**Table 1.** Location of study sites with mean climate conditions, soil order, and dominant AM and ECM tree species in the selected study plots by basal area

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| **Site** | **Location** | **MAT (**°C) | **MAP (mm)** | **Dominant Soil Order** | **Dominant AM**  **Tree Species** | **Dominant ECM**  **Tree Species** |  |  |
| Treehaven (TREE) | Lincoln County, WI  45.49369 °N  -89.58571 °W | 4.8 | 797 | Spodosol | *Acer rubrum*  *Acer saccharum* | *Pinus strobus*  *Picea mariana* |  |  |
| Bartlett Experimental Forest (BART) | Carroll County, NH  44.063889 °N  -71.287375 °W | 6.2 | 1325 | Spodosol | *Acer rubrum*  *Fraxinus americana* | *Fagus grandifolia* *Tsuga canadensis* |  |  |
| Harvard Forest (HARV) | Worcester County, MA  42.53691 °N  -72.17265 °W | 7.4 | 1199 | Inceptisol | *Acer rubrum*  *Fraxinus americana* | *Tsuga canadensis*  *Quercus rubra* |  |  |
| Smithsonian Environmental Research Center (SERC) | Anne Arundel County, MD  38.890131 °N  -76.560014 °W | 13.6 | 1075 | Ultisol | *Liriodendron tulipifera*  *Liquidambar styraciflua* | *Quercus alba*  *Fagus grandifolia* |  |  |
| Oak Ridge National Lab (ORNL) | Anderson County, TN  35.964128 °N  -84.282588 °W | 14.4 | 1340 | Ultisol | *Liriodendron tulipifera*  *Acer rubrum* | *Quercus alba*  *Quercus montana* |  |  |
| Dead Lake (DELA) | Greene County, AL  32.541727 °N  -87.803877 °W | 17.6 | 1372 | Ultisol | *Acer rubrum*  *Celtis laevigata* | *Pinus taeda*  *Quercus michauxii* |  |  |
| Lenoir Landing (LENO) | Choctaw County, AL  31.853861 °N  -88.161181 °W | 18.1 | 1386 | Inceptisol | *Liquidambar styraciflua*  *Platanus occidentalis* | *Quercus pagoda*  *Quercus laurifolia* |  |  |

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|  | **MAOM C proportion** | | | **[MAOM C]**  **(mg g soil-1)** | | | **MAOM N proportion** | | | **[MAOM N]**  **(mg g soil-1)** | | |
| *Predictors* | *Std. Beta* | *Std. SE* | *p* | *Std. Beta* | *Std. SE* | *p* | *Std. Beta* | *Std. SE* | *p* | *Std. Beta* | *Std. SE* | *p* |
| (Intercept) | -0.002 | 0.157 | **<0.001** | -0.002 | 0.232 | **<0.001** | -0.000 | 0.121 | **<0.001** | -0.002 | 0.175 | **0.001** |
| ECM dominance | -0.398 | 0.130 | **0.002** | -0.024 | 0.107 | 0.824 | -0.227 | 0.126 | 0.071 | -0.025 | 0.111 | 0.823 |
| Climate decomposition Index | 0.029 | 0.176 | 0.870 | -0.658 | 0.244 | **0.007** | 0.462 | 0.141 | **0.001** | -0.277 | 0.190 | 0.144 |
| Oxalate-Extractable Iron content | 0.472 | 0.159 | **0.003** | 0.598 | 0.148 | **<0.001** | 0.165 | 0.141 | 0.243 | 0.858 | 0.146 | **<0.001** |
| **Random Effects** | | | | | | | | | | | | |
| σ2 | 0.004 | | | 37.813 | | | 0.003 | | | 0.139 | | |
| τ00 | 0.000 Site | | | 26.600 Site | | | 0.000 Site | | | 0.040 Site | | |
| ICC | 0.089 | | | 0.413 | | | 0.003 | | | 0.224 | | |
| N | 7 Site | | | 7 Site | | | 7 Site | | | 7 Site | | |
| Observations | 46 | | | 46 | | | 46 | | | 46 | | |
| Marginal R2 / Conditional R2 | 0.313 / 0.374 | | | 0.360 / 0.624 | | | 0.361 / 0.363 | | | 0.485 / 0.600 | | |

