BIO 277: Foundations of Community Ecology – Fall 2021

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Learning goals

Intended primarily for early- to mid-career graduate students, this course is designed to develop a historical perspective to understand current issues and identify future directions in community ecology and such related fields as population, ecosystem, and evolutionary ecology. To achieve this goal, we will read and discuss foundational papers and related contemporary papers. As a way to explore key ideas first-hand, we will also practice studying them using simple simulation models. By the end of this course, students should have an improved ability to:

1. use knowledge of foundational papers to identify new research questions that are fundamental to the further development of community ecology and related fields,
2. moderate and participate in discussion to collaboratively achieve 1 above, and
3. explain and investigate basic processes that affect communities using simple models.

Meeting time

3:15 - 4:45 pm, Tuesday and Thursday

Masking and other COVID-19 considerations

In compliance with Santa Clara County policies effective August 2021, Stanford University is mandating the use of masks indoors for everyone, regardless of vaccination status. This means that whenever we spend time together indoors - in class, sections, labs, and office hours - we are each required to wear a mask. If we see someone not wearing a mask indoors, this is not necessarily a violation of the requirement. Some of us have health conditions precluding our ability to wear masks. Students in this situation should work with the Office of Accessible Education (OAE) immediately, to receive an accommodation for a mask exemption. In addition, some of us might feel more comfortable wearing masks even when not required, such as when we are outdoors. Some of us might feel more comfortable social distancing even when masked and not required, for example, during small-group work in class or section. All of our preferences are reasonable, and it is important that we treat each other's preferences with respect and care. In the first couple of weeks of class, we will formulate community commitments for how we will interact with one another. One of the issues we will explicitly discuss is honoring our respective preferences for COVID-19 health and safety beyond the bare requirements, so that we each feel comfortable and prepared to learn in class. You can find the most current policies on masking requirements on the COVID-19 Health Alerts site.

Academic accommodations

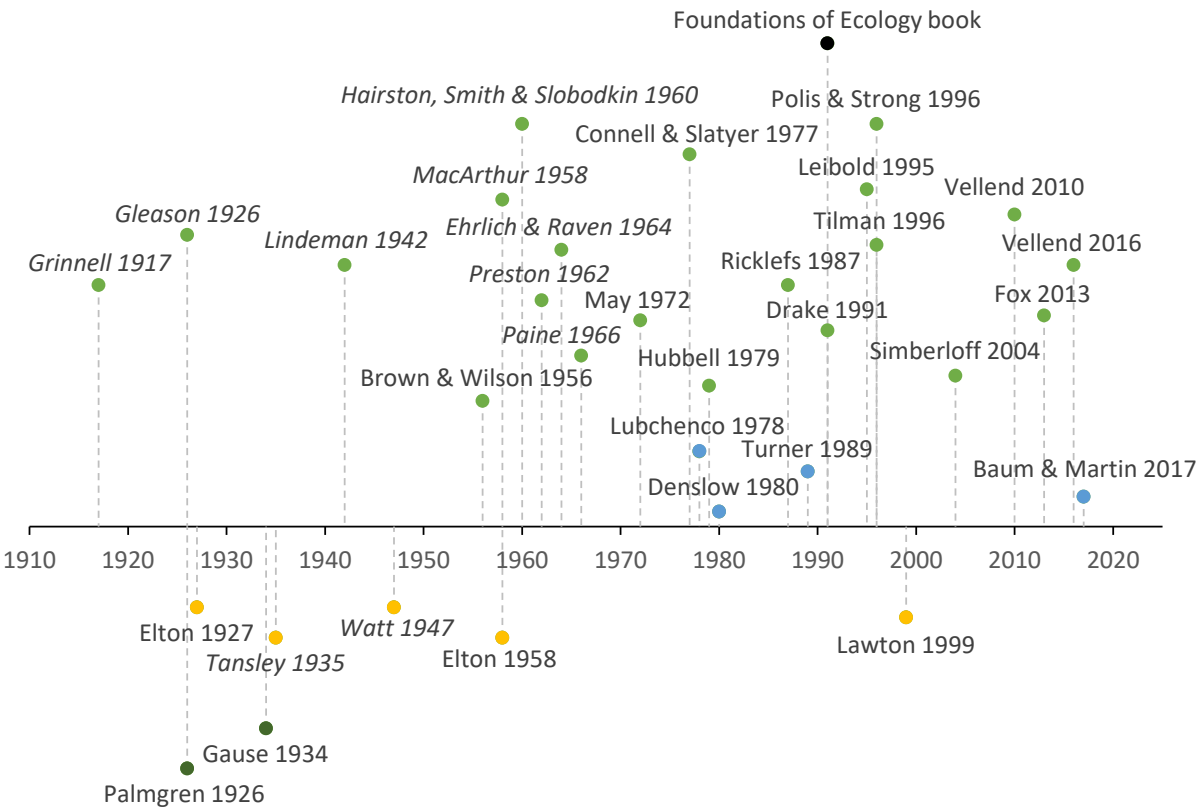
Students who may need an academic accommodation based on the impact of a disability must initiate the request with OAE. Professional staff will evaluate the request with required

