**BIO 434, SOS 434 People and Nature: Ecosystem Services**

BIO 434 88670

SOS 434 89343

BIO 434 88671 (Honors)

BIO 434 88684 (Recitation)

**Semester:** Fall 2014

**Semester hours**: 3

**Course instructors:** AnnKinzig ([kinzig@asu.edu](mailto:kinzig@asu.edu)) LSA 124

Charles Perrings ([Charles.Perrings@asu.edu](mailto:Charles.Perrings@asu.edu)), LSA 127

**Office hours: Perrings: Tuesdays 1.00pm-3.00pm or by appointment**

**Kinzig: Wednesdays 10.00am -12.00pm or by appointment**

**Times and location**: Lectures: M W 1:30 PM - 2:45 PM Tempe – LSE BO4

Recitation (only for those enrolled in BIO 434, 88684)

F 1:30 PM -2:20 PM Tempe – LSE B52

**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**: **88670, 89343**

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]*

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| **Day** | **Date** | **Lecture** | **Lecturer** |
| M | 25-Aug | IC: Introduction to course content and structure | Kinzig |
| W | 27-Aug | IC: The drivers behind changes in ecosystem services | Perrings |
| M | 1-Sep | LABOR DAY: NO CLASS |  |
| W | 3-Sep | IC: Anthropocentrism vs. biocentrism | Kinzig |
| M | 8-Sep | OL: Species, communities, biomes | Kinzig |
| W | 10-Sep | IC: In class discussion, small groups for papers | Kinzig |
| M | 15-Sep | OL: Species, functional traits, ecosystem services | Kinzig |
| W | 17-Sep | IC: Discussion of niche separation, functional traits | Kinzig |
| M | 22-Sep | OL: Allocating natural resources: the economics of conservation | Perrings |
| W | 24-Sep | IC: Problem set on allocation of natural resources | Perrings |
| M | 29-Sep | OL: Why markets fail to deliver environmental protection | Perrings |
| W | 1-Oct | IC: Problem set on environmental public goods and externalities | Perrings |
| **M** | 6-Oct | IC: The nitrogen problem | Kinzig & Perrings |
| W | 8-Oct | MIDTERM EXAM |  |
| M | 13-Oct | FALL BREAK: NO CLASS |  |
| W | 15-Oct | IC: Review of midterm exam results | Kinzig |
| M | 20-Oct | OL: Environmental externalities: policy options | Perrings |
| W | 22-Oct | IC: Discussion of green taxes | Perrings |
| M | 27-Oct | OL: Biodiversity and extinction | Kinzig |
| W | 29-Oct | IC: Discussion of IUCN Red List | Kinzig |
| M | 3-Nov | OL: Payments for ecosystem services | Perrings |
| W | 5-Nov | IC: Discussion of REDD+ | Perrings |
| M | 10-Nov | OL: Emerging conservation strategies | Kinzig |
| W | 12-Nov | IC: Focus on paper assignments; small groups | Kinzig & Perrings |
| M | 17-Nov | OL: Ecology/econ of invasive species | Kinzig |
| W | 19-Nov | IC: Discussion of conservation/development trade-offs | Kinzig & Perrings |
| M | 24-Nov | OL: Sustainability and global change | Kinzig & Perrings |
| W | 26-Nov | DAY BEFORE THANKSGIVING: NO CLASS | Kinzig & Perrings |
| M | 1-Dec | IC: Local vs. global solutions | Kinzig & Perrings |
| W | 3-Dec | IC: Final exam review | Kinzig & Perrings |

**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.