

Economics 475 (L01) (Economics of Natural Resources)

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Lecture Location: PF 110
Lecture Days/Time: TR 14:00 - 15:15

Office: ZOOM Delivery
<https://ucalgary.zoom.us/j/98708596532?pwd=TDRNdjJZLzA1QlhuSzAvc0puVGVFdz09>
Office Hours: R 15:30 – 16:30
Winter 2023

Course Description:

Class will provide the lens through which to view scarcity of natural resources. Class will model the optimal allocation of environmental resources over time using dynamic optimization techniques in discrete and continuous time. We will examine applications in non-renewable and renewable resources, conservation, and natural disasters, examining both seminal and recent papers in the field.

Course Learning Outcomes:

Students who successfully complete this course will understand and appreciate the history, rationale, and functioning of natural resource markets. This involves having some familiarity with the regulation and institutions in a number of sectors.

Understand and appreciate key principles, theories and ideas in natural resource economics literature including:

- The importance of property rights and the economic problem of the commons.
- Understanding the effect of market power upon natural resource use.
- Understanding the sources of economic growth and the implications that natural resources have upon economic growth.
- Understanding the effects of regulations in situations involving common property, market power, and combinations thereof.
- Understanding how to think about economic dynamics and steady-state analysis in bioeconomic systems.
- Be able to apply the key principles in the natural resource literature to analyse, critique, and craft regulatory institutions, processes, and policies.
- Assess the strengths and weaknesses of different regulatory policies
- Assess the strengths and weaknesses of different regulatory institutions

Tentative Course Outline (all readings available on Leganto through D2L):**Week 1: Intro to tools**

- Optimization without constraints
- Optimization with constraints
- Discounting
- Dynamic models
- Hamiltonian

References:

Grafton RQ, Nelson H, Renzetti S, Dupont D, Hill RJ, Adamowicz W, eds. Models, Systems, and Dynamics. In: *The Economics of the Environment and Natural Resources*. Blackwell Publishing Ltd; 2004:7-35. doi:10.1002/9780470755464.ch2 (Pages 29-33 on Optimal Control)

On Lagrangians and Hamiltonians, Lori Benneer's lecture notes:

https://people.duke.edu/~lds5/Teaching_files/dynamic_problems.pdf

Week 2: Non-renewable resources: theory

- Two period model of non-renewable extraction
- Multiperiod model
- Hotelling rule

References:

Perman R, Perman R, eds. *Natural Resource and Environmental Economics*. 4th ed. Pearson Addison Wesley; 2011. (Chapter 15)

Week 3: Textbook extensions of non-renewable resources theory

- Extraction in a competitive market
- Extraction in a monopolistic market
- Change in discount rate
- Change in size of resource stock
- Change in demand
- Change in backstop technology

References:

Perman R, Perman R, eds. *Natural Resource and Environmental Economics*. 4th ed. Pearson Addison Wesley; 2011. (Chapter 15)

Week 4: Property rights in resource extraction

- Property rights
- Rule of capture

References:

LUECK D. The Rule of First Possession and the Design of the Law. *The Journal of law & economics*. 1995;38(2):393-436. doi:10.1086/467337

Dasgupta PS, Heal GM. TAXATION OF EXHAUSTIBLE RESOURCES. In: *Economic Theory and Exhaustible*

Resources. ; 1980:361-376. doi:10.1017/CBO9780511628375.013 (Section 8 of chapter 12)

Week 5-6: Empirical applications in non-renewable resources

- Taxation
- Application of Hotelling
- Misallocation in production
- Resource curse

References:

Rao N L. Taxes and US Oil Production: Evidence from California and the Windfall Profit Tax. *American economic journal Economic policy*. 2018;10(4):268-301. doi:10.1257/pol.20140483

Anderson ST, Kellogg R, Salant SW. Hotelling under Pressure. *The Journal of political economy*. 2018;126(3):984-1026. doi:10.1086/697203

Asker J, Collard-Wexler A, De Loecker J. (Mis)Allocation, Market Power, and Global Oil Extraction. *The American economic review*. 2019;109(4):1568-1615. doi:10.1257/aer.20171438

Caselli F, Michaels G. Do Oil Windfalls Improve Living Standards? Evidence from Brazil. *American economic journal Applied economics*. 2013;5(1):208-238. doi:10.1257/app.5.1.208

Week 7: Reading week

Week 8: Non-renewable resources and conservation

- Models of renewable resources (e.g., timber, fisheries)
- History of thought of natural resources
- Models of conservation

References:

Keohane NO, Olmstead SM. *Markets and the Environment*. Island Press; 2007.

Krutilla JV. Conservation Reconsidered. *The American economic review*. 1967;57(4):777-786.

