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## Morphological Indicators of Young Tree Health and Recovery in Agroforestry Systems

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Alexandre de Haldat Du Lys, Lecoq Mathis, Yves Caraglio, Claire Atger, Eric-André Nicolini. Morphological Indicators of Young Tree Health and Recovery in Agroforestry Systems. 18e congrès de la Société Européenne d'Agronomie, Aug 2024, Rennes (FRA), France. hal-04808412

**HAL Id: hal-04808412**

**<https://hal.inrae.fr/hal-04808412v1>**

Submitted on 28 Nov 2024

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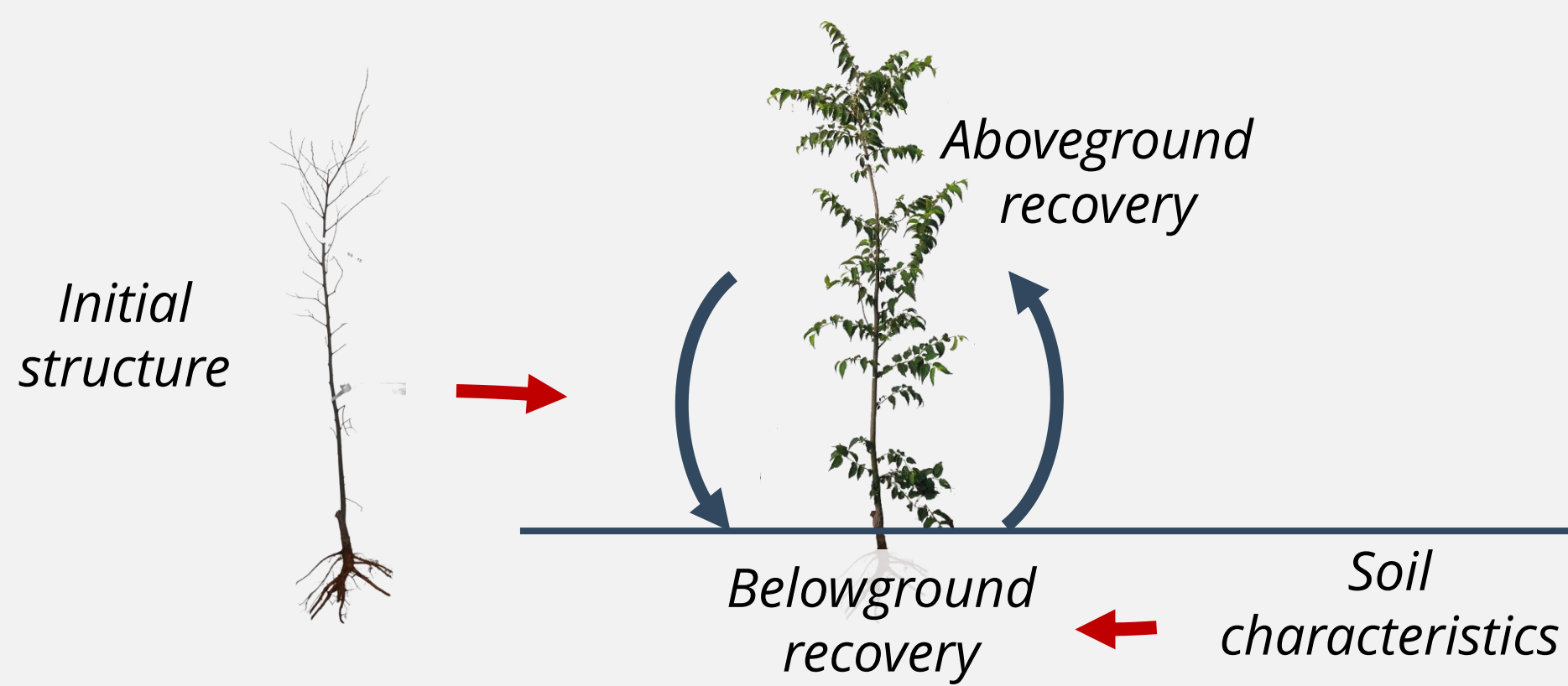
## Introduction

### Context

The transition from an agricultural model to an agroforestry model raises the question of how to manage the trees planted. The tree establishment phase following planting is a delicate and decisive step in setting up an agroforestry system.

