

**Supplemental Table S1.** Standard statistics for co-occurring samples of *M. churchi* (n = 458) and *M. setosa* (n = 870). SD = Standard Deviation. 1) Forest Stand Structure (CCFA = Conifer Cover from Above, HCFA = Hardwood Cover from Above, OSTD = Overstorey Tree Diameter, TCFA = Total Tree Cover from Above, TSIZ = Tree Size Class, MUSYM = Soil-type); 2) Mesoscale Climate (EVAP = Evapotranspiration, PASM = Average Annual Summer Precipitation, PAWN = Average Annual Winter Precipitation, TASM = Average Annual Summer Temperature, TAWN = Average Annual Winter Temperature; 3) Exposure-Distance (ASPC = Aspect, DNST = Distance to Nearest Stream (m), ELEV = Elevation, HLSD = Hill-shade, SLOPE = Slope; 4) Average Monthly Minimum Temperature (TMIN), 5) Average Monthly Maximum Temperature (TMAX), and 6) Average Monthly Precipitation (PPT). Numbers for monthly variables are arranged 1–12 (i.e., Jan–Dec) and average annual temperature totals = TMINAN and TMAXAN. (SD = Standard Deviation, AD = Anderson-Darling statistic)

S1a. *M. churchi* statistics

| Variable Category      | Variable | $\bar{x}$ | Min   | Max    | Range  | SD    | AD    | P-value |
|------------------------|----------|-----------|-------|--------|--------|-------|-------|---------|
| Forest Stand Structure | CCFA     | 47.9      | 1.0   | 95.0   | 94.0   | 22.9  | 10.0  | < 0.001 |
| Forest Stand Structure | HCFA     | 10.7      | 1.0   | 85.0   | 84.0   | 15.2  | 73.0  | < 0.001 |
| Forest Stand Structure | OSTD     | 20.2      | 1.0   | 40.0   | 39.0   | 9.4   | 45.0  | < 0.001 |
| Forest Stand Structure | TCFA     | 59.6      | 1.0   | 95.0   | 94.0   | 25.9  | 18.0  | < 0.001 |
| Forest Stand Structure | TSIZ     | 4.0       | 1.0   | 5.0    | 4.0    | 1.2   | 48.0  | < 0.001 |
| Forest Stand Structure | MUSYM    | 527.9     | 509.0 | 725.0  | 216.0  | 55.3  | 143.0 | < 0.001 |
| Mesoscale Climate      | EVAP     | 32.6      | 26.6  | 34.9   | 8.3    | 1.2   | 12.0  | < 0.001 |
| Mesoscale Climate      | PANN     | 955.8     | 764.4 | 2016.7 | 1252.3 | 207.7 | 33.0  | < 0.001 |
| Mesoscale Climate      | PASM     | 30.3      | 25.1  | 72.5   | 47.4   | 6.0   | 48.0  | < 0.001 |
| Mesoscale Climate      | PAWN     | 1200.3    | 953.8 | 2692.3 | 1738.5 | 266.7 | 33.0  | < 0.001 |
| Mesoscale Climate      | TANN     | 11.6      | 10.0  | 13.3   | 3.3    | 0.5   | 34.0  | < 0.001 |
| Mesoscale Climate      | TASM     | 19.9      | 17.8  | 21.9   | 4.1    | 0.6   | 50.0  | < 0.001 |
| Mesoscale Climate      | TAWN     | 5.3       | 3.9   | 6.6    | 2.7    | 0.5   | 41.0  | < 0.001 |
| Exposure-Distance      | ASPC     | 163.9     | 1.0   | 360.0  | 359.0  | 102.7 | 9.0   | < 0.001 |
| Exposure-Distance      | DIST     | 444.4     | 1.1   | 1147.0 | 1145.9 | 261.8 | 2.0   | < 0.001 |
| Exposure-Distance      | ELEV     | 1005.4    | 325.0 | 1692.0 | 1367.0 | 257.7 | 9.0   | < 0.001 |
| Exposure-Distance      | HLSD     | 207.8     | 122.0 | 255.0  | 133.0  | 28.8  | 3.0   | < 0.001 |
| Exposure-Distance      | SLOPE    | 35.1      | 1.0   | 87.0   | 86.0   | 16.8  | 1.0   | 0.001   |

