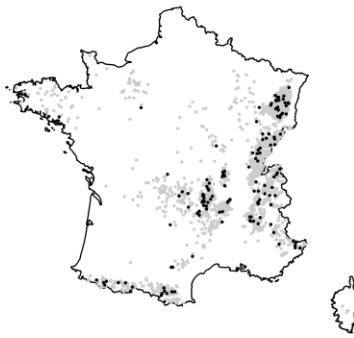
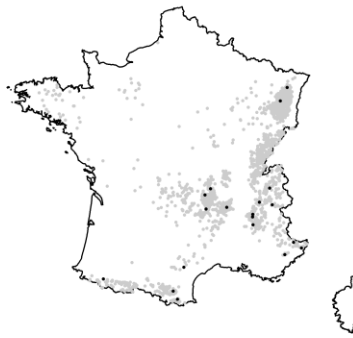


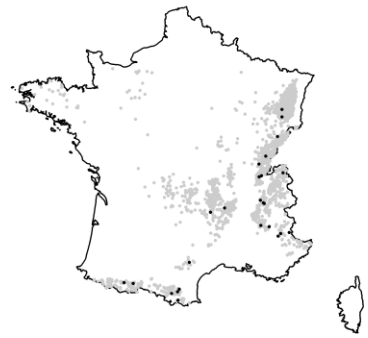
*Abies alba* - Suppressed trees  
24 cm <= Circ < 151



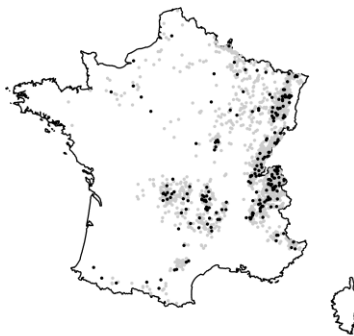
*Abies alba* - Small trees  
26 cm <= Circ < 118



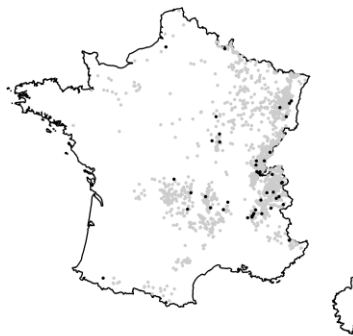
*Abies alba* - Large trees  
118 <= c13 < 207



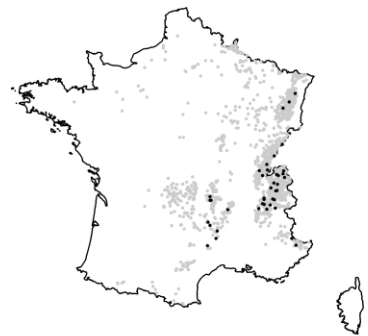
*Picea abies* - Suppressed trees  
24 cm <= Circ < 146



*Picea abies* - Small trees  
26 cm <= Circ < 104



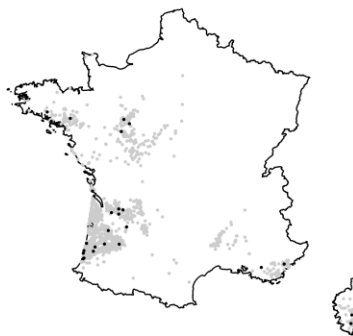
*Picea abies* - Large trees  
104 <= c13 < 223



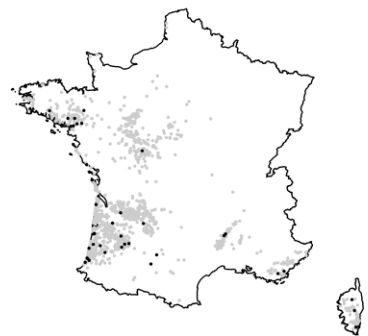
*Pinus pinaster* - Suppressed trees  
24 cm <= Circ < 151



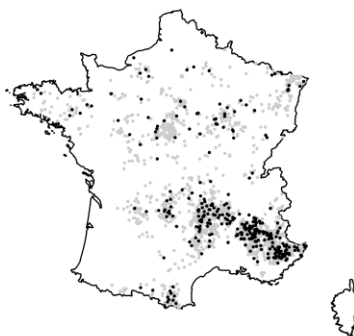
*Pinus pinaster* - Small trees  
26 cm <= Circ < 103



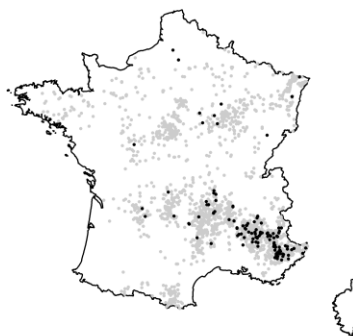
*Pinus pinaster* - Large trees  
103 <= c13 < 262



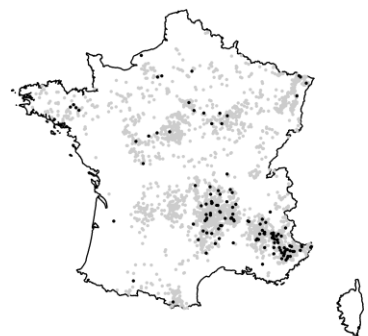
*Pinus sylvestris* - Suppressed trees  
24 cm <= Circ < 126

