Ecosystem Services (RMES 500K): Integrating Ecology, Economics, and Ethics for Better Environmental Policies and Institutions

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Purpose

RMES 500K will prepare students to contribute to a world where ecosystems are sustainably managed and protected for the benefit and principles of current and future people. The concept of "ecosystem services" (the flow of benefits from nature to people) provides one novel framework for advancing this vision. This concept is inherently transdisciplinary—involving an integration of the natural sciences, social sciences, and humanities—and its implementation is multifaceted, requiring innovation in business, law, and governance. Accordingly, this course is intended for diverse students and will focus on teamwork, learning from peers, and integrating across disciplines to analyze real-world cases.

Learning Objectives and Outcomes

When we have completed this course, students will be able to do the following:

1. Explain to policymakers and lay people the concept of ecosystem services and their importance for sustainability and effective governance;
2. Advocate and support their views on the appropriate role of ecosystem services in decision making and the progress necessary in law, policy, business, and academics to realize that role;
3. Evaluate programs, policies, and institutions that manage and protect ecosystem services, for
    a. efficiency (economic and ecological),
    b. equity (social, environmental, and intergenerational), and
    c. sustainability (financial, political, and environmental);
4. Propose new—or amendments to—programs, policies, and institutions to better manage or protect ecosystem services according to the same criteria; and
5. Advocate and support their views on the pros and cons of economic valuation of ecosystem services.

Course Description

We are faced with a society that is deeply reliant upon ecosystems for the various goods and services that make our lives possible and enjoyable, but which insufficiently protects these benefits from unsustainable degradation. The challenge for current generations is to understand and account for these benefits in a way that enables a high and sustainable quality of life for people while also respecting our duties to nonhuman organisms. This challenge will require that leaders in academics, business, law, and governance (i) understand the workings of ecosystems and the nature of our benefits from them, and (ii) harness this understanding to cooperatively build institutions and policies for managing ecosystems effectively, fairly, and sustainably. RMES 500K seeks to foster these leaders in an environment where a diversity of perspectives and experiences is a necessity.

Through participatory lectures, role-plays, discussions, debates, and workshops, students will do the following:

- Learn the history of thinking on ecosystem services and new developments in policy;
- Characterize the ecological dynamics underpinning numerous key services, and their relationship with biodiversity conservation;
- Evaluate ecosystems in economic and non-economic terms;
- Evaluate and critique the application of economics to ecosystem services;
- Employ ethical argument for or against environmental policies;
- Structure environmental policies to increase benefits relative to costs in different circumstances;
- Identify opportunities for profit from ecosystem services;

- Describe the opportunities and impediments to laws, regulations, and programs for managing ecosystem services in British Columbia;

- Apply these skills and experiences individually and in teams to demonstrate the learning objectives and outcomes through written assignments, presentations, and a final paper.

Because lasting positive societal change regarding ecosystem services will only occur through coordinated efforts across private, public, and academic sectors, it is crucial that students who will take these various perspectives learn and work together. Through RMES 500K, students will gain a level of common knowledge that will enable cooperative action to arise from such differences.

Course Policies

(The formal language in this section is to conform to University requirements.)

Attendance

Following university regulation, regular attendance is expected of students. Students who neglect their academic work and assignments may be excluded from the final examinations (note: there are no exams in this course). Students who are unavoidably absent because of illness or disability should report to their instructors on return to classes.

The University accommodates students with disabilities who have registered with the Disability Resource Centre. The University accommodates students whose religious obligations conflict with attendance, submitting assignments, or completing scheduled assignments. Please let me (Kai) know in advance, preferably in the first week of class, if you will require any accommodation on these grounds. Students who plan to be absent for varsity athletics, family obligations, or other similar commitments, cannot assume they will be accommodated, and should discuss their commitments with the instructor before the drop date.

Late assignments

This course is not intended to run or ruin your life. So when exceptional circumstances will prevent you from completing an assignment on time, you may request an extension and it will be granted where possible and appropriate. In the absence of a granted extension, a 5% reduction of grade will be assigned for each day an assignment is late beyond the required due date.

Academic Dishonesty

Please review the UBC Calendar "Academic regulations" for the university policy on cheating, plagiarism, and other forms of academic dishonesty.

Students should retain a copy of all submitted assignments (in case of loss) and should also retain all their marked assignments in case they wish to apply for a Review of Assigned Standing. Students have the right to view their marked examinations with their instructor, providing they apply to do so within a month of receiving their final grades. This review is for pedagogic purposes. The examination remains the property of the university.

