Crown defoliation effect on tree growth rates recorded at the Romanian level II plots

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Introduction

Tree growth information delivered by the Romanian forest monitoring system at the Level II plots has a great importance towards estimating the forest health status. The main purpose of the large-scale forest monitoring is to assess the dynamics and spatial distribution of tree damage and to analyze long term data series related to forest health status and vitality. Given the complexity of these processes, establishing a trend on forest health is a huge challenge especially in the context of research concerns. The tree growth its an synthetic indicator of forest condition, and can be expressed in different ways.(UNECE-CLRTAP, Manual, 2016)

This study includes tree growth periodic measurements starting from 1991 with an emphasis on the main tree species in representative forest ecosystems.

In assessing the effect of defoliation on tree growth it was analyzed the correlation between climate factors, crown condition, BAI and volume increment.

Material and Methods

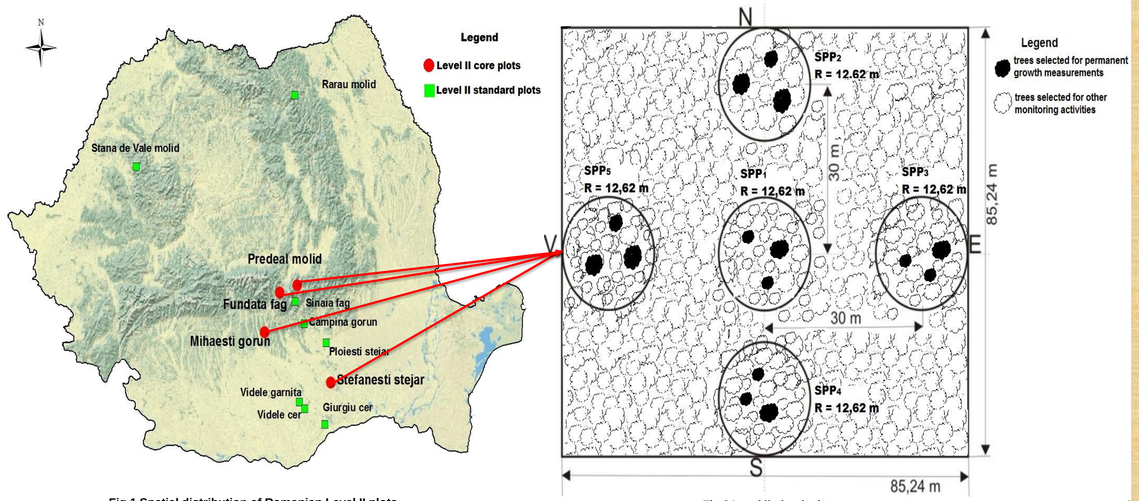

Fig.1 Spatial distribution of Romanian Level II plots

Fig.2 Level II plot design

Climate factors and crown condition

Relation between crown condition and yearly temperatures underlines a stronger correlation between yearly average temperatures (r=-0.57) compared with the average values from vegetation period (r=-0.2). The opposite happens for precipitations where they show a stronger influence on crown condition in the vegetation period then the overall yearly average precipitation. Also healthy trees show a bigger resistance to harsh climate having a lower correlation (r=-0,71) with it then the damaged trees(r=-0,97).

