Supplementary Material

Threshold response to extreme drought shifts inter-tree growth dominance in *Pinus sylvestris*

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Table S1 - Periodic assessments of previously unrecorded tree mortality in the both the high density (ρ_H) and low density (ρ_L) plots and scaled up to a hectare (ha).

Year	No. trees (ha)	No. trees (plot)	Mortality (ha)	Mortality (ha)	Stand
1955	3805	400	30	12	ρ_H
1969	3241	341	154	16	ρ_H
1974	2823	297	413	43	ρ_H
1980	2471	260	351	37	ρ_H
1985	2148	226	323	34	ρ_H
1990	1929	203	218	23	ρ_H
1955	1258	152	27	11	ρ_L
1969	1240	150	16	2	ρ_L
1974	1215	147	24	3	ρ_L
1980	1157	140	53	6	ρ_L
1985	1074	130	82	10	ρ_L
1990	1008	122	66	8	ρ_L

Table S2 – Results of the pairwise comparison of slopes between the three drought years. *Df =* degrees of freedom, SE = standard error.

Drought year comparison	Estimate	SE	*df*	t.ratio	p.value
1976 - 1984	-0.142	0.051	773	-2.809	0.014
1976 - 1995	0.148	0.050	773	2.951	0.009
1984 - 1995	0.290	0.050	773	5.763	<0.001

Table S3 - Post-hoc analyses of estimated marginal means for BAI between the three drought events (1976, 1984 and 1995) in the drought year (Year 0) and four post-drought years (Years 1-4). Significant values (*p < 0.05*) are highlighted in bold.

Contrast	Estimate	SE	df	t.ratio	p.value
Year 0					
1976 - 1984	**0.52**	**0.0761**	**773**	**6.826**	**< 0.0001**
1976 - 1995	0.13	0.0804	773	1.62	0.2379
1984 - 1995	**-0.39**	**0.0786**	**773**	**-4.956**	**<0.0001**
Year 1					
1976 - 1984	**0.617**	**0.073**	**773**	**8.447**	**< 0.0001**
1976 - 1995	**-0.218**	**0.0775**	**773**	**-2.811**	**0.014**
1984 - 1995	**-0.835**	**0.0756**	**773**	**-11.041**	**< 0.0001**
Year 2					
1976 - 1984	**0.545**	**0.0682**	**773**	**7.991**	**< 0.0001**
1976 - 1995	-0.165	0.073	773	-2.257	0.0626
1984 - 1995	**-0.71**	**0.071**	**773**	**-10.002**	**< 0.0001**
Year 3					
1976 - 1984	**0.3477**	**0.73**	**773**	**4.76**	**< 0.0001**
1976 - 1995	-0.0279	0.0775	773	-0.36	0.9309
1984 - 1995	**-0.3756**	**0.0756**	**773**	**-4.968**	**< 0.0001**
Year 4					
1976 - 1984	0.0669	0.0761	773	0.879	0.6537
1976 - 1995	-0.01248	0.0804	773	-1.553	0.267
1984 - 1995	**-0.1917**	**0.0786**	**773**	**-2.439**	**0.0396**

Table S4 - Post-hoc pairwise comparison of estimated marginal means for the proportion of trees growing at < 2 SD of the SPEI-constrained pre-drought growth averages ($BAI1976_{con}$, $BAI1984_{con}$, $BAI1995_{con}$) for all three drought events (1976, 1984 and 1995). Pairwise comparisons were conducted annually between all three droughts for events (Year = 0) and in the four post-drought years (Year = 1, 2, 3 and 4). Significant results are highlighted in bold, and *p-values* were adjusted using a Bonferroni correction to adjust for multiple tests and SE = standard error.

