

SALVAGE FELLING AND PEST AGENTS OCCURRENCE IN SLOVAKIA WITHIN THE PERIOD 1960–2014

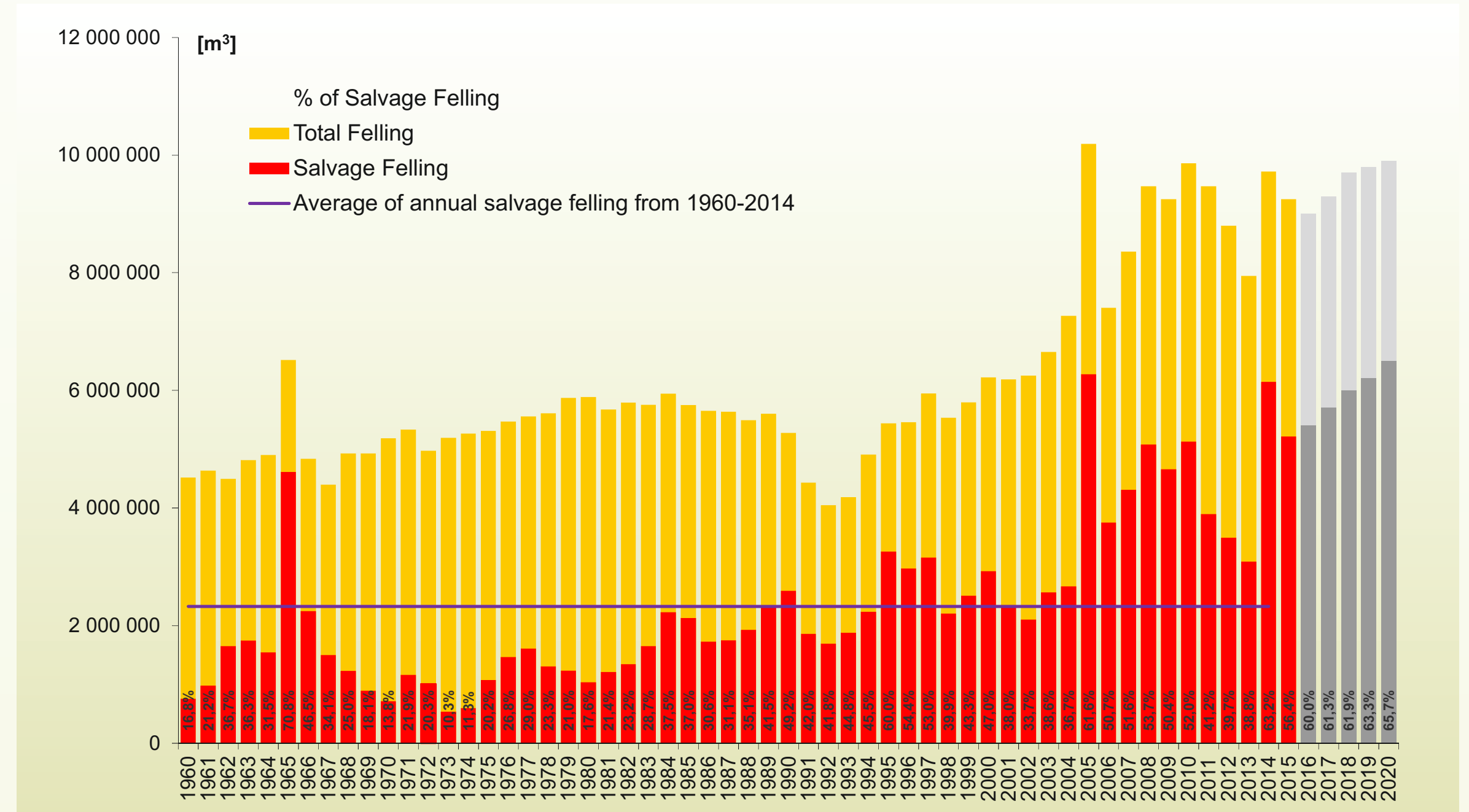
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Introduction

The salvage felling is one of the tools to evaluate the forest health status. As the salvage felling has to be triggered by a pest agent it is possible to analyze the importance of these pest agents by the amount of the cut wood within a salvage felling. As a result there are some pest agents which dramatically damage forests. On the other hand, although some are less important, they may have a potential to increase its influence.

Methods

During the 55 years (1960–2014) more than 80 pest agents were analyzed from forestry statistical reports and professional and scientific papers. Pest agents were grouped into 3 main pest agents groups: abiotic, biotic and anthropogenic pest agents. The amount of annual cut wood damaged by pest agents was summarized to show the importance of certain groups of pest agents. Moreover, annual data were presented as the long-term development of pest agent's occurrence. The long-term average (calculated from 55 years) and linear trends were stated as a help to compare the current forest health status and for a prediction of the development.



Development of annual total and annual salvage felling in Slovakia

Results

The total felling over 55 years was 334 mil. m³, the total salvage felling reached 128 mil. m³ which is 38.3% from total felling. Averaged annual salvage felling was 2.3 mil. m³ (min. 0.5 mil. m³, max. 6.3 mil. m³). There were 21 years when the annual salvage felling (further on "ASF") exceeded the level of averaged ASF (which is 2.3 mil. m³). Within the last 20 years, there were 18 years that exceeded averaged ASF!

As in 2014 the second most largescale windstorm occurred in Slovak forests and the following year 2015 was extremely dry in Central Europe, the prognosis for ASF is bad. Mostly bark beetles on spruce as a secondary pest agent is supposed to spread over the mountainous regions and might increase the ASF in Slovakia for the next 3–5 years.

Separating the reason of the salvage felling into damaging agents, the abiotic pest agents were the most important, followed by biotic and anthropogenic pest agents. The wind represents 78.7% of the abiotic pest agent's damages, *Ips typographus* (spruce bark beetle) represents 82.5% of the bark beetles, *Armillaria* spp. represents 54.9% of the fungi and imissions represent 89.1% of the anthropogenic pest agents. As for leaf eating insects, defoliation on oaks represents 79.5% of all damages of leaves and needles.

