

# Developing an initialization procedure for the CEP growth simulator

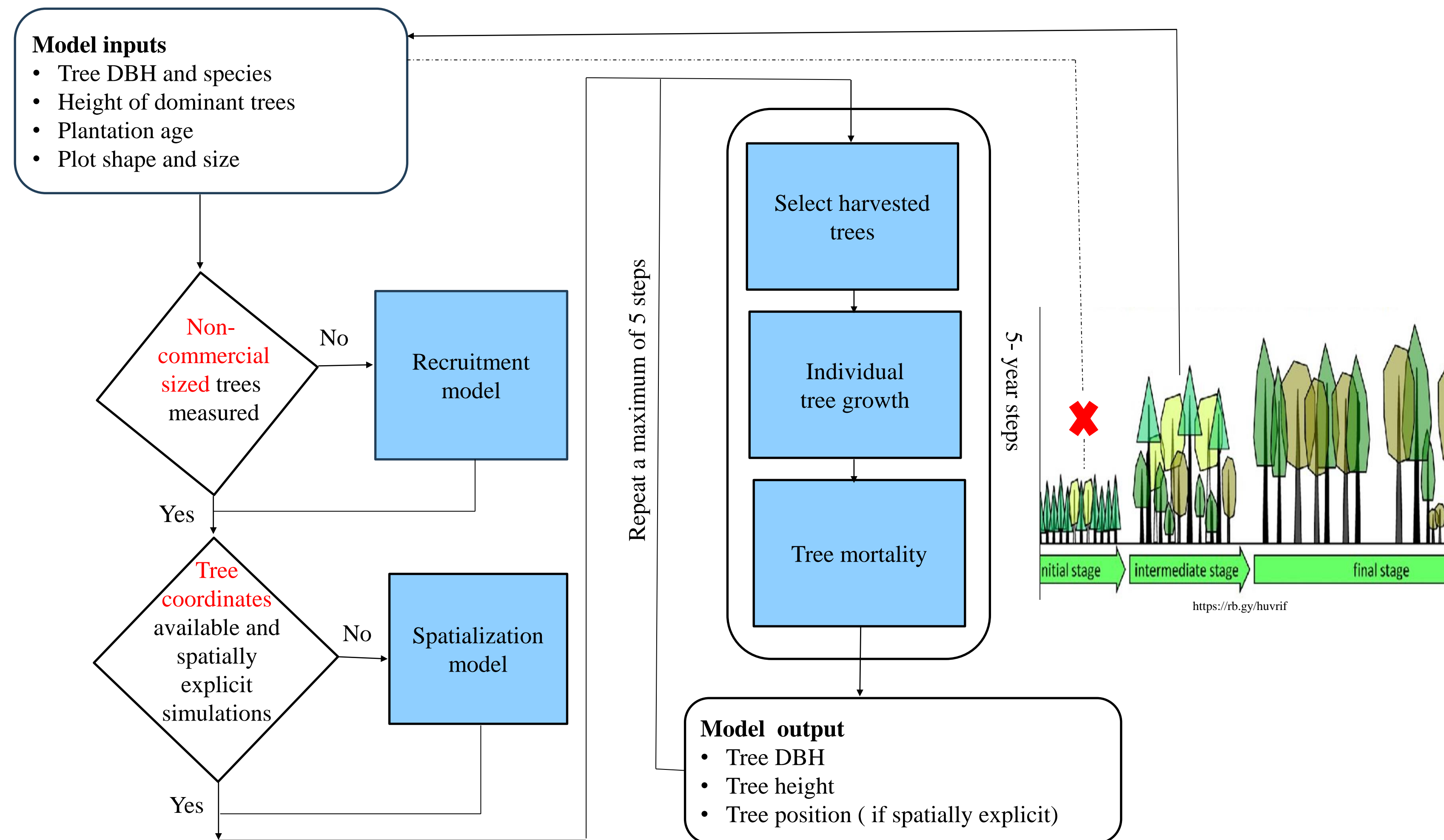
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## Context

- Growth and yield simulators are essential tools to help with decisions about forest management.
- For white spruce plantations in the Quebec province of Canada, an individual tree-level CEP simulator (*Croissance des Épinettes en Plantation*)<sup>1</sup> was developed, which simulates plantations that are ready for commercial thinning<sup>2</sup>.
- Younger plantations or plantations without detailed inventory data cannot be used in CEP.

