

**Economics 144**  
**Economics of Conservation**  
**Summer Session II, 2020**

**Course Hours:** MTWTh 3:30 – 4:50 PM

**Classroom:** Online Zoom

**Instructor:** Dale Squires [dsquires@ucsd.edu](mailto:dsquires@ucsd.edu)

**Office Hours:** Immediately after class or by appointment

**TA:** Michael Chua [mchua@ucsd.edu](mailto:mchua@ucsd.edu)

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**Office:** N/A

**Office Hours:** To Be Determined

**Weekly Review Session:** To Be Determined

**Course Dates:** Monday, August 3 – Saturday, September 5

**Midterm:** Exam given in third week, August 20, 3:30pm-4:40pm. Covers material through Section 3. Covers first two weeks of material and class (Aug 3-14).

**Midterm Review Sessions:** 2-3 days before the midterm

**Final:** Friday September 4, 3:00pm - 4:30pm

**Final Exam Review Sessions:** Sunday, August 30 & Wednesday September 3

**Some Important Dates for Students:**

Drop without a “W” Posted to Transcript and Refund:	August 7
Drop without “W” Posted to Transcript and No Refund:	August 14
Change Grade Option:	August 14
Can No Longer Drop Class:	August 24
Last Day to File an Incomplete:	September 7

**Some Important Contacts for Students:**

Undergraduate advisors are available to answer questions from students, regarding Department policy and procedure, and University processes. If you have questions that do not relate to the direct instruction of this course, please contact:

**UC San Diego students:** Submit questions to [vac.ucsd.edu](http://vac.ucsd.edu) (the Virtual Advising Center)

**Visiting students:** Email questions to [econugadvisor@ucsd.edu](mailto:econugadvisor@ucsd.edu)

Common questions that you can ask include:

- Class enrollments and waitlists
- Late Adds
- Dropped for non-payment of fees
- Grading option for majors/minors
- Increasing seats/adding more sections

**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 course approaches biodiversity and ecosystems and their services as impure public goods, with both market and non-market values. The economic question becomes how to obtain the optimum level of both private and public goods and services and their optimum mix. In the process, up to five externalities are considered: the public good biodiversity and ecosystem service externality, the externality from exploiting a renewable resource impure public good at the sub-optimal time, the asymmetric information externality due to producers having more information than consumers about the impact upon biodiversity and ecosystem services, the transboundary externality if the biodiversity or ecosystem straddles two or more jurisdictions, and knowledge for technological change.

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 125: Communities and the Environment.

### Readings Availability

- All readings are available in pdf files from the class Canvas website.
- Basic economic theory is in your textbooks from microeconomics classes, although I will lecture on it, and the core readings present the concepts.
- Many 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 and see how they work in the real world.
- Exception: All papers by Norton-Griffiths should be more closely read. I repeatedly refer to his work, and his examples may be used on exams to frame the questions through an example.

### Core Readings (Canvas Module 0)

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.)
- 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. (Discusses most of the major economic concepts developed in this class. Warning: Figure 2 has an error that is corrected in class.)

- 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. Warning: The basic public goods figure and types of public goods (e.g. best shot, weakest link) is fundamental material and will be on exam.)
- Dasgupta, P. 2020. The Dasgupta Review – *Independent Review on the Economics of Biodiversity, Interim Report*. Government of the United Kingdom. Available on Canvas and online at: [https://asvis.it/public/asvis2/files/News/DASGUPTA\\_REVIEW\\_ECON\\_BIO\\_DIVERSITY\\_INTERIM\\_REPORT\\_2020.pdf](https://asvis.it/public/asvis2/files/News/DASGUPTA_REVIEW_ECON_BIO_DIVERSITY_INTERIM_REPORT_2020.pdf) or <https://www.gov.uk/government/publications/interim-report-the-dasgupta-review-independent-review-on-the-economics-of-biodiversity>
  - Dasgupta approaches biodiversity and ecosystem services as the optimal use of natural capital, including the optimum rate of return. This class acknowledges the natural capital approach but instead approaches the economic issue as an impure public goods problem.
- 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.)