Contrast	Odds ratio	SE	z.ratio	*p.value*
Year 0				
1976 - 1984	0.167	0.116	-2.568	0.153
1976 - 1995	2.825	2.99	0.981	1
1984 - 1995	**16.96**	**16.315**	**2.943**	**0.049**
Year 1				
1976 - 1984	**0.066**	**0.029**	**-6.151**	**<0.001**
1976 - 1995	4.208	2.661	2.273	0.346
1984 - 1995	**64.141**	**39.166**	**6.814**	**<0.001**
Year 2				
1976 - 1984	**0.067**	**0.032**	**-5.608**	**<0.001**
1976 - 1995	3.716	2.575	1.894	0.874
1984 - 1995	**55.155**	**36.455**	**6.067**	**<0.001**
Year 3				
1976 - 1984	**0.18**	**0.09**	**-3.418**	**0.009**
1976 - 1995	1.945	1.232	1.05	1
1984 - 1995	**10.784**	**6.351**	**4.038**	**<0.001**
Year 4				
1976 - 1984	1.258	1.364	0.212	1
1976 - 1995	0.603	0.648	-0.47	1
1984 - 1995	0.479	0.49	-0.719	1

Table S5 – The number of trees (*n*) growing at <2SD of the pre-drought growth averages (BAI1976$_{con}$, BAI1984$_{con}$, BAI1995$_{con}$) in all three drought years (1976, 1984 and 1995) and four post-drought years in both the low (ρ_L – 29 trees) and high (ρ_H – 27 trees) density stands.

ρL					
Year	***n***	**Year**	***n***	**Year**	***n***
1976	3	1984	6	1995	1
1977	3	1985	13	1996	2
1978	1	1986	16	1997	1
1979	1	1987	3	1998	1
1980	0	1988	2	1999	2

