

Forest ecosystems play a very important role in nature, among others as areas preserving biodiversity. Forests are characterised by a large spatial diversity and in this context, we can talk about biodiversity unrelated to the species composition, but connected with the structural organisation of the ecosystem (with the degree of differentiation characteristics of the trees forming forests). Biodiversity is closely associated with dynamics of forest. The research on forest dynamics is increasingly based on simulation techniques, enabling to generate distributions of the different characteristics of stands (usually tree diameters), representing specific spatial structures. Modelling of diameter distributions allows, among others, the identification of various tree groups forming the stand and characteristics of the forest structure.

The main objective of this project is to investigate the suitability of various theoretical distributions to (1) model the empirical tree diameter distributions of two- and multi-species forests and to (2) simulate data from these stands.

The study will be conducted in mixed-species forests with different species composition in Poland, Slovakia and the USA. Tree diameter data sets will be simulated using selected theoretical distributions and models. These data allow generating "artificial forests" representing actually occurring objects. Simulation techniques enable "unlimited expansion" of databases and efficient modelling of dynamics of forests.

Understanding the diameter structures of near-natural and managed forests is necessary for assessment of the degree of naturalness of stands, formulating protection plans and planning forest management. The proposed research is pioneering in the forest sciences, because they embracing very diverse theoretical distributions, among others mixture models consisting of hundreds of components. The results of the research will allow for testing hypotheses about biodiversity, taking into account diameter structures of selected European and North American near-natural and managed forests. They will make an important contribution to the development of simulation techniques using in forest ecology.