



Faculty of Science: Department of Economics
Course Syllabus
ECON3332.03: Natural Resource Economics
Fall, 2026

Dalhousie University operates in the unceded territories of the Mi'kmaw, Wolastoqey, and Peskotomuhkati Peoples. These sovereign nations hold inherent rights as the original peoples of these lands, and we each carry collective obligations under the Peace and Friendship Treaties. Section 35 of the Constitution Act, 1982, recognizes and affirms Aboriginal and Treaty rights in Canada. We recognize that African Nova Scotians are a distinct people whose histories, legacies, and contributions have enriched the part of Mi'kma'ki known as Nova Scotia for over 400 years.

Instructor: Ruth Forsdyke, Ruth.Forsdyke@Dal.ca, room C12, Maxwell House

Lectures: Tues, Thurs. 4:05 pm- 5:25, LSC Common Area, rm C332

Office Hours (Professor): In Person (Room C12, Econ. Department): Friday, 10:30 am - 12:20 pm or email for an appointment in person or via teams

TA: uncertain, **TA Office hours:** TBA if available

Course Delivery: In person, lectures not recorded.

If you need help but are unable to attend these office hours, please email Ruth to set up an appointment.

Course Description:

CREDIT HOURS: 3

This course focuses on intertemporal economics and the economics of market failure as they pertain to the use of natural resources. A selection of resource sectors will also be discussed. Fisheries, agriculture, forestry, and energy represent possibilities, but this will vary from year to year.

NOTES: Approved with Canadian Studies. All Economics courses, unless stated otherwise, have a minimum grade requirement of C for their prerequisite courses.

FORMAT: Lecture

Course Prerequisites and Exclusions:

PREREQUISITES: ECON 2200.03 (or ECON 2210.03 or ECON 2220.03), MATH 1000.03 or equivalent with minimum grades of C

"... fishing at the current scale is enabled by large government subsidies, without which as much as 54% of the present high-seas fishing grounds would be unprofitable at current fishing rates ... these results support recent calls for subsidy and fishery management reforms on the high seas." Enric Sala et al. (2018)

Course Materials:

- no required textbook

Readings, videos, and other media are **posted on Brightspace** under content, discussions, announcements, and assessment. A reading list is shown with each topic in the chart in the "Content" section below.

*The most suitable textbook, **Hartwick and Olewiler**, 1998, (H&O) is out of print but is on reserve along with other Natural Resource Books.*

Hartwick, John M. and Nancy D. Olewiler (1998) *The Economics of Natural Resource Use* (Addison-Wesley, 1998, 2nd edn.)

The following e-book is available via the Killam Library at the Link Below:

Aruga, Kentaka (2022) *Environmental and Natural Resource Economics*, Springer, Switzerland.

<https://link-springer-com.ezproxy.library.dal.ca/book/10.1007/978-3-030-95077-4>

- Online material for the course is available in Brightspace under “**content**”, “**discussions**”, “**announcements**”, and “**Assessments**”.
- lecture slides are posted after the class. All material in slides may not be covered in the class -- you are expected to work through the slides and relate this to the material covered in in person lectures.
- Please be responsible for checking “**Announcements**” regularly to be sure not to miss important information.

Course Objectives/Learning Outcomes:

1. Understand reasons for depletion of both non-renewable and renewable resources.
2. Understand the importance of sustainability of natural resources and management for sustainability.
3. Understand and be able to apply a variety of models to explain resource depletion for both renewable and non-renewable resources and use the model to investigate policy solutions.
4. Understand ethical and moral dimensions of natural resource use including criteria to judge policy alternatives, while considering the concept of "justice".
5. Understand the logic of discounting and how to apply it to natural resource problems.
6. Explain the difference between the interest rate and the social discount rate.
7. Explain how different moral positions affect social discount rate choices and how this may affect beliefs and opinions on rates of extraction of natural resource use.
8. Practice problem solving skills by applying economics in the context of natural resource economics
9. Learn how to find scientifically valid information on resource economics
10. Learn and practice critical thinking, writing, and communicating.
11. Understand the seriousness and urgency of making human resource use sustainable and what you can do to help.
12. Get experience working in groups and oral communication skills via the poster session.

