Drivers of tundra shrub abundance in SW Greenland - supplementary material

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## Study species overview

| **species name** | **canopy persistence** | **pollination mode** | **dispersal mode / clonality** | **PC1 (resource economics)** a | **PC2 (plant size)** a | **references** |
| --- | --- | --- | --- | --- | --- | --- |
| *Empetrum nigrum* L. | evergreen |  | animals, clonal | -3.59 | 0.79 | Matthews (1992a) |
| *Cassiope tetragona* L. | evergreen | insects | animals | -3.46 | 0.66 |  |
| *Phyllodoce caerulea* (L.) Bab. | evergreen |  | animals | -3.27 | 0.28 |  |
| *Rhododendron groenlandicum* (Oeder) Kron & Judd | evergreen | insects | wind, (clonal) | -3.22 b | 0.46 b | Gucker (2006) |
| *Rhododendron tomentosum* (Stokes) Harmaja | evergreen | insects | wind, (clonal) | -3.22 b | 0.46 b | Gucker (2005) |
| *Betula nana* L. | deciduous | wind | (wind), clonal | -1.47 | 0.64 | Tollefson (2007) |
| *Vaccinium uliginosum* L. | deciduous |  | animals, (clonal) | -1.33 | 0.23 | Matthews (1992b) |
| *Salix arctophila* Cockerell | deciduous | wind | wind, clonal | -0.93 c | 1.71 c |  |
| *Salix glauca* L. | deciduous | wind | wind, (clonal) | -0.93 c | 1.71 c | Uchytil (1992) |

## Correlation matrix

|  | **summer (JJA) temperature** | **annual maximum temperature** | **annual minimum temperature** | **annual temperature variability** | **summer (JJA) precipitation** | **winter-spring (JFMAM) precipitation** | **spring (MAM) precipitation** | **slope inclination** | **solar radiation (SRI)** | **terrain ruggedness (TRI)** | **wetness (TWI)** | **wetness (TCWS)** | **diff. to CWM acquisitiveness** | **total shrub cover** | **graminoid cover** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| summer (JJA) temperature | 1.00 | 1.00 | 0.50 |  | 0.42 |  |  |  |  |  |  |  |  |  |  |
| annual maximum temperature | 1.00 | 1.00 | 0.47 |  | 0.41 |  |  |  |  |  |  |  |  |  |  |
| annual minimum temperature | 0.50 | 0.47 | 1.00 | -0.83 | 0.71 | 0.83 | 0.68 |  |  |  |  |  |  |  |  |
| annual temperature variability |  |  | -0.83 | 1.00 | -0.54 | -0.74 | -0.64 |  |  |  |  |  |  |  |  |
| summer (JJA) precipitation | 0.42 | 0.41 | 0.71 | -0.54 | 1.00 | 0.94 | 0.92 |  |  |  | -0.57 |  |  |  |  |
| winter-spring (JFMAM) precipitation |  |  | 0.83 | -0.74 | 0.94 | 1.00 | 0.97 |  |  |  | -0.49 |  |  |  |  |
| spring (MAM) precipitation |  |  | 0.68 | -0.64 | 0.92 | 0.97 | 1.00 |  |  |  | -0.45 |  |  |  |  |
| slope inclination |  |  |  |  |  |  |  | 1.00 | -0.96 | 0.67 | -0.41 |  |  |  |  |
| solar radiation (SRI) |  |  |  |  |  |  |  | -0.96 | 1.00 | -0.64 |  |  |  |  |  |
| terrain ruggedness (TRI) |  |  |  |  |  |  |  | 0.67 | -0.64 | 1.00 | -0.45 |  |  |  |  |
| wetness (TWI) |  |  |  |  | -0.57 | -0.49 | -0.45 | -0.41 |  | -0.45 | 1.00 |  |  |  |  |
| wetness (TCWS) |  |  |  |  |  |  |  |  |  |  |  | 1.00 |  | 0.42 |  |
| diff. to CWM acquisitiveness |  |  |  |  |  |  |  |  |  |  |  |  | 1 |  |  |
| total shrub cover |  |  |  |  |  |  |  |  |  |  |  | 0.42 |  | 1.00 |  |
| graminoid cover |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 |

## Variable selection (TWI)

| **variable** | **VIF (step 1)** | **VIF (step 2)** | **VIF (step 3)** | **VIF (step 4)** | **VIF (step 5)** | **VIF (step 6)** |
| --- | --- | --- | --- | --- | --- | --- |
| summer (JJA) temperature | 51,274.0 | 5.1e+04 | 5.4 | 1.9 | 1.8 | 1.6 |
| annual maximum temperature | Inf |  |  |  |  |  |
| annual minimum temperature | Inf | 1.7e+05 |  |  |  |  |
| annual temperature variability | Inf | 1.2e+05 | 17.8 | 2.1 | 2.1 | 1.8 |
| summer (JJA) precipitation | 21.3 | 2.1e+01 | 20.1 | 12.2 | 12.0 | 2.5 |
| winter-spring (JFMAM) precipitation | 697.1 | 7.0e+02 | 211.8 |  |  |  |
| spring (MAM) precipitation | 246.1 | 2.5e+02 | 83.2 | 10.9 | 10.6 |  |
| slope inclination | 14.5 | 1.4e+01 | 14.3 | 13.7 |  |  |
| solar radiation (SRI) | 13.2 | 1.3e+01 | 13.1 | 12.7 | 1.8 | 1.8 |
| terrain ruggedness (TRI) | 2.1 | 2.1e+00 | 2.1 | 2.1 | 2.0 | 2.0 |
| wetness (TWI) | 2.0 | 2.0e+00 | 1.9 | 1.9 | 1.9 | 1.9 |
| diff. to CWM acquisitiveness | 1.0 | 1.0e+00 | 1.0 | 1.0 | 1.0 | 1.0 |
| total shrub cover | 1.2 | 1.2e+00 | 1.1 | 1.1 | 1.1 | 1.1 |
| graminoid cover | 1.4 | 1.4e+00 | 1.3 | 1.3 | 1.3 | 1.2 |

