BIO 434, SOS 434 People and Nature: Ecosystem Services

BIO 434 79519
SOS 434 79779
BIO 434 79520 (Honors)

Semester: Fall 2017

Semester hours: 3

Course instructors: Ann Kinzig (kinzig@asu.edu) LSA 124
Charles Perrings (Charles.Perrings@asu.edu), LSA 127

Office hours: Perrings: Wednesdays, 1.00pm-3.00pm or by appointment
Kinzig: TBD

Times and location: Lectures: M W 3:05 PM – 4:20 PM Tempe – WGHL L1-04

Honors: M during on-line lecture sessions (see schedule)

Course description: Ecosystem services are the benefits that people derive from the ecosystems (and the biosphere more generally). They include the production of foods, fuels and fibers; recreation, and the aesthetic and spiritual appreciation of landscapes; buffering against environmental hazards; and the basic ecosystem services and functions that underpin all other human uses of the natural world.

Using the ecosystem services framework, the course aims to provide students with an understanding of the way in which people interact with ecosystems. It offers a set of principles for the optimal management of ecosystems, and uses student-led case studies to illustrate how those principles can be applied.

The course is constructed around a number of questions: How and why have people transformed their environment, and with what ecological consequences? How have changes in ecosystem processes and ecological functioning affected the delivery of ecosystem services, and what does this mean for human wellbeing? How do the principles of economics and ecology help us optimize the use we make of ecosystems?

Students will be exposed to (a) the ecological theory relating changes in ecosystem components to changes in ecosystem services, and (b) the

economic theory relating peoples' decisions about resource use to perceptions of value, and the impact of institutions, governance structures and markets on those decisions. They will learn how to apply this theory to the management of ecosystems at different scales, and to the solution of specific real-world problems.

The ecosystem services approach is increasingly being adopted by federal and state agencies, by intergovernmental organizations, and by both national and international non-governmental organizations. The course will provide students aiming to build a career in such organizations with a state-of-the art skill set in the field. It will also provide students interested in graduate study in the field with a well-grounded introduction to the literature, and to the tools and techniques being developed to manage for the delivery of ecosystem services.

Learning outcomes: Upon completion of this course:

- Students will be familiar with the most important contributions to the literature on ecosystem services.
- Students will understand the principles of ecology and economics required to manage ecosystems for the delivery of ecosystem services.
- Students will be able to apply the tools of ecosystem management to particular ecosystems.

Organization: The course comprises on-line and in-class lectures, discussions and review sessions, and in-class assignment breakout groups.
On-line and in-class lectures provide information on the concepts and methods students need to understand what drives human use of ecosystems, and how that affects the flow of ecosystem services. On-line lectures are supported by in-class discussion and review sessions designed to address outstanding questions, and to show how the methods described in lectures can be implemented. In-class assignments provide students with the opportunity to think through application of the principles of ecosystem management, and to discuss their findings with fellow students and instructors.

Assessment: **79519, 79779**

Mid term exam	20%
Occasional assignments	20%
Final exam	30%
Term paper	30%

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Recitation discussion	20%
Honors contract	80%

Occasional assignments: Assignments for in-class discussion are posted on Blackboard a few days before they are due. Assessment is based both on the content of the assignment, and students' engagement in the discussion.

Exams: The mid-term and final exam will combine multi-choice and short answer questions. The exams test student familiarity with relevant principles, and their capacity to apply those principles to the solution of particular problems.

Term paper: A 3000 word term paper is due on at the end of the course. While the paper is required to address a number of dimensions of ecosystem management, students have flexibility as to which system they wish to study. Assessment is based on (a) the extent to which the specific requirements of the term paper are addressed, (b) the unique features of case study developed by the student, and (c) the clarity and quality of the argument.

Honors students will be required to prepare an extended paper to satisfy the honors contract, supported by additional reading and discussion in the recitation section.

Academic honesty

All students and faculty participating in this course are bound by the academic integrity policy of the university. The academic integrity policy can be found at https://provost.asu.edu/academicintegrity/policy and students are encouraged to be familiar with its content. Significant infractions of the academic integrity policy can result in a failing grade for the course, or expulsion from the university. Please consult the instructors with *any* questions you may have on what constitutes academic integrity, or its infractions.

