

Coniferous trees planted with high stem densities produce finely branched, solid logs but are vulnerable to extreme weather events, e.g., storms. Recently, conifer stands have been planted at lower stand densities, resulting in wider crowns, lower crown bases, and higher stand stability, but this might decrease the quality of coniferous timber due to an increased growing rate and wider annual rings. Therefore, the influence of different silvicultural treatments and stand densities on tree morphology and wood properties of spruce and douglas fir was investigated in this study up to the final product. Tree morphology was assessed using mobile laser scanning. Ring width analysis, wood density measurements and four-point-bending-strength test on visually graded boards were conducted to gain information on wood properties and product quality. In spruce stands thinned from below, higher wood densities were observed due to smaller annual rings compared to stands that were thinned from above. In addition, crown asymmetry and the height-to-diameter-ratio were identified as proxies for wood density. The regulation of stand density, crown development, and tree growth influenced wood density of spruce as the wood of trees from stands that were thinned from below was denser than the wood of trees from stands thinned from above at equal annual ring widths. In addition, visually assessed quality differences between the forest stands were discerned on the examined boards. The expectations regarding growth-related quality impediments for thinning from above, where the accelerated growth of single-tree care and linked decreasing densities impact the mechanical performance, was verified. Additionally project data support the thesis that from beginning of the 21st century the impact of climate change on growth of coniferous trees is higher than the impact of silvicultural treatments. For both forestry and wood industry, this knowledge has major implications for future actions. New cultivation and management strategies for our forests are urgently needed and must be implemented. The current processes and standards for manufacturing wood-based products need to be reconsidered and modified in some areas. For this purpose, the project provides the first important recommendations for practice.