# Department of Economics
# Course Outline

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|---|---|---|---|
| | | **Term:** | Winter 2005 |
| **Course:** | Economics 599.06<br>[Advanced Issues in Resource Economics] | **Section:** | 01 |
| **Time:** | TR 11:00 ? 12:15 | **Place:** | SS 423 (subject to change) |
| **Instructor:** | Dr. John R. Boyce | | |
| **Office:** | SS 412 | **Telephone:** | 220-5860 |
| **Office Hours:** | TR 14:00 - 15:00 | **E-Mail:** | boyce@ucalgary.ca |

**Textbook(s):**

N/A

**Readings:** **(SS 425, Economics Resource Room)**

*Exhaustible Resources and Economic Theory*, P. S. Dasgupta & G. W. Heal, Cambridge University Press, 1979.

*Environmental Economics: In Theory and Practice*, N. Hanley, J. F. Shogren, & B. White, Oxford University Press, 1997.

*Dynamic Optimization: Calculus of Variations and Optimal Control Theory in Economics and Management* (2nd Ed.), M. Kamien & N. Schwartz, North Holland, 1991.

*Natural Resource and Environmental Economics*, Roger Perman, Yue Ma, and James McGilvray, Longman, London, 1996.

*Economic Growth*, Robert J. Barro and Xavier Sala-i-Martin, McGraw-Hill, New York.

Other readings (the bulk of the course) will be made available in the reading room.

## Course Outline:

- Review of Basic Issues in Natural Resource Economics (3 weeks)

a. Optimal control theory
b. Dynamic programming
c. Differential & Markov games

- Exhaustible Resources (4 weeks)

a. Perfect competition, fixed stock
b. Imperfect competition, fixed stock
c. Exploration and mixed stocks
d. Global Warming
e. Taxation & regulation

- Renewable Resources (4 weeks)

a. Perfect competition, full property rights
b. Imperfect competition, full property rights
c. Common property & open access
d. Extinction
e. Regulation

- Other Applications (2 weeks)

a. Forests
b. Cleaning up hazardous wastes
c. Environmental Kuznet?s Curve
d. Curse of Natural Resources

## Grade Determination and Final Examination Details:

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|---|---|
| Four Assignments | (12.5% each, 50% total) |

| | |
|---|---|
| Term Paper | 25% |
| Final Examination | 25% |

Assignments and the final exam are marked on a numerical (percentage) basis. The letter grade is calculated using the following letter grade equivalences:

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|---|---|---|---|---|---|
| A+ | 98 ? 100 | B | 80 ? 84 | C- | 60 ? 64 |
| A | 95 ? 97 | B- | 75 ? 79 | D+ | 55 ? 59 |
| A- | 90 ? 94 | C+ | 70 ? 74 | D | 50 ? 54 |
| B+ | 85 ? 89 | C | 65 ? 69 | F | <50 |

The term paper shall consist of a literature review, empirical modeling, or theoretical modeling. First Draft is due first class meeting in March. Final draft is due last day of classes.

If, for some reason, the distribution of grades determined using the aforementioned conversion chart appears to be abnormal the instructor reserves the right to change the grade conversion chart if the instructor, *at the instructor's discretion*, feels it is necessary to more fairly represent student achievement.

**Basic Models of Exhaustible Resource Use**

## READING LIST


Hotelling, Harold A. (1931), "Economics of Exhaustible Resources," *Journal of Political Economy* 39: 137-175.

Gray, L.C. (1911), "The theory of the mine," *Quarterly Journal of Economics*.

Solow, Robert M., "The economics of resources, or the resources of Economics," *American Economic Review*, 1974.

Smith, Vernon L. (1968), "Economics of Production from Natural Resources," *American Economic Review*, 58 (June), 409-431.

Salant, Stephen, Mukesh Eswaran, and Tracy Lewis (1983), "The Length of Optimal Extraction Programs When Depletion Affects Extraction Costs," *Journal of Economic Theory*, 31: 364-374.

Solow, Robert M., and F. Y. Wan (1976), "Extraction Costs in the Theory of Exhaustible Resources," *Bell Journal of Economics*, 7 (Autumn), 359-370.

Stiglitz, Joseph E. (1974), "Optimal growth with exhaustible Resources," *Review of Economic Studies*.

Stiglitz, Joseph E. (1976), "Monopoly extraction of an exhaustible resource," *American Economic Review*.

Weinstein, Martin C., and R. J. Zeckhauser (1975), "The Optimal Consumption of Depletable Natural Resources," *Quarterly Journal of Economics*.

, 89 (August), 371-392.

Hartwick, John M. (1977), "A Savings rule for Exhaustible Resources," *American Economic Review*.

Pindyck, Robert S. (1978), "The Optimal Exploration and Production of Nonrenewable Resources," *Journal of Political Economy*, 86(5), 841-861.