## Variable selection (TCWS)

| **variable** | **VIF (step 1)** | **VIF (step 2)** | **VIF (step 3)** | **VIF (step 4)** | **VIF (step 5)** | **VIF (step 6)** |
| --- | --- | --- | --- | --- | --- | --- |
| summer (JJA) temperature | 48,176.1 | 4.8e+04 | 5.4 | 1.9 | 1.9 | 1.6 |
| annual maximum temperature | Inf |  |  |  |  |  |
| annual minimum temperature | Inf | 1.6e+05 |  |  |  |  |
| annual temperature variability | Inf | 1.1e+05 | 19.1 | 2.1 | 2.1 | 1.8 |
| summer (JJA) precipitation | 23.4 | 2.3e+01 | 22.0 | 12.3 | 12.2 | 2.5 |
| winter-spring (JFMAM) precipitation | 690.7 | 6.9e+02 | 226.4 |  |  |  |
| spring (MAM) precipitation | 243.8 | 2.4e+02 | 87.1 | 10.9 | 10.7 |  |
| slope inclination | 15.0 | 1.5e+01 | 14.8 | 14.5 |  |  |
| solar radiation (SRI) | 13.7 | 1.4e+01 | 13.6 | 13.4 | 1.8 | 1.8 |
| terrain ruggedness (TRI) | 2.0 | 2.0e+00 | 2.0 | 2.0 | 1.9 | 1.9 |
| wetness (TCWS) | 1.8 | 1.8e+00 | 1.8 | 1.7 | 1.6 | 1.6 |
| diff. to CWM acquisitiveness | 1.0 | 1.0e+00 | 1.0 | 1.0 | 1.0 | 1.0 |
| total shrub cover | 1.3 | 1.3e+00 | 1.3 | 1.3 | 1.3 | 1.3 |
| graminoid cover | 1.4 | 1.4e+00 | 1.3 | 1.3 | 1.3 | 1.2 |

## Model output tables (TWI)

### All shrubs

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -0.93 | 0.07 | -1.07 | -1.35 | -0.83 | -0.80 | 1.001 |
| summer temperature | -0.06 | 0.09 | -0.23 | -0.20 | 0.08 | 0.10 | 1.002 |
| summer temperature ^2 | -0.17 | 0.06 | -0.29 | -0.27 | -0.08 | -0.07 | 1.001 |
| temperature variability | 0.14 | 0.07 | 0.00 | 0.02 | 0.25 | 0.28 | 1.001 |
| summer precipitation | -0.03 | 0.08 | -0.18 | -0.16 | 0.09 | 0.12 | 1.001 |
| solar radiation | 0.05 | 0.05 | -0.04 | -0.02 | 0.13 | 0.14 | 1.001 |
| terrain ruggedness | 0.00 | 0.05 | -0.11 | -0.09 | 0.09 | 0.10 | 1.002 |
| topographic wetness | 0.00 | 0.08 | -0.15 | -0.12 | 0.13 | 0.15 | 1.002 |
| graminoid cover | -0.18 | 0.05 | -0.29 | -0.27 | -0.10 | -0.09 | 1.001 |
| sigma.plotgroup | 0.30 | 0.06 | 0.19 | NA | NA | 0.42 | 1.001 |

### All evergreens

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -1.43 | 0.14 | -1.71 | -2.11 | -1.33 | -1.17 | 1.003 |
| summer temperature | -0.08 | 0.18 | -0.43 | -0.37 | 0.22 | 0.29 | 1.001 |
| summer temperature ^2 | -0.87 | 0.26 | -1.44 | -1.33 | -0.46 | -0.41 | 1.006 |
| temperature variability | -0.01 | 0.11 | -0.23 | -0.19 | 0.17 | 0.20 | 1.001 |
| summer precipitation | 0.02 | 0.13 | -0.23 | -0.19 | 0.24 | 0.29 | 1.001 |
| solar radiation | 0.09 | 0.06 | -0.03 | -0.01 | 0.20 | 0.22 | 1.001 |
| terrain ruggedness | 0.07 | 0.08 | -0.10 | -0.07 | 0.19 | 0.22 | 1.001 |
| topographic wetness | 0.09 | 0.15 | -0.20 | -0.15 | 0.33 | 0.38 | 1.002 |
| graminoid cover | -0.24 | 0.09 | -0.42 | -0.39 | -0.10 | -0.08 | 1.002 |
| sigma.plotgroup | 0.52 | 0.10 | 0.34 | NA | NA | 0.75 | 1.001 |

### All deciduous

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -1.35 | 0.24 | -1.82 | -2.15 | -1.13 | -0.90 | 1.098 |
| summer temperature | 0.19 | 0.13 | -0.06 | -0.02 | 0.41 | 0.45 | 1.065 |
| temperature variability | 0.71 | 0.27 | 0.20 | 0.28 | 1.17 | 1.28 | 1.034 |
| temperature variability ^2 | -1.67 | 0.83 | -3.30 | -3.03 | -0.27 | -0.12 | 1.177 |
| summer precipitation | -0.02 | 0.13 | -0.28 | -0.23 | 0.20 | 0.25 | 1.013 |
| solar radiation | 0.09 | 0.06 | -0.02 | -0.01 | 0.19 | 0.21 | 1.001 |
| terrain ruggedness | -0.06 | 0.07 | -0.21 | -0.18 | 0.06 | 0.08 | 1.001 |
| topographic wetness | 0.11 | 0.09 | -0.07 | -0.04 | 0.26 | 0.29 | 1.005 |
| graminoid cover | -0.19 | 0.06 | -0.31 | -0.29 | -0.09 | -0.08 | 1.002 |
| sigma.plotgroup | 0.47 | 0.08 | 0.34 | NA | NA | 0.65 | 1.002 |

