9-2014

BIOS 532.01: Ecosystem Ecology

H. Maurice Valett
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Fundamentals of Ecosystem Ecology
BIOS 532 01: CRN 74235 (3 cr)
GBB 225, MW 10:10-11:30AM

Instructor: Dr. Maurice Valett
Time:
i) Lecture: M/W 10:10-11:30AM, GBB 225 (Gallagher Business Building, rm 225)
ii) Literature group: 2-hr evening discussion
(Biob 596 06: IS: Readings – Ecosys Ecology, 75468, 1 cr)
Office: HS 513A, Office hours, T 10-11:30 AM, W 1:30-3:00 pm or by appointment
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Overview: Ecosystem ecology embraces a system approach to the study of the interactions among naturally occurring physical, chemical, and biological elements. This course will provide a graduate level overview of the perspectives, tools, and paradigms that define the discipline. Fundamentals will be addressed in the context of primary literature and contemporary research.

Prerequisites and co-requisites: Because ecosystem ecology relies on a first principles well grounded in the physical sciences, students should have a working knowledge of general chemistry (i.e., inorganic chemistry). Students are also expected to have taken a course in ecology at the undergraduate level. Participation without these courses is available upon permission from the instructor.

Text: No text is required for the course. Two texts exist that are devoted to the subject, but both are heavily (or exclusively) dedicated to terrestrial systems. They will be available on reserve at the library along with other support texts. Note, however, that the majority of lecture content will be drawn from combined primary literature sources across multiple ecosystem types. Texts that will be on reserve will include:

Aber, J.D. and J.M. Melillo. 1991. Terrestrial Ecosystems. Saunders College Publishing, Chicago.

Golley, Frank B. 1993. A history of the ecosystem concept in ecology : more than the sum of the parts.Yale University Press, New Haven.

Schlesinger, W.H. 1997. Biogeochemistry : an analysis of global change. 2nd ed., Academic Press, San Diego

Chapin, F.S., Matson, P.A., and P.M. Vitousek. 2011. Principles of terrestrial ecosystem ecology, 2nd ed. Springer, New York.

Grading:

1) exams (4 total – all required and applied, 20% each)	80%
2) literature discussion group & activities	15%
3) participation (attendance & interaction)	5%
	100%

BIOS 532 Fundamentals of Ecosystem Ecology

Syllabus: BIOS 532/Fall 2014

Wk #	Lect No.	Day/Date	Section	Concepts
			I. Physical templates and ecosystem structure	
1	1	M Aug 25	systems - basics of ecosystems	elements, boundaries , disturbance, succession, and stress
	2	W Aug 27	climate	macro vs. micro, ENSO, remote sensing, GCMs
2		M Sep 1	Labor Day – no class	no class
	3	W Sep 3	chemical environment	redox potential, Liebig's law, Redfield ratio, stable isotopes
3	4	M Sep 8	(quiz 1) Stable isotopes	Kinetic/equilibrium fractionation, trophic shift, tracers
	5	W Sep 10	hydrologic cycle I	physical hydrology, catchments
4	6	M Sep 15	hydro II	aquifers, Darcy's law
	6	W Sep 17	(hypothesis quiz) Soils I	soil structure, horizons
5	6	M Sep 22	soils II/rate mini-lecture	soil chemistry basics, biomes, rate constants
	7	W Sep 24	aquatic ecosystems	ecosystem structure of rivers, lakes, and oceans
			Exam I – take-home	

Wk	Lect	Day/Date	II. Ecosystem Energetics	Concepts
6	8	M Sep 28	metabolism 1	P, R, fermentation, TEAPS, allochthony and autochthony
	9	W Oct 1	metabolism 2	P, R, fermentation, TEAPS, allochthony and autochthony
7	10	M Oct 6	organic matter budgets	P/R, OM budgets
	11	W Oct 8	decomposition I	food quality, course of decomposition in aquatic and soil
8	12	M Oct 13	decomposition II	breakdown models, environmental influences
	13	W Oct 15	GPP, NPP , NEP, NEE	MODIS, NDVI, Eddy Diffusion, and large scale energetics
9	13	M Oct 20	GPP, NPP , NEP, NEE II	MODIS, NDVI, Eddy Diffusion, and large scale energetics
	14	W Oct 22	Trophic dynamics and ecological efficiencies I	Fates of NPP, AE, IE, Lindeman's efficiency
			Exam II – take-home	

Wk	Lect	Day/Date	III. Nutrient Cycling and Biogeochemistry	Concepts
10	14	M Oct 27	trophic dynamics and ecological efficiencies 2	Fates of NPP, AE, IE, Lindeman's efficiency
	15	W Oct 29	nitrogen cycle 1	N pools, assimilation, ammonification, nitrification
11	15/16	M Nov 3	nitrogen cycle 2	ammonification, nitrification, denitrification
	16	W Nov 5	nitrogen cycle 3	N fixation, anammox
12	17	M Nov 10	phosphorus cycling	P biogeochemistry
	19	W Nov 12	elemental interactions	N saturation, ecological stoichiometry, coupled cycles
			Exam III – take-home	

Wk	Lect	Day/Date	IV. Disturbance, succession, and large-scale ecology	Concepts
13	20	M Nov 17	primary succession: ecosystem development	disturbance, Glacier Bay, Hawaii chronosequence
	20/21	W Nov 19	primary succession/Secondary succession	disturbance, recovery, and succession
14	21	M Nov 24	secondary succession & stability	biomass accumulation, nutrient retention, stability
	na	W Nov 26	Thanksgiving travel – no class	Seuss effect, CO_2 record, GHG emissions, carbon footprint
15	22	M Dec 1	global carbon cycle I	Seuss effect, CO_2 record, GHG emissions, carbon footprint
	22	W Dec 3	global carbon cycle II	global carbon & bioclimatology
		R Dec 11	Final Exam 8AM-10AM	Section IV