

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

TOPIC 1: NORTHERN ECOSYSTEMS ARE DYNAMIC

In the shadows of glaciers

Paraglacial lakes and continental drainage

Physical legacies of glaciers

Effects on species distribution

Extinction of the mammal megafauna

Ecozones

The Milankovitch cycle

Continuing change

Something to think about:

Contemplate the short and long-term consequences following the extinction of the mammal megafauna in North America. How did the demise of these great mammals influence northern ecosystems? Will the extinction of smaller species have a similar influence?

Required reading:

Lorenzen, E. D. et al. 2011. Species-specific responses of Late Quaternary megafauna to climate and humans. *Nature* 479:359-364. <http://dx.doi.org/10.1038/nature10574>

Rule, S. et al. 2012. The aftermath of megafaunal extinction: ecosystem transformation in Pleistocene Australia. *Science* 335:1483-1486. <http://dx.doi.org/10.1126/science.1214261>

Workshop 1:

Begin work on the class term research proposal.

Identify the big problems associated with ecological structure in northern environments. Write out key questions for each of the following themes.

People problems

Climate problems

Biodiversity problems

Political problems

Economic problems

What expectations would coincide with the following indicators of student achievements on this task (exceptional, outstanding, very strong, strong, moderate and insufficient: make a list or table)?

Some related reading:

Johnson, C. 2009. Megafaunal decline and fall. *Science* 326:1072-1073.

<http://science.sciencemag.org/content/326/5956/1072>

McGlone, M. 2012. The hunters did it. *Science* 335:1452-1453. <http://science.sciencemag.org/content/335/6075/1452>

Sandom, C. et al. 2014. Global late Quaternary megafauna extinctions linked to humans, not climate change.

Proceedings of the Royal Society B 281: doi: 10.1098/rspb.2013.3254

<http://rspb.royalsocietypublishing.org/content/281/1787/20133254>

Willerslev, E. et al. 2014. Fifty thousand years of Arctic vegetation and megafaunal diet. *Nature* 506:47-51.

<http://www.nature.com/nature/journal/v506/n7486/full/nature12921.html>

Bartlett, L.J. et al. 2015. Robustness despite uncertainty: regional climate data reveal the dominant role of humans in explaining global extinctions of Late Quaternary megafauna. *Ecography* 38: DOI: [10.1111/ecog.01566](https://doi.org/10.1111/ecog.01566)

Meltzer, D.J. 2015. Pleistocene overkill and North American mammal extinctions. *Annual Review of Anthropology* 44:33-53. <https://www.annualreviews.org/doi/pdf/10.1146/annurev-anthro-102214-013854>

Barnosky, A.D. et al. 2016. Variable impact of late-Quaternary megafaunal extinction in causing ecological state shifts in North and South America. *Proceedings of the National Academy of Sciences, USA*. 113: 856-861.

<http://ib.berkeley.edu/labs/barnosky/PNAS-2015-Barnosky-1505295112.pdf>

Barnosky, A.D. et al. 2017. Merging paleobiology with conservation biology to guide the future of terrestrial ecosystems. *Science* 355: eaah4787.

<http://science.sciencemag.org/content/sci/355/6325/eaah4787.full.pdf?ijkey=ToaAxfyIowKgw&keytype=ref&siteid=sci>

Smith, F.A. et al. 2018. Body size downgrading of mammals over the late Quaternary. *Science* 360: 310-313.

<http://science.sciencemag.org/content/360/6386/310/tab-pdf>