

Economics 144
Economics of Conservation
Summer Session II

Course Hours: MTWTh 3:30 – 4:50 PM

Classroom: Solis 111

Instructor: Dale Squires dsquires@irpsmail.ucsd.edu

Office: Econ 108 **Office Hours:** Immediately preceding class or by appt

Course Dates: Monday, August 4 – Saturday, September 6, 2014

Final: Friday, September 5, 3:30 – 5:59pm

Purpose:

Biodiversity and ecosystems and their services face growing threats. Their loss affects human welfare. Humans depend on natural systems to produce a wide variety of ecosystem goods and services, ranging from direct use of certain species for food or medicines to ecosystem functions that provide water purification, nutrient retention, or climate regulation. Sustaining biodiversity and ecosystems in the face of increasing human populations and increased human economic activity promises to be a major challenge. Since most of the threats to biodiversity and ecosystems originate from human actions, understanding human behavior and the social, political and economic systems in which people operate is an essential component for those interested in conserving biodiversity and ecosystems. Conservation biology, ecology, or economics alone are insufficient to address their growing threats.

This course examines conservation policy from an economic perspective, applying economics principles to develop policy, but drawing upon conservation biology and ecology. Major themes include: biodiversity and ecosystems and their services have economic value; both market and non-market benefits and costs should be evaluated and balanced; there are trade-offs and opportunity costs to conservation; policies should be crafted utilizing both social norms and economic incentives.

The focus is upon conservation of biodiversity and ecosystems and their services through policies that orient social norms and economic incentives to align individual and group behavior with the social-ecological optimum. Special attention will be given to conservation of endangered species. Climate change, an important driver of changes in biodiversity and ecosystems and their services, is covered in Economics of the Environment, Economics 131, and hence not covered here.

Students interested in related political science issues should consider Political Science 125A: Communities and the Environment and Political Science.

Readings Availability

- All readings are available in pdf files from the class Blackboard (Ted) website.
- Basic economic theory is in your textbooks from microeconomics classes, although I will lecture on it, and the core readings present the concepts.
- Most of the sections below start with conceptual readings and the last reading or two is an example. I do not test on examples (empirical studies), but you should read (skim) to better understand the concepts.

Core Readings

Selected chapters from Swanson, T.M. and E. Barbier, editors. 1992. *Economics for the Wilds: Wildlife, Diversity, and Development*. Island Press, Washington, D.C.

- Barbier, E. Chapter 2, Economics for the Wilds. (Covers total economic value, costs and benefits, discounting, fundamental reasons for market failure / economically inefficient resource allocation (insufficient conservation) – due to inability of resource users to capture the full economic value over their opportunity cost, importance of incentives)
- Alyward, B. Chapter 3, Appropriating the Value of Wildlife and Wildlands. (Covers pure and impure public goods and three resources considered public goods – species and habitat existence, ecosystem services, and genetic resources – how public good nature of resources leads to external benefits and insufficient incentives to provide public goods (i.e. conserve) since don't capture full benefits, non-market external benefits and free riders, dispersion of benefits but concentration of conservation costs on resource users, private and communal resource users and incentives for conservation.)
- Swanson, T. Chapter 4. The Role of Wildlife Utilization and Other Policies in Biodiversity Conservation. (Discusses global public goods and transboundary issues, international collective action, conservation funding, property rights, wildlife trade regulation.)
- Barbier, E. Chapter 5. Community-Based Development in Africa. (Introduction to indirect incentive approach to conservation through community conservation and integrated development and conservation projects plus discussion of poster child CAMPFIRE program.)
- Barnes, Burgess, and Pearce. Chapter 6. Wildlife Tourism.

Bulte, E., G. van Kooten, and T. Swanson. 2003. Economic Incentives and Wildlife Conservation. Paper presented to Workshop on Economic Incentives and Trade Policy. Geneva, Switzerland: CITES.

Polasky, S, C Costello, and A Solow. 2005. The Economics of Biodiversity. Chapter 29 in K-G Mäler and J Vincent, editors, *Handbook of Environmental*

Economics, Volume 3. Elsevier. (Comprehensive survey paper on the economics of conservation of biodiversity and ecosystem services.)

Arriagada, R. and C. Perrings. 2011. Paying for International Environmental Public Goods. *Ambio* 40:798–806. (Discusses different types of public goods and implications for their provision.)

Squires, D. 2014. "Biodiversity Conservation in Asia." *Asia & The Pacific Policy Studies* 1(1): 144-159. (Although focused on Asia, covers general topic of biodiversity conservation, major economic concepts, and policy tools.)

Milner-Gulland, E.J. and R. Mace. "Practical Considerations When Applying the Theory." Chapter 4, **Sections 4.3. & 4.4.** in Milner-Gulland and Mace, *Conservation of Biological Resources*. Blackwell Sciences. (Reviews most of the major economic concepts and policy tools introduced and developed in this class.)