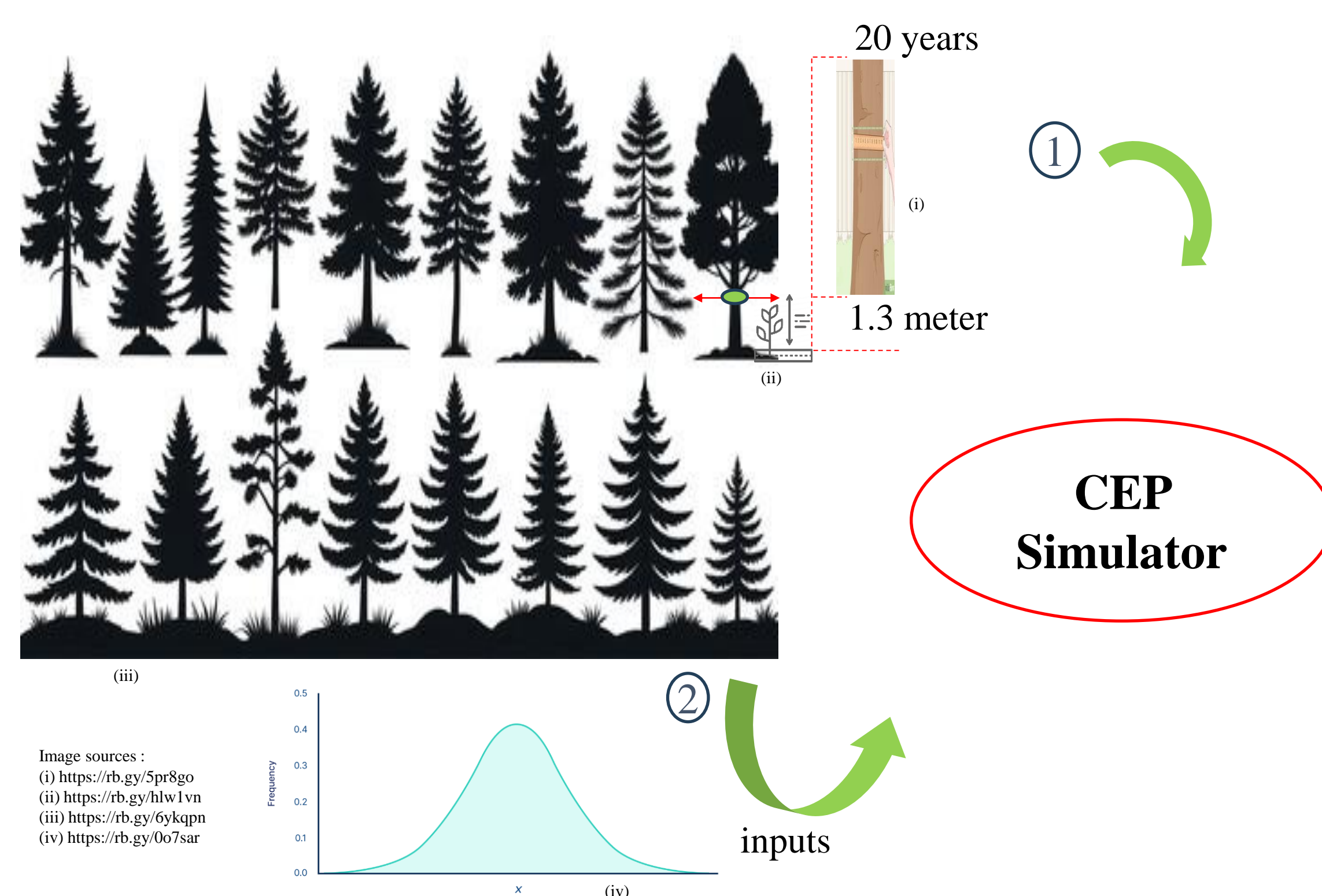
### Structure of CEP<sup>1</sup>



## Objectives

This study aims to develop an initialization module to enable the use of simulator with younger plantations or plantations without detail inventory. The initialization process will rely on two methods:

- (1) the simulation of seedling development from 0 to 20 years old and
- (2) a diameter distribution model for older plantations.



