

## Mixed forest silviculture

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Mixed forest is a generic term used for a multitude of combinations of tree species within a forest stand, with variation in age, size and structure. In addition, the mixture is often desired as a method to combine management objectives, where the tree species represents different, or opposite, goals with the management of forest. Forest can be intentionally regenerated as mixtures, to increase the chances of successful and fast establishment. However, regenerations often unintentionally become young mixed forest stands, when spontaneous naturally regeneration blends with planted trees. In the contemporary forestry of northern Europe, this is often welcomed and somewhat preserved over the stand rotation, where the planted trees are managed for future yield, and the naturally regenerated species are preserved for improving species richness and forest habitat quality.

The understanding of mixtures, how to describe them, and how to predict future growth and provision of ecosystem services, is one of my main interests as a researcher.

Consequently, the implications of classical silvicultural measures, is what I investigate in my research. This includes exploring spacing and density, stand development and rotation length, thinnings for harvest and stand tending.

Although the composition of tree species is the most obvious descriptor of a mixed forest, the structure will impact both on forest growth and functioning. By structure we often use diameter distributions, species density proportions and canopy levels to be able to predict future development of the stand.

In this lecture I will present some of the insights and research results that we retrieved from long term experiments with Norway spruce, Scots pine and birch in Sweden. In most of the studies, the experiments have been designed not only to answer questions of comparable growth rate and merchantable yield for monocultures and mixtures, but also to the question on how to stabilize or to maintain a mixed forest composition over the stand rotation.

Although many mixtures spontaneously occur due to natural regeneration within plantations, I will demonstrate the challenges we may have with withholding the mixture when one of the tree species grow faster than the others. I will also discuss some of the management we can apply in order to retain the desired composition and structure of the mixed forest.