Schedule

- Nine weeks of lessons featuring lectures, role-plays, discussions, and debates.

- Two weeks of workshops on policy/program/institution analysis among teams with instructor guidance.

- Two weeks of presentations of team analyses.

Weekly descriptions are below: date, title, form ("**F**"), learning objectives ("**LO**"), readings ("**R**"; "*" indicates a need for familiarity only; see also **Readings** regarding the volume and expectations), and reading directions. All classes are Wednesday 1-4pm in AERL 107/8.

1. Sep 6 2006. Birth of a concept: ecosystem services

F: Introductions to each other and to the course; "Which service am I?" exercise; interactive lecture on the history of the concept, the furor surrounding initial attempts at valuation and characterization of ecosystem services.
LO: Meet other students and instructor and learn what knowledge and skills they possess to complement each of ours; understand and communicate the concept of ecosystem services.
R: (Costanza et al. 1997; Daily 1997*; Mooney and Ehrlich 1997*; Nature 1998; Various 1998*)
Read as much of Daily as you need to understand the basics and the concept of ecosystem services; the introduction is a good place to start if it's all new, and Mooney & Ehrlich provide some interesting historical context. Read Costanza et al and Nature 1998 to understand what was done and the response it received; read as much of the 'Various' responses to flesh out this understanding.

2. Sep 13 2006. Ten years onward: what have we got to show?

F: Interactive lecture on the recent public-policy changes resulting from ecosystem-services thinking. We will focus on case studies from Daily and Ellison (2002) (e.g., Napa River restoration, carbon markets, Catskills watershed conservation), the Millennium Ecosystem Assessment, and the Ecosystem Marketplace (no need to read all documents associated with these sources; simply make yourself familiar with what they entail, and read what interests you).
LO: Understand what has been done thus far on the ecology, the values, and the policy of ecosystem services (through several case studies) and the major pressing needs for the future.
R: (Daily and Ellison 2002; Millennium Ecosystem Assessment 2003*; Economist 2005; Millennium Ecosystem Assessment 2005*; The Katoomba Group 2005*)
Read Economist and at least some of Daily & Ellison (you can return to the rest later—it is entertaining stuff). Familiarize yourself with the organization and purpose of the Millennium Ecosystem Assessment and Ecosystem Marketplace.

3. Sep 20 2006. The ecological underpinnings

F: Interactive lecture/tutorial including group exercise. We will focus on risk mitigation of wildlife-borne diseases, pollination of agricultural crops, and water regulation.
LO: Learn the basis for ecosystem services research in ecology (e.g., diversity-ecosystem function and diversity-stability relationships); understand and communicate two ways of studying the ecological basis of provision of ecosystem

services (from Kremen 2005); learn to understand scientific concepts associated with ecosystem services from reading primary literature (with a focus on graphs).

R: (Guo et al. 2000; Guo and Gan 2002*; Ostfeld and LoGiudice 2003; Ricketts 2004; Ricketts et al. 2004*; Kremen 2005; Kremen and Ostfeld 2005; Ezenwa et al. 2006; Ostfeld et al. 2006*)

Read Kremen 2005 and Kremen & Ostfeld closely; read enough of each of the others to understand the purpose of their paper and what they found.

4. Sep 27 2006. Will ecosystem services help biodiversity conservation?

F: Interactive lecture followed by structured discussion (*pros & cons of a biodiversity protection agency or NGO investing in ecosystem services protection or provision*). We will consider research on ecological functions as well as attempts to assess the spatial correspondence of priority areas for biodiversity protection and ecosystem services provision.

LO: Learn and communicate the prospects for ecosystem-services provision to contribute to biodiversity conservation, and the evidence (scientific and logical/philosophical) to support those prospects.

R: (Balvanera et al. 2001; Boyd and Wainger 2002*; National Research Council 2005, ch 5*; Srivastava and Vellend 2005; Chan et al. in press CB; Chan et al. in press PLoS Bio)

Read Srivastava & Vellend sufficiently to understand the ecology that informs the importance of varying levels of biodiversity for ecosystem services; read Chan et al. in press Cons Bio for a review of the relevance of ecosystem services for conservation (focus on the intro and the section on insights from ecosystem services); read Chan et al. in press PLoS Bio to understand one recent attempt to analyze spatial correspondence of biodiversity-conservation and ecosystem-services goals (including the spirit of the methods but not the details); understand the main point of others.

