

## Reply to McDonald et al.: Climate change, not deer herbivory, has shaped species decline in Concord, Massachusetts

McDonald et al. (1) suggest that browsing by white-tailed deer, rather than climate change (2), may better explain the phylogenetic pattern of species decline in Concord, MA.

To address this concern we reanalyzed our data to include a binary measure of deer browsing preference based on three studies (3–5). This trait was coded and analyzed following ref. 1 for 55 of 266 genera. The results were similar to our previous findings (2) when analyses were restricted to only those species with available browsing data.

We found that deer browsing preference is phylogenetically conserved (observed mean variance rank 1/9,999), which indicates that deer do selectively browse certain plant clades. Deer browsing preference, however, cannot explain the phylogenetic pattern of species loss because it is not correlated with change in abundance either when tested alone ( $n = 87$ ,  $\beta = 0.60$ ,  $P = 0.1946$ ) or when tested with other variables ( $n = 41$ ,  $\beta = -0.34$ ,  $P = 0.5168$ ). Most importantly, the correlation between flowering time tracking and change in abundance remains significant ( $n = 41$ ,  $\beta = -1.44$ ,  $P = 0.0061$ )

despite the reduced taxon sample size and the inclusion of deer preference.

These results further strengthen our original conclusion that climate change is the best explanation for the pattern of species loss in Concord. Although deer browsing is clearly detrimental to certain species (e.g., ref. 6), more explicit studies of deer herbivory are needed to fully understand its community-wide impacts. Regardless, it is clear that climate change has shaped and will likely continue to shape the phylogenetic pattern of species decline in Concord.

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The authors declare no conflict of interest.

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