documentation, recommend reasonable accommodations, and prepare an Accommodation Letter for instructors dated in the current quarter in which the request is being made. Students should contact OAE as soon as possible since timely notice is needed to coordinate accommodations. OAE is located at 563 Salvatierra Walk (phone: 723-1066, URL: http://oae.stanford.edu). **Important for Fall 2021**: Students who are immunocompromised should register with the OAE as soon as possible.

Schedule

Day	Date	Topic	Papers
Tue	9/21	Intro & organization	Baum & Martin 2017
Thu	9/23	Four basic processes	Vellend 2010
Tue	9/28	No class, Tad away; Read Vellend 2016, Ch 6	
Thu	9/30	No class, Tad away; Run simulation	
Tue	10/5	Chance	Gleason 1926, Palmgren 1926
Thu	10/7	Niche	Grinnell 1917, Elton 1927, Leibold 1995
Tue	10/12	Competition	Gause 1934 Ch. 5, MacArthur 1958
Thu	10/14	Coevolution	Brown & Wilson 1956, Ehrlich & Raven 1964
Tue	10/19	Ecosystem	Tansley 1935, Lindeman 1942
Thu	10/21*	Species abundance	Preston 1962
Tue	10/26*	Succession	Connell & Slatyer 1977, Drake 1991
Thu	10/28*	Patch dynamics	Watt 1947, Hubbell 1979
Tue	11/2	No class, Democracy Day	
Thu	11/4*	Landscape	Rickelfs 1987, Turner 1989
Tue	11/9*	Stability	Elton 1958, May 1973, Tilman 1996
Thu	11/11*	Keystone predation	Paine 1966, Lubchenco 1978
Tue	11/16*	Trophic cascade	Hairston, Smith, & Slobodkin 1960, Polis & Strong 1996
Thu	11/18	Disturbance	Denslow 1980, Fox 2013
Tue	11/23	No class, Thanksgiving recess	
Thu	11/25	No class, Thanksgiving recess	
Tue	11/30	Contingency	Lawton 1999, Simberloff 2004
Thu	12/2	Simulation project presentation	

*During each of these classes, one group will present a 7-min progress report on their simulation project, followed by an 8-min feedback session.



Which key authors and papers are missing from our list?

Papers

Baum, J. K., and T. G. Martin. 2018. It is time to overcome unconscious bias in ecology. Nature Ecology & Evolution 2:201–201.

Brown, W. L., and E. O. Wilson. 1956. Character displacement. Systematic Zoology 5:49–64.

Connell, J. H., and R. O. Slatyer. 1977. Mechanisms of succession in natural communities and their role in community stability and organization. The American Naturalist 111:1119–1144.

Denslow, J. S. 1980. Patterns of plant species diversity during succession under different disturbance regimes. Oecologia 46:18–21.

Drake, J. A. 1991. Community-assembly mechanics and the structure of an experimental species ensemble. The American Naturalist 137:1–26.

Ehrlich, P. R., and P. H. Raven. 1964. Butterflies and plants: a study in coevolution. Evolution 18:586–608.

Elton, C. S. 1927. Chapter V. The Animal Ecology. Page Animal Ecology. Macmillian.

Elton, C. S. 1958. Chapter 8. The reasons for conservation. & Chapter 9. The conservation of variety. In: The Ecology of Invasions by Animals and Plants. Methuen.

Fox, J. W. 2013. The intermediate disturbance hypothesis should be abandoned. Trends in Ecology & Evolution 28:86–92.

