

### Above- and belowground biomass of boreal understorey vegetation

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#### Introduction

This study is a part of the EU co-funded project “The role of understorey vegetation, forest litterfall and forest floor in the carbon and nutrient fluxes of boreal coniferous forest ecosystems”. The project investigates the relationships between the understorey vegetation, tree litterfall and organic layer along a climatic gradient and a range of forest site types in Finland.

#### Aims

In this poster we present preliminary results on:

- 1) the division of the biomass of understorey vegetation into above- and belowground parts.
- 2) the biomass production of the understorey vegetation (proportion of different functional plant groups).

#### Material and methods

The project was carried out on 11 of the Forest Focus Level II monitoring plots (30 x 30 m) and on one control plot of a fertilization experiment in 2002 and 2003. Six of the plots are located in Scots pine stands and six in Norway spruce stands (Table 1). The sample points consist of 30 cm x 30 cm squares, seven squares on each side of the plot, giving a total of 28 sample points per plot.

The organic layer and all the understorey vegetation growing on each square were removed in one intact piece and frozen prior to pre-treatment. The biomass fractions of the plant material were dried at 70 °C/2d.

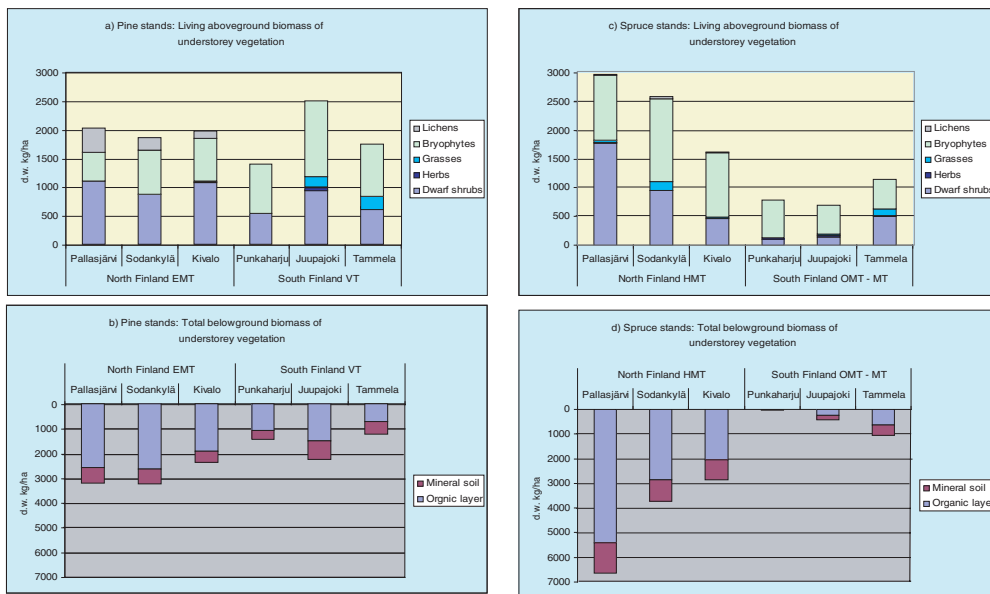


Figure 1. Division of the understorey vegetation into living above- and total belowground biomass in Scots pine (a,b) and Norway spruce (c,d) stands.

#### Results

1. The average amount of living aboveground biomass of the understorey vegetation ranged from 1900 to 2000 kg/ha in the northern and from 1400 to 2500 kg/ha in the southern Scots pine stands (Fig.1a). The corresponding values for the spruce stands were 1600 - 3000 kg/ha (North) and 700 - 1100 kg/ha (South) (Fig.1c). Bryophytes and ericaceous dwarf shrubs were the most important components in the aboveground biomass. The proportion of dwarf shrub biomass increased towards the north. The relative abundance of bryophytes was highest in the herb-rich (OMT) spruce stands (Fig.1c).

2. Generally 40 - 60 % of the total living biomass was allocated to the belowground parts. The proportion of the belowground biomass increased towards the north in both the Scots pine and Norway spruce stands

(Fig. 1b, c). The major part of the belowground biomass was concentrated in the organic layer.

3. Dwarf shrubs produced over half of the total annual biomass of the understorey vegetation in the northernmost stands. The proportion of bryophytes and grasses in biomass production increased towards the south (Fig.2).

#### Conclusions

The belowground parts of the understorey vegetation account for a considerable portion of the carbon stores in the organic layer, especially in the north. In addition, the litter production of dwarf shrubs and bryophytes represents a significant input of carbon to forest soils. It is therefore essential to include the understorey vegetation when calculating carbon balance estimates of boreal forests.

Stand	Latitude	Elevation, m a.s.l.	Annual temper. sum, °C	Stand age, yrs	Site type	Forest type	Site index (Ht) m	Basal area, m <sup>2</sup> ha <sup>-1</sup>
Norway spruce								
Tammela	60° 38' N	143	1577	60	mesic	MT	30.18	27.6
Punkaharju	61° 48' N	88	1602	70	herb-rich	OMT	34.69	28.5
Juupajoki	61° 51' N	177	1529	80	herb-rich	OMT	27.95	33.2
Sodankylä	67° 42' N	240	730	96	mesic	HMT	13.4	11.5
Kivalo	68° 20' N	252	1074	70	mesic	HMT	17.26	21.6
Pallasjärvi	67° 60' N	300	886	140	mesic	HMT	10	13
Scots pine								
Tammela	60° 37' N	120	1577	60	sub-xeric	VT	25.52	21.9
Punkaharju	61° 46' N	99	1602	80	sub-xeric	VT	25.98	29.4
Juupajoki	61° 52' N	154	1523	80	sub-xeric	VT	23.61	17.9
Sodankylä	67° 20' N	201	730	80	sub-xeric	EMT	16.03	16.3
Kivalo	68° 21' N	145	1009	55	sub-xeric	EMT	17.85	21.3
Pallasjärvi	67° 57' N	321	886	90	sub-xeric	EMT	14.03	12.9

Table 1. The site characteristics of the studied Norway spruce and Scots pine stands.

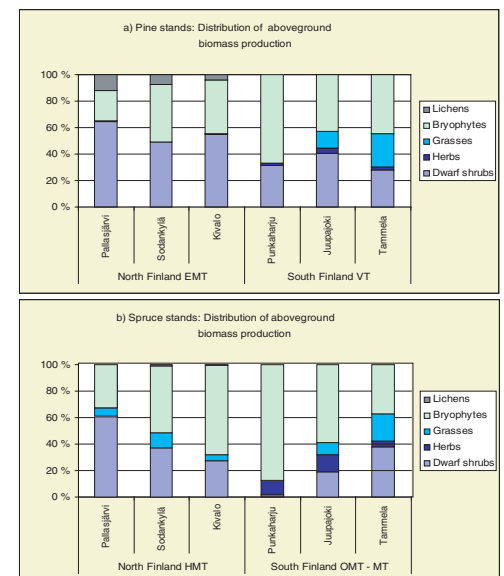


Figure 2. Proportion (%) of the annual biomass production of different functional plant groups in the understorey vegetation.

#### Acknowledgements

We thank the staff of the Salla Office/Rovaniemi Research Unit (Metla) for organizing and performing the sample fractionation and weighing, and recording the biomass data. Anna-Maija Kokkonen, M.Sc. assisted in the data analysis phase.