ENVS 89 Soils, Forests and Food (formerly Forest Biogeochemistry); EEES 189 Fall 2019
Class Meetings: 3A in 113A Steele: Monday 3:30-5:20 Friedland
Monday 5:35-6:25 (x-hour)
Thursday 4:30-6:20

Instructor: Andy Friedland, 111 Steele Hall, X6-3609, andy.friedland@dartmouth.edu
Office Hours: Monday 2-3 pm & by appointment

Readings: Numerous articles from the scientific literature.
Text: *Biogeochemistry: An Analysis of Global Change, 3e*. W.H. Schlesinger and E.S. Bernhardt, Academic Press, 2013. On Reserve.
Text: Optional: *Hubbard Brook: The Story of a Forest Ecosystem*. R.T. Holmes and G. E. Likens, Yale University Press, 2016. On Reserve.
A complete list of books on reserve in Kresge Library (3rd floor of Fairchild) can be accessed from the Dartmouth Canvas course page

Description
This seminar class will examine elemental cycling and related biogeochemical processes in terrestrial ecosystems, with a strong focus on secondary forests that were previously agricultural lands. The objective is to gain a thorough and current understanding of forest biogeochemistry, with emphasis on cycling of the major elements carbon and nitrogen, and the trace elements mercury and lead. The interaction of disturbed and undisturbed forests with the global carbon budget will be a major topic of study throughout the course. This course fulfills the Science (SCI) distributive.

The required text will be used as a reference. Class meetings will be taught like a graduate seminar. More class time will be spent discussing articles from the peer-reviewed literature, with presentations by class participants, than in formal lecture. Most class meeting will begin with a general presentation of the topic by the instructor and an examination of at least one "classic" paper from the literature. Then a preselected paper—that everyone has read prior to class—will be presented by a member of the class, who will then lead a discussion about the paper and topic.

Grading

One problem set	25 points
One 2-page real-world carbon question solution	50 points
In-class article presentations and class participation	50 points
Final presentation during last class	25 points
Final paper in peer-review journal format (~15 pages)	100 points
Total	250 points

The final paper may be written as: an original paper based on your own forest biogeochemistry dataset in peer-review journal format **or** a literature synthesis and review written in the format of "Reviews" in *Frontiers in Ecology and the Environment*. With permission, a research proposal that identifies gaps in knowledge within a particular area of biogeochemistry may be written. Graduate students **must** write a research proposal or paper based on an original dataset.

ENVS 89—Fall—2019 (Articles to be discussed on each date are listed in Canvas)

Date	Description
09/16	**Mon:** Introduction and Framework
09/19	**Thurs:** The Hubbard Brook and Other Ecosystem Models
	Processes
09/23	**Mon:** Forest Elevational Gradient **Gile Mountain Field Trip**
09/26	**Thurs:** Deposition of Nutrients and Pollutants to Forests Understanding Common Biogeochemistry Calculations (Prob Set Due)
09/30	**Mon:** Class begins at 4:30 in 006 Steele Hall Guest Lecture: Carbon Valuation (this title may change) Professor J. Kēhaulani Kauanui, Wesleyan University
10/03	**Thurs:** Soil Processes including Weathering, Cation Exchange, Leaching, Accumulation Dinner provided at end of class
	Forest-Agricultural System Integration
10/07	**Mon:** Mass-Balance and Nutrient Cycling
10/14	**Mon:** Carbon Accumulation and Reorganization After Clear Cutting (Beef/Mushroom Carbon Trade-off or other Real World Calculation Due)
10/21	**Mon: Guest:** Microbial Communities and Carbon Balance **Emily Lacroix (D '15, PhD Candidate) Stanford U.** (Submit final paper topic)
10/28	**Mon:** What Can We Learn from the Lead and Acid Rain Literature? **(Submit draft final paper Abstract)**
10/31	**Th:** The Soil-Plant Taste Connection in Agricultural Lands **Guest: Krista Scruggs, Zaffa Wines, Burlington, Vermont**
11/04	**Mon:** Biomass and Carbon Accounting
11/11	**Mon:** Presentations (Final Class) (Dinner provided at end of class)
11/18	**Mon:** Individual meetings on final papers
11/22	**Final Papers Due at Noon (Word document, electronic submission via Canvas)**

In addition to the texts for this course, you should browse these books early in the term (all are on reserve in Kresge Library): http://libcat.dartmouth.edu/search/p?SEARCH=friedland

Content

FH Bormann and GE Likens. Pattern and Process in a Forested Ecosystem. Springer, 1981.
H Jenny. The Soil Resource. Springer, 1980.
GE Likens and FH Bormann. Biogeochemistry of A Forested Ecosystem, 3e. Springer, 2013.

Mechanics of Writing

RA Day and B Gastel. How to Write and Publish a Scientific Paper, 8e. Greenwood Press, 2016.
AJ Friedland, CL Folt, JL Mercer. Writing Successful Science Proposals, 3e. Yale Press, 2018.
D Hacker and N Sommers. A Writer's Reference, 9e. Bedford, 2017.
J Schimel. Writing Science: How to Write Papers That Get Cited and Proposals That Get Funded. Oxford, 2012.

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Please read:

The Academic Honor Principle applies to all Dartmouth students at all times. I recognize the importance of the Honor Principle and expect you to do so as well.

I encourage students with disabilities, including "invisible" disabilities like chronic diseases, learning disabilities, and psychiatric disabilities to discuss with me appropriate accommodations that might be helpful.

Some students may wish to take part in religious observances that occur during this academic term. If you have a religious observance which conflicts with your participation in the course, please see me before the end of the first week of the term to discuss appropriate accommodations.

I recognize that the academic environment at Dartmouth is challenging, that our terms are intensive, and that classes are not the only demanding part of your life. There are a number of resources available to you on campus to support your wellness, including: your undergraduate dean (http://www.dartmouth.edu/~upperde/), Counseling and Human Development (http://www.dartmouth.edu/~chd/), and the Student Wellness Center (http://www.dartmouth.edu/~healthed/). I encourage you to use these resources and speak with me if you think I can be of help throughout the term.