

**UNIVERSITY OF COLORADO AT BOULDER
DEPARTMENT OF ECONOMICS, SPRING 2007
NATURAL RESOURCE ECONOMICS, Econ 4535-001**

Lectures: MWF 10:00 a.m. to 10:50 a.m. @ HLMS 241

Instructor: Vijaya R. Sharma, Ph.D.

Office Hours: MWF 9:00 a.m.-10:00 a.m. @ Econ 4A

Voice mail: 303-492-3021

E-mail: vijaya.sharma@colorado.edu

Web site: <http://spot.colorado.edu/~sharmav/>

Course Introduction

This course presents theories of efficient utilization of natural resources and discusses issues related to current practices of use of resources. It also discusses issues of sustainability, conservation, and preservation. The course extensively uses graphical analyses and some mathematical models. It also assigns a number of readings and preparation and presentation of a paper on a relevant natural resource issue.

Course Prerequisites

Econ 3070 Intermediate Microeconomics and Econ 1070/1080 Mathematical Economics

Textbook (optional)

Environmental and Natural Resource Economics, by Frank A. Ward, Pearson Prentice Hall

Web Notes

Notes on most course materials are available on the instructor's web site. They may differ from actual lectures in some details, especially the mathematical and graphical representations, and may even be incomplete or nonexistent for some topics.

Assignments

Fourteen assignments are prescribed in the course and are listed in the course outline. Some assignments require you to prepare a summary of the readings assigned; you can access the readings from the instructor's web site.

Paper Presentation

Each student chooses a topic on or before February 16, conducts the necessary research and study, submits both hard and electronic copies of paper, and presents the findings to the class on the day scheduled for the topic. A list of suggested topics would be posted on the instructor's website before January 26.

Examinations

Exam dates are firm. No makeup exam shall be given.

Midterm 1: Feb 16, Friday

Midterm 2: Mar 21, Wednesday

Final (cumulative): May 7, Monday at 10:30 A.M.

Grading Policy

The course grade will base on performances in two midterm tests, one paper presentation, assignments, and the cumulative final exam:

Midterm 1	20%
Midterm 2	20%
Paper presentation	20%
Assignments (best 10 of 14 assignments)	10%
Cumulative Final Exam	30%

Among the first three in the above list – two midterms and one paper presentation – if you miss one, the remaining two shall count 25% each and the final exam shall count 40% of course grade.

Course Outline and Tentative Schedule

1. ECONOMICS APPROACH TO USE OF RESOURCES AND INTER-TEMPORAL DECISIONS AND RELATED CONCEPTS - Jan 17, 19, 22

Introduction to course, syllabus, and grading policy

Resource Taxonomy – Resource Flows, Natural Resources (Renewable and Non-renewable), Environmental Resources, Reasons of Studying Natural Resource

Economics – involves inter-temporal decisions, pervasive market failure, potential irreversible consequences, and multidisciplinary knowledge

Broad Issues – Efficient utilization, Sustainability, Resource Scarcity and Economic Growth, Economics Approach of weighing benefits and costs and the problem of interpersonal comparison

Assignment #1 due on Jan 22 (write a summary of the following reading):

The Cost of Fur (news piece published in the Economist of March 1, 2001)

Rate of time preference, concept of discounting, inter-temporal optimal allocation rule (two-vertical-axes graphical model), marginal user cost and scarcity rent

2. HOTELLING MODEL OF OPTIMAL RATE OF DEPLETION OF NONRENEWABLE RESOURCES – Jan 24, 26, 29, 31, Feb 2, 5

Reserve Taxonomy – Current Reserves, Potential Reserves, and Total Resource Endowment; Two Markets – Asset Market and Flow Market

Two-Period Hotelling Model – Mathematical Derivation, Graphical Explanations, Equilibrium Conditions, Interpretations

Assignment #2 due Feb 2: Mathematically derive and interpret the equilibrium conditions of Hotelling model

Best Reserve First Principle, Time Path of efficient prices and scarcity rent under Zero MEC, Constant MEC, Increasing MEC, Impacts of changes in discount rate, Price of substitute, Stock, MEC, and Demand, Extraction under Monopoly, Negative externality, Effect of Price Ceiling, Effect of Recycling

Assignment #3 due Feb 5: Choose any one case of a change in parameter or market failure discussed in the following reading and describe with the help of a graph the effect on time path of price:

The Economics of Resources or the Resources of Economics, by Robert Solow (from American Economic Review, vol. 64, no.2, May 1974, pp. 1-14; or from Economics of the Environment, Selected Readings, 3rd edition, edited by R.

