Syllabus BIEB 174 “Ecosystems and Global Change”
Fall quarter 2010
Lectures MWF 2:00-2:50 p.m. Ledden Auditorium
Final exam Wednesday December 8th 3-5:59 p.m., location TBA
Faculty:
Elsa Cleland, Asst. Professor
Contact information: email ecleland@ucsd.edu, office phone 858-246-0506
Office hours: Mondays 12:30-2 p.m., Muir Biology room 1115
Teaching Assistants:
Angelita Ashbacher, acg002@ucsd.edu
Discussion sections: Tuesdays 10-10:50 a.m. in HSS 1315 & Wednesdays 10-10:50 a.m. in Center 207
Office hours: Fridays 3-4:30 p.m., Muir Biology Rm 1115
Peter Dentith, pdentith@ucsd.edu
Discussion sections: Wednesdays 3-3:50 p.m. in HSS 2150
Office hours: Wednesdays 10:15-11:45 a.m. at the S&E library in Giesel
Marina LaForgia, mlaforgi@ucsd.edu
Discussion sections: Tuesdays 11-11:50 a.m. in HSS 1315
Office hours: Thursdays 2-3:30 at Perks
Claire Wainwright, cwainwri@ucsd.edu
Discussion sections: Mondays 11-11:50 am & 12-12:50 p.m in HSS 2150
Office hours: Wednesdays 12:30-2 p.m. at the Grove Cafe
Course description:
This course will teach the principles of terrestrial ecosystem ecology, and will use examples from recent research to help students understand how global environmental changes are altering processes from leaf-level ecophysiology to global-scale cycling of carbon, water and nutrients.
Why you should take this course:
In recent decades human activities have altered ecosystems around the globe, through changes in climate, land use, and nutrient cycling. Understanding the impacts of these global changes requires a background in ecosystem ecology. Ecosystem ecology is a field that scales phenomena from physiological processes within plant leaves, to global biogeochemical cycles of carbon, nitrogen and water. “Ecosystems and Global Change,” will teach the fundamental concepts of ecosystem ecology, while using examples from current research in the field of environmental science. Thus, the course is designed to fulfill two primary goals: providing depth to students who want training in ecosystem science in an upper division course towards their EBE major, and providing breadth in environmental science to students in other science majors.
Prerequisites
BILD 2, & 3. This is an upper division course and will build on concepts from the introductory course series. While not required, introductory chemistry and physics courses will be helpful. Basic algebra is also required (simple equations, ratios).
Textbook
The course uses an excellent and inexpensive textbook ($50 new, $40 used, in paperback): "Principles of Terrestrial Ecosystem Ecology" by Chapin, Matson & Mooney (2002), Springer. The optional text “Environmental Science, 7th Edition” by Botkin – this text is expensive and will seldom be drawn on during lectures. However, some students in the past requested additional background material to help them understand the more advanced Chapin et al. text, and this basic environmental science text provides such background. Copies of both texts will be reserve at the library.

Lectures

Attendance in lectures is required to do well in this course. Lecture slides will be posted on WebCT by the morning before each lecture, but not all material presented verbally in lectures will be contained in these slides. We will use iclickers in class, please purchase an iclicker from the bookstore and register it using your email username (not PID) at www.iclicker.com. If you buy a used clicker, it is your responsibility to make sure it is the same model sold in the bookstore, otherwise it will not work with the iclicker system in the classroom. **Please turn off all cell phones at the start of lecture.**

Discussion sections:

Discussion sections are required, and are designed so that students can gain experience in activities that are not possible in a large lecture setting. In discussion sections students will have the opportunity to think critically and creatively, and communicate ideas both verbally and in writing. Approximately 5-6 review questions per week (due at the beginning of each section) will guide the discussions, and will be posted on WebCT. Hence, while discussion sections offer a chance to ask questions and explore the weekly concepts more deeply, the lecture materials *will not be summarized again in discussion sections*. Discussion sections begin meeting Monday September 27th, during the first week students will complete an in-class exercise rather than completing review questions before section. **You must enroll in a section at: https://sections.ucsd.edu/**

Expectations

This is an upper division course, and will build on concepts gained in lower division courses. Ideally you will find it challenging but not overwhelming. As a 4 credit course, the expected time requirement is 12 hours per week (4 hours in lecture/discussion section and 8 hours of outside reading/studying). Please plan this amount of time in your weekly schedule so that you feel prepared for lecture/discussion and confident for your exams.