### Objectives

1) Identify morphological indicators on the aboveground system that practitioners can use to assess the recovery and health of young trees

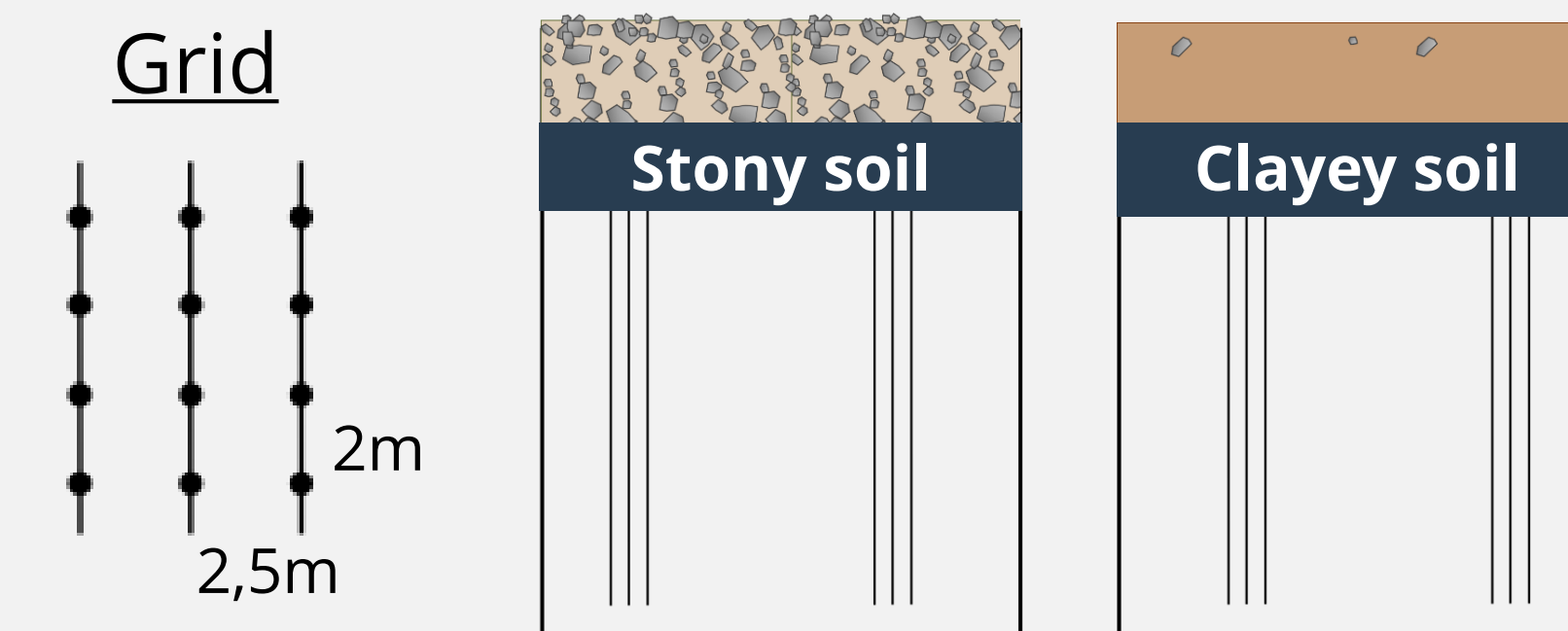


2) Identify the factors affecting tree recovery

## Materials and Methods

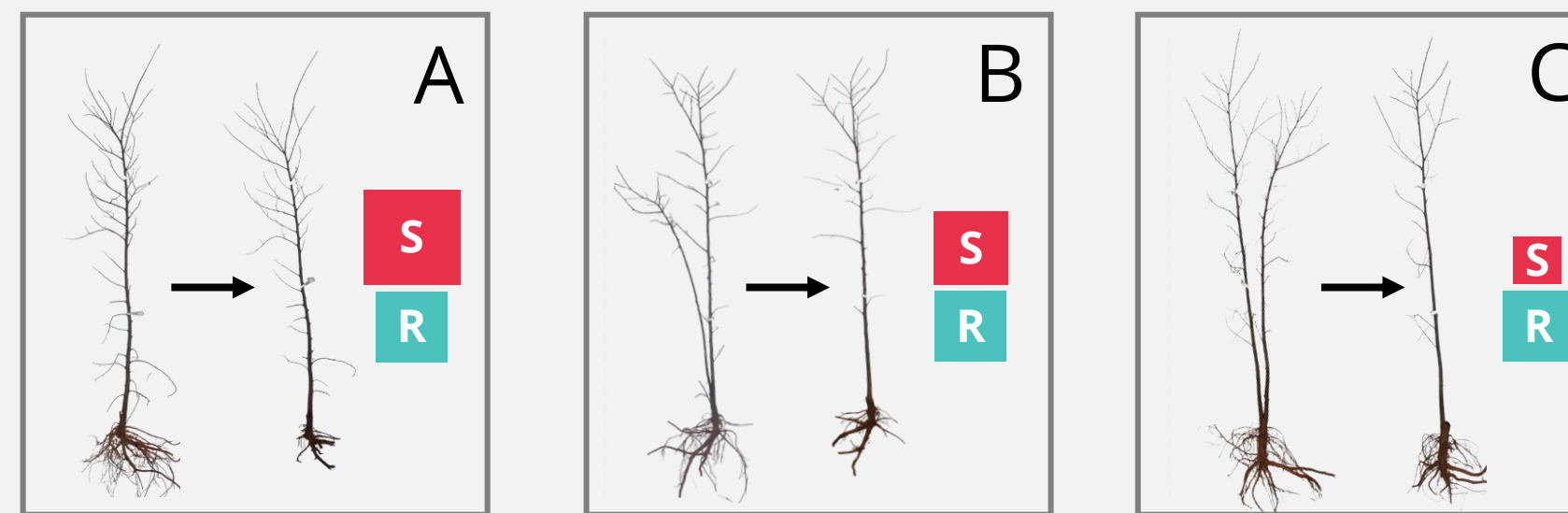
### Experimental Design

- 588 Hackberry trees (*Celtis australis* L.) planted in two plots



- 3 root/shoot balances before planting

Pruning protocol:



→ Test the need for a high root/shoot balance at planting

### Study Site



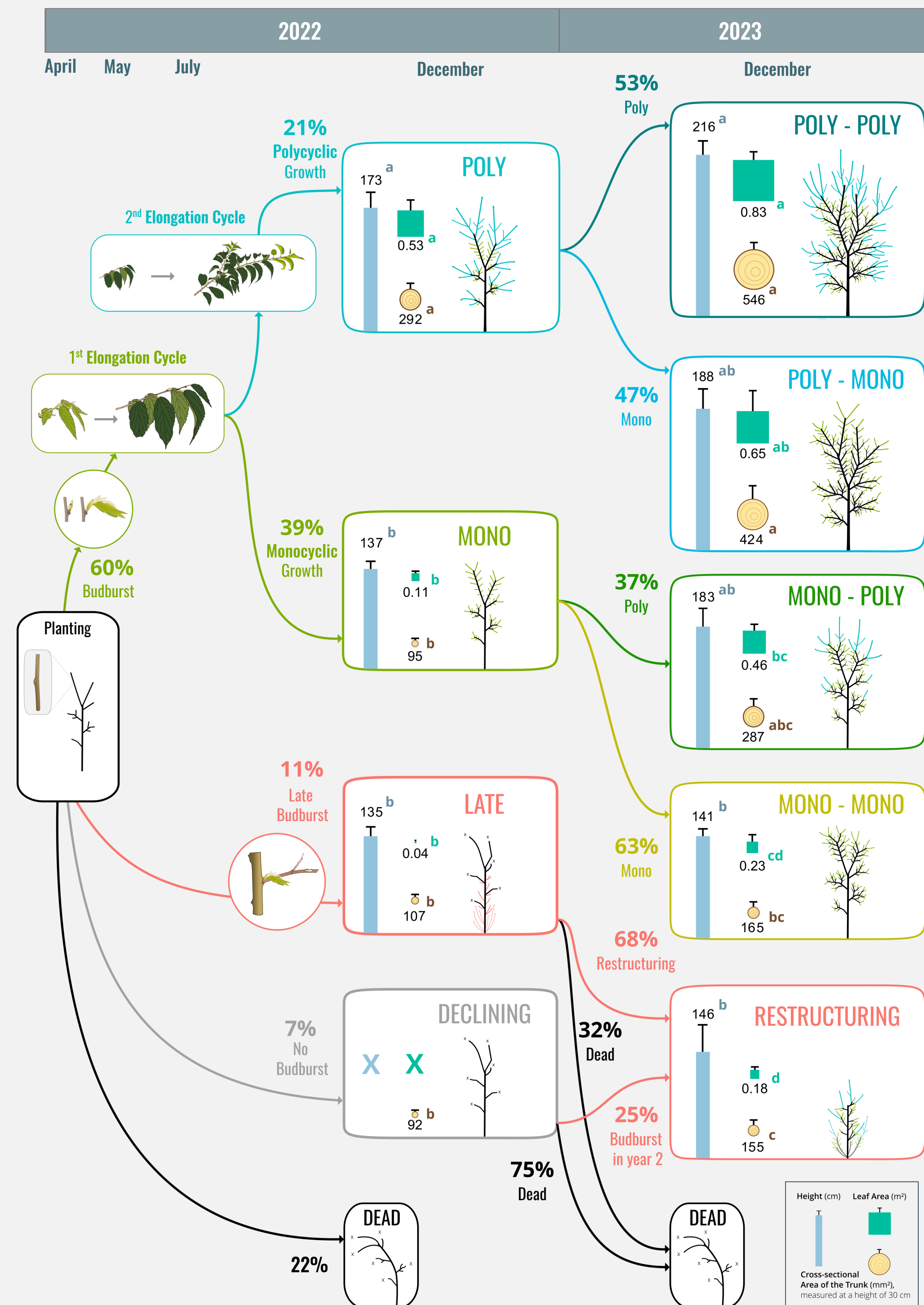
### Aboveground Tree Growing Sequence

- Phenology: budburst, elongation cycle dates
  - Growth: height, trunk diameter
- Capture the growth dynamics