Miteva, D, S. Pattanayak, and P. Ferraro. 2012. Evaluation of Biodiversity Policy Instruments: What Works and Doesn't? *Oxford Review of Economic Policy* 28(1): 69-92. (Reviews three core conservation policy instruments and their effectiveness: protected areas, decentralization, and payments for ecosystem services. (Skip the discussion of Section II.i. and Section IV.)

General Source of Information

Mongabay.com

Evaluation: Exams, Grades, and Re-Grades

- One midterm and final exam, each of which is 50% of the final course grade.
- Bluebooks may be required.
- Re-grade requests are to be made in writing and must explain the reason why a re-grade is requested, i.e. a logical discussion and thorough explanation of why your answer deserves more credit. Exam answers must be written in pen to be eligible for a re-grade.

1. Introduction

- Powerpoint Lecture: 1. Introduction
- Purpose: Review basic biodiversity status of the planet and how economics of conservation approaches this issue.
- Pimm, S.L., C.N. Jenkins, R. Abell, J.L. Gittleman, L.N. Joppa, P.H. Raven, C.M. Roberts, and J.O. Sexton. 2014. The Biodiversity of Species and Their Rates of Extinction, Distribution, and Protection. *Science*

- 344(6187) doi: 10.1126/science.1246752 (Skim to get idea of severity of biodiversity problem.)
- Barnosky et al. 2011. Has the Earth's Six Mass Extinction Already Arrived? *Nature* 471(7336): 51-57. (Skim to get idea of severity of biodiversity problem.)
 - Browse one of the two following reports to get the basic overview:
 - Millennium Ecosystem Assessment Synthesis. 2005. *Ecosystems and Human Well-Being: Biodiversity Synthesis*. Washington, D.C.: World Resources Institute. (Browse through the executive summary to get an idea of the factual background and issues.)
 - Convention on Biodiversity Conservation. 2010. *Global Biodiversity Outlook 3*. Browse through this. You can also watch a short video on this at: <http://www.cbd.int/gbo3/>
 - Squires, D. 2014. "Biodiversity Conservation in Asia." *Asia & The Pacific Policy Studies* 1(1): 144-159. (Skim to give you a sense of how economics of conservation is applied to develop policies. You likely won't understand all the concepts and details, but this gives you a sense of the big picture and the overall aim of this class.)
 - *Der Spiegel*. What would it cost to save nature? March 23, 2008. <http://www.spiegel.de/international/world/0,1518,554982,00.html> (Read to get idea of the basic issues and magnitudes of economic values involved.)

Additional Reading (Not Required):

- Barbier, E. Chapter 2, Economics for the Wilds. Swanson, T.M. and E. Barbier, editors. 1992. *Economics for the Wilds: Wildlife, Diversity, and Development*. Island Press, Washington, D.C. (This chapter gives you a basic sense of the economics and economics issues involved.)
- Cardinale, B., J. Duffy, A. Gonzalez, D. Hooper, C. Perrings, P. Venail, Anita Narwani, G. Mace, D. Tilman, D. Wardle, A. Kinzig, G. Daily, M. Loreau, J. Grace, A. Larigauderie, D. Srivastava & S. Naeem. 2012. Biodiversity Loss and Its Impact on Humanity. *Nature* 486: 59-67. (Skim to get basic understanding of issues.)
- Norton-Griffiths. 2007. How Many Wildebeest Do You Need? *World Economics* 8(2): 41-64. (Read to understand many of the basic issues within a Kenya context.)
- Armsworth, P.R., B.E. Kendall, and P. Davis. 2004. An Introduction to Biodiversity Concepts for Environmental Economists. *Resource and Energy Economics* 26: 115-136. (Discusses basic conservation biology and ecological concepts.)
- Trombulak, S.C., K. S. Omland, J.A Robinson, J.J. Lusk, T.L. Fleischner, G. Brown and M Domroese. 2004. Principles of conservation biology: recommended guidelines for conservation literacy from the education committee of the Society for Conservation Biology. *Conservation Biology* 18(5): 1180-1190.
- Elmqvist, T., Maltby, E., Barker, T., Mortimer, M., Perrings, C., Aronson, J.L., de Groot, R., Fitter, A., Mace, G., Norberg, J., Sousa Pinto, I. & Ring,

- I. 2010. Biodiversity, Ecosystems and Ecosystem Services. *The Economics of Ecosystems and Biodiversity: Ecological and Economic Foundations* (ed. by P. Kumar), pp. 41-112. Earthscan, London. (Read for basic conservation biology and ecological concepts. I won't test you on these concepts, but you should have read them and gotten the basic idea.)
- Pearce, D. and D. Moran. 1994. The Economic Value of Biodiversity. IUCN — The World Conservation Union. London: Earthscan Publications. (Very comprehensive overview relying upon a basic benefit-cost approach.) Section 1. (Surveys basic biodiversity.)
- http://en.wikipedia.org/wiki/Conservation_biology

2. Review of Economic Concepts

2.1. Externalities and Market Failure

- Powerpoint Lecture: 2. Environmental Externalities and Market Failure
Purpose: Review basic economic concepts.
- Readings: Review any of these readings if you want a refresher.
- Tisdell, C. 2007. *Economics of Environmental Conservation*. Edward Elgar. Chapter 3. (Reference material. Discusses basic environmental, conservation, and resource economics.)
- Illustration of Coase Theorem:
<http://www.sjsu.edu/faculty/watkins/coasetheorem.htm>
Milner-Gulland, E.J. and R. Mace. "Practical Considerations When Applying the Theory." Chapter 4, **Section 4.3.** in Milner-Gulland and Mace, *Conservation of Biological Resources*. Blackwell Sciences. (Reviews most of the major economic concepts and policy tools introduced and developed in this class.)

