**Supplementary materials**

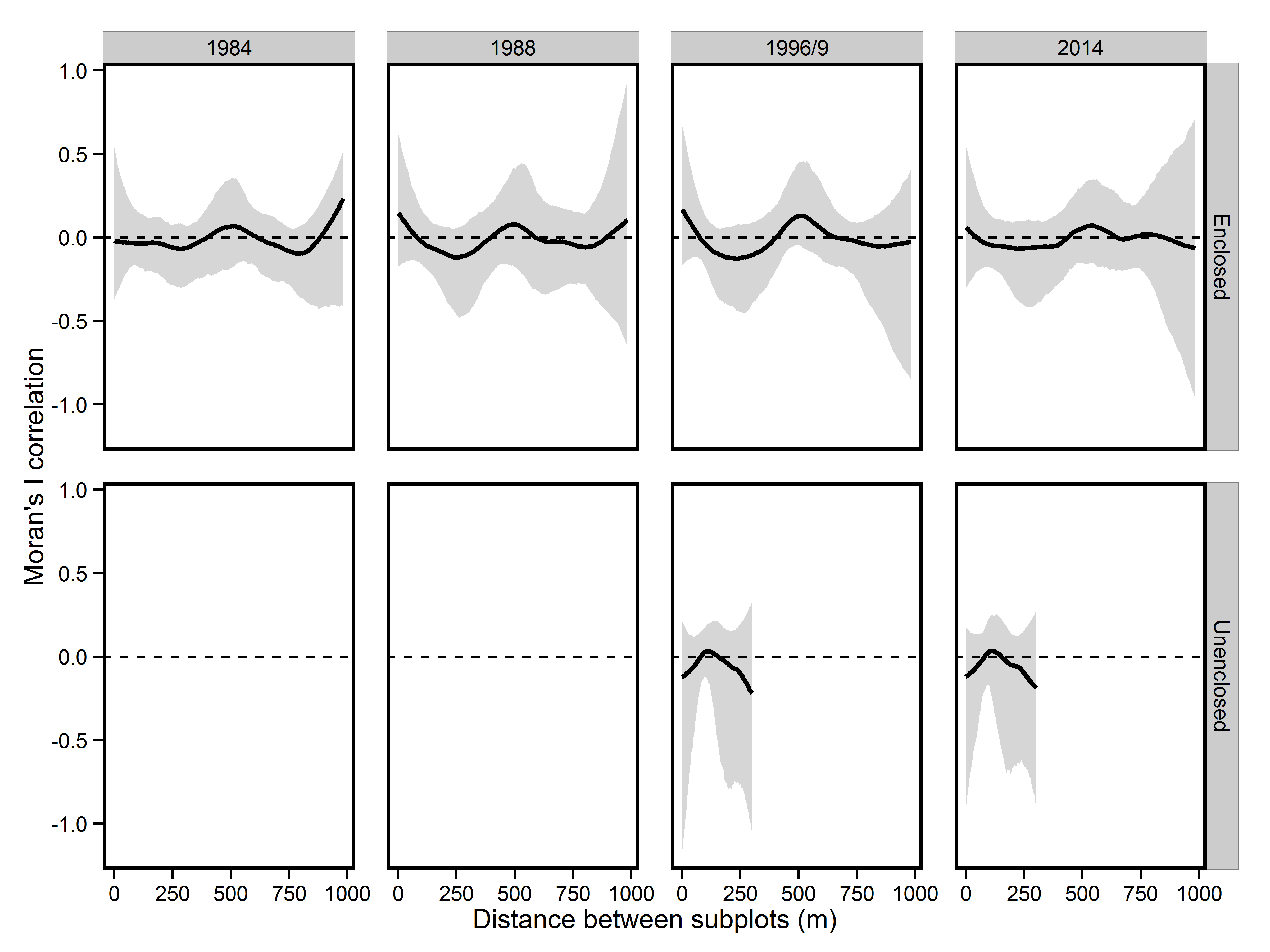


Figure S1 – Relationship between Moran’s I correlation for percentage decline in subplot BA and distance between subplots used in pairwise comparisons for both Enclosed and Unenclosed transects. Solid lines represent median bootstrapped correlations, and the grey shaded area the 95% confidence intervals for these correlations. The dashed line indicates where correlation was equal to zero. At no distance are pairwise correlations deemed to be significantly different from zero (α=0.05) since the grey shaded area overlap zero at all times.