Course Assessment:

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

A+ (90-100)	B+ (77-79)	C+ (65-69)	D	(50-54)
A (85-89)	B (73-76)	C (60-64)	F	(<50)
A- (80-84)	B- (70-72)	C- (55-59)		

Component	Marks	Date, Details
Midterm	20	Thurs, Oct. 22nd, in person on paper in class
Final Exam	40	in person on paper, scheduled by Registrar
Assignments	12	best 2 out of 3 (2 before midterm and 1 after midterm)
Group Poster Presentation	4	Proposal, 1 - 1.5 pages including references, 12 font (Nov 5th), & meeting with professor to discuss prior to this date.
	12	Present poster during poster session. submit poster (Nov. 24th or 26th after your poster presentation)
	4	Attendance at Poster Session (Nov. 24th and 26th) Reflect on and Evaluate other posters, other group members, and self, submit to Brightspace (Nov. 27th)
Participation	8	Participation, Engagement, Attendance

Details on Course Work and Assessment

Assignments:

- these are individual assignments to be submitted via Brightspace "assessments" >> "assignments"

They ***must be written in your own words*** in handwriting with hand drawn graphs. Please do these yourself using your own brain requiring you to think, put ideas together in a logical manner in writing, learn to plot and interpret graphs, and solve the problem. Otherwise, you are missing out on practicing critically thinking so as to truly understand this important material. Try your best to solve the problem yourself as this is how you learn. Doing the problems using AI or and copying off other students will not help you to learn skills of analysis, thinking, writing, and graph plotting. **Assignments will be graded** based on a combination of: 1) completion, and 2) some selected questions and components of questions. **If no TA is assigned to this class, a larger component of the grade will be based on completion.**

Readings & Videos:

- posted on first page of the slides and/or in readings folder,
 - there is a tentative list on the topics table below.
 - these should give other perspectives and help to add context to lectures, and link ideas together to "see the big picture".

Lecture Slides: posted after class -- all content of slides may not be covered in the class room, and some class content will not be in the slides. They are a complement to readings and lectures and may be highly imperfect substitutes. The readings should enable you to more comprehensively understand lectures and slides.

Practice Problems: provided for practice and are NOT handed in. **Answers** are posted so you can check your answers. If you get stuck, you may peak at answers to help you to see how to proceed. However, do your best to try the problem on your own before doing so.

Discussion Board: Participate in Discussion board forums "**Ask a Question**" and "**Natural Resource Economics in the News**" by means such as asking a question, making a comment, relating class content to real world events (ex. link to news article with brief explanation), or responding to posts made by the professor, TAs, or other students, and making helpful posts. You may either use your name or participate anonymously (meaning that other class members will not know who you are but the professor and teaching assistants, if there is one, will know your name).

Office Hours: There are schedules in person office hours (see above). If you are unable to make these hours and have a question, please email Ruth to set up an appointment. Dependent upon conditions such as covid, poor weather, and so on office hours may be moved online to Teams.

Math Background: Students should be familiar with basic algebra like solving equations to find unknowns, the rules of exponents, natural logarithms, and graphing. Some basic calculus will be used but the concepts will be explained, and review provided.

Poster Presentation: The poster presentation is group work. Prior to making your poster, please submit a proposal and set up an appointment to discuss your topic with the professor (or TA if available). Your group will explore a particular resource. Examples might include oil, shale gas, the Congo Rainforest, gold, skipjack tuna in the Indian Ocean, Canada's boreal forests, Bluefin Tuna, Nova Scotia's Lobster Fishery, Diamonds, cobalt (used in lithium ion batteries), lithium, horseshoe crabs, bison, Vaquita dolphin, biodiversity, healthy Ph. Ocean, the Northern Summer Sea Ice and Ice sheets on Greenland, Glaciers in the Rocky Mountains, locally adapted seeds, or water buffalo in Iraq, the cost of AI data centres in terms of resources like electricity, water, and Earth's surface area. In the project, you will relate theoretical concepts and theory learned to your particular resource, and you will collect data such as prices and extraction rates. Is the resource being sustainably managed and how would we determine this? What policies are currently being used to manage the resource. If the resource is not being sustainably managed, discuss possible policy tools to bring about sustainability.

