

Thesis outline

Christophe Rouleau-Desrochers

February 18, 2025

Introduction

1. CC impacts on biological systems and how phenological trends are already shifting with warming temperatures.
 - (a) Warmer temperature led to earlier spring events for amphibians, birds, butterflies and wild plants (Walther, 2002)
 - (b) Autumn phenological events are delayed, but the trend is not as clear as spring's. We have a good mechanistic understanding of the drivers that lead plants to leaf out early, but we don't for Autumn. *Maybe talk about why the trend isn't clear (e.g. monitoring leaf fall and colouring is hard. Can be highly influenced by a single episode of wind, precipitation or frost (Gunderson, 2012))*
 - (c) Counterinteraction of winter warming that delays spring phenology because of non-met chilling requirements *don't want to get lost in the weeds here though*. Talk about deacclimation forms during spring
 - (d) Overall, earlier spring and delayed autumn lead to a longer phenological growing season (Korner, 2023 for pheno GS definition).
 - (e) Potential impacts of spring frost. Explain how reliance on photoperiod can be a better strategy to avoid spring frosts. Species that are less photoperiod dependant may be more vulnerable to spring frost.
 - (f) Increased drought events in the summer and how earlier spring might increase water deficit later on in the GS. (Vitesse 2021)
 - (g) Pros and cons of early SOS:
Pros: Potential competitive ability of carbon uptake at the individual and stand level (increased productivity) (Estiarte, 2015); More days to reach fruit maturity.
Cons: Trophic mismatch (though limited support) (Loughnan 2024); Increased summer drought induced stress; Increased pest and disease pressure; Soil nutrient depletion (to read: Reich 2006)
 - (h) Pros and cons of delayed EOS
2. Tree rings measurements allows for a finer scale understanding of the cambium and leaf phenology relationship.
 - (a) Diameter and height measurements are widely used to assess yearly biomass increment. However, these measurements are punctual and are often the cumulative result of many climatic events and constraints that occurent during a tree's lifespan. Thus the use of high resolution, tree ring images allows for a more detailed assessment of the climate influence on tree growth.

- 38 (b) Cambial phenology. Growth onset and duration vary because of inter-annual differences
39 in weather, with cambium reactivation in spring being highly dependent on temperature.
- 40 (c) Radial growth increased by temperature depends on **when** it is warmer. Long season at
41 low temperature will produce fewer cell rows than at warmer temperature.
- 42 (d) The growth rate has a more direct influence on tree growth than the growing season
43 length.
- 44 (e) test

45 **Chapter 1. Fuelinex: fueling next year's growth with longer**
46 **growing season*****

47 **Question**

48 **Objectives**

49 **Methods**

50 **Chapter 2.Wildchrokie X CoringTreeSpotters**

51 **Question**

52 **Objectives**

53 **Methods**

54 **Conclusion**