

BIOL/ENST/NORT 3313: ECOLOGICAL STRUCTURE IN NORTHERN ENVIRONMENTS

TOPIC 4: POPULATION DYNAMICS OF NORTHERN SPECIES

Basics of population growth

Population regulation

Stochastic dynamics

Cyclical dynamics

Direct and delayed density dependence

Specialist predator hypothesis

Climate change and the end of cycles?

Experimental population dynamics with snowshoe hares

Something to think about:

Models of population growth typically rely on numerous assumptions that we know are unrealistic for most organisms, yet these models are the foundation of ecology. Does this mean that our theories are too simple? Are the models unreliable caricatures of nature? When would we need more refined models? What are the consequences of building ever more realistic models? What is the role of theory in ecology?

Required reading:

Krebs, C. J. 2011. Of lemmings and snowshoe hares: the ecology of northern Canada.

Proceedings of the Royal Society B 278:481-489.

<http://dx.doi.org/10.1098/rspb.2010.1992>

Workshop 4:

Re-evaluate progress and timelines for the class term research proposal.

Refine the research requirements. At the end of class, select one of the following terms describing your self-assessment on this task (exceptional, outstanding, very strong, strong, moderate, insufficient). Do the same for the class as a whole. Submit both 'scores' to your GA before leaving. Answer the following questions:

What progress have we made (cross items off of your earlier list)?

Have we exhausted the applicable literature?

What questions can we answer (make a list)?

What can't we do (make a list)?

What more do we need to know (add to the list)?

What additional resources do we need (add to the list)?

When will we do what (modify your timeline and distribute)?

Who does what when (modify the list)?

Some related reading:

Ims, R. A., N. G. Yoccoz, and S. T. Killengreen. 2011. Determinants of lemming outbreaks. *Proceedings of the National Academy of Sciences USA* 108:1970-1974.

<http://www.pnas.org/content/108/5/1970.full.pdf>

Kausrud, K. L. et al. 2008. Linking climate change to lemming cycles. *Nature* 456:93-97.

<http://www.nature.com/nature/journal/v456/n7218/full/nature07442.html>

Krebs, C. J. et al. 2001. What drives the 10-year cycle of snowshoe hares? *Bioscience* 51:25-35.

<http://bioscience.oxfordjournals.org/content/51/1/25.full>

Nolet, B.A. et al. 2013. Faltering lemming cycles reduce productivity and population size of a migratory Arctic goose species. *Journal of Animal Ecology* 82:805-813.

<http://onlinelibrary.wiley.com/doi/10.1111/1365-2656.12060/pdf>

Turchin, P. 2009. Long-term population cycles in human societies. *Annals of the New York Academy of Sciences* 1162:1-17. <http://peterturchin.com/PDF/RevSEC.pdf>

Yan, C. et al. 2013. Linking climate change to population cycles of hares and lynx. *Global Change Biology* 19:3263-3271. <http://onlinelibrary.wiley.com/doi/10.1111/gcb.12321/pdf>