Participation: Based on attendance, engagement, participation in class exercises & games, including writing answers to short questions, and reflecting on course content on small pieces of paper and submitting these.

Course Content:

- topics and readings are tentative as time permits.
- changes including additions of subtractions will be announced in class and recorded on the cover page of the relevant slides.

* refers to required background reading while "no *" are extra.

Lecture # and Topic	Background Readings	Reading in H&O (on reserve or Kentaka)
L1_Introduction: What is Natural Resource Economics? Why is it important? How will we study it?	- slides * Natural Resources Canada 10 Key Facts at https://natural-resources.canada.ca/science-and-data/data-and-analysis/10-key-facts-on-canadas-natural-resources/16013	(H&O, ch. 1&2)

L2 - Intertemporal Decision Making - determinants of interest rates - mechanics and logic of discounting. - interest rates vs social discount rate.	- VIDEO: On intertemporal consumption smoothing and interest rate - slides	(H&O, ch. 1&2)
L3_Models of Land and Water Use - The Concept of Economic Rent - Ricardian (different land quality) vs. VonThünen (location model) - Water pricing (monetary non-equity weighted efficiency vs. equity).	* Von Thünen Model of Agricultural Land Use (Mr Sinn) (short video) https://www.youtube.com/watch?v=yZDy7bTA82k * Von Thünen, J.H (1966) <i>The Isolated State</i> , An English Edition, pg 144 - 158, German version 1826 - 1863, [read for broad overview] https://archive.org/details/isolatedstateeng0000thun/page/158/mode/2up	H&O, ch. 3
L4_Renewable Resources (Fishery) - Gordon-Shaefer Model of the Fishery - extinction	* Kentaka (Section 5.2.2, 133 - 145) <i>Economics and Fisheries Resources</i> . OR Pearce and Turner (1990) <i>Economics of Natural Resources and the Environment</i> , Ch. 16, <i>Renewable Resources</i> , pg. 241 - 261, John Hopkins University Press, UK. * H. Scott Gordon (1954) pg. 88-99 <i>A Common Property Resource: The Fishery</i> , <i>The Journal of Political Economy</i> , 62 (2), pg. 124-142 Copes, Parzival (1970) 'The backward-bending supply curve of the fishing industry.' <i>Scottish Journal of Political Economy</i> 17, 69-77	Ch. 4 (H&O, 90-126) Ch. 4 (H&O, pg. 126 - 133)
L5_Policy For Renewable Resources (the Fishery) - community based fisheries management, non-tradable quotas, fishing fees, Individual transferable quotas (ITQs)	* Kentaka (Section 5.2.2, 145 - 147) <i>Fisheries Management</i> . * Ostrom, E.(1990) <i>Governing the Commons; The Evolution of Collective Action</i> , Ch. 3, Analyzing long-enduring, self-organized, and self-governed CPRs, pg. 58 - 102. * Copes, P. & Charles, A. (2004, Oct.) <i>Socioeconomics of Individual Transferrable Quotas and Community Based Fishery Management</i> , <i>Agriculture and Resource Economics Review</i> , 33(2), pg. 171 - 181 Copes, P. & Pálsson (2000) <i>Challenging ITQs: Legal and Political Action in Iceland, Canada and Latin America A Preliminary Overview</i> , IIFET 2000 Proceedings.	Ch. 5, H&O Kentaka (Section 5.2.2, 145 - 147)
L6_Non-renewable resource extraction (Mining) - durable vs. non-durable (ex. gold vs. oil) - Hotelling Rule, Hartwick $r\%$ rule - Backstops, choke prices, and exhaustion	* H&O, Ch. 8, <i>Non-Renewable Resource Use: The Theory of Depletion</i>	Ch. 8, 9 (H&O) Kentaka, (section 5.2) pg. 115 - 122
L7_Renewable Resources, Forests - Silviculture, Clear Cut, Biodiverse healthy forest ecosystems, agroforestry, vs. plantation monocultures. - harm due to climate changes, and forest damaging human activities such as clearing for agriculture.	* Kentaka, pg. 122 - 133, <i>Economics and Forest Resources</i> OR * Conrad, J.M.(2010) <i>The Economics of Forestry</i> , 132 - 152, Cambridge University Press. Samuelson, P.A., "Economics of Forestry in an Evolving Society," <i>Economic Inquiry</i> XIV, Dec. 1976, 466-92. [quite mathematical] OR	Ch. 10 (H&O) Kentaka, Section 5.2.1, pg. 122 - 133