### General Source of Conservation Information

Mongabay.com and news.mongabay.com

### Evaluation: Exams, Grades, and Re-Grades

- One midterm and final exam, each of which is 45% of the final course grade.
- Four quizzes, each 2.5% of the grade.
- You will not be explicitly tested on examples from readings other than the case studies in class. Warning: However, you are expected to know the basic of the examples in the various Norton-Griffiths papers.
- 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.
- During the exam, you will be asked to record yourself via zoom and make the record available on the web to the instructor and TAs. This approach will help minimize inappropriate examination behavior.

## 1. Introduction (Canvas Module 1)

- Powerpoint Lecture: 1. Introduction
- Purpose: Review basic biodiversity status of the planet and how economics of conservation approaches this issue.
- Reading (Required):
- Dasgupta, P. 2020. *The Dasgupta Review – Independent Review on the Economics of Biodiversity, Interim Report*. Government of the United Kingdom. (Skim: Chapter 1 and pages 19-26.)
  - Available on Canvas and online at:  
[https://asvis.it/public/asvis2/files/News/DASGUPTA\\_REVIEW\\_ECON\\_BIODIVERSITY\\_INTERIM\\_REPORT\\_2020.pdf](https://asvis.it/public/asvis2/files/News/DASGUPTA_REVIEW_ECON_BIODIVERSITY_INTERIM_REPORT_2020.pdf) or  
<https://www.gov.uk/government/publications/interim-report-the-dasgupta-review-independent-review-on-the-economics-of-biodiversity>
- Reading (Optional):
- 99 Conservation Successes You May Have Missed:  
<https://medium.com/future-crunch/99-good-news-stories-you-probably-didnt-hear-about-in-2018-cc3c65f8ebd0>
- 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.)

## 2. Review of Economic Concepts

### 2.1. Externalities and Market Failure (Canvas Module 2)

- Powerpoint Lecture: 2. Environmental Externalities and Market Failure  
Purpose: Review basic economic concepts.
- Reading (Optional): 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.)
- 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.)
- Illustration of Coase Theorem:  
<http://www.sjsu.edu/faculty/watkins/coasetheorem.htm>

## 2.2. Total Economic Value and Markets for Biodiversity (Canvas Module 3)

- Powerpoint Lecture: 3. Biodiversity Markets
- Purpose: Develop concept of total economic value and present various types of markets for biodiversity.
- Reading (Required):
- 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. On midterm.)
- 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.)

## 2.3. Opportunity Costs of Conservation: Impacts on Local Inhabitants (Canvas Module 4)

- 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.
- Reading (Required):

- Example: Norton-Griffiths, M. and C. Southey. 1995. The opportunity costs of biodiversity conservation in Kenya. *Ecological Economics* 12(2): 125-139. (Know basics of the example, including basic concept.)
- 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. (Skim to get the basic idea and an example.)
- Borneo rain forests:  
<http://www.timesonline.co.uk/tol/news/world/asia/article5908207.ece>

## 2.4. Costs, Benefits, and Discounting (Canvas Module 5)

- Most not likely covered in 2020.
- 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. Discuss the Ramsey Rule of social discounting and how intra- and inter-generational equity and risk impact the discount rate and the impact upon conservation decisions, particularly those that are long-term and for species that are slow-growing or near extinction.
- Reading (Required):
- 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.)
- Video: Kahn Academy, Economic Profit versus Account Profit (includes opportunity cost) <https://www.khanacademy.org/economics-finance-domain/microeconomics/firm-economic-profit/economic-profit-tutorial/v/economic-profit-vs-accounting-profit>
- Optional Reading: Arnsworth, P.R. "Time Discounting and the Decision to Protect Areas that are Near and Threatened or Remote and Cheap to Acquire." *Conservation Biology* 32(5): 1063-1073.