5. Oct 4 2006. Economic valuation of ecosystem services

F: Interactive lecture/tutorial including group exercise.

LO: Articulate the purpose of economic valuation in the current policy framework; identify the appropriate use of several methods of economic valuation and forms of discounting; perform simple cost-benefit analysis using net-present-value with discounting.

R: (Arrow et al. 1996; Goulder and Kennedy 1997*; Heal 2000; Heal 2000, ch 7; de Groot et al. 2002*; Goulder and Stavins 2002; International Union for the Conservation of Nature and Natural Resources (IUCN) 2004*; Pagiola et al. 2004*; National Research Council 2005)

Read Arrow et al and Goulder & Stavins carefully; Heal 2000 in Ecosystems and Heal 2000 ch 7 are largely redundant, so read one carefully (the former is slightly shorter but denser); National Research Council (NRC) 2005 chs 2 & 4 are effectively an elaboration on Heal's points (i.e., you can choose these two chapters instead of Heal if you want an expanded version), but ch 6 has numerous additional and highly relevant points on investigator judgments and handling uncertainty; IUCN 2004 and Pagiola 2004 are virtually identical and only add significantly (regarding valuation) to the above readings in the sections on "winners and losers" (p.21 of IUCN or p.29 of Pagiola).

6. Oct 18 2006. Employing ethics and critiquing economic valuation

F: Structured discussion drawing upon readings with additional tutorial-style mini-lectures (*pros & cons of employing economic valuation of ecosystem services, where cons include questionable assumptions and missing stakeholders*).

LO: (1) Understand the purpose of ethical argument, explain the extent to which it can be effective (e.g., without falling prey to critiques of relativism and subjectivism); (2) state the major assumptions of economics, recount some of the most compelling evidence of violations of those assumptions, and voice supported opinions for the implications for economics and other methods of valuation; (3) explain the difference between private preference and principles of public interest and the ramifications of this difference for environmental valuation and decision-making.

R: (Singer 1993, ch 1; Costanza and Folke 1997; Sagoff 1998; Gatto and De Leo 2000*; Heal 2000, ch 9*; Ludwig 2000; Chan submitted*)

Read Singer 1993 carefully, in particular for LO1; skim Chan submitted for an example of an ethical justification for biodiversity conservation. Read Ludwig 2000 carefully, in particular for LO2; skim Gatto & De Leo 2000. Read Costanza & Folke carefully, especially for LO2 and LO3; read Sagoff 1998 as closely as possible given the limited time, especially for LO3 (it's dense, but well worth it if you can get through it; it will be easier to return to it after class, if not). The first part of Heal's ch 9 is mostly redundant with last week, but the section on 'market forces and sustainability' pertains to LO3 (see if you can figure out how).

7. Oct 25 2006. Policies and institutions for ecosystem services

F: Market role-play exercise with embedded tutorials on the functions and pros and cons of the multitude of policies possible for protecting ecosystem services (command-and-control legislation, incentive programs of various kinds, regulatory relief, and various market-based initiatives including certification). Students will identify forms of policies appropriate to varying circumstances and demonstrate the potential benefits relative to other policies.

LO: Understand and communicate the way that different kinds of policies—and different actual policies in various places—impact people's behaviours and the social values associated with ecosystem services, using economic logic.

R: (Polasky et al. 1997*; Camino et al. 2000*; Heal 2000, chs 1-3, 8; Heal et al. 2001; Salzman et al. 2001*; Leslie 2004*; Wilcove and Lee 2004; Eigenraam 2005; Goldstein 2005; Hawn 2005*; Salzman 2005*)

1: Read Heal 2000 first; ch 1 should be a refresher on earlier classes, so skim if you like; chs 2-3 & 8 have much of the core economics in simple terms with good examples. **2**: Read Wilcove & Lee to understand how different policies and programs play out for endangered species conservation in the US, then read Eigenraam and Goldstein for some innovative and incredibly interesting programs in Australia. **3**: Next roughly familiarize yourself with Leslie (for certification systems), Salzman (for discussions of several case studies and critiques of payment systems; basically read the ToC for future reference), Camino et al. (for the payment for environmental services program—PSA in Spanish—in Costa Rica: most relevant are p.15-19, p.30-34, p.42-43, p.49-62), and Polasky et al. (for endangered species in US; this article is fantastic, but too dense for now; perhaps worth returning to for class 8 for those interested). **4**: Finally, as time permits, familiarize yourself with or read Heal et al. 2001 (for the concept of ecosystem service districts and their expression of the kinds of information we would need to make policies for ecosystem services in general).