### Betula nana

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -2.22 | 0.25 | -2.73 | -2.99 | -1.71 | -1.76 | 1.003 |
| summer temperature | -0.09 | 0.13 | -0.35 | -0.30 | 0.12 | 0.16 | 1.001 |
| temperature variability | 0.74 | 0.21 | 0.34 | 0.40 | 1.10 | 1.18 | 1.001 |
| summer precipitation | 0.07 | 0.18 | -0.27 | -0.22 | 0.36 | 0.42 | 1.001 |
| solar radiation | -0.02 | 0.10 | -0.21 | -0.18 | 0.14 | 0.17 | 1.001 |
| terrain ruggedness | -0.02 | 0.12 | -0.26 | -0.22 | 0.17 | 0.20 | 1.001 |
| topographic wetness | 0.18 | 0.13 | -0.09 | -0.04 | 0.40 | 0.44 | 1.001 |
| dCWA | 0.65 | 0.20 | 0.27 | 0.33 | 0.99 | 1.05 | 1.004 |
| graminoid cover | -0.34 | 0.11 | -0.56 | -0.52 | -0.17 | -0.13 | 1.001 |
| other shrub cover | -0.07 | 0.09 | -0.24 | -0.21 | 0.08 | 0.11 | 1.002 |
| phi | 6.58 | 0.71 | 5.26 | NA | NA | 8.07 | 1.001 |
| sigma.plotgroup | 0.63 | 0.12 | 0.41 | NA | NA | 0.88 | 1.001 |

### Cassiope tetragona

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -44.95 | 16.77 | -83.63 | -82.20 | -21.32 | -18.66 | 1.065 |
| summer temperature | -7.35 | 6.27 | -20.76 | -17.95 | 2.23 | 4.83 | 1.016 |
| summer temperature ^2 | -8.73 | 6.70 | -25.10 | -21.19 | -0.31 | 0.92 | 1.027 |
| temperature variability | 51.57 | 18.61 | 19.20 | 23.86 | 82.35 | 89.68 | 1.168 |
| temperature variability ^2 | 2.10 | 14.32 | -28.00 | -23.99 | 24.57 | 28.84 | 1.082 |
| summer precipitation | -0.21 | 4.21 | -10.04 | -7.40 | 5.38 | 7.21 | 1.027 |
| summer precipitation ^2 | -1.09 | 4.51 | -12.02 | -8.94 | 4.93 | 6.43 | 1.026 |
| solar radiation | -1.93 | 0.92 | -3.80 | -3.48 | -0.47 | -0.24 | 1.023 |
| terrain ruggedness | -0.53 | 0.72 | -2.02 | -1.74 | 0.61 | 0.85 | 1.003 |
| topographic wetness | -4.08 | 3.32 | -10.96 | -9.96 | 1.01 | 1.86 | 1.019 |
| dCWA | 1.34 | 1.44 | -1.36 | -0.94 | 3.76 | 4.28 | 1.006 |
| graminoid cover | -0.48 | 0.68 | -2.03 | -1.72 | 0.48 | 0.63 | 1.005 |
| other shrub cover | 0.56 | 0.70 | -0.79 | -0.57 | 1.73 | 1.99 | 1.012 |
| phi | 11.02 | 4.83 | 4.19 | NA | NA | 22.69 | 1.003 |
| sigma.plotgroup | 8.19 | 6.56 | 0.45 | NA | NA | 26.17 | 1.166 |

### Empetrum nigrum

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -0.69 | 0.36 | -1.40 | -1.70 | -0.43 | 0.02 | 1.013 |
| summer temperature | 0.04 | 0.11 | -0.18 | -0.15 | 0.22 | 0.26 | 1.001 |
| temperature variability | -0.24 | 0.10 | -0.44 | -0.41 | -0.07 | -0.04 | 1.002 |
| summer precipitation | 0.22 | 0.13 | -0.02 | 0.02 | 0.44 | 0.48 | 1.002 |
| solar radiation | 0.05 | 0.10 | -0.13 | -0.10 | 0.21 | 0.24 | 1.001 |
| terrain ruggedness | 0.00 | 0.10 | -0.20 | -0.17 | 0.18 | 0.21 | 1.001 |
| topographic wetness | -0.08 | 0.12 | -0.31 | -0.27 | 0.11 | 0.15 | 1.002 |
| dCWA | 0.45 | 0.41 | -0.35 | -0.21 | 1.13 | 1.25 | 1.014 |
| graminoid cover | -0.12 | 0.11 | -0.35 | -0.31 | 0.06 | 0.09 | 1.001 |
| other shrub cover | 0.37 | 0.22 | -0.07 | 0.01 | 0.73 | 0.80 | 1.011 |
| phi | 3.98 | 0.39 | 3.26 | NA | NA | 4.79 | 1.002 |
| sigma.plotgroup | 0.29 | 0.14 | 0.04 | NA | NA | 0.57 | 1.039 |