ρH					
1976	0	1984	5	1995	0
1977	2	1985	8	1996	0
1978	3	1986	13	1997	0
1979	3	1987	2	1998	1
1980	1	1988	1	1999	0
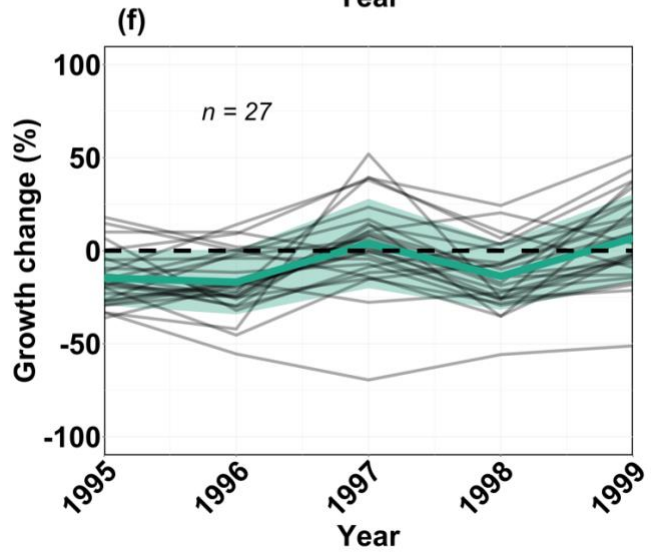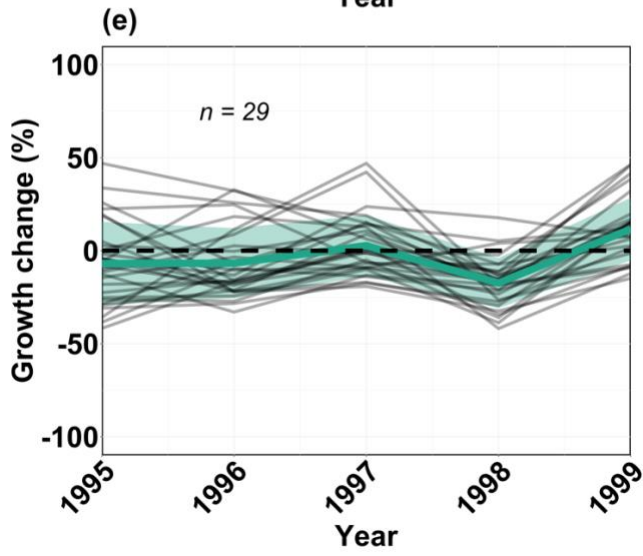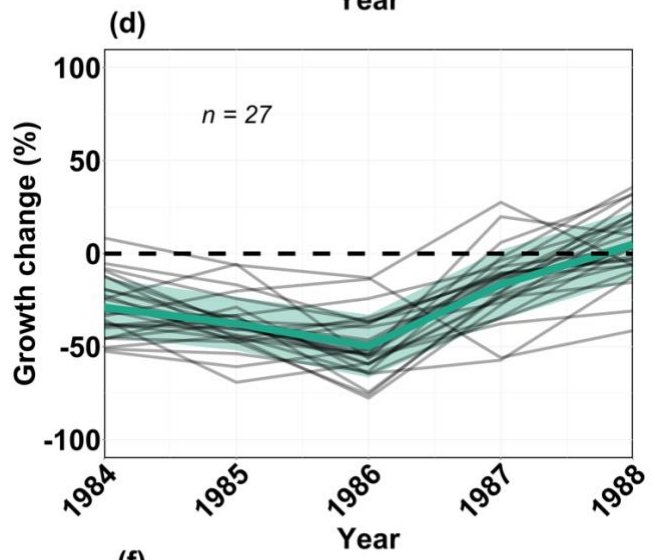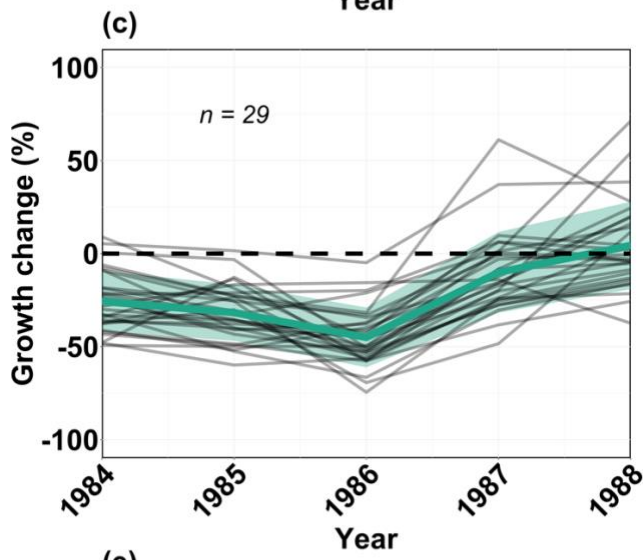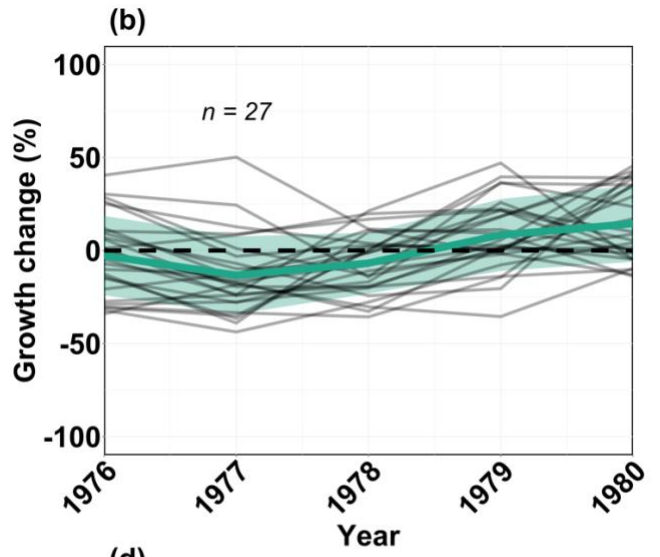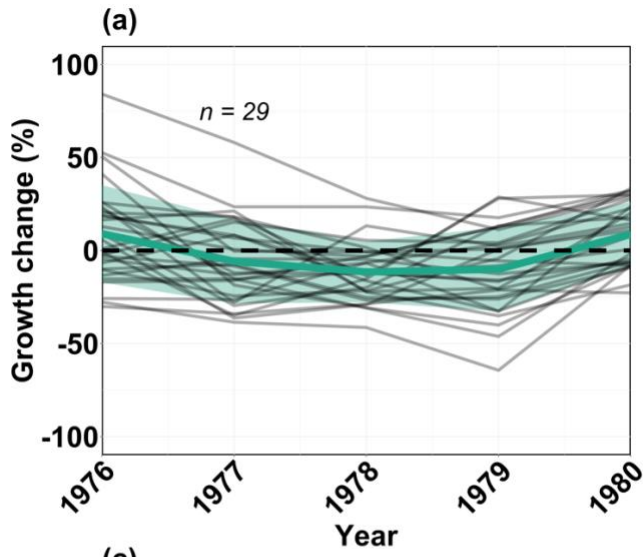
Supplementary Figure S1 - Individual tree and mean percentage growth change relative to RWI1976$_{con}$, RWI1984$_{con}$ or RWI1995$_{con}$ values for the 1976 (a, b), 1984 (c, d) and 1995 (e, f) droughts respectively, calculated annually for both high density (ρ_H – a, c, d) and low density (ρ_L – b, d, f) stands. RWI$_{con}$ values represent the pre-drought growth averages calculated using the same approach as for BAI in the main text but form ring width data detrended using a cubic smoothing spline with a 30-year cut off. Grey lines are individual trees, while solid green lines and green shaded area are the annual mean ± 1SD across all trees at a given density. Solid