## Methods

1 Increment core samples

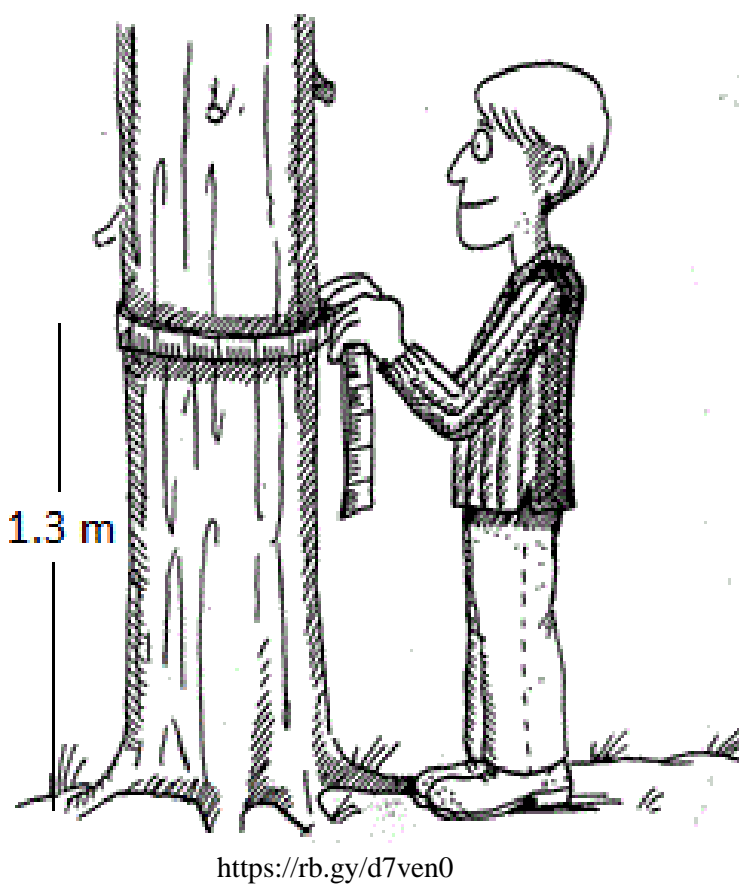


480 randomly selected white spruce

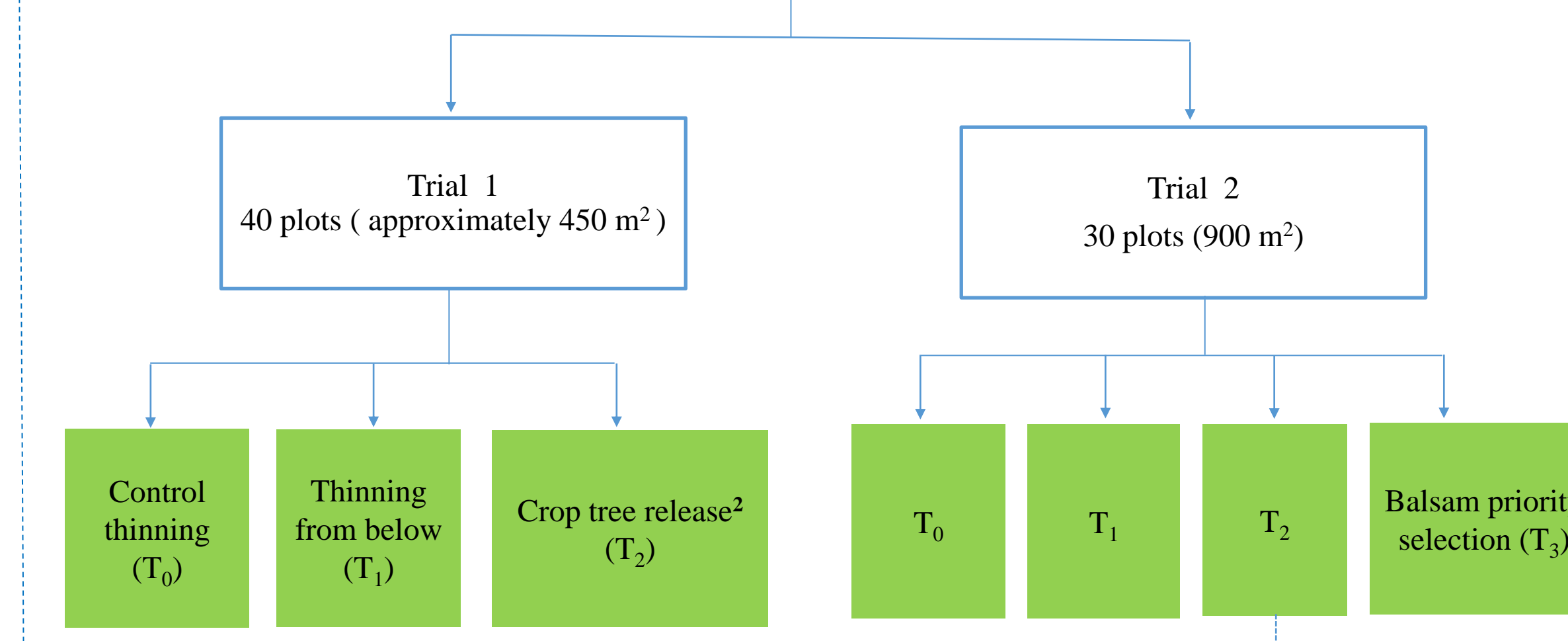
