

THEME: HISTORICAL ECOLOGY

1. HOW WOULD YOU DEFINE ECOLOGY?

An easy question? Perhaps, but I've seen people fall apart during oral exams with such a straightforward topic. Also, the 'best' answer may often depend upon your audience. The other day I stumbled across the website of the Institute of Ecosystem Studies (Millbrook, New York) and noticed that they dedicate a major portion of their introduction to 'defining ecology'. This is the file I sent named 'defining ecology.pdf'. Food for thought.

2. HISTORY OF ECOLOGY: ARE YOU "UP TO DATE"?

Following (Hagen 1992), I've prepared an abbreviated outline (Outline Ecol History.pdf), which is more or less in chronological order and which identifies some key events in ecology that have shaped where we are today. I'll briefly run through this in class as a starting point for a discussion on this topic. Be sure to know where your current advisor received his/her PhD!

Some suggested readings on the history of ecology:

- Allen, T and T. W. Hoekstra, **Toward a Unified Ecology** (Columbia)
- Bormann F. H. & S. R. Kellert, **Ecology, Economics, Ethics: The Broken Circle** (Yale)
- Leopold, Aldo - Sand County Almanac (Oxford)
- Merchant, Carolyn, **Ecological Revolutions: Nature, Gender, and Science in New England** (North Carolina)
- McIntosh, Robert P. 1985. **The background of ecology: concept and theory**. Cambridge Univ. Press, Cambridge
- Blair, W. Frank. 1977. **Big biology: The US/IBP**. Dowden, Hutchinson and Ross, Stroudsburg, PA.
- Golley, Frank B. 1993. **A history of the ecosystem concept in ecology: More than the sum of the parts**. Yale Univ. Press, New Haven.
- Hagen, Joel. 1992. **An entangled bank: The origins of ecosystems ecology**. Rutgers Univ. Press, New Brunswick. QH540.8 .H34 1992
- Egerton, Frank (ed), **History of American Ecology**, New York: Arno 1977
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3. CLASSIC PAPERS & THE CURRENT STRUCTURE OF ENVIRONMENTAL BIOLOGY AT NSF

Today's attachments. Ecology at NSF has always organized itself along various logical groupings. These groupings make it easier to classify incoming proposals, allocate funds, prepare new initiatives, and manage the diversity of queries and challenges in this always rapidly changing field of science.

In the early-to-mid-1990s, five ecological '*clusters*' were identified:

1. ECOSYSTEMS & PHYSIOLOGICAL ECOLOGY
2. POPULATION & COMMUNITY ECOLOGY
3. ECOLOGICAL INTERACTIONS
4. INTEGRATIVE & THEORETICAL ECOLOGY
5. CROSS-CUTTING AREAS

Compare the above to the current '*clusters*' (<http://www.nsf.gov/bio/deb/debecological.htm>):

SYSTEMATIC & POPULATION BIOLOGY

- Population Biology
- Systematic Biology
- Biodiversity Surveys & Inventories

ECOLOGICAL STUDIES

- Ecosystem Studies
- Ecology
- Long-Term Ecological Research (LTER)
- Long-Term Research in Environmental Biology (LTREB)

Quite a difference. Any thoughts?

In the next several pages I've summarized some 'classic' papers in terms of how they might fall into one or more of the topical 'clusters' from the 90s. Look these over. How might the current cluster groupings work?

Food for thought.

Classic Papers, UPE 302, Spring 2005 (JF Reynolds)

CITATION	ECOSYSTEMS & PHYSIOLOGICAL ECOLOGY	POPULATION & COMMUNITY ECOLOGY	ECOLOGICAL INTERACTIONS	INTEGRATIVE & THEORETICAL ECOLOGY	CROSS-CUTTING AREAS
<p>Forbes, Stephen A. 1887. The lake as a microcosm. <i>Bull. of the Peoria Scientific Assoc.</i>, 77-87.</p>	<p>Ecosystem (=microcosm) dynamics</p> <p>Animal physiological ecology</p>	<p>Vegetation analysis & plant communities</p> <p>Plant competition</p> <p>Plant reproduction ecology</p> <p>Animal population ecology</p> <p>Animal community ecology</p>	<p>Predator-prey interactions</p> <p>Competition among animals</p> <p>Herbivory & plant defenses (plant-animal interactions)</p>	<p>Presents qualitative, theoretical model of aquatic microcosm</p>	<p>Terrestrial invertebrate ecology</p> <p>Terrestrial vertebrate ecology</p> <p>Ecology of fishes</p> <p>Succession</p> <p>Freshwater ecology</p> <p>Disturbance ecology</p>
<p>Cowles, Henry C. 1899. The ecological relations of the vegetation on the sand dunes of Lake Michigan. <i>Bot. Gaz.</i> 27: 95-117, 167-202, 281-308, 361-91.</p>		<p>Succession</p> <p>Vegetation analysis & plant communities</p> <p>Plant reproduction ecology</p> <p>Pollination ecology</p> <p>Plant demography</p>			<p>Soil ecology</p> <p>Fire ecology</p> <p>Conservation ecology [<i>suggests ways develop natural barriers to control dune movements</i>]</p>
<p>Grinnell, Joseph. 1917. The niche-relationships of the California Thrasher. <i>The Auk</i> 34: 427-33.</p>		<p>Animal population ecology</p> <p>Animal community ecology</p> <p>{<i>Animal physiological ecology</i>}</p>	<p>Herbivory & plant defenses (plant-animal interactions) [<i>concluded that range of Thrasher determined by biotic - abiotic conditions in chaparral associations</i>]</p>		<p>Terrestrial vertebrate ecology</p>

