**Table S1: Conversion table use to obtained vegetation coverage map from the ESA CCI LCC map.**

| ID | CCI ESA Land Cover Class Description | Trees BE | Trees BD | Trees NE | Trees ND | Shrub BE | Shrub BD | Shrub NE | Shrub ND | Herbaceous Natural | Herbaceous Crops | NVPs | Non-vegetated Bare soil | Non-vegetated Water | Non-vegetated Snow/Ice | Non-vegetated Urban | Non-vegetated No data |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | No data | | | | | | | | | | | | | | | | 100 |
| 10 | Cropland, rainfed | | | | | | | | | | 100 | | | | | | |
| 11 | Herbaceous cover | | | | | | | | | | 100 | | | | | | |
| 12 | Tree or shrub cover | | | | | | 50 | | | | 50 | | | | | | |
| 20 | Cropland, irrigated or post-flooding | | | | | | | | | | 100 | | | | | | |
| 30 | Mosaic cropland (>50%) / natural vegetation (<50%) | 5 | 5 | | | 5 | 5 | 5 | | 15 | 60 | | | | | | |
| 40 | Mosaic natural vegetation (>50%) / cropland (<50%) | 5 | 5 | | | 7.5 | 10 | 7.5 | | 25 | 40 | | | | | | |
| 50 | Tree cover, broadleaved, evergreen, closed to open (>15%) | 90 | | | | 5 | 5 | | | | | | | | | | |
| 60 | Tree cover, broadleaved, deciduous, closed to open (>15%) | | 50 | | | | 20 | | | 30 | | | | | | | |
| 61 | Tree cover, broadleaved, deciduous, closed (>40%) | | 70 | | | | 15 | | | 15 | | | | | | | |
| 62 | Tree cover, broadleaved, deciduous, open (15-40%) | | 30 | | | | 25 | | | 45 | | | | | | | |

| Code | Description | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 70 | Tree cover, needleleaved, evergreen, closed to open (>15%) | | | 50 | | 2.5 | 2.5 | 15 | | 30 | | |
| 71 | Tree cover, needleleaved, evergreen, closed (>40%) | | | 70 | | 5 | 5 | 5 | | 15 | | |
| 72 | Tree cover, needleleaved, evergreen, open (15-40%) | | | 30 | | | | 25 | | 45 | | |
| 80 | Tree cover, needleleaved, deciduous, closed to open (>15%) | | | | 50 | 2.5 | 2.5 | 2.5 | 12.5 | 30 | | |
| 81 | Tree cover, needleleaved, deciduous, closed (>40%) | | | | 70 | 5 | 5 | 5 | | 15 | | |
| 82 | Tree cover, needleleaved, deciduous, open (15-40%) | | | | 30 | | | | 25 | 45 | | |
| 90 | Tree cover, mixed leaf type (broadleaved and needleleaved) | | 30 | 20 | 10 | 5 | 5 | 5 | | 25 | | |
| 100 | Mosaic tree and shrub (>50%) / herbaceous cover (<50%) | **7** | **15** | **4** | **5** | **8** | **15** | **6** | | 40 | | |
| 110 | Mosaic herbaceous cover (>50%) / tree and shrub (<50%) | **4** | **7** | **4** | | **6** | **13** | **6** | | 60 | | |
| 120 | Shrubland | | | | | 15 | 30 | 15 | | 40 | | |
| 121 | Shrubland evergreen | | | | | 30 | | 30 | | 40 | | |
| 122 | Shrubland deciduous | | | | | | 60 | | | 40 | | |
| 130 | Grassland | | | | | | | | | 100 | | |