### Phyllodoce caerulea

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -44.56 | 33.68 | -126.46 | -142.31 | -2.53 | -3.94 | 1.187 |
| summer temperature | 4.15 | 10.35 | -15.74 | -11.02 | 23.07 | 28.92 | 1.068 |
| summer temperature ^2 | 2.25 | 6.78 | -12.45 | -8.63 | 13.74 | 17.02 | 1.045 |
| temperature variability | -3.94 | 13.17 | -33.81 | -26.81 | 17.25 | 23.58 | 1.038 |
| temperature variability ^2 | -6.90 | 8.78 | -28.61 | -23.65 | 4.09 | 7.48 | 1.069 |
| summer precipitation | 9.65 | 11.48 | -4.89 | -2.29 | 32.53 | 38.60 | 1.082 |
| summer precipitation ^2 | 3.87 | 8.62 | -13.11 | -8.52 | 19.38 | 24.36 | 1.045 |
| solar radiation | -2.94 | 1.63 | -6.81 | -5.92 | -0.82 | -0.57 | 1.192 |
| terrain ruggedness | -1.64 | 1.84 | -6.09 | -5.18 | 0.76 | 1.07 | 1.227 |
| topographic wetness | -2.80 | 5.97 | -14.45 | -12.64 | 7.82 | 10.42 | 1.103 |
| dCWA | 0.21 | 2.84 | -5.93 | -4.85 | 4.55 | 5.41 | 1.068 |
| graminoid cover | -0.14 | 0.56 | -1.37 | -1.13 | 0.69 | 0.85 | 1.010 |
| other shrub cover | 0.63 | 1.00 | -1.24 | -0.92 | 2.29 | 2.74 | 1.023 |
| phi | 20.12 | 10.07 | 6.40 | NA | NA | 45.03 | 1.001 |
| sigma.plotgroup | 27.65 | 21.63 | 0.75 | NA | NA | 80.14 | 1.222 |

### Rhododendron groenlandicum

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -2.39 | 0.30 | -3.02 | -2.60 | -1.22 | -1.84 | 1.005 |
| summer temperature | -0.06 | 0.21 | -0.48 | -0.41 | 0.29 | 0.36 | 1.001 |
| summer temperature ^2 | -0.50 | 0.18 | -0.89 | -0.81 | -0.23 | -0.18 | 1.002 |
| temperature variability | 0.93 | 0.38 | 0.27 | 0.36 | 1.60 | 1.76 | 1.006 |
| summer precipitation | -0.31 | 0.18 | -0.67 | -0.60 | -0.02 | 0.04 | 1.001 |
| solar radiation | 0.13 | 0.13 | -0.11 | -0.07 | 0.35 | 0.39 | 1.001 |
| terrain ruggedness | 0.13 | 0.13 | -0.14 | -0.09 | 0.35 | 0.39 | 1.001 |
| topographic wetness | 0.27 | 0.20 | -0.13 | -0.06 | 0.58 | 0.65 | 1.002 |
| dCWA | -0.14 | 0.28 | -0.68 | -0.60 | 0.32 | 0.41 | 1.002 |
| graminoid cover | -0.33 | 0.18 | -0.71 | -0.64 | -0.05 | 0.00 | 1.001 |
| other shrub cover | 0.14 | 0.14 | -0.14 | -0.09 | 0.37 | 0.42 | 1.001 |
| phi | 7.80 | 1.17 | 5.72 | NA | NA | 10.31 | 1.002 |
| sigma.plotgroup | 0.41 | 0.18 | 0.07 | NA | NA | 0.78 | 1.043 |

### Rhododendron tomentosum

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -10.51 | 7.05 | -28.83 | -15.51 | 7.17 | -1.55 | 1.040 |
| summer temperature | 5.40 | 3.82 | -1.06 | 0.08 | 12.11 | 14.23 | 1.027 |
| summer temperature ^2 | -2.21 | 2.66 | -7.96 | -6.68 | 1.76 | 2.82 | 1.016 |
| temperature variability | -1.15 | 4.95 | -12.17 | -9.50 | 6.14 | 8.47 | 1.013 |
| temperature variability ^2 | -6.39 | 6.67 | -26.19 | -20.07 | 0.21 | 0.89 | 1.032 |
| summer precipitation | -3.22 | 3.30 | -11.67 | -9.50 | 0.58 | 1.23 | 1.032 |
| summer precipitation ^2 | 0.56 | 2.60 | -4.65 | -3.38 | 4.74 | 6.21 | 1.014 |
| solar radiation | -0.05 | 0.40 | -0.90 | -0.74 | 0.57 | 0.69 | 1.004 |
| terrain ruggedness | 0.29 | 0.84 | -1.43 | -1.08 | 1.65 | 1.98 | 1.002 |
| topographic wetness | -5.69 | 3.92 | -15.64 | -13.61 | -0.65 | -0.11 | 1.052 |
| dCWA | 1.37 | 1.47 | -1.31 | -0.92 | 3.91 | 4.48 | 1.001 |
| graminoid cover | -0.49 | 0.70 | -2.04 | -1.72 | 0.55 | 0.73 | 1.002 |
| other shrub cover | 0.29 | 0.49 | -0.58 | -0.44 | 1.17 | 1.39 | 1.003 |
| phi | 18.40 | 9.71 | 6.01 | NA | NA | 42.86 | 1.001 |
| sigma.plotgroup | 6.91 | 4.42 | 1.77 | NA | NA | 18.77 | 1.052 |