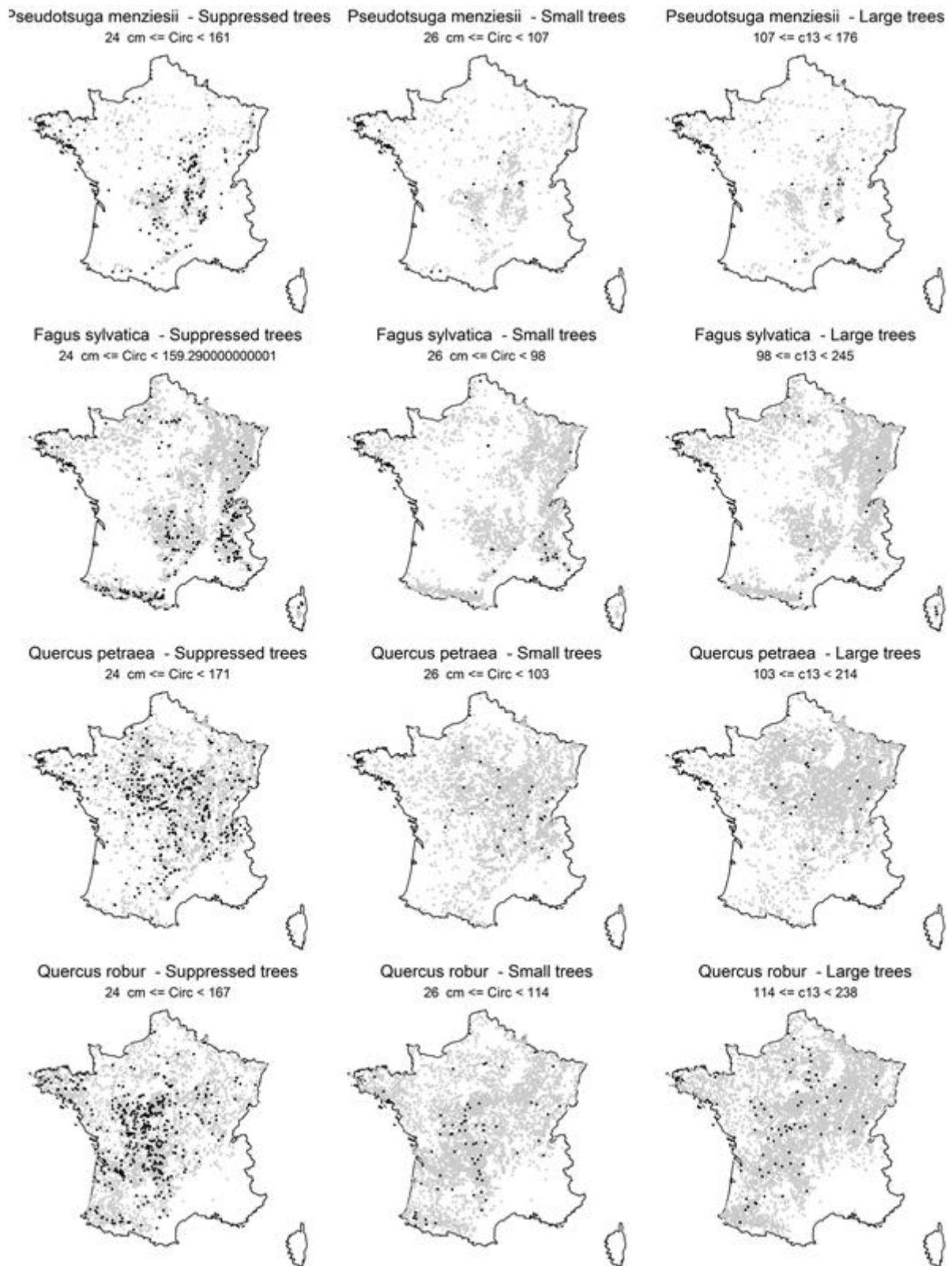


*Pinus sylvestris* - Small trees  
26 cm <= Circ < 88.5



*Pinus sylvestris* - Large trees  
88.5 <= c13 < 166





**Appendix A:** For the eight species studied, location of the plots on which the species is present (grey dots) and with at least one dead tree (black dots), for the suppressed, small and large dominant tree subsets.

Abies alba			
	Suppressed	Dominant - Small	Dominant - Large
Live	7729	5470	7818
Dead	187	26	26

Picea abies			
	Suppressed	Dominant - Small	Dominant - Large
Live	7203	6000	7839
Dead	376	54	56

Pinus pinaster			
	Suppressed	Dominant - Small	Dominant - Large
Live	4818	4691	5698
Dead	170	45	47

Pinus sylvestris			
	Suppressed	Dominant - Small	Dominant - Large
Live	6722	6945	9432
Dead	423	149	148

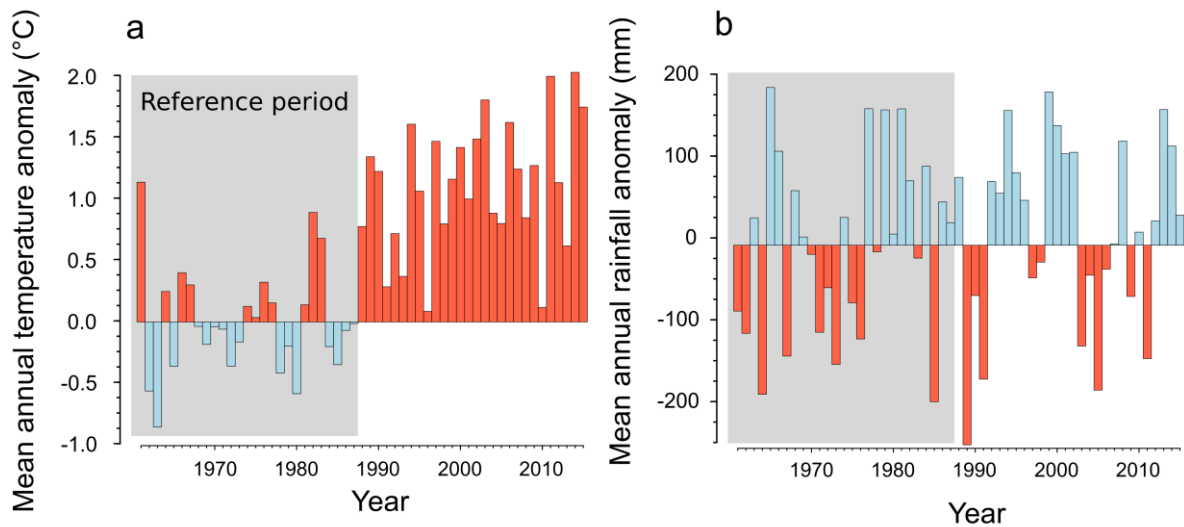
Pseudotsuga menziesii			
	Suppressed	Dominant - Small	Dominant - Large
Live	3468	2972	3611
Dead	191	20	22

Fagus sylvatica			
	Suppressed	Dominant - Small	Dominant - Large
Live	16876	9342	13543
Dead	296	25	24