| Code | Land cover class | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 140 | Lichens and mosses | | | | | | | **10** | **70** | **20** | | | | |
| 150 | Sparse vegetation (tree, shrub, herbaceous cover) (<15%) | 4.7 | 4.7 | 3.1 | 4.7 | 4.7 | 3.1 | **10.0** | **45.0** | **20.0** | | | | |
| 151 | Sparse tree (<15%) | 9.4 | 9.4 | 6.2 | | | | **10.0** | **45.0** | **20.0** | | | | |
| 152 | Sparse shrub (<15%) | | | | 7.5 | 7.5 | 5.0 | **15.0** | **45.0** | **20.0** | | | | |
| 153 | Sparse herbaceous cover (<15%) | | | | | | | **35.0** | **45.0** | **20.0** | | | | |
| 160 | Tree cover, flooded, fresh or brakish water | 37.5 | 37.5 | | | | | 25 | | | | | | |
| 170 | Tree cover, flooded, saline water | 75 | | | 25 | | | | | | | | | |
| 180 | Shrub or herbaceous cover, flooded, fresh/saline/brakish water | | | | 25 | 15 | | **30** | **30** | | | | | |
| 190 | Urban areas | | | | | | | | | | | 100 | | |
| 200 | Bare areas | | | | | | | | | | 100 | | | |
| 201 | Consolidated bare areas | | | | | | | | | | 100 | | | |
| 202 | Unconsolidated bare areas | | | | | | | | | | 100 | | | |
| 210 | Water bodies | | | | | | | | | | | | 100 | |
| 220 | Permanent snow and ice | | | | | | | | | | | | | 100 |

BE : Broadleaf Evergreen, BD : Broadleaf Deciduous, NE : Needleleaf Evergreen and ND : Needleleaf Deciduous.

Bold: modified values for the introduction of new boreal vegetation (i.e., shrubs, NVPs and cold climate grass PFTs)

a) Latitudinal transect of the mean 2001-2013 of living biomass (gC.m⁻²) with boreal broad-leaved trees

b) Continental time series from 1901-2013 of living biomass (gC.m⁻²) with boreal broad-leaved trees
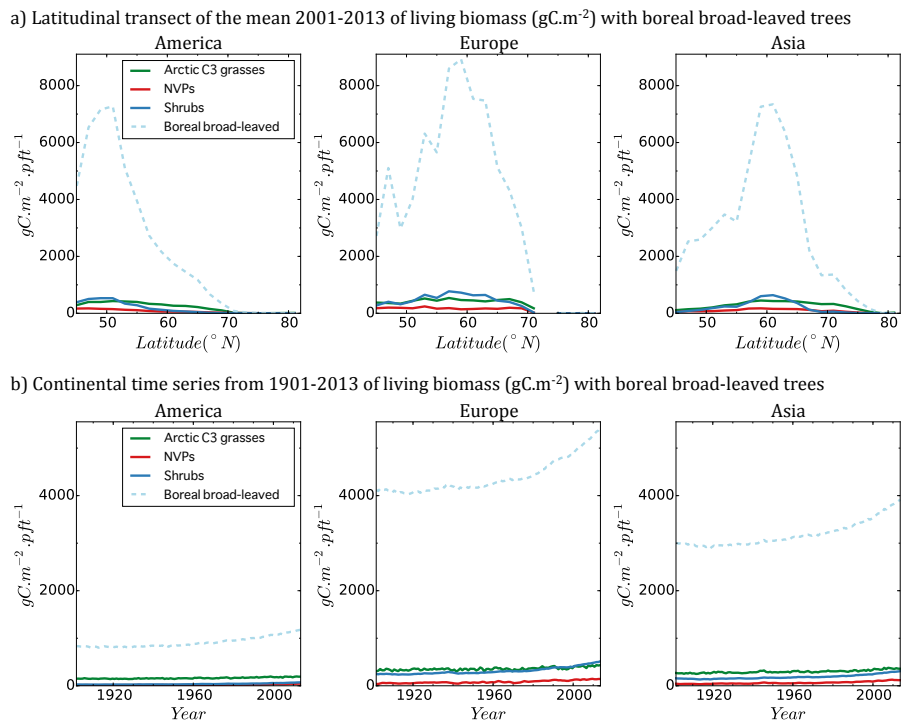
**Figure S1: Latitudinal transects of the mean 2001-2013 (from 45°N) and time series from 1901 to 2013 (from 55°N) of total summer live biomass of new PFTs (cold climate C3 grasses, NVPs and boreal shrubs) and boreal broad-leaved tree (dashed).**

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