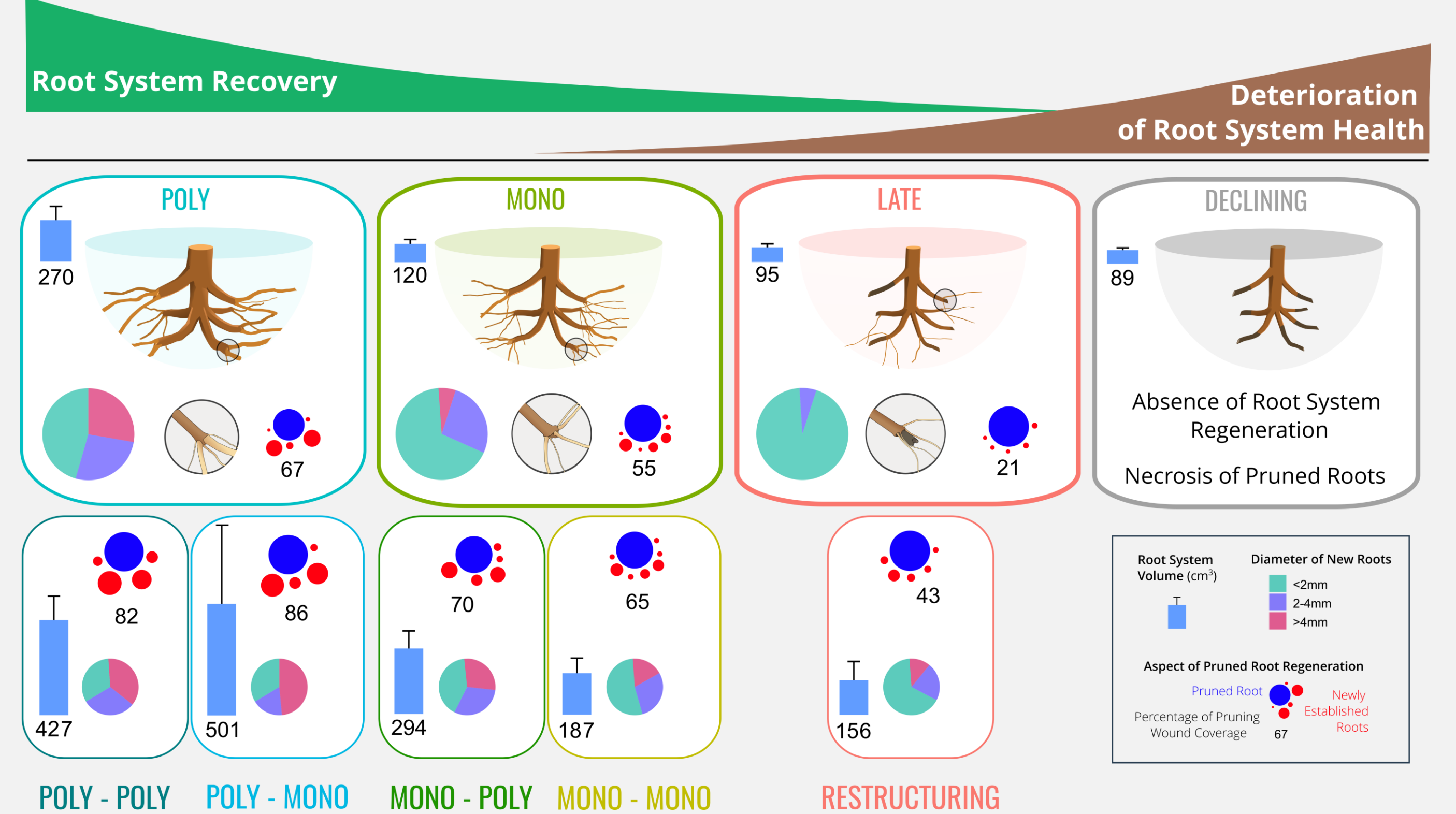
### Root System Excavations

- 80 trees excavated 1 year after planting
  - 32 trees excavated 2 years after planting
- Root traits: volume, number and diameter of newly established