Swierzbinski, Joseph E., and Robert Mendelsohn (1989), "Exploration and Exhaustible Resources: The Microfoundations of Aggregate Models," *International Economic Review*, 30 (February), 175-186.

Livernois, John, and Russell Uhler (1987), "Extraction Costs and the Economics of Nonrenewable Resources," *Journal of Political Economy*, 95 (February), 195-203.

Slade, Margaret E. (1982), "Trends in Natural-Resource Commodity Prices: An Analysis of the Time Domain," *Journal of Environmental Economics and Management*, 9(June), 122-37.

Krautkraemer, Jeffery A. (1998), "Nonrenewable resource scarcity," *Journal of Economic Literature*, XXXVI (4): 2065-2107.

Farzin, Y. H. (1992), "The Time Path of Scarcity Rent in the Theory of Exhaustible Resources," *Economic Journal*, 102 (July), 813-830.

***Strategic Models of Exhaustible Resources***

Salant, Stephen (1976), "Exhaustible Resources and Industrial Structure: A Nash-Cournot Approach to the World Oil Market," *Journal of Political Economy*, 84(Oct.), 1079-93.

Polasky, Stephen, (1992), "Do oil producers act as ?oil?ogopolists?" *Journal of Environmental Economics and Management.*

Eswaran, Mukesh, and Tracy R. Lewis (1985), "Exhaustible resources and alternative equilibrium concepts," *Canadian Journal of Economics*, 18: 459-3.

Reignanum, Jennifer F., and Nancy L. Stokey (1985), "Oligopoly extraction of a non-renewable common property resource: the importance of the period of commitment in dynamic games," *International Economic Review*, 26 (1), 161-73.

Newberry, David M. G. (1981), "Oil Prices, Cartels, and the Problem of Dynamic Inconsistency," *Economic Journal*, 91 (September), 617-646.

Groot, F., et al. (1992), "Note on the Open-Loop von Stackelberg Equilibrium in the Cartel versus Fringe Model," *Economic Journal*, 102(November), 1478-84.

***Regulation of Exhaustible Resources***

Libecap, Gary D., and Steven N. Wiggins (1985), "Oil field unitization: contractual failure in the presence of imperfect information," *American Economic Review*, 75 (June), 368-85.

Libecap, Gary D., and Steven N. Wiggins (1985), "The Influence of Private Contractural Failure on Regulation: the Case of Oil Field Unitization," *Journal of Political Economy*, (August), 690-714.

Karp, Larry (1992), "Efficiency Inducing Tax for a Common Property Oligopoly," *Economic Journal*, 102 (March), 321-

332.

Deacon, Robert T. (1993), "Taxation, Depletion, and Welfare: A Simulation Study of the U.S. Petroleum Resource," *Journal of Environmental Economics and Management*, 24: 159-187.

Burness, Harold S. (1976), "On the Taxation of Nonreplenishible Natural Resources," *Journal of Environmental Economics and Management*, 3: 289-311.

Yucel, M. K. (1989), "Severance Taxes and Market Structure in an Exhaustible Resource Industry," *Journal of Environmental Economics and Management*, 16: 134-148.

Nordhaus, William. (1991), "To Slow or Not to Slow: The Economics of the Greenhouse Effect," *Economic Journal*, 101(July), 920-37.

Hoel, Michael (1993), "Intertemporal Properties of an International Carbon Tax," *Resource and Energy Economics*, 15 (March), 51-70.

Bohn, H., and Robert T. Deacon (2000), "Ownership risk, investment, and the use of natural resources," *American Economic Review*, 90 (June): 526-49.

Nordhaus, William. (1993), "Optimal Greenhouse Gas Reductions and Tax Policy in the "Dice" Model," *American Economic Review*, 83 (2): 313-17.

Chakravorty, U., J. Roumasset, and K. Tse (1997), "Endogenous Substitution among Energy Resources and Global Warming," *Journal of Political Economy*; 105 (6): 1201-34.



Gordon, H. Scott (1954), "The economic theory of a common-property resource: the fishery," *Journal of Political Economy* , 62 (April), 124-42.

Scott, Anthony (1955), "The fishery: the objectives of sole ownership," *Journal of Political Economy*, 63 (April), 116-24.

Copes, Parcival (1970), "The back-wards bending supply curve in a fishery." *Scottish Journal of Political Economy*; 17 (Feb.), 69-77.

Boyce, John R. (1996), "An Economic Analysis of the Fisheries Bycatch Problem," *Journal of Environmental Economics and Management*, 31: 314-36.

Boyce, John R. (2000), "Congestion costs in a fishery," *Marine Resource Economics*, 15 (3): 233-44.

Boyce, John R. (2004), "Instrument Choice in a Fishery," *Journal of Environmental Economics and Management*.

