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Legacy of last millennium timber use on plant cover in Central Europe: insights from tree rings and pollen

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Throughout history, humans have relied on wood for constructions, tool production or as an energy source. How and to what extent these human activities have impacted plant abundance and composition over a long-term perspective is, however, not well known. To address this knowledge gap, we combined 44 239 precisely dated tree-ring samples from economically and ecologically important tree species (spruce, fir, pine, oak) from historical buildings, and pollen-based plant cover estimates using the REVEALS model from 169 records for a total of 34 1° x 1° grid cells for Central Europe. Building activity and REVEALS estimates were compared for the entire study region (4–15° E, 46–51°N), and for low (< 500m asl) and mid/ high elevations (≥ 500m asl) in 100-year time windows over the 1150–1850 period. Spruce and oak were more widely used in wooden constructions, amounting to 35% and 32%, respectively, compared to pine and fir. Besides wood properties and species abundance, tree diameters of harvested individuals, being similar for all four species, were found to be the most crucial criterion for timber selection throughout the last millennium. Regarding land use changes, from the 1150-1250's onwards, the forest cover generally decreased due to deforestation until 1850, especially at lower elevations, resulting in a more heterogeneous landscape. The period 1650–1750 marks a distinct change in the environmental history of Central Europe; increasing agriculture and intense forest management practices were introduced to meet the high demands of an increasing population and intensifying industrialization, causing a decrease in plant/palynological diversity, in particular at low elevations. Likely the present Central European landscapes originated from that period. Our results further show that land use has impacted vegetation composition and diversity at an increasing speed leading to a general homogenization of landscapes through time, highlighting the limited environmental benefits of even-aged plantation forestry.

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