## 2.5. Economic Efficiency and the Mitigation Hierarchy (Canvas Module 6)

- Powerpoint Lecture: 6. Economic Efficiency and the Mitigation Hierarchy
- Purpose: Develop the biodiversity mitigation hierarchy framework and how partial and full compensation fit in, yielding partial net gain, no net loss, and net gain. Examines concept of no net loss. Integrate economic efficiency, including least-cost conservation, into the mitigation hierarchy to show: (1) how greater conservation can be achieved when there are conservation budgets and (2) the opportunity cost of foregone conservation when following the mitigation hierarchy without consideration of the direct and indirect costs of conservation.

- Reading (Required):
- Garcia, S.M. and D. Squires. 2016. "Economic Efficiency and the Mitigation Hierarchy." *Conservation Biology* 32(5): 989-997. (Know concepts of direct vs. incentive-based regulation, what mitigation hierarchy is and why conventional application leads to ineffective and inefficient conservation, what least-cost conservation is and how it works in turns of mitigation hierarchy and how it leads to greater conservation given a fixed conservation budget. Forms basis of powerpoint lecture.)
- Griffiths, V.F., J.W. Bull, J. Baker, and E.J. Milner-Gulland. 2019. "No Net Loss for People and Biodiversity." *Conservation Biology* 33(1): 76-87. (Skim. Know basic idea, but don't need to know all the details.)
- Another advocate of using biodiversity offsets earlier than the residual, fourth step (Optional):
- Moilanen, A. and J.S. Kutiaho. In press. "Three Ways to Deliver a Net Positive Impact with Biodiversity Offsets." *Conservation Biology*.
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## 2.6. Property Rights (Canvas Module 7)

- Powerpoint Lecture: 7. Property Rights
- Purpose: Introduce the economics of property rights, including types of rights and characteristics of rights.
- Reading (Required):
- 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. Know characteristics of property rights, types of property rights, and examples for midterm.
- 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. Be able to recognize this example and its basic idea for midterm.

## 2.7. Public Goods, Common Resources, Coase Theorem (Canvas Module 8)

- Powerpoint Lecture: 8. Impure Public Goods (two lectures)
- Purpose: Introduce pure and impure public goods, also known as mixed goods, and the different ways in which they can be provided.
- Reading (Required):



- 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. Provides canonical additive public good diagram. On midterm.)
- Bulte, van Kooten, and Swanson. 2003. Economic Incentives and Wildlife Conservation. **Read Section 1.**
- Optional:
- Video: Kahn Academy, Negative Externalities  
<https://www.khanacademy.org/economics-finance-domain/microeconomics/consumer-producer-surplus/externalities-topic/v/negative-externalities>
- Video: Kahn Academy, Taxes for Negative Externalities  
<https://www.khanacademy.org/economics-finance-domain/microeconomics/consumer-producer-surplus/externalities-topic/v/taxes-for-factoring-in-negative-externalities>
- Video: Kahn Academy, Positive Externalities  
<https://www.khanacademy.org/economics-finance-domain/microeconomics/consumer-producer-surplus/externalities-topic/v/positive-externalities>
- Video: Kahn Academy, Tragedy of the Commons  
<https://www.khanacademy.org/economics-finance-domain/microeconomics/consumer-producer-surplus/externalities-topic/v/tragedy-of-the-commons>

## 2.8. Collective Action, Social Norms, and Economic Incentives (Canvas Module 9)

- Powerpoint Lecture: 9. Collective Action and Social Norms
- Purpose: Introduce social norms, an important complement to economic incentives.
- Reading (Required):
- Young, P. 2008. Social Norms. *New Palgrave Dictionary of Economics, Second Edition*, edited by S.N. Durlauf and L.E. Blume. London: Macmillan.
  - This paper should be selectively read. You can skip over the game theory discussion. Read the conceptual parts to learn the basic concepts.
- Additional Readings (Optional):
- Young, P. 2015. The Evolution of Social Norms. *Annual Review of Economics* 7: 359-387. (Source of some lecture material, from earlier parts of article.)

