intermediate microeconomics and differential calculus. I will spend little time reviewing basic differential calculus, so if you feel weak in this area then I suggest refreshing your memory with a basic calculus book or Alpha Chiang's book *Fundamentals of Mathematical Economics*.

Grading:

Your grade will be based on one mid-term exam (20 %), one non-cumulative final exam (20 %) several homework assignments* (30 %), an issue brief (20%), and in-class participation (10%). The homework assignments will be done in groups of 3 to 5 students.

Issue Brief:

The issue brief requires each student to analyze a contemporary natural resource policy issue in a 5-7 page paper. Each student is responsible for researching all relevant aspects of the policy or issue in question. The student will then be responsible for applying an economic critique of the policy or issue using the tools and concepts discussed in class. The issue brief grade is composed of a brief proposal summarizing the policy you will analyze (20%), and a final written report (80%). The proposal is due by November 7 and the final written report is due by December 11.

Example issue briefs include—but are not limited to—the following:

- Fishery policies
 - Tradable fishery quotas
 - Gear restrictions
 - Marine reserves
- Forest resources
 - Forest certification
 - Ecosystem management in national forests
 - Carbon sequestration policies
- Land conservation
 - Wisconsin smart-growth and urban sprawl
 - Private land trust conservation
 - Endangered species act
- Water conservation
 - Water rights trading
 - Wisconsin groundwater pricing
 - Riparian doctrine
- Energy conservation
 - Renewable-electricity standards
 - Tax credits for renewable energy

Example issue briefs can be found on the website of Resources for the Future (www.rff.org), a think tank specializing in the economics of environmental and natural resource management. The web page holding all issue briefs is: http://www.rff.org/rff/Publications/Issue_Briefs.cfm. Please note that plagiarism will not be tolerated.

* There will be approximately 5-6 assignments throughout the term.

Outline of Topics and Readings

1. Optimization over time – Conrad Ch. 1
2. Numerical allocation problems - Conrad Ch. 2
3. Fisheries - Conrad Ch.3, K.O. Ch. 7, 9, 10
 - a. Basic bio-economic model
 - b. Open access
 - c. Bio-economic management
 - d. Policy issues – ITQs
 - e. Common property resources
4. Forest resources – Conrad Ch. 4, K.O. Ch. 7
 - a. Timber rotations
 - b. Optimal stock of old-growth
 - c. Policy issues – multiple-use vs. specialization
5. Irreversible Decisions and option value – Conrad Ch. 7
6. Land resources
 - a. Land rent and urban sprawl
 - b. Ecosystem services
 - c. Biodiversity conservation
7. Non-renewable resources – Conrad Ch. 5, K.O. Ch. 6
 - a. Hotelling’s rule of resource extraction
 - b. Reserve-dependent costs; exploration
 - c. Economic scarcity
 - d. Policy issues - backstop resources and bio-fuels
8. Water resources K.O. Ch. 10
 - a. Groundwater extraction
 - b. Policy issues - water pricing
9. Stock pollutants and climate change – Conrad Ch. 6 & outside readings
 - a. Basic stock pollutant problem
 - b. Application to climate change
10. Sustainable development Conrad Ch. 8, K.O. Ch.11
 - a. Co-evolution and altruism
 - b. Economics of an ancient societal collapse

Required Books:

- Conrad, J. 1999. **Resource Economics**. Cambridge University Press.
- Keohane, N.O., and S.M. Olmstead. 2007. **Markets and the Environment**. Island Press.

AAE / ECON / FOREST 531 - Outside Reading List

Fisheries / Common Property:

- [1] Sanchirico, J., and J.E. Wilen. 2002. "Global Marine Fisheries Resources: Status and Prospects." *Resources for the Future Issue Brief #02-17*.
- [2] Sanchirico, J., and R. Newell. 2003. "Catching Market Efficiencies: Quota-Based Fisheries Management." *Resources*, 150: 8-11.
- [3] Newell, R., Sanchirico, J., and S. Kerr. 2002. "Fishing Quota Markets." *Resources for the Future Discussion Paper 02-20*.
- [4] Grafton, R.Q., Kompas, T., and R.W. Hilborn. 2007. "Economics of Overexploitation Revisited." *Science*, 318(7): 1601.
- [5] Wilson, J., Yan, L., and C. Wilson. 2007. "The Precursors of Governance in the Maine Lobster Fishery." *Proceedings of the National Academy of Sciences*, 104(39): 15212-15217.

