

Supplementary material:

## Linking moss cover, soil organic matter fractions, and carbon stabilization pathways in temperate forest ecosystems

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### Contents

**Fig. S1** Fraction-specific soil organic carbon concentrations ( $\text{g kg}^{-1}$ ) under moss and adjacent no moss soils in two temperate forest ecosystems.

**Fig. S2** Nitrogen concentrations of free particulate, occluded particulate, and mineral-associated organic matter fractions in moss-covered and adjacent no moss soils across two temperate forest ecosystems.

**Fig. S3** Soil organic carbon stock under moss-covered and no moss soils in two temperate forest ecosystems.

**Table S1** Two-way ANOVA results for soil carbon and nitrogen variables under different cover and forest types

Supplementary Figure S1: Fraction-specific soil organic carbon concentrations ( $\text{g kg}^{-1}$ ) under moss and adjacent no moss soils in two temperate forest ecosystems.

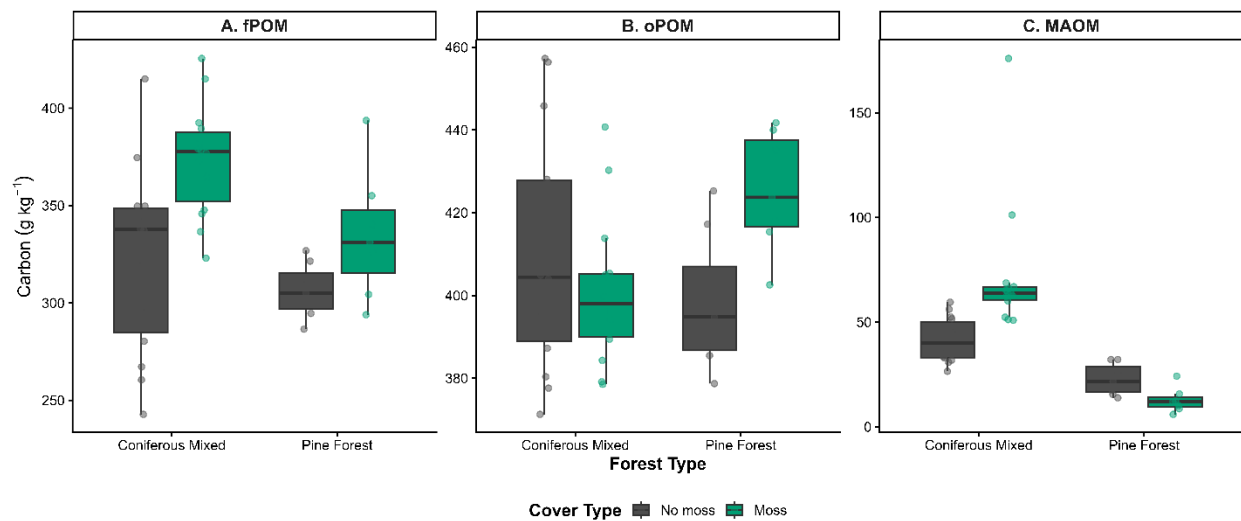
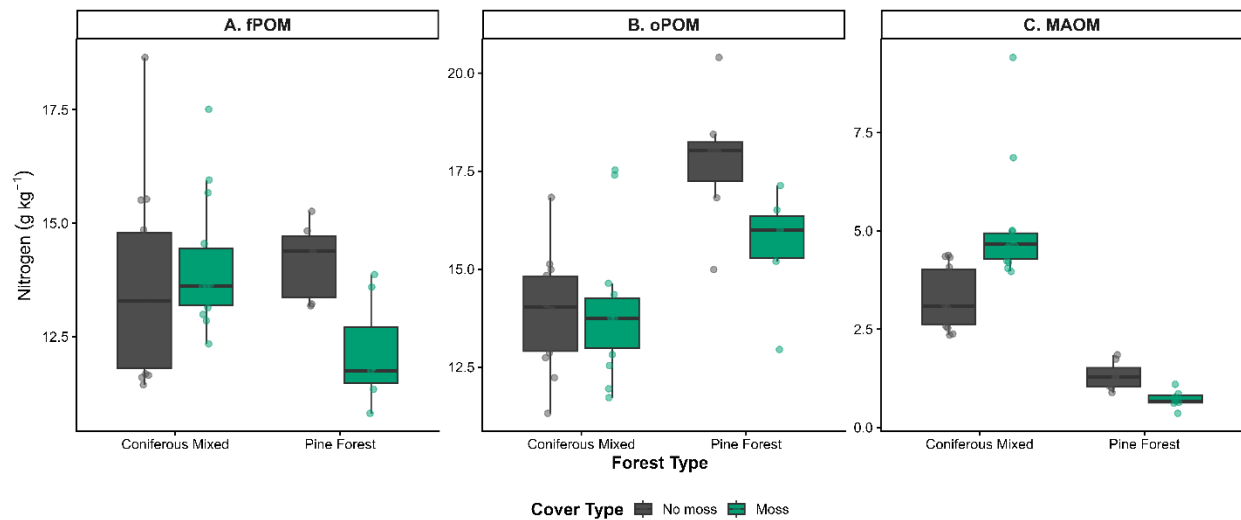


