

Harvesting of old-growth boreal forest decrease soil carbon stock

Short term effects on soil carbon after a first regeneration cut of boreal forest in northern Sweden

INTRODUCTION

There are uncertainties on the best climate change mitigation strategy for boreal forests; use the carbon (C) in forest products to reduce use of fossil products, or store it in vegetation and soil. Boreal forests have the majority of the stored C below ground, and choice of management methods in these forests can have large impact on these C stocks.

METHODS

This study focus on the effects on soil C in old-growth boreal forests in northern Sweden 15-55 years after a first regeneration cut (figure 1). Soil C stock was quantified in the humus layer and to 20 cm depth in the mineral soil at 14 paired sites of adjacent old-growth and younger stands.

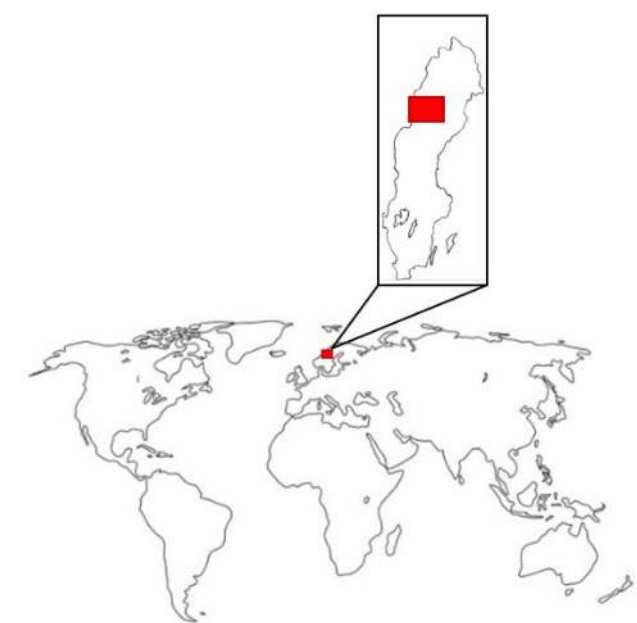


Figure 1. The studied sites are located in boreal forest in northern Sweden.

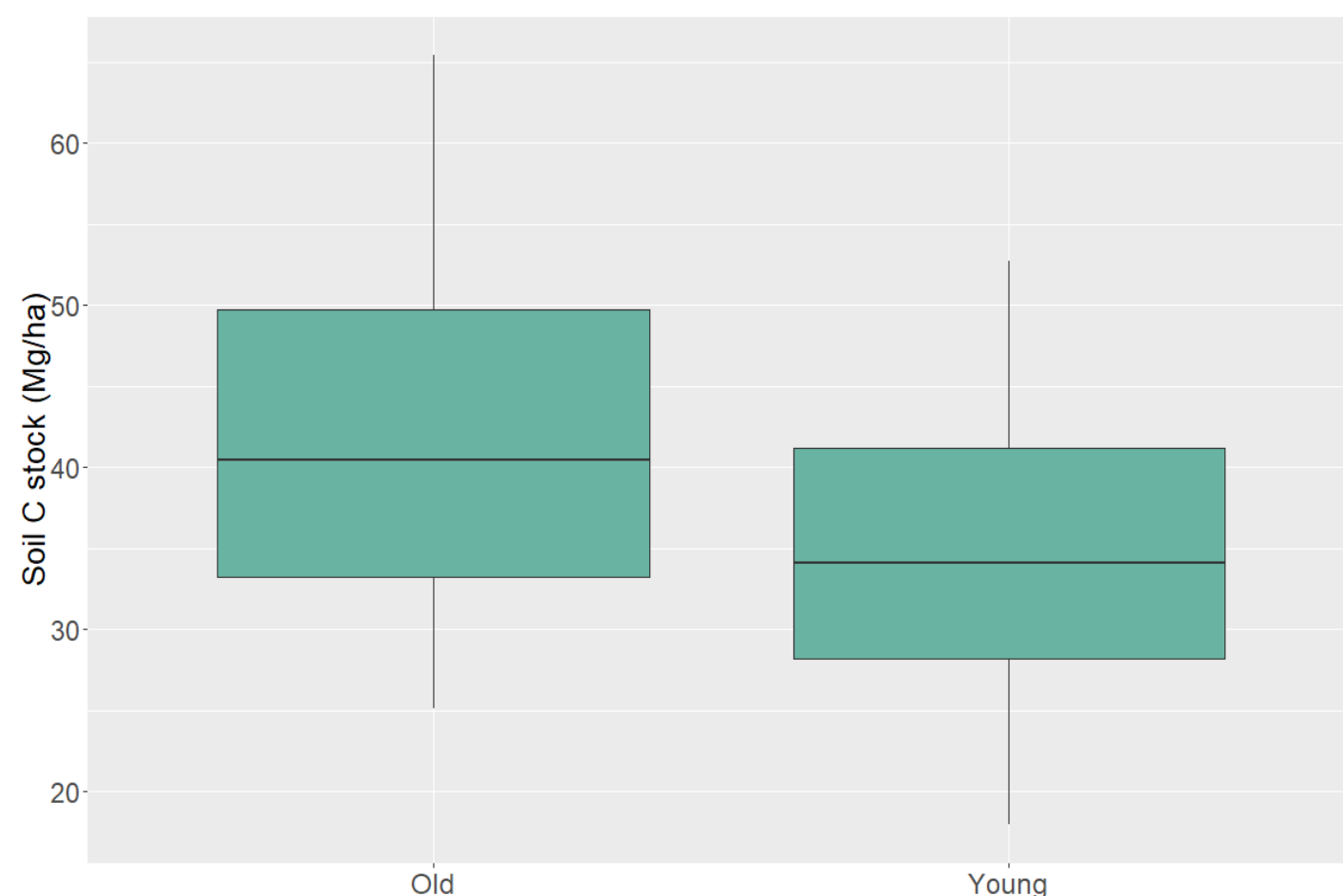


Figure 2. Soil C stock in humus layer and mineral soil down to 20 cm depth in old-growth boreal forest ($41.56 (\pm 11.64) \text{ Mg ha}^{-1}$) and in younger forest 15-55 years after harvesting of old-growth forest ($34.77 (\pm 9.04) \text{ Mg ha}^{-1}$). Results show a significant difference ($p = 0.027$, paired t-test).

RESULTS

C stocks in the studied old-growth forest was on average $41.56 \text{ Mg ha}^{-1} (\pm 11.64)$, and in the young forest $34.77 \text{ Mg ha}^{-1} (\pm 9.04)$ (figure 2). Results show significantly less soil C in the young forest compared to the old-growth forest. ($p = 0.027$, paired t-test) than in the old-growth forest, with an average reduction of 16 %.

CONCLUSION

Harvesting of old-growth boreal forest shows a 16 % reduction of soil C. This temporary or permanent carbon debt needs to be considered when assessing the climate benefit of turning old growth forests into managed forests.



Jenny Dahl
PhD student
Department of forest ecology and management
Jenny.dahl@slu.se

Tomas Lundmark
Professor in silviculture
Department of forest ecology and management
Tomas.lundmark@slu.se