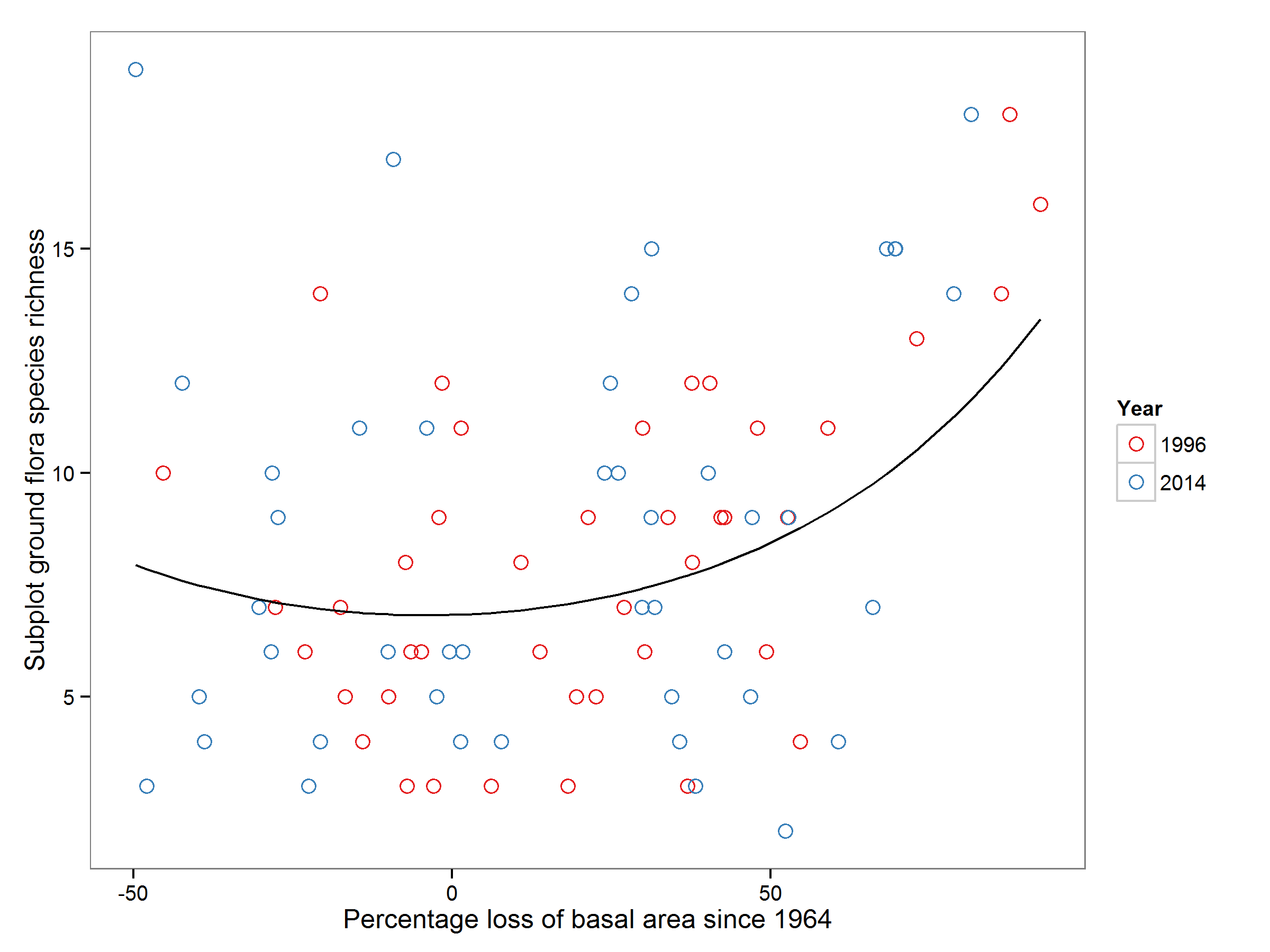


Figure S2 – Relationship between percentage loss in subplot basal area and ground flora species richness. Circles represent individual subplots on the enclosed transect surveyed in 1996 (red) or 2014 (blue). The line represents model averaged coefficients where ΔAICc≤7 (marginal R2=0.13). Only subplots from the enclosed transect are included in this figure as data on ground cover was missing for the unenclosed transect for 1964.

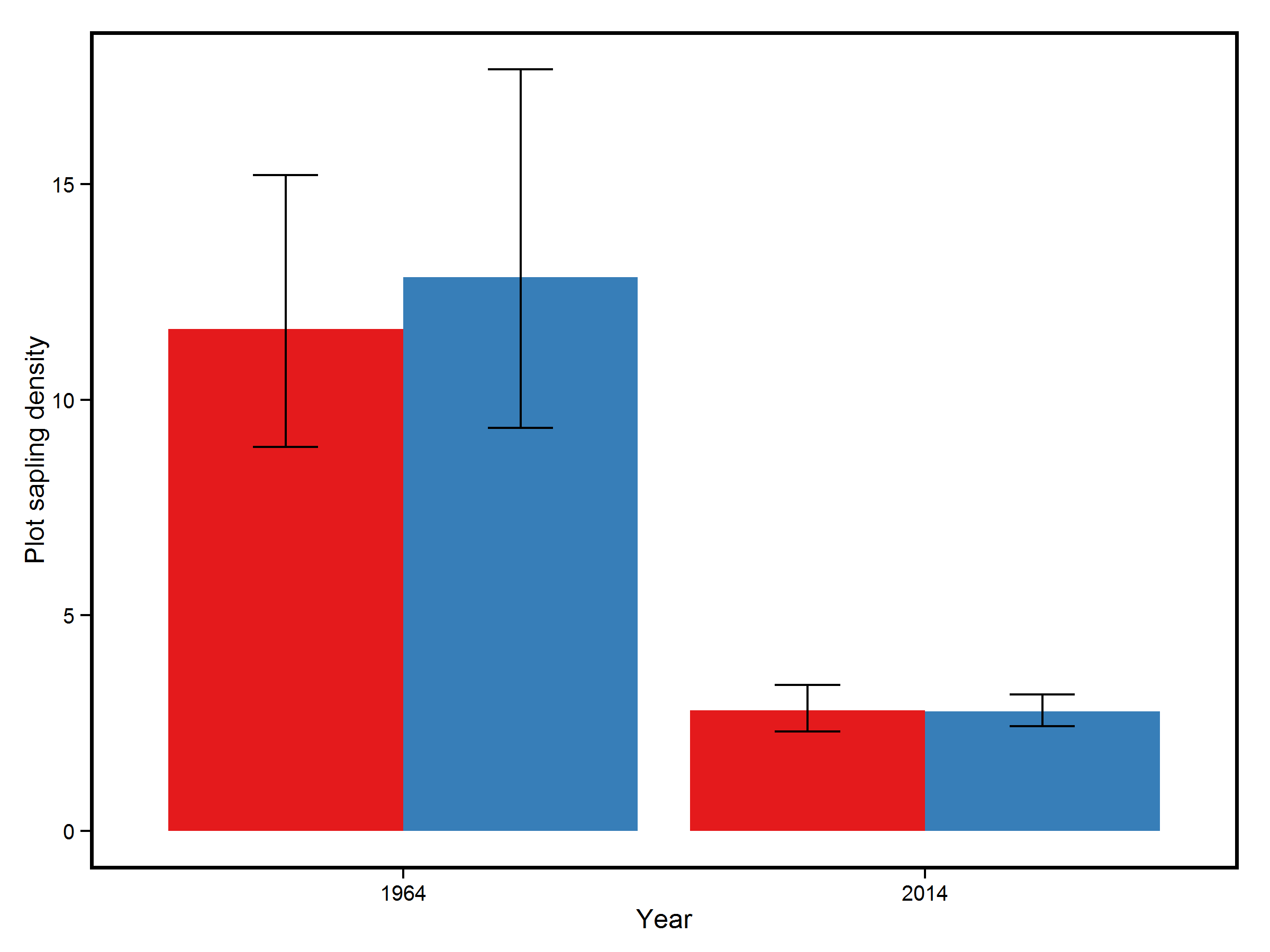


Figure S3 - Differences in stem density for beech seedlings in subplots that collapsed at some point from 1964-2014 (red) and those that remained stable (blue) for the years 1964 and 2014. Bars represent model averaged coefficients of generalised mixed models and error bars 95% confidence intervals of these coefficients.

