# EC 970: Natural Resource Economics

Harvard University Department of Economics

Fall 2022


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| Instructor: Andrés de Loera | E-mail: adeloerabrust@g.harvard.edu |
| Office Hours: By Appointment | Class Hours: TTH 10:30am-11:45am |
| Stata/R Office Hours: Mini Course Site | Class Room: Sever Hall 111 |


Last Updated 09/07/2022[1]

## Course Description

This tutorial will explore the economics underlying the relationship between humans and the natural world, an issue of growing importance as humanity grapples with resource scarcity and its impact on the environment. The course will analyze natural resource issues through the lens of environmental economics. We will begin with one of the most defining issues of the era: the tragedy of the commons, where resources that are available to all are inevitably overused. We will discuss the incentive schemes that economists have devised to deal with this issue as well as the ways these interact with social norms and politics. We will also explore how well incentives and institutions manage natural resources, such as fisheries, forests and minerals, more generally. We will then discuss how to think about and measure the many values of the natural world that are not captured by markets, as a springboard to explore the many interactions between economic activity and the natural world with a special emphasis on the role of biodiversity. By the end of the course, students will be familiar with the major methods and questions of natural resource economics and be prepared to assess and conduct research in the field.

## Course Requirements

### Prerequisites

A course in intermediate microeconomics and introductory statistics is a prerequisite for this class. A course in econometrics and some background in calculus is strongly recommended.

### Participation (15% of Grade)

Since in-class discussion is the central component of this course, class attendance and participation are mandatory. You may occasionally ask for permission for online attendance due to extenuating circumstances.

[1] The syllabus is a living document and I reserve the right to make amendments.

## Reading Assignments

Before each class you will be assigned at least two academic papers and possibly some pieces of general audience media. Some weeks you will be assigned a brief paper responding to these readings. Regardless of whether a response paper is due, you are expected to read these totally and thoroughly, unless otherwise noted, since having read the papers is critical to a productive in class discussion.

## Writing Assignments (70% of grade)

- **Describe Yourself (∼1 Page, ungraded)** Your first assignment will be to write a one page description about your background and what elements of economics interest you most.
- **Reading Responses (1-2 pages each, 10% of grade total)** Throughout the semester you will be expected to submit many short papers thoughtfully reflecting on the papers you were assigned to read for the week. These will be due before class discussion to ensure everyone has had time to read and deliberate about the papers.
- **Data Report (∼3 Pages, 5% of grade)** A good dataset is essential to empirical economics. In this assignment I would like you to find and describe one (or more) interesting dataset(s), as well as show some basic summary statistics and interesting visualizations.
- **Institutions Essay (5+ pages, 10% of grade)** Your first large essay of the semester will be to describe a natural resource "institution," broadly defined. This will give you practice thinking about applying economics to the real world, and hopefully give you institutional knowledge you can use for your final research paper.
- **Valuation Essay (3-5 Pages, 5% of grade)** As we will discuss in class, the question of how to value natural resources which are not traded in markets is perhaps the most fundamental in natural resource economics. In this essay I would like you to describe and assess the major methods of valuation that natural resource economists use for non-market goods.
- **Referee Report (3+ Pages, 5% of grade)** Peer review is a fundamental part of academic publishing–it is how journals ensure that what they publish is up to the intellectual standards of the academic community. For this assignment you will select one of a few options of unpublished research papers to critically evaluate.
- **Final Paper (15-20 Pages, 35% of grade)** Your capstone project for this class is to write a short research paper of your own. The final research paper should roughly mimic a shorter version of a journal paper, including a review of relevant literature, a description of methodology and results, and possibly a discussion of policy implications.

  Since this is the most significant assignment of the semester, it will be submitted in four parts:

  - **Prospectus (ungraded):** Between your institutions essay and your data report, I would like you to submit at least one brief (1-2 page) prospectus about your final paper, outlining what you would like to work on. Before submitting your prospectus, I require that we meet one on one in office hours and discuss your ideas.