8. Nov 8 2006. Markets and profit-making for the good

F: (following 7) Continued interactive tutorial on policies for ecosystem services protection, focusing on market-based mechanisms. We will examine in detail the cases of mitigation banking for wetlands and for endangered species in the USA.

LO: Understand and communicate how markets work in the context of environmental protection and the role of government regulation in their construction and operation;

determine which environmental problems are more appropriately dealt with through market-based initiatives (MBIs) than regulations and vice versa, and the kind of regulations necessary to make the MBIs work effectively.

R: (Heal 2000, chs 4-6; Bayon 2002; Daily and Ellison 2002; Heal 2003*; Bayon 2004)

1: Read Heal 2000 first, for context: this is relatively light without much of the key concepts, but use it to focus your thinking on the benefits and challenges of markets for ecosystem-service protection. **2**: Read Bayon 2002 and 2004 for details on various markets for environmental goods (& bads) and ecosystem services. **3**: As time permits, read Daily & Ellison 2002 and Heal 2003.

9. Nov 15 2006. Policies for ecosystem services in BC

F: Interactive lecture (possibly with a guest) followed by group-think exercise. The lecture will focus on existing laws and policies in BC and the associated impediments and shortcomings, and together we will consider opportunities for addressing ecosystem service protection and provision through novel policy mechanisms integrating learning throughout the course.

LO: Communicate a supported opinion of how the federal and provincial laws and policies do at ecosystem service protection, how they could do if they were optimally enforced, what the gaps are, and how you would recommend policymakers to address those gaps and ensure sustainable and wise use of ecosystem services now and in the future.

R: (Boyd 2003, chs 1-2, 4.2-.3, 6-9, 11)

Read the sections that are most interesting and relevant in detail, read the other sections more quickly.

Assignments

Overview (% of total marks)

- Two short written assignments: ≥1 op-ed essay and ≤1 policy brief (10 + 10).
- Two reviews of fellow students' assignments (5 + 5).
- Two short problem sets (5 + 5).
- One final team-analysis project, including a proposal (5), presentation (10), and final paper (30). Project can involve program evaluation, analytical essay, or literature review as appropriate for individual students.
- Journal entries and class participation (5 + 10).

Schedule

- Sep 13 2006: journal entries
- Sep 20 2006: short paper 1 (ecosystem services and why they matter)
- Sep 27 2006: fellow review 1; (mini-problem set (zoonotic disease risk)—cancelled)
- Oct 4 2006: final project proposal
- Oct 11 2006: mini-problem set (cost-benefit analysis)
- Oct 25 2006: short paper 2 (ethics in economics and politics)
- Nov 1 2006: fellow review 2
- Nov 22 2006: journal entries
- Nov 22, 29 2006: final project presentations
- Dec 6 2006: final project papers, journal entries

Details

All assignments should be submitted by email (kaichan@ires.ubc.ca) by **noon** on the date noted as MS Word-compatible attachments (rich text format, rtf, is fine; to enable commenting and suggested changes) except the problem set, which should ideally be submitted as a MS Excel-compatible spreadsheet. For the report, please also print a double-sided copy (if possible; or use 1-sided reused paper) to submit to my box in AERL. Please label assignments in the following manner: "(first name) (last name) (assignment title)", e.g., "Kai Chan op-ed 1.doc". Reviews should be labelled by tacking on the reviewer's initials: "(author first name) (author last name) (assignment) (reviewer initials)", e.g., "Kai Chan op-ed 1 LK".

Please keep within word limits; excessive violations will be penalized. You may consult with others in doing your assignments, just make sure that you acknowledge them and specify who did which parts.

Short papers 1 & 2

One of the themes of this course is the crucial need to transfer technical knowledge from experts to stakeholders and decision makers. Such communication can differ starkly from the typical academic paper, which partly explains the dearth of effective communication on resource management and environmental issues to date. Accordingly, one crucial skill to be gained in this course is writing for lay people (e.g., in opposite-editorials, "op-eds") and decision makers (e.g., in policy briefs). The key components here are (1) seizing and holding the attention of your audience, and (2) conveying complex concepts effectively in simple terms. Thus, 5 marks are for structure, flow, and style, and 5 are for content.

