

Economics 435
Natural Resource Economics
Autumn 2015
Professor Robert Halvorsen

This course is a survey of the economics of natural resources. Topics covered include renewable resources, such as fish and trees, nonrenewable resources, such as oil and copper, environmental resources, such as clean air and water, and ecological resources, such as biodiversity. A principal theme in analyzing these topics is the determination of the optimal trade-offs between the benefits and costs of resource use, with special emphasis on trade-offs between current and future resource use and sustainability. The role of property rights in determining the optimality of market decisions concerning resource use is also stressed.

By the end of the course students should understand how to determine the optimal rate of utilization for different types of natural resources; the circumstances under which a free market system will and will not result in optimal outcomes with respect to the utilization of resources; and the lessons economics provides on how to design the best public policies to obtain the desired results.

The prerequisite for this course is ECON 300 and the class discussions will assume that students have a solid understanding of intermediate level microeconomics. There will be two exams and eight required problem sets. The exams will count for 85% of the grade and the problem sets will count for 15%. The exam grade will be a weighted average of the numeric grades assigned to the individual exams, with the exam on which you do better receiving a weight of .6 and the exam on which you do worse receiving a weight of .4. Please refer to the next page for further, very important, information concerning the rules for taking the exams and policies with respect to academic honesty.

There is no textbook for this course. Lecture notes are posted on the course webpage, which can be accessed through MyUW. Practice exams, problem sets, answers to problem sets, and other handouts will also be posted there.

If you have any questions at any point during the course, my office hours during the Autumn Quarter are 2:00 to 3:00 on Monday and Friday and 10:00 to 11:00 on Tuesday in Savery 351. An appointment to meet at another mutually convenient time can be made in person after class, by phone at 543-5546, or by email at halvor@uw.edu. Email may also be used to ask any short questions that may arise as you review your notes or work on the problem sets.

Exam Rules

I Exam Absence Policy

1. If you are unable to make it to an exam period due to illness or another unexpected happening, do the following:
 - i. Notify me no later than the time of the exam that you are not able to take the exam and why.
 - ii. If you missed the exam for health reasons, you need to show me a note issued by a medical professional documenting the reason you missed the exam.
 - iii. If there was some other reason for missing the exam come and see me to explain the reason. You will need to show appropriate documentation. Not waking up or missing your bus/plane is not an acceptable excuse.
2. If you know that you are going to be away due to a University-related activity, such as participation in an away sport or debate, let me know well in advance so that arrangements can be made.

II Exam Taking Rules

1. Material allowed during an exam.
 - i. You must use a large bluebook for your answers.
 - ii. All books, papers, notebooks, etc., must be placed inside your backpack or other type of bag, which must be securely and fully closed. If you do not have a bag, you must place all your material out of your reach.
 - iii. No electronic devices can be accessible during the exam. Cellular phones must be turned off before entering the class and placed in your closed bag (not in your pocket). You are not allowed to use a cellular phone during an exam. Doing so will result in the termination of your exam time.
 - iv. Baseball caps and any other kinds of headgear that conceal your eyes are not permitted.
2. Attendance and special accommodation
 - i. You are not allowed to leave the room during the exam. This includes restroom use; be sure to use the restroom before the beginning of the exam.
 - ii. If you arrive late to an exam, you cannot expect to get extra time after the official end of the exam to make up for the missing time at the beginning.
 - iii. If you have a documented disability, please show me documentation from the Office of Disability Resources for Students on the first day of class, so that I can make any arrangements required for accommodations.

III Academic Integrity

1. Exams are individual work and cheating will not be tolerated. Looking at notes or your neighbors' answers will result in the immediate termination of your exam time and a grade of zero for the exam.
2. Altering an exam before submitting it for a review of the grading, obtaining an advance copy of an examination, or arranging for a surrogate test-taker are all flagrant violations of University policy.
3. Cheating of any kind may result in expulsion from the University. The Department will follow University policy in case of academic misconduct. I strongly recommend that you review University policy at <http://www.washington.edu/uaa/advising/help/academicintegrity.php>. Students found to have engaged in academic dishonesty will be subject to sanctions, which range from a disciplinary warning to permanent expulsion from the University, depending on the seriousness of the misconduct.