Forest resources:

- [6] Sedjo, R.A., and D. Botkin. 1997. "Using Forest Plantations to Save Natural Forests." *Environment*, 39(10): 14-30.
- [7] Rametsteiner, E., and M. Simula. 2003. "Forest Certification—an Instrument to Promote Sustainable Forest Management?" *Journal of Environmental Management*, 67: 87-98.
- [8] Sedjo, R.A., and M. Amano. 2006. "The Role of Forest Sinks in a Post-Kyoto World." *Resources*, 162: 19-22.
- [9] Vincent, J.R., and C.S. Binkley. 1993. "Efficient Multiple-Use Forestry May Require Land-Use Specialization." *Land Economics*, 69(4): 370-376.

Land Resources:

- [10] McConnell, V., Walls, M., and E. Kopits. 2006. "Explaining Sprawl: How Much Does Zoning Matter?" *Resources*, 161: 16-19.
- [11] Stein, B.A. 2001. "A Fragile Cornucopia: Assessing the Status of U.S. Biodiversity." *Environment*, 43(7): 10-22.
- [12] Jacobs, H. M. 2008. "Designing Pro-Poor Rewards for Ecosystem Services: Lessons from the United States?" University of Wisconsin Land Tenure Center, Tenure Brief No. 8. March.

[13] Armsworth, P.R., Dailey, G.C., Kareiva, P., and J.N. Sanchirico. 2006. "Land Market Feedbacks can Undermine Biodiversity Conservation." *Proceedings of the National Academy of Sciences*, 103(14): 5403-5408.

[14] Armsworth, P.R., and J.E. Roughgarden. 2003. "The Economic Value of Ecological Stability." *Proceedings of the National Academy of Sciences*, 100(12): 7147-7151.

[15] Nelson, E., Polasky, S., Lewis, D.J., Plantinga, A.J., Lonsdorf, E., White, D., Bael, D., and J. Lawler. 2008. "Efficiency of Incentives to Jointly Increase Carbon Sequestration and Species Conservation on a Landscape." *Proceedings of the National Academy of Sciences*, 105(28): 9471-9476.

[16] Jack, B.K., Kousky, C., and K.R.E. Sims. 2008. "Designing Payments for Ecosystem Services: Lessons from Previous Experience with Incentive-Based Mechanisms." *Proceedings of the National Academy of Sciences*, 105(28): 9465-9470.

Energy Resources:

[17] Newell, R.G. 2006. "What's the big deal about oil? How we can get oil policy right." *Resources*, 163:6-10.

[18] Kopp, R.J. 2006. "Replacing Oil: Alternative Fuels and Technologies." *Resources*, 163:15-18.

[19] Runge, C.F., and B. Senauer. 2007. "How Biofuels Could Starve the Poor." *Foreign Affairs*, May/June: 41-53.

[20] Fargione, J., Hill, J., Tillman, D., Polasky, S., and P. Hawthorne. 2008. "Land Clearing and the Biofuel Carbon Debt." *Science*, 319(29): 1235-1238.

[21] Krautkraemer, J.A. 2005. "The Economics of Natural Resource Scarcity: The State of the Debate." *Resources for the Future Discussion Paper* 05-14.

Water Resources:

[22] Seely, R. 2008. "Many Wells, Little Regulation." *Wisconsin State Journal*, Sunday, July 27.

Stock Pollutants and Climate Change:

[23] Falk, I., and R. Mendelsohn. 1993. "The Economics of Controlling Stock Pollutants: An Efficient Strategy for Greenhouse Gases." *Journal of Environmental Economics and Management*, 25: 76-88.

Sustainability:

[24] Brander, J.A., and M.S. Taylor. 1998. "The Simple Economics of Easter Island: A Ricardo-Malthus Model of Renewable Resource Use." *American Economic Review*, 88(1): 119-138.

[25] Foley, J.A. et al. 2005. "Global Consequences of Land Use." *Science*, 309 (July 22): 570-574.

[26] Worm, B. et al. 2006. "Impacts of Biodiversity Loss on Ocean Ecosystem Services." *Science*, 314 (Nov. 3): 787-790.