roots, percentage of pruning wound coverage
- Link the growth dynamics and root system regeneration and health

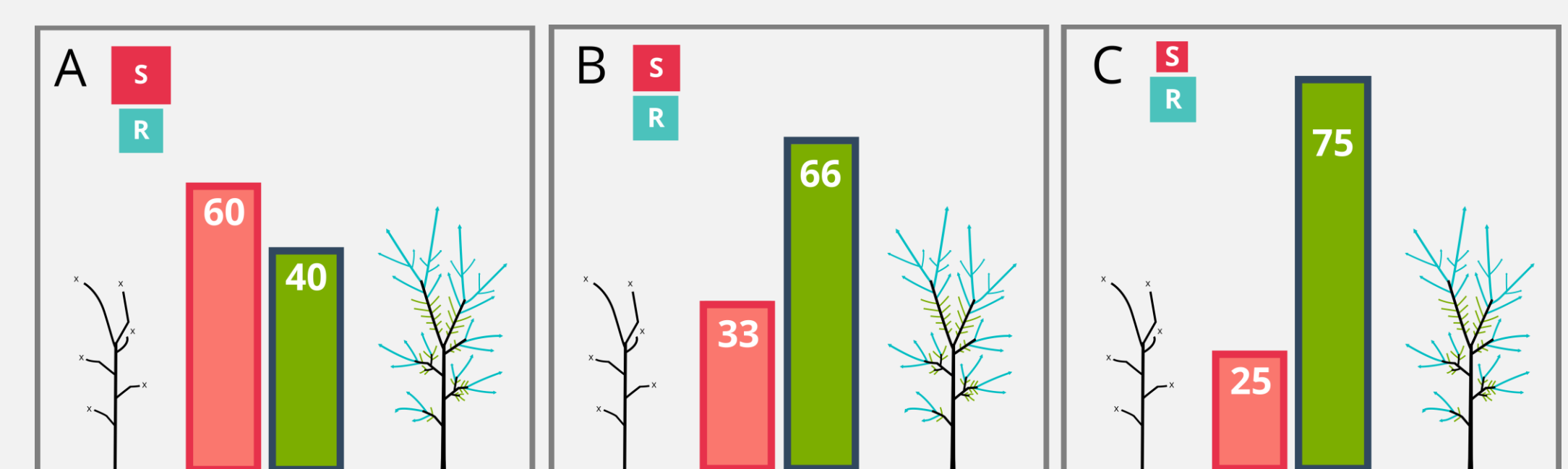
## Results 1) Different Growth Dynamics of Aboveground Systems