- Gneezy, U., S. Meier, and P. Rey-Biel. 2011. When and Why Incentives (Don't) Work to Modify Behavior. *Journal of Economic Perspectives* 25(4): 191-210. (Source of some lecture material.)
- Nyborg et al. Social Norms as Solutions. *Science* 354 (6308).
- 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. (Skim to see 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. (Skim 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. (Skim. 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

- No lecture or required readings for this sub-section.
- Basic Reference:
- Dasgupta, P. 2020. *The Dasgupta Review – Independent Review on the Economics of Biodiversity, Interim Report*. Government of the United Kingdom
- Optional References:
- 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 (Canvas Module 10)

- Powerpoint Lecture: 10. Ecosystem Services
- Purpose: This short lecture covers MEA's ecosystem services, provides definitions and basic background, etc. You should know them and examples for the exam.
- Reading (Required):
- Dasgupta, Pages 11-13, especially Box 1A on pages 12-13.
- Reading (Optional):
- 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.)

#### Supplemental Material

- 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.)
- UNEP. Ecosystems and Their Services. (Excellent introduction to ecosystems and their services for a lay person. Skim if you like.)

### 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.

**MIDTERM FOR 2020 COVERS ALL MATERIAL THROUGH SECTION 3.  
TAKES TWO WEEKS TO COVER. EXAM GIVEN IN THIRD WEEK OF CLASS.**

### 4. Direct Regulation and Conservation: Technology, Process, and Performance Standards (Including) Protected Areas (Canvas Module 12)

- Powerpoint Lecture: 11. Direct Regulation
- Purpose: Introduce direct regulation by the government, also called command-and-control regulation. Direct regulation is through standards (technology, process, and performance), and includes protected areas and direct provision of public goods by the public and sometimes private sectors. Discusses four broad approaches to public regulation: (1) private solutions (intrinsic motivation and voluntary), (2) direct regulation, (3) incentive-based / market-based, and (4) hybrid of direct and incentive-based conservation (liability laws).
- Reading (Required):
- Bulte et al. Section 3.1.
- Helfand, G. 2013. "Standards." *Encyclopedia of Energy, Natural Resource, and Environmental Economics* 3:217-221.

#### 4.1. Protected Areas & Habitat Conversion: 1/2 Lecture (Canvas Module 11)

- Powerpoint Lecture 12 Short: Protected Areas and Habitat Conversion (< 0.5 full lecture)

- Purpose: Discuss habitat conversion and protected areas, still the most fundamental and important conservation tool. Direct provision of public goods by public and private sectors.
- Reading (Optional):
- Akçakaya, H.R., G. Mills, and C. P. Doncaster. 2007. "The Role of Metapopulations in Conservation." Pages 64-84 in *Key Topics in Conservation Biology*. D.W. Macdonald and K. Service, editors. Blackwell Publishing.

Additional Reading (Optional):

- Popular article on conservation corridors from The Atlantic: <https://www.theatlantic.com/science/archive/2017/08/animal-commutes-connectivity/537951/>
- 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.)
- Volenec, Z.M. and A.P. Dobson. 2020. "Conservation Value of Small Reserves." *Conservation Biology* 34(1): 66-79.

## **5. Direct Incentive Approaches to Biodiversity & Ecosystem Public Good: Markets and Market-Based Policy**

### **5.1. Direct and Indirect Incentives for Conservation**

- Powerpoint Lecture: 13. Direct and Indirect Conservation (1 lecture)
- Purpose: Introduces direct incentive-based conservation, which establishes direct incentives to conserve, and indirect conservation, which through community conservation or alternative livelihoods (integrated conservation and development projects) 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.