Academic integrity

Academic integrity is taken extremely seriously at all universities, and UCSD is no exception. Any student caught cheating will fail the course. Please note that because iClickers will be used for formal assessment related to student grades, it is considered a serious infraction to answer iClicker questions for another student using their iClicker, and would lead to both students failing the course. For information on academic integrity at UCSD:

http://www.senate.ucsd.edu/manual/appendices/app2.htm

Grading & Assessment:

Assessment reinforces the ideas presented over the quarter, and allows students to gauge their progress in the subject. More information about these assessments will be discussed in lecture/discussion sections and will be placed on WebCT.

5% Clicker Quiz Oct 11th (Lectures up to Oct 8th)
20% Midterm exam Oct 22nd (Chapters 2-7)
20% Midterm exam Nov. 12th (Chapters 8-13)
30% Final exam Dec 8th (Lectures Nov 8th-Dec 1st and cumulative across the quarter)
10% Lecture participation

Assessed via iClicker questions, answers do not need to be correct, this is a learning activity, full credit will be given if at least 75% of questions are answered in at least 75% of lectures (starting in week 3), this allows flexibility for late adds, illnesses or other emergencies.

15% Discussion Section

10% Weekly review questions from the end of each chapter in the text (written answers must be completed before arriving in section, and will be turned in during section. Late turn-ins will not receive credit without documentation of illness or emergency)

5% Section participation (attendance & discussion, 0.5 points per section)

What will be on the exam? The exams will focus on material that has been presented during lectures, and material that is the focus of review questions. You do not need to know details from the reading that are not covered in the lectures.
Make up policy**:**
Please note that there will be no make-up exams, or quizzes. If you miss a quiz, midterm or final exam, then you will be required to submit documentation of illness or unavoidable emergency. Without such documentation, you will receive zero points for that assessment. For missed quizzes or midterms, and with valid documentation, the proportion of your grade that is based on your final exam will be increased to cover the assessment that was missed. For a missed final exam and with valid documentation, you will be expected to take the final orally or you will receive an incomplete for the course. For students with 3 finals on Wednesday Dec 8th, I will offer an alternate final on Monday Dec 6th (time TBD).
Students wishing to have questions from exams re-graded need to submit a written request specifying the questions in dispute and the reason for the re-grade, realizing that the entire exam will be re-evaluated.
If you miss discussion section due to a documented illness or emergency, you must submit your review questions in person or by email to your TA email by the end of the week to have full credit. If you miss a discussion section for any other reason, you have the option of completing an extra assignment in addition to your weekly review questions to receive full credit (only one time during the quarter). To avail yourself of this option, attend the Ecology, Behavior & Evolution seminar held on Fridays 11-noon in Muir Biology 1115, and write a short summary of the seminar (no more than one page). Turn this into your TA along with your completed review questions.
How to do well in the course

1. Focus on the big picture. Ecosystems are dynamic and exciting, if you can cultivate a curiosity about how they work, the material will be more interesting to you, and will "stick in your head."

2. Attend lecture ready to focus on the material. You can skim the chapter before coming to lecture if that will help you to absorb the material, but don't try to read it completely as there is much more depth in the reading than will be covered in the lectures.

3. After lecture, look at the review questions associated with the chapter covered, and use both your lecture notes and the chapter to help you answer the questions. Plan to spend 8 hours a week reading, studying, and answering review questions.

4. Participate in discussion section, sharing your answer to the review questions with other students. Note when the TAs or other students add additional aspects to the answer that you didn't think of. Your biggest challenge is to figure out what you don't know. Daily clicker questions will also help you figure out where you need to focus your study.

5. After quizzes or midterms, make sure you look carefully at the answers on the key, and figure out if there are areas that you don't understand.

Schedule of lectures, readings, and assessments:
Sep 24th: Ch. 1 The Ecosystem Concept
Overview and history of ecosystem ecology; controls over ecosystem processes; human-caused changes in Earth's ecosystems.
Sep 27th: Ch. 2 Ecosystems of the globe
Ecosystem distribution in relation to climate
Sept 29th: Ch2. Earth's Climate System
Earth's energy budget; atmosphere, oceans, landforms & vegetation contributions to climate; temporal variability in climate