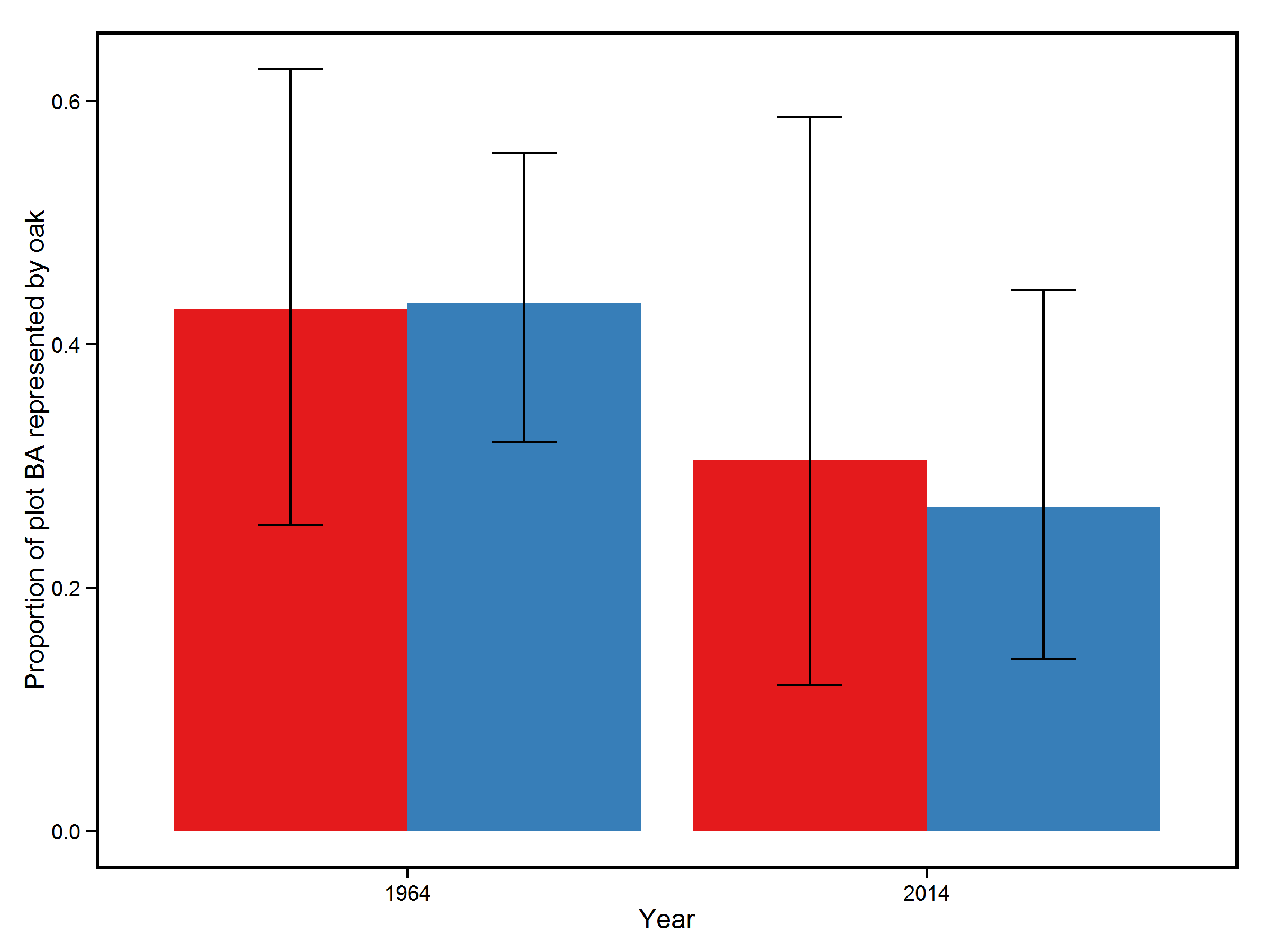


Figure S4 - Differences in the proportion of subplot BA represented by oak for subplots that collapsed at some point from 1964-2014 (red) and those that remained stable (blue) for the years 1964 and 2014. Bars represent model averaged coefficients of generalised mixed models and error bars 95% confidence intervals of these coefficients.

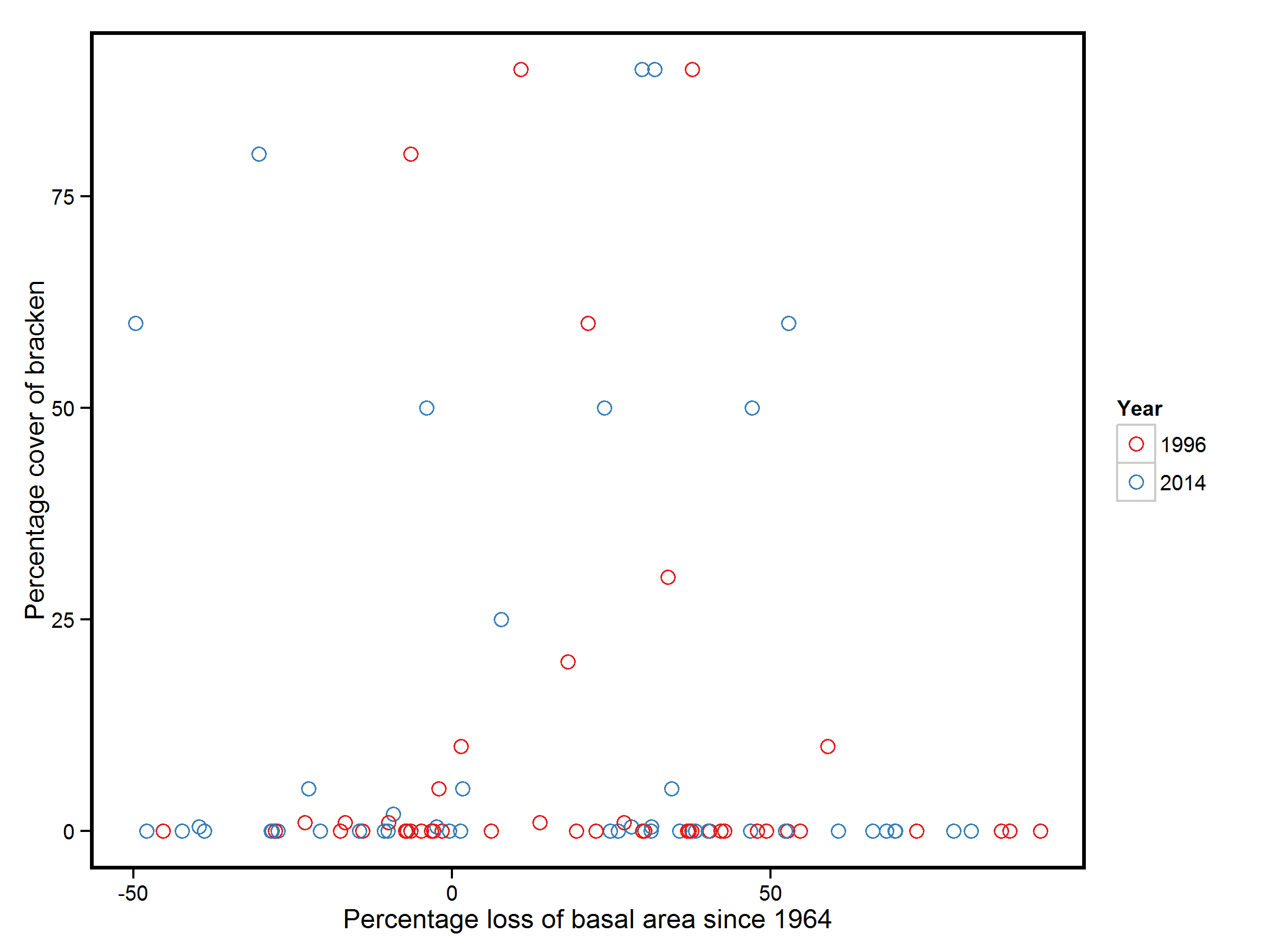


Figure S5 – Lack of relationship between percentage loss of subplot basal area and the percentage cover of bracken

