**Introduction**

**Context**

Plant phenology is the study of periodically recurring patterns of growth and development throughout a year 1. Due to human-induced climate change, significant shifts in phenology have already been observed and are expected to continue as temperature rises 2. For example, there has already been an extension of the growing season in ecosystems worldwide, leading to substantial changes in plant phenology 1,3,4. In temperate and boreal forests, temperature plays a crucial role in trees’ physiological activity. As spring temperature rises earlier and autumn is delayed, trees may cease this opportunity and take advantage of these extra days 5,6.

**Hypothesis**

I hypothesize that an extension of the growing season could enhance a tree’s capacity to accumulate carbohydrates. Trees that seize this opportunity may experience increased growth in the subsequent growing season. Thus, daily mean temperature significantly impact the timing of leaf senescence in trees 7. With this insight, I postulate that trees capable of accumulating nutrients, like nitrogen, after leaf senescence, might exhibit growth increment in the following growing season.

**Objectives**

First, I aim to assess the phenological adaptability of trees to an extended growing season. Secondly, I will determine whether trees can absorb nutrients beyond their theoretical growing season. And if increased storage pools translate into more growth in the following growing season…

**Methodology**

First, we will manipulate spring and autumn temperature by subjecting 10 different tree species to controlled conditions using climate chambers. There will be four distinct treatments: Cool spring-Cool autumn (Control), Cool spring-Warm autumn, Warm spring-Cool autumn, Warm spring-Warm autumn. The control group will also be placed in climate chambers to mitigate any potential chamber-specific effects. For the nutrient enrichment treatment, liquid nutrients will be administered to the treatment trees. Two sets of replicates will receive these nutrients: Cool spring - Cool autumn and Warm spring - Warm autumn.

Throughout the summer of 2024, we will continuously monitor radial growth using magnetic dendrometers. We will apply pinning treatments to 'mark' the bark, enabling us to track cell increment. Concurrently, phenological monitoring will be conducted. In 2025, the trees will be returned to ambient temperatures with no additional treatments. Finally, we will assess growth on the individual (total biomass) and the cellular level (number of cells and their characteristics).

References

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