2.2. Total Economic Value and Markets for Biodiversity

- Powerpoint Lecture: 3. Biodiversity Markets
- Purpose: Develop concept of total economic value and present various types of markets for biodiversity.
- Total Economic Value, pp. 129-137 in D. W. Pearce and R.K. Turner, 1990. *Economics of Natural Resources and the Environment*. London: Harvester Wheatsheaf. (Read. Textbook discussion of total economic value and the classification used in this class.)
- Example: Naidoo, Malcom, and Tomasek. 2009. Economic Benefits of Standing Forests in Highland Areas of Borneo: Quantification and Policy Impacts. *Conservation Letters* 2: 34-44. (Skim to get basic idea and an example.)

- Example: Adger, W. N., Brown, K., Cervigni, R., & Moran, D. 1995. Total Economic Value of Forests in Mexico, *Ambio* 24 (5): 286-296 (Skim to get the basic idea and an example.)

Additional Reading (Not Required):

- Pagiola, Landell-Mills, and Bishop. 2002. Making market-based mechanisms work for forests and people. Chapter 15 in Pagiola, Bishop, and Landell-Mills, editors, *Selling Forest Environmental Services: Market-Based Mechanisms for Conservation and Development*. Earthscan. (Discusses not just the conceptual but also concrete issues of establishing a market.)

2.3. Opportunity Costs of Conservation: Impacts on Local Inhabitants

- Powerpoint Lecture: 4. Opportunity Costs of Conservation
- Purpose: Conservation policies yield economic benefits but also economic create costs, both direct (out of pocket) and indirect costs. These indirect costs of conservation are the opportunity costs of conservation. This lecture develops the concepts and basic measurement.
- Example: Norton-Griffiths, M. and C. Southey. 1995. The opportunity costs of biodiversity conservation in Kenya. *Ecological Economics* 12(2): 125-139.
- Example: Butler, R., L.P. Koh, and J. Ghazoul. 2009. REDD in the red: Palm oil could undermine carbon payment schemes. *Conservation Letters* 2(2): 67-73.
- Borneo rain forests:
<http://www.timesonline.co.uk/tol/news/world/asia/article5908207.ece>

2.4. Costs, Benefits, and Discounting

- Powerpoint Lecture: 5. Costs, Benefits, and Discounting
- Purpose: Introduce the economics of cost-benefit analysis and social discounting. This is a basic framework by which economics evaluates the costs and benefits of policies.
- Sinden, Chpt. 5 "Valuation with Market Prices" and Sinden, Appendices.
- Example: Naidoo and Ricketts. 2006. Mapping the economic costs and benefits of conservation. *PLoS Biology* 4(11): 2153-2164. (Skim: Case study that clearly discusses concepts and illustrates benefits and costs of conservation.)

Further Reading (Not Required):

- Pearce, D. and D. Moran. 1994. The Economic Value of Biodiversity. IUCN — The World Conservation Union. London: Earthscan Publications. Sections 2, 3, and 9.
- Gowdy, J., R.B. Howarth, and C. Tisdell. 2010. Discounting, ethics and options for maintaining biodiversity and ecosystem integrity. Chapter 6 in P. Kumar, editor, *The Economics of Ecosystems and Biodiversity: The Ecological and Economic Foundations*. Earthscan.
- Thomas Elmqvist, Cost-Benefit Analysis of Ecosystem Restoration Projects, YouTube Video from Yale University <http://environment.yale.edu/teeb/foundations/elmqvist/>
- Howarth on Ethics of Discounting, YouTube Video from Yale University <http://environment.yale.edu/teeb/foundations/howarth/>

2.5. Property Rights

- Powerpoint Lecture: 6. Property Rights
- Purpose: Introduce the economics of property rights, including types of rights and characteristics of rights.
- Squires, D. 2010. Property and Use Rights in Fisheries. In R. Allen, J. Joseph, and D. Squires, editors, *Conservation and Management of Transnational Fishing Industries*. Blackwell Publishing. **Read pages 39-44.** (Discusses different types of property rights and characteristics of property rights.)
- Example: Norton-Griffiths, M. 1996. Property rights and the marginal wildebeest: an economic analysis of wildlife conservation options in Kenya. *Biodiversity and Conservation* 5: 1557-1577. (Read to see an illustration of the importance of property rights and the importance of many of the basic economic concepts.)

