

## **The big question: What should we do to enhance biodiversity in Swedish forests?**

We live in a biodiversity crisis, caused by habitat loss, fragmentation and degradation caused by us humans extracting products from nature, and often over-exploiting the natural resources. Boreal forest biome that covers the northern part of the globe is among the least affected biomes, but even we see considerable changes in forest-dwelling species communities. Today, approximately 6 % of productive forest is protected in Sweden, and additional 5 % is set aside from forestry. This land area is clearly not enough to ensure viable population sizes of the most demanding forest species. According to latest red-list assessment, we are still losing species despite the actions to halt the decline and despite the facts that over 70 % of Swedish land area is covered by forests, and the forests are growing faster than ever. The question over the sustainability of Swedish forestry has become an incredibly hot debate topic between forest industries and conservation-minded actors. I, as a researcher on forest biodiversity, objective and leaning on the facts, should have a word to say about the topic.

The loss of biodiversity in boreal forests is related to *habitat amount hypothesis*, which predicts that large area can sustain a greater amount of species, to certain level. However, we have forests and according to official statistics, the wood volume in forests has doubled in 100 years, so what is the problem? Several studies on forest history emphasize the differences between the historical forests and today's forests. One key aspect is habitat heterogeneity, or the quality of the forests, which leads to another central hypothesis. According to the *habitat heterogeneity hypothesis*, the more diverse a habitat is, the more species it can support, because different species live in different *niches*. Following this hypothesis, forests with even-age and one-species management system should be poor in species diversity, while forest stands with high heterogeneity, several tree species, different sizes and with high diversity of microhabitats, are assumed to support higher diversity of species. The solution should therefore be straightforward – increase the heterogeneity in production forests to sustain biodiversity.

Indeed, active measures have been used in order to improve habitat quality, heterogeneity and amount, and they have become a backbone of forest management. For example restoration actions, retention forestry and uneven-aged forestry aim to sustain high diversity in our forests, by increasing the amount of certain habitats, such as dead wood, but also to increase habitat heterogeneity. According to my research, the habitats can be improved, monocultural wood plantations can be transformed to species rich habitats, and many severely threatened species can be benefited. But it does not always work as we assume, and the answers are far from straightforward.

In this lecture I will talk about how I have applied habitat amount and habitat heterogeneity hypotheses in my research in Fennoscandian forests during the last 15 years and how I am planning to continue to improve the answers that I have been able to give by today.