Lecture Schedule

Dates shown for lectures and the mid-term exam are subject to revision.

Lecture 1: October 1st

Introduction

Syllabus

Preview of some new results

Economic efficiency and equity

Definitions of:

Economic Efficiency

Equity

Efficiency in distribution

Consumer sovereignty

Private markets and efficiency

Definition of perfect competition

Lecture 2: October 6th

Sources of Market and Government Failure

Market failures

Potential compensation criterion

Government failures

Dynamic efficiency

Preferences

Opportunity Costs

Condition for Dynamic Efficiency

Lecture 3: October 8th

Capital markets and dynamic efficiency

Present Value Analysis

Present value of consumption

Net present value

Accounting for inflation

Numerical example

Future value

Continuous time formulas

Lecture 4: October 13th

Non-renewable Resources

Condition for Efficient Extraction

Demonstrations of condition's correctness

Proof by contradiction

Arbitrage interpretation

Calculus proof

Diagrammatic proof

Derivation of marginal net benefit for:

Society

Perfectly competitive firm
Monopoly
Review with solved problem

Lecture 5: October 15th

Effect of constant extraction cost
Monopoly
 Zero extraction cost
 Constant elasticity
 Non-constant elasticity
 Constant extraction cost
 Constant elasticity
Effects of taxes
 Tax per Unit
 Constant
 Non-constant
 High-grading

Lecture 6: October 20th

Gross revenue tax
Profit tax
Summary
Effects of subsidies
Effects of externalities
 Definition
 Constant externality cost
 Non-constant externality cost
Limitation on future price
 Future price control
 Backstop technology
 Green Paradox
Rate of discount
Threat of expropriation

Lecture 7: October 22th

Forestry Economics

Renewable vs. nonrenewable resource
Growth function
Derivation of optimal harvesting age: No replanting
 Calculus
 Algebra
 Graph
Comparative statics analysis
 Level of interest rate
 Level of stumpage price
 Trend in stumpage price
Standing value
Value of land in alternative use

Lecture 8: October 27th

- Harvesting with replanting
 - Balanced forest
 - Maximum sustainable yield rule
 - Faustmann rule
 - Standing value
- Sources of inefficiency
- Recycling and the stock of trees
- Deforestation

FIRST EXAM COVERS LECTURES 1 THROUGH 8 (Tentative date is November 10th)

Lecture 9: October 29th

Economics of the Environment

- Externalities
- Pollution diagram
- Coase theorem
 - Efficiency
 - Equity
 - Uniqueness
 - Policy relevance

Lecture 10: November 3rd

- Policy instruments when know MB and MD curves
 - Pigouvian tax
 - Regulation
- Policy instruments when have almost no information on MB and MD
 - Target vs. efficient level of pollution
 - Per unit tax vs. regulation
 - Attaining the target level
 - Minimizing total cost
 - Tradable pollution permits

Lecture 11: November 12th

Economics of Fisheries

- Property rights
- Fish Biology
- Sustainable yield as a function of stock
- Dynamic analysis of optimal stock and harvest
- Optimal vs. market outcomes

Lecture 12: November 17th

- Sustainable yield as a function of effort
- Total revenue and total expenditure
- Efficient vs. open-access level of effort
- Perverse open-access results

- Fishery has no net benefit
- Environmental improvement has no net benefit
- Technological progress is not good
- Backward-bending supply curve
- Qualifications to result that net benefit equals zero
 - Short-run vs. long-run
 - Non-constant prices

Lecture 13: November 19th

- Goals of public policy
- Effort function
- Command and control instruments
 - Direct control of technology
 - Direct control of effort
 - Direct control of fishing areas
 - Direct control of harvest
- Economic incentives
 - Per unit tax on harvest
 - Individual transferable quotas

Lecture 14: November 24th

Sustainability

- Definition and desirability
- Feasibility
 - Total capital stock
 - Substitution
 - Technology
 - Recycling
- Prospects

Lecture 15: December 1st

Ecological Resources

- Oikos
- Biodiversity
 - Quantification
 - Valuation
- Preservation of species
- US Endangered Species Act
- CITES

SECOND EXAM COVERS LECTURES 9 THROUGH 15 (Thursday, December 10)