Figure S1: Carbon concentrations ( $\text{g kg}^{-1}$ ) of (A) free particulate organic matter (fPOM), (B) occluded particulate organic matter (oPOM), and (C) mineral-associated organic matter (MAOM)

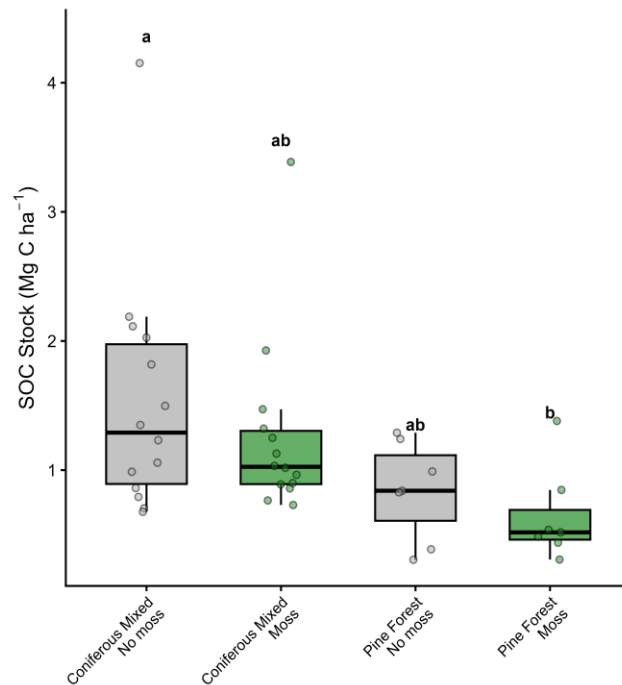
in moss-covered and no moss soils from the coniferous mixed forest (Tübingen, Baden-Württemberg) and the pine forest (Linde, Brandenburg, Germany). Green and grey boxplots represent moss-covered and no moss soils, respectively. Individual circles denote independent soil samples. Horizontal lines indicate the median, boxes show the interquartile range (25th–75th percentiles), whiskers extend to  $1.5 \times$  the interquartile range, and points beyond the whiskers represent outliers. Soil organic matter fractions were obtained by density fractionation as described in the main manuscript. The figure provides the underlying data distribution for the fraction-specific carbon concentrations used in the statistical analyses.

Supplementary Figure S2. Nitrogen concentrations of free particulate, occluded particulate, and mineral-associated organic matter fractions in moss-covered and adjacent no moss soils across two temperate forest ecosystems.



Nitrogen concentrations (g kg<sup>-1</sup>) of (A) free particulate organic matter (fPOM), (B) occluded particulate organic matter (oPOM), and (C) mineral-associated organic matter (MAOM) in moss-covered and no moss soils from the coniferous mixed forest (Tübingen, Baden-Württemberg) and the pine forest (Linde, Brandenburg, Germany). Green and grey boxplots represent moss-covered and no moss soils, respectively. Individual circles denote independent soil samples. Horizontal lines indicate the median, boxes show the interquartile range (25th–75th percentiles), whiskers extend to  $1.5 \times$  the interquartile range, and points beyond the whiskers represent outliers. Soil organic matter fractions were obtained by density fractionation as described in the main manuscript. The figure provides the underlying data distribution for the fraction-specific nitrogen concentrations used in the statistical analyses.