- **Methods and Results (2% of grade):** To ensure you are making progress, I will request that you send me a preliminary version of your methods and results sections in advance of the first draft. This will allow me to give you feedback on the core of your paper before it is too late to make any changes.
- **First Draft (3% of grade):** To ensure your final product is of high quality, you must submit a first draft two weeks before the final draft is due. This draft should have all the major parts of the paper written, short of a conclusion or abstract. I will review this draft and give you detailed feedback with at least a week to edit it in advance of the final deadline.
- **Final Draft (30% of grade):** Your final submission should be a well polished research paper, adding a new insight into an interesting problem in natural resource economics. Your grade for the final paper will be based on this final draft.

### Presentation (5% of Grade)

During the last week of class, everyone will be expected to do a short presentation on their final paper project. You will have already submitted your first draft of the paper and thus should be able to present a largely complete work. However, the presentation will be very low stakes–it is simply an opportunity to share your work and get feedback from your peers.

### Empirical Problem Sets (10% of Grade)

All Ec 970 students are expected to complete empirical problem sets in Stata or R as part of a discrete mini-course hosted on a separate Canvas site. This course will consist of video tutorials and four problem sets due in the first half of the semester. Personally, I would recommend doing the problem sets in R. There are specific office hours run by the department to provide you support for the problem sets in either language, but you are welcome to schedule office hours with me for help as well. These problem sets will help prepare you to write an empirical paper of your own for the end of the course, and to work with data more broadly, so I recommend giving them appropriate attention.

## Course Logistics

### Contacting Me

Please sign up for office hours if you have anything at all you would like to chat about! Office hours are by far the best way to discuss anything in depth. If you have a quick or time sensitive concern, please email me at adeloerabrust@g.harvard.edu and include [EC 970] in the subject line. I will do my best to respond within 24 hours, though I may be slower during weekends or holidays. On most days I will also be happy to chat after class.

### Late Assignments

I will give you two "Late Days" which you can use as you see fit throughout the semester with the exception of the final paper. Beyond those two late days, you will need to ask for a formal extension, which will likely require a note from your academic dean.

### Collaboration

I encourage you to discuss class topics with you classmates. You may also find collaboration useful for the empirical problem sets. However, note that you must submit separate and unique assignments. If you plagiarize, you will fail the course. See The Harvard College Handbook for Students for details.

### Office Hours

I encourage you to schedule office hours with me regularly throughout the semester. I will require that we meet at least twice throughout the semester: once to discuss your prospectus, and once to discuss your final paper draft. Please schedule office hours through this link.

### Stata/R Office Hours

The department will provide specialized office hours run by other teaching fellows to support you through the Stata/R mini-course. More details can be found on that program's Canvas site.

### Recommended Readings

For those interested in an introductory text in natural resource economics, I personally recommend Natural Resource Economics: An Introduction by Barry C. Field. For more on econometric methods I recommend Causal Inference: The Mixtape by Scott Cunningham. For guidance on writing for economics, see the department's Writing Economics guide.

## Key Dates

- Describe Yourself Due 09/04
- Empirical Problem Set 1 Due 09/16
- Data Report Due 09/23
- Empirical Problem Set 2 Due 09/30
- Institutions Essay Due 10/07
- Empirical Problem Set 3 Due 10/14
- Prospectus Due 10/21
- Valuation Essay Due 10/24
- Empirical Problem Set 4 Due 10/28
- Referee Report Due 11/05
- Methods and Results Due 11/12
- Final Paper Draft Due 11/22
- Final Paper Due 12/07 at 5pm [NO EXTENSIONS]

## Schedule

**Week 01, 08/29 - 09/02:** Introduction to Natural Resource Economics

- Readings:
  - Fullerton, Don, and Robert Stavins. "How Economists See the Environment." Nature 395, no. 6701 (October 1, 1998): 433–34.
  - Stavins, Robert N. "The Problem of the Commons: Still Unsettled after 100 Years." American Economic Review 101, no. 1 (2011): 81–108.
  - Sections 0-2 of "Writing Economics"
- **Describe Yourself Due 9/04**