Dorfman and N. Dorfman, W.W. Norton & Company, New York, 1993, pp.162-178)

3. GROUND WATER, SURFACE WATER ALLOCATION AND BENEFIT-COST ANALYSIS – Feb 7, 9, 12, 14
Safe Yield Use Principle of maintaining water table in aquifers, optimal rate of depletion of aquifers
Equi-marginal principle of allocating surface water – mathematical derivation and graphical model, scarcity rent of water, marginal user cost, and marginal cost pricing of water
Assignment #4 due Feb 14: Mathematically derive the equi-marginal principle and interpret
Benefit-cost analysis of water development projects – B/C ratio, NPV, IRR, Payback Period, incremental analysis for mutually exclusive projects

MIDTERM 1: FEB 16, FRIDAY

4. TIMBER HARVESTING MODEL – Feb 19, 21, 23, 26
Growth characteristics of timber, stumpage value, the MAI rule of harvesting
Net present value from timber harvesting, Single Crop Optimal Harvesting Period – mathematical derivation, graphical representation, and interpretation
Optimum Rotation Model, Site Expectational Value, Addition of non-timber values
Assignment #5 due Feb 28: Mathematically derive and interpret the single crop timber harvesting rule and discuss the change in the rule when infinite rotation is allowed.
5. FISHERY SUSTAINABLE YIELD MODEL – Feb 28, Mar 2, 5, 7
Fishery growth characteristics, Minimum threshold stock, Maximum sustainable stock, Physical relationship between stock and yield, Concept of Maximum Sustainable Yield (MSY)
Economic model (graphical presentation) – assumptions, fishing effort, relationship between fishing effort and sustainable yield, Revenue and Cost graph, Optimum sustainable stock and yield, interpretations
Assignment #6 due Mar 9: Clearly draw the graphical model, label the axes, show the optimum sustainable harvesting point, and interpret the optimal point.
6. USE VERSUS NON-USE VALUES OF RESOURCES AND MEASUREMENT TECHNIQUES – Mar 9, 12, 14, 16, 19
Reasons for Higher Value of Resources in Future: Asymmetry of Technological Progress and Inability of technology to reproduce unique resources (supply side reason) and Changing Preferences in Favor of Natural Resources – learning by doing (demand side reason)
**Assignment #7 due Mar 12: Write a summary of the following reading:
Economic Assessment of Biodiversity and Protected Species, from
Environmental Economics, Theory, Application, and Policy, by Duane
Chapman, Addison Wesley Longman, 2000, pp. 273-281**

Basis for Option, Discovery and Existence Values: Uncertainty, Lack of Information and Possible Irreversible Consequences (Measures of Caution), Non-human value – the difference between economic value and environmental value

Short introduction to techniques of estimating values – hedonic price method, travel cost method, contingent valuation method