### Salix arctophila

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -7.20 | 1.98 | -12.30 | -18.53 | -6.79 | -4.34 | 1.017 |
| summer temperature | 0.40 | 0.72 | -0.90 | -0.67 | 1.53 | 1.97 | 1.003 |
| summer temperature ^2 | 0.40 | 0.50 | -0.49 | -0.34 | 1.21 | 1.52 | 1.013 |
| temperature variability | 0.89 | 1.15 | -1.38 | -0.91 | 2.66 | 3.16 | 1.001 |
| temperature variability ^2 | 0.59 | 0.60 | -0.51 | -0.31 | 1.55 | 1.85 | 1.002 |
| summer precipitation | 1.21 | 0.93 | -0.31 | -0.07 | 2.81 | 3.43 | 1.014 |
| summer precipitation ^2 | -0.83 | 0.64 | -2.37 | -1.95 | -0.01 | 0.14 | 1.014 |
| solar radiation | 0.61 | 0.48 | -0.24 | -0.12 | 1.45 | 1.64 | 1.001 |
| terrain ruggedness | 0.19 | 0.45 | -0.77 | -0.59 | 0.88 | 1.00 | 1.002 |
| topographic wetness | -0.32 | 0.65 | -1.78 | -1.44 | 0.65 | 0.84 | 1.003 |
| dCWA | 1.28 | 0.74 | 0.04 | 0.21 | 2.58 | 2.96 | 1.003 |
| graminoid cover | 0.22 | 0.40 | -0.59 | -0.45 | 0.86 | 1.00 | 1.001 |
| other shrub cover | 0.36 | 0.35 | -0.32 | -0.21 | 0.94 | 1.07 | 1.001 |
| phi | 28.27 | 11.26 | 11.75 | NA | NA | 55.09 | 1.001 |
| sigma.plotgroup | 0.99 | 0.95 | 0.05 | NA | NA | 3.84 | 1.013 |

### Salix glauca

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -3.60 | 0.39 | -4.39 | -4.56 | -2.84 | -2.87 | 1.010 |
| summer temperature | -0.01 | 0.17 | -0.35 | -0.29 | 0.27 | 0.33 | 1.002 |
| temperature variability | 0.49 | 0.20 | 0.10 | 0.16 | 0.83 | 0.90 | 1.002 |
| summer precipitation | 0.05 | 0.20 | -0.35 | -0.28 | 0.38 | 0.44 | 1.001 |
| solar radiation | -0.09 | 0.11 | -0.31 | -0.27 | 0.10 | 0.14 | 1.001 |
| terrain ruggedness | 0.21 | 0.14 | -0.06 | -0.02 | 0.43 | 0.47 | 1.002 |
| topographic wetness | 0.38 | 0.17 | 0.05 | 0.11 | 0.65 | 0.71 | 1.001 |
| dCWA | 1.25 | 0.24 | 0.81 | 0.87 | 1.65 | 1.73 | 1.009 |
| graminoid cover | -0.09 | 0.11 | -0.31 | -0.28 | 0.09 | 0.12 | 1.001 |
| other shrub cover | 0.21 | 0.11 | 0.01 | 0.04 | 0.39 | 0.43 | 1.004 |
| phi | 7.70 | 1.11 | 5.71 | NA | NA | 10.08 | 1.001 |
| sigma.plotgroup | 0.69 | 0.15 | 0.42 | NA | NA | 1.00 | 1.002 |

### Vaccinium uliginosum

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -3.13 | 0.32 | -3.79 | -4.25 | -2.80 | -2.54 | 1.001 |
| summer temperature | 0.31 | 0.19 | -0.05 | 0.00 | 0.64 | 0.71 | 1.001 |
| temperature variability | 0.26 | 0.18 | -0.09 | -0.03 | 0.56 | 0.62 | 1.001 |
| summer precipitation | 0.23 | 0.20 | -0.16 | -0.09 | 0.56 | 0.62 | 1.001 |
| solar radiation | 0.03 | 0.14 | -0.23 | -0.19 | 0.27 | 0.33 | 1.001 |
| terrain ruggedness | -0.06 | 0.14 | -0.35 | -0.30 | 0.17 | 0.22 | 1.001 |
| topographic wetness | 0.28 | 0.17 | -0.07 | -0.01 | 0.55 | 0.61 | 1.002 |
| dCWA | 1.13 | 0.25 | 0.67 | 0.74 | 1.55 | 1.65 | 1.001 |
| graminoid cover | 0.19 | 0.15 | -0.11 | -0.06 | 0.42 | 0.47 | 1.001 |
| other shrub cover | 0.11 | 0.10 | -0.08 | -0.05 | 0.28 | 0.32 | 1.001 |
| phi | 8.56 | 1.35 | 6.18 | NA | NA | 11.49 | 1.001 |
| sigma.plotgroup | 0.68 | 0.16 | 0.37 | NA | NA | 1.02 | 1.002 |

## Model output tables (TCWS)

### All shrubs

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -1.12 | 0.05 | -1.22 | -1.48 | -1.02 | -1.04 | 1.001 |
| summer temperature | 0.02 | 0.05 | -0.08 | -0.07 | 0.11 | 0.13 | 1.002 |
| temperature variability | 0.03 | 0.06 | -0.08 | -0.07 | 0.12 | 0.14 | 1.001 |
| summer precipitation | 0.08 | 0.06 | -0.04 | -0.02 | 0.18 | 0.20 | 1.001 |
| solar radiation | 0.04 | 0.04 | -0.04 | -0.03 | 0.11 | 0.12 | 1.001 |
| terrain ruggedness | -0.07 | 0.05 | -0.16 | -0.15 | 0.01 | 0.02 | 1.001 |
| Tasseled-cap wetness | 0.37 | 0.05 | 0.27 | 0.29 | 0.46 | 0.48 | 1.001 |
| graminoid cover | -0.15 | 0.05 | -0.24 | -0.23 | -0.08 | -0.06 | 1.001 |
| sigma.plotgroup | 0.21 | 0.06 | 0.08 | NA | NA | 0.32 | 1.123 |

