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 80% of the grade and the problem sets will count for 20%. 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 Spring Quarter are 10:00 to 11:00 on Monday and Thursday and 2:00 to 3:00 on Friday 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: March 30th

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: April 1st

Sources of Market and Government Failure
- Market failures
- Potential compensation criterion
- Government failures

Dynamic efficiency
- Preferences
- Opportunity Costs
- Condition for Dynamic Efficiency

Lecture 3: April 6th

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: April 8th

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: April 13\textsuperscript{th}

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: April 15\textsuperscript{th}

  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: April 20\textsuperscript{th}

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: April 22\textsuperscript{nd}

- 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 May 6\textsuperscript{th})

Lecture 9: April 27\textsuperscript{th}

Economics of the Environment
- Externalities
- Pollution diagram
- Coase theorem
- Policy instruments when know MB and MD curves
  - Pigouvian tax
  - Regulation

Lecture 10: April 29\textsuperscript{th}

- 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: May 11\textsuperscript{th}

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: May 13\textsuperscript{th}

- 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: May 18th
  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: May 20th
  Sustainability
    Definition and desirability
    Feasibility
      Total capital stock
      Substitution
      Technology
      Recycling
    Prospects

Lecture 15: May 27th
  Ecological Resources
    Oikos
    Biodiversity
      Quantification
      Valuation
    Preservation of species
    US Endangered Species Act
    CITES

SECOND EXAM COVERS LECTURES 9 THROUGH 15 (Wednesday, June 3rd)