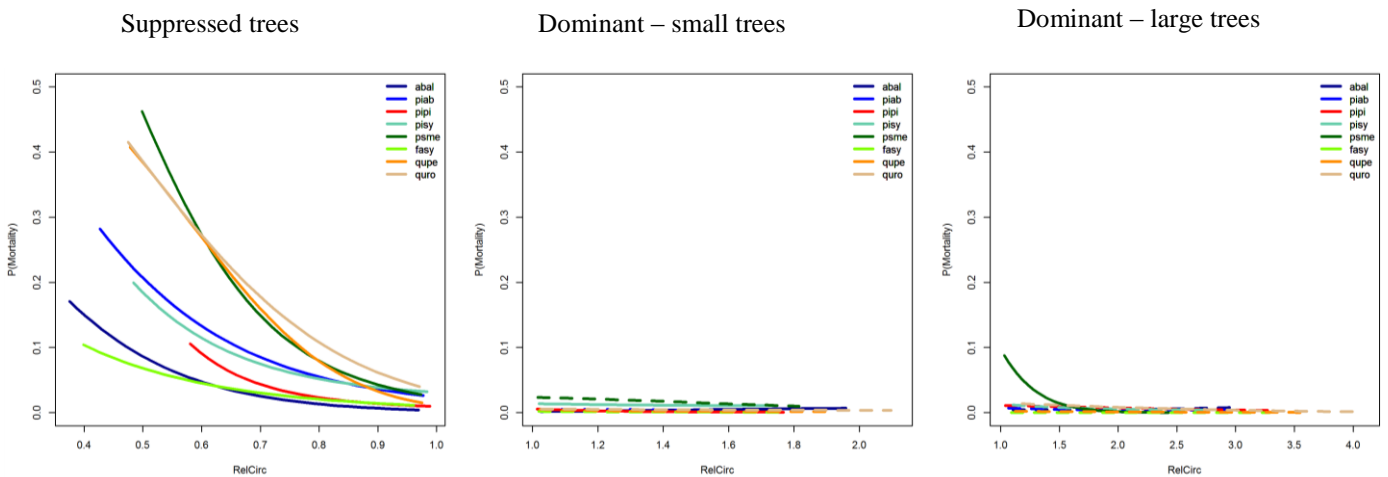
Quercus petraea			
	Suppressed	Dominant - Small	Dominant - Large
Live	10658	11298	15194
Dead	500	30	30

Quercus robur			
	Suppressed	Dominant - Small	Dominant - Large
Live	9467	11258	15524
Dead	547	76	76

**Appendix B:** Number of live and dead trees for suppressed, small and large dominant trees per species.

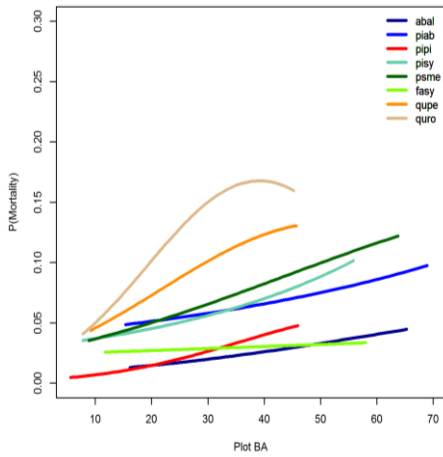


**Appendix C:** Changes between 1961 and 2015. (a) for temperature ( $^{\circ}\text{C}$ ); (b) for rainfall (mm). The period 1961-1987 was considered as the reference period before temperature increase.

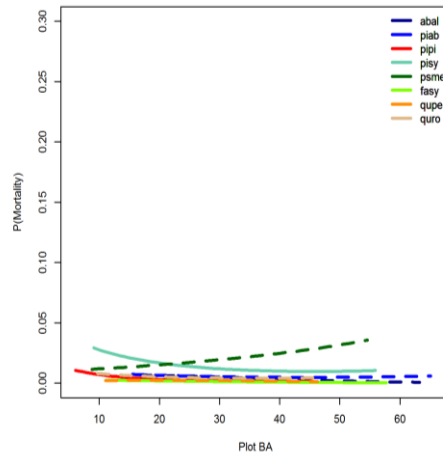


**Appendix D:** Modelled probability of background mortality as a function of relative tree circumference (RelCirc) for the suppressed, small dominant and large dominant tree subsets. We varied the RelCirc variable, whereas the other model variables were set to their average values. Dashed lines are shown when the variable was not significant ( $p > 0.05$ ). abal = *Abies alba*, piab = *Picea abies*, pipi = *Pinus pinaster*, pisy = *Pinus sylvestris*, psme = *Pseudotsuga menziesii*, fasy = *Fagus sylvatica*, qupe = *Quercus petraea*, quro = *Quercus robur*.

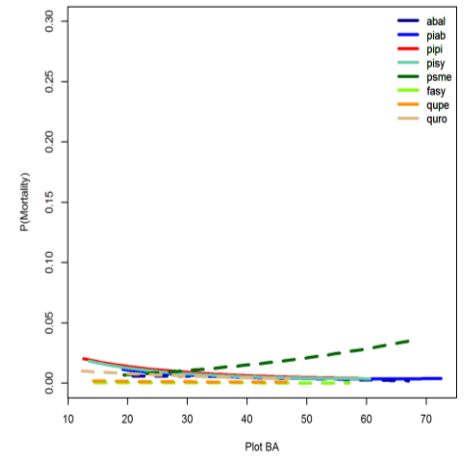
Suppressed trees



Dominant – small trees

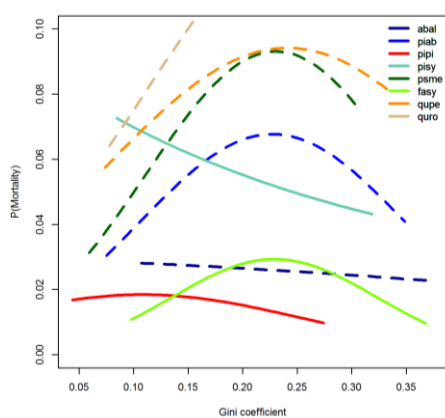


Dominant – large trees

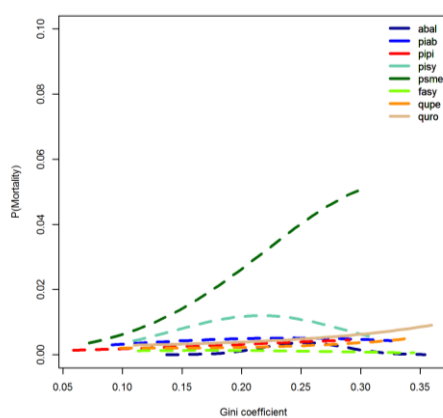


**Appendix E:** Modelled probability of background mortality as a function of plot basal area (BA) for the suppressed, small dominant and large dominant tree subsets. We varied the BA variable, whereas the other model variables were set to their average values. Dashed lines are shown when the variable was not significant ( $p > 0.05$ ). abal = *Abies alba*, piab = *Picea abies*, pipi = *Pinus pinaster*, pisy = *Pinus sylvestris*, psme = *Pseudotsuga menziesii*, fasy = *Fagus sylvatica*, qupe = *Quercus petraea*, quro = *Quercus robur*.