Table S1 – Models considered for explanation of changes in subplot BA and associated measures of parsimony (AICc), support (ΔAICc, AICc weight) and goodness of fit (Marginal R2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Model structure** | Degrees of freedom | Log likelihood | AICc | ΔAICc | AICc weight | Marginal R2 |
| Year\*Collapse | 6 | -468.323 | 949.376 | 0 | 1 | 0.338 |
| Collapse | 5 | -502.907 | 1016.331 | 66.955 | <0.01 | 0.152 |
| Year+Collapse | 4 | -506.528 | 1021.398 | 72.0217 | <0.01 | 0.126 |
| Year | 4 | -515.866 | 1040.074 | 90.698 | <0.01 | 0.027 |
| Null model | 3 | -519.487 | 1045.178 | 95.802 | <0.01 | 0 |

Table S2 – Coefficient estimates for the most parsimonious model explaining changes in subplot basal area for the period 1964-2014. For the purposes of the model Year was standardised to reflect years after 1964, so the intercept is an estimate of BA for stable subplots

Coefficients for collapsed plots

Full model-averaged coefficients (with shrinkage):

Estimate Std. Error Adjusted SE z value Pr(>|z|)

(Intercept) 4.856e+01 2.534e+00 2.552e+00 19.027 < 2e-16 \*\*\*

Year2 -5.334e-01 1.506e-01 1.508e-01 3.537 0.000404 \*\*\*

I(Year2^2) -1.993e-05 7.178e-03 7.183e-03 0.003 0.997787

I(Year2^3) 8.060e-06 9.692e-05 9.697e-05 0.083 0.933762

---

Coefficients for stable plots

Full model-averaged coefficients (with shrinkage):

Estimate Std. Error Adjusted SE z value Pr(>|z|)

(Intercept) 3.932e+01 3.208e+00 3.247e+00 12.112 <2e-16 \*\*\*

Year2 1.455e-01 2.402e-02 2.429e-02 5.990 <2e-16 \*\*\*

I(Year2^2) 8.458e-06 1.621e-04 1.626e-04 0.052 0.959

I(Year2^3) 9.358e-10 6.105e-07 6.122e-07 0.002 0.999

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Estimate | SE | T value | P value |
| Intercept | 39.799 | 3.062 | 12.996 | <0.001 |
| Year | 7.820 | 2.351 | 3.327 | <0.001 |
| Collapsed | 9.792 | 3.830 | 2.557 | 0.0105 |
| Year\*Collapse | -31.644 | 2.940 | -10.763 | <0.001 |

Table S3 - Generalised linear mixed models considered for explanation of changes in subplot stem density and associated measures of parsimony (AICc), support (ΔAICc, AICc weight) and goodness of fit (Marginal R2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Model structure** | Degrees of freedom | Log likelihood | AICc | ΔAICc | AICc weight | Marginal R2 |
| Year\*Collapse | 7 | -838.301 | 1691.024 | 0 | 0.98 | 0.37 |
| Year | 5 | -844.697 | 1699.619 | 8.59 | 0.01 | 0.31 |
| Year+Collapse | 6 | -844.502 | 1701.32 | 10.30 | <0.01 | 0.32 |
| Null model | 4 | -888.421 | 1784.992 | 93.97 | <0.01 | 0 |
| Collapse | 5 | -888.334 | 1786.893 | 95.87 | <0.01 | <0.01 |

Table S4 – Coefficient estimates for the most parsimonious model explaining changes in subplot stem density for the period 1964-2014, note that coefficients are in log units due to use of poisson generalised linear mixed models

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model Parameter | Estimate | SE | z.value | P value |
| Intercept | 3.286 | 0.102 | 32.269 | <0.0001 |
| Collapsed | -0.015 | 0.128 | -0.117 | 0.91 |
| Year | -0.017 | 0.003 | -6.573 | <0.001 |
| Collapsed\*Year | -0.012 | 0.003 | -3.697 | <0.001 |

Table S5 - Generalised linear mixed models considered for explanation of changes in subplot stem density for trees >45cm DBH and associated measures of parsimony (AICc), support (ΔAICc, AICc weight) and goodness of fit (Marginal R2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Model structure** | **Degrees of freedom** | **Log likelihood** | **AICc** | **ΔAICc** | **AICc weight** | **Marginal R2** |
| Year\*Collapse | 5 | -210.001 | 430.519 | 0 | 1 | 0.214 |
| Year+Collapse | 4 | -218.823 | 445.988 | 15.469 | <0.001 | 0.073 |
| Collapse | 3 | -220.788 | 447.780 | 17.261 | <0.001 | 0.040 |
| Year | 3 | -221.053 | 448.310 | 17.791 | <0.001 | 0.037 |
| Null model | 2 | -223.018 | 450.137 | 19.618 | <0.001 | 0 |

Table S6 - Coefficient estimates for the most parsimonious model explaining changes in subplot stem density for trees >45cm DBH for the period 1964-2014, note that coefficients are in log units due to use of poisson generalised linear mixed models

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Model Parameter** | **Estimate** | **SE** | **z.value** | **P value** |
| Intercept | 1.020 | 0.128 | 7.965 | <0.001 |
| Year | 0.320 | 0.168 | 1.902 | 0.057 |
| Collapse | 0.200 | 0.155 | 1.288 | 0.198 |
| Year\*Collapse | -0.926 | 0.223 | -4.151 | <0.001 |

Table S7 - Generalised linear mixed models considered for explanation of changes in subplot stem density for trees 25-45cm DBH and associated measures of parsimony (AICc), support (ΔAICc, AICc weight) and goodness of fit (Marginal R2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Model structure** | **Degrees of freedom** | **Log likelihood** | **AICc** | **ΔAICc** | **AICc weight** | **Marginal R2** |
| Collapse | 3 | -222.685 | 451.574 | 0 | 0.558 | 0.144 |
| Collapse+Year | 4 | -222.214 | 452.771 | 1.197 | 0.307 | 0.147 |
| Collapse\*Year | 5 | -221.979 | 454.474 | 2.901 | 0.131 | 0.146 |
| Null model | 2 | -229.092 | 462.285 | 10.711 | 0.003 | 0 |
| Year | 3 | -228.621 | 463.446 | 11.872 | 0.001 | 0.003 |