2 datasets from Easter Canada

2 Inventory data

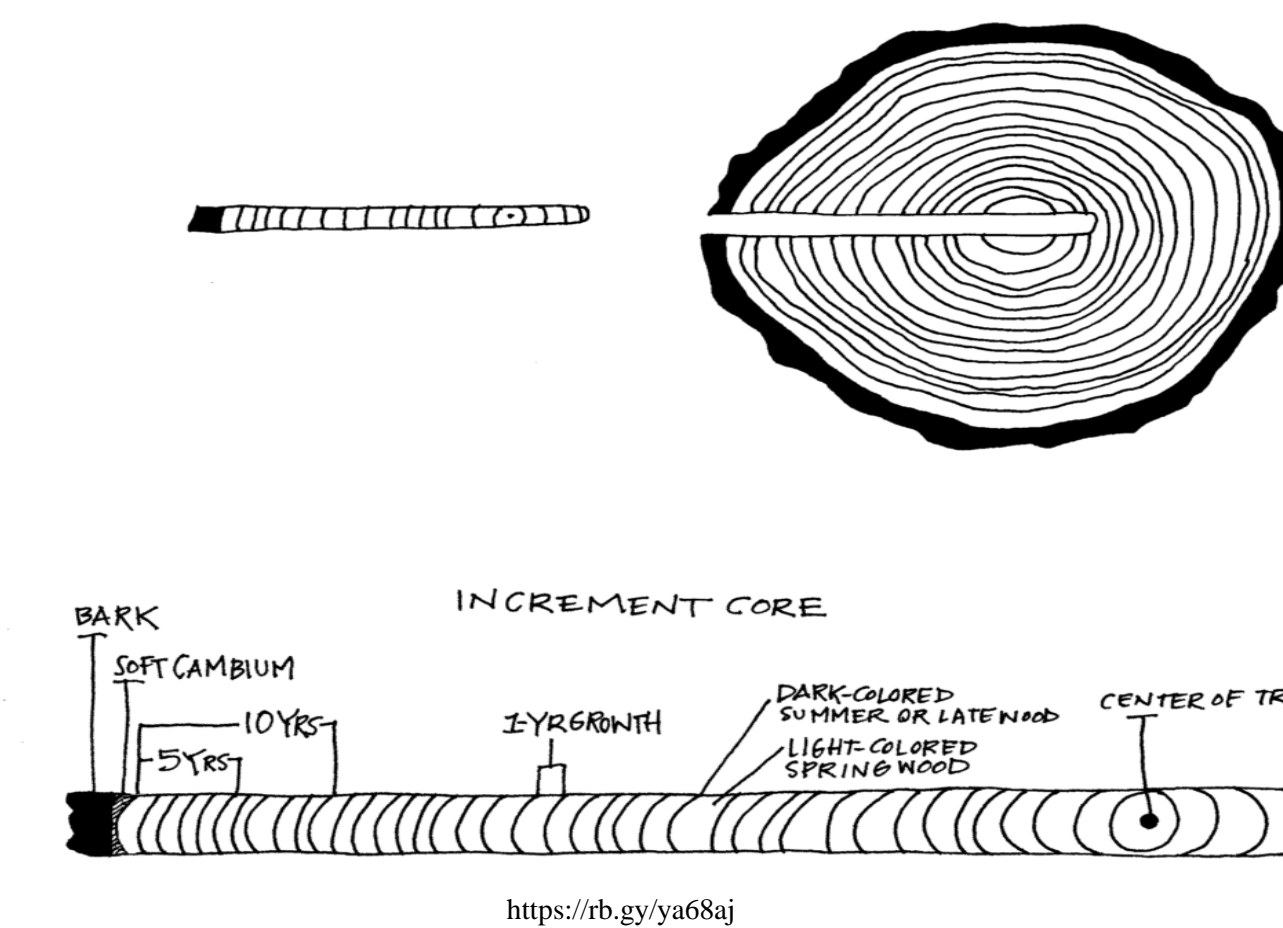
Diameter measurements  
(4 times in trial 1 and 3 times in trial 2)