### All evergreens

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -1.92 | 0.15 | -2.23 | -2.50 | -1.73 | -1.64 | 1.004 |
| summer temperature | 0.21 | 0.18 | -0.12 | -0.07 | 0.53 | 0.61 | 1.002 |
| summer temperature ^2 | -0.35 | 0.20 | -0.80 | -0.71 | -0.07 | -0.03 | 1.002 |
| temperature variability | -0.31 | 0.11 | -0.53 | -0.49 | -0.13 | -0.10 | 1.002 |
| summer precipitation | 0.11 | 0.11 | -0.10 | -0.07 | 0.29 | 0.33 | 1.002 |
| solar radiation | 0.06 | 0.06 | -0.05 | -0.04 | 0.16 | 0.18 | 1.001 |
| terrain ruggedness | -0.04 | 0.07 | -0.19 | -0.16 | 0.07 | 0.10 | 1.001 |
| Tasseled-cap wetness | 0.74 | 0.15 | 0.46 | 0.50 | 0.99 | 1.04 | 1.004 |
| graminoid cover | -0.19 | 0.08 | -0.35 | -0.32 | -0.07 | -0.05 | 1.001 |
| sigma.plotgroup | 0.40 | 0.09 | 0.24 | NA | NA | 0.60 | 1.002 |

### All deciduous

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -1.13 | 0.21 | -1.54 | -1.88 | -0.98 | -0.71 | 1.032 |
| summer temperature | 0.27 | 0.12 | 0.04 | 0.07 | 0.49 | 0.53 | 1.026 |
| temperature variability | 0.74 | 0.28 | 0.22 | 0.30 | 1.21 | 1.32 | 1.011 |
| temperature variability ^2 | -2.69 | 0.79 | -4.41 | -4.11 | -1.44 | -1.26 | 1.064 |
| summer precipitation | 0.06 | 0.11 | -0.17 | -0.13 | 0.24 | 0.28 | 1.004 |
| solar radiation | 0.10 | 0.06 | -0.01 | 0.01 | 0.19 | 0.21 | 1.001 |
| terrain ruggedness | -0.11 | 0.07 | -0.25 | -0.23 | -0.01 | 0.01 | 1.001 |
| Tasseled-cap wetness | 0.36 | 0.08 | 0.21 | 0.23 | 0.50 | 0.53 | 1.004 |
| graminoid cover | -0.18 | 0.06 | -0.29 | -0.27 | -0.08 | -0.07 | 1.001 |
| sigma.plotgroup | 0.44 | 0.07 | 0.32 | NA | NA | 0.61 | 1.002 |

### Betula nana

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -2.19 | 0.24 | -2.67 | -2.86 | -1.66 | -1.75 | 1.002 |
| summer temperature | -0.08 | 0.13 | -0.35 | -0.31 | 0.13 | 0.17 | 1.001 |
| temperature variability | 0.67 | 0.21 | 0.29 | 0.35 | 1.02 | 1.10 | 1.001 |
| summer precipitation | 0.03 | 0.17 | -0.29 | -0.24 | 0.30 | 0.36 | 1.001 |
| solar radiation | -0.00 | 0.10 | -0.19 | -0.17 | 0.16 | 0.19 | 1.001 |
| terrain ruggedness | -0.08 | 0.11 | -0.31 | -0.27 | 0.11 | 0.14 | 1.001 |
| Tasseled-cap wetness | 0.10 | 0.12 | -0.13 | -0.10 | 0.29 | 0.33 | 1.001 |
| dCWA | 0.63 | 0.20 | 0.25 | 0.31 | 0.95 | 1.02 | 1.002 |
| graminoid cover | -0.32 | 0.11 | -0.54 | -0.50 | -0.14 | -0.11 | 1.001 |
| other shrub cover | -0.09 | 0.09 | -0.27 | -0.24 | 0.06 | 0.09 | 1.001 |
| phi | 6.56 | 0.72 | 5.24 | NA | NA | 8.05 | 1.001 |
| sigma.plotgroup | 0.62 | 0.12 | 0.40 | NA | NA | 0.88 | 1.003 |

### Cassiope tetragona

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -39.63 | 15.02 | -74.90 | -70.41 | -19.30 | -17.34 | 1.024 |
| summer temperature | -5.92 | 4.57 | -15.10 | -13.27 | 1.10 | 3.04 | 1.017 |
| summer temperature ^2 | -7.09 | 5.72 | -20.41 | -17.19 | -0.44 | 0.39 | 1.035 |
| temperature variability | 49.05 | 17.28 | 21.03 | 23.71 | 80.18 | 88.14 | 1.085 |
| temperature variability ^2 | 7.82 | 11.24 | -13.78 | -10.47 | 26.10 | 30.17 | 1.347 |
| summer precipitation | 1.39 | 2.46 | -3.69 | -2.42 | 5.22 | 6.47 | 1.003 |
| summer precipitation ^2 | 0.57 | 2.88 | -5.69 | -3.91 | 4.57 | 5.65 | 1.008 |
| solar radiation | -1.49 | 0.76 | -3.08 | -2.80 | -0.32 | -0.10 | 1.002 |
| terrain ruggedness | -0.01 | 0.80 | -1.59 | -1.33 | 1.32 | 1.61 | 1.002 |
| Tasseled-cap wetness | -3.99 | 2.18 | -8.62 | -7.85 | -0.71 | -0.15 | 1.041 |
| dCWA | 1.65 | 1.36 | -0.91 | -0.54 | 3.94 | 4.45 | 1.001 |
| graminoid cover | -0.88 | 0.70 | -2.41 | -2.12 | 0.14 | 0.28 | 1.002 |
| other shrub cover | 0.63 | 0.62 | -0.55 | -0.37 | 1.64 | 1.87 | 1.001 |
| phi | 10.82 | 4.27 | 4.37 | NA | NA | 20.87 | 1.002 |
| sigma.plotgroup | 5.23 | 4.23 | 0.16 | NA | NA | 15.66 | 1.006 |

