



Temperature and photoperiodic control of spring bud burst in temperate forest trees at rising spring temperatures

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Warmer spring temperatures, as caused by climate warming, led to an earlier spring bud burst and an extended growing season in many temperate and boreal species. To which extent will the phenology of these species keep tracking rising temperatures in future? Phenology is controlled by three important factors: the degree of winter chilling, photoperiod and temperature. Contrary to the high inter-annual variation of spring temperatures, the length of photoperiod is an astronomical and thus weather independent signal for the progression of the season. Photoperiodic control of spring development protects trees from flushing too early under mild winter and early spring temperatures, before the period of potentially fatal freezing damage is over. Photoperiod sensitive species may therefore stop tracking climate the closer temperature modulated bud break is shifted toward the genetically fixed photoperiod threshold. We assessed the photoperiod sensitivity of spring bud break in several common temperate tree species using growth chamber experiments with variable photoperiod \times temperature interaction. While early successional species showed photoperiod-insensitive and thus mostly temperature controlled bud break, the timing of bud break in late successional species was additionally photoperiod controlled. Climate warming will thus not lead to much longer growing seasons in such species, as is often assumed.