

Relationship between environmental factors and site index in Douglas-fir plantations in central Italy

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Abstract

Accurate and reliable evaluation of site suitability for the cultivation of selected species and availability of potential timber yield information is vital for the assessment of afforestation projects. This study examined the relationship between site index and environmental factors in Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*) plantations in the province of Firenze (central Italy). The aim was to predict site index by readily measurable factors. The influence of climatic (temperature and rainfall), topographic (elevation, aspect, topographical exposure, etc.) and soil (pH, texture, etc.) on Douglas-fir site index was evaluated by multiple regression analysis exploiting data from 71 plots distributed across the study area. Approximately 58% of the observed site index variation is explained by annual rainfall, water surplus, clay content, calcium-carbonate content and east–west component of aspect. Climatic factors directly related to water balance have a greater influence on the productivity of examined Douglas-fir plantations than examined topographic and soil factors. Results of the study are ecologically sound and of practical value for field foresters, with reference to the study area. The precision of the model may be only indicative for assessing site index for single sites. At a landscape mapping level, estimate reliability is quite appropriate. © 1998 Elsevier Science B.V.

Keywords: Forest plantations; Site quality; *Pseudotsuga menziesii*

1. Introduction

Recent reforms of the Common Agricultural Policy of the European Union have increased the interest in establishing forest tree plantations on agricultural land. Accurate and reliable evaluation of site suitability with respect to selected species and availability of potential timber yield information is vital for the

assessment of afforestation projects. This information may be provided by models that estimate the site quality for various tree species as a function of climatic, soil and topographic characteristics. Indeed, assessment of site potential in terms of wood productivity is one of the most important aspects of land management from forestry point of view (Monserud et al., 1990; Carmean, 1996; Tyler et al., 1996).

Quantitative analysis of the influence of environmental factors on forest stand productivity is a recognized study field. Reviews of principles and investigations have been presented, *inter alia*, by

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