MIDTERM 2: MARCH 21, WEDNESDAY

7. DISCUSSION ON ENERGY RESOURCES – Mar 23, Apr 2, 4
Trend of oil prices, reasons, and inferences
Presentations by students writing on energy resources
Assignment #8 due Mar 23: Write a summary of the following reading
Energy Resources - Cornucopia or Empty Barrel? by Peter McCabe, the American Association of Petroleum Geologists, 1998
Warehouse concept of reserves, Resource Pyramid, Closed model and Open model, Theoretical production and price trends
8. DISCUSSION ON COLORADO RIVER COMPACT, WATER RIGHTS MARKET, AND MUNICIPAL WATER SCARCITY – Apr 6, 9, 11
Presentations by students writing on water issues
Assignment #9 due Apr 6: write a summary of the following readings
Economic Analysis of Groundwater Use in Douglas County, by Paul Flack, 2005
Average cost pricing vs. marginal cost pricing, Practice of tap fees, Price vs. watering restrictions for conservation of water
Colorado River Compact and Water Rights Market
9. DISCUSSION ON FORESTRY RESOURCES – Apr 13, 16, 18
Presentations by students writing on forest management and forestry issues
Assignment #10 due April 13: write a summary of the following reading
Free Market Forestry, by Mark Muro, from the Denver Rocky Mountain News, Sunday, June 1, 1997, pp. 1B
Forestry issues: roadless and wilderness v. roaded, protection against wildfire and invasive species, timber management v. multiple use management, below-cost timber sales, allowing participation of environmental activist organizations in bidding for clear-cutting of forests
10. DISCUSSION ON PROBLEMS OF OPEN ACCESS – Apr 20, 23, 25
Presentations by students writing on open access resources
Assignment #11 due April 20: write a summary of the following reading
Individual Fishing Quotas, by Lauren Fluken, 2005
Coase theorem, applicability, issues with privatization, alternative ways of resolving open access problem
Assignment #12 due April 23: write a summary of the following reading

Economic Incentives and Poaching of the One-Horned Indian Rhinoceros in Nepal, from the Poverty Reduction and Environmental Management No. 1, Jan 2005

11. POPULATION, ENVIRONMENT, TRENDS OF RESOURCE SCARCITY, AND SUSTAINABILITY – April 27, 30, May 2, 4

Neo-Malthusian Perspective on Population, Economic model of family size, Modern theory of demographic transition, Mutual relationship between economic growth and population growth, Impact of population growth on environment – downward spiral hypothesis, induced innovation hypothesis, Ecological perspectives and Ecological Economics

Assignment #13 due May 2: write a summary of the following reading

Sustainability - An Economist's Perspective, by Robert Solow, from Economics of the Environment, Selected Readings, 3rd edition, edited by R. Dorfman and N. Dorfman, W.W. Norton & company, 1993, pp. 179-187

John Rawl's sustainability principle of nondeclining welfare, Solow-Hartwick sustainability rule of nondeclining capital, Issue of Substitutability of Natural Capital with Manmade Capital, Weak Measure of Sustainable Development, Strong Measure of Sustainable Development, Empirical Findings on Sustainable Development in Selected Countries, Safe Minimum Standard of Use (SMS), Daly's Steady-State Principles

Assignment #14 due May 4: write a summary of the following reading

Trend of Natural Resource Commodity Prices, by Margaret Slade, from Journal of Environmental Economics and Management

Trends of Economic Scarcity – Price, marginal extraction cost, and rent, Factors Mitigating Scarcity, Recent findings in the literature

FINAL EXAM (CUMULATIVE): MAY 7 MONDAY AT 10:30 A.M.

Accommodations for Students with Documented Disability

If you qualify for accommodations because of a disability, please submit a letter to me from Disability Services in a timely manner so that your needs may be addressed. Disability Services determines accommodations based on documented disabilities. Contact 303-492-8671, Willard 322, or www.Colorado.EDU/disabilityservices.

Absences due to Religious Observances

Campus policy regarding religious observances requires that faculty make every effort to reasonably and fairly deal with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. If you have any such conflict, please inform the instructor at least two weeks in advance to make a reasonable arrangement or adjustment according to the University policy, which can be seen at http://www.colorado.edu/policies/fac_relig.html.

Classroom Behavior Policy

Students and faculty each have responsibility for maintaining an appropriate learning environment. Students who fail to adhere to behavioral standards may be subject to

discipline. Faculty have the professional responsibility to treat students with understanding, dignity and respect, to guide classroom discussion and to set reasonable limits on the manner in which students express opinions. See policies at <http://www.colorado.edu/policies/classbehavior.html> and at http://www.colorado.edu/studentaffairs/judicialaffairs/code.html#student_code.

Honor Code

All students of the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. All incidents of academic misconduct shall be reported to the Honor Code Council (honor@colorado.edu; 303-725-2273). Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion). Additional information on the Honor Code can be found at <http://www.colorado.edu/policies/honor.html> and at <http://www.colorado.edu/academic/honorcode>.