2.6. Public Goods, Common Resources, Coase Theorem

- Powerpoint Lecture: 7. Impure Public Goods
- Purpose: Introduce pure and impure public goods, also known as mixed goods, and the different ways in which they can be provided.
- Aylward, Appropriating the value of wildlife and wildlands, Chapter 3 in Swanson and Barbier. **Read pages 34-40.** (Discusses basic public good approach to conservation.)
- Arriagada, R. and C. Perrings. 2011. Paying for International Environmental Public Goods. *Ambio* 40:798–806. (Discusses different types of public goods and implications for their provision.)
- Bulte, van Kooten, and Swanson. 2003. Economic Incentives and Wildlife Conservation. **Read Section 1.1**

Further Reading (Not Required)

- Norton-Griffiths, M. 2006. The Economic Dimension to Human-Wildlife Conflicts. Paper presented to Strathmore Business School Conservation, Wildlife & Markets Conference and Workshop November 9-11. (Feisty defense of fundamental importance of property rights and aligning economic incentives with social-ecological objectives and importance of private sector.)
- Montero, T. and C. Perrings. 2011. "The Provision of International Environmental Public Goods." Paper No. 16, Division of Environmental Policy Implementation, United Nations Environment Program.

2.7. Collective Action, Social Norms, and Economic Incentives

- I'm not covering the topic this year in order to leave more time for case studies.
- Powerpoint Lecture: 8. Collective Action Social Norms
- Purpose: Introduce social norms, an important complement to economic incentives.
- Baland, J.P. and J.-P. Platteau. Conditions for Successful Collective Action: Insights from Field Experiences. Chapter 12 in *Halting Degradation of Natural Resources*. Food and Agriculture Organization of the United Nations, selected pages.
- Young, P. 2008. Social Norms. *New Palgrave Dictionary of Economics, Second Edition*, edited by S.N. Durlauf and L.E. Blume. London: Macmillan. (You can skip over the game theory references. Read to learn the basic concepts.)
- Example: Milner-Gulland, E J and Leader-Williams, N. 1992. A Model of Incentives for Illegal Exploitation of Rhinos and Elephants: Poaching Pays in Luangwa Valley, Zambia. *Journal of Applied Ecology*, 29(2): 388-401. (Economic incentives and poaching.)
- Example: Jones, J., M. Andriamarivololona, and N. Hockley. 2008. The Importance of Taboos and Social Norms to Conservation in Madagascar. *Conservation Biology* 22(4): 976-986. (Read this to see an example.)
- Example: Kerr, J., M. Vardhan, R. Jindal. 2012. Prosocial behavior and incentives: Evidence from field experiments in rural Mexico and Tanzania. *Ecological Economics* 73: 220-227. (Discusses an experiment to evaluate when social norms / norm-based collective action and monetary economic incentives work best when common property is involved.)

3. Biodiversity and Ecosystem Services

- Polasky, Costello, and Solow, The Economics of Biodiversity. Sections 2 and 3

- Heal, G. 2004. Economics of biodiversity: An introduction. *Resource and Energy Economics* 26: 105-114.

3.1. Biodiversity and Ecosystem Services

- Powerpoint Lecture: 9. Ecosystem Services
- Purpose: This short lecture covers MEA's 5 ecosystem services, provides definitions and basic background, etc.
- Polasky, Costello, and Solow, The Economics of Biodiversity **Read Section 3.3.**
- Aylward, Appropriating the Value of Wildlife and Wildlands, Chapter 3 in Swanson and Barbier. **Read pages 49-61.**
- Perrings, C., Naeem, S., Ahrestani, F., Bunker, D. E., Burkill, P., Canziani, G., Elmqvist, T., et al. (2010). Ecosystem Services for 2020. *Science*, 330(6002), 323 -324. (Skim if you want to read more.)
- Barker et al. Biodiversity, Ecosystems and Ecosystem Services. Chapter 2 in TEEB (2010) *The Economics of Ecosystems and Biodiversity: The Ecological and Economic Foundations*. Edited by Pushpam Kumar. London and Washington: Earthscan. (Read as much as you want for a general biological background. You won't be tested on any of this material.)

Further Reading (Not Required):

- Millennium Ecosystem Assessment PowerPoint. (I won't directly lecture on this, but this extensive powerpoint summarizes the well-known MEA and gives lots of background facts on the problems. Skim this to get an idea of the factual background and issues.)
- Millennium Ecosystem Assessment Synthesis. 2005. *Ecosystems and Human Well-Being: Biodiversity Synthesis*. Washington, D.C.: World Resources Institute. (An alternative to the powerpoint listed above; skim through the executive summary to get an idea of the factual background and issues.)
- Pagiola, S., K. von Ritter, and J. Bishop. 2004. Assessing the Economic Value of Ecosystem Conservation. Environment Paper No. 101, Environment Department, World Bank. (Good overview paper of the economics of conservation plus plenty of case studies.)
- Convention on Biodiversity Conservation. 2010. *Global Biodiversity Outlook 3*.

3.2. Sustainability

- I don't cover this section, but included for comprehensiveness.
- Arrow, K. et al. 1995. Economic growth, carrying capacity, and the environment. *Science* 268: 520-521.

