Forest carbon stocks and the effect of thinning

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INTRODUCTION

Information on carbon sequestration is required for reporting to the International Panel on Climate Change and United Nations Framework Convention on Climate Change and the Kyoto protocol. Under the terms of the protocol, carbon sequestration by forests may be used to offset greenhouse gas emissions. It is estimated that the contribution of "Article 3.3 forests" may account for ~16% of the required reduction in national emissions for Ireland to meet its Kyoto target.

Uncertainties in forest carbon stock estimations are being reduced by current research and through the use of national forest inventory data. However, projections of forest increment and disturbances due to management (*e.g.* thinning operations) still represent significant causes of uncertainty.

The aim of this study is to carry out a comparison between the carbon stocks of a normal commercially thinned stand and an unthinned one at the early stages of a rotation.

METHODOLOGY

The study was carried out in a Coillte owned forest in Dooary, Co. Laois, in a stand of 42 ha planted with Sitka spruce (*Picea sitchensis* (Bong.) Carr.). The stand was planted in 1988 and has proved to be a productive stand, achieving a yield class of 24-26 $m^3ha^{-1}a^{-1}$. In 2005 an area of *c.* 2 ha was cordoned off and marked not to be thinned. Three 0.05 ha plots were established randomly in both the thinned and unthinned areas. A survey was carried out to record the normal forest parameters (including diameter at breast height (*i.e.* at 1.3 m; DBH), height, basal area) which were used later to estimate biomass.

The forest was thinned commercially in November 2005, and again in December 2007. Surveys were carried out annually at the end of each growth season (surveys covered 4 years: 2005-2008).

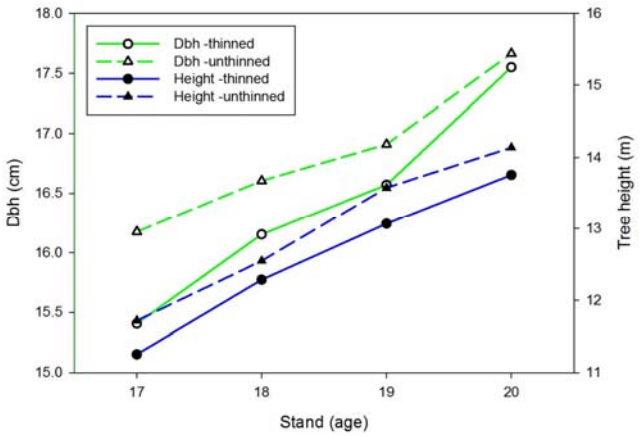
Estimates of the total biomass stock were made using models produced by previous research work at the site.

The thinning carried out at Dooary in winter 2007. The harvester has felled trees to the left and right, and removed their branches in the centre to act as a brash mat to prevent damaging the forest soil.

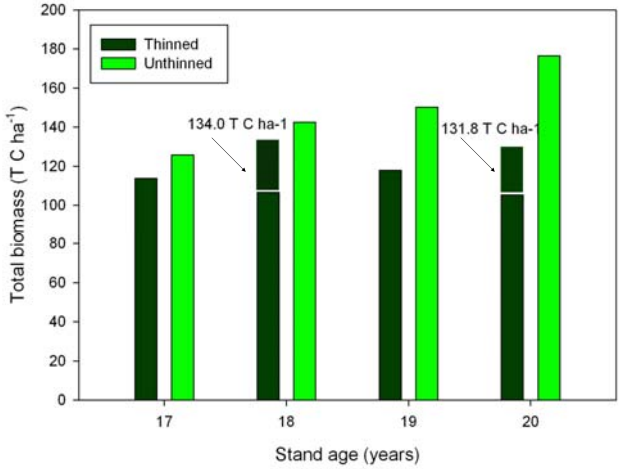
CONCLUSIONS

The study has so far only examined the early stages of the rotation. Recognising the aim of thinning as the redistribution of stand growth onto fewer stems and favoring those few to encourage larger and more valuable timber lengths implies that a fair comparison of the two management approaches can only be made at rotation end. However, this work will be used as part of an integrated chronosequence approach, and will also be combined with studies on coarse woody debris (above- and belowground) as well as ecosystem flux measurements.

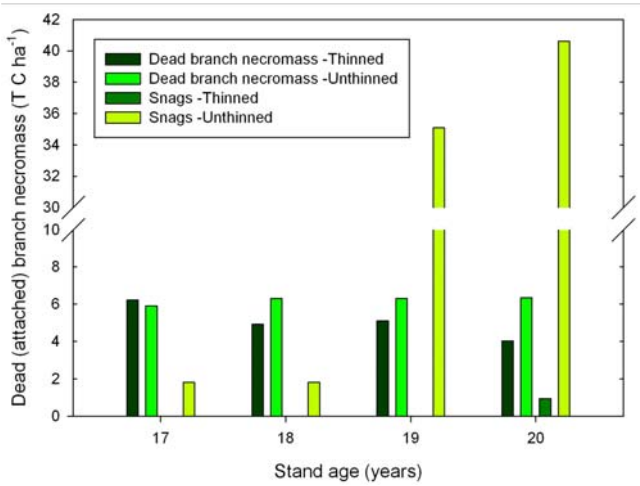
PRELIMINARY RESULTS



Both Dbh and height behaved similarly in both thinned and unthinned stands over the first three survey years, however, by year 20 the thinned stand shows a sharp increase in mean Dbh. This was because the two successive thinnings have removed many of the poorly formed and double stemmed trees.



Stocks in the unthinned stand increased by 40% over the four surveyed years, however, overall the standing stock in the thinned stand decreased slightly because of the removals of thinnings (134 and 132 T C ha^{-1} in 2005 and 2007, respectively; in each operation removing approximately 25% of the total biomass.



One of the bigger differences between the two stands was in stocks of necromass –dead (attached) branches and standing dead trees (snags). Thinning did reduce the amount of dead branch mass, as well as almost eradicating dying/dead trees. Or conversely, no thinning allowed smaller trees to be out competed and shaded out.