

# Re-evaluating sheet erosion rates in a popular trekking trail located at the Spanish Central System

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Degradation of walking tracks, mainly due to sheet erosion associated with hiking activities, damages the natural and recreational value of protected natural areas. Resource managers and decision makers need to obtain objective and reliable information regarding sheet erosion rates in order to manage walking tracks adequately. The Senda Schmidt is a popular trail located at the northern slope of the Sierra de Guadarrama (Central Spanish System). It shows high denudation morphologies on account of accelerated soil-erosion processes, basically caused by human influence (trampling by continuous trekking), resulted in exposed roots. Previous works have used dendrogeomorphological methods in this trail to estimate sheet erosion rates based on the changing morphology of tree rings (from concentric to eccentric) when root is exposed. This study aims to evaluate soil erosion reconstructing the first year of root exposure by analyzing changes in wood anatomical parameters within growth rings. First results show that following the exposure of roots, increased growth in the ring is accompanied by a slight reduction of the cell lumina of the earlywood tracheids. At the end of the ring, several rows of thick-walled tracheids define latewood tissue and visible annual borders very clearly. All of these indicators made possible to determine with precision the first year of exposure and to estimate erosion rates in mm/year with a significance level of 95%. Additionally, different multivariate statistical approaches were used in order to determinate the influence of different environmental factors affecting the variation in velocity of the sheet erosion processes.

Key words: Recreational impacts; Dendrogeomorphology; Exposed roots; Sheet erosion; Wood anatomy; Senda Schmidt