- Callicott, J.B. and K Mumford. 1997. Ecological sustainability as a conservation concept. *Conservation Biology* 11(1): 32-40.

4. Command-and-Control Conservation: Quota Schemes and Protected Areas

- Bulte et al. Section 3.1.

4.1. Protected Areas & Habitat Conversion

- Powerpoint Lecture 10: Protected Areas and Habitat Conversion
- Purpose: Discuss habitat conversion and protected areas, still the most fundamental and important conservation tool.
- Ferraro, P.J., M.M. Hanauer, and K.R.E. Sims. 2011. Conditions Associated with Protected Area Success in Conservation and Poverty Reduction. *Proceedings of the National Academy of Sciences of the United States of America* 108(34): 13913-13918.
- Joppa, L.N. and A. Pfaff. 2010. Global Area Protected Impacts. *Proceedings of the Royal Society B: Biological Sciences* 278(1712): 1633-1638. (Read only Section 1 & Section 4 for the main points, unless you are interested in the details of the study and how it was done.)
- Craigie, I.D., J.E.M. Braille, A. Balmford, C. Carbone, B. Collen, R.E. Green. 2010. Large Mammal Population Declines in Africa's Protected Areas. *Biological Conservation* 143: 2221-2228. (Skim to get the main empirical points. Don't worry about methodology or quantitative details.)
- Miteva, D, S. Pattanayak, and P. Ferraro. 2012. Evaluation of Biodiversity Policy Instruments: What Works and Doesn't? *Oxford Review of Economic Policy* 28(1): 69-92. (Skip the discussion of Section II.i. and Section IV.)

Further Reading (Not Required):

- Ferraro, P., M. Hanauer, D. Miteva, G. Canavire-Bacarreza, S. Pattanayak, and K.R.E. Sims. 2013. More Strictly Protected Areas are not Necessarily More Protective: Evidence from Bolivia, Costa Rica, Indonesia, and Thailand. *Environmental Research Letters* 8: 1-7.
- Ferraro, P.J. and M.M. Hanauer. 2011. Protecting Ecosystems and Alleviating Poverty with Parks and Reserves: 'Win-Win' or Tradeoffs? *Environmental and Resource Economics* 48: 269-286.
- Coad, L., A. Campbell, L. Miles, and K. Humphries. 2008. The Costs and Benefits of Forest Protected Areas for Local Livelihoods: A Review of the Current Literature. United Nations Environment Program. (Reviews a lot of the protected area literature from the perspective of costs and benefits.)
- Naughton-Treves, L., J. Alix-Garcia, and C. Chapman. 2011. Lessons about parks and poverty from a decade of forest loss and economic

- growth around Kibale National Park, Uganda. *Proceedings of the National Academy of Sciences* (An empirical analysis of impact of protected areas / parks on well-being of adjacent inhabitants.)
- Sims, K. 2010. Conservation and Development: Evidence from Thai Protected Areas. *Journal of Environmental Economics and Management* 60: 94-114. (An empirical analysis of the impact of protected areas / parks upon well-being of adjacent inhabitants.)

5. Direct Incentive Approaches: Markets and Market-Based Policy

5.1. Direct and Indirect Incentives for Conservation

- Powerpoint Lecture: 11. Direct and Indirect Conservation
- Purpose: Introduces direct conservation, which establishes direct incentives to conserve, and indirect conservation, which establishes indirect incentives to conserve through primarily enhancing employment and incomes and redirecting economic activity away from those that harm biodiversity or activities that create conservation as an indirect outcome.
- Polasky, Costello, and Solow, The Economics of Biodiversity. **Section 5**
- Bulte, E., G. van Kooten, and T. Swanson. 2003. Economic Incentives and Wildlife Conservation. **Read Sections 2 and 3.**

Further Reading (Not Required):

- Simpson, R.D. 2004. Conserving biodiversity through markets: A better approach. *PERC Policy Series* Issue Number PS-32: 1-28.
- Stavins, R. 2003. Experience with market-based environmental policy instruments. In *Handbook of Environmental Economics*, ed. M. Karl-Goran, and R.V. Jeffrey. Amsterdam: North Holland, 85 pp.
- Barrett, C.B., E. H. Bulte, P. Ferraro, and S. Wunder. No date. Economic Instruments for Nature Conservation
- Ostrom, E. 2010. Beyond markets and states: Polycentric governance of complex economic systems. *American Economic Review* 100: 641-672.

5.2. Payments for Environmental Services (PES)

- Powerpoint Lecture: 12. Conservation Payments
- Purpose: Introduce payments for ecosystem services, which are the primary form of direct conservation incentives and approaches.
- Engle, S., S. Pagiola, and S. Wunder. 2008. Designing payments for environmental services in theory and practice: An overview of the issues.