Conclusions

The salvage felling has been increasing during the last 55 years. With regards to the increasing frequency of largescale wind disturbances within last 20 years, the occurrence of secondary biotic pest agents, it is obvious that the salvage felling will be increasing at least next 3 years. In order to stop or at least diminish the trend, it is necessary to analyze certain pest agent's development and to apply their proper management.

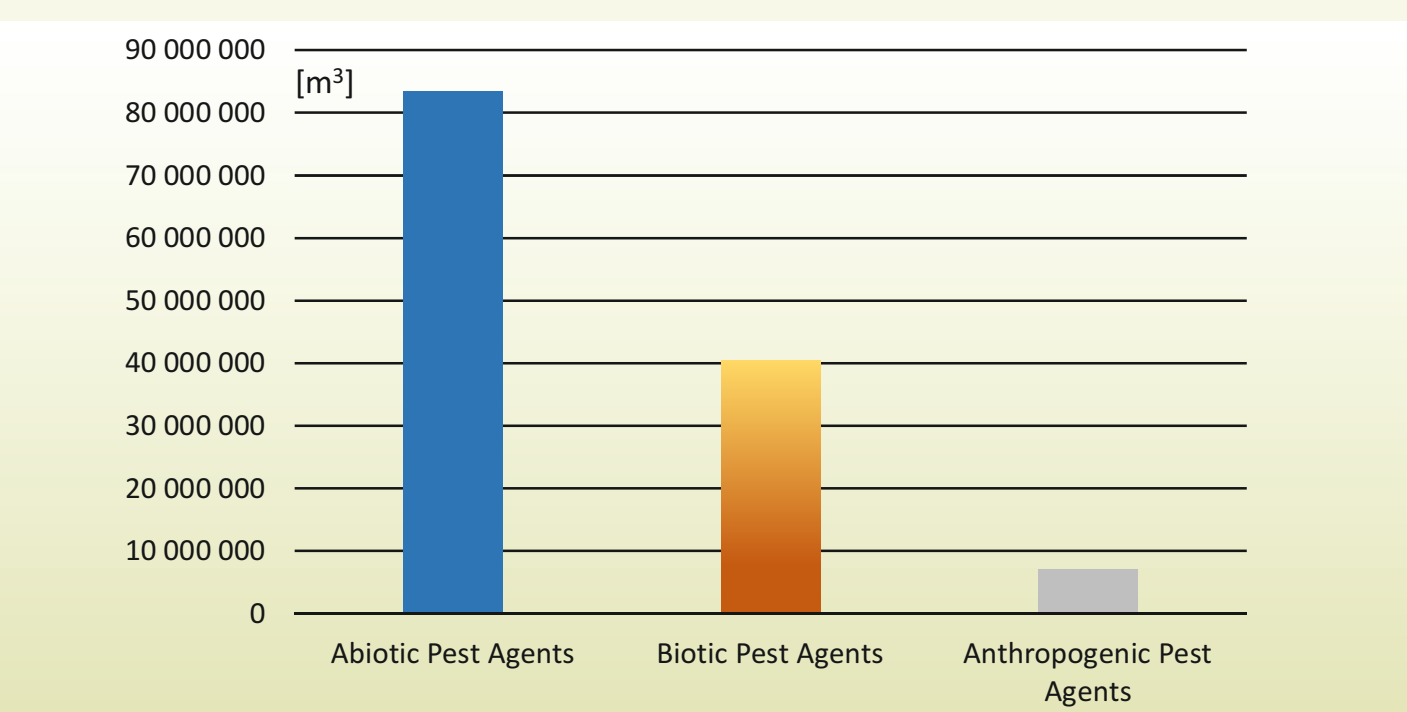
Acknowledgement

APVV-0707-12 Research of Disturbance Factors Affecting Long Lasting Development of Slovak Forest Health
 APVV-14-0567 Information and Warning System for Invasive Organisms in the Forests and Urban Areas
 APVV-15-0348 New methods in an integrated forest protection incorporating the use of entomopathogenic fungi
 APVV-15-0531 Web GIS application for monitoring of harmful pests in forests of Slovakia