| <b>Variable Category</b>             | <b>Variable</b> | $\bar{x}$ | <b>Min</b> | <b>Max</b> | <b>Range</b> | <b>SD</b> | <b>AD</b> | <b>P-value</b> |
|--------------------------------------|-----------------|-----------|------------|------------|--------------|-----------|-----------|----------------|
| Average Seasonal Minimum Temperature | TMIN1           | -0.5      | -1.6       | 0.9        | 2.5          | 0.4       | 28.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMIN2           | -0.5      | -1.5       | 0.7        | 2.2          | 0.3       | 30.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMIN3           | 0.3       | -0.6       | 1.6        | 2.2          | 0.4       | 51.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMIN4           | 1.6       | 0.7        | 3.0        | 2.2          | 0.4       | 61.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMIN5           | 4.7       | 4.0        | 6.0        | 2.0          | 0.4       | 54.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMIN6           | 7.6       | 6.4        | 8.8        | 2.4          | 0.5       | 22.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMIN7           | 11.6      | 9.5        | 13.6       | 4.1          | 1.0       | 40.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMIN8           | 11.1      | 8.7        | 13.2       | 4.5          | 1.1       | 36.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMIN9           | 8.5       | 5.5        | 11.0       | 5.5          | 1.3       | 32.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMIN10          | 4.4       | 1.8        | 6.5        | 4.7          | 1.2       | 31.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMIN11          | 1.5       | 0.0        | 2.7        | 2.7          | 0.5       | 26.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMIN12          | -0.7      | -1.8       | 0.5        | 2.3          | 0.4       | 21.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMINAN          | 4.1       | 2.6        | 5.2        | 2.5          | 0.6       | 34.0      | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX1           | 8.8       | 7.6        | 10.0       | 2.4          | 0.5       | 9.0       | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX2           | 10.7      | 8.3        | 12.7       | 4.4          | 1.0       | 15.0      | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX3           | 12.8      | 9.7        | 15.4       | 5.8          | 1.3       | 12.0      | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX4           | 15.9      | 11.9       | 19.1       | 7.2          | 1.5       | 11.0      | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX5           | 21.0      | 16.6       | 24.3       | 7.7          | 1.6       | 11.0      | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX6           | 26.0      | 21.3       | 29.0       | 7.7          | 1.6       | 13.0      | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX7           | 31.8      | 27.3       | 35.0       | 7.7          | 1.5       | 10.0      | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX8           | 31.8      | 27.3       | 35.0       | 7.7          | 1.5       | 10.0      | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX9           | 31.6      | 27.2       | 34.7       | 7.5          | 1.5       | 9.0       | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX10          | 28.4      | 24.7       | 31.2       | 6.5          | 1.3       | 9.0       | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX11          | 21.0      | 18.5       | 23.2       | 4.8          | 1.1       | 13.0      | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX12          | 12.5      | 10.4       | 14.4       | 3.9          | 0.8       | 16.0      | < 0.001        |
| Average Seasonal Maximum Temperature | TMAXAN          | 8.0       | 6.7        | 9.3        | 2.5          | 0.5       | 10.0      | < 0.001        |
| Average Seasonal Precipitation       | PPT1            | 202.5     | 156.7      | 418.4      | 261.7        | 34.9      | 43.0      | < 0.001        |
| Average Seasonal Precipitation       | PPT2            | 167.1     | 131.2      | 349.0      | 217.7        | 35.5      | 68.0      | < 0.001        |

| <b>Variable Category</b>       | <b>Variable</b> | $\bar{x}$ | <b>Min</b> | <b>Max</b> | <b>Range</b> | <b>SD</b> | <b>AD</b> | <b>P-value</b> |
|--------------------------------|-----------------|-----------|------------|------------|--------------|-----------|-----------|----------------|
| Average Seasonal Precipitation | PPT3            | 154.7     | 126.8      | 342.2      | 215.4        | 28.9      | 64.0      | < 0.001        |
| Average Seasonal Precipitation | PPT4            | 81.0      | 59.2       | 259.3      | 200.1        | 22.1      | 75.0      | < 0.001        |
| Average Seasonal Precipitation | PPT5            | 50.1      | 39.0       | 155.3      | 116.3        | 11.6      | 83.0      | < 0.001        |
| Average Seasonal Precipitation | PPT6            | 20.7      | 16.6       | 63.1       | 46.5         | 4.4       | 87.0      | < 0.001        |
| Average Seasonal Precipitation | PPT7            | 6.6       | 4.7        | 13.9       | 9.2          | 0.8       | 18.0      | < 0.001        |
| Average Seasonal Precipitation | PPT8            | 6.2       | 3.4        | 15.5       | 12.1         | 1.6       | 16.0      | < 0.001        |
| Average Seasonal Precipitation | PPT9            | 10.8      | 8.6        | 31.0       | 22.4         | 2.4       | 78.0      | < 0.001        |
| Average Seasonal Precipitation | PPT10           | 64.5      | 48.6       | 169.4      | 120.8        | 14.1      | 47.0      | < 0.001        |
| Average Seasonal Precipitation | PPT11           | 122.4     | 101.8      | 337.4      | 235.6        | 25.6      | 64.0      | < 0.001        |
| Average Seasonal Precipitation | PPT12           | 228.3     | 190.9      | 564.9      | 374.0        | 48.0      | 66.0      | < 0.001        |

S1b. *M. setosa* statistics

| <b>Variable Category</b> | <b>Variable</b> | $\bar{x}$ | <b>Min</b> | <b>Max</b> | <b>Range</b> | <b>SD</b> | <b>AD</b> | <b>P-value</b> |
|--------------------------|-----------------|-----------|------------|------------|--------------|-----------|-----------|----------------|
| Forest Stand Structure   | CCFA            | 47.9      | 1.0        | 95.0       | 94.0         | 22.9      | 10.0      | < 0.001        |
| Forest Stand Structure   | HCFA            | 10.7      | 1.0        | 85.0       | 84.0         | 15.2      | 73.0      | < 0.001        |
| Forest Stand Structure   | OSTD            | 20.2      | 1.0        | 40.0       | 39.0         | 9.4       | 45.0      | < 0.001        |
| Forest Stand Structure   | TCFA            | 59.6      | 1.0        | 95.0       | 94.0         | 25.9      | 18.0      | < 0.001        |
| Forest Stand Structure   | TSIZ            | 4.0       | 1.0        | 5.0        | 4.0          | 1.2       | 48.0      | < 0.001        |
| Forest Stand Structure   | MUSYM           | 527.9     | 509.0      | 725.0      | 216.0        | 55.3      | 143.0     | < 0.001        |
| Mesoscale Climate        | EVAP            | 32.6      | 26.6       | 34.9       | 8.3          | 1.2       | 12.0      | < 0.001        |
| Mesoscale Climate        | PANN            | 955.8     | 764.4      | 2016.7     | 1252.3       | 207.7     | 33.0      | < 0.001        |
| Mesoscale Climate        | PASM            | 30.3      | 25.1       | 72.5       | 47.4         | 6.0       | 48.0      | < 0.001        |
| Mesoscale Climate        | PAWN            | 1200.3    | 953.8      | 2692.3     | 1738.5       | 266.7     | 33.0      | < 0.001        |
| Mesoscale Climate        | TANN            | 11.6      | 10.0       | 13.3       | 3.3          | 0.5       | 34.0      | < 0.001        |
| Mesoscale Climate        | TASM            | 19.9      | 17.8       | 21.9       | 4.1          | 0.6       | 50.0      | < 0.001        |
| Mesoscale Climate        | TAWN            | 5.3       | 3.9        | 6.6        | 2.7          | 0.5       | 41.0      | < 0.001        |
| Exposure–Distance        | ASPC            | 163.9     | 1.0        | 360.0      | 359.0        | 102.7     | 9.0       | < 0.001        |
| Exposure–Distance        | DIST            | 444.4     | 1.1        | 1147.0     | 1145.9       | 261.8     | 2.0       | < 0.001        |

