

**Exploring Ecosystem Services**  
**ENV 675-660**  
**University of Pennsylvania – MES Program**  
**Spring 2015**  
**Prof. Ira Feldman**

***Course Description:***

This interdisciplinary seminar introduces students to the ecological, economic and policy issues involved in the study of "ecosystem services" -- the valuable services provided by functioning ecosystems that improve human well-being. The course will explore the various general categories of ecosystem services in relation to ecosystem functions as well as the challenges and limitations in measuring and valuing ecosystem services.

By studying the findings and methodologies of the Millennium Ecosystem Assessment, we will trace the recent emergence of ecosystem services as a research and policy construct that has affected more traditional areas of inquiry such as biodiversity and natural resources management. Through case studies and other materials we will examine the potential for markets in ecosystem services and the increasing use of ecosystem services in sustainable business practices. Throughout, we will also consider the impact of ecosystem services on social and ethical issues. Finally, we will place an emphasis on implementation of ecosystem services concepts and principles, including through policy, law, regulation and management best practices.

***Instructor Contact Information:***

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Office hours by appointment (in person, phone or SKYPE)

***Course Materials:***

This continues to be a rapidly evolving field with an interdisciplinary community of practice; new reports and other materials are continuously being released, posted on websites and discussed on blogs. Our goal in this course is to develop a shared understanding of ecosystem services.

Most of the basic readings for this course will be found in the following books and reports, each of which will be accessible in electronic form:

National Research Council (NRC), *Valuing Ecosystem Services: Toward Better*

*Environmental Decision-Making*. National Academies Press (2005). Text available online at: <http://www.nap.edu/openbook.php?isbn=030909318X>. (“NRC Valuation”)

Millennium Ecosystem Assessment, *Ecosystems and Human Well-Being: A Framework for Assessment*. Island Press (2003). Text available online at: <http://www.unep.org/maweb/en/Framework.aspx>. (“MEA Framework”)

Millennium Ecosystem Assessment, *Ecosystems and Human Well-Being: Synthesis*. Island Press (2005). Text available online at: <http://www.unep.org/maweb/documents/document.356.aspx.pdf>. (“MEA Synthesis”)

President’s Council of Advisors on Science and Technology (PCAST), *Sustaining Environmental Capital: Protecting Society and the Economy*. (July 2011). Text available at: [http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast\\_sustaining\\_environmental\\_capital\\_report.pdf](http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast_sustaining_environmental_capital_report.pdf)

National Ecosystem Services Partnership, *Federal Resource Management and Ecosystem Services “FRMES” Guidebook*. (December 2014). Text available at: <https://nespguidebook.com>

The Economics of Ecosystems & Biodiversity (TEEB), *The Economics of Nature: A synthesis of the Approach, Conclusions and Recommendations of TEEB*. (2010). Text available online at: <http://www.teebweb.org/teeb-study-and-reports/main-reports/synthesis-report/>. (“TEEB report”)

World Resources Institute (WRI), *Corporate Ecosystem Services Review*. (Revised version, 2012). Text available online at: <http://www.wri.org/publication/corporate-ecosystem-services-review>

J.B. Ruhl, S.E. Kraft, and C.L. Lant. *The Law and Policy of Ecosystem Services*. Island Press (2007). (“Ruhl”) [Electronic file will be posted]

The following books are highly recommended as supplementary reading and as potential sources of paper topics:

Gretchen Daily, G. (ed.) *Nature’s Services: Societal Dependence on Natural Ecosystems*. Island Press (1997).

Tim Gieseke. *EcoCommerce 101: Adding an ecological dimension to the economy*. Bascom Hill Publishing Group (2010)

Lance Gunderson and C.S. Holling. *Panarchy: Understanding Transformations in Human and Natural Systems*. Island Press (2002).

Other readings are recommended below for each class session, and most materials will be accessible on the web. These recommendations are starting points only. It is expected that, in advance of each class session, you will use your research skills to locate additional sources of relevant information and be prepared to share your findings with your colleagues in class discussion.

***Assignments and grading:***

There is no exam. There will be two required papers. One will be a case study with an emphasis on scope, methodology, implementation and results; the other can be (at your option) a second case study OR a report on a "special topic" in ecosystem services.

The special topic can be an ecosystem services topic that is not on the syllabus but relevant to your own academic/professional goals (needs instructor approval) OR a "deeper dive" into topic introduced in class or included in the course readings. One of these papers (selected in consultation with the instructor) will be the basis of a short student presentation during the last several class sessions. Taken together, these 2 papers and the in-class presentation will comprise 2/3 of the final grade.