Barbier EB. The Evolution of Economic Views on Natural Resource Scarcity. *Review of environmental economics and policy*. 2021;15(1):24-44. doi:10.1086/712926

Banzhaf HS. THE ENVIRONMENTAL TURN IN NATURAL RESOURCE ECONOMICS: JOHN KRUTILLA AND "CONSERVATION RECONSIDERED." *Journal of the History of Economic Thought*. 2019;41(1):27-46. doi:10.1017/S1053837218000305

Week 9: Midterm (March 7)

Week 9-10: Applications in conservation

- Endangered species protection
- Wetland protection
- Albertan coal mining

References:

Metrick A (Harvard U., Weitzman M. Patterns of behavior in endangered species preservation. *Land economics*. 1996;72(1):1-16. doi:10.2307/3147153

Taylor CA, Druckenmiller H. Wetlands, Flooding, and the Clean Water Act. *The American economic review*. 2022;112(4):1334-1363. doi:10.1257/aer.20210497

A MULTIPLE ACCOUNT BENEFIT-COST ANALYSIS OF COAL MINING IN ALBERTA. *The School of Public Policy Publications*. 2021;14(1). doi:10.11575/sppp.v14i1.73574

Week 11: R Tutorial**Week 12-13: Natural disasters: forest fire causes and implications**

- Causes of forest fires and losses associated with fires
- Implications of forest fires: fiscal, health
- Management of forest fires
- Insuring for natural disasters

References:

Liao Y (Penny), Kousky C. The Fiscal Impacts of Wildfires on California Municipalities. *Journal of the Association of Environmental and Resource Economists*. 2022;9(3):455-493. doi:10.1086/717492

Miller N. Blowing smoke: Health impacts of wildfire plume dynamics.
<https://ashecon.confex.com/ashecon/2019/webprogram/Paper7800.html>

Boomhower J, Baylis P. Mandated vs. Voluntary Adaptation to Natural Disasters: The Case of U.S. Wildfires. Published online 2021. doi:10.3386/w29621

Burke M, Driscoll A, Heft-Neal S, Xue J, Burney J, Wara M. The changing risk and burden of wildfire in the United States. *Proceedings of the National Academy of Sciences - PNAS*. 2021;118(2). doi:10.1073/PNAS.2011048118

Wibbenmeyer M. Wildfires in the United States 101: Context and Consequences.
<https://www.rff.org/publications/explainers/wildfires-in-the-united-states-101-context-and-consequences/>

Boomhower J, Baylis P. Moral Hazard, Wildfires, and the Economic Incidence of Natural Disasters. Published online 2019. doi:10.3386/w26550

Katherine R. H. Wagner. Designing insurance for climate change. *Nature Climate Change*. <https://www-nature-com.ezproxy.lib.ucalgary.ca/articles/s41558-022-01514-2>

Week 14: Last class review**Prerequisites/corequisites:**

Economics 357 and 359.

Required Textbook(s):

All readings posted on D2L's Leganto

Recommended Textbook(s):

Natural resource and environmental economics (physical copy on reserve at the library)

The economics of natural resource use (physical copy on reserve at the library)

Keohane and Olmstead, Markets and the Environment (Available online at the [library](#))

Books on Reserve:

The list of reserve titles, if any, is posted at the course D2L site.

Desire2Learn:

This course will make use of the Desire2Learn (D2L) platform. Students who are registered in the course can log on at <http://d2l.ucalgary.ca> through their student centre. Please note that D2L features a class e-mail list that may be used to distribute course-related information. These e-mails go to your University of Calgary e-mail addresses only.

Grade Determination:

MIDTERM EXAM (March 7)	30%
ASSIGNMENTS	20%
GROUP PRESENTATION	5%
FINAL EXAMINATION	45%

Examination Details:

Tests and exams will not involve multiple choice questions.

Programmable calculators, cellphones, textbooks, course notes, and other electronic devices will not be allowed during the writing of tests or final examinations. Students are reminded that simply being able to access their cellphone during an exam is academic misconduct.

The midterm will be held in class on March 7.

Grading Policies:

The official grading system will be used. See <http://www.ucalgary.ca/pubs/calendar/current/f-1-1.html>.

Students must receive a passing grade on the final exam to pass the course. Students committing academic misconduct during the final exam will not receive a passing grade for the course.

If a student's letter grade on the final exam exceeds their midterm(s) letter grade, the weight of the midterm(s) is (are) transferred to the final exam. The student must have written the midterm(s) or provided supporting documentation for the absence(s). For Winter 2023 the University has suspended the requirement for supporting documentation. Instructors cannot currently ask students for documentation to support absences.

As per the Writing Across the Curriculum Statement in the Calendar, writing and grading thereof will be a factor in the evaluation of student work. [See https://www.ucalgary.ca/pubs/calendar/current/e-2.html](https://www.ucalgary.ca/pubs/calendar/current/e-2.html).

Any student work which remains undistributed after the last day of classes will be available to students through the instructor's office during the instructor's office hours.

The final examination will be comprehensive, scheduled by the Registrar, held in a classroom, and last 2 hours. If a student cannot write their final exam on the date assigned by the Registrar's Office, they need to apply for a deferred exam <https://www.ucalgary.ca/pubs/calendar/current/g-6.html>. Under no circumstance will this be accommodated by the Department.