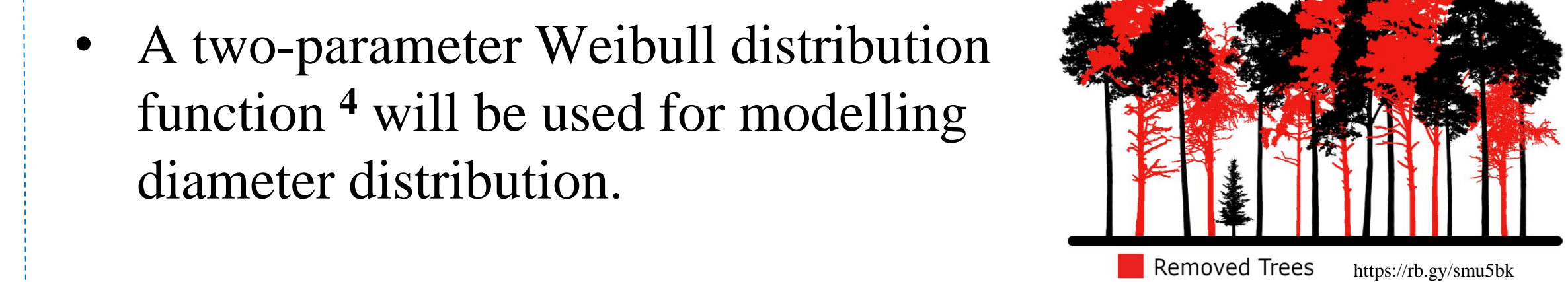
3 70 plots : two commercial thinning trial



- Extracted from 43 plantations within the network of 94 permanent sample plots in 48 plantations.



- The ring width and number of rings per core will be obtained by scanning the cores using a micro-CT scanner.
- A generalized linear model will be used to predict the time for each seedling to reach a height of 1.3 meters and to relate diameter at breast height development until the plantation reaches 20 years.



- A two-parameter Weibull distribution function<sup>4</sup> will be used for modelling diameter distribution.
- The Weibull distribution will be calibrated to each plot, and the obtained parameters will then be regressed against possible predictor variables.

## Implication

- Developing an initialization module will enable CEP simulator for simulating growth and yield of white spruce plantations from the time of plantations to maturity, providing valuable information for forest managers in their important decision making for forest management.

## References

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2. Dupont-Leduc L, Schneider R, Sirois L. Preliminary results from a structural conversion thinning trial in Eastern Canada. *Journal of Forestry*. 2020 Sep 1;118(5):515-33.
3. Duchateau E, Schneider R, Tremblay S, Dupont-Leduc L. Density and diameter distributions of saplings in naturally regenerated and planted coniferous stands in Québec after various approaches of commercial thinning. *Annals of Forest Science*. 2020 Jun;77:1-6.
4. Weibull W. A statistical distribution function of wide applicability. *Journal of applied mechanics*. 1951.

## Acknowledgements



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