**Week 02, 09/05 - 09/09:** The Tragedy of the Commons: Individual Transferable Quotas

- Class 1 Readings **+ Reading Response**:
  - Arnason, Ragnar. "Property Rights in Fisheries: How Much Can Individual Transferable Quotas Accomplish?" Review of Environmental Economics and Policy 6, no. 2 (July 1, 2012): 217–36.
  - Costello, Christopher, Steven D. Gaines, and John Lynham. "Can Catch Shares Prevent Fisheries Collapse?" Science 321, no. 5896 (September 19, 2008): 1678–81.
- Class 2 Readings **+ Reading Response**:
  - Isaksen, Elisabeth Thuestad, and Andries Richter. "Tragedy, Property Rights, and the Commons: Investigating the Causal Relationship from Institutions to Ecosystem Collapse." Journal of the Association of Environmental and Resource Economists 6, no. 4 (July 1, 2019): 741–81.
  - *Optional:* Sumaila, U. Rashid. "A Cautionary Note on Individual Transferable Quotas." Ecology and Society 15, no. 3 (2010).

**Week 03, 09/12 - 09/16:** Tragedy of the Commons: Social Norms

- Class 1 Readings:
  - Ostrom, Elinor. "Institutions and the Environment." Economic Affairs 28, no. 3 (September 1, 2008): 24–31.
  - Acheson, James, and Roy Gardner. "The Evolution of the Maine Lobster V-Notch Practice: Cooperation in a Prisoner's Dilemma Game." Ecology and Society, 2011.
  - *Optional:* Dietz, Thomas, Elinor Ostrom, and Paul C. Stern. "The Struggle to Govern the Commons." Science 302, no. 5652 (December 12, 2003): 1907–12.
- Class 2 Readings **+ Reading Response**:
  - Sakai, Yutaro, Hiroe Ishihara, and Mitsuhiro Ishino. "Sharing in the commons: Evaluating the pooling system in a Danish seine fishery in Japan." Marine Policy 139 (May 1, 2022): 105017.

  - Molina, Renato. "The lack of property rights can make natural disasters worse: The case of small-scale fisheries in Chile." Ecological Economics 200 (October 1, 2022): 107540.

- **Empirical Problem Set 1 Due 09/16**

**Week 04, 09/19 - 09/23:** Natural Resource Institutions

- Class 1 Readings **+ Reading Response**:
  - Heldring, Leander, James A Robinson, and Sebastian Vollmer. "The Economic Effects of the English Parliamentary Enclosures." National Bureau of Economic Research Working Paper Series No. 29772 (2022).
- Class 2 Readings:
  - Edwards, Eric C., and Todd Guilfoos. "The Economics of Groundwater Governance Institutions across the Globe." Applied Economic Perspectives and Policy 43, no. 4 (December 1, 2021): 1571–94.
  - The Economist. "How an auction is helping Britain's turtle doves," July 22, 2021.
  - Section 4 of "Writing Economics"
- **Data Report Due 9/23**

**Week 05, 09/26 - 09/30:** Incentives for Conservation

- Class 1 Readings + **Reading Response**:
  - Jayachandran, Seema, Joost de Laat, Eric F. Lambin, Charlotte Y. Stanton, Robin Audy, and Nancy E. Thomas. "Cash for carbon: A randomized trial of payments for ecosystem services to reduce deforestation." Science 357, no. 6348 (July 21, 2017): 267–73.
  - Ovando, Daniel, Gary D. Libecap, Katherine D. Millage, and Lennon Thomas. "Coasean Approaches to Address Overfishing: Bigeye Tuna Conservation in the Western and Central Pacific Ocean." Marine Resource Economics 36, no. 1 (January 1, 2021): 91–109.
  - *Optional Podcast:* Levitt, Steven D. "The Simple Economics of Saving the Amazon Rainforest." Freakonomics Radio. July 29, 2020.
- Class 2 Readings **+ Reading Response**:
  - PERC. "Saving African Rhinos: A Market Success Story," August 19, 2011.
  - Englander, Gabriel. "Armed conflict increases elephant poaching." Working Paper (2019).
  - Kremer, Michael, and Charles Morcom. "Elephants." American Economic Review 90, no. 1 (2000): 212–34.
- **Empirical Problem Set 2 Due 09/30**