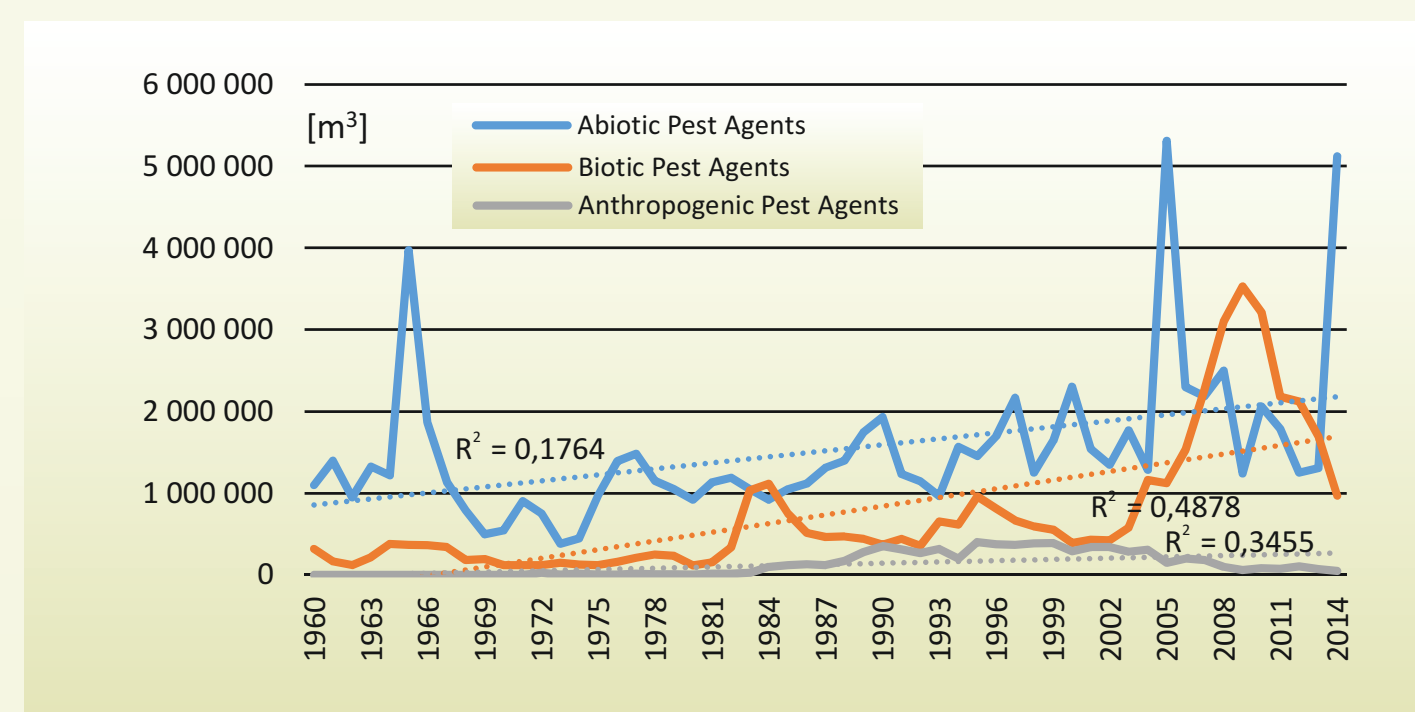
Literature

KUNCA, A., ZÚBRİK, M., GALKO, J., VAKULA, J., LEONTOVYČ, R., KONÔPKA, B., NIKOLOV, CH., GUBKA, A., LONGAUEROVÁ, V., MALOVÁ, M., KAŠTIER, P., RELL, S., 2015: Salvage felling in the Slovak forests in the period 2004–2013. *Lesn. Cas. For. J.* 61 (3): 188–195.

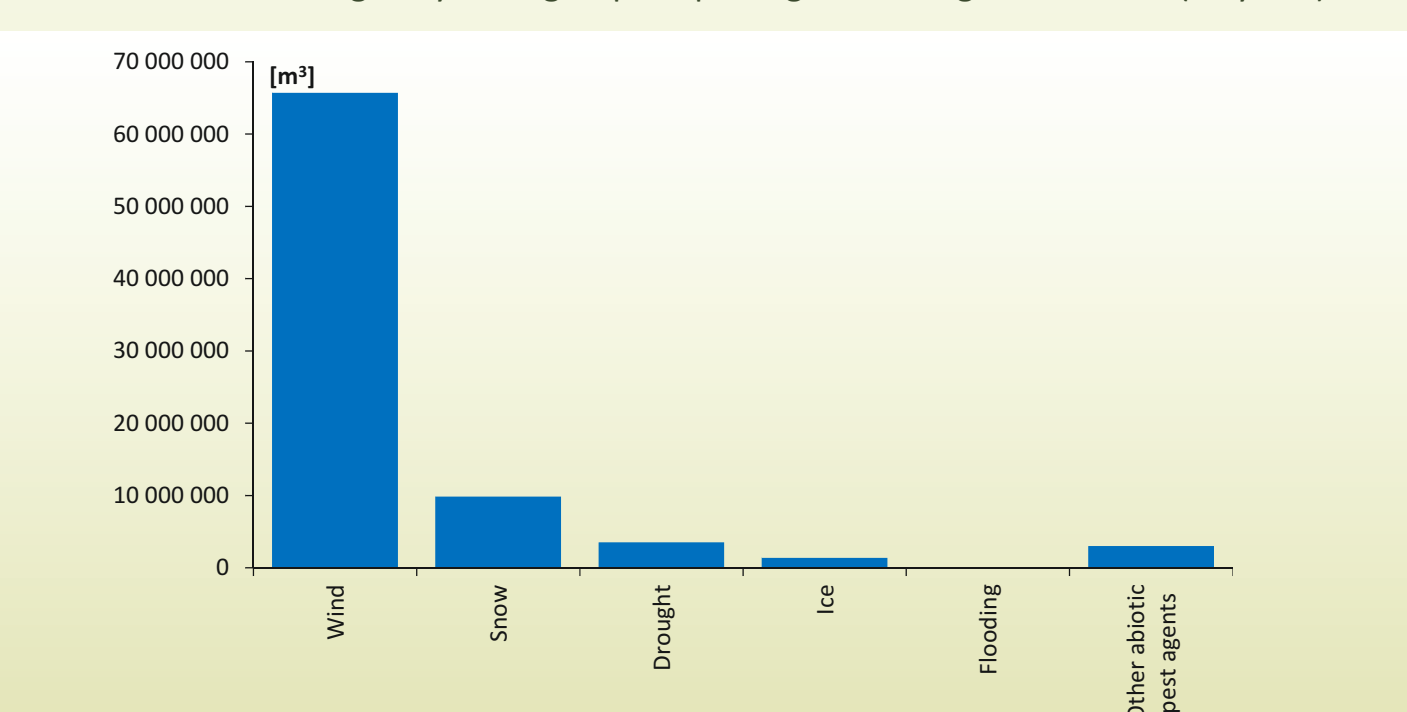
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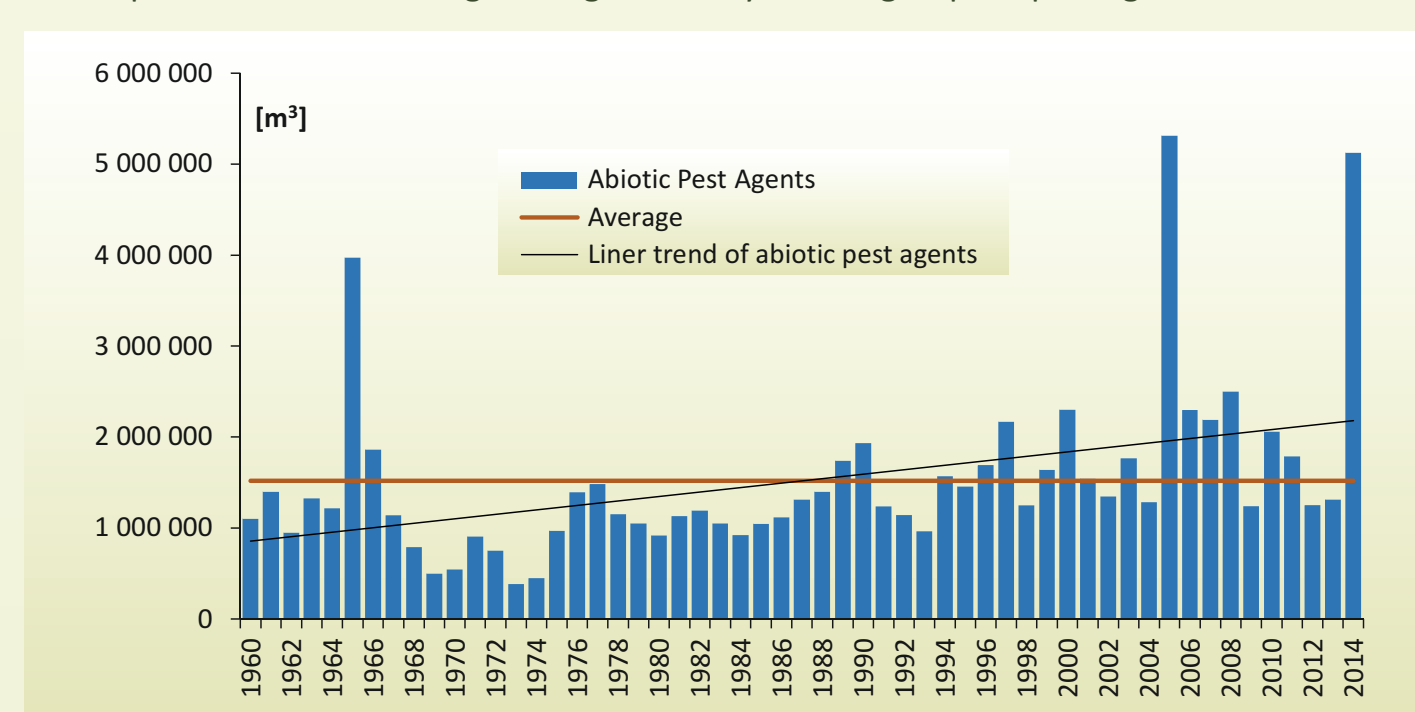
Volume of wood damaged by main groups of pest agents during 1960 – 2014 (55 years)