- Ecological Economics* 65(4): 663-674. (The gold standard reading defining PES. Start with this paper to lay out and define PES.)
- Kinzig, A.P., Perrings, C., Chapin, F.S., Polasky, S., Smith, V.K., Tilman, D. & Turner, B.L. 2011. Paying for Ecosystem Services: Promise and Peril. *Science*, 334: 603-604.
 - Jack, B.K., C. Kousky, and K. Sims. 2008. Designing Payments for Ecosystem Services: Lessons from Previous Experience with Incentive-Based Mechanisms. *Proceedings of the National Academy of Sciences* 105(28): 9465-9470.
 - Miteva, D, S. Pattanayak, and P. Ferraro. 2012. Evaluation of Biodiversity Policy Instruments: What Works and Doesn't? *Oxford Review of Economic Policy* 28(1): 69-92. (Skip the discussion of Section II.i. and Section IV.)
 - Example: Nelson, F. et al. 2009. Payments for Ecosystem Services as a Framework for Community-Based Conservation in Northern Tanzania. *Conservation Biology* 24(1): 78-85. (Skim to see an example.)
 - YouTube Video: Sven Wunder on PES
<http://www.youtube.com/watch?v=uNGPF1CdK-4>

Further Reading (Not Required):

- Alix-Garcia, J. and H. Wolff. In press. Payments for Ecosystem Services from Forests. *Annual Review of Resource Economics*. (Discusses lots of design details.)
- Cooley, D. and L. Olander. 2011. Stacking Ecosystem Service Payments: Risks and Solutions. Nicholas Institute for Environmental Policy Solutions Working Paper NI WP 11-04. Duke University, **Section 1. (Read Section 1 only** unless you want to delve deeper. Introduces basic idea of stacking and additionality, both of which are discussed more extensively in this paper.)
- Pattanayak, S., S. Wunder, and P.J. Ferraro. 2010. Show Me the Money: Do Payments Supply Environmental Services in Developing Countries? *Review of Environmental Economics and Policy* 4(2): 252-274. (Comprehensive review of PES in developing countries.)
- Niesten, E., Gjertsen, H., Fong, P. 2013. Incentives for Marine Conservation: Options for Small Island Developing States. *Environmental and Development Economics*. 18(4): 440-458. (Brings together the concepts of incentives, PES/direct conservation, and community/indirect conservation plus has three detailed case studies.)
- Gillenwater, M. 2012. What is Additionality? Implications for Stacking and Unbundling. Discussion Paper No. 003, Greenhouse Gas Management Institute, Silver Springs, Maryland.
- Bennett, K. 2010. Additionality: The Next Step for Ecosystem Service Markets. *Duke Environmental Law & Policy Forum* 20: 417-438.
- Woodward, R. T. 2011. Double-Dipping in Environmental Markets. *Journal of Environmental Economics and Management* 61(2): 153-169.

5.3. Biodiversity Offsets

- Powerpoint Lecture: 13. Biodiversity Offsets (1 lecture)
- Purpose: Discuss biodiversity offsets, both as a residual, last-resort approach after all other approaches in the mitigation hierarchy have been exhausted (the conventional approach) and as a least-cost, complementary conservation activity that is undertaken earlier in the mitigation hierarchy. Biodiversity offsets are voluntary provision of public goods.
- Bull, J., K. Suttle, A. Gordon, N. Singh, and E.J. Milner-Gulland. Biodiversity Offsets in Theory and Practice. 2013. *Oryx* 47(3): 369-380.
- Gjertsen, H., D. Squires, P. Dutton, and T. Eguchi. 2014. Cost-Effectiveness of Alternative Conservation Strategies with Application to the Pacific Leatherback Turtle. *Conservation Biology* 28(1): 140-149 doi: 10.1111/cobi.12239 (Skim: illustrates the advantages of least-cost conservation and starting offsets earlier in the mitigation hierarchy as a complementary activity rather than as a residual, last-resort activity.)

Further Reading (Not Required):

- ten Kate, K. and J. Pilgrim. 2014. Biodiversity Offsets Technical Paper. IUCN Technical Study Group on Biodiversity Offsets. Gland, Switzerland: International Union for the Conservation of Nature, 52 pages.
- Madsen, B., N. Carroll, and K. Moore. 2010. Offset and compensation programs worldwide. Washington: Ecosystem Marketplace.
- Boonie, R. 1999. Endangered species mitigation banking: promoting recovery through habitat conservation planning under the Endangered Species Act. *Science of the Total Environment* 240: 11-19.
- Burgin, S. 2008. BioBanking: an environmental scientist's view of the role of biodiversity banking offsets in conservation. *Biodiversity Conservation* 17:807–816.
- Salzman, J. and J. Ruhl. 2000. Currencies and the Commodification of Environmental Law. *Stanford Law Review* 53(3): 607-694.
- Wissel, S. and F. Wätzold. 2010. A Conceptual Analysis of the Application of Tradable Permits to Biodiversity Conservation. *Conservation Biology* 24(2): 404-411.
- Kotchen, M.J. Voluntary Provision of Public Goods for Bads: A Theory of Environmental Offsets. *The Economic Journal* 119: 883-899.

