Syllabus for the E3B Graduate Seminar:

Ecological Foundations of Payment for Ecosystem Service Schemes

Department of Ecology, Evolution & Environmental Biology (E3B)
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Instructors:
Prof. Shahid Naeem, E3B
Dr. Carter Ingram, Wildlife Conservation Society (WCS)
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Research and Conservation (CERC)

Fall 2010

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E3B Graduate Seminar, Fall 2010

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Place and time

Fall 2010
Schermerhorn Ext 1015
Wednesday, 2:30 – 4:00

Overview

Payments for Ecosystem Services (PES) schemes aim to reduce poverty and promote conservation by facilitating the exchange of cash (via subsidies or market payments) for services provided by nature such as erosion control, carbon sequestration, water filtration, and pollination. Creating markets for ecosystem services allows buyers to pay for the service(s) they "consume" which generates income and revenues that promote the conservation of biodiversity, natural resources, or habitats by landowners. The global proliferation of PES schemes has brought ecosystem services to the attention of many governments, businesses, and other groups who have not been traditionally associated with conservation. The design and implementation of PES schemes, however, has focused largely on social issues such as property rights, contract design, negotiation processes, risk allocation, and public participation while paying less attention to ecological issues such as population viability, community ecology, ecosystem functioning, and much more. While there is a considerable body of literature on the ecological foundations of ecosystem services, it has not been integrated consistently into PES schemes. This lack of integration begs the question of how effective many PES schemes can be in securing ecosystem services, providing consistent economic benefits to landowners, and promoting conservation over the long term if PES schemes are not based on the foundations of ecology.

This class will explore the ecological foundation of PES schemes and examine the degree to which current PES schemes from around the world incorporate ecological science in their planning, development, and monitoring. The goal of this study is to publish a critical, synthetic review of PES schemes in a peer-reviewed journal that will contribute positively and meaningfully to the PES literature. The course will review PES schemes, develop an ecological framework for PES, then evaluate existing PES schemes against this framework. The questions we will address are: Are the majority of existing PES schemes consistent with ecological principles? If not, which kinds of PES schemes are ecologically well designed and which are not? What are the likely outcomes of a PES scheme if it does not have an ecologically sound foundation? What recommendations can we make for integrating ecological principles into PES schemes?

We will interact with partners in TransLinks (http://www.translinks.org/) depending on scheduling and availability.

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SYLLABUS

Week 1 – What is PES?

Introduction to the concept of PES and the natural science foundations of ecosystem services.
Presentations and briefing on overview of course and anticipated goals.
PowerPoint: Ecosystem Services and Payments for Ecosystem Services at WCS
PowerPoint: Payments for Ecosystem Services: some brief background and resource materials

Week 2 -

Students divided into the following teams to review these classes of ecosystem services tentatively
designated as:

1. Carbon
2. Water
3. Biodiversity (including all wildlife related services, e.g. Pollination, tourism, etc.)

PowerPoint: Ecosystem Services and PES - Week 2: Definitions and Refinement

Week 3 – Representative cases for each class of PES

Each team provides an overview of cases in their class. They will address

1. Is there sufficient depth of information in case studies for analyses?
2. How well are PES schemes doing in delivering services?
3. How do the different classes compare (which are doing well, which are doing poorly, which are well developed, which are poorly structured, etc.)?

Week 4 – PES as an effective conservation tool

What are the pros and cons of PES as a tool in conservation? Each team will consider:

1. synergies and tradeoffs between economic and ecological objectives of PES
2. risks of PES as a conservation tool
3. how to handle multiple services; stacking and bundling services

Week 5 – Developing an ecological framework for PES schemes

We will begin to develop an ecological framework for PES schemes. Review of similar past projects to
look at construction of an appropriate framework. We will focus on key elements such as such as
monitoring ecosystem services, evaluation methods, and management plans (i.e., is it static, adaptive,
ecologically sound?).

1. Are some services more amenable to PES schemes than others?
2. What is the importance of baseline ecological data for managing, monitoring, and evaluation?
3. How do we consider "service flux" between systems or over time?
4. How does one measure ecosystem services – in isolation, as interactive sets?

Week 6 – PES and Ecosystem Restoration in Haiti

Guest Lecture by Alex Fischer of CIESIN and the Haiti Restoration Project. UNEP is leading a wide scale (multi-decadal, $200 million) restoration program focusing on one watershed in southern Haiti. The class will hear about proposed plans as well as consider the feasibility of PES in the region, or what factors should be investigated to consider PES as the project is in early phases.

Week 7 – No Class

Students will prep 2-3 page research summary based on preliminary investigation of existing state of PES data availability.

Weed 8 – Presentations of Preliminary Results

After seeing everyone's presentations, two sub-groups with representation from biodiversity, carbon, and water groups will be created for methods and results. Methodology for seeking cases broadly as well as individual criteria for specific sectors will be described by the methods group. With data collected to date, results group will begin to craft an appropriate "Science Index" from which to build the framework for analysis.

PowerPoint: Preliminary Results

Week 9 – Presentation and Discussion of Methods and Results

Collective discussion surrounding methodology and results, within the context of what is required for per-review publication (to be led by Dr. Naeem). These considerations used to further adapt the framework for assessment.