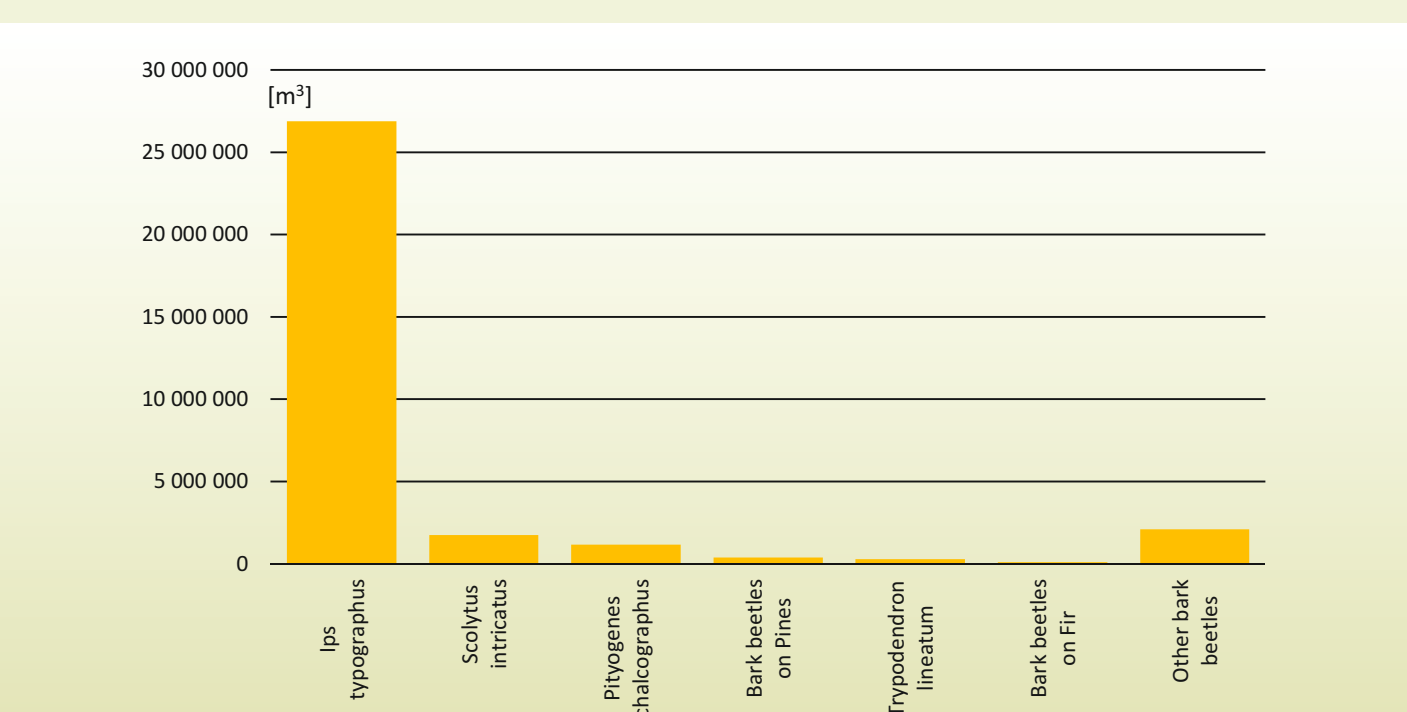
Development of annual salvage felling caused by 3 main groups of pest agents in Slovakia