6. Indirect Incentives Approaches: Community Conservation, Alternative Livelihoods, and Eco-Tourism

6.1. Community Conservation

- Powerpoint Lecture: 14. Community Conservation (1.5-2 lectures)
- Purpose: Discuss a key form of indirect conservation, community conservation, which is also called Integrated Conservation and Development Projects.
- Milner-Gulland, E.J. and R. Mace. "Practical Considerations When Applying the Theory." Chapter 4, **Sections 4.4., pages 155-163** in Milner-Gulland and Mace, *Conservation of Biological Resources*. Blackwell Sciences.
- Bulte, E., G. van Kooten, and T. Swanson. 2003. Economic Incentives and Wildlife Conservation, **Section 2.1, pages 13-15**.
- Hackel, J. 1999. Community Conservation and the Future of Africa's Wildlife. *Conservation Biology* 13(4): 726-734.
- Example: Jackson, R. 2004. Pakistan's Community-based Trophy Hunting Programs and Their Relationship to Snow Leopard Conservation.

Further Reading (Not Required):

- Wilshusen, P., S. Brechin, C. Fortwangler, and P. West. 2002. Reinventing a Square Wheel: Critique of a Resurgent "Protection Paradigm" in International Biodiversity Conservation. *Society and Natural Resources* 15: 17-40. (Discusses renewed interest in top-down imposition of protected areas.)
- Naughton-Treves, L., J. Alix-Garcia, and C. Chapman. 2011. Lessons about parks and poverty from a decade of forest loss and economic growth around Kibale National Park, Uganda. *Proceedings of the National Academy of Sciences* (An empirical analysis of impact of protected areas / parks on well-being of adjacent inhabitants.)
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- Berkes, F. 2004. Rethinking community-based conservation. *Conservation Biology* 18(3): 621-630.

6.2. Indirect Incentives: Eco-Tourism

- Powerpoint Lecture: 15. Ecotourism (1.5 lectures)
- Purpose: Discuss eco-tourism, which is an indirect conservation approach.
- Barnes, Burgess, and Pearce. Wildlife tourism, Chapter 6 in Swanson and Barbier, editors. 1992. *Economics for the Wilds*.
- Hussain S. 2000. Protecting the Snow Leopard and Enhancing Farmers' Livelihoods. *Mountain Research and Development* 20(3): 226-331.
- Jackson, R. 2004. Pakistan's Community-based Trophy Hunting Programs and Their Relationship to Snow Leopard Conservation.

Further Reading (Not Required):

- Jackson, R. and R. Wangchuk. 2004. A Community-Based Approach to Mitigating Livestock Depredation by Snow Leopards. *Human Dimensions of Wildlife*, 9: 307–315
- Mishra, C., Allen, P., McCarthy, T., Madhusan, M. D., Bayarjargal, A., & Prins, H. T. 2003. The role of incentive programs in conserving the snow leopard. *Biological Conservation* 17(6), 1512–1520.
- Li, J. et al. 2013. Role of Tibetan Buddhist Monasteries in Snow Leopard Conservation. *Conservation Biology* 28(1): 87-94.
- Mishra, C., et al. 2003. The Role of Incentive Programs in Conserving Snow Leopards. *Conservation Biology* 17(6): 1512-1520.

6.3. Decentralization

- We won't cover this important topic, but some key references follow if you want to read about it on your own. This is decentralized provision of local public goods.
- Larson, A.M. 2002. Natural Resources and Decentralization in Nicaragua: Are Local Governments Up to the Job? *World Development* 30(1): 17-31.
- Larson, A.M. and F. Soto. 2008. Decentralization of Natural Resource Governance Regimes. *Annual Review of Environment and Resources* 33(1): 213-239.
- Besley, T. and S. Coate. 2003. Centralized versus Decentralized Provision of Local Public Goods: A Political Economy Approach. *Journal of Public Economics* 87(12): 2611-2637.
- Miteva, D, S. Pattanayak, and P. Ferraro. 2012. Evaluation of Biodiversity Policy Instruments: What Works and Doesn't? *Oxford Review of Economic Policy* 28(1): 69-92. (Skip the discussion of Section II.i. and Section IV.)

7. Applications and Case Studies

7.1. Game Ranching

- Powerpoint Lecture: 16. Game Ranching Illegal Trade (2 lectures)
- Purpose: Discuss a powerful economic conservation policy instrument.
- Luxmoore, R. and T. Swanson. 1992. Wildlife and Wildland Utilization and Conservation, Chapter 5 in Swanson and Barbier, eds., *Economics for the Wilds: Wildlife, Diversity, and Development*, 1992.
- Erwin Bulte and Richard Damania, "An Economic Assessment of Wildlife Farming and Conservation," *Conservation Biology*, Vol. 19, No. 4, August 2005, pp. 1222-1233.
- Norton-Griffith, Michael. 2003. The Case for Private Sector Investment in Conservation: An African Perspective. Vth World Park Congress, Durban,

South Africa, 7 pp. (An easy read. A real blast against state bureaucracies and in favor of private sector involvement in conservation.)

