
Short term effect of pre-commercial thinning on the carbon budget of fertile birch stands in Estonia

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CAR-ES meeting

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Background

- Outcome of the project „ The impact of pre-commercial thinning on the development of fertile birch stands“, funded by Estonian Environmental Investment Centre, project no T180199MIME (1.05.2019–30.04.2021)
- Pre-commercial thinnings (PCT) widely used silvicultural practice in Nordic countries
- Crucial for directing the development and species composition of the stand
- In light demanding birch stands early thinnings important for maintaining living crown dimensions -> productivity

What and when?

- 2 study sites, thinning from below, 3 treatments:
- Thinning July 2019
 - Control – no thinning
 - Moderate thinning (MT) – 2,500 trees remaining (usual management)
 - Heavy thinning (HT) – 1,500 trees remaining
- C budgeting 2020
 - NPP of stand:
AGB and BGB production of old trees, vegetative regeneration,
herbaceous understorey
 - Heterotrophic respiration

Study sites

- Site 2 – 12 y, Drained swamp site type , Drainic Eutric Histosol
- *Betula pubescens*, naturally regenerated

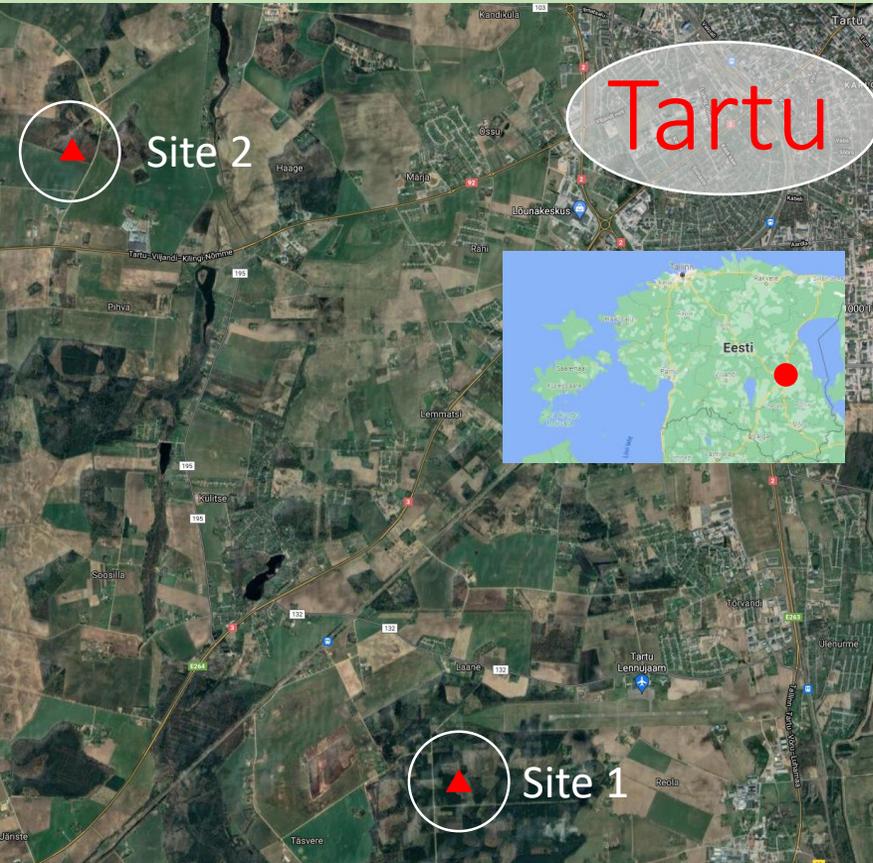


Table 1. Characteristics of studied stands in autumn 2020, 1.5 growing seasons after PCT

Site	Treatment	Trees, N ha ⁻¹	DBH, cm	H, m	Basal area, m ² ha ⁻¹	BA after thinnings, %	Share of living crown, %
Site 1	Control	17,500	2.0±1.2	6.1±1.0	5.6	100	77±8
	Moderate thinning (MT)	2,500	4.9±1.4	7.4±0.5	4.7	53	76±4
	Heavy thinning (HT)	1,500	5.0±1.2	6.8±0.6	2.9	37	77±7
Site 2	Control	27,000	2.8±1.5	9.1±1.2	16.3	100	42±4
	Moderate thinning (MT)	2,500	5.1±1.6	8.7±1.1	5.1	24	55±7
	Heavy thinning (HT)	1,500	6.1±1.4	8.0±0.7	4.4	19	52±4

- Site 1 – 6 y, Oxalis site type, Albeluvisol
- *Betula pendula*, planting + natural

July 2019



Site 1

July 2019



Control

Heavy thinning



September 2021

September 2021

July 2019



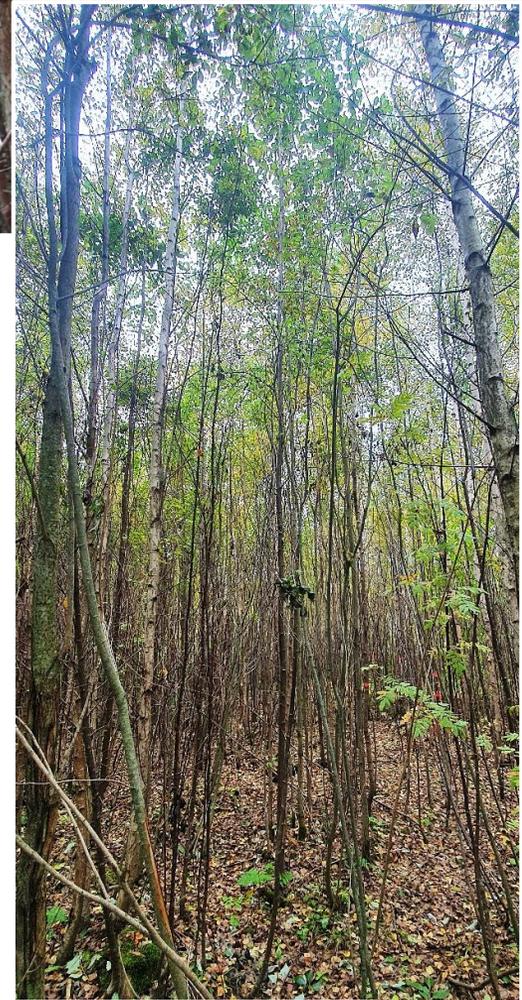
Control

Site 2

July 2019



Heavy thinning



September 2021



September 2021

Results and discussion, Site 1.
6 y, Oxalis, mineral soil

Results and discussion, Site 2.
12 y, Drained swamp, organic soil

Conclusions

- Site 1, mineral soil, stands C sinks after PCT:
 - Decline of NPP modest, similar Rh
- Site 2, drained swamp, stands C sources shortly after PCT:
 - Strong decline of NPP, larger Rh
- Understorey vegetation contributed significantly to NPP, except in Site 2 Control
- The results show really short-term impact, in longer term the picture changes, the productivity of trees on thinned plot increases
- Despite the C budget, PCT is irreplaceable in managed stands from the silvicultural and timber quality point of view.



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Thank you!