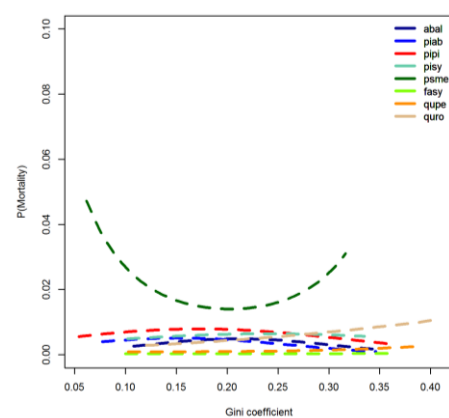
Suppressed trees



Dominant – small trees

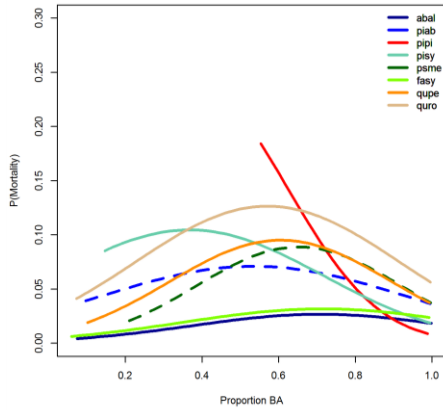


Dominant – large trees

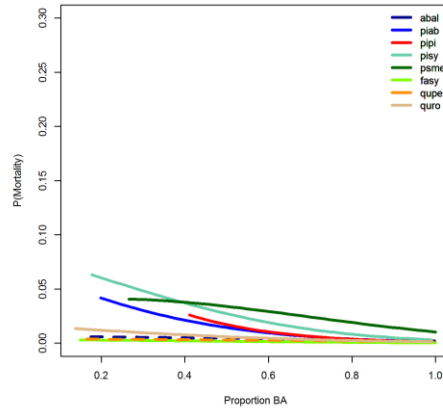


**Appendix F:** Modelled probability of background mortality as a function of the Gini coefficient for the suppressed, small dominant and large dominant tree subsets. We varied the Gini variable, whereas the other model variables were set to their average values. Dashed lines are shown when the variable was not significant ( $p > 0.05$ ). abal = *Abies alba*, piab = *Picea abies*, pipi = *Pinus pinaster*, pisy = *Pinus sylvestris*, psme = *Pseudotsuga menziesii*, fasy = *Fagus sylvatica*, qupe = *Quercus petraea*, quro = *Quercus robur*.

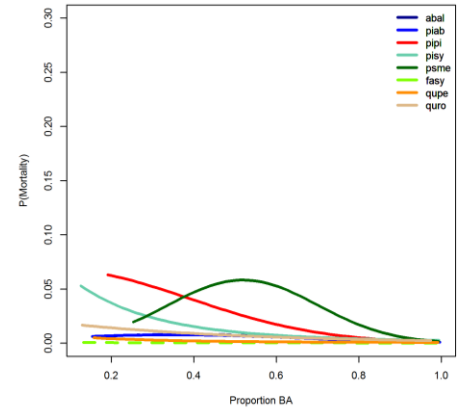
Suppressed trees



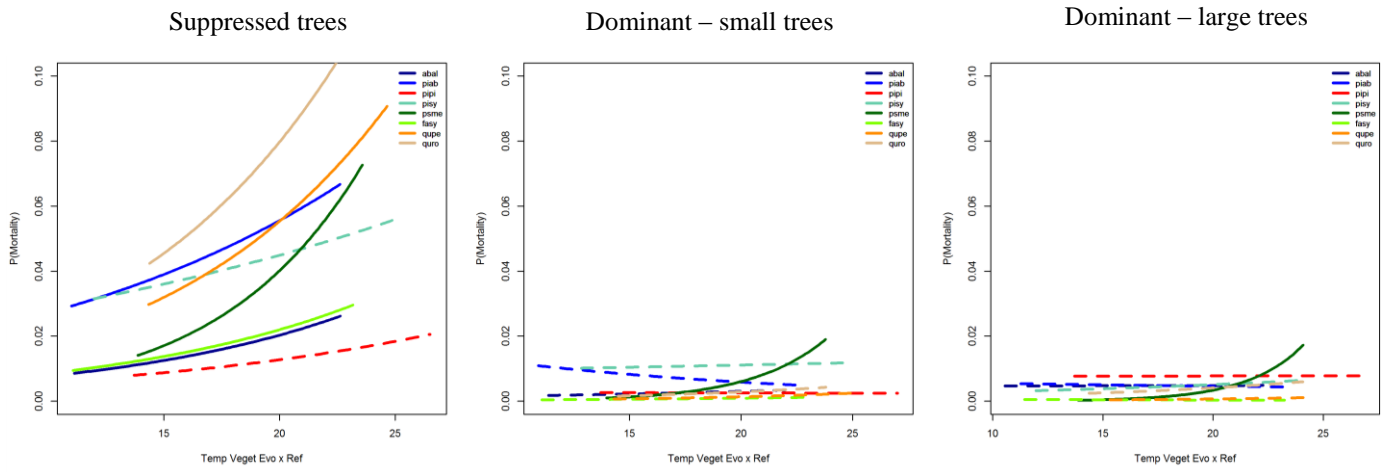
Dominant – small trees



Dominant – large trees



**Appendix G:** Modelled probability of mortality as a function of the proportion of basal area (PropBA) occupied by the species on the plot for the suppressed, small dominant and large dominant tree subsets. We varied the PropBA variable, whereas the other model variables were set to their average values. Dashed lines are shown when the variable was not significant ( $p > 0.05$ ). abal = *Abies alba*, piab = *Picea abies*, pipi = *Pinus pinaster*, pisy = *Pinus sylvestris*, psme = *Pseudotsuga menziesii*, fasy = *Fagus sylvatica*, qupe = *Quercus petraea*, quro = *Quercus robur*.