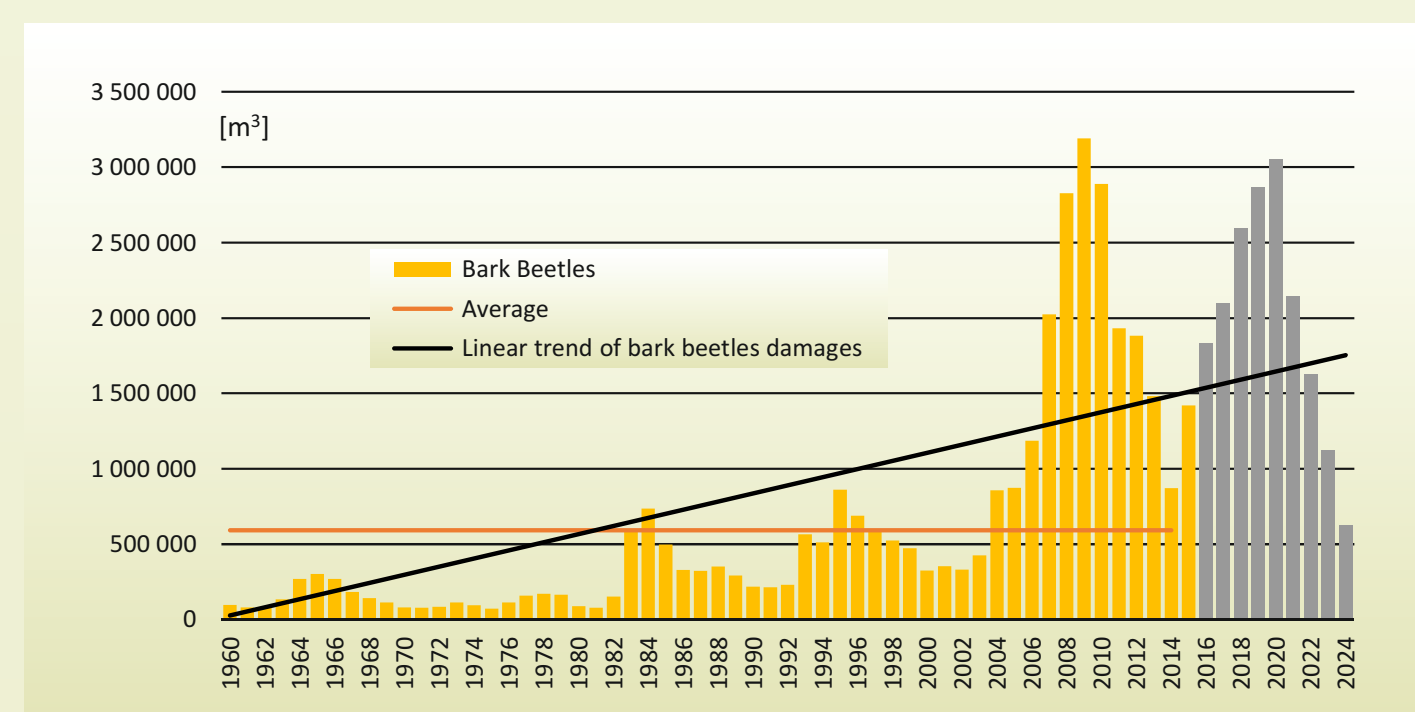
Volume of wood damaged by single abiotic pest agents during 1960 – 2014 (55 years)



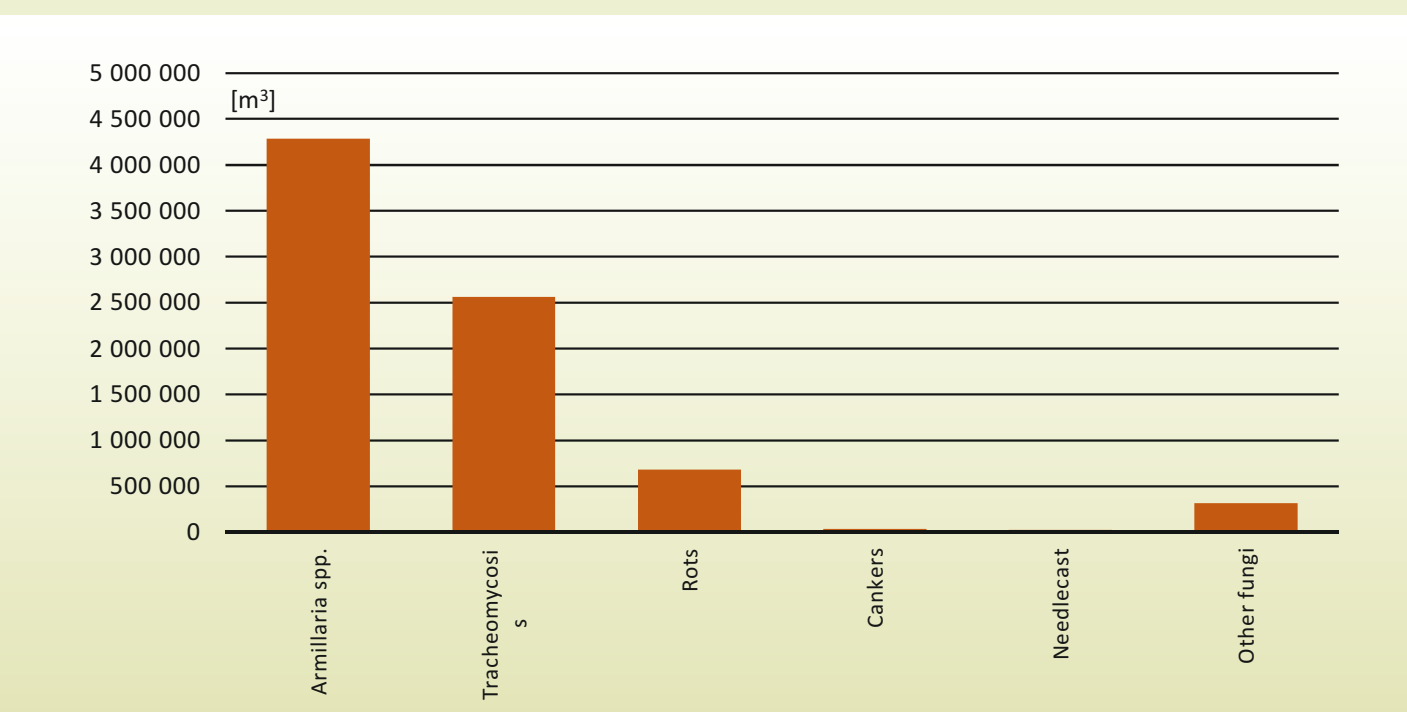
Development of annual salvage felling caused by abiotic pest agents in Slovakia



