

# Studies of Wood Resources Dynamics in the Faculty of Forest

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Annual values of wood volume current increase such as potential increase (PCI), volume debris (VD), natural increase (NCI), volume removal (VR), and real increase (RCI) have been used to assess wood resources dynamics at the forest stand and stand set levels. Appropriate methods for evaluation the above mentioned quantitative parameters have been elaborated and empirically proved at the Department of Silviculture of LLU. The main explanations: PCI is the summary result of physiological processes of forming the wood amount in the past year; VD indicates the common stem volume of trees, which ended the production of wood in the particular year; VR is evaluated as part of a stem volume cut during the past year; RCI indicates the portion of NCI after subtraction of VR. NCI yearly supplements wood resources of forest.

The practical estimation of the dynamic indices of forest is a complex problem in view of the exceptional variety of both the forest stands themselves and the conditions for their growth. The key aspect composes the evaluation of PCI, since the values of this parameter are not indicated by forest statistics. Especially it relates to the estimation of forest stand sets frequently growing on the extensive and varying areas. The following laboratory procedure is proposed.

PCI is expressed by means of equation (1):

$$PCI = G \cdot Z'_M \quad (1), \text{ where}$$

$G$  - cross-section area of a certain forest stand set at the breast height, m<sup>2</sup>;

$Z'_M$  - reduced value of PCI produced by one square metre of cross-section area at the breast height, m<sup>3</sup> · m<sup>2</sup>. Our studies showed that the value of  $Z'_M$  depends on the wood species, age  $A$  and site index class  $B$ . This dependence is approximated by the expression (2):

$$Z'_M = a_1 + b_1 B + c_1 B^2 + \frac{a_2 + b_2 B + c_2 B^2}{A} + \frac{a_3 + b_3 B + c_3 B^2}{A^2} \quad (2)$$

All wood species have the following values of  $B$  for: class Ia  $B = 0$ ; class I  $B = 1$ ; class II  $B = 2$ ; class III  $B = 3$ ; class IV  $B = 4$ ; class V  $B = 5$ .

$a_i, b_i, c_i$  - empirical coefficients depending on wood species, for example, for the Norway spruce *Picea abies* Karst:  $a_1 = -0.10341$ ;  $b_1 = -0.01785$ ;  $c_1 = 0.007786$ ;  $a_2 = 43.7988$ ;  $b_2 = -2.5706$ ;  $c_2 = -0.60422$ ;  $a_3 = -430.820$ ;  $b_3 = 26.968$ ;  $c_3 = 5.5933$ . The values of coefficients listed above relate to the age interval  $15 \leq A \leq 160$  years.

The calculations of summary amount of potential current increase in volume PCI for the Norway spruce stands growing in the entire territory of Latvia are carried out as an example for the application of the proposed method. It is obtained that PCI amounted to 5.94 million m<sup>3</sup> on January 1, 2008.

Accuracy and labour expanses of laboratory method were checked empirically by means of the statistical evaluation of data obtained by the proposed method and the control method of sample areas. Control method is based on the measurement of the width of growth rings, and the equation (3) is used in monitoring of forest resources in Latvia.

$$Z'_M = 12732.4\psi H^\alpha D^{\beta \lg H + \varphi - 2} \left[ \frac{Z_H(\alpha + \beta \lg D)}{H} + \frac{Z_D(\varphi + \beta \lg H)}{10D} \right] \quad (3), \text{ where}$$

$H$  - average height,  $m$ ;  $D$  - average diameter at breast height,  $cm$ ;  $Z_D$  and  $Z_H$  - average diameter and height increase respectively;  $\psi, \alpha, \beta, \varphi, a, b, c$  - empirical coefficients depending on the wood species, for the Norway spruce:  $\psi = 2.3106 \cdot 10^{-4}$ ;  $\alpha = 0.78193$ ;  $\beta = 0.34175$ ;  $\varphi = 1.18811$ ;  $a = -0.0256$ ;  $b = 1.693$ ;  $c = 5.794$ .

The sample areas were placed in separate forest stands with different soil, phytocenotic and morphometric characteristics. The results confirmed the adequacy of the proposed laboratory method.

**Key words:** wood volume, current increase, assessment method.