### Empetrum nigrum

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -1.10 | 0.34 | -1.77 | -2.23 | -0.98 | -0.42 | 1.018 |
| summer temperature | 0.04 | 0.11 | -0.18 | -0.14 | 0.21 | 0.24 | 1.007 |
| temperature variability | -0.31 | 0.09 | -0.50 | -0.47 | -0.16 | -0.12 | 1.009 |
| summer precipitation | 0.30 | 0.11 | 0.08 | 0.12 | 0.48 | 0.52 | 1.006 |
| solar radiation | 0.03 | 0.09 | -0.15 | -0.12 | 0.18 | 0.21 | 1.001 |
| terrain ruggedness | -0.11 | 0.10 | -0.31 | -0.28 | 0.06 | 0.09 | 1.001 |
| Tasseled-cap wetness | 0.42 | 0.10 | 0.23 | 0.26 | 0.59 | 0.62 | 1.002 |
| dCWA | 0.07 | 0.38 | -0.67 | -0.56 | 0.70 | 0.84 | 1.016 |
| graminoid cover | -0.12 | 0.11 | -0.34 | -0.30 | 0.04 | 0.07 | 1.001 |
| other shrub cover | 0.09 | 0.21 | -0.32 | -0.26 | 0.44 | 0.52 | 1.009 |
| phi | 4.08 | 0.39 | 3.36 | NA | NA | 4.89 | 1.002 |
| sigma.plotgroup | 0.18 | 0.13 | 0.00 | NA | NA | 0.44 | 1.013 |

### Phyllodoce caerulea

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -9.10 | 4.40 | -19.94 | -21.51 | -3.67 | -3.19 | 1.005 |
| summer temperature | 0.84 | 1.41 | -1.90 | -1.31 | 3.19 | 3.85 | 1.003 |
| summer temperature ^2 | 1.90 | 1.15 | -0.02 | 0.29 | 3.98 | 4.59 | 1.004 |
| temperature variability | -2.77 | 2.48 | -8.44 | -7.12 | 0.63 | 1.44 | 1.008 |
| temperature variability ^2 | -1.70 | 1.35 | -4.98 | -4.16 | 0.08 | 0.41 | 1.002 |
| summer precipitation | 1.57 | 1.51 | -0.91 | -0.45 | 4.27 | 5.22 | 1.001 |
| summer precipitation ^2 | 0.31 | 1.32 | -2.01 | -1.55 | 2.63 | 3.42 | 1.002 |
| solar radiation | -1.52 | 0.71 | -3.11 | -2.77 | -0.50 | -0.32 | 1.003 |
| terrain ruggedness | -0.38 | 0.78 | -2.06 | -1.72 | 0.78 | 0.99 | 1.002 |
| Tasseled-cap wetness | 3.08 | 1.79 | 0.17 | 0.61 | 6.39 | 7.33 | 1.022 |
| dCWA | 2.25 | 1.78 | -1.24 | -0.64 | 5.18 | 5.81 | 1.004 |
| graminoid cover | -0.19 | 0.46 | -1.21 | -1.02 | 0.48 | 0.60 | 1.002 |
| other shrub cover | 0.28 | 0.60 | -0.87 | -0.68 | 1.28 | 1.50 | 1.004 |
| phi | 19.11 | 9.19 | 6.61 | NA | NA | 41.81 | 1.001 |
| sigma.plotgroup | 2.68 | 2.09 | 0.18 | NA | NA | 8.11 | 1.034 |

### Rhododendron groenlandicum

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -2.90 | 0.27 | -3.42 | -3.24 | -1.97 | -2.38 | 1.007 |
| summer temperature | 0.03 | 0.17 | -0.29 | -0.25 | 0.32 | 0.37 | 1.004 |
| temperature variability | 0.63 | 0.41 | -0.05 | 0.04 | 1.35 | 1.50 | 1.024 |
| summer precipitation | -0.18 | 0.16 | -0.50 | -0.44 | 0.08 | 0.11 | 1.009 |
| solar radiation | 0.11 | 0.13 | -0.13 | -0.09 | 0.33 | 0.37 | 1.001 |
| terrain ruggedness | -0.15 | 0.13 | -0.41 | -0.36 | 0.06 | 0.11 | 1.001 |
| Tasseled-cap wetness | 0.69 | 0.19 | 0.34 | 0.40 | 1.00 | 1.07 | 1.005 |
| dCWA | -0.32 | 0.27 | -0.86 | -0.77 | 0.13 | 0.21 | 1.007 |
| graminoid cover | -0.30 | 0.18 | -0.68 | -0.61 | -0.02 | 0.03 | 1.002 |
| other shrub cover | -0.01 | 0.14 | -0.28 | -0.24 | 0.22 | 0.26 | 1.003 |
| phi | 7.32 | 1.06 | 5.45 | NA | NA | 9.59 | 1.001 |
| sigma.plotgroup | 0.24 | 0.16 | 0.00 | NA | NA | 0.59 | 1.080 |

### Rhododendron tomentosum

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -47.70 | 37.01 | -130.30 | -123.76 | -2.17 | -3.64 | 1.874 |
| summer temperature | 6.03 | 10.68 | -13.92 | -8.64 | 25.79 | 30.89 | 1.139 |
| summer temperature ^2 | -0.49 | 7.97 | -20.44 | -15.26 | 11.43 | 14.60 | 1.087 |
| temperature variability | -2.28 | 15.85 | -35.95 | -29.56 | 24.79 | 32.23 | 1.082 |
| temperature variability ^2 | -14.07 | 15.30 | -52.03 | -44.07 | 3.19 | 7.38 | 1.148 |
| summer precipitation | -3.28 | 9.72 | -25.89 | -21.09 | 11.51 | 15.78 | 1.101 |
| summer precipitation ^2 | -1.25 | 9.92 | -23.82 | -18.90 | 14.66 | 19.31 | 1.102 |
| solar radiation | -0.13 | 0.54 | -1.24 | -1.05 | 0.69 | 0.86 | 1.239 |
| terrain ruggedness | -1.39 | 2.32 | -6.84 | -5.88 | 1.54 | 2.09 | 1.501 |
| Tasseled-cap wetness | 22.30 | 15.44 | 0.76 | 1.34 | 48.19 | 51.41 | 2.720 |
| dCWA | 1.71 | 1.81 | -1.67 | -1.15 | 4.79 | 5.45 | 1.019 |
| graminoid cover | -1.85 | 1.71 | -5.60 | -5.02 | 0.44 | 0.77 | 1.320 |
| other shrub cover | 0.01 | 0.59 | -1.13 | -0.95 | 0.98 | 1.20 | 1.047 |
| phi | 19.73 | 10.24 | 6.30 | NA | NA | 45.86 | 1.002 |
| sigma.plotgroup | 30.43 | 22.91 | 0.95 | NA | NA | 80.71 | 1.954 |

