

# FOREST TREE EVOLUTION VIA EXPRESSION REGULATION (FOREVER)



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Correct interpretation of environmental cues is a matter of life and death for plants, because as sessile organisms they cannot escape unfavorable conditions. For example, pines and birches have the ability to measure the day-length and to use it for determining the end of the growing season and to start making preparations for winter. Gene expression and its control have an important role in observing these signals and converting them to actual functional and physiological changes.

In this project, we study how genomic regions controlling gene expression affect physiological responses driven by the environment and how these reactions differ among two tree species having very different genome sizes and large evolutionary distance from each other. We will

also inspect how populations from different European locations differ in their genomic response to environmental change.

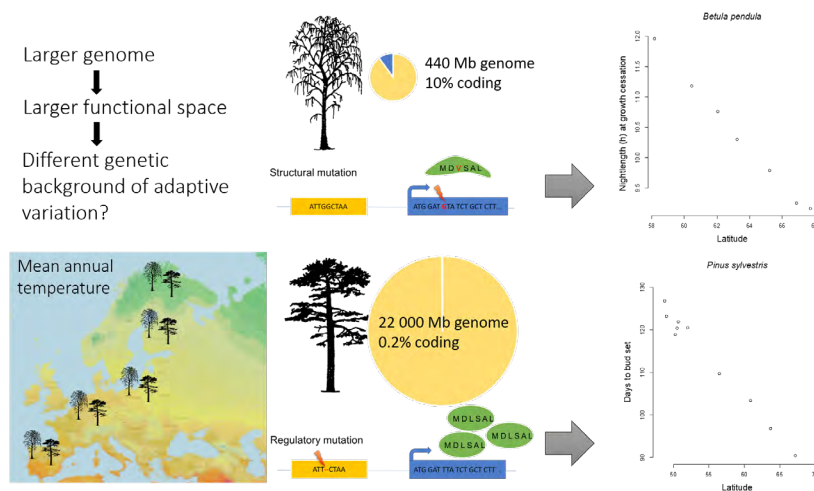
We concentrate on Scots pine and silver birch because they have similar adaptations at the phenotypic level, even though they are phylogenetically very distant and differ in genome size: birch has a small genome in comparison to gigantic conifer genomes. Both species are ecologically and economically important and already have been studied extensively, which provides a lot of necessary background information. Our results will help to understand how plants genetically adapt to environmental change and how fast responses we can expect from them. The results can be also utilized in forest tree breeding, optimal deployment of regeneration

material and predicting the impact of breeding.

To answer these questions, we will carry out both greenhouse and field experiments, DNA sequencing to identify genetic diversity, RNA sequencing to assess gene expression levels and novel molecular methods to identify active, regulatory regions of the genome. New analytical and statistical methods are developed during the project to optimally combine different types of large datasets.



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*Visual abstract of the project*

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