| <b>Variable Category</b>             | <b>Variable</b> | $\bar{x}$ | <b>Min</b> | <b>Max</b> | <b>Range</b> | <b>SD</b> | <b>AD</b> | <b>P-value</b> |
|--------------------------------------|-----------------|-----------|------------|------------|--------------|-----------|-----------|----------------|
| Exposure–Distance                    | ELEV            | 1005.4    | 325.0      | 1692.0     | 1367.0       | 257.7     | 9.0       | < 0.001        |
| Exposure–Distance                    | HLSD            | 207.8     | 122.0      | 255.0      | 133.0        | 28.8      | 3.0       | < 0.001        |
| Exposure–Distance                    | SLOPE           | 35.1      | 1.0        | 87.0       | 86.0         | 16.8      | 1.0       | 0.001          |
| Average Seasonal Minimum Temperature | TMIN1           | -0.5      | -1.6       | 0.9        | 2.5          | 0.4       | 28.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMIN2           | -0.5      | -1.5       | 0.7        | 2.2          | 0.3       | 30.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMIN3           | 0.3       | -0.6       | 1.6        | 2.2          | 0.4       | 51.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMIN4           | 1.6       | 0.7        | 3.0        | 2.2          | 0.4       | 61.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMIN5           | 4.7       | 4.0        | 6.0        | 2.0          | 0.4       | 54.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMIN6           | 7.6       | 6.4        | 8.8        | 2.4          | 0.5       | 22.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMIN7           | 11.6      | 9.5        | 13.6       | 4.1          | 1.0       | 40.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMIN8           | 11.1      | 8.7        | 13.2       | 4.5          | 1.1       | 36.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMIN9           | 8.5       | 5.5        | 11.0       | 5.5          | 1.3       | 32.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMIN10          | 4.4       | 1.8        | 6.5        | 4.7          | 1.2       | 31.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMIN11          | 1.5       | 0.0        | 2.7        | 2.7          | 0.5       | 26.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMIN12          | -0.7      | -1.8       | 0.5        | 2.3          | 0.4       | 21.0      | < 0.001        |
| Average Seasonal Minimum Temperature | TMINAN          | 4.1       | 2.6        | 5.2        | 2.5          | 0.6       | 34.0      | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX1           | 8.8       | 7.6        | 10.0       | 2.4          | 0.5       | 9.0       | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX2           | 10.7      | 8.3        | 12.7       | 4.4          | 1.0       | 15.0      | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX3           | 12.8      | 9.7        | 15.4       | 5.8          | 1.3       | 12.0      | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX4           | 15.9      | 11.9       | 19.1       | 7.2          | 1.5       | 11.0      | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX5           | 21.0      | 16.6       | 24.3       | 7.7          | 1.6       | 11.0      | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX6           | 26.0      | 21.3       | 29.0       | 7.7          | 1.6       | 13.0      | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX7           | 31.8      | 27.3       | 35.0       | 7.7          | 1.5       | 10.0      | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX8           | 31.8      | 27.3       | 35.0       | 7.7          | 1.5       | 10.0      | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX9           | 31.6      | 27.2       | 34.7       | 7.5          | 1.5       | 9.0       | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX10          | 28.4      | 24.7       | 31.2       | 6.5          | 1.3       | 9.0       | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX11          | 21.0      | 18.5       | 23.2       | 4.8          | 1.1       | 13.0      | < 0.001        |
| Average Seasonal Maximum Temperature | TMAX12          | 12.5      | 10.4       | 14.4       | 3.9          | 0.8       | 16.0      | < 0.001        |

| <b>Variable Category</b>             | <b>Variable</b> | $\bar{x}$ | <b>Min</b> | <b>Max</b> | <b>Range</b> | <b>SD</b> | <b>AD</b> | <b>P-value</b> |
|--------------------------------------|-----------------|-----------|------------|------------|--------------|-----------|-----------|----------------|
| Average Seasonal Maximum Temperature | TMAXAN          | 8.0       | 6.7        | 9.3        | 2.5          | 0.5       | 10.0      | < 0.001        |
| Average Seasonal Precipitation       | PPT1            | 202.5     | 156.7      | 418.4      | 261.7        | 34.9      | 43.0      | < 0.001        |
| Average Seasonal Precipitation       | PPT2            | 167.1     | 131.2      | 349.0      | 217.7        | 35.5      | 68.0      | < 0.001        |
| Average Seasonal Precipitation       | PPT3            | 154.7     | 126.8      | 342.2      | 215.4        | 28.9      | 64.0      | < 0.001        |
| Average Seasonal Precipitation       | PPT4            | 81.0      | 59.2       | 259.3      | 200.1        | 22.1      | 75.0      | < 0.001        |
| Average Seasonal Precipitation       | PPT5            | 50.1      | 39.0       | 155.3      | 116.3        | 11.6      | 83.0      | < 0.001        |
| Average Seasonal Precipitation       | PPT6            | 20.7      | 16.6       | 63.1       | 46.5         | 4.4       | 87.0      | < 0.001        |
| Average Seasonal Precipitation       | PPT7            | 6.6       | 4.7        | 13.9       | 9.2          | 0.8       | 18.0      | < 0.001        |
| Average Seasonal Precipitation       | PPT8            | 6.2       | 3.4        | 15.5       | 12.1         | 1.6       | 16.0      | < 0.001        |
| Average Seasonal Precipitation       | PPT9            | 10.8      | 8.6        | 31.0       | 22.4         | 2.4       | 78.0      | < 0.001        |
| Average Seasonal Precipitation       | PPT10           | 64.5      | 48.6       | 169.4      | 120.8        | 14.1      | 47.0      | < 0.001        |
| Average Seasonal Precipitation       | PPT11           | 122.4     | 101.8      | 337.4      | 235.6        | 25.6      | 64.0      | < 0.001        |
| Average Seasonal Precipitation       | PPT12           | 228.3     | 190.9      | 564.9      | 374.0        | 48.0      | 66.0      | < 0.001        |