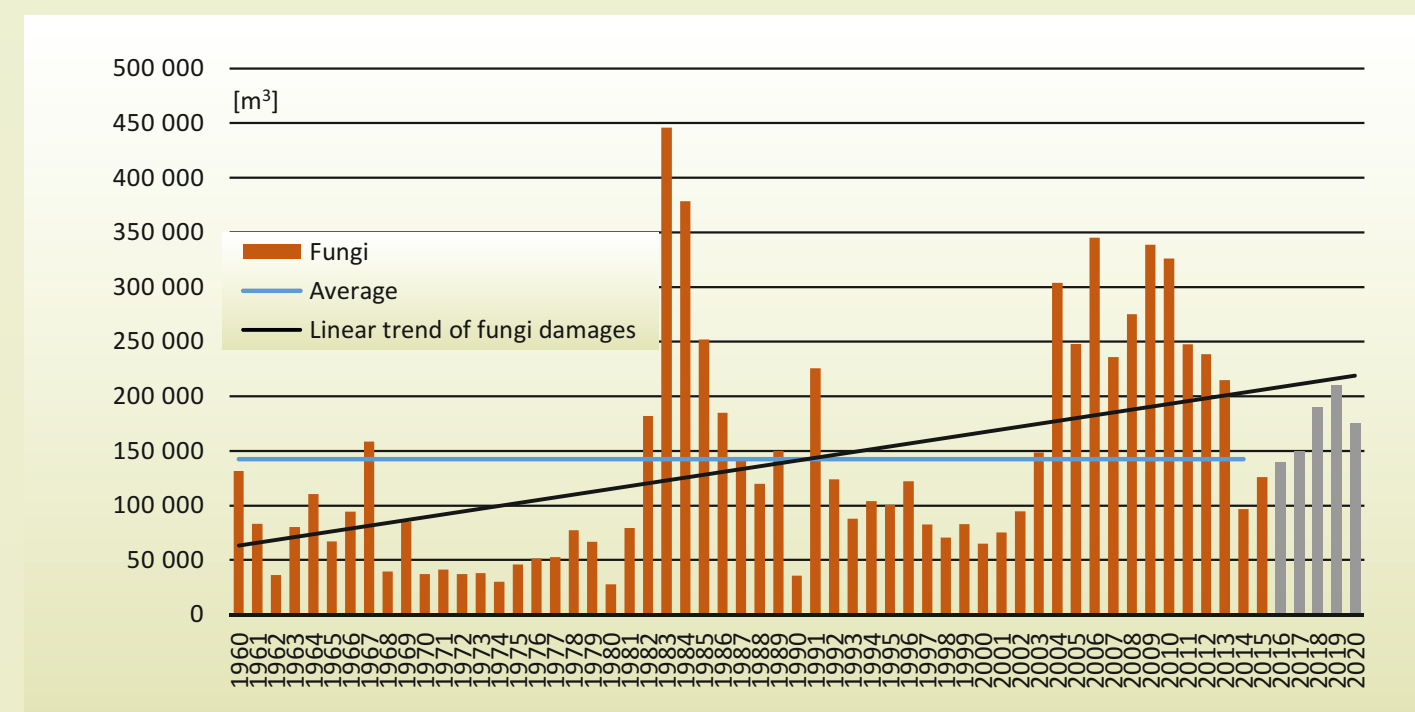
Volume of wood damaged by single bark beetles during 1960 – 2014 (55 years)



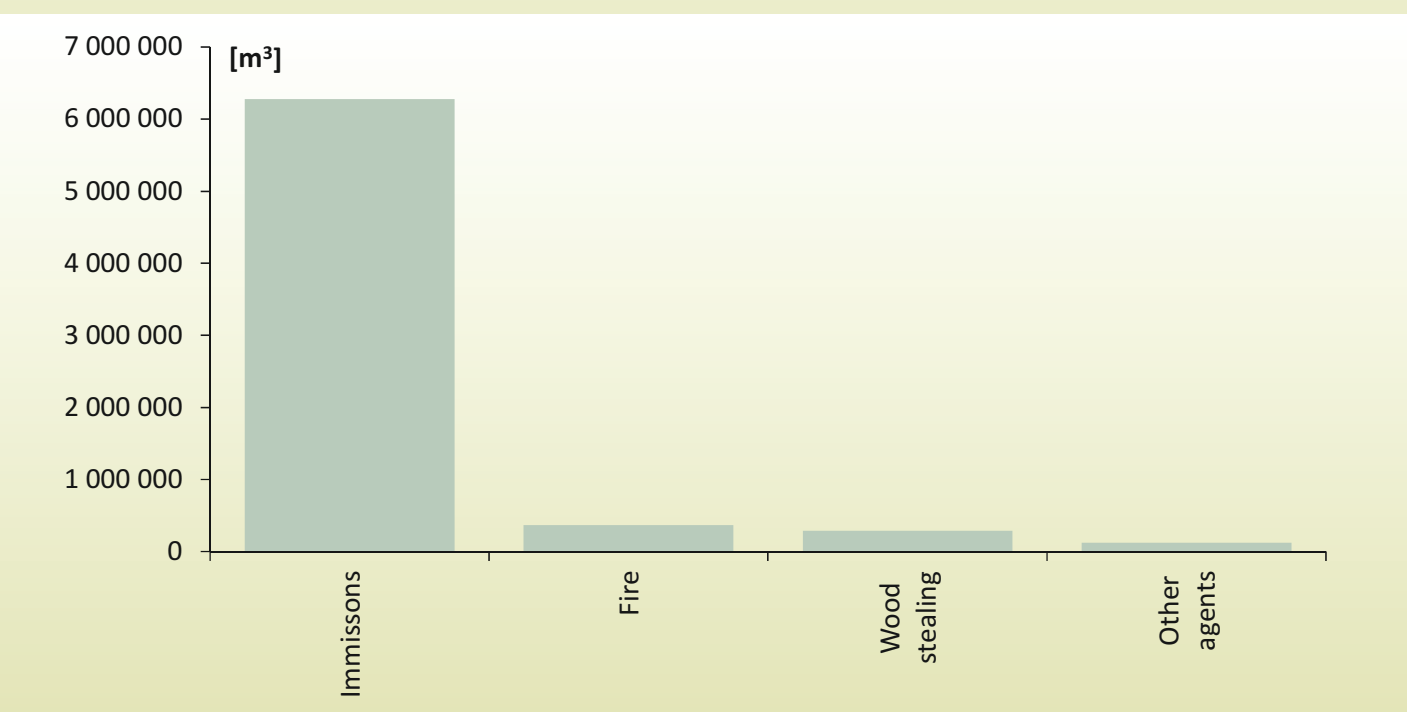
Development of annual salvage felling caused by bark beetles in Slovakia