PowerPoint: Payments for Ecosystem Services - Biodiversity

Week 10 – Evaluating current PES schemes from the perspective of an ecological framework

Now that we have an ecological framework, we can ask the following questions for each PES scheme in the set of schemes we have collected. This week will be devoted to narrowing the questions we will address in this exercise. Questions we might ask of each PES scheme are:

1. Are there scientific or ecological indicators in the PES scheme and what role do they serve?
2. Were baseline ecological data collected? If not, how does it affect the likely success of a PES scheme?
3. How does one define or evaluate success of a PES scheme?
4. Are services in a PES scheme being measured correctly? For example, is each service being measured in isolation of others even though they interact with one another? Is the same service being measured across different ecosystems?
5. Are the most "successful" projects environmentally sustainable based on ecological principles?

Presentation: Ecological Foundations of Payments for Ecosystem Services

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Week 11– Establishing Criteria

Based on activities/discussions of previous week, establish universal, specific criteria for assessing and evaluating all PES case studies for analysis within the context of the ecological principles.

Week 12-13: Refinement and revisiting of cases

Simultaneous drafting of introductions, methods, results, preliminary discussion section

Week 14: Submit zero-order draft of final product parts

Resources

Alix-Garcia, J., De Janvry, A., Sadoulet, E., Torres, J.M., 2005. An assessment of Mexico's payment for environmental services program. Unpublished paper prepared for FAO by UC Berkeley and the Centre for Research and Teaching of Economics, Mexico.

Barbier E.B., Koch E.W., Silliman B.R., Hacker S.D., Wolanski E., Primavera J., Granek E.F., Polasky S., Aswani S., Cramer L.A., Stoms D.M., Kennedy C.J., Bael D., Kappel C.V., Perillo G.M.E.and D.J. Reed. 2008. Coastal ecosystem-based management with nonlinear ecological functions and values. Science 319: 321-323.

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Goldman RL, Tallis H, Kareiva P, Daily GC. 2008. Field evidence that ecosystem service projects support biodiversity and diversify options. PNAS.

Greiber T (ed.). 2009. Payments for Ecosystem Services. Legal and Institutional Frameworks. IUCN. Gland, Switzerland. Xvi + 296 pp.

Jack BK, Kousky C, Sims KRE. 2008. Designing PES: Lessons from previous experience with incentive-based mechanisms. PNAS 105.

Kramer RA, D. Richter, S. Pattanayak and N. Sharma. 1997. Ecological and economic analysis of watershed protection in Eastern Madagascar, *Journal of Environmental Management* 49.

Kontogianni, A., Luck,. G., Skourtos, M. 2010. Valuing ecosystem services on the basis of service-

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providing units: A potential approach to address the 'endpoint problem' and improve stated preference methods. Ecological Economics 69: 1479–1487

Kremen and R.S. Ostfeld, A call to ecologists: measuring, analyzing, and managing ecosystem services, *Frontiers of Ecology and Environment* 3 (10) (2005), pp. 540–548

Luck, G. W., R. Harrington, P. A. Harrison, C. Kremen, P. M. Berry, R. Bugter, T. P. Dawson, F. de Bello, S. Diaz, C. K. Feld, J. R. Haslett, D. Hering, A. Kontogianni, S. Lavorel, M. Rounsevell, M. J. Samways, L. Sandin, J. Settele, M. T. Sykes, S. van den Hove, M. Vandewalle, and M. Zobel. 2009. Quantifying the Contribution of Organisms to the Provision of Ecosystem Services. Bioscience 59:223-235.

Naeem, S. and J. P. Wright. 2003. Disentangling biodiversity effects on ecosystem functioning: deriving solutions to a seemingly insurmountable problem. Ecology Letters 6:567-579.

Naeem, S. 1998. Species redundancy and ecosystem reliability. Conservation Biology 12:39-45.

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Nelson E, Guillermo Mendoza, James Regetz, Stephen Polasky, Heather Tallis, DRichard Cameron, Kai MA Chan, Gretchen C Daily, Joshua Goldstein, Peter M Kareiva, Eric Lonsdorf, Robin Naidoo, Taylor H Ricketts, M Rebecca Shaw (2009) Modeling multiple ecosystem services, biodiversity conservation, commodity production, and tradeoffs at landscape scales. Frontiers in Ecology and the Environment: Vol. 7, No. 1.

Porras et al., 2008. All that glitters: A review of payments for watershed services in developing countries. Natural Resources Issues No. 11. International Institute for Environment and Development. London, UK.

Raudsepp-Hearne C., Peterson. G.D., Bennett, E.M. Ecosystem service bundles for analyzing tradeoffs in diverse landscapes. PNAS 107: 5242–5247 |

Sánchez-Azofeifa, A. Pfaff, J.A. Robalino and J.P. Boomhower. 2007. Costa Rican payment for ecological services program: intention, implementation and impact, *Conservation Biology* 21 (5).

Secretariat of the Convention on Biological Diversity 2007. An exploration of tools and methodologies for valuation of biodiversity and biodiversity resources and functions. CBD Technical Series No. 28.

Tallis H, P Kareiva, M Marvier, A Chang. 2008. An ecosystem services framework to support both practical conservation and economic development. PNAS.

Wunder, S. 2006. Are direct payments for environmental services spelling doom for sustainable forest management in the tropics? *Ecology and Society* 11 (2).

Wünscher, T, S. Engel and S. Wunder. 2008. Spatial targeting of payments for environmental services: a tool for boosting conservation benefits, *Ecological Economics* 65 (4).

Other Resources:

Ecosystem Market Place

http://www.rmportal.net/library/content/translinks (All of the TL Case Studies will be stored here; We can also hand out searchable DVD of all TL products, with lots of case studies, for their use)

PES Primer by ForestTrends

Biodiversity, Ecosystem Functioning, and Human Wellbeing: An Ecological and Economic Perspective Edited by Shahid Naeem, Daniel E. Bunker, Andy Hector, Michel Loreau and Charles Perrings