**Supplemental Table S2.** Map symbol (MUSYM), map key (MUKEY), and soil families, found at sites where species were sampled. Bolded percents represent > 2.0% of all soil families, which were used in cumulative bar graphs (Fig. 4B). Soil-types were derived from USDA-NCSS soil survey data (SSURGO) and verified regionally by use of the University of California U.C. Davis Soil Research Lab, SoilWeb Apps. (MC = *M. churchi*, MS = *M. setosa*)

| MUSYM | MUKEY   | Soil Family  | n (MC)    | % (MC)     | n (MS) | % (MS) |
|-------|---------|--|-----------|------------|--------|--------|
| 451hc | 3003442 | Burgsblock-Coolyork-Tannin complex, 15 to 30% slopes   | 1         | 0.2        | 0      | 0.0    |
| 162tw | 1868792 | Indleton-Caris-Hoosimbim complex, 50 to 75% slopes   | 1         | 0.2        | 0      | 0.0    |
| 156tw | 1868784 | Hoosimbim gravelly loam, 30 to 50% slopes  | <b>18</b> | <b>3.9</b> | 0      | 0.0    |
| 151tw | 1868780 | Haysum gravelly loam, 2 to 5% slopes   | 1         | 0.2        | 0      | 0.0    |
| 153tw | 1868770 | Holkat-Hoosimbim complex, 30 to 50% slopes   | 1         | 0.2        | 0      | 0.0    |
| 139tw | 1868760 | Dubakella cobbly clay loam, 30 to 50% slopes   | 1         | 0.2        | 0      | 0.0    |
| 129tw | 1868753 | Crefork clay loam, 15 to 30% slopes  | 2         | 0.4        | 0      | 0.0    |
| 127tw | 1868749 | Crefork loam, 2 to 9% slopes   | 1         | 0.2        | 0      | 0.0    |
| 124tw | 1868745 | Carrcreek gravelly loam, 2 to 5% slopes  | 1         | 0.2        | 0      | 0.0    |
| 258sr | 1868194 | Albus-Race families association, deep, 35 to 70% slopes  | 7         | 1.5        | 4      | 0.5    |
| 256sr | 1868190 | Hecker family, deep, 35 to 70% slopes  | <b>14</b> | <b>3.0</b> | 0      | 0.0    |
| 254sr | 1868188 | Deadwood-Skymor families association, 35 to 70% slopes   | 0         | 0.0        | 1      | 0.1    |
| 237sr | 1868180 | Clallam family, moderately deep, unstable-Melbourne family, deep association, 35 to 70% slopes | 0         | 0.0        | 2      | 0.2    |
| 351   | 470949  | Xerofluvents-River-wash association, 0 to 20 % slopes  | 6         | 1.3        | 0      | 0.0    |
| 346   | 470944  | Weitchpec-Dunsmuir families association, 40 to 60% slopes                                      | 2         | 0.4        | 0      | 0.0    |
| 342   | 470940  | Weitchpec family, 60 to 80% slopes   | 0         | 0.0        | 1      | 0.1    |
| 328   | 470926  | Typic Xerorthents, 60 to 80% slopes  | 0         | 0.0        | 10     | 1.2    |
| 268   | 470866  | Rock outcrop-Neuns family association, 60 to 80% slopes  | 7         | 1.5        | 0      | 0.0    |
| 265   | 470863  | Rock outcrop-Lithic Haploxeralfs-Beaughton family complex, 60 to 80% slopes                    | <b>10</b> | <b>2.2</b> | 0      | 0.0    |
| 259   | 470857  | Rock outcrop-Goulding family complex, 40 to 80% slopes   | 1         | 0.2        | 2      | 0.2    |