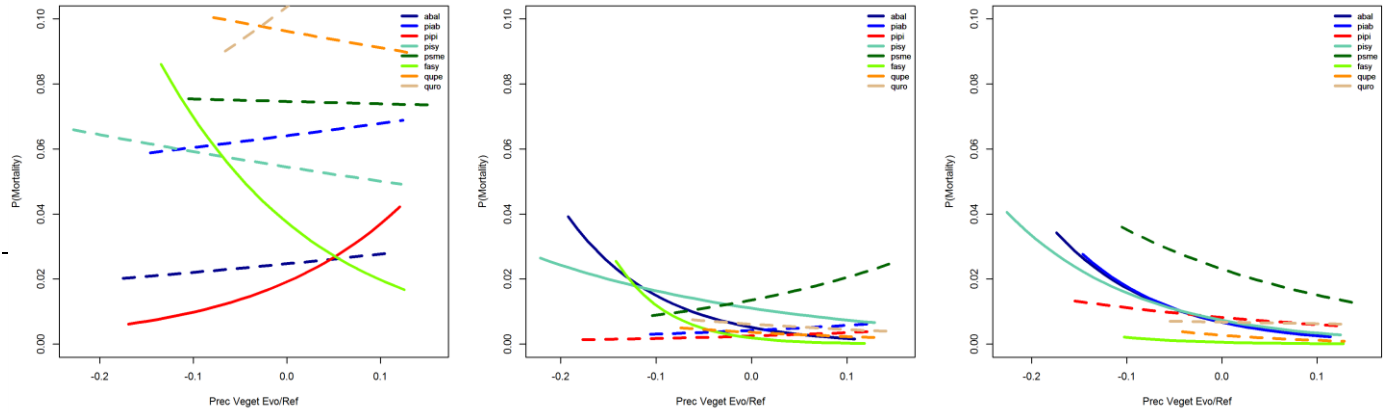
**Appendix H:** Modelled probability of background mortality as a function of temperature evolution for the vegetation period ( $T^{\circ}\text{Evo}$ ) for the suppressed, small dominant and large dominant tree subsets. We varied the  $T^{\circ}\text{Evo}$  variable, whereas the other model variables were set to their average values. Dashed lines are shown when the variable was not significant ( $p > 0.05$ ). abal = *Abies alba*, piab = *Picea abies*, pipi = *Pinus pinaster*, pisy = *Pinus sylvestris*, psme = *Pseudotsuga menziesii*, fasy = *Fagus sylvatica*, qupe = *Quercus petraea*, quro = *Quercus robur*



Suppressed trees

Dominant – small trees

Dominant – large trees



	0.10	p = 0.02	0.07	p < 0.05	0.00	p = 0.10	0.01	p = 0.21	0.40	p = 0.5	0.14	p = 0.74
Trails_Coeff2	0.08	NA	0.59	NA	-0.01	NA	0.35	NA	0.29	NA	-0.04	NA
PropBA	6.51	p < 0.001	-0.40	p = 0.14	4.35	p = 0.06	3.51	p = 0.28	-2.61	p < 0.0001	3.66	p < 0.001
PropBA <sup>2</sup>	-4.59	p < 0.001	-0.73	p = 0.52	-5.64	p = 0.18	-3.28	p < 0.0001	-1.44	p = 0.46	-5.23	p < 0.05
Gini											13.26	p = 0.29
Gini <sup>2</sup>											-43.74	p = 0.17
T°Evo											-0.02	p = 0.33
RfEvo											-9.77	p < 0.01

**Appendix I: Modelled probability of background mortality as a function of rainfall**

evolution for the vegetation period (Rf°Evo) for the suppressed, small dominant

and large dominant tree subsets. We varied the Rf°Evo variable, whereas the other

model variables were set to their average values. Dashed lines are shown when the

variable was not significant (p > 0.05). abal = *Abies alba*, piab = *Picea abies*, pipi =

*Pinus pinaster*, pisy = *Pinus sylvestris*, psme = *Pseudotsuga menziesii*, fasy =

*Fagus sylvatica*, qupe = *Quercus petraea*, quro = *Quercus robur*

Dominant - large	
coeffs	pval
-0.18	NA
-1.69	p = 0.07
0.27	p = 0.36
-0.08	p < 0.0001
0.00	p = 0.14
0.04	p < 0.05
0.44	NA
-5.65	p < 0.0001
1.90	p = 0.22
7.10	p = 0.71
-14.72	p = 0.28
0.06	p = 0.46
-7.72	p < 0.0001

(Intercept)