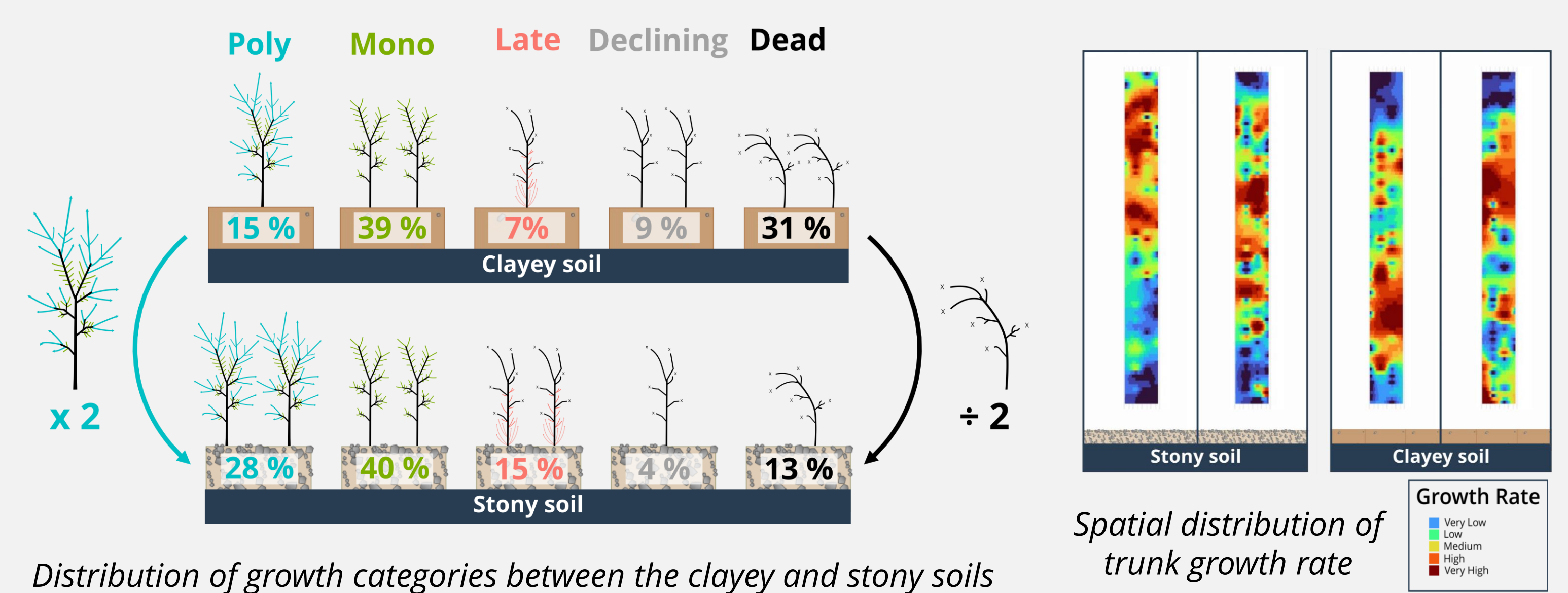
## 2) Growth Dynamics Reflect Root System Regeneration and Health



## 3) Effect of Root-to-Shoot Balance Before Planting on Tree Establishment

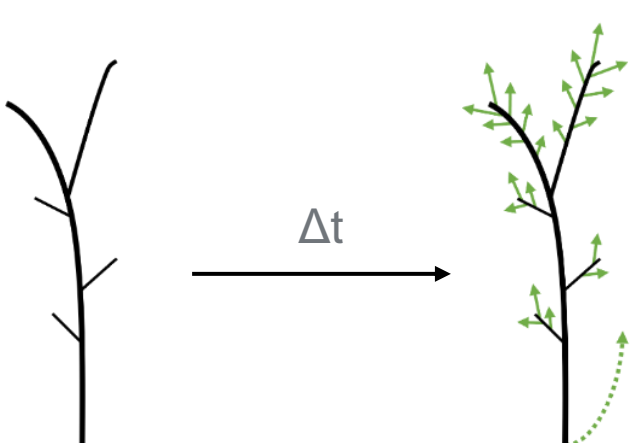


## 4) Influence of Soil Characteristics on Tree Recovery



## Key indicators

Delay from planting to budburst



Localization of buds mobilised within the structure



Annual shoots: Growth Type, Number, and Length



Leaf Area



Trunk Growth