THERE WILL BE NO MAKEUP OR DEFERRED QUIZZES/TESTS/EXAMS under any circumstances, nor may the quizzes/tests/exams be written early. Students unable to write the quizzes/tests/exams because of documented illness, family emergency, religious observance, or university-sanctioned event will have the weight shifted to the final examination; otherwise a grade of zero will be assigned.

Reappraisal of Grades:

For Reappraisal of Graded Term Work, see Calendar I.2

<http://www.ucalgary.ca/pubs/calendar/current/i-2.html>

For Reappraisal of Final Grade, see Calendar I.3

<http://www.ucalgary.ca/pubs/calendar/current/i-3.html>

Academic Misconduct and Intellectual Honesty:

Academic Misconduct refers to student behavior that compromises proper assessment of students' academic activities and includes: cheating; fabrication; falsification; plagiarism; unauthorized assistance; failure to comply with an instructor's expectations regarding conduct required of students completing academic assessments in their courses; and failure to comply with exam regulations applied by the Registrar.

Statement of Intellectual Honesty, see Calendar K.4

<https://www.ucalgary.ca/pubs/calendar/current/k-3.html>

Plagiarism and Other Academic Misconduct

<https://ucalgary.ca/student-services/student-success/learning/academic-integrity>

Academic Accommodations:

Students seeking an accommodation based on disability or medical concerns should contact Student Accessibility Services. SAS will process the request and issue letters of accommodation to instructors. Students who require an accommodation in relation to their coursework based on a protected ground other than disability should communicate this need in writing to their Instructor. The full policies on Student Accommodations are available at <https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Accommodation-for-Students-with-Disabilities-Procedure.pdf> and <https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Student-Accommodation-Policy.pdf>.

Freedom of Information and Protection of Privacy (FOIP) Act:

Personal information is collected in accordance with FOIP. Assignments can only be returned to the student and will be accessible only to authorized faculty and staff. For more information, see <https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/faq-privacy-faculty-members.pdf> and <https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/faq-privacy-students.pdf>

Internet and Electronic Communication Device information:

The use of cell phones for any purpose in class is prohibited. Computers and tablets may be used for note taking only unless otherwise authorized by the instructor.

Copyright Legislation:

See the University of Calgary policy on Acceptable Use of Material Protected by Copyright at <https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Acceptable-Use-of-Material-Protected-by-Copyright-Policy.pdf>. Students who use material protected by copyright in violation of this policy may be disciplined under the Non-Academic Misconduct Policy.

Recording of Lectures:

Recording of lectures is prohibited, except for audio recordings authorized as an accommodation by SAS or an audio recording for individual private study and only with the written permission of the instructor. Any unauthorized electronic or mechanical recording of lectures, their transcription, copying, or distribution, constitutes academic misconduct. See <https://www.ucalgary.ca/pubs/calendar/current/e-6.html>.

Instructor Intellectual Property:

Course materials created by instructors (including presentations and posted notes, labs, case studies, assignments and exams) remain the intellectual property of the instructor. These materials may NOT be reproduced, redistributed, or copied without the explicit consent of the instructor. The posting of course materials to third party websites such as note-sharing sites without permission is prohibited. Sharing of extracts of these course materials with other students enrolled in the course at the same time may be allowed under fair dealing.

Important Dates:

Please check: <http://www.ucalgary.ca/pubs/calendar/current/academic-schedule.html>.

Student Organizations:

Faculty of Arts Students' Association (F.A.S.A.):

Economics Department Representative

Office: SS 803, E-mail: econrep@fasaucalgary.ca and Web: www.fasaucalgary.ca.

Society of Undergraduates in Economics:

<https://www.ucalgarysue.com/>.

Society of Undergraduates in Economics is a student run organization whose main purpose is to assist undergraduate economics students to succeed both academically and socially at the University of Calgary. Services include access to the exam bank, career events such as Industry Night and information sessions, mentorship programs, and social events for members. They invite you to join by contacting SUE at sue@ucalgarysue.com.

Faculty of Arts Program Advising and Student Information Resources:

- Have a question, but not sure where to start? The Arts Students' Centre is your information resource for everything in Arts! Drop in at SS102, call them at 403-220-3580, or email them at artsads@ucalgary.ca. You can also visit the Faculty of Arts website at <http://arts.ucalgary.ca/undergraduate> which has detailed information on common academic concerns, including program planning and advice.
- For registration (add/drop/swap), paying fees and assistance with your Student Centre, contact Enrolment Services at 403-210-ROCK [7625] or visit them in the MacKimmie Library Block.

Student Support and Resources:

- See <https://www.ucalgary.ca/registrar/registration/course-outlines> for information on campus mental health resources, the Student Ombuds' Office, Student Success Centre, Safewalk, and Emergency Evacuation and Assembly.
- Online writing resources are available at <https://ucalgary.ca/student-services/student-success/writing-support>.

Notes:

1. Students are responsible for all assigned material, e.g., supplementary material posted on D2L, regardless of whether or not the material was covered in class.

LM

2022-12-08