

Männistö E., Jetsonen J., Peltola H., Rouvinen T., Launiainen S., Laurén A., Palviainen M. (2026). Short-term impacts of nitrogen fertilization on the cover of vascular plant and bryophyte species in boreal Scots pine and Norway spruce stands. *Silva Fennica* vol. 60 no. 2 article id 25052. <https://doi.org/10.14214/sf.25052>

Supplementary file S4

Mean cover (%) and standard error (SE, in the parenthesis) of each species recorded in different fertilization treatments (0 = unfertilized control; 150 = fertilization with 150 kg N ha⁻¹; 200 = fertilization with 200 kg N ha⁻¹) in each study year (2018, 2021, 2022) at Ilomantsi Scots pine stand. Species that were observed only three times and less and thus excluded from the statistical analyses are marked with an asterisk *.

| Species | Ilomantsi | | | | | | | | |
|------------------------------------|------------|------------|------------|------------|------------|------------|-----------|-----------|------------|
| | 2018 | | | 2021 | | | 2022 | | |
| | 0 | 150 | 200 | 0 | 150 | 200 | 0 | 150 | 200 |
| Grasses | | | | | | | | | |
| <i>Agrostis</i> sp. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Calamagrostis arundinacea</i> | 2.0 (0.8) | 0.2 (0.1) | 0.8 (0.4) | 0.8 (0.4) | 0.4 (0.2) | 1.6 (0.6) | 0.1 (0.1) | 0.2 (0.1) | 0.2 (0.2) |
| <i>Calamagrostis phragmitoides</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 (0.1) | 0 | 0.2 (0.2) |
| <i>Deschampsia flexuosa</i> | 6.4 (1.9) | 1.5 (0.5) | 3.4 (1.1) | 1.4 (0.7) | 1.6 (0.9) | 1.8 (0.7) | 0.1 (0.0) | 0.3 (0.1) | 0.5 (0.2) |
| <i>Poa nemoralis</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Shrubs | | | | | | | | | |
| <i>Calluna vulgaris</i> | 0.5 (0.3) | 0.4 (0.2) | 1.1 (0.5) | 0.2 (0.1) | 0 | 0.1 (0.1) | 0.1 (0.1) | 0 | 0.1 (0.1) |
| <i>Linnea borealis</i> | 1.6 (0.8) | 1.2 (0.6) | 2.6 (1.5) | 0.9 (0.7) | 0.3 (0.1) | 2.0 (1.3) | 0.1 (0.0) | 0.1 (0.1) | 0.1 (0.1) |
| <i>Salix</i> sp. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Vaccinium myrtillus</i> | 18.9 (2.7) | 16.6 (2.2) | 15.2 (2.7) | 14.4 (2.3) | 14.4 (2.3) | 13.6 (2.8) | 9.8 (2.2) | 6.9 (1.4) | 11.3 (2.5) |
| <i>Vaccinium vitis-idaea</i> | 9.8 (1.7) | 10.6 (1.6) | 10.0 (1.8) | 4.2 (0.9) | 4.8 (1.2) | 4.2 (1.0) | 3.7 (1.1) | 2.9 (0.7) | 2.7 (0.6) |
| Herbs | | | | | | | | | |
| <i>Athyrium filix-femina</i> * | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Carex brunnescens</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 (0.1) | 0 | 0 |
| <i>Carex digitata</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 (0.1) | 0 | 0 |
| <i>Carex globularis</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 (0.1) | 0 | 0 |
| <i>Carex ovalis</i> * | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 (0.1) | 0 | 0 |