### Salix arctophila

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -7.61 | 1.96 | -12.24 | -18.70 | -7.07 | -4.63 | 1.014 |
| summer temperature | 0.76 | 0.65 | -0.49 | -0.24 | 1.80 | 2.14 | 1.035 |
| summer temperature ^2 | 0.58 | 0.61 | -0.52 | -0.30 | 1.53 | 1.88 | 1.035 |
| temperature variability | 0.65 | 1.16 | -1.62 | -1.19 | 2.40 | 2.88 | 1.005 |
| temperature variability ^2 | 0.64 | 0.58 | -0.42 | -0.25 | 1.58 | 1.84 | 1.004 |
| summer precipitation | 1.17 | 0.93 | -0.17 | -0.02 | 2.70 | 3.26 | 1.025 |
| summer precipitation ^2 | -0.85 | 0.67 | -2.36 | -1.93 | -0.03 | 0.10 | 1.045 |
| solar radiation | 0.50 | 0.47 | -0.35 | -0.22 | 1.32 | 1.50 | 1.002 |
| terrain ruggedness | -0.00 | 0.48 | -1.00 | -0.82 | 0.74 | 0.88 | 1.001 |
| Tasseled-cap wetness | 1.21 | 0.87 | -0.26 | -0.03 | 2.75 | 3.15 | 1.002 |
| dCWA | 1.23 | 0.75 | -0.00 | 0.16 | 2.55 | 3.06 | 1.037 |
| graminoid cover | 0.24 | 0.39 | -0.57 | -0.42 | 0.84 | 0.97 | 1.001 |
| other shrub cover | 0.17 | 0.38 | -0.57 | -0.44 | 0.80 | 0.93 | 1.004 |
| phi | 27.50 | 10.75 | 11.64 | NA | NA | 53.08 | 1.001 |
| sigma.plotgroup | 0.86 | 0.91 | 0.02 | NA | NA | 3.60 | 1.014 |

### Salix glauca

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -3.49 | 0.38 | -4.27 | -4.29 | -2.68 | -2.79 | 1.004 |
| summer temperature | -0.07 | 0.16 | -0.40 | -0.35 | 0.19 | 0.24 | 1.001 |
| temperature variability | 0.43 | 0.20 | 0.05 | 0.11 | 0.76 | 0.83 | 1.002 |
| summer precipitation | -0.02 | 0.19 | -0.40 | -0.34 | 0.29 | 0.36 | 1.001 |
| solar radiation | -0.06 | 0.12 | -0.29 | -0.25 | 0.13 | 0.17 | 1.002 |
| terrain ruggedness | 0.09 | 0.13 | -0.17 | -0.13 | 0.30 | 0.34 | 1.002 |
| Tasseled-cap wetness | 0.17 | 0.14 | -0.11 | -0.07 | 0.40 | 0.45 | 1.002 |
| dCWA | 1.18 | 0.23 | 0.75 | 0.81 | 1.57 | 1.65 | 1.004 |
| graminoid cover | -0.02 | 0.11 | -0.25 | -0.21 | 0.16 | 0.20 | 1.001 |
| other shrub cover | 0.17 | 0.11 | -0.04 | -0.01 | 0.35 | 0.39 | 1.002 |
| phi | 7.60 | 1.14 | 5.57 | NA | NA | 10.02 | 1.001 |
| sigma.plotgroup | 0.70 | 0.16 | 0.39 | NA | NA | 1.03 | 1.002 |

### Vaccinium uliginosum

| **param** | **mean** | **sd** | **l95** | **l90** | **u90** | **u95** | **Rhat** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intercept | -3.06 | 0.31 | -3.69 | -4.17 | -2.81 | -2.50 | 1.002 |
| summer temperature | 0.31 | 0.20 | -0.05 | 0.00 | 0.64 | 0.71 | 1.001 |
| temperature variability | 0.15 | 0.18 | -0.20 | -0.14 | 0.44 | 0.50 | 1.001 |
| summer precipitation | 0.24 | 0.18 | -0.12 | -0.06 | 0.54 | 0.60 | 1.001 |
| solar radiation | 0.05 | 0.14 | -0.21 | -0.17 | 0.29 | 0.34 | 1.001 |
| terrain ruggedness | -0.20 | 0.14 | -0.49 | -0.44 | 0.03 | 0.07 | 1.001 |
| Tasseled-cap wetness | 0.44 | 0.16 | 0.14 | 0.19 | 0.71 | 0.76 | 1.001 |
| dCWA | 0.97 | 0.24 | 0.52 | 0.59 | 1.37 | 1.45 | 1.002 |
| graminoid cover | 0.16 | 0.14 | -0.12 | -0.07 | 0.39 | 0.43 | 1.001 |
| other shrub cover | 0.00 | 0.10 | -0.20 | -0.16 | 0.18 | 0.21 | 1.001 |
| phi | 9.02 | 1.42 | 6.50 | NA | NA | 12.05 | 1.001 |
| sigma.plotgroup | 0.66 | 0.15 | 0.39 | NA | NA | 0.97 | 1.001 |