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## Growing mixed forests in Estonia

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## 1 What is mixed forest?

A mixed forest is a forest consisting of two or more tree species that is different to a pure stand from growing conditions, growing and uses. Mixed forests can be coniferous-mixed forests, deciduous-mixed forests or deciduous-coniferous-mixed forests. In fertile soils in Estonian climatic condition it's more expedient to grow mixed forest than pure stand. In contrast, on soils with certain extreme properties, a pure stand is preferred, for example, pine on podzol and sandy soils.



On the picture there is a forest grown as a mixed forest of spruce-birch-pine. In addition to the planted spruce and pine trees on the felling site there is also second growth of spruce, pine and oak trees from natural regeneration. During the thicket tending (after post-planting) the competitive herbs have been removed from the trees, but the natural second growth has been left to grow.

## 2 Advantages of growing mixed forests

- Mixture of birches and alders in conifer stands reduces the soil acidity and fastens the decomposition of litter and substance circulation.
- On too wet and heavy soils the pubescent birch (*Betula pubescens*) can help to improve the water regime and the availability of oxygen on roots.

- Mixture of birches decreases the root competition and brings more nutrients into the plants' substance circulation, because the root system of birch penetrates deeper than the spruce.
- The growth factor (water, light, nutrients) efficiency is bigger in mixed stands than in pure stands, because the competition among different species is not as rough as among the same species.
- The temperature and light regime are more favorable in mixed stand than in pure stand. During the winter time when the deciduous trees have fallen their leaves then this increases the snow thickness which helps to decrease the soil freezing. In the spring time the soil in the mixed stand warms up quicker than in pure spruce stand with same amount of trees.
- The bark beetle attacks and diseases usually hit one tree species, therefore the risk of big damages is smaller in mixed stands. Also the storm risk is smaller compared in pure spruce stand, because the root system of different tree species is located at different depths.
- The mixture of birch and aspen with coniferous majority increases the landscape value of the stand and the diversity of nature, which increases the wildlife living conditions. Biodiversity, especially species richness, is higher than in pure stands
- Compared to a pure spruce stand, the economic damage from game damage is smaller.
- The timber has better quality, especially on silver birch which is mixed with spruce.

### **3 How to grow mixed forests?**

Fertile soils, that meet the growth of demand of several species, are more suitable for growing mixed forests. Fertile soils are more in wood sorrel, hepatica, goutweed, meadowsweet, fern, wood sorrel full drained forest site types. There is no point of creating mixed forests in less fertile and dry habitats such as in heather, lichen and cowberry site types. Only the dry pine stands are the place where it's reasonable to let the birch grow to improve the soil characteristics and reduce the danger of fires.

### **3.1 Thicket tending**

After planting conifers, there is a need to do the maintenance in the felling site – the weeding around the plants and also removing the deciduous trees if necessary. It depends on the forest owner's goal what kind of forest he or she wants to create for the future.

Pine is a tree that needs a lot of light at a young age. In order to have mixed forests with the participation of pine, then pines should be planted and also maintained after the planting. During the maintenance it is reasonable to grow fast growing tree species such as birches and aspens. Fast-growing species are starting to grow again and reach the same height as the pine trees for cleaning felling. In young pine culture it is worth keeping slower growing trees such as oaks. Such trees do not give shade to pines and they all can successfully grow side by side. This approach provides an opportunity for broadleaf to reach the first tree layer.



### **3.2 Cleaning felling**

After the thicket tending the next forest management activity is cleaning felling, which is being started in 10-year-old forest. The reason of doing it is to cut down the species that are not wanted in the future forest or just to decrease the share of them. Cleaning felling creates

the foundation of the composition of species in the future forest, which can be adjusted by subsequent thinning operations.

Cleaning felling can enrich biodiversity and the forest in order to keep other trees growing, especially broadleaf trees, such as lindens, maples, oaks, elm and soft-leaved elms.

When leaving different tree species to grow, it is important to keep in mind that light-demanding species should grow together in the upper layer. In the second layer it can be grown shade-tolerant tree species, which can up during their growth to the trees in the first layer.

### **3.3 Additional options**

Forest owner can also increase species biodiversity by planting additionally other suitable species to spruce and pine species that didn't grow in the previous forest. For native species in Estonia, one of the most easily grown tree is the common oak, but young oaks need protection from rodents and goats.

### **Summary**

In short, modern efforts should be made to handle and manage forests by making more use of the potential of a diverse ecosystem. The coniferous-deciduous mixed forest is often a healthier and more productive forest as a whole, when things are viewed from the point of view of timber production, biodiversity, recreational opportunities and forest damage risks, and the optimal combination of habitat and maintenance options is chosen.

## Literature

Study magazine Sinu Mets, September 2019, pages 6-7 <https://dea.digar.ee/cgi-bin/dea?a=d&d=sinumets20190903.2.4.2>

Guideline materials How to Grow Mixed Forests <https://www.eramets.ee/wp-content/uploads/2021/04/segamets-2-web.pdf>