- beetles and fires, role in carbon sequestration. - Faustman Model - Externalities and market power. - colonialism	Tietenberg, T. & Lewis, L.(2015) Environmental and Natural Resource Economics, pg. 254 - 275.[quite descriptive] * Greenpeace (2007) Carving up the Congo, video at: https://www.youtube.com/watch?v=xxMLYNmRcI	
L8_Market Power in the Resource Sector - Monopsony/Oligopsony buyers of natural resources (wheat, coffee, oil) - Fair Trade	- Slides Robinson, J. (1933) Economics of Imperfect Competition, Ch. 18 & 19, pg. 218 - 231.	
L9_Wrap-up & Sustainable Economics Revisited - human Carrying Capacity - concept of an optimal population	* Daily, G.C. & Ehrlich, P.R.(1992, Nov.) Population, Sustainability and Carrying Capacity, BioScience, 42 (10), pg. 761-771. * Daily, G.C., Ehrlich, A.H., & Ehrlich, P.R. (1994, July) Optimum Population Size, Population and Environment, pg. 469 - 475. * Lesthaeghe, Ron (2014) The second demographic transition: A concise overview of its development, PNAS pg. 1 - 4.	Ch. 12 (H&O)

Other topics that may be covered as time commits or/and as part of the project are:

Resource Curse: Ex. Sachs, J.D. & Warner, A.M. (2001) The curse of natural resources, European Economic Review, 45, 827 - 838.

The Problem of Subsidies * Ruseski, G.(1998) International Fish Wars: The Strategic Roles for Fish Licensing and Export Subsidies, JEEM, 36, 70 - 78.

Sala, E. et al. (2018) The Economics of Fishing the High Seas, *Science Advances*, pg. 1-13.

Sakai, Y., Yagi, N., & Sumalia, U.R.(2018) Fisheries Subsidies, the Interaction between science and policy,

Kotchen, M.J.(2021) The Producer Benefits of implicit fossil fuel subsidies in the United States, Ch. 11 Appendix (H&O)

Economic Psychology and Resource Management (Cognitive Dissonance and Information Problems, Quasi-hyperbolic discounting)

* Akerlof, G. (1989, Spring) The Economics of Illusion, *Economics & Politics*, 1, pg. 1 - 10.

Thaler, Richard (2015) Misbehaving, Will Power: No Problem, pg. 87 - 98, "quasi-hyperbolic discounting" (descriptive)

*VIDEO "A Conversation with James Hansen" at

<https://www.youtube.com/watch?v=jarAWIGML5k>

Dynamic Models

- steady state economies or collapse.

- predator prey model, humans as the predator.

* Brander, J.A. & Taylor, S.M. (Mar., 1998) The Simple Economics of Easter Island: A Richardo-Malthus Model of Renewable Resource Use, AER, 88(1), pg. 119 - 138. Diamond, J. (2005) Collapse: How Societies Choose to Fail or Succeed, Ch. 2 "Twilight at Easter"

Ch. 11, H&O.

For some of the above papers, the math is beyond the level of the course and descriptive approaches in combination with basic, algebra, graphs, and calculus will be employed.