Table S8 - Coefficient estimates for the most parsimonious model explaining changes in subplot stem density for trees 25-45cm DBH for the period 1964-2014, note that coefficients are in log units due to use of poisson generalised linear mixed models

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model Parameter | Estimate | SE | z.value | P value |
| Intercept | 1.095 | 0.167 | 6.477 | <0.0001 |
| Collapse | -0.779 | 0.218 | 3.544 | <0.0001 |
| Year | -0.062 | 0.118 | 0.527 | 0.599 |
| Year\*Collapse | 0.022 | 0.105 | 0.208 | 0.835 |

Table S9 - Generalised linear mixed models considered for explanation of changes in subplot stem density for trees 15-25cm DBH and associated measures of parsimony (AICc), support (ΔAICc, AICc weight) and goodness of fit (Marginal R2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Model structure** | **Degrees of freedom** | **Log likelihood** | **AICc** | **ΔAICc** | **AICc weight** | **Marginal R2** |
| Collapse\*Year | 5 | -251.932 | 514.381 | 0 | 0.423 | 0.124 |
| Collapse+Year | 4 | -253.216 | 514.774 | 0.393 | 0.348 | 0.109 |
| Collapse | 3 | -254.762 | 515.727 | 1.346 | 0.216 | 0.090 |
| Year | 3 | -258.000 | 522.204 | 7.823 | 0.008 | 0.019 |
| Null model | 2 | -259.545 | 523.191 | 8.810 | 0.005 | 0 |

Table S10 - Coefficient estimates for the most parsimonious model explaining changes in subplot stem density for trees 15-25cm DBH for the period 1964-2014, note that coefficients are in log units due to use of poisson generalised linear mixed models

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model Parameter | Estimate | SE | z.value | P value |
| Intercept | 1.246 | 0.076 | 16.297 | <0.0001 |
| Year | -0.070 | 0.088 | 0.796 | 0.426 |
| Collapse | -0.446 | 0.113 | 3.933 | <0.001 |
| Year\*Collapse | -0.136 | 0.172 | 0.790 | 0.429 |

Table S11 - Generalised linear mixed models considered for explanation of changes in subplot stem density for trees 10-15cm DBH and associated measures of parsimony (AICc), support (ΔAICc, AICc weight) and goodness of fit (Marginal R2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Model structure** | **Degrees of freedom** | **Log likelihood** | **AICc** | **ΔAICc** | **AICc weight** | **Marginal R2** |
| Year | 3 | -243.417 | 493.038 | 0 | 0.422 | 0.280 |
| Year\*Collapse | 5 | -241.292 | 493.100 | 0.063 | 0.409 | 0.307 |
| Year+Collapse | 4 | -243.261 | 494.863 | 1.825 | 0.169 | 0.283 |
| Null model | 2 | -283.497 | 571.094 | 78.058 | <0.001 | 0 |
| Collapse | 3 | -283.34 | 572.884 | 79.846 | <0.001 | 0.006 |

Table S12 - Coefficient estimates for the most parsimonious model explaining changes in subplot stem density for trees 10-15cm DBH for the period 1964-2014, note that coefficients are in log units due to use of poisson generalised linear mixed models

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model Parameter | Estimate | SE | z.value | P value |
| Intercept | 1.252 | 0.030 | 0.030 | <0.0001 |
| Year | -0.931 | 0.148 | 0.148 | <0.001 |
| Collapse | -0.005 | 0.047 | 0.047 | 0.920 |
| Year\*Collapse | -0.208 | 0.250 | 0.250 | 0.400 |

Table S13 - Generalised linear mixed models considered for explanation of changes in subplot tree species richness and associated measures of parsimony (AICc), support (ΔAICc, AICc weight) and goodness of fit (Marginal R2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Model structure** | **Degrees of freedom** | **Log likelihood** | **AICc** | **ΔAICc** | **AICc weight** | **Marginal R2** |
| BA | 3 | -326.643 | 659.401 | 0 | 0.480 | 0.031 |
| BA+BA2 | 4 | -325.635 | 659.463 | 0.061 | 0.465 | 0.048 |
| Null model | 2 | -329.838 | 663.734 | 4.333 | 0.055 | 0 |

Table S14 - Coefficient estimates for the most parsimonious model explaining changes in subplot subplot tree species richness, note that coefficients are in log units due to use of poisson generalised linear mixed models

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model Parameter | Estimate | SE | z.value | P value |
| Intercept | 1.039 | 0.049 | 0.049 | <0.0001 |
| BA loss since 1964 | -0.284 | 0.108 | 0.109 | 0.009 |
| BA loss since 19642 | -0.083 | 0.104 | 0.105 | 0.428 |

Table S15 - Linear mixed models considered for explanation of changes in subplot tree community composition using the Tanner index and associated measures of parsimony (AICc), support (ΔAICc, AICc weight) and goodness of fit (Marginal R2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Model structure** | **Degrees of freedom** | **Log likelihood** | **AICc** | **ΔAICc** | **AICc weight** | **Marginal R2** |
| BA loss+BA loss2 | 8 | -108.801 | 234.311 | 0 | 1 | 0.47 |
| BA loss | 7 | -130.077 | 274.702 | 40.39 | <0.01 | 0.40 |
| Null model | 6 | -135.940 | 284.290 | 50.00 | <0.01 | 0 |

Table S16 - Coefficient estimates for the most parsimonious linear mixed model explaining changes in subplot tree community composition using the Tanner index

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model Parameter | Estimate | SE | z.value | P value |
| Intercept | 1.255 | 0.201 | 6.245 | <0.001 |
| BA loss | 1.453 | 0.137 | 10.633 | <0.001 |
| BA loss2 | -0.763 | 0.101 | -7.539 | <0.001 |

Table S17 - Linear mixed models considered for explanation of changes in subplot grass cover and associated measures of parsimony (AICc), support (ΔAICc, AICc weight) and goodness of fit (Marginal R2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Model structure** | **Degrees of freedom** | **Log likelihood** | **AICc** | **ΔAICc** | **AICc weight** | **Marginal R2** |
| Year\*Collapse | 8 | -284.812 | 586.757 | 0 | 0.99 | 0.44 |
| Year+Collapse | 6 | -291.873 | 596.398 | 9.641 | <0.01 | 0.40 |
| Year | 5 | -295.229 | 600.919 | 14.161 | <0.01 | 0.36 |
| Collapse | 4 | -327.115 | 662.535 | 75.778 | <0.01 | 0.05 |
| Null model | 3 | -330.798 | 667.779 | 81.021 | <0.01 | 0 |

Table S18 - Coefficient estimates for the most parsimonious linear mixed model explaining changes in subplot grass cover

