

Figure S1. Soil water potential (m pressure head) as a function of soil water content and soil texture. Curves end at the soil saturation point, and their shape as soil water potential values approach zero is relevant to waterlogging tolerance. Wilting point and field capacity in terms of pressure are defined as 153 and 3.4 m of pressure head, respectively. Soil acronyms follow FAO conventions. Data from Saxton and Rawls (2004).



Figure S2. An example of monthly soil temperature (*Tsoil*) profiles on a sandy, saturated soil for a single year under a hypothetical high-latitude climate.

Table S1. Water stress parameters for the hypothetical species used in both the lowland forest and permafrost test experiments. Values given in units of m of pressure head.

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Waterlogging intolerant species | Intermediate waterlogging tolerant species | Waterlogging tolerant species |
| H1 | 0 | -2.5 | -10 |
| H2 | 5 | 2.5 | 0.5 |
| H3 | 118 | 109 | 100 |
| H4 | 160 | 150 | 140 |

Table S2. Selected PnET-Succession parameter values for Siberian tree species.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Lati-tude1 | FolN | Half Sat | H1 | H2 | H3 | H4 | Leaf On MinT | Psn TMin | Psn TOpt | Psn TMax | FracFol3 | Fr ActWd4 | Frac BelowG5 | Cold Tol |
| Species / Units  | oN | % wt. | mol/ m2/s | 2 | 2 | 2 | 2 | oC | oC | oC | oC | Fraction | Unitless | Fraction | oC |
| abiesibi | 58-66 | 1.4 | 141 | -0.45 | 4 | 106 | 142 | 2.8 | 6.7 | 19 | 28.5 | 0.085 | 0.00004 | 0.34 | -63 |
| alnuglut | 58 | 2.3 | 227 | -3 | 1 | 107 | 146 | 3.8 | 8.6 | 23 | 32.8 | 0.03 | 0.00010 | 0.33 | -56 |
| betunana | 66-70 | 2.0 | 298 | -9 | 1 | 100 | 136 | 2.2 | 5.5 | 17 | 26.5 | 0.033 | 0.0004 | 0.32 | -69 |
| betupend | 58 | 2.4 | 269 | -1 | 4 | 107 | 144 | 3.7 | 8.3 | 21.4 | 31.0 | 0.03 | 0.00004 | 0.33 | -60 |
| larisibi | 66-70 | 2.2 | 311 | -1 | 2 | 111 | 149 | 3.0 | 7.7 | 19.5 | 29.1 | 0.031 | 0.00004 | 0.32 | -65 |
| piceobov | 58-66 | 1.4 | 158 | -1 | 3 | 107 | 144 | 3.0 | 7.7 | 19.5 | 30.0 | 0.085 | 0.00004 | 0.34 | -64 |
| pinusibi | 58-66 | 1.4 | 275 | -2 | 2 | 112 | 151 | 3.3 | 8.3 | 22.2 | 32.8 | 0.095 | 0.00004 | 0.33 | -61 |
| pinusylv | 58-62 | 1.4 | 291 | -1 | 2 | 117 | 157 | 3.5 | 8.1 | 22.2 | 31.0 | 0.1 | 0.00004 | 0.32 | -59 |
| poputrem | 58 | 2.4 | 257 | -1 | 3 | 111 | 149 | 3.9 | 8.8 | 23.4 | 33.0 | 0.031 | 0.00004 | 0.32 | -57 |
| sphagnum | 66 | 2.0 | 100 | -50 | 0 | 100 | 136 | 3.0 | 7.7 | 19.6 | 29.0 | 0.038 | 0.00010 | 0.50 | -64 |
| genegrss | 58 | 2.4 | 350 | -9 | 1 | 119 | 170 | 3.0 | 8.0 | 24.5 | 34.0 | 0.05 | 0.00007 | 0.50 | -54 |

1 latitude(s) where species was initialized

2 negativepressure head (m)

3 amount of foliage as a fraction of woody biomass

4 shape parameter to compute fraction of woody biomass that is active xylem as a function of size

5 fraction of woody biomass that is allocated to roots