** refers to readings that you should read, non-starred items are recommended but optional.*

** not all components of all readings will be covered. The course lectures and slides should help you to determine how much time to devote to readings. If you are uncertain, please ask.*

Course Policies:

- 1) Students are responsible for **checking the final exam schedule prior to booking any flights. EARLY final exams will NOT be scheduled under ANY conditions**, so please do NOT ask.
- 2) **Late or Missed Exams:** If you miss a midterm due to illness, as soon as possible, inform the professor via email and attach a signed **Declaration of Absence (Student DOA) form**: **DOA forms may only be used for the midterm but NOT for the final exam**. These are available at:
<https://cdn.dal.ca/content/dam/dalhousie/pdf/faculty/computerscience/forms/StudentDeclarationofAbsenceFORM.pdf/subassets/page1.pdf>
In the case of a **missed midterm** the final exam weight will be the combined weight of both the final exam and the midterm (based on the above table). There is no make-up midterm. If the **final exam is missed due to illness**, or some other valid reason such as death in the family, please inform the professor by email as soon as possible to arrange to write an alternative exam.
- 3) **Late assignments** receive a maximum penalty of 5% per day and will not be accepted after answers have been posted on the Brightspace.
- 4) Students are responsible for **checking Brightspace “Announcements” regularly**. Important information to guide your learning as well as occasional corrections to assignments or test review questions is posted there.
- 5) You are responsible for establishing whether you have access to all course material as soon as the term begins and before the ADD/DROP date. If you do not have access to certain material, inform the instructor as soon as possible. Alternative access methods are not guaranteed.
- 6) Please do not attend class if you test positive for **covid**. Even if your covid test is negative, but you have not been feeling well or have been near someone who has covid, it is highly recommended that you stay at home or wear a mask to protect others. Find out what you missed via emailing other students (or TA or professor if you do not know other students) and catch up via online content. You may wish to make an appointment with the professor or TA via Teams.
- 7) **Please do not give me gifts** as this may be a conflict of interest, and may increase my ecological and carbon footprint. If you want to thank me or the TA by email, a small written card, or dropping by the office, AFTER you receive your grade, that is fine.
- 8) **Laptop Policy:** Students are strongly discouraged from using laptops during class, although it is fine to use a tablet to take notes. **Phones are strictly prohibited in the classroom**.
- 9) **Course Accessibility:** Refer to the [Student Accommodation Policy](#) for information on how Dalhousie instructors and staff work collaboratively with students to create and sustain an accessible educational environment.

- You are eligible for accommodations based on [protected characteristics](#) such as religion, cultural, or community- significant observances that conflict with course requirements, reach out to me to collaboratively to discuss alternatives.
- To begin the process of requesting a formal academic accommodation, contact the [Student Accessibility Centre](#)

How to Learn in this Course:

- attend class! -- if you have to miss a lecture (due to illness or a varsity sports team event for example), ask another student to take notes and find out what you missed by asking other students or/and attending office hours.
- attending class will help you to establish a rhythm and reduce chances of falling behind.
- go over your lecture notes after the lecture and use readings and slides to help you understand the notes.
- do your best to pay attention in class.
- taking notes in class requires that you process information which can help you to pay attention so as to make the best possible use of class time. If you missed some parts, leave a space and fill this in later using the slides, videos, or asking during office hours, etc.
- read the course syllabus to get an overview of what lies ahead.
- make a schedule, write down due dates in your planner and set aside times to study.
- Manage your time and **avoid distractions such as social media while studying**. Turn it off!
- After logging into Brightspace, check **Announcements** for new information.
- do all assignments yourself using your own brain -- start early -- if you get stuck, come and ask for help during office hours. Other students may also be helpful!
- read and work through readings using the slides to guide your focus. You may wish to take notes, or use slides to augment your class notes. Taking your own notes may help you to learn better by organizing the material in a manner that makes sense to you and relates material to prior knowledge. Charts, flow charts and mind maps may be helpful. Work through the mathematical problems and write down and/or talk through the method used. Make summaries to identify key points.
- do the practice problems on your own. If you get stuck, peak at the solution and then try on your own again. Repeat as necessary. Note down where you went wrong in your initial attempt. If you are still stuck, ask the professor to explain.
- relate course concepts to other things you know.
- ask questions while studying, in office hours and on discussion boards.
- start studying early for tests. Do review sheet problems.
- explain concepts to yourself and friends (orally using words). Test yourself.
- If you are having trouble focussing your study, please visit office hours for advice.

Syllabus Appendix

For information on student supports, university policies, statements, and guidelines, please refer to the following link:

[Syllabus Appendix: Student Supports & University Statements, Policies, and Guidelines](#)