Illustrate your points through some issue of current interest and some particular ecosystem service(s). For op-eds, please plan to submit these after comments and revision. References are not necessary for op-eds; if present, they should be streamlined into the text. Policy briefs should have references where appropriate (in one standard style of your choice).

1, Ecosystem services and why they matter: In 800-1000 words, explain the concept of ecosystem services and why it should matter to your chosen audience (please specify).

2, Ethics in economics and politics: In 800-1000 words, argue for the strengths and weaknesses of our economic and political systems to incorporate ethical concerns, and propose and defend a way (broadly conceived) to better incorporate such concerns.

Fellow reviews 1 & 2

Another theme of ecosystem services is the crucial need for collaboration with others, especially those from diverse backgrounds. In order to grapple with this multidisciplinary problem, we must work together and improve each others' work. Providing collegial input on papers can also be a tremendous short-cut to improving our own writing. Remember that input is worth nothing—and can be counterproductive—if it cannot be received as constructive. Also, we learn not only from suggestions about what might work better but also affirmation of what works well. Accordingly, make sure to commend as well as suggest.

Pick a new partner for each short paper, and send that person your paper on the due date above. Comment (up to 500 words) on their paper and send it back to them and to me by the following week. These comments can be distributed across in-text embedded comments (e.g., in Word) and a short blurb with general remarks, whatever seems most appropriate. I will evaluate for both style ("packaging", not quality of prose; 2 marks) and content (3 marks).

Mini-problem sets

Specific details to come.

Please submit your answers in an Excel spreadsheet, showing your work and writing out answers to the questions, with units, etc., as appropriate. Where you feel that the question is ambiguous, feel free to ask for clarification. Where you feel that several interpretations are equally correct, feel free to make an assumption, but please state that assumption explicitly. As with other assignments, you may work with and consult others, but please acknowledge all sources of help explicitly.

Final projects

I believe that you'll do your best work when you're working on projects of your own passion and which overlap with your thesis work. If your class project contributes to your thesis, fantastic! All that matters is that you do creative original work and learning regarding ecosystem services. Accordingly, please feel free to propose a project that suits you best in form and content.

The **purpose** of the project is to analyze a program or policy for its ecosystem services implications. The emphasis is on integrating across the disciplines to provide a perspective that is often missing in policy formation. In class we often learned about each of the different disciplines separately because it is crucial to understand the key principles and underlying assumptions before integrating in a meaningful way. Now the challenge is for you to bring this understanding together. The core components of the project are (1) context, (2) characterization, and (3) recommendations. You need not organize your report by these headings or the sub-headings that follow; simply ensure that you're addressing questions like these (not necessarily these exactly, these particulars are just to trigger your thinking).

(1) Context:

a. ***Ecological:*** What are the relevant ecological (and hydrological, etc.) dynamics and conservation priorities? What were they like, and what are they like now? What are the threats to future dynamics, and what are the ecological opportunities for change (e.g., has the system entered a new stable state)? How much is known about the relevant dynamics and how much is not (e.g., what determines the ecological provision of the relevant ecosystem services)?
b. ***Social:*** Who are the relevant stakeholders? What are their needs and wants in relation to relevant ecosystem services and opportunity costs? Who gains or loses from the current policy/program and who stands to gain or lose from changes? What historical events, policies, etc., still have relevance to stakeholders and so bear upon current and future policy? What relevant rights do people have? What other programs or policies have relevant impacts on the way people interact with the ecosystems?
c. ***Integration:*** How do the ecological dynamics impact social dynamics and vice versa? How do the ecological functions manifest in values to people and how do human actions play out in ecosystems? If there are multiple ecosystem services of value, do the key ecosystem-service providers interact with the providers of other ecosystem services? To what extent are the relevant ecosystem services captured privately vs. enjoyed publicly? Are there tragedies of the commons or other social traps?

(2) Characterization: What are the impacts of the policy in question?

a. ***Ecological:*** How does the policy alleviate current or future threats? How does it impact or restore ecological function and conservation priorities? How much and what information is being gathered about the policy's ecological impact?
b. ***Social:*** How does the policy impact stakeholders directly? How are they responding to the policy? How much and what information is being gathered about the policy's social impact? How does the policy interact with other policies?
c. ***Integration:*** What are the implications of the policy and resulting human actions for ecosystems and the values of ecosystem services (the indirect effects of the policy on stakeholders)? Does it favour one ecosystem service at the

expense of others? Do the spatial and temporal scales of ecological provision of services mesh with the scales at which people derive value and at which the policies impact or manage the services or threats to them?

