



## **Environmental drivers of sapwood and heartwood proportions**

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Recent advances combining information on stem volume from remote sensing with allometric relationships derived from forest inventory databases have led to spatially continuous estimates of stem, branch, root and foliage biomass in northern boreal and temperate forests. However, a separation of stem biomass into sapwood and heartwood mass has remained unsolved, despite their important differences in biogeochemical function, for instance concerning their contribution to tree respiratory costs. Although relationships between sapwood cross-sectional area and supported leaf area are well established, less is known about relations between sapwood or heartwood mass and other traits (e.g. stem mass), since these biomass compartments are more difficult to measure in practice. Here we investigate the variability in sapwood and heartwood proportions and determining environmental factors. For this task we explore an available biomass and allometry database (BAAD) and study relative sapwood and heartwood area, volume, mass and density in dependence of tree species, age and climate. First, a theoretical framework on how to estimate sap- and heartwood mass from stem mass is developed. Subsequently, the underlying assumptions and relationships are explored with the help of the BAAD. The established relationships can be used to derive spatially continuous sapwood and heartwood mass estimates by applying them to remote sensing based stem volume products. This would be a fundamental step forward to a data-driven estimate of autotrophic respiration.