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Model parameter** | **Estimate** | **SE** | **df** | **T value** | **P value** |
| Intercept | -5.324 | 0.455 | 112.427 | -11.699 | <0.001 |
| 1996 | 2.426 | 0.555 | 87.501 | 4.371 | <0.001 |
| 2014 | 2.106 | 0.555 | 87.501 | 3.794 | <0.001 |
| Collapse | -0.289 | 0.617 | 112.427 | -0.467 | 0.640 |
| 1996\*Collapse | 1.967 | 0.748 | 86.787 | 2.631 | 0.009 |
| 2014\*Collapse | 2.495 | 0.748 | 86.787 | 3.338 | <0.001 |

Table S19 - Linear mixed models considered for explanation of differences in subplot grass cover over the gradient of collapse and associated measures of parsimony (AICc), support (ΔAICc, AICc weight) and goodness of fit (Marginal R2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Model structure** | **Degrees of freedom** | **Log likelihood** | **AICc** | **ΔAICc** | **AICc weight** | **Marginal R2** |
| BA+BA2+BA3 | 8 | -169.230 | 356.2 | 0 | 0.721 | 0.385 |
| BA+BA2 | 7 | -171.398 | 358.2 | 1.9 | 0.276 | 0.380 |
| BA | 6 | -176.957 | 366.9 | 10.7 | 0.003 | 0.327 |
| Null model | 5 | -181.262 | 373.2 | 17.0 | <0.001 | 0 |

Table S20 - Coefficient estimates from model averaging of linear mixed models considered for explanation of differences in subplot grass cover over the gradient of collapse

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Model parameter** | **Estimate** | **SE** | **Z value** | **P value** |
| Intercept | -2.6180 | 0.2633 | 9.799 | <0.001 |
| Loss in BA since 1964 | 1.8238 | 0.8158 | 2.203 | 0.0276 |
| Loss in BA since 19642 | 3.4729 | 2.2121 | 1.547 | 0.122 |
| Loss in BA since 19643 | 0.7975 | 2.546 | 0.276 | 0.783 |

Table S21 – Generalised linear mixed models considered for explanation of differences in subplot ground flora species richness over the gradient of collapse and associated measures of parsimony (AICc), support (ΔAICc, AICc weight) and goodness of fit (Marginal R2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Model structure** | **Degrees of freedom** | **Log likelihood** | **AICc** | **ΔAICc** | **AICc weight** | **Marginal R2** |
| BA+BA2 | 4 | -222.095 | 452.677 | 0 | 0.682 | 0.136 |
| BA+BA2+BA3 | 5 | -222.063 | 454.867 | 2.190 | 0.228 | 0.135 |
| BA | 3 | -225.593 | 457.476 | 4.798 | 0.062 | 0.057 |
| Null model | 2 | -227.447 | 459.037 | 6.360 | 0.028 | 0 |

Table S22 - Coefficient estimates from model averaging of generalised linear mixed models considered for explanation of differences in subplot ground flora species richness over the gradient of collapse

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Model parameter** | **Estimate** | **SE** | **Z value** | **P value** |
| Intercept | 1.903 | 0.079 | 23.693 | <0.001 |
| Loss in BA since 1964 | -0.027 | 0.239 | 0.241 | 0.912 |
| Loss in BA since 19642 | 1.03402 | 0.369 | 2.762 | 0.006 |

Table S23 - Linear mixed models considered for explanation of differences in community weighted Ellenburg light indicator values for subplot ground flora over the gradient of collapse and associated measures of parsimony (AICc), support (ΔAICc, AICc weight) and goodness of fit (Marginal R2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Model structure** | **Degrees of freedom** | **Log likelihood** | **AICc** | **ΔAICc** | **AICc weight** | **Marginal R2** |
| BA | 4 | -35.818 | 80.124 | 0 | 0.593 | 0.100 |
| BA+BA2 | 5 | -35.932 | 82.606 | 2.482 | 0.171 | 0.101 |
| Null model | 3 | -38.383 | 83.054 | 2.931 | 0.137 | 0 |
| BA+BA2+ BA3 | 6 | -35.332 | 83.715 | 3.591 | 0.098 | 0.102 |

Table S23 - Coefficient estimates from model averaging of linear mixed models considered for explanation of differences in community weighted Ellenburg light indicator values for subplot ground flora over the gradient of collapse

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Model parameter** | **Estimate** | **SE** | **Z value** | **P value** |
| Intercept | -6.432 | 0.066 | 96.433 | <0.001 |
| Loss in BA since 1964 | 0.409 | 0.185 | 2.173 | 0.030 |
| Loss in BA since 19642 | -0.090 | 0.358 | 0.247 | 0.805 |
| Loss in BA since 19643 | -0.011 | 0.420 | 0.026 | 0.979 |

Table S24 – Linear mixed models considered for explanation of differences in community weighted Ellenburg nitrogen indicator values for subplot ground flora over the gradient of collapse and associated measures of parsimony (AICc), support (ΔAICc, AICc weight) and goodness of fit (Marginal R2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Model structure** | **Degrees of freedom** | **Log likelihood** | **AICc** | **ΔAICc** | **AICc weight** | **Marginal R2** |
| Null model | 3 | -106.385 | 219.049 | 0 | 0.508 | 0 |
| BA+BA2+ BA3 | 6 | -103.940 | 220.891 | 1.842 | 0.202 | 0.022 |
| BA+BA2 | 5 | -105.351 | 221.416 | 2.367 | 0.155 | 0.021 |
| BA | 4 | -106.614 | 221.699 | 2.650 | 0.135 | 0.019 |

Table S25 – Linear mixed models considered for explanation of differences in community weighted Ellenburg moisture indicator values for subplot ground flora over the gradient of collapse and associated measures of parsimony (AICc), support (ΔAICc, AICc weight) and goodness of fit (Marginal R2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Model structure** | **Degrees of freedom** | **Log likelihood** | **AICc** | **ΔAICc** | **AICc weight** | **Marginal R2** |
| BA+BA2+ BA3 | 6 | -131.325 | 275.6629 | 0 | 0.413554 | 0.032 |
| BA | 4 | -134.269 | 277.0088 | 1.345966 | 0.210989 | 0.036 |
| BA+BA2 | 5 | -133.187 | 277.0884 | 1.425565 | 0.202757 | 0 |
| Null model | 3 | -135.565 | 277.4093 | 1.746458 | 0.172701 | 0.038 |

Table S26 – Linear mixed models considered for explanation of differences in the proportion of subplot basal area represented by oak trees >10cm DBH and associated measures of parsimony (AICc), support (ΔAICc, AICc weight) and goodness of fit (Marginal R2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Model structure** | **Degrees of freedom** | **Log likelihood** | **AICc** | **ΔAICc** | **AICc weight** | **Marginal R2** |
| Collapse | 4 | -250.115 | 508.574 | 0 | 0.458 | 0.047 |
| Collapse + Year | 5 | -249.986 | 510.493 | 1.919 | 0.176 | 0.051 |
| Null model | 3 | -252.21 | 510.626 | 2.052 | 0.164 | 0 |
| Collapse\*Year | 6 | -249.114 | 510.965 | 2.391 | 0.139 | 0.055 |
| Year | 4 | -252.092 | 512.528 | 3.954 | 0.063 | 0.004 |