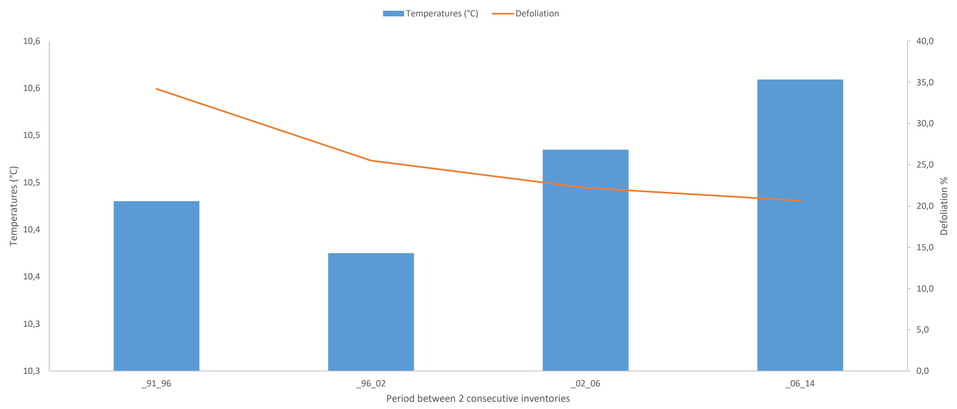

Fig.3 Correlations between yearly averrage temperatures and crown condition

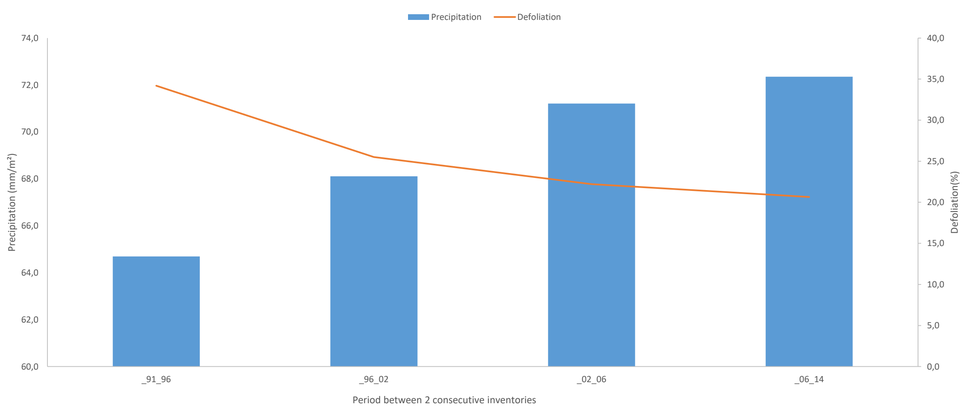

Fig.4 Correlations between yearly averrage precipitation and crown condition

Crown condition and basal area increment (BAI)

The health status of the trees within the plots was assessed analyzing their structure also. A considerable amount of trees improved their health status during analyzed period.

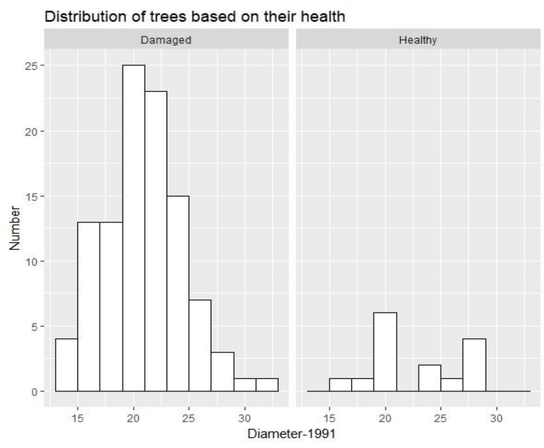

Fig.5 Distribution of trees based on their health year 1991

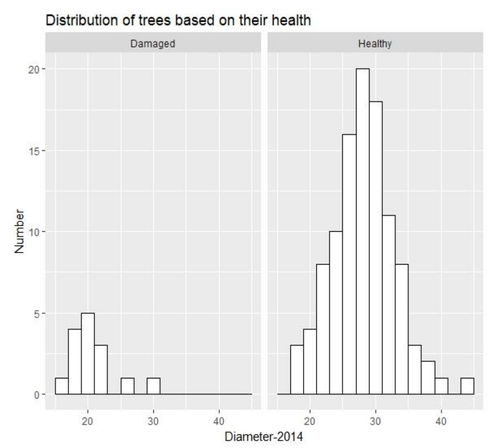

Fig.6 Distribution of trees based on their health year 2014

BAI had significant different values recorded in 2006 . Almost 98% of the trees from the Mihaesti plot recorded a higher BAI compared with all years studied.

