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CROWN DENSITY OF OVER-AND UNDERSTORY IN MIXED FOREST STANDS AS EXPLAINED BY AIRBORNE LIDAR METRICS

Hooman Latifi1*, Marco Heurich[2], Florian Hartig[3], Jörg Müller[2], Peter Krzystek[4], Hans Jehl[2], Stefan Dech[1,5]

1- Dept. of Remote Sensing in cooperation with German Aerospace Center, University of Würzburg, Oswald-Külpe-Weg 86, 97074 Würzburg, Email: hooman.latifi@uni-wuerzburg.de

2- Department of Nature Protection and Research, Bavarian Forest National Park, Freyunger Str. 2, D - 94481 Grafenau, Germany, Email: [marco.heurich, joerg.mueller, hans.jehl] @npv-bw.bayern.de

3- Department of Biometry and Environmental System Analysis, University of Freiburg, Tennenbacherstrasse 4, 79106 Freiburg, Germany, Email: florian.hartig@biom.uni-freiburg.de

4- Faculty of Geoinformation, University of Applied Sciences Munich, D-80333 Munich-Germany, Email: krzystek@hm.edu

5- German Remote Sensing Data Center (DFD), German Aerospace Center (DLR), 82234 Weßling, Germany, Email: stefan.dech@dlr.de

* Presenting author.

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ABSTRACT:

Forest over- and understory, including different woody and herbaceous plant layers provide important habitats in forests. In temperate forests the highest richness in plants is regularly found in the understorey. The understory also provides important food and shelter for other species. Moreover it can be a crucial factor for the fuel available to forest fires. In temperate forests the highest richness in plants is regularly found in the understorey. Mapping understory characteristics is therefore of high interest for forest managers and conservationists. Despite significant progress of remote sensing in forests detecting the understory cover is still a challenge, as passive sensors do not penetrate down to the forest ground layer. 3D metrics extracted from Light Detection and Ranging (LiDAR) provide an alternative. Here, we evaluate this method for describing the vegetation density of over- and understory layers (trees and shrubs as well as the ground herbal vegetation the mixed stands of a large protected area in South-eastern Germany. We used the metrics to describe the coverage degrees of woody layers (trees and shrubs) as well as the ground layer, mainly in combination with the existing habitat types. The Akaike Information Criterion (AIC) was applied to select LiDAR and habitat type predictors to arrive at a parsimonious regression model for each forest layer. The results allowed to identify LiDAR metrics which showed significant correlations with the vegetation density in the different over-and understory layers. Moreover, we found several interactions between the LiDAR metrics and the forest habitat types, suggesting that the relationship between LiDAR predictors and vegetation density depends on forest type. Whereas the canopy and the herb layer showed strong correlations with the applied LiDAR metrics, descriptive power was lower for the intermediate forest layers. The selected regression models were applied for making spatial predictions over the entire study area. This study highlights the value of selected LiDAR metrics in characterizing key forest structure components with wide spatial extend which are important from both the wildlife and the forest management perspectives.