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| <i>Convallaria majalis</i> | 2.0 (0.8) | 0.6 (0.3) | 1.1 (0.4) | 1.1 (0.5) | 0.5 (0.3) | 1.6 (0.6) | 0.1 (0.1) | 0.2 (0.1) | 0.4 (0.2) |
| <i>Dryopteris carthusiana</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Epilobium angustifolium</i> | 0.3 (0.3) | 0 | 0 | 0.1 (0.1) | 0.1 (0.1) | 0 | 0 | 0 | 0.1 (0.1) |
| <i>Equisetum sylvaticum*</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Fragaria vesca</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Goodyera repens</i> | 0.1 (0.1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Gymnocarpium dryopteris</i> | 0 | 0 | 0.2 (0.2) | 0 | 0 | 0.2 (0.1) | 0 | 0 | 0.1 (0.1) |
| <i>Hierachium sp.</i> | 0 | 0.1 (0.1) | 0.0 (0.0) | 0.1 (0.1) | 0.6 (0.5) | 0.1 (0.1) | 0 | 0 | 0 |
| <i>Juncus effusus</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Luzula pilosa</i> | 1.2 (0.4) | 0.3 (0.2) | 0.5 (0.3) | 0.2 (0.1) | 0.3 (0.1) | 0.3 (0.1) | 0.1 (0.0) | 0.1 (0.1) | 0.1 (0.1) |
| <i>Lycopodium clavatum*</i> | 0.1 (0.1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Maianthemum bifolium</i> | 0.6 (0.2) | 0.3 (0.1) | 0.3 (0.2) | 0.3 (0.1) | 0.8 (0.7) | 0.4 (0.2) | 0 | 0 | 0.1 (0.1) |
| <i>Melampyrum pratense</i> | 1.1 (0.4) | 0.2 (0.1) | 0.1 (0.1) | 0.3 (0.1) | 0.4 (0.2) | 0.1 (0.1) | 0.1 (0.0) | 0 | 0 |
| <i>Orthilia secunda</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Oxalis acetosella</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Potentilla erecta</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Pteridium aquilinum</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Rubus idaeus</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Rubus saxatilis</i> | 0.4 (0.3) | 0 | 1.2 (0.7) | 0.1 (0.1) | 0.0 (0.0) | 1.0 (0.7) | 0.1 (0.1) | 0 | 0.7 (0.7) |
| <i>Solidago virgaurea</i> | 1.7 (0.7) | 0.4 (0.3) | 0.2 (0.1) | 0.4 (0.3) | 0 | 0 | 0.1 (0.1) | 0.2 (0.1) | 0.2 (0.1) |
| <i>Stellaria media</i> | 0 | 0 | 0 | 0.2 (0.1) | 0.3 (0.1) | 0.3 (0.1) | 0.0 (0.0) | 0 | 0.0 (0.0) |
| <i>Trientalis europea</i> | 1.4 (0.4) | 0.4 (0.2) | 0.6 (0.2) | 0 | 0 | 0 | 0.1 (0.1) | 0 | 0.1 (0.1) |
| <i>Veronica officinalis</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Viola palustris</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bryophytes | | | | | | | | | |
| <i>Aulacomnium palustre</i> | 0 | 0 | 0 | 0.3 (0.1) | 0.6 (0.1) | 0.1 (0.0) | 0 | 0 | 0 |
| <i>Brachythecium sp.</i> | 2.5 (0.8) | 0.1 (0.1) | 0.9 (0.9) | 0.1 (0.0) | 0 | 0.2 (0.2) | 0 | 0 | 0 |
| <i>Bryum sp*</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Dicranum sp.</i> | 5.6 (1.4) | 4.9 (1.0) | 5.6 (2.0) | 0.5 (0.2) | 0.1 (0.0) | 0.2 (0.1) | 0.4 (0.2) | 0.5 (0.2) | 0.1 (0.1) |
| <i>Hylocomium splendens</i> | 10.2 (3.1) | 7.5 (3.3) | 0.2 (0.1) | 4.5 (1.6) | 2.1 (1.5) | 0.1 (0.0) | 2.7 (1.1) | 2.0 (1.5) | 0.0 (0.0) |

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| <i>Marchantiophyta</i> (hepatic) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Pleurozium schreberi</i> | 21.5 (5.1) | 31.6 (4.9) | 32.6 (5.5) | 8.2 (2.9) | 5.5 (2.6) | 6.6 (2.6) | 6.8 (3.2) | 3.6 (1.8) | 4.7 (2.8) |
| <i>Pohlia nutans</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Polytrichum</i> sp. | 0.6 (0.6) | 0.3 (0.1) | 0.9 (0.7) | 0.3 (0.3) | 0.1 (0.0) | 0 | 0 | 0 | 0 |
| <i>Ptilium crista-castrensis</i> | 0.5 (0.3) | 2.1 (2.1) | 1.1 (1.1) | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Rhodobryum roseum</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Sphagnum</i> sp. | 0 | 0.1 (0.1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

*Observed only three times or less