- Reading (Required):
- 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.**
- Gjertsen, H. and T. Stevenson. 2011. Direct Incentives for Leatherback Turtle Conservation. Chapter 11 in P. Dutton, D. Squires, and M. Ahmed, editors. *Conservation of Pacific Sea Turtles*. Honolulu: University of Hawaii Press. (Read only pages 164-170.)
- Reading (Optional):
- Chiavacci, S.J. and E.J. Pindilli. 2020. "Trends in Biodiversity and Habitat Quantification Tools Used for Market-Based Conservation in the United States. *Conservation Biology* 34(1):125-136. (Skim: Gives status of market (incentive)-based conservation policy instruments in the USA.)

## 5.2. Payments for Environmental Services (PES) (Canvas Module 14)

- Powerpoint Lecture: 14. Conservation Payments (1.5 lectures)
- Purpose: Introduce payments for ecosystem services (PES), which are one of the most important forms of direct conservation incentives.
- Reading (Required):
- 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.
- 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>
- Additional Reading (Optional): Marshall, L. and M. Selman. 2010. Markets for Ecosystem Services: Principles, Objectives, Designs, and Dilemmas. Washington, D.C. World Resources Institute.

## 5.3. Biodiversity Offsets (Canvas Module 16)

- Powerpoint Lecture: 15. 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.

- Reading (Required):
- 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.
- Additional Reading (Optional):
- Example:
- 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.
- Current Assessment:
- zu Ermgassen, S.O.S.E., J. Baker, R.A. Griffiths, N. Strange, M.J. Struebig, and J.W. Bull. 2019. "The Ecological Outcomes of Biodiversity Offsets under "No Net Loss" Policies: A Global Review." *Conservation Letters*
- Theis, S., J.W. Ruppert, K.N. Roberts, C.K. Minns, M. Koops, and M.S. Poesch. 2020. "Compliance with and Ecosystem Function of Biodiversity Offsets in North American and European Freshwaters." *Conservation Biology* 34(1): 41-54.

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

### 6.1. Community Conservation and Integrated Conservation and Development Projects: NOT Covered in 2020 (Canvas Module 16)

- I'm not covering the topic this year in order to leave more time for case studies.
- Powerpoint Lecture: 16. 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.
- Reading (Required):
- 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.**
- Reading (Optional):
- Hackel, J. 1999. Community Conservation and the Future of Africa's Wildlife. *Conservation Biology* 13(4): 726-734.
- Hughes, R. and F. Flintan. 2001. Integrating Conservation and Development Experience: *A Review and Bibliography of the ICDP Literature*. London: International Institute for Environment and Development. (Read pages 1-11 [through Section 2.5])
- Example: Jackson, R. 2004. Pakistan's Community-based Trophy Hunting Programs and Their Relationship to Snow Leopard Conservation.

## 6.2. Indirect Incentives: Eco-Tourism (Canvas Module 17)

- Powerpoint Lecture: 17. Ecotourism (2 lectures)
- Purpose: Discuss eco-tourism, which is an indirect conservation approach. Introduces several extremely interesting examples, notably snow leopards and trophy hunting.
- Reading (Required):
- Barnes, Burgess, and Pearce. Wildlife tourism, Chapter 6 in Swanson and Barbier, editors. 1992. *Economics for the Wilds*. (Skim for main points.)
- Additional Reading on Snow Leopard (Optional):
- Hussain S. 2000. Protecting the Snow Leopard and Enhancing Farmers' Livelihoods. *Mountain Research and Development* 20(3): 226-331.
- Li, J., H. Yin, D. Wang, A. Jiagong, and Z. Lu. Human-snow leopard conflicts in the Sanjiangyuan Region of the Tibetan Plateau. *Biological Conservation* 166: 118-123.
- Jackson, R. 2004. Pakistan's Community-based Trophy Hunting Programs and Their Relationship to Snow Leopard Conservation.
- Lindsey, P.A. 2007. "Economic and Conservation Significance of the Trophy Hunting Industry in Sub-Saharan Africa." *Biological Conservation* 134: 455-469.
- Additional Reading on Trophy Hunting (Optional):
- Batavia, C., M.P. Nelson, C.T. Darimont, P.C. Paquet, W.J. Ripple, and A.D. Wallach. 2019. The Elephant (Head) in the Room: A Critical Look at Trophy Hunting. *Conservation Letters* 12(1)
- Dickman, A.J. et al. 2019. Is There an Elephant in the Room? A Response to Batavia et al. *Conservation Letters* 12(1)
- Cove, M.V. 2019. What if Trophy Hunters Did Not Kill Their Trophies? *Conservation Letters* 12(1).
- Di Minin, E., N. Leader-Williams, and C.J.A. Bradshaw. 2016. Banning Trophy Hunting Will Exacerbate Biodiversity Loss. *Trends in Ecology & Evolution* 31: 99–102.