Gause, G. F. 1934. Chapter V. Competition for common food in protozoa. In: The Struggle for Existence. Williams & Wilkins.

Gleason, H. G. 1926. The individualistic concept of the plant association. Bulletin of the Torrey Botanical Club 53:7–26.

Grinnell, J. 1917. The niche-relationships of the California thrasher. The Auk 34:427–433.
Hairston, N. G., F. E. Smith, and L. B. Slobodkin. 1960. Community structure, population control, and competition. The American Naturalist 94:421–425.
Hubbell, S. 1979. Tree dispersion, abundance, and diversity in a tropical dry forest. Science 203:1299–1309.
Lawton, J. H. 1999. Are there general laws in ecology? Oikos 84:177.
Leibold, M. 1995. The niche concept revisited - mechanistic models and community context. Ecology 76:1371–1382.
Lindeman, R. L. 1942. The trophic-dynamic aspect of ecology. Ecology 23:399–417.
Lubchenco, J. 1978. Plant species diversity in a marine intertidal community: importance of herbivore food preference and algal competitive abilities. The American Naturalist 112:23–39.
MacArthur, R. H. 1958. Population ecology of some warblers of northeastern coniferous forests. Ecology 39:599–619.
May, R. M. 1972. Will a large complex system be stable? Nature 238:413–414.
Paine, R. 1966. Food web complexity and species diversity. The American Naturalist 100:65–75.
Palmgren, A. 1926. Chance as an element in plant geography. Proceedings of the International Congress of Plant Sciences 1:591–602.
Polis, G. A., and D. R. Strong. 1996. Food web complexity and community dynamics. The American Naturalist 147:813–846.
Preston, F. W. 1962. The canonical distribution of commonness and rarity: part I. Ecology 43:185–215.
Ricklefs, R. 1987. Community diversity - relative roles of local and regional processes. Science 235:167–171.
Simberloff, D. 2004. Community ecology: is it time to move on? The American Naturalist 163:787–799.
Tansley, A. G. 1935. The use and abuse of vegetational concepts and terms. Ecology 16:284–307.
Tilman, D. 1996. Biodiversity: population versus ecosystem stability. Ecology 77:350–363.
Turner, M. G. 1989. Landscape ecology - the effect of pattern on process. Annual Review of Ecology and Systematics 20:171–197.
Vellend, M. 2010. Conceptual Synthesis in Community Ecology. The Quarterly Review of Biology 85:183–206.
Vellend, M. 2016. Chapter 6. Simulating dynamics in ecological communities. In: The Theory of Ecological Communities. Princeton University Press.
Watt, A. 1947. Pattern and process in the plant community. Journal of Ecology 35:1–22.

Discussion format

Before the class

1. By 4pm of the previous day, everyone will read the papers listed above in the schedule and submit their answers to the following on each paper in Canvas:

    A) Which paragraph in the paper do you find most interesting or illuminating?
    B) Which paragraph in the paper do you find most confusing or unclear?
    C) What open-ended question relating to both papers would you pose to the class for discussion to identify a new research direction?

2. Discussion leaders (each student is expected to lead discussion in one session) will

    - Prepare a 20-min presentation about the historical context and contemporary relevance of the papers (Tad can suggest supplementary readings to prepare for this presentation)
    - Make 3 discussion questions based on the answers submitted by everyone

In the class

20 min - Presentation by discussion leader
10 min - Follow up by Tad
10 min - Q&A for clarification
20 min - Group discussion on the 3 questions from discussion leaders
30 min - Class discussion led by discussion leaders

Simulation project

Students will work in pairs (to be formed by shared interests) to do a simple simulation project in order to gain better understanding of some of the basic processes that affect community structure.

Each pair will choose one of the eight Boxes in Chapter 5 of the Vellend 2016 book and modify the simulation in the Box to ask a new question about community assembly. The R code for the simulation is available at http://mvellend.recherche.usherbrooke.ca/TOEC.html

See the two ADDENDUMs by Melissa Chen for examples, even though they are more extensive than expected in the projects in this class.

Each pair will present the results of their simulation during the last class session and submit a short write-up summarizing the questions, the results, and the significance and novelty of the results.

Grading

Participation in discussion – 50%
Moderating discussion – 30%
Simulation project – 20%