Supplementary Figure S3. Soil organic carbon stock under moss-covered and no moss soils in two temperate forest ecosystems.



Soil organic carbon (SOC) stock ( $\text{Mg C ha}^{-1}$ ) measured on the topsoil (0–2 cm) beneath moss-covered and no moss plots in the coniferous mixed forest (Tübingen, Baden-Württemberg) and the pine forest (Linde, Brandenburg, Germany). Green and grey boxplots represent moss-covered and no moss soils, respectively. Individual circles denote independent soil samples. Horizontal lines indicate the median, boxes show the interquartile range (25th–75th percentiles), whiskers extend to  $1.5 \times$  the interquartile range, and points beyond the whiskers represent outliers. Different lowercase letters indicate significant differences among treatment groups according to Tukey's honestly significant difference (HSD) test ( $p < 0.05$ ). SOC stocks were calculated from soil organic carbon concentration, bulk density, and sampling depth as described in the main manuscript.

Supplementary Table S1. Two-way ANOVA results for soil carbon and nitrogen variables under different cover and forest types.

| Variable   | Cover <i>F</i> -value | Cover <i>p</i> -value | Forest <i>F</i> -value | Forest <i>p</i> -value | Interaction <i>F</i> -value | Interaction <i>p</i> -value |
|------------|-----------------------|-----------------------|------------------------|------------------------|-----------------------------|-----------------------------|
| Total N    | 2.256                 | 0.141                 | 28.567                 | <b>&lt;0.001</b>       | 3.625                       | 0.065                       |
| Total SOC  | 1.690                 | 0.201                 | 13.262                 | <b>&lt;0.001</b>       | 2.076                       | 0.158                       |
| C: N Ratio | 4.366                 | <b>0.043</b>          | 44.747                 | <b>&lt;0.001</b>       | 7.750                       | <b>0.008</b>                |
| fPOM %     | 0.034                 | 0.855                 | 1.698                  | 0.200                  | 0.013                       | 0.910                       |
| oPOM %     | 5.538                 | <b>0.024</b>          | 3.447                  | 0.071                  | 0.461                       | 0.501                       |
| MAOM %     | 0.063                 | 0.804                 | 0.727                  | 0.399                  | 0.000                       | 0.987                       |
| fPOM-N     | 0.692                 | 0.411                 | 1.968                  | 0.169                  | 5.608                       | <b>0.023</b>                |
| oPOM-N     | 2.182                 | 0.148                 | 29.604                 | <b>&lt;0.001</b>       | 4.533                       | <b>0.040</b>                |
| MAOM-N     | 10.201                | <b>0.003</b>          | 99.240                 | <b>&lt;0.001</b>       | 13.316                      | <b>&lt;0.001</b>            |
| fPOM-C     | 15.465                | <b>&lt;0.001</b>      | 5.621                  | <b>0.023</b>           | 0.876                       | 0.355                       |
| oPOM-C     | 0.156                 | 0.695                 | 0.686                  | 0.413                  | 6.648                       | <b>0.014</b>                |
| MAOM-C     | 7.691                 | <b>0.009</b>          | 35.191                 | <b>&lt;0.001</b>       | 9.507                       | <b>0.004</b>                |
| fPOM C: N  | 28.302                | <b>&lt;0.001</b>      | 0.377                  | 0.543                  | 3.919                       | 0.055                       |
| oPOM C: N  | 1.318                 | 0.258                 | 20.662                 | <b>&lt;0.001</b>       | 8.204                       | <b>0.007</b>                |
| MAOM C: N  | 3.633                 | 0.064                 | 47.347                 | <b>&lt;0.001</b>       | 1.218                       | 0.277                       |

Values are *F*-statistics and corresponding *p*-values from two-way ANOVA. Significant effects ( $p < 0.05$ ) are shown in bold. Cover type comprised moss-covered and adjacent no moss soils, and forest type comprised the coniferous mixed forest (Tübingen, Baden-Württemberg) and the pine forest (Linde, Brandenburg, Germany). Abbreviations: SOC, soil organic carbon; fPOM, free particulate organic matter; oPOM, occluded particulate organic matter; MAOM, mineral-associated organic matter.