**Week 06, 10/03 - 10/07:** The Political Economy of Conservation

- Class 1 Readings **+ Reading Response**:
  - Costello, Christopher, and Corbett A. Grainger. "Property Rights, Regulatory Capture, and the Exploitation of Natural Resources." Journal of the Association of Environmental and Resource Economists 5, no. 2 (April 1, 2018): 441–79.
  - Abman, Ryan. "Rule of Law and Avoided Deforestation from Protected Areas." Ecological Economics 146 (April 1, 2018): 282–89.
- Class 2 Readings:
  - Balboni, Clare, Robin Burgess, Anton Heil, Jonathan Old, and Benjamin A. Olken. "Cycles of Fire? Politics and Forest Burning in Indonesia." AEA Papers and Proceedings 111 (2021): 415–19.
  - Burgess, Robin, Francisco J.M. Costa, and Benjamin A Olken. "Wilderness Conservation and the Reach of the State: Evidence from National Borders in the Amazon." National Bureau of Economic Research Working Paper Series No. 24861 (2018).
- **Institutions Essay Due 10/07**

**Week 07, 10/10 - 10/14:** Non-Market Valuation of Natural Resources

- **Office Hours to Discuss Prospectus**
- Class 1 Readings *(Skim)*:
  - Pelletier, Marie-Chantale, Elizabeth Heagney, and Mladen Kovač. "Valuing recreational services: A review of methods with application to New South Wales National Parks." Ecosystem Services 50 (August 1, 2021): 101315.
  - Kuwayama, Yusuke, Sheila Olmstead, and Jiameng Zheng. "A more comprehensive estimate of the value of water quality." Journal of Public Economics 207 (March 1, 2022): 104600.
  - Hynes, Stephen, Wenting Chen, Kofi Vondolia, Claire Armstrong, and Eamonn O'Connor. "Valuing the ecosystem service benefits from kelp forest restoration: A choice experiment from Norway." Ecological Economics 179 (January 1, 2021): 106833.
- Class 2 Readings:
  - Carson, Richard T. "Contingent Valuation: A Practical Alternative When Prices Aren't Available." Journal of Economic Perspectives 26, no. 4 (2012): 27–42.
  - Hausman, Jerry. "Contingent Valuation: From Dubious to Hopeless." Journal of Economic Perspectives 26, no. 4 (2012): 43–56.
  - *Optional:* Xie, Lusi, Wiktor Adamowicz, Maik Kecinski, and Jacob R. Fooks. "Using economic experiments to assess the validity of stated preference contingent behavior responses." Journal of Environmental Economics and Management 114 (July 1, 2022): 102659.
- **Empirical Problem Set 3 Due 10/14**

**Week 08, 10/17 - 10/21:** Other Topics in Valuation

- **Office Hours to Discuss Prospectus**
- Class 1 Readings **+ Reading Response**:
  - Brandon, Carter, Katrina Brandon, Alison Fairbrass, and Rachel Neugarten. "Integrating Natural Capital into National Accounts: Three Decades of Promise and Challenge." Review of Environmental Economics and Policy 15, no. 1 (January 1, 2021): 134–53.
  - Section 3 of "Writing Economics"
- Class 2 Readings:
  - Teh, Louise S. L., Lydia C. L. Teh, U. Rashid Sumaila, and William Cheung. "Time Discounting and the Overexploitation of Coral Reefs." Environmental and Resource Economics 61, no. 1 (May 1, 2015): 91–114.
  - Franklin, Sergio L., and Robert S. Pindyck. "Tropical Forests, Tipping Points, and the Social Cost of Deforestation." Ecological Economics 153 (November 1, 2018): 161–71.
- **Prospectus Due 10/21**

**Week 09, 10/24 - 10/28:** Biodiversity Theory

- **Valuation Essay Due 10/24**
- Class 1 Readings:
  - Heal, Geoffrey. "The Economic Case for Protecting Biodiversity." National Bureau of Economic Research Working Paper Series No. 27963 (2020).
  - Metrick, Andrew, and Martin L. Weitzman. "Conflicts and Choices in Biodiversity Preservation." Journal of Economic Perspectives 12, no. 3 (1998): 21–34.
- Class 2 Readings:
  - Perry, Neil. "The Ecological Importance of Species and the Noah's Ark Problem." Ecological Economics 69, no. 3 (January 15, 2010): 478–85.
  - Moore, Frances C., Arianna Stokes, Marc N. Conte, and Xiaoli Dong. "Noah's Ark in a Warming World: Climate Change, Biodiversity Loss, and Public Adaptation Costs in the United States." Journal of the Association of Environmental and Resource Economists 9, no. 5 (September 1, 2022): 981–1015.
  - *Optional:* Weikard, Hans-Peter. "Diversity Functions and the Value of Biodiversity." Land Economics 78, no. 1 (2002): 20–27.
- **Empirical Problem Set 4 Due 10/28**