Table S27 - Coefficient estimates from model averaging of linear mixed models considered for explanation of differences the proportion of subplot basal area represented by oak trees >10cm DBH

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Model parameter** | **Estimate** | **SE** | **Z value** | **P value** |
| Intercept | -0.338 | 0.425 | 0.789 | 0.430 |
| Collapse | -0.720 | 0.606 | 1.180 | 0.238 |
| Year | -0.053 | 0.235 | 0.222 | 0.824 |
| Collapse\*Year | -0.079 | 0.277 | 0.285 | 0.776 |

Table S28 – Generalised linear mixed models considered for explanation of differences in the subplot abundance of beech saplings and associated measures of parsimony (AICc), support (ΔAICc, AICc weight) and goodness of fit (Marginal R2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Model structure** | **Degrees of freedom** | **Log likelihood** | **AICc** | **ΔAICc** | **AICc weight** | **Marginal R2** |
| Collapse + Year | 4 | -149.444 | 307.309 | 0 | 0.403 | 0.310 |
| Collapse\*Year | 5 | -148.553 | 307.744 | 0.436 | 0.324 | 0.314 |
| Year | 3 | -150.918 | 308.086 | 0.777 | 0.273 | 0.302 |
| Collapse | 3 | -215.043 | 436.336 | 129.027 | <0.001 | <0.001 |
| Null model | 2 | -216.474 | 437.071 | 129.763 | <0.001 | 0.000 |

Table S29 - Coefficient estimates from model averaging of generalised linear mixed models considered for explanation of differences in sapling density

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Model parameter** | **Estimate** | **SE** | **Z value** | **P value** |
| Intercept | 2.454 | 0.137 | 17.786 | <0.001 |
| Collapse | -1.426 | 0.98 | 14.380 | <0.001 |
| Year | 0.099 | 0.162 | 0.605 | 0.545 |
| Collapse\*Year | -0.008 | 0.068 | 0.116 | 0.907 |

Table S30 - Linear mixed models considered for explanation of differences in subplot bracken cover over the gradient of collapse and associated measures of parsimony (AICc), support (ΔAICc, AICc weight) and goodness of fit (Marginal R2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Model structure** | **Degrees of freedom** | **Log likelihood** | **AICc** | **ΔAICc** | **AICc weight** | **Marginal R2** |
| Null model | 3 | 27.973 | -49.668 | 0 | 0.842 | 0 |
| BA | 4 | 26.937 | -45.403 | 4.264 | 0.100 | 0.014 |
| BA+BA2+BA3 | 6 | 28.301 | -43.591 | 6.077 | 0.040 | 0.031 |
| BA+BA2 | 5 | 26.327 | -41.941 | 7.727 | 0.018 | 0.019 |

Table S31 - Coefficient estimates from model averaging of linear mixed models considered for explanation of differences in subplot bracken cover over the gradient of collapse

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Model parameter** | **Estimate** | **SE** | **Z value** | **P value** |
| Intercept | 0.107 | 0.043 | 2.470 | 0.014 |
| BA | 0.033 | 0.101 | 0.320 | 0.749 |
| BA2 | 0.295 | 0.253 | 1.156 | 0.247 |
| BA3 | 0.430 | 0.373 | 1.146 | 0.252 |

**Methods for gradient analysis**

We subset data from the permanent transects in Denny wood to only include those plots which lost ≥75% of the BA they had in 1964 at any point from 1964-2014. Then we calculated the number of years since 1964 (i.e. Year of survey-1964). Following this we modelled the BA of each of these plots using linear mixed models to determine the dynamics of BA change in the plots. Each model had a random effect fitted to account for difference in trajectories of each plot. The models tested were a linear relationship, log and polynomial relationships between time since 1964 and BA.

The model with lowest ranked AICc included only a log relationship with BA. No other models had a ΔAICc<7. The marginal R2 of the top model calculated using the methods of Nakagawa and Schielzeth (2013) was 0.57.

The model predictions were then transformed to percentage change of BA since 1964 by calculating the percentage change in the prediction relative to the value at the intercept. We used this method rather than modelling percentages directly because modelling of percentages produced non-random variance in residual plots, since all plots had a value of 0 at the intercept, thus violating the assumptions of linear models (Warton and Hui, 2011).

Using transformed predictions from the model suggested that plots lost 25% of BA after 2.2 years (Lower CI=2, Upper CI=2.4), 50% by 9 years (Lower CI=7.1,Upper CI=10.7), 75% after 30.2 years (Lower CI=20.0,Upper CI=43.9), and had declined by 89% after 50 years (Lower CI=29.2,Upper CI=79.7).

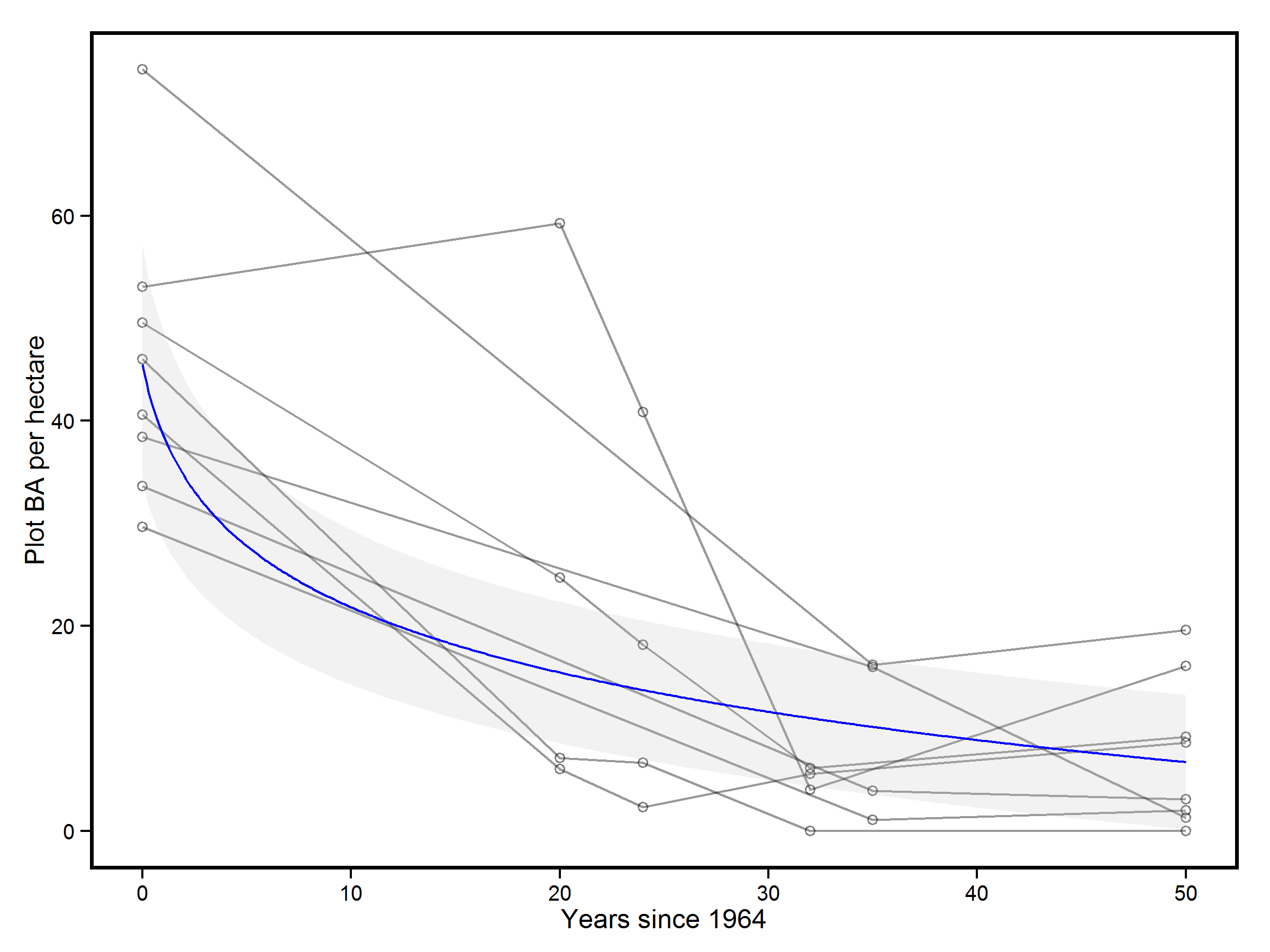
Table 1 - Model selection table for different potential candidate models