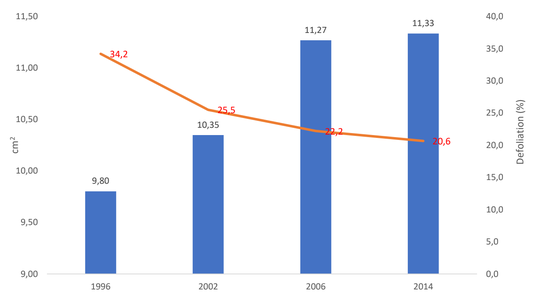

Fig.7 BAI and crown condition

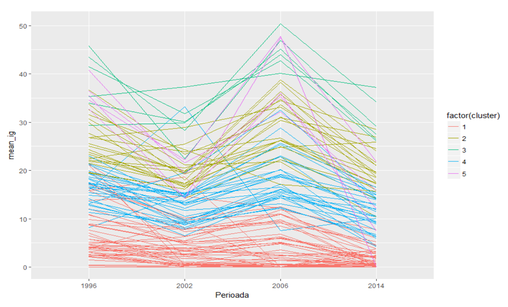

Fig.8 Yearly BAI dynamic cluster

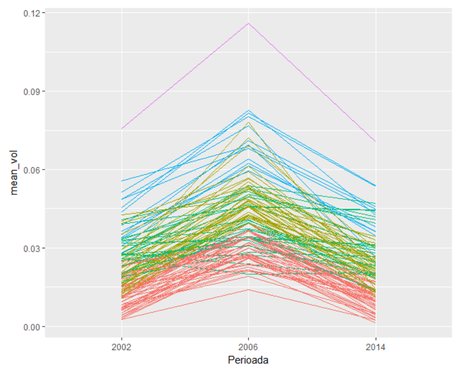

Fig.9 Volume growth cluster

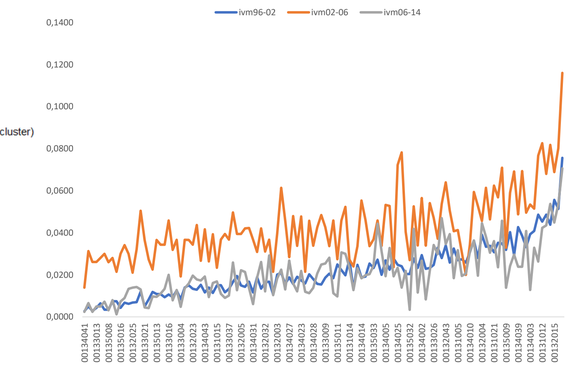

Fig. 10 Plot volume dynamic

Giving the fact that BAI has a direct relation with the volume increment, trees analyzed had also a significant higher values of mean volume increment in the period 2002-2006.

CONCLUSION

- Forest health status improved starting from 1996 every year. Climate factors improved also which lead to an increase of basal area and volume, reaching a peak in 2002-2006 period. Following the same trend the healthy trees number increase every year, main causes are:
  - The number of trees with defoliation percent of 30-35% that have been moving in the first class of defoliation due to favorable climate conditions
  - Drastic appreciation of crown condition in the beginning of forest monitoring in Romania
- The period of intense migration of damaged trees to healthy classes took place between years 2002 and 2006 when 15% of the total number of trees improved their heath condition.
- Tree models based on each tree resemblance in BAI allowed us to assess forest condition from less observations using trees with same characteristics as the tree models and using them as health and growth indicators of the stand.
- For better results a further analysis would be conducted for this method.

Bibliography

1. UNECE, CLRTAP, ICP Forests - MANUAL on methods and criteria for harmonized sampling, assessment, monitoring and analysis of the effects of air pollution on forests