|     |        |  |           |            |           |            |
|-----|--------|--|-----------|------------|-----------|------------|
| 230 | 470828 | Neuns family, schist substratum-Neuns family, deep complex, 20 to 40% slopes | 0         | 0.0        | <b>61</b> | <b>7.1</b> |
| 228 | 470826 | Neuns family, deep-Neuns family complex, 40 to 70% slopes                    | 1         | 0.2        | 2         | 0.2        |
| 227 | 470825 | Neuns, deep-Hugo families complex, 20 to 40% slopes                          | 0         | 0.0        | <b>32</b> | <b>3.7</b> |
| 225 | 470823 | Neuns family, deep, 40 to 60% slopes   | 1         | 0.2        | 0         | 0.0        |
| 222 | 470820 | Neuns family-Neuns family, deep complex, 60 to 80% slopes                    | 1         | 0.2        | 0         | 0.0        |
| 218 | 470816 | Neuns-Marpa families complex, 40 to 60% slopes                               | <b>13</b> | <b>2.8</b> | 0         | 0.0        |
| 214 | 470812 | Neuns-Holland, deep families complex, 40 to 80% slopes                       | 0         | 0.0        | 10        | 1.2        |
| 211 | 470809 | Neuns-Holland families complex, 40 to 60% slopes                             | 0         | 0.0        | 6         | 0.7        |
| 209 | 470807 | Neuns-Goulding families association, 60 to 80% slopes                        | <b>25</b> | <b>5.4</b> | 2         | 0.2        |
| 207 | 470805 | Neuns-Deadwood families complex, 60 to 80% slopes                            | 6         | 1.3        | 10        | 1.2        |
| 206 | 470804 | Neuns-Deadwood families complex, 40 to 60% slopes                            | 2         | 0.4        | 4         | 0.5        |
| 205 | 470803 | Neuns-Deadwood families complex, 20 to 40% slopes                            | 0         | 0.0        | 4         | 0.5        |
| 204 | 470802 | Neuns family, 60 to 80% slopes   | <b>14</b> | <b>3.1</b> | <b>18</b> | <b>2.1</b> |
| 203 | 470801 | Neuns family, 40 to 60% slopes   | 6         | 1.3        | <b>17</b> | <b>2.0</b> |
| 202 | 470800 | Neuns family, 20 to 40% slopes   | 1         | 0.2        | 0         | 0.0        |
| 187 | 470785 | Marpa-Neuns families complex, 40 to 60% slopes                               | 0         | 0.0        | 16        | 1.8        |
| 174 | 470772 | Marpa family, 20 to 40% slopes   | 2         | 0.4        | 0         | 0.0        |
| 145 | 470743 | Huntmount-Hugo-Marpa, deep families complex, 15 to 45% slopes                | 1         | 0.2        | 0         | 0.0        |
| 144 | 470742 | Huntmount family, 40 to 60% slopes   | 0         | 0.0        | 2         | 0.2        |
| 143 | 470741 | Hugo, moderately deep-Neuns families complex, 60 to 80% slopes               | 2         | 0.4        | 0         | 0.0        |
| 137 | 470735 | Hugo-Neuns families complex, 20 to 40% slopes                                | 0         | 0.0        | <b>77</b> | <b>8.9</b> |
| 136 | 470734 | Hugo-Holland, deep families complex, 20 to 40% slopes                        | 1         | 0.2        | 1         | 0.1        |
| 135 | 470733 | Hugo-Chaix families complex, 60 to 80% slopes                                | <b>37</b> | <b>8.0</b> | 0         | 0.0        |
| 134 | 470732 | Hugo-Chaix families complex, 40 to 60% slopes                                | 2         | 0.4        | 0         | 0.0        |
| 133 | 470731 | Hugo family, 60 to 80% slopes  | 0         | 0.0        | 14        | 1.6        |

|     |        |  |            |             |            |             |
|-----|--------|--|------------|-------------|------------|-------------|
| 131 | 470729 | Hugo family, 15 to 40% slopes                                    | 1          | 0.2         | <b>43</b>  | <b>5.0</b>  |
| 127 | 470725 | Holland, deep-Neuns families complex, 40 to 60% slopes           | <b>28</b>  | <b>6.0</b>  | 4          | 0.5         |
| 121 | 470719 | Holland, deep-Hugo families complex, 20 to 40% slopes            | 5          | 1.1         | <b>438</b> | <b>50.6</b> |
| 120 | 470718 | Holland family, deep-Holland family complex, 40 to 60% slopes    | <b>11</b>  | <b>2.4</b>  | 0          | 0.0         |
| 117 | 470715 | Holland family, deep, 40 to 60% slopes                           | 0          | 0.0         | 2          | 0.2         |
| 116 | 470714 | Holland family, deep, 20 to 40% slopes                           | 4          | 0.9         | 8          | 0.9         |
| 106 | 470704 | Holland-Neuns families complex, 20 to 40% slopes                 | <b>11</b>  | <b>2.4</b>  | 6          | 0.7         |
| 104 | 470702 | Holland family-Holland family, deep complex, 20 to 40% slopes    | 5          | 1.1         | 0          | 0.0         |
| 96  | 470694 | Hohmann-Neuns families complex, 40 to 60% slopes                 | <b>104</b> | <b>22.5</b> | 2          | 0.2         |
| 95  | 470691 | Hohmann-Hugo families complex, 40 to 60% slopes                  | 0          | 0.0         | 1          | 0.1         |
| 85  | 470683 | Goulding family-Rock outcrop complex, 50 to 80% slopes           | 3          | 0.6         | 0          | 0.0         |
| 84  | 470682 | Goulding-Neuns families association, 50 to 80% slopes            | 1          | 0.2         | 4          | 0.5         |
| 81  | 470679 | Goulding family, 60 to 80% slopes                                | 1          | 0.2         | 4          | 0.5         |
| 66  | 470664 | Forbes family, 20 to 40% slopes.                                 | 0          | 0.0         | 4          | 0.5         |
| 61  | 470659 | Etsel family, 40 to 80% slopes.                                  | 0          | 0.0         | <b>18</b>  | <b>2.1</b>  |
| 54  | 470652 | Dunsmuir-Olete families complex, 20 to 40% slopes.               | 0          | 0.0         | 1          | 0.1         |
| 52  | 470650 | Dunsmuir-Dubakella-Weitchpec families complex, 40 to 60% slopes. | 7          | 1.5         | 0          | 0.0         |
| 50  | 470648 | Dunsmuir family, 15 to 40% slopes.                               | 0          | 0.0         | 6          | 0.7         |
| 47  | 470645 | Dubakella-Weitchpec families complex, 20 to 40% slopes.          | 1          | 0.2         | 0          | 0.0         |
| 43  | 470641 | Dubakella family, 20 to 40% slopes.                              | 3          | 0.6         | 0          | 0.0         |
| 36  | 470635 | Deadwood-Neuns families complex, 60 to 80% slopes                | 6          | 1.3         | 0          | 0.0         |
| 35  | 470633 | Deadwood-Neuns families complex, 40 to 60% slopes.               | 3          | 0.6         | 0          | 0.0         |
| 33  | 470631 | Deadwood family, 60 to 80% slopes.                               | 2          | 0.4         | <b>22</b>  | <b>2.5</b>  |
| 32  | 470630 | Deadwood family, 40 to 60% slopes.                               | <b>11</b>  | <b>2.4</b>  | 0          | 0.0         |
| 25  | 470623 | Chawanakee-Chaix families complex, 60 to 80% slopes.             | 4          | 0.9         | 0          | 0.0         |
| 23  | 470621 | Chawanakee family, 60 to 80% slopes.                             | 7          | 1.5         | 0          | 0.0         |
| 22  | 470620 | Chaix-Hugo families complex, 20 to 40% slopes.                   | 1          | 0.2         | 2          | 0.2         |



