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## **INFLUENCE OF ROOT SYSTEMS OF DECIDUOUS TREES ON SOIL REINFORCEMENT – A CASE STUDY FROM THE CARPATHIANS, POLAND**

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### **Abstract**

Forests play a significant role in the protection of slopes against shallow landslides, and the presence of the tree roots in the soil is considered the most relevant factor increasing its shear strength. Most research on root reinforcement carried out in the European mountains refer to coniferous tree species but there is still not enough information about the root systems of deciduous trees and their role in enhancing the slope stability. The aim of this study was to determine root reinforcement of four typical tree species (European hornbeam, common birch, black locust and small-leaved linden) growing in the forests of the Polish Carpathians. The measurements of root systems were performed using the trench wall method and the root reinforcement values were calculated using two fiber-bundle models - RBMw and RBMe, which represented different approaches to tensile force distribution within the root bundle. Studies have shown that the hornbeam roots have the highest, and the black locust roots – the lowest values of the tensile strength. Calculations showed that the values of root reinforcement obtained using the RBMw model are 17% higher than the ones calculated using the RBMe model. Root reinforcement values for common birch, black locust and small-leaved linden did not exceed 10 kPa, and in case of hornbeam they were about 20 kPa max. As part of the work, the parameters of the Root Distribution Model were estimated, which after integration with the bundle models allowed to determine the relation between the root reinforcement, the distance from the tree and its diameter.

*Keywords:* fiber bundle model, root area ratio, root reinforcement, root distribution model

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