

Emily Register

The relationship between biomass and stand age in Swedish forests

The storage of carbon (C) within forest vegetation is a key component of the global C cycle. Forests are therefore important in the context of climate change mitigation as they remove carbon from the atmosphere into their stems, branches and roots, where it remains stored. It is generally understood that old forests contain a large amount of C, but it is debated whether carbon accumulation continues over time or if these forests reach a limit to their C stock. Most Swedish forests today are managed by planting monocultures and allowing them to grow for 60 – 100 years, before all trees are logged. Historically, they were managed by selecting only the largest and most valuable trees to cut. Therefore, there are few old-growth forests remaining in Sweden, and these forests are likely to be located in areas that are colder, with poorer growing conditions, and more difficult to access. Studies of the effects of forest age on C storage thus have to account for the uneven spatial distribution of old-growth forests in less productive areas. The organic material, or biomass, of trees is made up of 50% C and can therefore be analysed to understand carbon dynamics. In this study, biomass data was normalised by region, and therefore by similar climatic conditions, using data collected by the national forest inventory. A curve of the relationship between the mean biomass and the age of a group of trees (stand age) was created using the normalised biomass data. Other factors that affect growth such as the forest class, soil moisture, local elevation and aspect were also controlled to determine their effect on this relationship.

It was determined that the mean biomass in Swedish forests continues to accumulate with age in stands of up to at least 260 – 320 years old. There was a large spread of biomass values around this mean, which could sometimes be explained by the environmental conditions of the area. In cases where this could not explain the results, it could instead be a result of the historical forest management in the area. The largest biomass values in old forests are possibly located in areas that are thought to be unsuitable for forestry due to poor growing conditions. This emphasises that conserving the old-growth forests that have not yet been clear-cut in Sweden is very important, as these forests both contain large amounts of carbon and are continuing to accumulate carbon as they age. If there is an age at which the C stock reaches a limit in Swedish forests, it could not be found in this study.

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

Advisor: **Anders Ahlström**

Master degree project 30 credits in Physical Geography and Ecosystem Science.

Department of Physical Geography and Ecosystem Science, Lund University. Student thesis series INES nr 615