Population Ecology
EcEv 428, Winter 2018
Cathy Pfister
All Readings are on Canvas

Date	Lecture Topic & Reading
5 January 2018	Exponential population growth I. Models for populations that assume exponential growth, including the Euler-Lotka model and its application. Rockwood, L. L. 2006. *Introduction to Population Ecology*. Blackwell, Malden MA. Chapter 1. & pp. 143-145. Lewontin, R. C. 1965. Selection for colonizing ability. Pages 77-91, in Baker, H. G. and G. L. Stebbins, *The Genetics of Colonizing Species*. Academic Press, NY.
12 January 2018	Population growth, continued. Density dependence in populations, Logistic growth, and applications to harvested populations. Rockwood, L. L. 2006. *Introduction to Population Ecology*. Blackwell, Malden MA. Chapter 2. May, R. 1976. Biological populations with nonoverlapping generations: stable points, stable cycles, and chaos. Science 186:273-275. Reprinted in *Foundations of Ecology* Hassell, M. P., J. H. Lawton, and R. M. May. 1976. Patterns of dynamical behaviour in single-species populations. *J. Anim. Ecol*. 45:471-486.
19 January 2018	Exponential population growth II. Age, stage, and size-based population models and their application. **Bring your Laptop with R loaded and ready,** *https://www.**r-project**.org/* ** Caswell, H. 1997. Matrix methods for population analysis. Pages 19-37, in S. Tuljapurkar and H. Caswell, *Structured-Population Models in Marine, Terrestrial, and Freshwater Systems*. Chapman and Hall, NY. READ to p. 37 only. Rockwood, L. L. 2006. *Introduction to Population Ecology*. Blackwell, Malden MA. Chapter 4.

Date	Discussion Topic & Reading	Discussion Leader(s)	Lecture Topic & Reading
26 January 2018	Griffith, A. B., I. N. Forseth. 2005. Population matrix models of *Aeschynomene virginica*, a rare annual plant: implications for conservation. *Ecological Applications* 15:222-233. Crone, E. E., M. M. Ellis, W. F. Morris, A. Stanley, T. Bell, P. Bierzychudek, J. Ehrlén, T. N. Kaye, T. M. Knight, P. Lesica, G. Oostermeijer, P. F. Quintana-Ascencio, T. Ticktin, T. Valverde, J. L. Williams, D. F. Doak, R. Ganesan, K. Mceachern, A. S. Thorpe, and E. S. Menges. 2013. Ability of matrix models to explain the past and predict the future of plant populations: forecasting population dynamics. *Conservation Biology* 27:968–978.	___________	**Time Series, Dynamics and Variability** Ives, A. R., K. C. Abbott, and N. L. Ziebarth. 2010. Analysis of ecological time series with ARMA(*p*,*q*) models. *Ecology* 91:858–871. Jassby, A. D. and T. M. Powell. 1990. Detecting changes in ecological time series. *Ecology* 71:2044.
2 February 2018	Wetzel, WC, HM Kharouba, M Robinson M Holyoak R Karban. 2016. Variability in plant nutrients reduces insect herbivore performance Nature. 539: 425-427, doi: 10.1038/nature20140.	___________	**Populations and links to ecosystems** Andersen T, JJ. Elser, DO Hessen. 2004. Stoichiometry and population dynamics. *Ecology Letters* 7:884–900
9 February 2018	Elser, JJ, T Andersen, JS Baron,A Bergström, M Jansson, M Kyle, KR Nydick, L Steger, DO Hessen. 2009. Shifts in Lake N:P stoichiometry and nutrient limitation driven by atmospheric nitrogen deposition. *Science* 326:835-837. DOI: 10.1126/science.1176199 Moreno, AR., AC. Martiny. 2017. Ecological Stoichiometry of Ocean Plankton. Annual Review of Marine Science. 2018. 10:6.1–6.27	___________	**Life history theory and empiricism** Young, T. P. 2002. The poppy paradox and a novel derivation for the demographic conditions favoring the evolution of semelparity. *Bull Ecol Soc America,* April 2002: 121-123. Young, T. P. & C. K. Augspurger. 1991. Ecology and evolution of long-lived semelparous plants. *Trends in Ecology and Evolution* 6:285-289.