RelCirc

RelCirc<sup>2</sup>

BA

BA<sup>2</sup>

Trails

Trails\_Coeff2

PropBA

PropBA<sup>2</sup>

Gini

Gini<sup>2</sup>

T°Evo

RfEvo

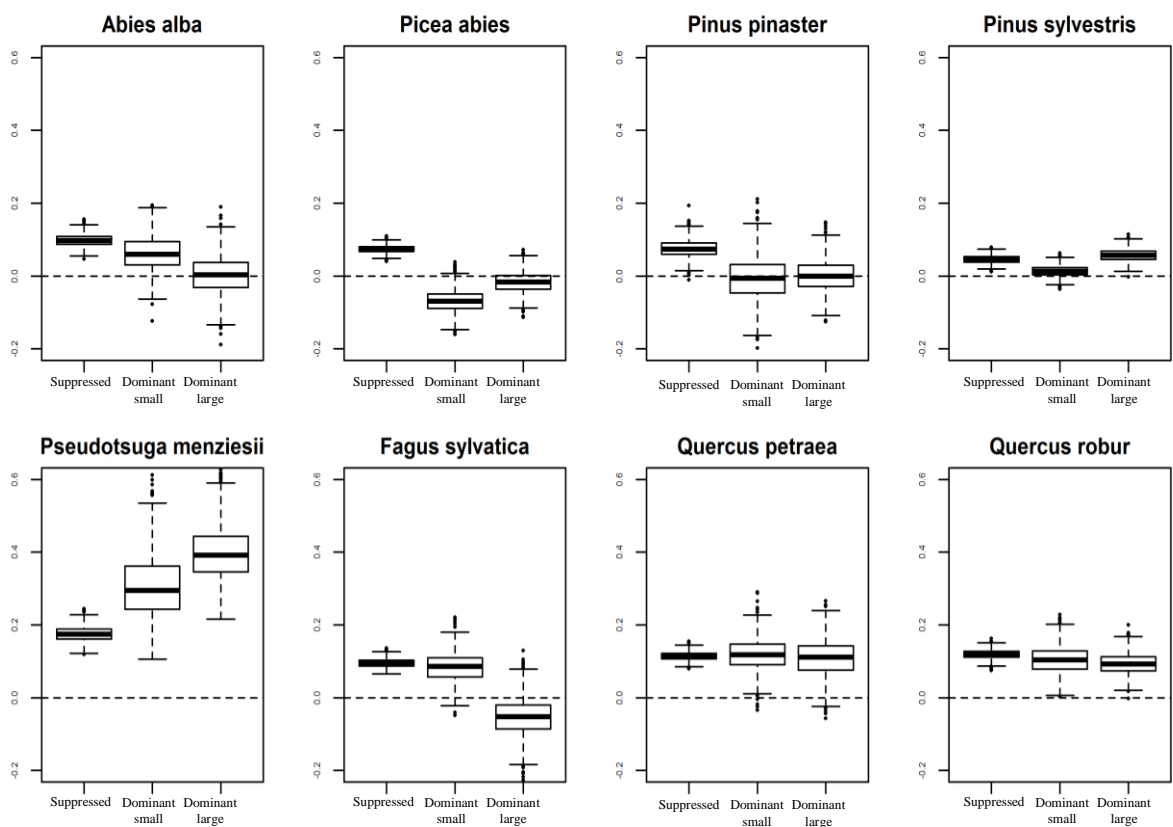
Pseudotsuga menziesii

	Suppressed		Dominant - small		Dominant - large	
	coeffs	pval	coeffs	pval	coeffs	pval
(Intercept)	-5.34	NA	-14.78	NA	-10.92	NA
RelCirc	-11.08	p < 0.0001	0.72	p = 0.47	-2.64	p < 0.05
RelCirc <sup>2</sup>	2.66	p = 0.72	-0.63	p = 0.66	-0.54	p = 0.54
BA	0.04	p < 0.001	0.02	p = 0.1	0.05	p = 0.13
BA <sup>2</sup>	0.00	p = 0.44	0.00	p = 0.69	0.00	p = 0.72
Trails	-0.15	p = 0.44	-0.11	p = 0.48	0.52	p = 0.38
Trails_Coeff2	0.25	NA	-15.18	NA	-13.79	NA
PropBA	10.15	p = 0.11	0.88	p < 0.05	16.68	p < 0.05
PropBA <sup>2</sup>	-7.78	p < 0.0001	-2.19	p = 0.23	-16.06	p < 0.05
Gini	18.16	p = 0.53	26.21	p = 0.13	-25.45	p = 0.69
Gini <sup>2</sup>	-39.41	p < 0.05	-38.80	p = 0.46	62.75	p = 0.33
T°Evo	0.18	p < 0.001	0.31	p < 0.05	0.40	p < 0.01
RfEvo	-0.10	p = 0.71	4.24	p = 0.46	-4.35	p = 0.42

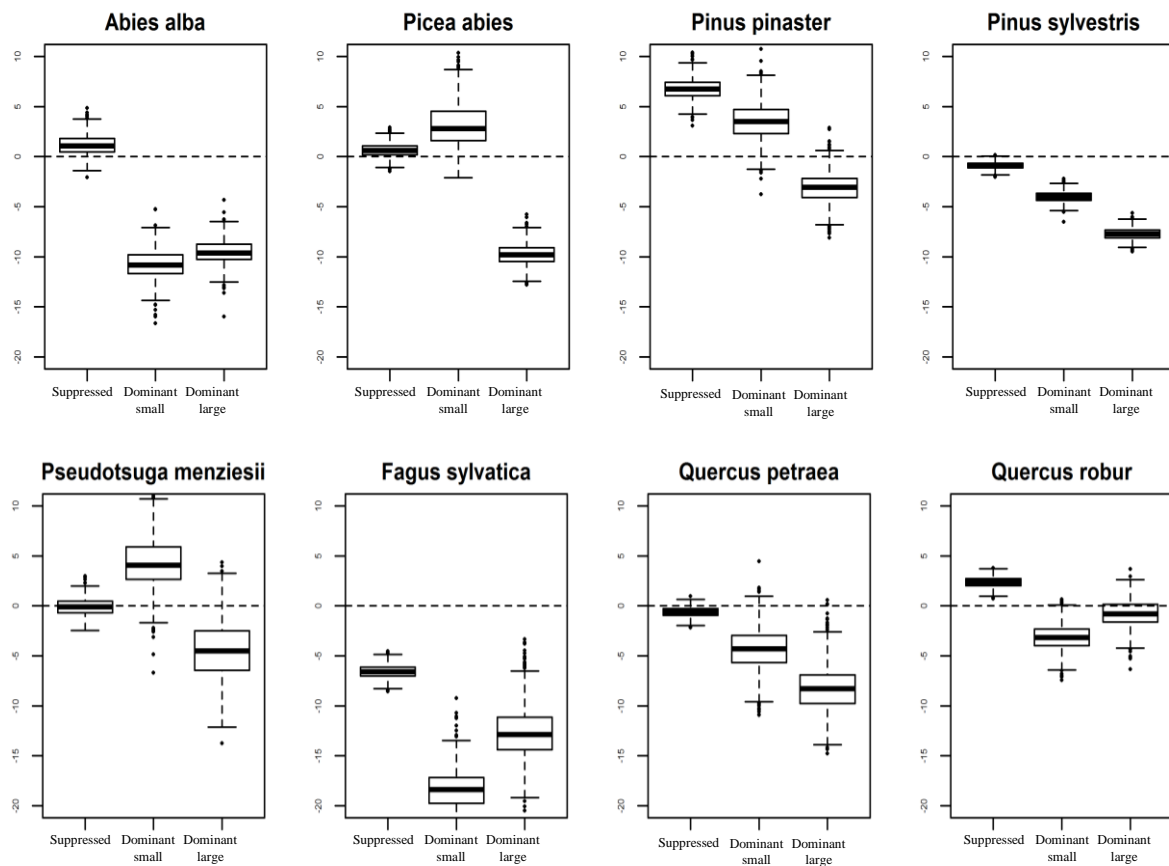
	Fagus sylvatica						Quercus petraea					
	Suppressed		Dominant - small		Dominant - large		Suppressed		Dominant - small		Dominant - large	
	coeffs	pval	coeffs	pval	coeffs	pval	coeffs	pval	coeffs	pval	coeffs	pval
(Intercept)	-7.59	NA	-3.46	NA	-2.42	NA	-7.76	NA	-2.83	NA	-4.33	NA
RelCirc	-5.49	p < 0.0001	-4.05	p = 0.56	-0.84	p = 0.34	2.18	p < 0.0001	-6.74	p = 0.64	-0.38	p = 0.67
RelCirc <sup>2</sup>	1.03	p = 0.72	1.03	p = 0.31	0.14	p = 0.4	-6.77	p < 0.0001	1.91	p = 0.16	-0.06	p = 0.7
BA	0.01	p < 0.05	-0.02	p < 0.05	-0.04	p = 0.65	0.07	p < 0.0001	0.05	p = 0.67	-0.05	p = 0.66
BA <sup>2</sup>	0.00	p = 0.47	0.00	p = 0.57	0.00	p = 0.47	0.00	p < 0.01	0.00	p = 0.43	0.00	p = 0.33
Trails	0.35	p < 0.0001	0.08	p = 0.06	-0.03	p < 0.01	0.27	p < 0.01	-0.07	p = 0.44	0.02	p = 0.76
Trails_Coeff2	0.79	NA	0.64	NA	1.36	NA	0.17	NA	0.48	NA	-0.69	NA
PropBA	5.47	p < 0.0001	-0.10	p < 0.05	-2.15	p = 0.38	8.02	p < 0.05	-0.21	p = 0.1	-4.78	p < 0.01
PropBA <sup>2</sup>	-3.82	p < 0.0001	-2.10	p = 0.51	0.80	p = 0.61	-6.62	p < 0.0001	-0.82	p = 0.62	2.25	p = 0.41
Gini	26.97	p < 0.05	9.50	p = 0.32	-6.47	p = 0.56	9.20	p = 0.69	-4.84	p = 0.18	-4.03	p = 0.34
Gini <sup>2</sup>	-58.85	p < 0.0001	-28.07	p = 0.42	16.86	p = 0.59	-19.09	p < 0.05	19.35	p = 0.5	15.53	p = 0.53
T°Evo	0.10	p < 0.01	0.08	p = 0.54	-0.05	p = 0.38	0.11	p < 0.0001	0.12	p = 0.23	0.11	p = 0.28
RfEvo	-6.57	p < 0.0001	-18.37	p < 0.001	-12.65	p < 0.05	-0.60	p = 0.61	-4.35	p = 0.37	-8.23	p = 0.16

