# ENVIRONMENTAL STATUS ASSESSMENT ACCORDING TO TREE CROWN DEFOLIATION AND RADIAL INCREMENT CHANGES

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Tree ring analyse is quite suitable as a means of indication of long-term environmental changes.During growth, tree rings accumulate information on environmental phenomena (pollutants, ecoclimatic changes etc.) and store it for a many years. A comparative study of tree rings enables us to use these records for indication of environmental status changes over a long period of time.

Due to heavier atmospheric pollution over the last decades a negative effect of pollutants on forests was observed by many scientists. Tree crowns are defoliated, tree rings are effected too. It is imperative that in synergetic impact of climatic changes and atmospheric pollution a component of antrophoge- nic pollution must be singled out. The beginning of forest defoliation is determined as a fall in radial increment of trees and defoliation. There are no more reliable methods of retrospectively determining of environmental status changes according to forest decline level.

The hypothesis of our investigation has been based on the following assumptions:

1) normal fluctuation of the tree ring increment is typical for undefoliate trees;

2) defoliation correlates with the width of annual tree rings;

3) by applying the analysis of the series of the annual radial increment it is feasible to search retrospectively for the deviation of the increment from the normal-standard process;

4) due to atmospheric pollution cyclic fluctuation of the tree ring increment, which is conditioned by the climatic background, weakens the deviation of the increment in the period of the maxima and strengthens in the period of the minima.

Through the forest monitoring data it has been revealed that the values of the radial increment are inversely proportional to the extend of crown defoliation. The increment of severely defoliated (60-80%) trees is lowest, that of conditionally healthy and slightly (0-20%) defoliated trees is highest. The dependence of the annual radial increment of *Pinus sylvestris* on crown defoliation can be expressed by the equation:

$$Zr = 0,14 + \frac{1,94}{0,1D[1,5 - 0,13(8 - 0,1D)] + 1}$$

where Zr refers to the annual radial increment (mm), $D$ - crown defoliation (%).

The coefficient of correlation between the current crown defoliation and the radial increment of that year amounts to 0.73; over the last five years - 0.52; over the last ten years - 0.45.

On the basis of the data on the radial increment of the last 20-30 years series of the increment have been constructed for the following extent of crown defoliation: 0-10%; 20%; 40%; 60% and 80%. The effect of the climatic background is explicitly seen in the dynamics of the series of the increment : the maximum was in 1972-1973 and the minimum - in 1979-1981. By analysing series of time it has been ascertained that with increasing crown defoliation, fluctuation of the increment tends to diminish. Calculation of the trend coefficients of all series resulted in determining that nearly all of them were significant and adverse. Only the series of time constructed from the increment of trees without crown defoliation had no significant trend coefficient.