16 February 2018	Reznick, D., H. Bryga, *and* J. A. Endler. 1990. Experimentally induced life history evolution in a natural population. *Nature* 346:357–359. Walsh, MR, DN Reznick. 2009. Phenotypic diversification across an environmental gradient: a role for predators and resource availability on the evolution of life histories. *Evolution* 63:3201-3213	________	**When population size is small: demographic and genetic considerations for conservation** Lande, R. 1988. Genetics and demography in biological conservation. *Science* 241:1455-1460. Wootton, J. T. & C. A. Pfister. 2013. Experimental Separation of Genetic and Demographic Factors on Extinction Risk in Wild Populations. *Ecology* 94:2117-2123. doi: 10.1890/12-1828.1
23 February 2018	Williams, J. L., B. E. Kendall, and J. M. Levine. 2016. Rapid evolution accelerates plant population spread in fragmented experimental landscapes. Science 353:482–485.	________	**Populations in space: dispersal, source-sink dynamics and metapopulations** Pulliam, H. R. 1988. Sources, sinks, and population regulation. *Am. Nat.* 132:652-661. Rockwood, L. L. 2006. *Introduction to Population Ecology*. Blackwell, Malden MA. Chapter 5
2 March 2018	Crone, E. E., D. Doak, and J. Pokki. 2001. Ecological influences of the dynamics of a field vole metapopulation. *Ecology* 82:831-843. Germain, R. M., S. Y. Strauss, and B. Gilbert. 2017. Experimental dispersal reveals characteristic scales of biodiversity in a natural landscape. Proceedings of the National Academy of Sciences 114:4447–4452.	________	**Population trajectories and Global Change** Morris, W. F, C. A. Pfister, S. Tuljapurkar, C. Haridas, C. Boggs, M. S. Boyce, E. M. Bruna, D. R. Church. T. Coulson, D. F. Doak, S. Forsyth, J. M. Gaillard, C. C. Horvitz, S. Kalisz, B. E. Kendall. T. M. Knight. C. T. Lee, E. S. Menges. 2008. Longevity can buffer plant and animal populations against changing climatic variability. *Ecology* 89:19-25. Sparks, T. H. & P. D. Carey. 1995. The responses of species to climate over 2 centuries: an analysis of the Marsham phenological record, 1736-1947. *J Ecology* 83:321-329.

9 March 2018 ALL DISCUSS FROM A GROUP OF PAPERS (subject to additions & deletions)	Reed, T. E., S. Jenouvrier, and M. E. Visser. 2013. Phenological mismatch strongly affects individual fitness but not population demography in a woodland passerine. Journal of Animal Ecology 82:131–144 Freeman, B. G. & Class Freeman, A. M. 2014 Rapid upslope shifts in New Guinean birds illustrate strong distributional responses of tropical montane species to global warming. *Proceedings of the National Academy of Sciences* **111**, 4490–4494. (doi:10.1073/pnas.1318190111) Menzel, A. and many coauthors. 2006. European phonological response to climate change matches the warming pattern. Global Change Biology 12:1969-1976. Reed, T. E., S. Jenouvrier, and M. E. Visser. 2013. Phenological mismatch strongly affects individual fitness but not population demography in a woodland passerine. Journal of Animal Ecology 82:131–144 Shantz AA, Lemoine NP, Burkepile DE (2016) Nutrient loading alters the performance of key nutrient exchange mutualisms. *Ecology Letters*, **19**, 20–28. van de Pol M, Y Vindenes, Bernt-Erik Sæther, S Engen, BJ. Ens, K Oosterbeek, J M. Tinbergen 2010. Effects of climate change and variability on population dynamics in a long-lived shorebird. Ecology 91:1192–1204. http://dx.doi.org/10.1890/09-0410.1 Willis, C. G., B. Ruhfel, R. B. Primack, A. J. Miller-Rushing, C. C. Davis. 2008. Phylogenetic patterns of species loss in Thoreau's woods are driven by climate change. *PNAS 105:17029-17033* (McDonald, J., S. Christensen, R. Deblinger, W. Woytek. 2009. An alternative to climate change for explaining species loss in Thoreau's woods *Proc. Natl. Acad. Sci. USA 106 , E28)*

Class Format:

I will lecture and lead paper discussions for the first 3 weeks. Then, the format will change such that I will introduce a topic with a lecture and we will discuss a paper that follows up on the lecture during the following class (e.g. the matching colors). You will each be a discussion leader for 1 class period, using a reading list that I will provide and the designated paper. You will need to provide a verbal and written summary of the topic that will serve as an analysis of what we know about the topic and what we need to know. Your summary should include the following elements:

a verbal summary for class

- summary of the literature you have read, including an analysis of what papers were important.
- your opinion about what theory (in general) would advance our knowledge in the area
- your opinion on the types of empirical work that are needed (e.g. what ideas still need to be tested?, what systems might we expect these ideas to be appropriate for?)
- lead a discussion about the assigned reading

a written summary for me

- include in this the material you used for the verbal summary in class
- consider picking a theme (or thesis) and discussing what literature is relevant to that theme
- emphasize a **synthesis** of material, not simply a summary
- cite the literature relevant to your topic; hence, read widely but then organize this material into a key theme
- 5-7 pages should be sufficient (e.g. not a long paper, but a concise summary)
- due 1 week after your verbal summary in class

Thus, 1 week after I first introduce a topic you give a verbal summary of the assigned paper and related literature. And another week after that you hand in your paper. If the paper needs revising for an improved grade, you will get a week to do so. Your course grade will be based on your verbal presentation (30%), your written summary (45%) and class participation (25%).