THE UNIVERSITY OF BRITISH COLUMBIA
Faculty of Forestry

Dear Dr. Bardgett,

Please consider our paper, "Budburst timing within a functional trait framework" for publication as a research article in *Journal of Ecology*. We combined multiple global databases to show how woody plant budburst timing relates to a number of major functional plant traits, supporting foundational—but generally untested hypotheses—of the role of phenology within plant strategies.

Climate change is impacting species phenologies—timing of life history events—reshaping ecological communities and altering ecosystem functioning. Increasing research suggests these changes are linked, as species that shift the most phenologically with warming appear to also perform better. Yet research has failed to test whether species phenologies or their growth strategies drive this relationship. Teasing this apart has been challenging because the variability of plant phenology has led it to be systematically omitted from global trait frameworks that link to plant growth strategies.

Here we overcome these challenges by combining global data from experiments on budburst phenology and plant traits, with cutting-edge Bayesian approaches that can jointly model budburst in response to environmental cues and in relation to major plant traits. Our dataset represents one of the most comprehensive datasets of trait syndromes available, making it an important first step to identify general trends that scale across populations and species. Further, by using a joint modelling approach, we are the first to identify broader trait relationships to phenological cues based on species-level trait variation, while also accounting for the high degree of uncertainty that arises when combining datasets of diverse communities and locations.

We found strong evidence inextricably linking plant phenologies to their growth strategies, as was proposed in the 1970s but rarely, if ever, been tested. Earlier species exhibit acquisitive traits—shorter maximum heights, and denser, lower nitrogen leaves—while later-active species are taller with low nitrogen leaves. Our results are some of the first to fit budburst phenology firmly within major functional trait frameworks, allowing us to tease apart the underlying mechanisms shaping species phenology and traits globally, and provide novel insights that can be used to better predict how communities may shift in their growth strategies alongside changing phenology with climate change.

All authors contributed to this work and approved this version for submission. The manuscript is 3569 words with a 267 word summary, and 4 figures. It is not under consideration elsewhere. We hope you find it suitable for publication in *Journal of Ecology*, and look forward to hearing from you.

Sincerely,

Deirdre Loughnan

Deirdre Loughnan, PhD
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