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The relationship between biomass and stand age in Swedish forests

The accumulation of carbon (C) within boreal forest biomass is an important component of the global carbon cycle. Whilst it is understood that old forests contain a large carbon stock, the continued sequestration of carbon in these forests is debated. Swedish forests today are intensively managed as even-aged monocultures with short rotation times and have historically been managed through selective logging. The remaining old-growth forests are therefore distributed in areas of lower productivity and potentially of lower accessibility. Thus, there is a lack of knowledge around the relationship between C storage and stand age in Sweden that accounts for this distribution. In this study, regional normalisation of biomass data was performed to account for the biased spatial distribution of old forests using a forest inventory of >35,000 temporary plots. A curve to characterise the relationship between biomass and stand age was created by binning the normalised data and plotting against stand age. Further driving factors such as forest class, soil moisture, local elevation and aspect were controlled to determine their effect on the variability of the stand-age-biomass relationship.

It was determined that across Sweden, mean biomass continues to accumulate with stand age in stands of up to at least 260 – 320 years old. The variability of data around the mean could sometimes be explained by differing environmental drivers and in some cases, may be indicative of the historical forest management practices in the area. It is possible that the largest relative biomass values in old forests are found in the areas unsuitable for forestry. This emphasises the importance of conserving the remaining old-growth forests in Sweden, not only as these forests continue to accumulate carbon but also because of their relatively large existing carbon stocks. If there is an age at which the carbon balance of Swedish forests is in equilibrium, it was not determined in this study.

Keywords: Physical geography, ecosystem analysis, old-growth, boreal forests, stand-age, biomass, carbon storage, carbon sequestration

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