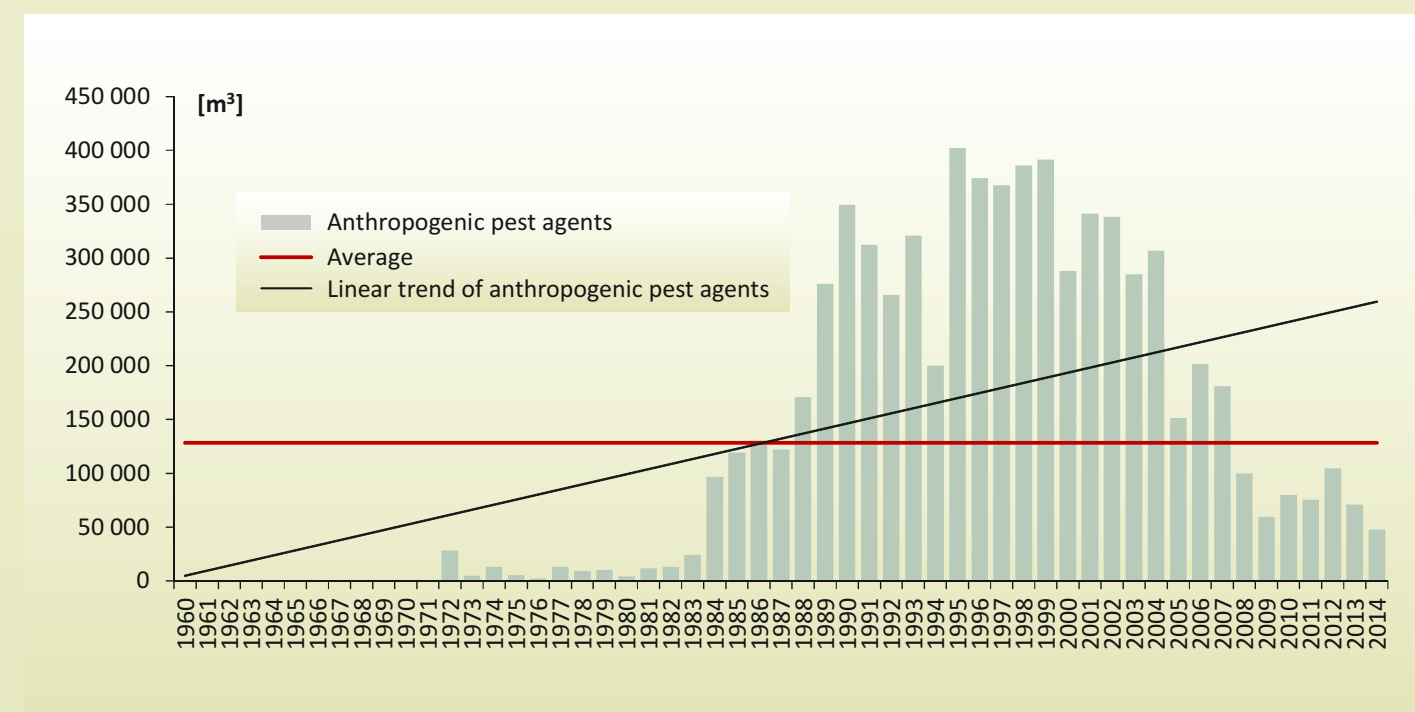
Volume of wood damaged by single pathogenic fungi during 1960 – 2014 (55 years)