(3) Recommendations: How might the policy be improved? How do the proposed changes improve ecological dynamics and enhance the social benefits or reduce social costs (to particular stakeholders) of the policy?

Grading Criteria (presentation /10, paper /30):

Content:

- *Context/set-up* (/1, /5): how well you explain the issue and the relevant threats, policies, stakeholders, and how it all comes together.
- *Data* (/1, /5): the quality of the data you've marshalled (or, where good data are not available, the quality of your search for data as you describe it and your description of the kind of data you would want/need) for the relevant natural and social science.
- *Analysis* (/2, /9): the quality of your analysis of the data (their implications) and the integration across disciplines for a synthetic understanding of the relevant ecosystem service.
- *Recommendations* (/1, /5): the creativity and appropriateness of your recommendations (in light of the data & analysis)

Presentation:

- *Visual aids* (/2, /6): clarity, aesthetics, layout, organization, balance of materials for different styles of learning (e.g., visual vs. verbal)
- *Delivery* (/3, /0): stance, projection, audience engagement, pacing

This is intended to be a **team** effort. As in every case with ecosystem services, the relevant expertise is distributed among different people. I prefer teams of 2 but will consider proposals with different numbers and will adjust grading expectations accordingly. Teams will receive the same grades on all components except for the delivery component of the presentation, as it is assumed that you will make use of your reviewing skills to improve your partner's contributions. Exceptions to the policy of equal grades will be considered only if requested *by both parties together at the due date*.

Wherever possible, please make your project useful to **decision makers** and consider this in your project design by discussing with the decision maker in question what would me most useful to them. If you do good work in this area, somebody somewhere will be deeply interested, and it's your responsibility to find them (but not necessarily alone: I have contact in NGOs and government and can facilitate finding appropriate contacts for your projects). In addition to your own contacts, I am also hoping that we can publish your reports either individually or collectively in some forum (possibly a journal, possibly an online source like Ecosystem Marketplace).

Proposal: In ≤1000 words, explain and justify your chosen area and policy, and lay out the structure and content of the paper. Describe the methods that you will use, and refer to some of the literature that you will consult. Please also describe your plan for ensuring that it will be considered appropriately by the decision makers in question (ideally you would already have established contact).

Presentation: In ≤30 minutes, present your initial findings in the areas outlined above. Presentations are intended to get valuable feedback from the instructor and peers. Please share presentation time equitably. There will be 5 marks for content (common to the team) and 5 marks for delivery (individual). Marks will be deducted for going over time.

Paper: In ≤7000 words (including figures, tables, and all text except references and supplementary appendices), present your findings. Papers should be fully referenced according to the style of your choice. Exceptions to the word limit will be considered if requested by Nov 22 2006 based on discussions with your decision-maker contacts.

Journals

I do my best learning and integration when I take the time to reflect. With the assumption that many of you are the same, I'm "forcing" you to take that time. These reflections—which I ask you to share with me—will also benefit future students greatly by providing me with a small window into your minds. Teaching such a multidisciplinary group of students a transdisciplinary course is a new and considerable challenge. I need your help—well beyond the usual course evaluations.

In these weekly entries, please jot down your thoughts on your most important lessons and insights from the lessons, readings, and your project work. For the readings, I highly encourage you to enter the same reflections into a bibliographic software program like EndNote (not cheap) or RefWorks (free through UBC). These entries need not be long and I will not be grading for grammar or style. Basically, if you do some thinking and jot it down each week, you'll get these marks. Please submit your first entry (which should also contain answers to the questions of (1) what you're most excited about in the course; (2) what you're most concerned about regarding the course; and (3) what "ecosystem services" means to you) by the second class. After this, please submit your journals twice more: the week after the last lesson, and along with your final paper.

Class participation

I believe that you will learn best through interactive lessons, and I've structured the course accordingly. But this also means that you won't learn much unless *you* are interactive, so to acknowledge that, 10% of your final grades are for participation. Timely attendance is mandatory; please let me know in advance if you will not be able to make it on time to class. So that students don't miss out on crucial information presented at the beginning of class (e.g., the learning objectives, which should structure your thinking throughout class), I like to wait until everyone is present; if you're late and don't let me know, everyone else will suffer.