7.2. The Tiger

- Powerpoint Lecture: 17. Tigers (2 lectures)
- Purpose: Discuss status of tigers and a comprehensive conservation policy that utilizes all of the concepts the class has covered.
- Background: <http://www.21stcenturytiger.org/index.php?pg=facts>
- World Bank. 2008. *A Future for Wild Tigers*, 36 pp.
- Mitra, B. 2006. Sell the Tiger to Save It." *New York Times*. August 15, 2006.
http://www.nytimes.com/2006/08/15/opinion/15mitra.html?_r=1
- Zabel, A. and K. Holm-Müller. 2008. Conservation Performance Payments for Carnivore Conservation in Sweden. *Conservation Biology* 22(2): 247-251.

Further Reading (Not Required)

- Can the Wild Tiger Survive? by Virginia Morrell. *Science* vol. 317 September 2007
- Gratwicke, B., E. Bennett, S. Broad, S. Christie, A. Dutton, G. Gabriel, C. Kirkpatrick, and K. Nowell. 2008. "The World Can't Have Wild Tigers and Eat Them, Too." *Conservation Biology*, 22(1): 222–223.
- Linkie, M. and S. Christie. 2007. "The Value of Wild Tiger Conservation." *Oryx*, 41(4): 415–416.
- Abbott, B. and G.C. van Kooten. 2011. Can Domestication of Wildlife Lead to Conservation? The Economics of Tiger Farming in China." *Ecological Economics* 70(4): 721-728.

7.3. Poaching

- Powerpoint Lecture: 18. Poaching
- Purpose: Discuss poaching and illegal wildlife exploitation.
- Milner-Gulland, E.J. and N. Leader-Williams. Illegal Exploitation of Wildlife. Chapter 9 in T.M. and E. Barbier, editors. 1992. *Economics for the Wilds: Wildlife, Diversity, and Development*. Island Press, Washington, D.C.
- Messer, K.D. 2010. Protecting Endangered Species: When Are Shoot-On-Sight Policies The Only Viable Option to Stop Poaching? *Ecological Economics* 69: 2334-2340.
- Challender, D.W.S. and D.C. MacMillan. 2014. Poaching is More Than An Enforcement Problem. *Conservation Letters* doi: 10.1111/conl.12082
- *New York Times* article
http://www.nytimes.com/2012/09/04/world/africa/africas-elephants-are-being-slaughtered-in-poaching-frenzy.html?pagewanted=all&_r=0

- *National Geographic* article
<http://ngm.nationalgeographic.com/2012/10/ivory/christy-text>
- http://iccfoundation.us/index.php?option=com_content&view=article&id=445&Itemid=367

Further Reading (Not Required)

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7.4. Snow Leopards

- Hussain S. 2000. Protecting the Snow Leopard and Enhancing Farmers' Livelihoods. *Mountain Research and Development* 20(3): 226-331.
- Jackson, R. and R. Wangchuk. 2004. A Community-Based Approach to Mitigating Livestock Depredation by Snow Leopards. *Human Dimensions of Wildlife*, 9: 307–315
- Mishra, C., Allen, P., McCarthy, T., Madhusan, M. D., Bayarjargal, A., & Prins, H. T. 2003. The role of incentive programs in conserving the snow leopard. *Biological Conservation* 17(6), 1512–1520.
- Jackson, R. 2004. Pakistan's Community-based Trophy Hunting Programs and Their Relationship to Snow Leopard Conservation.

7.5. Forests, Carbon, REDD+

- Introduction to the concepts and opportunities of forest carbon and carbon markets, with an emphasis on emission reduction schemes, avoided deforestation, and opportunity costs of conservation.
- Godfrey, L. 2011. Conquering Nature: The Implications of Assigning Economic Values to Global Commons. *e-International Relations*.
- Hufty, M. and A. Haakenstad. 2011. Reduced Emissions for Deforestation and Degradation: A Critical Review. *Consilience: The Journal of Sustainable Development* 5(1): 1-24.

7.6. Bighorn Sheep/Mountain Lions/Wolves

- Guest Speaker

7.7. Bushmeat Hunting

7.8. The Vaquita

- Guest Speaker

- Jaramillo-Legorreta, A., L. Rojas-Bracho, R. Brownell Jr., A. Read, R. Reeves, K. Ralls, and B. Taylor. 2007. Saving the Vaquita: Immediate action, not more data. *Conservation Biology* 21(6): 1653–1655.
- D'agrosa, C., C. Lennert-Cody, O. Vidal. 2000. Vaquita Bycatch in Mexico's Artisanal Gillnet Fisheries: Driving a Small Population to Extinction. *Conservation Biology* 14(4): 1110-1119.
- Barlow, J., L. Rojas Bracho, C. Muñoz, S. Mesnick. In press 2009. Conservation of the Vaquita (*Phocoena sinus*) in the northern Gulf of California, Mexico, in R.Q. Grafton, R. Hilborn, D. Squires, M. Tait, and M. Williams, editors, *Handbook of Global Fisheries Management*. Oxford: Oxford University Press.

6.7. Migratory Species

- Guest speaker on migratory seabirds

6.8. Conservation in San Diego County

- Guest speaker