Casey, K. E., C. M. Dewees, B. R. Turris, and J. E. Wilen (1995), "The effects of individual vessel quotas in the British Columbia halibut fishery," *Marine Resource Economics*, 10 (3): 211-30.

Smith, Vernon L. (1968), "Economics of Production from Natural Resources," *American Economic Review*, 58 (June), 409-431.

Patterson, D., and James E. Wilen, (1977), "The case of the Pacific fur seal," *Economic History Review*.

Clark, Colin W., and Gordon Munro (1975), "The economics of fishing and modern capital theory: A simplified approach," *Journal of Environmental Economics and Management*, 2: 92-106.

Clark, Colin W., and Gordon R. Munro (1980), "Fisheries and the Processing Sector: Some Implications for Management Policy," *Bell Journal of Economics*, 11 (Autumn), 603-616.

Brown, Gardner M. (1974), "An Optimal Program for Managing Common Property Resources with Congestion Externalities," *Journal of Political Economy*, 82(1): 163-73.

McKelvey, Robert (1983), "The Fishery in a Fluctuating Environment: Coexistence of Specialist and Generalist Fishing Vessels in a Multipurpose Fleet," *Journal of Environmental Economics and Management*, 10 (December): 287-309.

Cropper, Maureen L. et al. (1979), "The Optimal Extinction of a Renewable Natural Resource," *Journal of Environmental Economics and Management*, 6 (4): 341-49.

Brander, James & M. Scott Taylor (1998), "The Simple Economics of Easter Island: A Ricardo-Malthus Model of Renewable Resource Use." *American Economic Review*. 88 (March): 119-38.

***Strategic Models of Renewable Resource Use***

Levhari, David, and Leonard J. Mirman (1980), "The great fish war: an example using a dynamic Cournot-Nash," *Bell Journal of Economics*, 11 (Spring), 322-34.

Mirman, Leonard J., and X. To, (2004), "Overlapping generations model of common property resource use," forthcoming, *Journal of Environmental Economics and Management.*

Hannesson, R. (1997), "Fishing as a Supergame," *Journal of Environmental Economics and Management*, 32 (March), 309-22,

Boyce, John R. (2002), "Conservation for sale." Unpublished manuscript, University of Calgary.

Kremer, M. and C. Morcom (2000), "Elephants," *American Economic Review*, 90 (March), 212-34.

Brooks, Robin et al. (1999) "When Is the Standard Analysis of Common Property Extraction under Free Access Correct? A Game-Theoretic Justification for Non-Game-Theoretic Analyses," *Journal of Political Economy*, 107 (August), 843-58.

***Regulation of Renewable Resources***

Clark, Colin W. (1980), "Towards a predictive model for the economic regulation of commercial fisheries," *Canadian Journal of Fisheries and Aquatic Science*, 37 (July), 1111-29.

Arnason, Ragnar, (1990), "Minimum information management in fisheries," 23 (August), 630-53.

Boyce, John R. (1992), "Individual transferable quotas and production externalities in a fishery," *Natural Resource Modeling*, 4 (Winter), 385-408.

Copes, Parzival (1986) "A critical review of the individual quota as a device in fisheries management," *Land Economics*, 62 (August), 278-91.

Johnson, Ronald N., and Gary D. Libecap (1982), "Contracting problems and regulation: the case of the fishery," *American Economic Review*, 72 (December), 1005-22.

Karpoff, Jonathan M. (1987), "Suboptimal controls in common resource management: the case of the fishery," *Journal of Political Economy*, 95 (February), 179-94.

Matulich, Scott C., R. C. Mittelhammer, and C. Reberte (1996), "Toward a more complete model of individual transferable fishing quotas: implications of incorporating the processing sector," *Journal of Environmental Economics and Management* , 31 (July), 112-28.

Samuelson, Paul A. (1974), "Is the rent-collector worthy of his full hire?," *Eastern Economic Journal*, 1 (January), 7-10; reprinted in N. Nagatani and K. Crowley, ed., *The Collected Scientific Papers of Paul Samuelson*, Vol. 4, 1977, MIT Press, Cambridge, Mass.

Homans, Frances R., and James E. Wilen (1997), "A model of regulated open access resource use," *Journal of Environmental Economics and Management*, **32** (January): 1-21.

Swanson, Timothy (1994), "The Economics of Extinction Revisited and Revised: A Generalised Framework for the Analysis of the Problems of Endangered Species and Biodiversity Losses," *Oxford Economic Papers*, 46 (Oct.), 800-821.

Brown, Gardner M. (2000), "Renewable natural resource management and use without markets," *Journal of Economic Literature*, XXXVIII (4): 875-914.

***Miscellaneous Topics***

***Miscellaneous Topics***

Caputo, Michael R.; Wilen, James E. (1995), "Optimal Cleanup of Hazardous Wastes", *International Economic Review*, 36 (1): 217-43.