Instructor

(Kai M. A. Chan) I am a transdisciplinary scholar of ecology and evolution, ethics, and policy. With colleagues at The Nature Conservancy (TNC; California chapter) and Stanford University, I completed one of the first ecoregional-scale spatially explicit analyses of the provision and societal importance of ecosystem services. I am launching a research program designed to create a framework for understanding and planning for ecosystem services in British Columbia (BC), in partnership with non-governmental organizations and government agencies. This work is associated with the Natural Capital Project (a partnership of World Wildlife Fund, TNC, and Stanford University).

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Letter to the Student

Dear student,

As I hope the syllabus has already persuaded you, RMES 500K is going to be a blast: we'll all learn a lot, and we'll enjoy it along the way. In addition to this effort to promote enjoyment, three features will characterize this course in 2006. (1) It will be small, so I will give considerable personal attention to students and also ensure considerable interaction with and learning from your peers. (2) RMES 500K will be all about what you get out of it. I have already structured the learning in a way that I hope will make it most useful for your futures, and I will happily tailor assignments to your particular circumstances (within reason) to further encourage this. (3) This course is very much in the testing stage, so I will be relying upon your patience and your constructive criticism to improve this course for this year and future years. But don't let this dissuade you from taking it this year: loads of interesting stuff is happening in this arena, so there's no time to waste learning about it!

Best,
Kai

Readings

In order to gain a working understanding of ecosystem services and their impacts and management, students must grasp key concepts from a wide range of sources, spanning diverse fields and intended audiences (academics vs. policymakers vs. business people). Accordingly, this course will involve consulting a mix of books, journal articles, reports, and online sources (e.g., Ecosystem Marketplace). The volume of reading may appear considerable, but I highly encourage students to employ a form of information gathering that may differ from other courses, and I will assist in this. There will be no tests of recapitulation of minutiae from assigned material, rather students will be assessed based on their ability to incorporate crucial concepts from the readings into their thoughts and products. Accordingly, your task is to identify the key ideas from each reading and understand how they fit in with each other and your own personal knowledge base and career path. This may mean in depth reading for some readings and skimming or speed-reading for others, but students will have different approaches to different readings.

Core Books

I will refer primarily to several books, which have been placed on short-term reserve at Koerner library. However, each is available for purchase at a reasonable price either at the UBC bookstore or online.

Daily, G. C., Ed. (1997). Nature's Services: Societal Dependence on Natural Ecosystems. Washington, DC, Island Press. http://www.amazon.ca/gp/product/1559634766/sr=1-1/qid=1155595726/ref=sr_1_1/702-8872424-7903261?ie=UTF8&s=books

Daily, G. C. and K. Ellison (2002). The New Economy of Nature: The Quest to Make Conservation Profitable. Washington, D. C., Island Press. http://www.amazon.ca/gp/product/1559631546/sr=1-3/qid=1155595726/ref=sr_1_3/702-8872424-7903261?ie=UTF8&s=books

Heal, G. (2000). Nature and the Marketplace: Capturing the Value of Ecosystem Services. Washington, D.C., Island Press. http://www.amazon.ca/gp/product/155963796X/sr=1-4/qid=1155595980/ref=sr_1_4/702-8872424-7903261?ie=UTF8&s=books

National Research Council (2005). Valuing Ecosystem Services: Toward Better Environmental Decision-Making. Washington, DC, National Academies Press**:** 277. http://www.amazon.ca/gp/product/030909318X/ref=sr_11_1/702-8872424-7903261?ie=UTF8 or free online at http://books.nap.edu/openbook/030909318X/html/index.html

In addition to these four, Boyd is a fantastic resource for Canadian laws and policies that impact ecosystems that I will rely upon in the later part of the course, so students may wish to purchase this book also:

Boyd, D. R. (2003). Unnatural Law: Rethinking Canadian Environmental Law and Policy. Vancouver, BC, UBC Press. http://www.amazon.ca/gp/product/0774810491/sr=8-1/qid=1155743057/ref=sr_1_1/701-5402013-4505904?ie=UTF8&s=gateway

Others

One of the most important skills to learn in graduate courses is how to find and organize references. Virtually all of the references below can be found electronically through UBC Library sources (I use ISI Web of Science to download citations to EndNote and also to find the pdfs online). I highly encourage you to institute such a system now (if you haven't already). But to make your life easier, I've provided urls to all of the readings below (some are on the course resources webpage).

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