|     |        |  |           |            |   |     |
|-----|--------|--|-----------|------------|---|-----|
| 18  | 470616 | Chaix family, 40 to 60% slopes.  | <b>15</b> | <b>3.2</b> | 0 | 0.0 |
| 15  | 470613 | Beaughton-Weitchpec families complex, 20 to 40% slopes.                                | <b>30</b> | <b>6.5</b> | 0 | 0.0 |
| 281 | 470261 | Clallam family, deep, extremely gravelly-Deadwood family association, 35 to 75% slopes | 0         | 0.0        | 3 | 0.3 |
| 260 | 470252 | Skalan-Kristirn-Holland families association, deep, 35 to 70% slopes                   | 0         | 0.0        | 1 | 0.1 |
| 258 | 470250 | Albus-Race families association, deep, 35 to 70% slopes                                | 2         | 0.4        | 0 | 0.0 |
| 256 | 470248 | Hecker family, deep, 35 to 70% slopes  | 2         | 0.4        | 0 | 0.0 |
| 156 | 466059 | Hoosimbim Gravelly Loam, 30 to 50% slopes  | 2         | 0.4        | 0 | 0.0 |
| 129 | 466030 | Crefork Clay Loam, 15 to 30% slopes  | 1         | 0.2        | 0 | 0.0 |
| 128 | 466029 | Crefork Clay Loam, 8 to 15% slopes   | 1         | 0.2        | 0 | 0.0 |
| 127 | 466028 | Crefork Clay Loam, 2 to 9% slopes  | 1         | 0.2        | 0 | 0.0 |
| 124 | 466023 | Carrcreek Gravelly Loam, 2 to 5% slopes  | 1         | 0.2        | 0 | 0.0 |

**Supplemental Table S3.** *M. churchi* pair-wise Spearman rank correlations ( $r_s$ ) between macroscale GIS-based environmental attributes measures for each ample correlation coefficients are below the diagonal and probabilities are above the diagonal. Forest Stand Structure (CCFA = Conifer Cover from Above, HCFA = Hardwood Cover from Above, OSTD = Over-story Tree Diameter, TCFA = Total Tree Cover from Above, TSIZ = Tree Size Class, MUSYM = Soil-type); Mesoscale Climate (EVAP = Evapotranspiration, PASM = Average Annual Summer Precipitation, PAWN = Average Annual Winter Precipitation, TASM = Average Annual Summer Temperature, TAWN = Average Annual Winter Temperature; Exposure-Distance (ASPC = Aspect, DNST = Distance to Nearest Stream (m), ELEV = Elevation, HLSD = Hill-shade, UTM-E = UTM East, and UTM-N = UTM North. The correlation between summer and winter temperatures was high but they were kept as data because they represent seasonal trends. Variables with the strongest pairwise correlations are bolded. Bolded correlations are  $r_s > 0.500$ . P-values: 0.05 = \*, 0.01 = \*\*\*, 0.001 = \*\*\*\*.

