

Atlases to reveal the diversity of French woods, their anatomy and their density

M-C. Trouy-Jacquemet

Lorraine University, INRAe, LERMaB (Laboratory for Studies and Research on Wood Material), 27 rue Philippe Séguin, 88000 EPINAL, France

Corresponding author: marie-christine.trouy@univ-lorraine.fr

In metropolitan France, forests have experienced spectacular expansion over the past several decades and now cover approximately one-third of the territory. The National Forest Inventory, conducted by the National Institute of Geographic and Forest Information (IGN), highlights a key aspect of French forests: their diversity. The IGN partnered with INRAE (the French National Research Institute for Agriculture, Food and Environment) and the University of Lorraine to carry out the XyloDensMap project, which aims to quantify wood density and its variability in French forests, in order to provide the data necessary for assessing forest carbon stocks and fluxes. These measurements show that the average trunk density (at 1.30 m) varies considerably between species: from approximately 300 kg/m³ for paulownia (*Paulownia tomentosa*) to over 850 kg/m³ for holm oak (*Quercus ilex*). Because wood density is linked to its anatomy, a thorough understanding of interspecific variability required the creation of atlases describing the wood of the 154 species recorded between 2016 and 2019, including 40 softwoods and 114 hardwoods.

Furthermore, given the scarcity of wood anatomy specialists and the outdated nature of existing reference works, the XyloDensMap project has enabled the development of a multi-scale identification tool with unprecedented content. The creation of the atlases required more than five years of work to build an exceptional study collection. Each specimen, of known origin, is precisely botanically identified and carefully prepared to ensure optimal observation conditions. For each species, the macroscopic description of the wood is illustrated by photographs of a 1:1 scale cylinder and of meticulously sanded cross-sections of the wood and bark. At the microscopic level, the wood anatomy is described according to the criteria defined by the IAWA (International Association of Wood Anatomists). Anatomical study is of increasing interest because it explains the drought resistance of certain species. The results of the XyloDensMap study (wood density) are also provided, along with dendrometric measurements (national distributions of tree height, diameter, age and ring width).

The forest species recorded during the study period are presented comprehensively, as some of today's secondary species are likely to become dominant species in the future as a result of climate change. A first atlas dedicated to softwoods was published in 2023, and a second volume dedicated to hardwood in 2025. These atlases constitute, at a specific point in time, a crucial snapshot for assessing the changes that will modify, in the future, not only the specific composition of forests but also tree growth rates, and the quality, anatomy and density of the wood produced.

Keywords: French forest, wood identification, wood anatomy, forest biomass, forest biodiversity

Atlas of hardwoods in France, Multi-scale identification tool (in French) Marie-Christine Trouy-Jacquemet, 594 pp., 2025. Éditions Quae, Versailles, ISBN: 978-2-7592-4056-2