

Abstract

Site productivity for Scots pine in Poland

This work aims to analyze (i) a relationship between productivity—both potential and actual site productivity for Scots pine and site features and stand characteristics, and (ii) spatial variability of this productivity on a national scale.

The research used measurement data from the national forest inventory (NFI) plots. Another data set included tree diameter growth and soil data from 312 research plots established close to the NFI plots. The research determined variables related to the potential and actual site productivity. These relationships helped to determine a map of the potential site productivity for Scots pine in Poland.

From the research carried out on the inventory and research plots, it follows that the potential site productivity for Scots pine depends mainly on the average annual temperature, annual rainfall, forest habitat types, geological substrate, and latitude and longitude. In the NFI plots, these factors explained 54% of variation in site index. In the research plots, a similar set of variables (although a little more detailed ones) accounted for 69% variation in site index. For both NFI and research plots, site index negatively correlated with age. Site index of second age class stands was higher by over 8 m than that of sixth age class stands. Most likely, changes in productivity can be related to changes in climate variables, such as increased CO₂ content in the atmosphere, prolonged growing season, and increased nitrogen deposition.

The actual site productivity, expressed as current volume increment, strongly correlated with stand features, in particular site index, stand age, stand density, and stand volume. These variables explained 57% of the variation in the current volume increment on NFI plots and for 83% on the research ones.

The models had good accuracy, which allowed their use in forestry practice in forest management planning and forest silviculture. A map of potential site productivity for Scots pine could be useful in planning forest regeneration and afforestation of abandoned lands. A map of site productivity could be also useful in forecasting risk of Scots pine stands from biotic and abiotic factors.

Key words: site productivity, site index, current annual volume increment, national forest inventory (NFI), Scots pine.