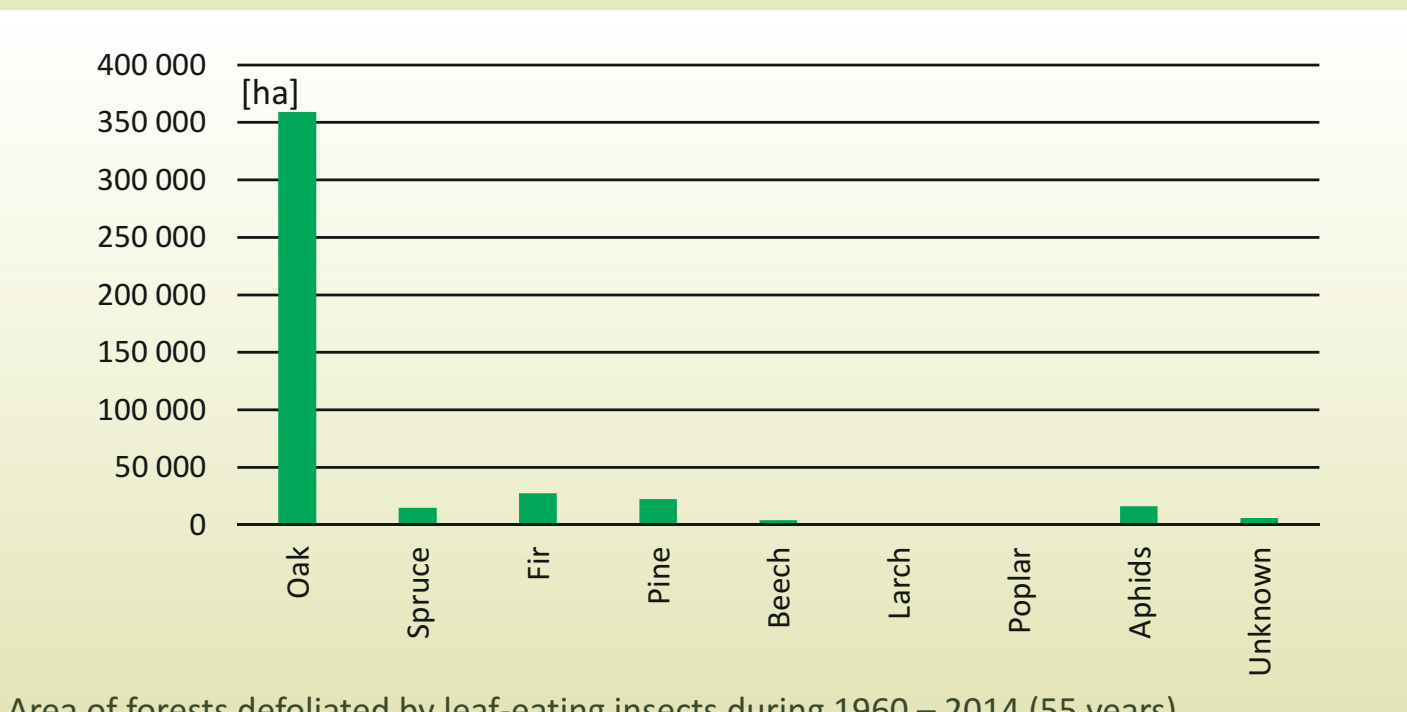
Development of annual salvage felling caused by pathogenic fungi in Slovakia



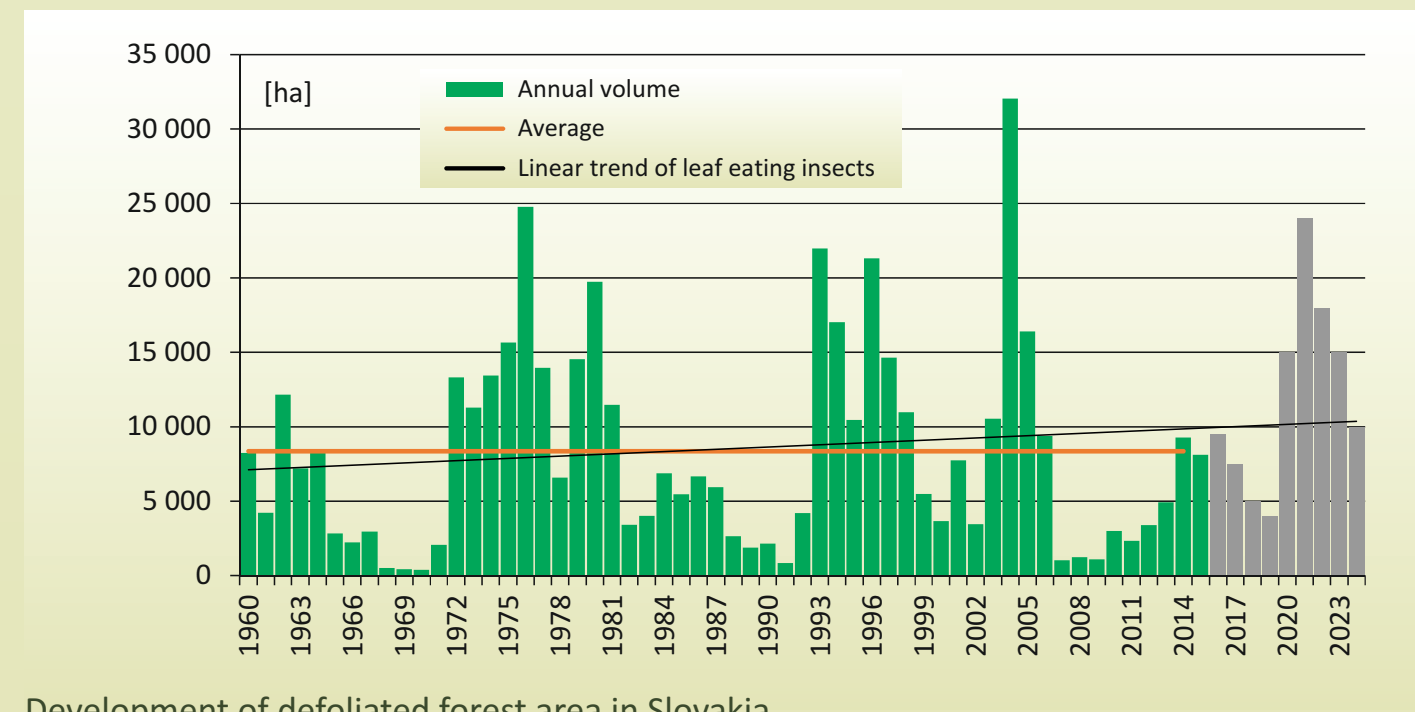
Volume of wood damaged by single anthropogenic pest agents during 1960 – 2014 (55 years)



Development of annual salvage felling caused by anthropogenic pest agents in Slovakia



Area of forests defoliated by leaf-eating insects during 1960 – 2014 (55 years)



Development of defoliated forest area in Slovakia