- Ripple, W. J., T.M. Newsome and G.I.H. Kerley, G. I. H. 2016. Does Trophy Hunting Support Biodiversity? A Response to Di Minin et al. *Trends in Ecology and Evolution* 7: 495–496.
- Funston, P. J., R.J. Groom, and P.A. Lindsey. 2013. Insights into The Management of Large Carnivores for Profitable Wildlife-Based Land Uses in African Savannas. *PLoS ONE* 8, e59044.

Further Reading (Optional):

- 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.

### 6.3. Decentralization: **NOT Covered in 2020**

- I'm not covering the topic this year in order to leave more time for case studies
- Purpose: This is decentralized provision of local public goods. Community Conservation Section 6.1. (Powerpoint 16) covers provision by communities and this concerns governments and other organizations.
- Reading:
- Enters, T. and J. Anderson. 1999. Rethinking the Decentralization and Devolution of Biodiversity Conservation. *Unasylva* 50(4). Decentralization and Devolution in Forestry. Rome: Food and Agriculture Organization of the United Nations.  
<http://www.fao.org/docrep/x3030e/x3030e04.htm#rethinking%20the%20decentralization%20and%20devolution%20of%20biodiversity%20conservation>
- Examples: Wyckoff-Baird, B., A. Kaus, C.A. Christen, and M. Keck. 2013. *Shifting the Power: Decentralization and Biodiversity Conservation*. Biodiversity Support Program, United States Agency for International Development, Washington, D.C. (Skim for update on current view of effectiveness and case studies. An easy read.)

## 8. Applications and Case Studies

### 8.1. Game Ranching (Canvas Module 18)

- Powerpoint Lecture: 18. Game Ranching Illegal Trade (1.5 lectures)



- Purpose: Discuss a powerful and controversial economic conservation policy instrument.

Reading (Optional):

*Financial Times* “Will Covid-19 Tame China’s Wildlife Trade?” pdf available. Any students from China or interested in China and also impact of Covid-19 will find this interesting and important.

[https://www.environment.gov.za/sites/default/files/docs/wildliferanching\\_contributionto\\_southafrica\\_economy.pdf](https://www.environment.gov.za/sites/default/files/docs/wildliferanching_contributionto_southafrica_economy.pdf)

[https://mountainscholar.org/bitstream/handle/10217/180942/CONF\\_IWRS\\_2016-plenary1\\_3-Oberem.pdf?sequence=1&isAllowed=y](https://mountainscholar.org/bitstream/handle/10217/180942/CONF_IWRS_2016-plenary1_3-Oberem.pdf?sequence=1&isAllowed=y)

Guardian Newspaper: <http://www.theguardian.com/vital-signs/2015/aug/03/cecil-lion-ivory-online-wildlife-trafficking-ebay>

Guardian Newspaper: <http://www.theguardian.com/vital-signs/2015/may/11/poaching-white-rhino-south-africa-texas-rhinoceros>