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<p>Lindeman, Raymond, L. 1942. The trophic - dynamic aspect of ecology. <i>Ecology</i> 23: 399-418.</p>	<p>Ecosystem dynamics Nutrient cycling</p>		<p>Predator-prey interactions Competition among animals Herbivory & plant defenses (plant-animal interactions)</p>	<p>Ecosystem dynamics [<i>ecosystem concept: eutrophic stage - equilibrium concept; hypothetical productivity growth - curve of a hydrosere</i>]</p>	<p>Freshwater ecology Succession</p>
<p>May, Robert M. 1974. Biological populations with non-overlapping generations: stable points, stable cycles, and chaos. <i>Science</i> 186: 645-47.</p>		<p>Animal population ecology Population & community modeling (animal and plant)</p>		<p>Population & community modeling (animal and plant) [<i>chaotic models, stable cycles, etc.</i>]</p>	
<p>MacArthur, Robert H. and Eric R. Pianka. 1966. On optimal use of a patchy environment. <i>American Naturalist</i> 100: 604-609.</p>			<p>Predator-prey interactions</p>	<p>Population & community modeling (animal and plant) [<i>optimal forging models in patchy envirs.</i>]</p>	
<p>Hutchinson, G.E. 1959. Homage to Santa Rosalia or Why are there so many kinds of animals? <i>American Naturalist</i> 93: 145-59.</p>		<p>Vegetation analysis & plant communities Animal community ecology</p>	<p>Predator-prey interactions [<i>length of food chains</i>] Herbivory & plant defenses (plant-animal interactions)</p>	<p>Population & community modeling (animal and plant) [<i>diversity - niche relns</i>]</p>	<p>Evolutionary ecology & population genetics</p>
<p>Likens, Gene E. et al. 1970. Effects of forest cutting and herbicide treatment on nutrient budgets in the Hubbard Brook Watershed ecosystem. <i>Ecol. Monog.</i> 40: 23-47.</p>	<p>Nutrient cycling Ecosystem dynamics</p>	<p>Vegetation analysis & plant communities [<i>deforestation manipulation -- affecting water uptake</i>]</p>			<p>Applied ecology & ecotoxicology Disturbance ecology</p>

These papers just happened to be nearest my desk. Hence, in a similar fashion to the classic citations, I ‘classified’ these as well.

CITATION	ECOSYSTEMS STUDIES	POPULATION & COMMUNITY ECOLOGY	ECOLOGICAL INTERACTIONS	INTEGRATIVE & THEORETICAL ECOLOGY	CROSS-CUTTING AREAS
Lightfoot, D. and W. Whitford. 1989. Interplant variation in creosotebush foliage characteristics and canopy arthropods. <i>Oecologia</i> 81:166-75	Nutrient dynamics Plant physiological ecology - water relations / nutrient relations	Vegetation analysis & plant communities Animal community ecology	Herbivory & plant defenses (plant-animal interactions) [<i>study of N rich sites and effect of foliage N on arthropods</i>]		Soil ecology
Van Cleve, K., F.S. Chapin III, et al. 1991. Element cycling in taiga forests: State - factor control. <i>BioSci.</i> 41: 78-88.	Ecosystem dynamics Nutrient dynamics				Global change Soil ecology Succession Fire ecology
Reynolds, J.F. and P. Leadley. Modeling the response of Arctic plants to changing climate. 1992. Chap. 20: IN <i>Arctic Ecosystems in a Changing Climate</i> , F.S. Chapin et al. [eds], Academic Press, NY.	Plant physiological ecology -- •C balance & growth •Water relations •Nutrient relations Ecosystem dynamics			Ecological modeling	Global change
DeAngelis, D. L. 1980. Energy flow, nutrient cycling, and ecosystem resilience. <i>Ecology</i> 61: 764-71.	Ecosystem dynamics Nutrient dynamics		Predator-prey interactions [<i>food webs</i>]	Ecological modeling [<i>stability analysis</i>]	Disturbance ecology
Turner, Monica G. and Susan Bratton. 1987. Fire, grazing, and the landscape heterogeneity of a Georgia Barrier island, In: <i>Landscape Heterogeneity and Disturbance</i> , M. Turner [ed.], Springer.	Ecosystem dynamics Nutrient dynamics	Animal population ecology [<i>horses</i>]	Herbivory & plant defenses (plant-animal interactions) [<i>Spartina - horse interactions</i>]	Ecosystem modeling	Landscape ecology Remote sensing Disturbance ecology Fire ecology Succession Wetland ecology