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|  | **oPOM C proportion** | | | | | | **[oPOM C]**  **(mg g soil-1)** | | | | | | **oPOM N proportion** | | | | | | | **[oPOM N]**  **(mg g soil-1)** | | | | |
| *Predictors* | *Std. Beta* | | *Std. SE* | *p* | | *Std. Beta* | | *Std. SE* | | *p* | | *Std. Beta* | | *Std. SE* | | *p* | | *Std. Beta* | | | *Std. SE* | | *p* | |
| (Intercept) | 0.003 | | 0.182 | | **0.030** | 0.004 | | | 0.186 | | **0.010** | 0.001 | | | 0.146 | | **<0.001** | | 0.004 | | | 0.194 | | **0.004** |
| ECM dominance | 0.328 | | 0.147 | | **0.026** | 0.231 | | | 0.132 | | 0.079 | 0.196 | | | 0.144 | | 0.174 | | 0.126 | | | 0.134 | | 0.348 |
| Climate decomposition Index | 0.104 | | 0.204 | | 0.611 | -0.427 | | | 0.205 | | **0.037** | -0.348 | | | 0.169 | | **0.040** | | -0.458 | | | 0.213 | | **0.031** |
| Oxalate-Extractable Iron content | -0.167 | | 0.182 | | 0.357 | 0.252 | | | 0.169 | | 0.135 | -0.020 | | | 0.165 | | 0.903 | | 0.288 | | | 0.173 | | 0.096 |
| **Random Effects** | | | | | | | | | | | | | | | | | | | | | | | | |
| σ2 | | 0.002 | | | | | 2.666 | | | | | | 0.001 | | | | | | | 0.003 | | | | |
| τ00 | | 0.000 Site | | | | | 0.532 Site | | | | | | 0.000 Site | | | | | | | 0.001 Site | | | | |
| ICC | | 0.101 | | | | | 0.166 | | | | | | 0.021 | | | | | | | 0.178 | | | | |
| N | | 7 Site | | | | | 7 Site | | | | | | 7 Site | | | | | | | 7 Site | | | | |
| Observations | | 46 | | | | | 46 | | | | | | 46 | | | | | | | 46 | | | | |
| Marginal R2 / Conditional R2 | | 0.099 / 0.190 | | | | | 0.225 / 0.354 | | | | | | 0.170 / 0.188 | | | | | | | 0.196 / 0.339 | | | | |

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|  | **fPOM C proportion** | | | **[fPOM C]**  **(mg g soil-1)** | | | **fPOM N proportion** | | | **[fPOM N]**  **(mg g soil-1)** | | |
| *Predictors* | *Std. Beta* | *Std. SE* | *p* | *Std. Beta* | *Std. SE* | *p* | *Std. Beta* | *Std. SE* | *p* | *Std. Beta* | *Std. SE* | *p* |
| (Intercept) | 0.000 | 0.136 | **<0.001** | -0.005 | 0.218 | **0.002** | 0.000 | 0.125 | **<0.001** | -0.005 | 0.214 | **0.001** |
| ECM dominance | 0.258 | 0.130 | **0.047** | 0.181 | 0.120 | 0.132 | 0.175 | 0.131 | 0.181 | 0.108 | 0.126 | 0.389 |
| Climate decomposition Index | -0.138 | 0.156 | 0.377 | -0.464 | 0.233 | **0.047** | -0.400 | 0.146 | **0.006** | -0.474 | 0.230 | **0.039** |
| Oxalate-Extractable Iron content | -0.477 | 0.151 | **0.002** | -0.039 | 0.163 | 0.813 | -0.225 | 0.146 | 0.124 | 0.011 | 0.168 | 0.946 |
| **Random Effects** | | | | | | | | | | | | |
| σ2 | 0.002 | | | 2.243 | | | 0.001 | | | 0.003 | | |
| τ00 | 0.000 Site | | | 0.981 Site | | | 0.000 Site | | | 0.001 Site | | |
| ICC | 0.032 | | | 0.304 | | |  | | | 0.266 | | |
| N | 7 Site | | | 7 Site | | | 7 Site | | | 7 Site | | |
| Observations | 46 | | | 46 | | | 46 | | | 46 | | |
| Marginal R2 / Conditional R2 | 0.325 / 0.347 | | | 0.259 / 0.484 | | | 0.314 / NA | | | 0.224 / 0.430 | | |