New York Times: <http://www.nytimes.com/2015/08/11/world/africa/outcry-for-cecil-the-lion-could-undercut-conservation-efforts.html?action=click&pgtype=Homepage&version=Most-Visible&module=inside-nyt-region&region=inside-nyt-region&WT.nav=inside-nyt-region&r=0>

New York Times: Africa’s Big 5 Trophy Animals:

[http://www.nytimes.com/interactive/2015/08/10/world/africa/africa-big-game-hunting.html?\\_r=1](http://www.nytimes.com/interactive/2015/08/10/world/africa/africa-big-game-hunting.html?_r=1)

- 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. (Read carefully. Discussed in detail in class and invariable on final exam.)
- 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.)
- Pitman, R.T., J. Fattebert, S.T. Williams, and K.S. Williams et al. 2017. The Conservation Costs of Game Ranching. *Conservation Letters* 10(4): 403-4013.

## 8.2. The Tiger (Canvas Module 19)

- Powerpoint Lecture: 19. Tigers (1.5 lectures)
- Purpose: Discuss status of tigers and a comprehensive conservation policy that utilizes all of the concepts the class has covered.

- Reading (Optional):
- 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](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.

### 8.3. African Elephants, Rhinos, and Illegal Trade (Canvas Module 20)

- Powerpoint Lecture: 20. Elephants, Rhinos, Illegal Trade (1 lecture)
- Purpose: Trade in ivory and rhino horns and poaching pose serious threats to African elephants and rhinos. These animals could disappear from many parts of the continent for good. Illegal trade in ivory and horns fuels much of the poaching. Other threats are habitat loss that we discuss elsewhere.
- Reading (Optional):
- Video: History of Ivory Trade, *National Geographic*  
<http://education.nationalgeographic.com/media/history-ivory-trade/>
- New York Times on elephants:  
<http://topics.nytimes.com/top/reference/timestopics/subjects/e/elephants/index.html>
- <https://www.nytimes.com/2019/07/01/science/elephants-poaching-botswana.html>
- CNN on elephants:
- <https://www.cnn.com/2019/06/06/world/elephants-poaching-decrease-trnd/index.html>
- Guardian Newspaper on elephant poaching:
- <https://www.theguardian.com/environment/2019/may/28/africas-elephant-poaching-is-in-decline-analysis-suggests>
- AAAS on elephant poaching:
- <https://www.sciencemag.org/news/2019/05/elephant-poaching-falls-dramatically-africa>
- New York Times on illegal wildlife trade:  
[http://www.nytimes.com/2015/02/12/us/politics/obama-administration-to-target-illegal-wildlife-trafficking.html?\\_r=0](http://www.nytimes.com/2015/02/12/us/politics/obama-administration-to-target-illegal-wildlife-trafficking.html?_r=0)
- Guardian Newspaper on rhinos:
- <https://www.theguardian.com/science/the-h-word/2017/mar/03/what-drives-the-demand-for-rhino-horns>
- <https://www.theguardian.com/environment/2017/mar/10/high-price-of-rhino-horn-leaves-bloody-trail-across-the-globe>
- <http://www.theguardian.com/world/2015/may/11/rhino-poaching-in-south-africa-at-record-levels-following-18-rise-in-killings>