	Quercus robur					
	Suppressed		Dominant - small		Dominant - large	
	coeffs	pval	coeffs	pval	coeffs	pval
(Intercept)	-6.83	NA	-4.21	NA	-5.43	NA
RelCirc	-3.42	p < 0.0001	-1.21	p = 0.46	-0.30	p = 0.19
RelCirc <sup>2</sup>	-1.59	p < 0.05	0.25	p = 0.65	-0.10	p = 0.15
BA	0.12	p < 0.0001	-0.07	p = 0.64	-0.03	p = 0.2
BA <sup>2</sup>	0.00	p < 0.0001	0.00	p = 0.22	0.00	p = 0.73
Trails	0.17	p = 0.24	-0.31	p = 0.65	0.07	p = 0.71
Trails_Coeff2	0.00	NA	-0.24	NA	-0.33	NA
PropBA	5.59	p < 0.05	-1.76	p < 0.0001	-2.31	p < 0.001
PropBA <sup>2</sup>	-4.89	p < 0.0001	-0.86	p = 0.49	-0.01	p = 0.69
Gini	11.29	p = 0.18	0.06	p < 0.05	6.16	p = 0.1
Gini <sup>2</sup>	-20.05	p < 0.05	9.45	p = 0.61	-2.98	p = 0.73
T°Evo	0.12	p < 0.001	0.11	p = 0.08	0.09	p = 0.14
RfEvo	2.37	p = 0.06	-3.14	p = 0.32	-0.76	p = 0.71

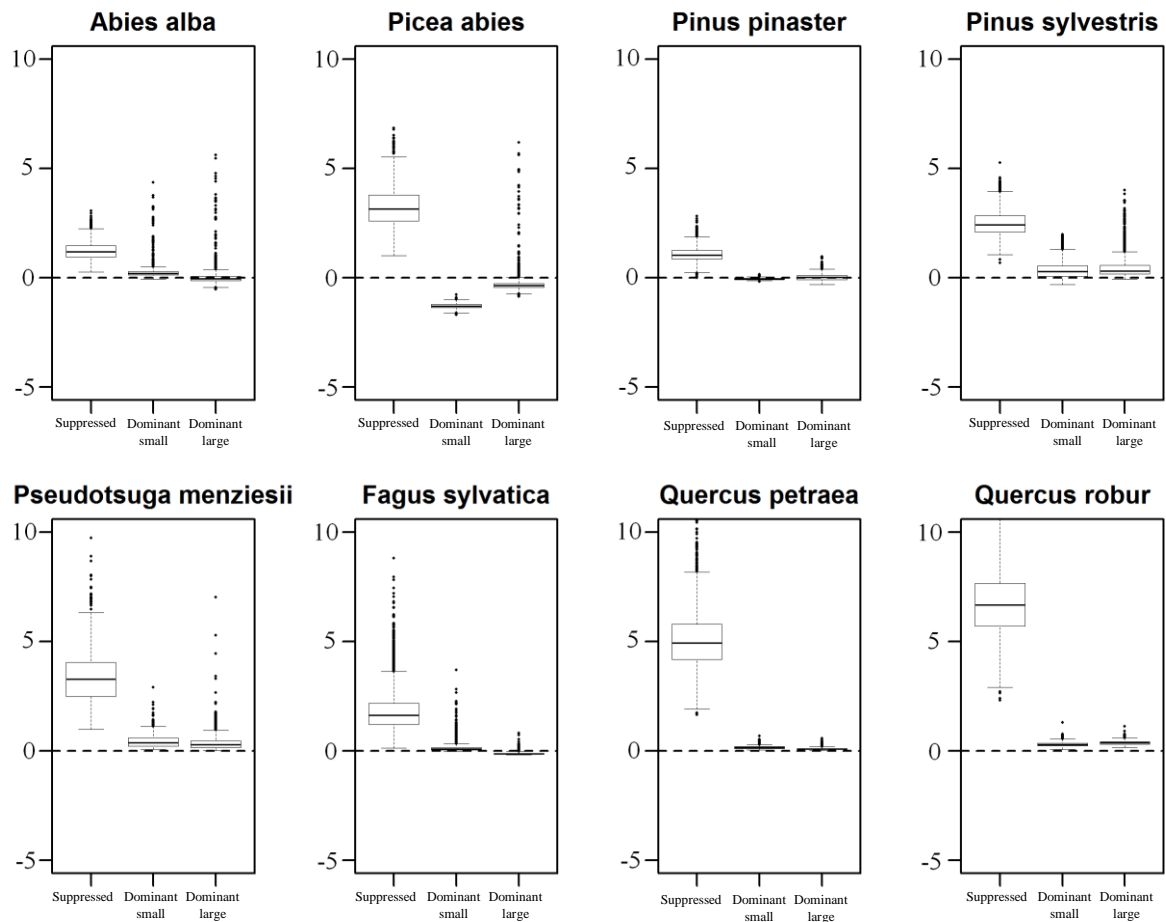
**Appendix J:** Coefficients and p-values for the variables used in the background mortality models for the suppressed, small dominant and large dominant trees subsets. Values were averaged from k-fold bootstraps (k = 1000).



