Instructor: Travis Idol  
Contact Info: Sherman Lab 125  
956-7508  

Class Times: MW 1:30-2:20  
Lab Time: 2 hrs, determined by class  
Class Location:  

Pre-requisites: undergraduate ecology course, e.g., BIOL 265, BOT 351, 453/454 or equivalent and undergraduate soils course, e.g., TPSS 304 or equivalent  

Texts: Articles and book chapters assigned and copied as handouts;  

Objective: To understand the major components and processes of terrestrial biogeochemistry, with an emphasis on internal nutrient cycling, relationships of biogeochemistry to ecosystem structure and function, and responses to changes in vegetation and climate.  

Class Format: Two lectures and one discussion section.  

Assignments:  

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<tr>
<th>Assignment</th>
<th>% of Grade</th>
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<tr>
<td>Weekly Article Reviews</td>
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<td>Discussion Group Participation</td>
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<td>Two In-Class exams</td>
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<td>Final Project</td>
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Weekly article reviews are due in class on the Monday following the class discussion. For each article reviewed, a pair of students will be assigned to lead the discussion, roughly following a set format (described below). Discussion leaders will receive a participation grade based on the quality of their facilitation of the discussion. Other students will be graded on their participation in the discussion. Exam 1 will cover lecture and discussion material from Weeks 1-5; Exam 2 will cover Weeks 6-10. Exam questions will require short essay answers. A study guide for each exam will be provided. Instructions for the final project are described below.  

Class Topics (by week)  

1. Systems Ecology: how to think like a biogeochemist  
2. Mineral Weathering and Soil Development  
3. Atmospheric Nutrient Inputs: N-fixation, acid rain, and global dust movement  
5. Nitrogen Cycling I: inputs, outputs, and internal cycling  
6. Nitrogen Cycling II: relationship to organic matter dynamics (Exam 1)  
7. Phosphorus Cycling I: inorganic fractions and soil development  
8. Phosphorus Cycling II: organic fractions and P cycling  
9. Modeling Biogeochemical Cycles I. the development of CENTURY, Biome-BGC, and TEM  
10. Modeling Biogeochemical Cycles II: comparative analysis and applications to tropical environments  
11. Comparative Biogeochemistry I: tropical vs. temperate ecosystems (Exam 2)  
12. Comparative Biogeochemistry II: forests vs. grasslands  
13. Watershed-Scale Biogeochemistry: the Hubbard Brook Experimental Forest  
14. Global Climate Change: productivity, C sequestration, and biogeochemistry  
15. Biodiversity: effects on biogeochemistry  
16. Presentations of Final Projects
Article Reviews
When preparing to lead the discussion for a specific article or write an article review, keep in mind the following questions.

1. What are the authors’ main points in the article? What hypothesis are they testing, argument they are defending, or principle they are outlining? What background information has led them to this point?

2. What methods to the authors use to carry out their experiment? If a review article, what kinds of data or studies do they use to build their case? Are these appropriate and sufficient for their purpose?

3. What are the major findings of the study? Are they interpreted or discussed correctly and fairly?

4. What are the major conclusions of the study? Were the authors’ initial hypotheses or arguments confirmed, refuted, altered in any way? Do their conclusions follow from the results? Do the authors suggest conducting the study differently or carrying out follow-up research?

Discussion Sections
We will discuss a major scientific article covering novel research or reviewing important research related to that week’s class topic. One pair of students will be tasked with leading the class discussion of the article, based on the questions in the article review above. Discussion leaders will not be required to give their own answers to the questions but rather to ask questions of the other students in order to solicit their thoughts and evaluations. The discussion leaders should use student response as a way to guide the discussion toward what they think are the relevant and important issues. Thus, students should have read and attempted to understand the articles in order to meaningfully participate in the discussion. The discussion leaders must be prepared additionally to anticipate student response and therefore guide the discussion.

Final Project
The final project will be a paper and a presentation on a topic covered in class. You should select one or more of the topics covered in class as the basis for your project, but your specific topic should reach beyond the lectures and class discussion. You paper should include: a well-reasoned description/review of the topic, its importance to biogeochemistry, and how it intersects with other biogeochemical topics covered (or not covered) in class.

You should concentrate your sources on primary scientific literature. Review papers and technical book chapters are acceptable, especially as background material. Often, these papers contain a wealth of primary literature citations you can use for the rest of your project. Internet citations are not acceptable unless they are linked to specific peer-reviewed publications or official government reports. Use standard scientific journal formatting for your references list and for citations within the text. Please include your name on the cover page and number the pages of your write-up.

For the presentation, prepare a 15 minute summary of your topic, covering the major issues outlined above. You may use whatever presentation media you like: overheads, handouts, Powerpoint slides, etc. The final presentations will be given during the final week of class. The final paper or model write-up is not due until finals week.