**Week 10, 10/31 - 11/04:** Biodiversity Protection

- Class 1 Readings **+ Reading Response**:
  - Ferraro, Paul J., Craig McIntosh, Monica Ospina. "The effectiveness of the US endangered species act: An econometric analysis using matching methods." Journal of Environmental Economics and Management 54, no. 3 (November 1, 2007): 245-261
  - *Optional:* List, John A, Michael Margolis, and Daniel E Osgood. "Is the Endangered Species Act Endangering Species?" National Bureau of Economic Research Working Paper Series No. 12777 (2006).
- Class 2 Readings (*Skim*):
  - Rausser, Gordon C., and Arthur A. Small. "Valuing Research Leads: Bioprospecting and the Conservation of Genetic Resources." Journal of Political Economy 108, no. 1 (February 1, 2000): 173–206.
  - Swanson, Tim, and Ben Groom. "Regulating Global Biodiversity: What Is the Problem?" Oxford Review of Economic Policy 28, no. 1 (2012): 114–38.
- **Referee Report Due 11/05**

**Week 11, 11/07 - 11/11:** Protected Areas

- Class 1 Readings **+ Reading Response**:
  - Joppa, Lucas N., and Alexander Pfaff. "Global Protected Area Impacts." Proceedings of the Royal Society B: Biological Sciences 278, no. 1712 (June 7, 2011): 1633–38.
  - McDermott, Grant R., Kyle C. Meng, Gavin G. McDonald, and Christopher J. Costello. "The Blue Paradox: Preemptive Overfishing in Marine Reserves." Proceedings of the National Academy of Sciences 116, no. 12 (March 19, 2019): 5319–25.
  - *Optional:* Englander, Gabriel. "Property rights and the protection of global marine resources." Nature Sustainability 2, no. 10 (October 1, 2019): 981–87.
- Class 2 Readings:
  - Walls, Margaret. "Public Land Conflicts and Controversies: The Designation of National Monuments in the Western United States." Review of Environmental Economics and Policy 14, no. 2 (June 1, 2020): 352–64.
- **Methods and Results Due 11/12**

**Week 12, 11/14 - 11/18:** Costs of Production

- Class 1 Readings:
  - Garg, Teevrat, and Ajay Shenoy. "The Ecological Impact of Place-Based Economic Policies." American Journal of Agricultural Economics 103, no. 4 (August 1, 2021): 1239–50.
  - Section 5 of "Writing Economics"

- Class 2 Readings **+ Reading Response**:
  - Liang, Yuanning, Ivan J Rudik, and Eric Zou. "Economic Production and Biodiversity in the United States." National Bureau of Economic Research Working Paper Series No. 29357 (2021).

**Week 13, 11/21 - 11/25:** Costs of Protection

- **Office Hours to Discuss Final Paper**
- Class 1 Readings:
  - Jayachandran, Seema. "The Inherent Trade-Off Between the Environmental and Anti-Poverty Goals of Payments for Ecosystem Services." National Bureau of Economic Research Working Paper Series No. 29954 (2022).
  - *Optional:* Ferris, Ann E., and Eyal G. Frank. "Labor Market Impacts of Land Protection: The Northern Spotted Owl." Journal of Environmental Economics and Management 109 (September 1, 2021): 102480.
- **Final Paper Draft Due 11/22**
- Thanksgiving break 11/23-11/27

**Week 14, 11/28 - 12/02:** Presentations

- **Office Hours to Discuss Final Paper**
- Presenters:
  1. TBD
- Presenters:
  1. TBD

**Week 15, 12/05 - 12/09:**

- **Final Paper Due 12/07**