horizontal dashed black lines indicate no detectable difference between a given years growth and RWI$_{con}$ (growth rates have recovered to RWI$_{con}$ levels for each drought). High density (ρ_H, *n = 29*) and low density (ρ_L, *n = 27*).
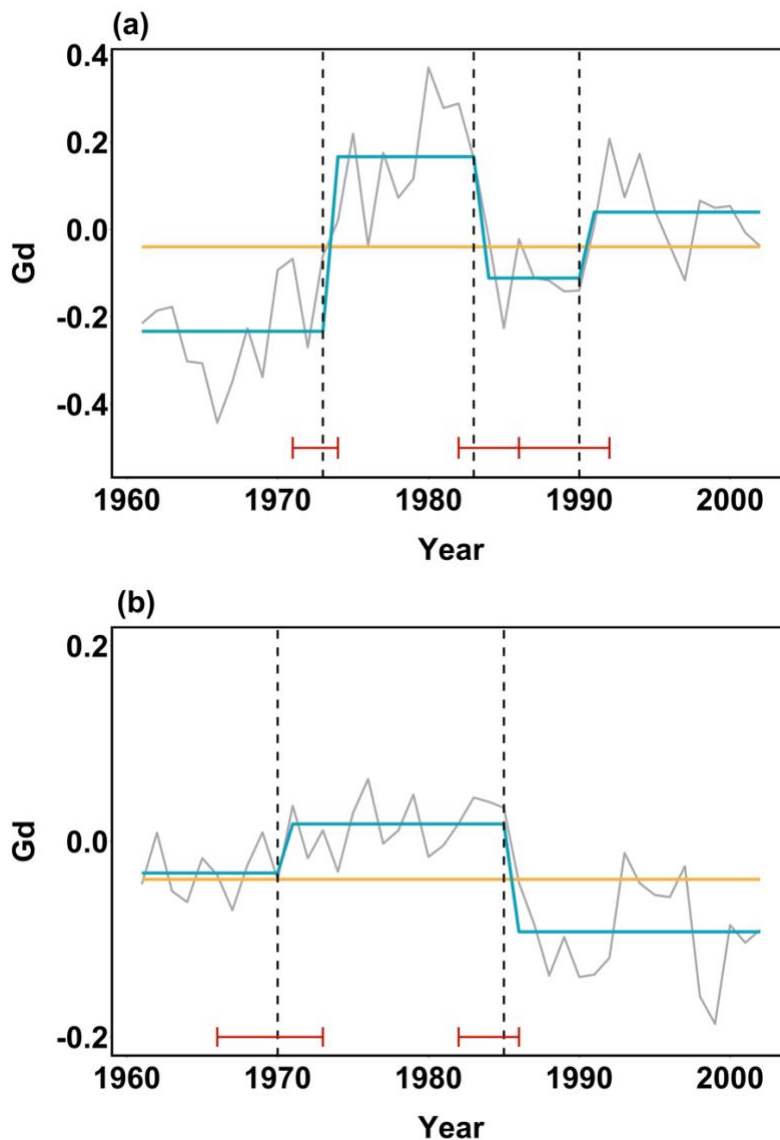
Supplementary Figure S2 – Change point analysis showing the years where abrupt changes (e.g. thresholds - vertical black dashed lines) in growth dominance (G_d) (grey lines) were detected for (a) the high (ρ_H – 1973, 1983 and 1990) and (b) low (ρ_L – 1970 and 1985) density treatments along with the corresponding 95% confidence intervals (red error bars). Horizontal yellow lines indicate the null model (linear regression line with no change points) and blue lines represent fitted regression lines of linear models with break points. Note the year indicated by each change point is the last year of the previous period (i.e., 1 year before a change to a lower or higher G_d level, so a change point in 1983 would indicate a change occurred in 1984).