- Yahoo on rhinos: <https://www.yahoo.com/travel/title-on-the-frontlines-of-the-rhino-genocide-96923355312.html>
- Washington Post on illegal trade: [http://www.washingtonpost.com/national/health-science/overwhelmed-us-port-inspectors-unable-to-keep-up-with-illegal-wildlife-trade/2014/10/17/2fc72086-fe42-11e3-b1f4-8e77c632c07b\\_story.html](http://www.washingtonpost.com/national/health-science/overwhelmed-us-port-inspectors-unable-to-keep-up-with-illegal-wildlife-trade/2014/10/17/2fc72086-fe42-11e3-b1f4-8e77c632c07b_story.html)
- National Geographic. Can Elephants Survive A Legal Ivory Trade? Debate is Shifting Against It. (Popular press article. Easy to read.) <http://news.nationalgeographic.com/news/2014/08/140829-elephants-trophy-hunting-poaching-ivory-ban-cities/>
- VICE NEWS on California Law on Selling Ivory and Rhino Horn: <https://news.vice.com/article/its-going-to-be-a-bit-harder-to-sell-ivory-and-rhino-horn-in-california>
- Hsiang, S. and N. Sekar. 2016. "Does Legalization Reduce Black Market Activity? Evidence from a Global Ivory Experiment and Elephant Poaching Data." Working Paper 22314. National Bureau of Economic Research.
- Wasser et al. 2014. "Elephants, Ivory, and Trade." *Science* 327: 1331-1332.
- Lemieux, A. and A. Clarke. 2009. "The International Ban on Ivory Sales and Its Effects on Elephant Poaching in Africa." *British Journal of Criminology* 49: 451-471.
- Bennett, E.L. 2014. "Legal Ivory Trade in a Corrupt World and Its Impact on African Elephant Populations." *Conservation Biology* 29(1): 54-60.
- Felbab-Brown, V. 2019. *The Extinction Market: Wildlife Trafficking and How to Counter It*. Oxford University Press.

#### **8.4. International Environmental Agreements (Canvas Module 21)**

- Powerpoint Lecture: 21. International Environmental Agreements
- Purpose: International environmental agreements are fundamental to conservation of many species of flora and fauna – and genetic material – due to the global public good and global common resource nature of these species and their international trade.
- Readings (Optional. These readings form the basis of the lecture):
- Scott Barrett. 2003. *Environment & Statecraft: The Strategy of Environmental Treaty-Making*. Oxford: Oxford University Press.
- Scott Barrett. 2005. "The Theory of International Environmental Agreements. Chapter 28 in *Handbook of Environmental Economics, Volume 3*. Edited by K.-G. Mäler and J.R. Vincent. Elsevier B.V, pp. 1458-1516.

## HIGHLY UNLIKELY WE GET TO LECTURES AFTER THE PREVIOUS ONE!!



### 8.5. Forests, Carbon, REDD+

- Powerpoint Lecture: 22. Forests, Carbon, and REDD+ (1 hour)
- Purpose: 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.

Guardian Newspaper: <http://www.theguardian.com/world/2015/nov/24/redd-papua-new-guinea-money-grow-on-trees?INTCMP=the-essential-read-automated>

### 8.6. Poaching

- Powerpoint Lecture: 23. Poaching
- Purpose: Further 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* 7: 484-494. doi: 10.1111/conl.12082
- Mason, C.F., E.H. Bulte, and R.D. Horan. 2012. Banking on Extinction: Endangered Species and Speculation. *Oxford Review of Economic Policy* 28(1): 180-192.
- Holden, M.H., D. Biggs, H. Brink, J. Rhodes, and E. McDonald-Madden. 2019. Increase Anti-Poaching Law-Enforcement or Reduce Demand for Wildlife Products? A Framework to Guide Strategic Conservation Investments. *Conservation Letters* 12(3)
- Economist Magazine: Big Game Poachers  
<http://www.economist.com/news/middle-east-and-africa/21631202-claims-links-between-politicians-and-poachers-merit-further-investigation-big>
- 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](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](http://iccfoundation.us/index.php?option=com_content&view=article&id=445&Itemid=367)

## 8.7. 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.
- <https://www.theguardian.com/environment/2016/oct/21/hundreds-of-snow-leopards-being-killed-every-year-report-warns>
- [https://www.theguardian.com/environment/2015/dec/31/the-indian-village-learning-to-live-in-harmony-with-snow-leopards?CMP=share\\_btn\\_tw](https://www.theguardian.com/environment/2015/dec/31/the-indian-village-learning-to-live-in-harmony-with-snow-leopards?CMP=share_btn_tw)

### 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.
- TRAFFIC. 2016. An Ounce of Prevention: Snow Leopard Crime Revisited.