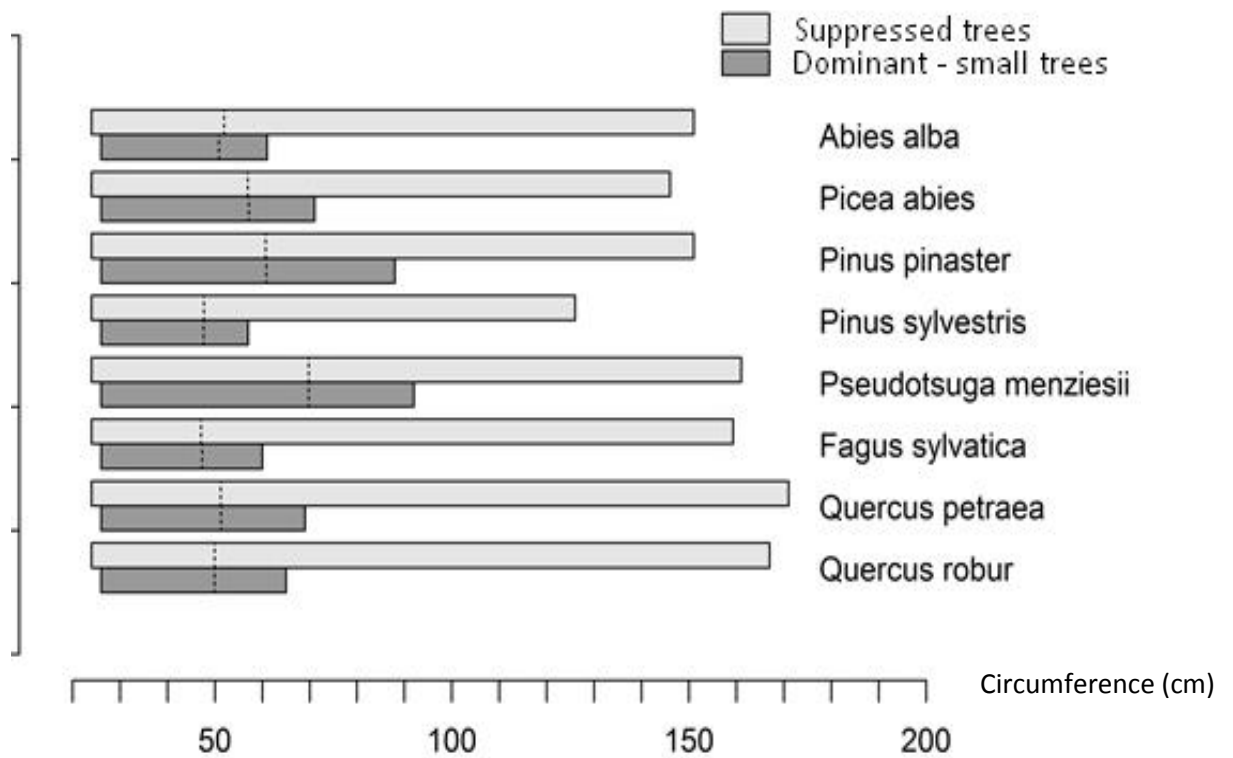
**Appendix K::** Coefficients of temperature evolution for the vegetation period ( $T^{\circ}\text{Evo}$ ) for the eight species and the suppressed, small dominant, and large dominant tree subsets. Each boxplot is composed of 1000 coefficient values obtained with a k-fold bootstrap on each of the eight species ( $k = 1000$ ). A positive value indicates an increasing probability of mortality in areas with warmer average reference temperatures from April to August, and that have experienced the most warming.



**Appendix L:** Coefficients of rainfall evolution for the vegetation period ( $Rf^{\circ}Evo$ ) for the eight species and the suppressed, small dominant, and large dominant tree subsets. Each boxplot is composed of 1000 coefficient values obtained with a k-fold bootstrap on each of the eight species ( $k = 1000$ ). A negative value indicates an increasing probability of mortality in areas with lower reference rainfall from April to August, and that have experienced the most rainfall decreases.

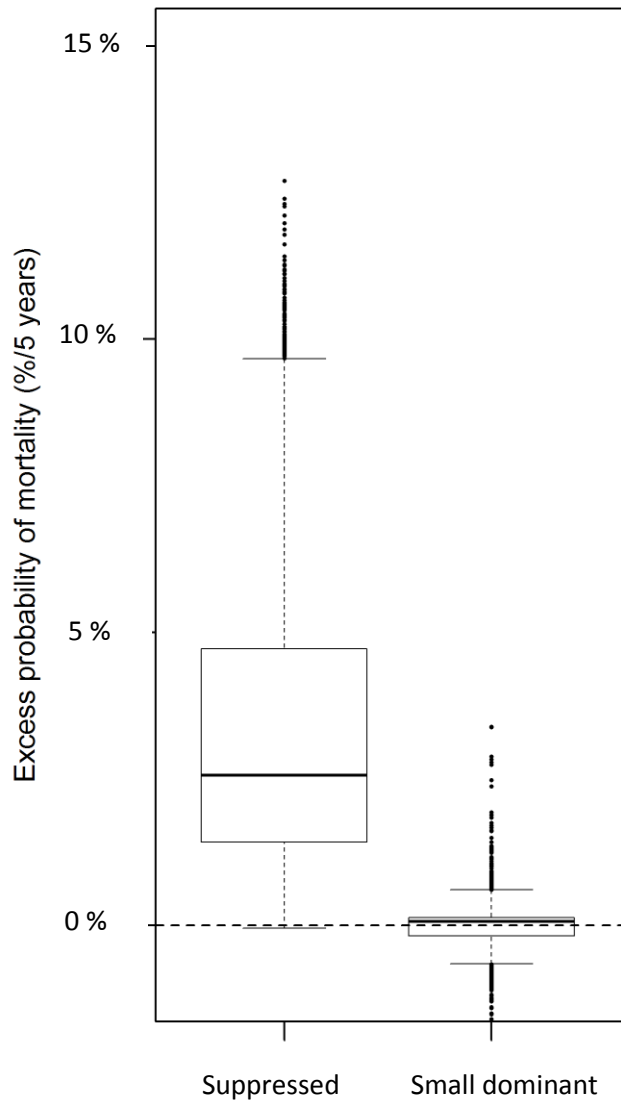


**Appendix M: Excess probability of mortality (%) attributed to combined temperature and rainfall changes for the suppressed, small dominant and large dominant tree subset.** The climate change-related excess probability of mortality is calculated as the difference between predicted values for the full model and a partial model where climate change-related effects have been set to 0. In order to assess the importance of the climate-change effects on tree mortality, all non-climate change-related variables were set to their mean value for all the trees of the considered species, while qualitative variables were set to their most frequent value.



**Appendix N:** Selection of two subsets of suppressed and dominant trees with equal average circumference to ensure that the differences in mortality were related to differences in social status: circumference (in cm) of the suppressed tree subset (light grey boxes), and small dominant tree subset (medium grey boxes). The dotted line represents the mean circumference value of all the trees in the considered box. The upper limit of the light grey and medium grey boxes represents the 1<sup>st</sup> and the 99<sup>th</sup> percentile of the distribution.

### Climate change-related excess probability of mortality



**Appendix O: Excess probability of mortality (%) due to combined temperature and rainfall changes for the suppressed and small dominant tree subsets with equal mean circumference.** It is calculated as the difference between predicted values for the full model and a partial model where climate change-related effects have been set to 0. For each model, all non-climate change-related variables were set to their mean value for all the trees of the considered species, while qualitative variables were set to their most frequent value.