Fullerton, Don, and T. C. Kinnaman (1996), "Household Responses to Pricing Garbage by the Bag," *American Economic Review*, 86 (4): 971-84.

Smith, Vernon L., "Garbage," *Quarterly Journal of Economics*, 1972

Fullerton, Don, "Burning, Recycling, and Garbage," *Journal of Environmental Economics and Management*, 1995.

***Water***

Negri, Donald H. (1989), "The Common Property Aquifer as a Differential Game," *Water Resources Research*, 25 (1): 9-15.

Gardner, R., M. R. Moore, and J. M. Walker (1997), "Governing a Groundwater Commons: A Strategic and Laboratory Analysis of Western Water Law," *Economic Inquiry*, 35 (2): 218-34.

***Forests***

Hartwick, John M., Long, Ngo Van, and H. Tian (2001), "Deforestation and Development in a Small Open Economy," *Journal of Environmental Economics and Management*, 41 (3): 235-51.

Reed, Robert (1974), "Optimal rotation of a forest subject to fire," *Journal of Environmental Economics and Management*.

Wirl, Franz (1999), "De and Reforestation: Stability, Instability and Limit Cycles," *Environmental and Resource Economics*, 14 (4): 463-79.

Deacon, Robert T. (1994), "Deforestation and the Rule of Law in a Cross-Section of Countries," *Land Economics* 70, 414-430.

***Land***

Innes, Robert, Stephen Polasky, John Tschirhart (1998), "Takings, Compensation and Endangered Species Protection on Private Lands," *Journal of Economic Perspectives*, 12 (3): 35-52.

Polasky, Stephen, J. D. Camm, and B. Garber-Yonts (2001), "Selecting Biological Reserves Cost-Effectively: An Application to Terrestrial Vertebrate Conservation in Oregon," *Land Economics*, 77 (1): 68-78.

**Growth, Trade, and the Environment**

Sachs, Jeffrey D.; Warner, Andrew M. (2001), "The Curse of Natural Resources," *European Economic Review*, 45 (May): 827-38.

Boyce, John R., and J. C. Herbert Emery, "The simple Analytics of the Curse of Natural Resources," unpublished working paper, University of Calgary, 2004.

Grossman, Gene, and Alan Krueger, (1995), "The environmental Kuznet?s curve," *Quarterly Journal of Economics.*

Harbaugh, William T.; Levinson, Arik; Wilson, David Molloy (2002), "Reexaming the Empirical Evidence for an Environmental Kuznets Curve," *Review of Economics and Statistics*, 84 (August): 541-51.

Stokey, Nancy L. (1999), "Are there limits to growth?," *International Economic Review*.

Brock, William A., and M. Scott TaYlor, "The Green Solow Model," Unpublished working paper, University of Calgary, 2004.

Dasgupta, Susmita, et al. (2002), "Confronting the Environmental Kuznets Curve," *Journal of Economic Perspectives*,16 (Winter): 147-68.

Antweiler, Werner; Copeland, Brian R.; Taylor, M. Scott (2001), "Is Free Trade Good for the Environment?" *American Economic Review*, 91 (September): 877-908

Copeland, Brian R.; Taylor, M. Scott (1994), "North-South Trade and the Environment," *Quarterly Journal of Economics*, 109 (August): 755-87.

***Pollution Regulation***

Hahn, Robert W.; (2000), "The Impact of Economics on Environmental Policy," *Journal of Environmental Economics & Management*, 39 (May): 375-99.

Hahn, Robert W.; (1989), "Economic Prescriptions for Environmental Problems: How the Patient Followed the Doctor's Orders," *Journal of Economic Perspectives*, 3 (Spring): 95-114.

Carlson, C., et al. (2000), "Sulfur Dioxide Control by Electric Utilities: What Are the Gains from Trade?," *Journal of Political Economy*, 108 (6) 1292-1326.

Joskow, Paul, Richard Schmalensee, and Elizabeth Baily (1998), "The market for SO2 permits," *American Economic Review*. ?/10

Stavins, Robert N. (1999), "The Costs of Carbon Sequestration: A Revealed-Preference Approach," *American Economic Review*, 89 (4) 994-1009.

Non-programmable calculators will be allowed during the writing of tests or final examinations.

There will be a Registrar scheduled final examination which will be held jointly with Economics 675 (01) two hours in duration. It will be held in a classroom.

Tests and exams will not involve multiple choice questions.

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Society of Undergraduates in Economics (S.U.E.)
www.fp.ucalgary.ca/econ

**Notes:**

- Students seeking reappraisal of a piece of graded term work (term paper, essay, etc.) should discuss their work with the Instructor within two weeks of the work being returned to the class.

Safewalk / Campus Security: 220-5333

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JRB:pst
2005-01-07