| Variable Category      | Variable | UTM-E | UTM-N | CCFA        | HCFA        | OSTD        | TCFA        | TSIZ  | MUSYM        | EVAP         | PASM         | PAWN        | TASM        | TAWN  | ASPC  | DIST | ELEV  | HLSD  | Slope |
|------------------------|----------|-------|-------|-------------|-------------|-------------|-------------|-------|--------------|--------------|--------------|-------------|-------------|-------|-------|------|-------|-------|-------|
| UTM                    | UTM-E    | 1.00  | 0.00  | 0.73        | 0.15        | 0.00        | 0.08        | 0.00  | 0.07         | 0.00         | 0.00         | 0.00        | 0.00        | 0.00  | 0.00  | 0.11 | 0.00  | 0.01  | 0.00  |
| UTM                    | UTM-N    | 0.44  | 1.00  | 0.39        | 0.00        | 0.01        | 0.00        | 0.00  | 0.00         | 0.00         | 0.01         | 0.72        | 0.00        | 0.02  | 0.00  | 0.13 | 0.00  | 0.50  | 0.00  |
| Forest Stand Structure | CCFA     | 0.02  | 0.04  | 1.00        | 0.00        | 0.00        | 0.00        | 0.00  | 0.04         | 0.06         | 0.41         | 0.15        | 0.03        | 0.85  | 0.08  | 0.22 | 0.26  | 0.00  | 0.00  |
| Forest Stand Structure | HCFA     | 0.07  | 0.16  | -0.30       | 1.00        | 0.01        | 0.00        | 0.00  | 0.00         | 0.00         | 0.00         | 0.00        | 0.00        | 0.00  | 0.70  | 0.04 | 0.00  | 0.00  | 0.28  |
| Forest Stand Structure | OSTD     | 0.18  | 0.13  | <b>0.51</b> | 0.12        | 1.00        | 0.00        | 0.00  | 0.00         | 0.00         | 0.00         | 0.00        | 0.84        | 0.05  | 0.05  | 0.04 | 0.00  | 0.05  | 0.00  |
| Forest Stand Structure | TCFA     | 0.08  | 0.23  | <b>0.57</b> | <b>0.58</b> | 0.47        | 1.00        | 0.00  | 0.00         | 0.01         | 0.22         | 0.20        | 0.00        | 0.00  | 0.01  | 0.12 | 0.05  | 0.22  | 0.00  |
| Forest Stand Structure | TSIZ     | 0.19  | 0.14  | <b>0.53</b> | 0.14        | <b>0.79</b> | <b>0.54</b> | 1.00  | 0.00         | 0.00         | 0.00         | 0.00        | 0.62        | 0.09  | 0.00  | 0.05 | 0.00  | 0.10  | 0.00  |
| Forest Stand Structure | MUSYM    | -0.08 | -0.44 | -0.09       | -0.23       | -0.25       | -0.29       | -0.22 | 1.00         | 0.00         | 0.00         | 0.00        | 0.00        | 0.00  | 0.00  | 0.74 | 0.00  | 0.98  | 0.00  |
| Mesoscale Climate      | EVAP     | 0.45  | 0.36  | -0.09       | 0.22        | 0.27        | 0.11        | 0.22  | <b>-0.56</b> | 1.00         | 0.00         | 0.00        | 0.00        | 0.00  | 0.00  | 0.01 | 0.00  | 0.07  | 0.00  |
| Mesoscale Climate      | PASM     | -0.20 | 0.12  | 0.04        | -0.16       | -0.20       | -0.06       | -0.15 | 0.32         | <b>-0.70</b> | 1.00         | 0.00        | 0.00        | 0.00  | 0.00  | 0.02 | 0.00  | 0.06  | 0.01  |
| Mesoscale Climate      | PAWN     | -0.37 | 0.02  | 0.07        | -0.18       | -0.19       | -0.06       | -0.14 | 0.35         | <b>-0.77</b> | <b>0.93</b>  | 1.00        | 0.00        | 0.00  | 0.00  | 0.01 | 0.00  | 0.01  | 0.00  |
| Mesoscale Climate      | TASM     | -0.32 | 0.35  | 0.10        | 0.19        | 0.01        | 0.25        | 0.02  | <b>-0.55</b> | 0.15         | -0.19        | -0.15       | 1.00        | 0.00  | 0.16  | 0.02 | 0.00  | 0.33  | 0.01  |
| Mesoscale Climate      | TAWN     | -0.37 | 0.11  | 0.01        | 0.20        | 0.09        | 0.17        | 0.08  | -0.49        | 0.32         | <b>-0.53</b> | -0.43       | <b>0.78</b> | 1.00  | 0.00  | 0.00 | 0.00  | 0.38  | 0.36  |
| Exposure-Distance      | ASPC     | 0.16  | 0.16  | 0.08        | 0.02        | 0.09        | 0.11        | 0.15  | -0.20        | 0.26         | -0.21        | -0.19       | 0.07        | 0.14  | 1.00  | 0.80 | 0.00  | 0.00  | 0.00  |
| Exposure-Distance      | DIST     | 0.07  | 0.07  | -0.06       | 0.10        | -0.10       | 0.07        | -0.09 | 0.02         | -0.13        | 0.11         | 0.12        | -0.11       | -0.20 | 0.01  | 1.00 | 0.00  | 0.52  | 0.36  |
| Exposure-Distance      | ELEV     | -0.29 | -0.43 | 0.05        | -0.17       | -0.24       | -0.09       | -0.20 | 0.50         | <b>-0.62</b> | 0.49         | <b>0.53</b> | -0.36       | -0.46 | -0.14 | 0.23 | 1.00  | 0.59  | 0.65  |
| Exposure-Distance      | HLSD     | -0.12 | 0.03  | 0.26        | -0.23       | 0.09        | 0.06        | 0.08  | 0.00         | -0.08        | 0.09         | 0.11        | 0.05        | 0.04  | 0.40  | 0.03 | 0.03  | 1.00  | 0.00  |
| Exposure-Distance      | SLOPE    | 0.27  | 0.31  | 0.18        | 0.05        | 0.16        | 0.22        | 0.26  | -0.31        | 0.33         | -0.13        | -0.15       | 0.12        | 0.04  | 0.26  | 0.04 | -0.02 | -0.15 | 1.00  |

**Supplemental Table S4.** *M. setosa* pair-wise Spearman rank correlations ( $r_s$ ) between macroscale GIS-based environmental attributes measures for each ample Correlation coefficients are below the diagonal and probabilities are above the diagonal. Forest Stand Structure (CCFA = Conifer Cover from Above, HCFA = Hardwood Cover from Above, OSTD = Over-story Tree Diameter, TCFA = Total Tree Cover from Above, TSIZ = Tree Size Class, MUSYM = Soil-type); Mesoscale Climate (EVAP = Evapotranspiration, PASM = Average Annual Summer Precipitation, PAWN = Average Annual Winter Precipitation, TASM = Average Annual Summer Temperature, TAWN = Average Annual Winter Temperature; Exposure-Distance (ASPC = Aspect, DNST = Distance to Nearest Stream (m), ELEV = Elevation, HLSD = Hill-shade, UTM-E = UTM East, and UTM-N = UTM North. The correlation between summer and winter temperatures was high but they were kept as data because they represent seasonal trends. Variables with the strongest pairwise correlations are bolded. Bolded correlations are  $r_s > 0.500$ ; P-values: 0.05 = \*, 0.01 = \*\*\*, 0.001 = \*\*\*.

