EcoValuation Working Group: Course Guide and Curriculum Framework

Ecosystem Services and Ecosystem Valuation

School of Natural Resources & Environment
University of Michigan

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Here we present courses offered at the University that graduate students can take to explore ecosystem services, ecosystem valuation, conservation and ecosystem finance, and ecosystem management and decision making.

Ecosystem Services and Ecosystem Valuation: These courses will provide students with an understanding of the scientific, economic, and socio-political basis for ecosystem services. These courses overlap with those centered on ecosystem structure and function, but will present these processes through the human lens, offering insight into how ecosystems benefit humans and how/why these services are measured, valued and monetized by governments, resource managers and businesses.

NRE 501.049: Ecosystem Services: *Professor Brad Cardinale. Winter Term*

> ***Description***: This course will evaluate the scientific, economic, and socio-political basis for Ecosystem Services. Ecosystem Services - sometimes referred to as Earth's 'Natural Capital' - represent the sum of all goods and services that natural and managed ecosystems provide to humanity. These services include direct provisioning of goods like food, wood, and freshwater, regulating services such as climate regulation or pest and disease control, and cultural services such as recreation and tourism. The idea that ecosystems have natural capital has become increasingly prominent over the past decade as scientists, economists, and politicians have considered how to account for the values of ecosystems that are not included in traditional economic markets. *This class will explore the ways in which ecosystem services are measured and related to basic ecological processes, how those services are valued and monetized by society, and how services are managed and encouraged by policy and law. Theoretical and practical concepts will be reinforced by student-led case studies that provide 'real-world' examples of ecosystem services being valued, including payment for ecosystem services projects, biodiversity offsets, certification schemes, and REDD+.*

NRE 501.039: Land Use and Global Change: *Professor Dan Brown. Fall Term (Not offered 2012)*

NRE 547: Forest Ecology in a Changing World: *Professor Ibanez. Fall Semester*

> ***Description:*** In this course we will cover the basic concepts in ecology as they apply to forests in the context of current forest ecology research. We will study the biological and ecological bases behind the current challenges forest ecosystems face under global change (i.e., climate change, landscape fragmentation, pollution, introduced species). We will also review the role and impact of humans on these communities, focusing on the services forests ecosystems provide and the emergence of urban ecology.

Part of the course will involve critical discussions of current literature in the field. Students will subscribe to the email alerts of major ecological journals and present summaries of published work related to the topics we are covering to the class on a regular basis.

Labs will consist on field trips during the first half of semester and wet-labs and computer labs during the second half. For these labs we will have the opportunity to collect and analyze field data and then learn about all the steps required in the scientific process. The projects will involve sampling of forest biodiversity, estimation of tree species demographic parameters, and measurement of forest carbon pools. Data collected in the field will be processed in the lab and analyzed during the computer labs. The goal of the computer labs will be to develop basic predictive models that will allow us to forecast the structure and composition of future forests.

NRE 570: Micro Economics with Natural Resource Application: *Professor Michael Moore. Fall Term (TBD)*

Develops the tools of microeconomics at an intermediate level. Supplementary materials highlight relevance of course concepts to natural resource and environmental issues. Emphasis is on skill development for natural resource policy analysis. Applications include oil cartels, forestry, common property fisheries, valuation of recreational sites, irreversible development projects, and below-cost timber sales.

NRE 639.075: Dimensions of Biodiversity: Examining the Relationships between Biodiversity and Ecosystem Services in Agroecosystems: *Professors Brad Cardinale and Ivette Perfecto. Fall and Winter Terms.*

Description: In this seminar we will read key articles related to biodiversity and ecosystem services (such as production, pollination and pest control) in agroecosystems, conduct an extensive literature review, construct a data set with results from the literature, analyze these data and write a review article for a peer-reviewed journal. We will also learn how to conduct meta-analyses based on published articles and will read various articles that use meta-analyses.

Following the tradition of the distributed seminars supported by NSF, this seminar will be part of a group of similar seminars that will take place at other universities. The lead students and faculty from all the seminars will meet at least twice a semester to report on progress, exchange ideas, and revise the direction of the research accordingly.

NRE 668: Advanced Natural Resource Economics.

Description: This course reviews the literature on the pricing of natural resources (agricultural goods, renewable and nonrenewable resources and durables) over time. The first half of the course considers resources which are privately owned; the second half considers resources that are common property. To provide a point of reference, the behavior of resource markets in the absence of government intervention is studied first. There is then an extensive treatment of the dynamic effects on market equilibria of widespread government policies (unanticipated, partially anticipated or fully anticipated). Policies analyzed include: bufferstocks used to affect prices (ceilings, floors, bands, and pegs); bans, embargoes, price controls and whatever else is timely or of interest to participants. To simplify the mathematics, discrete-time methods are

used predominately. The Kuhn-Tucker theorem is utilized when studying competitive equilibrium under certainty. Dynamic-programming is used to study single-agent (planning or monopoly) problems under uncertainty (with or without learning). Multi-stage game theory is used to investigate dynamic common-property problems. A working understanding of these methods is developed during the course.