

## **Diagnosing structure and composition typologies in uneven-aged broad-leaved forests: a comparison of classification methods**

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### **Abstract**

Structure and composition of forest stands are crucial factors for forest planning and biodiversity management. In Belgium, typologies of structure and composition exist to support planning in uneven-aged broadleaved forests (typically dominated by oak and beech). The principle of these typologies is to classify irregular stands with the percentage of small, medium, large, and very large trees (regarding dbh), and the percentage of basal area of oak and beech.

This paper investigates the potential of LiDAR data processed with classification methods (k-nn, K-Means, CART, etc.) to allocate a forest structure and composition type. For this purpose several supervised and unsupervised classification methods are compared, as well as the impact of leaf-on (summer) and leaf-off (winter) data to discriminate the forest types.

The study dataset is composed of a leaf-off and a leaf-on LiDAR high density data (13 points per m<sup>2</sup>). These datasets are characterized by intensity as well as a point classification (ground, high vegetation, water, etc.). Moreover, very high resolution (25cm) multispectral (r, g, b and ir) aerial images were also captured for the summer dataset.

Each field reference plot is characterized by several “LiDAR variables” calculated from metrics. These metrics are derived from the point cloud in raster format. Spectral information from aerial images is also integrated to complement LiDAR, particularly for species discrimination.

Reference data were obtained from field inventory through visual evaluation of tree girth based on a systematic sampling; this type of inventory is a very useful tool for the description of mixed broadleaved uneven-aged stands. A network of about 500 plots was visited in February 2012.