Extended abstract No.256

RESPONSE OF SCOTS PINE (*PINUS SYLVESTRIS* L.*)* RADIAL GROWTH TO DRAINING IN ESTONIA

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SUMMARY

A considerable part of Estonian forests has been drained in the last fifty years. Numerous studies have focused on the results of draining in the short term, but information about long-term effects is scarce. Therefore, the main aim of this study is to analyze the relationships between radial growth, draining intensity and climatic factors. The study material originates from Scots pine stands in Järvselja Training and Experimental Forest District located in the south-eastern part of Estonia. Increment cores were taken from stands which were at least 60 years old. Annual radial increments were measured from the cores using LINTAB 5 tree-ring measurement station with an accuracy of 1/100 mm. The measured increments were then compared in different forest site types and chronologies for various distances from ditches were constructed.

KEYWORDS: Scots pine, draining, tree-ring chronology, peatland forestry, climate variables

INTRODUCTION

The practice of peatland draining for improving forest growth has mainly been common to Fennoscandia, Baltic and some other former USSR countries (Paavilainen and Päivanän, 1995). It has considerable influence on the forest ecosystem and thus, it is important to understand the results of drainage. A lot of studies are focused on the results of draining in the short term, but very few on the long-term results of draining. Increase in wood productivity is the greatest for the first twenty years after drainage and it may continue up to 40 years since drainage (Hökkä and Penttilä, 1999).
Dendrochronological methods are used in this research to estimate the impact of draining in Scots pine (*Pinus Sylvestris L.*) stands. Long-term chronology for Scots pine in Estonia is available, which covers the period of 1516–1998 (Läänelaid and Eckstein, 2003) and has been updated in the past years (Hordo *et al.* 2009). There are many studies that explore climate effects on tree and forest growth with dendrochronological methods in Estonia (Lõhmus 1992b; Läänelaid and Eckstein 2003; Jaagus 2006; Hordo *et al.* 2011) and the neighbouring countries (Elferts 2007, Erlickytè and Vitas 2008). Most of them include dry and moderate site types, but few examine site types where drainage is widely used to increase stand productivity (Ots and Reisner 2004). Because of the disturbed hydrology of bogs climatic signals could be difficult to recognize (Cedro and Lamentowicz 2011). The aim of this study is to analyze the relationships between radial growth, draining intensity and climatic factors in drained Scots pine stands.

MATERIAL AND METHODS

Increment cores from Scots pine trees were collected from the study area in the winter of 2012. The study area is located in the south-east part of Estonia in Järvselja Training and Experimental Forest District. Pine stands at least 60 years old were studied in different forest types growing on mineral and peat soil. Studied forest types included mesotrophic, bog moss, drained peatland and sphagnum paludified forest site types (Lõhmus 2004). All studied sites were drained before 1975.

On transects pickets were made every 25 meters, starting in the middle of the draining ditch. At every picket the diameter and height of 5 nearest dominant Scots pine trees were measured. All trees were living and had no severe damage. The position of every tree was measured so the distances of all trees to the pickets and the nearest ditches were determined. From selected trees increment cores were collected with an increment borer and peat thickness measured. Increment cores were cored through the tree. Two sides were measured separately and the average of the two was used in analysis.

Annual increments were measured from the increment cores with LINTAB measuring device using the software TsapWin Scientific Version 0.59 (accuracy 1/100 mm) (Rinn 2003). Earlywood and latewood were measured separately. Measured series were cross-dated visually by comparing graphs and cross-dated series were controlled by using the computer program COFECHA (Holmes 1983). A series by trees and plots at the same distance from the ditch was built up with the software TSAP-Win. Standardization of tree-ring series was detrended using a negative exponent curve in the program ARSTAN.

Data from the Estonian Meteorological and Hydrological Institute at Praaga measuring station (N 58°26´00´´, E 27°14´00´´) was used to study climate effects on tree growth. As references previously constructed chronologies and results were used (Lõhmus 1992a, Hordo et al. 2009). For data analysis the software R was used. For estimating draining intensity the sum of the distances from the two nearest ditches to the tree was used. For this study 720 trees altogether were cored and measured.

RESULTS AND CONCLUSIONS

As the analysis is not completed yet the results are preliminary. To estimate draining intensity different approaches have been used. In Estonia the distance to the nearest ditch or level of the water table (e.g. Hainla 1957) has been commonly used. However, for the last few decades draining intensity has not been a popular study area in Estonia and the neighbouring countries (Sundström 1998).
Draining intensity as the sum of distances to two nearest ditches is a good feature for describing the results of draining. Draining intensity is more correlated with tree height and diameter growth than with the distance to the nearest ditch. Height growth is more correlated with draining intensity than with diameter growth.
Preliminary results show that a distance of 125m from the ditch has an influence on tree growth. To determine the range with a positive impact on stand growth in draining ditches, longer transects should be considered where possible. This requires further studies with expanded datasets.

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