Disability

Qualified students with disabilities who will require disability accommodations in this class are encouraged to make their requests to us at the beginning of the semester either during office hours or by appointment. **Note:** Prior to receiving disability accommodations, verification of eligibility from the Disability Resource Center (DRC) is required. Disability information is confidential.

BIO 434, SOS 434 Lecture schedule *Lecture schedule [both professors attend class whenever possible]*

Day	Date	Lecture	Lecturer
M	21-Aug	IC: Introduction to course content and structure	Kinzig & Perrings
W	23-Aug	IC: The human drivers behind changes in ecosystem services	Perrings
M	28-Aug	IC: Anthropocentrism vs. biocentrism	Kinzig
W	30-Aug	IC: How people make decisions	Perrings
M	4-Sep	LABOR DAY: NO CLASSES	
W	6-Sep	IC: Group discussion of human impacts	Kinzig & Perrings
M	11-Sep	OL: Species, communities, biomes	Kinzig
W	13-Sep	IC: Group lectures on habitats	Kinzig
M	18-Sep	OL: Species, functional traits, ecosystem services	Kinzig
W	20-Sep	IC: Discussion of niche separation, functional traits	Kinzig
M	25-Sep	OL: Allocating natural resources: the economics of conservation	Perrings
W	27-Sep	IC: Problem set on allocation of natural resources	Perrings
M	2-Oct	OL: Why markets fail to deliver environmental protection	Perrings
W	4-Oct	IC: Problem set on environmental public goods and externalities	Perrings
M	9-Oct	FALL BREAK: NO CLASS	
W	11-Oct	MIDTERM TEST	
M	16-Oct	OL: Environmental externalities: policy options	Perrings
W	18-Oct	IC: Discussion of green taxes	Perrings
M	23-Oct	OL: Payments for ecosystem services	Perrings
W	25-Oct	IC: Discussion of REDD+	Perrings
M	30-Oct	OL: Biodiversity and extinction	Kinzig
W	1-Nov	IC: Discussion of IUCN Red List	Kinzig
M	6-Nov	OL: Emerging conservation strategies	Kinzig
W	8-Nov	IC: Discussion of conservation/development trade-offs	Kinzig
M	13-Nov	OL: Ecology/econ of invasive species	Kinzig & Perrings
W	15-Nov	IC: Discussion of the problem of invasive species	Kinzig & Perrings
M	20-Nov	IC: Focus on paper assignments; small groups	Kinzig & Perrings
W	22-Nov	DAY BEFORE THANKSGIVING: NO CLASS	
M	27-Nov	OL: Sustainability and global change	Kinzig & Perrings
W	29-Nov	IC: Course review and discussion of final exam	Kinzig & Perrings

Final exam

M TBD WGHL L1-04

Reading

The required text for the class is:

Perrings, C. (2014) *Our Uncommon Heritage: Biodiversity, Ecosystem Services and Human Wellbeing*. Cambridge University Press, Cambridge.

Additional books and articles relevant to the lecture material include:

Balmford A., A. Bruner, P. Cooper, R. Costanza, S. Farber, R. E. Green, M. Jenkins, P. Jefferiss, V. Jessamy, J. Madden, K. Munro, N. Myers, S. Naeem, J. Paavola, M. Rayment, S. Rosendo, J. Roughgarden, K. Trumper, R. K. Turner. 2002. Economic reasons for conserving wild nature. *Science* 297: 950-953.

Cardinale B.J., Duffy J.E., Gonzalez A., Hooper D.U., Perrings C., Venail P., Narwani A., Mace G.M., Tilman D., Wardle D.A., Kinzig A.P., Daily G.C., Loreau M., Grace J.B., Larigauderie A., Srivastava D.S. & Naeem S. (2012). Biodiversity loss and its impact on humanity. *Nature*, 486, 59-67.

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.

Kinzig A. P., P. Ryan, M. Etienne, H. Allyson, T. Elmqvist, and B. H. Walker. 2006. Resilience and regime shifts: assessing cascading effects. *Ecology and Society* 11(1): 20. [online] URL: http://www.ecologyandsociety.org/vol11/iss1/art20/.

Millennium Ecosystem Assessment 2005. *Ecosystems and Human Well-Being: Synthesis*. Island press, Washington D.C.

Naeem S., D. Bunker, A. Hector, M. Loreau and C. Perrings (eds) 2009. *Biodiversity, Ecosystem Functioning, and Human Wellbeing: An Ecological and Economic Perspective*, Oxford, Oxford University Press.