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Model variables** | **df** | **Log Likelihood** | **AICc** | **ΔAICc** | **AICc weight** | **Marginal R2** |
| Log(Year+1) | 6 | -119.26 | 253.88 | 0 | 0.99 | 0.57 |
| Year | 6 | -125.04 | 265.43 | 11.56 | <0.01 | 0.52 |
| Year+Year2 | 7 | -124.55 | 267.77 | 13.89 | <0.01 | 0.59 |
| Intercept only (null model) | 5 | -132.76 | 277.82 | 23.95 | <0.01 | 0 |

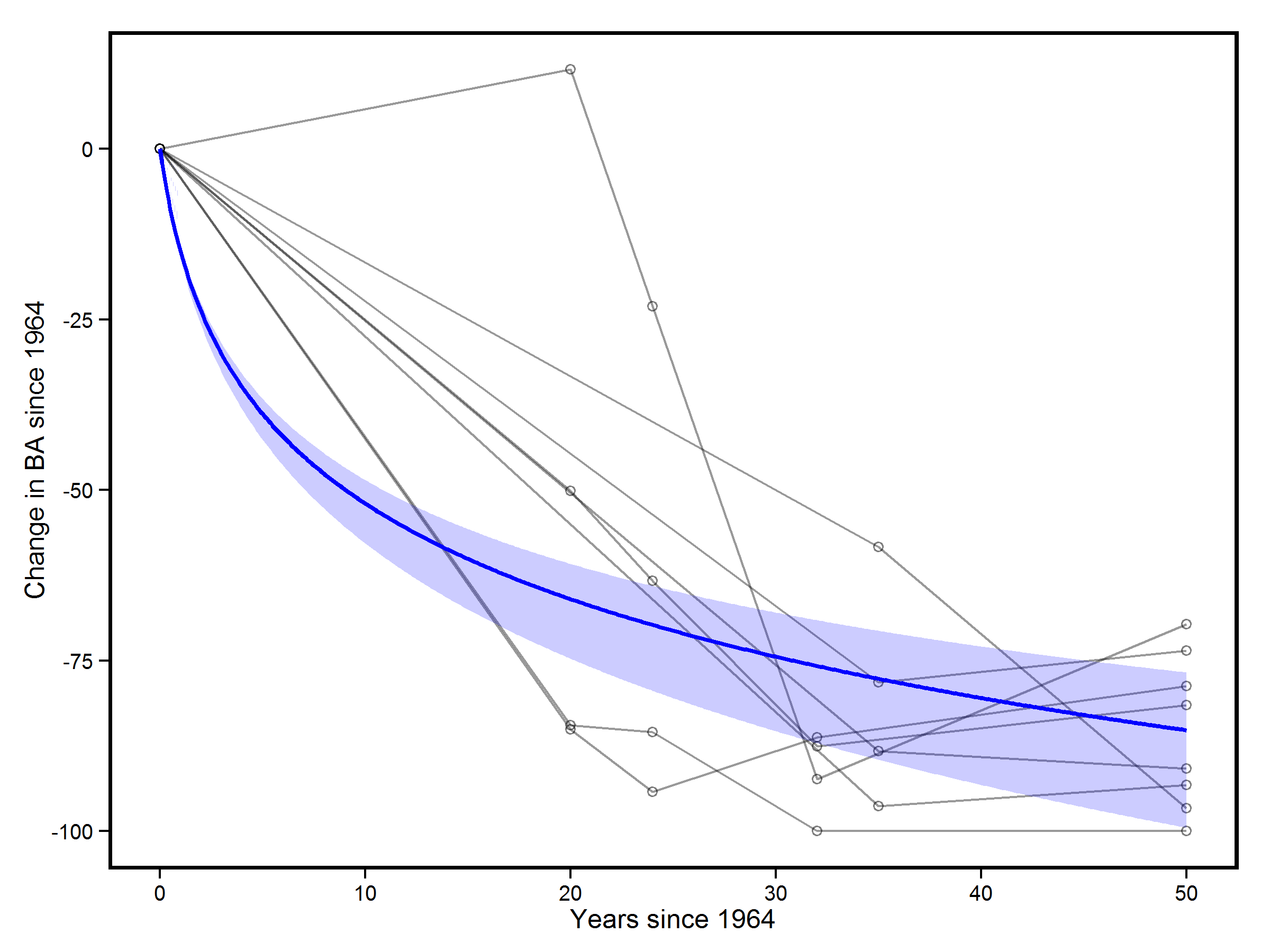
Table 2 – Model parameter estimates for the most parsimonious model

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Model parameter** | **Estimate** | **SE** | **T value** | **P value** |
| Intercept | 45.46 | 5.80 | 7.83 | <0.001 |
| Log(Year+1) | -9.86 | 1.22 | -8.09 | <0.001 |

**Figures**



Model predictions +/- 95%CIs for most parsimonious model (n=32)



Model predictions transformed to percentage change in BA +/- 95% CIs. (n=32)