Oct 1st: Ch. 3 Geology and Soils
Controls over soil formation & loss; soil profiles, horizons & classification; soil properties in relation to ecosystem functioning.
Oct 4th: Ch. 4 Terrestrial Water and Energy Balance
Ecosystem water inputs and losses; water movements among soil, roots, leaves, canopies; evapotranspiration and the energy balance
Oct 6th: Ch. 5 Carbon inputs to Terrestrial Ecosystems
Photosynthetic pathways (C3, C4, CAM); net photosynthesis in the leaf; limitation by light, CO2, water and nitrogen; influence of temperatures, gross primary production (GPP) controls and measures.
Oct 8th: Ch. 6 Production Processes
Plant respiration; net primary production (NPP); allocation of growth to different tissues; tissue turnover; global distribution of biomass and NPP; net ecosystem production (NEP) and controls
Oct 11th: **Clicker quiz**, Ch. 7 Decomposition Processes
Biological breakdown of litter by bacterial, fungi and animals; Litter breakdown through chemical and physical processes; environmental and enzymatic controls over decomposition; long-term carbon storage in soils
Oct 13th: Ch 7 (cont), & Ch. 8 Plant Nutrient Use
Macro- and micro-nutrient requirements for plant growth; nutrient movement in soils; uptake by plant roots & mycorrhizal symbionts; nutrient losses through senescence, leaching and herbivory
Oct 15th: Ch. 8 (cont.)
Oct 18th: Ch. 9 Terrestrial Nutrient Cycling
Nitrogen (N) inputs to ecosystems, biological N-fixation, N mineralization and pathways of loss; other nutrient cycles (Phosphorus, sulfur, essential cations); interactions among nutrient cycles
Oct 20th: Ch. 9 (cont) Human-caused N deposition, causes & consequences
Oct 22nd: **Midterm, covering up to Ch. 7**
Oct 25th: Ch. 10 Aquatic Carbon and Nutrient Cycling
Fundamental differences between terrestrial and aquatic ecosystems; carbon and nutrient cycling in oceans, lakes, rivers & streams
Oct 27th: Ch. 11 Trophic Dynamics (guest lecture by Katherine LeVan)
Plant-based trophic systems versus detritus-based trophic systems; assimilation efficiencies; food webs and trophic cascades
Oct 29th: Ch. 12 Community Effects on Ecosystem Processes
The functional trait concept; species-effects on ecosystems, climate and disturbance regimes; relationship between biodiversity and ecosystem function
Nov 1st: Ch. 13 Temporal Dynamics
Inter-annual versus long-term fluctuations in ecosystem processes; disturbance cycles and the successional process

Nov 3rd & 5th Field exercise, more information will be discussed in lecture and posted on WebCT
Nov 8th: Special topic: Nutrient interactions (Jonathan Shurin guest lecture)
Concept of multiple-nutrient stoichiometry at various levels of organization, from molecules to whole organisms, and experimental approaches for identifying resource limitation
Nov 10th: Special topic: Stable isotopes in ecology (Carolyn Kurle guest lecture).
Reading, pages 84-85, 104, & 171 in Chapin et al.
Nov 12th: **Midterm, chapters 8-13**
Nov 15th: Ch. 15 Global Biogeochemical Cycles
Global carbon cycle and long-term changes in atmospheric CO_2; terrestrial carbon sinks; global nitrogen, phosphorus, sulfur and water cycles; consequences of human-alterations of global biogeochemical cycling
Nov. 17th: Global climate change
Reading: Summary for policy makers, IPCC Fourth Assessment Report
Nov. 19th: Special topic: International climate change policy and tropical forests
(Guest lecture by John Niles)
Nov. 22nd: Ch. 16 Managing and Sustaining Ecosystems
Concepts in ecosystem management: natural variability, resilience, stability; application for managing forests, fisheries, endangered species; ecological restoration; valuation of ecosystem goods and services
Nov 24th – no class
Nov 29th: Species and ecosystem responses to climate change: Feedbacks
Dec 1st: Climate Change and Southern California Ecosystems
Reading: San Diego Focus 2050 report, pages 1-26
Dec 3rd Exam review in class
Dec 8th 3-5:59 p.m. **Final exam**, Focus on Chapters 15-16, special topics, and critical thinking and integration of concepts from the whole quarter
Discussion section schedule
Sept 27-29 In-class lab exercise on soil classification, come prepared to get dirty
Oct 4-6 Review questions for Ch. 1-3 (p. 17 # 2 & 4, p 45 # 3 & 9, p 67 # 2 & 6)
Oct 11-13 Review questions for Ch. 4 & 5 (p. 96 #3, 5 & 6, p 121 #1,2 & 6)
Oct 18-20 Review questions for Ch. 6 & 7 (p. 149 # 1, 6&10, p. 174 #2, 3& 6)
Oct 25-27 Review questions for Ch. 8 & 9 (p. 195 #1, 12&13, p. 222, #4, 8 & 9)
Nov 1-3 Review questions for Ch. 10 & 11 (p. 242 #1, 2 & 5, p. 263 1, 3 & 4)
Nov 8-10 Review questions for Ch. 12 & 13 (p. 277 # 2, 3, & 6, p. 303 # 4 & 5)
Nov 15-17 Review questions for Ch. 15 (p. 355 # 1, 3, 7, 8) + special topics
Nov 22-24 Review questions for Ch. 16 (p. 369 # 1, 2, 4, 5)+ global climate change & IPCC
Nov 29-Dec 1 Review questions regarding CA climate change & feedbacks