How a longer season affects growth during the current and subsequent years?

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Abstract

The most frequently observed biological impact of anthropogenic climate change over the past decades is major changes in phenology—the timing of recurring life history events. These shifts change when the growing season starts and when it ends, which modifies the growing season length. Earlier spring and delayed fall events support a long-lasting and intuitive assumption that these shifts extend seasons and thus increase growth. However, research from recent years has cast doubt on this hypothesis by demonstrating that, despite an earlier growth onset, longer seasons did not increase the growth rate nor overall annual increment in trees. To address this decoupling, we propose to use a full-factorial design of Cool/Warm, Spring/Fall treatments to test whether trees under experimental conditions can benefit from longer seasons during the first and the following year. More specifically, we want to demonstrate whether the treatment conditions during year one lead to a carry-over effect on the growth during year two. Using 15 replicates per treatment for all 7 species, our modelling approach examines the relative effects of each treatment on the outcome of each year and for each species, potentially revealing how different species may respond to a longer growing season, which is expected to keep shifting with climate change.