| Variable Category      | Variable | UTM-E | UTM-N        | CCFA        | HCFA  | OSTD  | TCFA  | TSIZ  | MUSYM        | EVAP         | PASM         | PAWN         | TASM         | TAWN  | ASPC  | DIST  | ELEV  | HLSD  | Slope |
|------------------------|----------|-------|--------------|-------------|-------|-------|-------|-------|--------------|--------------|--------------|--------------|--------------|-------|-------|-------|-------|-------|-------|
| UTM                    | UTM-E    | 1.00  | 0.05         | 0.11        | 0.00  | 0.05  | 0.00  | 0.00  | 0.00         | 0.00         | 0.00         | 0.00         | 0.00         | 0.00  | 0.00  | 0.38  | 0.00  | 0.00  | 0.80  |
| UTM                    | UTM-N    | -0.07 | 1.00         | 0.00        | 0.00  | 0.00  | 0.00  | 0.00  | 0.00         | 0.00         | 0.00         | 0.00         | 0.00         | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  |
| Forest Stand Structure | CCFA     | -0.06 | -0.14        | 1.00        | 0.00  | 0.00  | 0.00  | 0.00  | 0.00         | 0.23         | 0.00         | 0.49         | 0.00         | 0.00  | 0.00  | 0.49  | 0.76  | 0.17  | 0.00  |
| Forest Stand Structure | HCFA     | 0.34  | 0.44         | -0.39       | 1.00  | 0.94  | 0.00  | 0.00  | 0.00         | 0.00         | 0.66         | 0.00         | 0.27         | 0.52  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  |
| Forest Stand Structure | OSTD     | 0.07  | 0.15         | 0.25        | 0.00  | 1.00  | 0.00  | 0.00  | 0.00         | 0.00         | 0.00         | 0.00         | 0.01         | 0.09  | 0.19  | 0.00  | 0.00  | 0.00  | 0.00  |
| Forest Stand Structure | TCFA     | 0.24  | 0.23         | <b>0.62</b> | 0.46  | 0.21  | 1.00  | 0.00  | 0.00         | 0.00         | 0.00         | 0.00         | 0.00         | 0.00  | 0.96  | 0.00  | 0.00  | 0.01  | 0.00  |
| Forest Stand Structure | TSIZ     | 0.27  | 0.19         | 0.18        | 0.19  | 0.46  | 0.32  | 1.00  | 0.00         | 0.00         | 0.08         | 0.00         | 0.02         | 0.00  | 0.00  | 0.08  | 0.00  | 0.00  | 0.00  |
| Forest Stand Structure | MUSYM    | -0.33 | <b>-0.64</b> | 0.19        | -0.41 | -0.10 | -0.15 | -0.25 | 1.00         | 0.00         | 0.00         | 0.00         | 0.00         | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  |
| Mesoscale Climate      | EVAP     | -0.10 | <b>0.79</b>  | -0.04       | 0.31  | 0.20  | 0.22  | 0.15  | <b>-0.54</b> | 1.00         | 0.00         | 0.00         | 0.00         | 0.00  | 0.00  | 0.00  | 0.00  | 0.12  | 0.00  |
| Mesoscale Climate      | PASM     | 0.17  | -0.26        | -0.21       | -0.02 | -0.12 | -0.20 | 0.06  | 0.26         | -0.49        | 1.00         | 0.00         | 0.00         | 0.00  | 0.32  | 0.78  | 0.00  | 0.00  | 0.00  |
| Mesoscale Climate      | PAWN     | -0.31 | <b>-0.60</b> | -0.02       | -0.38 | -0.19 | -0.32 | -0.21 | <b>0.66</b>  | <b>-0.73</b> | <b>0.68</b>  | 1.00         | 0.00         | 0.00  | 0.00  | 0.00  | 0.00  | 0.01  | 0.00  |
| Mesoscale Climate      | TASM     | -0.17 | 0.26         | 0.14        | 0.04  | 0.09  | 0.16  | -0.08 | -0.20        | 0.45         | <b>-0.83</b> | <b>-0.63</b> | 1.00         | 0.00  | 0.20  | 0.72  | 0.00  | 0.00  | 0.00  |
| Mesoscale Climate      | TAWN     | -0.27 | 0.18         | 0.16        | -0.02 | 0.06  | 0.14  | -0.15 | -0.11        | 0.39         | <b>-0.85</b> | <b>-0.53</b> | <b>0.96</b>  | 1.00  | 0.85  | 0.04  | 0.00  | 0.00  | 0.00  |
| Exposure-Distance      | ASPC     | 0.14  | 0.13         | -0.16       | 0.19  | -0.05 | 0.00  | 0.15  | -0.26        | 0.24         | -0.03        | -0.25        | 0.04         | -0.01 | 1.00  | 0.00  | 0.00  | 0.00  | 0.06  |
| Exposure-Distance      | DIST     | -0.03 | -0.34        | -0.02       | -0.16 | 0.21  | -0.16 | -0.06 | 0.24         | -0.29        | -0.01        | 0.20         | 0.01         | 0.07  | -0.11 | 1.00  | 0.00  | 0.02  | 0.00  |
| Exposure-Distance      | ELEV     | -0.29 | <b>-0.65</b> | -0.01       | -0.45 | -0.11 | -0.38 | -0.29 | <b>0.72</b>  | <b>-0.65</b> | <b>0.52</b>  | <b>0.78</b>  | <b>-0.50</b> | -0.41 | -0.22 | 0.37  | 1.00  | 0.03  | 0.00  |
| Exposure-Distance      | HLSD     | 0.31  | 0.11         | -0.05       | 0.16  | 0.11  | 0.10  | 0.17  | -0.19        | -0.05        | 0.15         | -0.09        | -0.15        | -0.19 | -0.26 | 0.08  | -0.08 | 1.00  | 0.00  |
| Exposure-Distance      | SLOPE    | -0.01 | 0.27         | 0.13        | 0.14  | 0.13  | 0.23  | 0.14  | -0.27        | 0.34         | -0.28        | -0.34        | 0.34         | 0.30  | 0.07  | -0.24 | -0.39 | -0.29 | 1.00  |