The remaining 1/3 of the final grade will be based on a combination of regular class participation and 10 posts to a student journal (or equivalent) tracking the weekly course topics. Further details on these requirements will be discussed during first class session.

***Class format:***

This course is a graduate level seminar and will include presentations by the instructor and several invited guest lecturers. Ideally we will all engage in an interactive dialogue to develop our shared understanding. Implicit is the expectation that you prepare in advance of each session in order to facilitate a lively and useful exchange of information on each topic.

In this course, I want to encourage each of you to pursue interests that reflect your own professional and disciplinary preferences. Therefore, I will offer great flexibility in tailoring the course requirements and your paper topics to your individualized needs. Please make me aware of your specific interests and expectations as soon as possible. Note that changes to the schedule and/or readings below may be necessary to accommodate invited guest presenters.

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***Class schedule (with topics and resources):***

**Class 1 – Jan 15**

- Orientation and course requirements
- Student introductions
- Overview
  - The emergence of ecosystem services
  - Basic concepts, principles and lexicon
  - Categories of ecosystem services
  - Current policy and science state of play
  - Interdisciplinary challenges

Readings:

Costanza, R., R. d'Arge, R. de Groot, et al. "The value of the world's ecosystem services and natural capital." *Nature* 387:253-260 (1997). Available at: <https://groups.nceas.ucsb.edu/ma-eco-tradeoffs/documents/valuation-reprints-and-resources/Costanza%20et%20al%20-%20The%20value%20of%20the%20world%20s%20ecosystem%20services%20and%20natural%20capital.pdf/view>

Bockstael, N.E., A.M. Freeman, R.J. Kopp, et al., "On measuring economic values for nature." *Environmental Science and Technology* 34:1384-1389 (2000). Available at: <http://pubs.acs.org/doi/abs/10.1021/es990673l>

Salzman, J., C.A. Arnold, R. Garcia, K.H. Hirokawa, K. Jowers, J. LeJava, and L.P. Olander. "The Most Important Current Research Questions in Urban Ecosystem Services." *Duke Environmental Law & Policy Forum*, Forthcoming; Albany Law School Research Paper No. 4 for 2014-2015. Available at: [http://scholarship.law.duke.edu/cgi/viewcontent.cgi?article=6041&context=faculty\\_scholarship](http://scholarship.law.duke.edu/cgi/viewcontent.cgi?article=6041&context=faculty_scholarship)

**Class 2 – Jan 22**

- Ecosystems and ecology

- Biodiversity
- Natural resources management
- Payment for Ecosystem Services (PES)

Readings:

- NRC Valuation, Chapter 2
- MEA Framework, Chapters 1 and 3
- Additional Ecology and PES readings to be distributed

### **Class 3 – Jan 29**

- Valuation of ecosystems
- Categories of ecosystem services (continued)

Readings:

NRC Valuation, Chapters 4, 6, and 7

MEA Framework, Chapters 4 and 5

Additional valuation and typology readings to be distributed

### **Class 4 – Feb 5**

- The Framework for the Millennium Ecosystem Assessment

### **Class 5 – Feb 12**

- The Findings of the Millennium Ecosystem Assessment

### **Class 6 – Feb 19**

- US Federal policy, law and regulation

- NESP network
- International Platform for Biodiversity and Ecosystem Services

### **Class 7 – Feb 26**

- Corporate Ecosystem Services Review
- Corporate case studies (part 1)

### **Class 8 – March 2**

- TEEB
- Environmental Markets (part 1)

### **-- SPRING BREAK --**

### **Class 9 – March 19**

- Urban Ecosystems
- Corporate case studies (part 2)

### **Class 10 – March 26**

- Ecosystem based adaptation to climate change
- Environmental Markets (part 2)
- State-level case study (Oregon)
- Local/regional case study (Pittsburgh)

### **Class 11 – April 2**

- Green Infrastructure
- Legal and regulatory issues

- Philadelphia Consent Order

### **Class 12 – April 9**

- Review and consolidate
- Topic to be selected based on class interest
- Student Presentations

### **Class 13 – April 16**

- Topic to be selected based on class interest
- Student Presentations

### **Class 14 – April 23**

- Student Presentations
- Need for new institutions, processes, tools
- Immediate prospects and the long-term perspective for ecosystem services
- Wrap up