

1 Appendix A

Site	Coordinates(°)	Elevation (m)	MAT (°C)	SAP (mm)	Nplot mixed	Nplot beech	Nplot fir	Nplot oak
Bauges (Combe d'Ire)	45.697930°N 6.214553°E	980-1242	6.3- 7.6	1994- 2079	4	5	3	-
Vercors (Lente)	44.928504°N 5.321516°E	1084-1365	5.4- 7.1	1387- 1541	5	5	4	-
Mont Ventoux (Mont Serein)	44.187901°N 5.253608°E	1007-1345	5.6- 7.3	1208- 1224	5	5	5	-
Luberon Largarde (Lagarde d'Apt)	43.973001°N 5.479875°E	1052-1121	9.2- 9.6	1026- 1027	2	2	-	2
Grand Luberon (Cerestre)	43.819412°N 5.535047°E	929-1041	9.7- 10. 7	790- 796	3	3	-	3
Sainte Baume	43.334609°N 5.766041°E	725-775	9.9- 10. 2	938- 941	4	3	-	4

2 Description of the sites. *Coordinates*: latitudinal and longitude; *Elevation*; *MAT*: mean annual temperature;
3 *SAP*: sum of annual precipitation; *Nplot*: number of sampled plots according to the forest type (i.e. mixed
4 stand - mixed - and monospecific stand - fir, beech or oak)

5

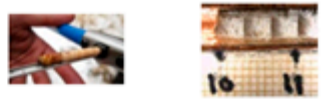
6 **Appendix B**

	Bauges	Vercors	Ventoux	Luberon Lagarde	Grand Luberon	Ste-Baume
Beech	0.30/0.67	0.30/0.41	0.45/0.50	0.41/0.64	0.29/0.46	0.26/0.34
Fir	0.60/0.58	0.34/0.36	0.53/0.37	-	-	-
Oak	-	-	-	0.16/0.49	0.51/0.31	0.26/0.16

7
8 Adjusted R-squares of linear models testing the effect of DBH on BAI for each site, each species in each stand
9 (in mixed stand/in monospecific stand). These linear models allow to reconstruct basal area increment of
10 missing growth series, i.e. no readable trees dendrochronological cores.

12 Appendix C

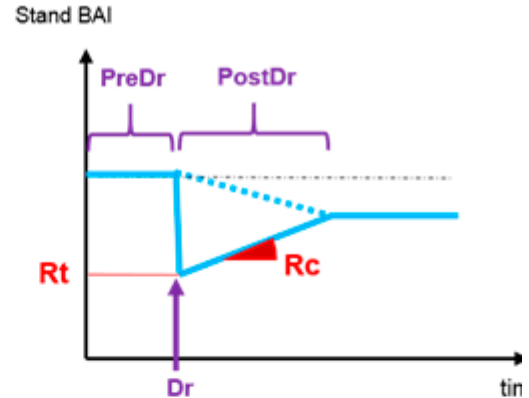
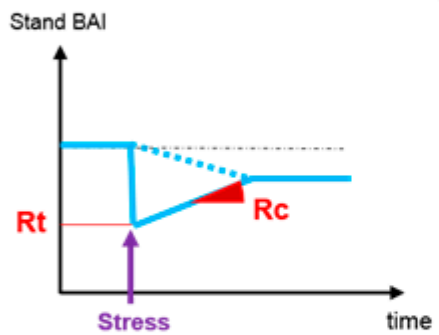
- Lab analyses :
- Coring trees with Pressler borer
 - Growing increment measured (ImageJ)



$$Rc = \text{PostDr}/\text{Dr}$$

$$Rt = \text{Dr}/\text{PreDr}$$

Resistance R_t
Recovery R_c



Predicted mixed stand calculation

Resistance and recovery calculation



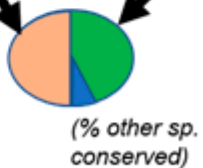
Monospecific stand beech



Monospecific stand fir or oak



Predicted BAI mixed stands

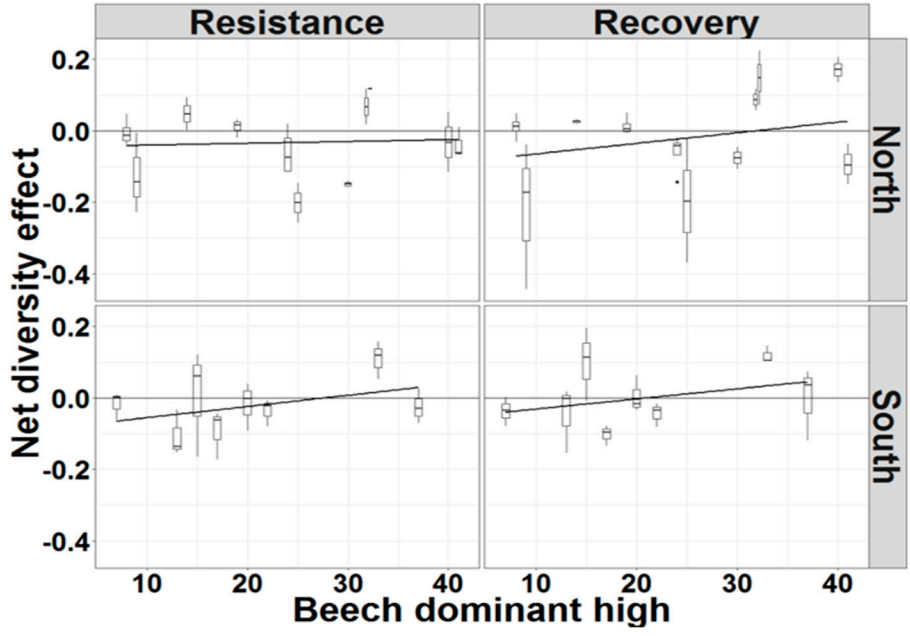


$$BAI_{s,t,p,y} = c_{0,s} + c_1 * BAI_p + a * lag_{intercept}(SPEI_y) + b * lag_{slope}(SPEI_y) + d_t + d_{p,t} + e_{s,t,p,y}$$

$$Rt_{div,eff}/Rc_{div,eff} = Rt/RC_{observed} - Rt/RC_{predicted}$$

14 Description of the several steps of the methodology used.

15 **Appendix D**



Model	$R_{div.eff} / R_{c.div.eff} \sim$	stress gradient +	Site
		(maximum beech height)	
North	$R_{div.eff}$	-0.002 (± 0.002)	Bauges : 0.05 (± 0.11) Vercors: 0.08 (± 0.08) Ventoux: -0.02 (± 0.05)
	$R_{c.div.eff}$	0.002 (± 0.003)	Bauges : -0.18 (± 0.15) Vercors: 0.01 (± 0.1) Ventoux: -0.1 (± 0.06)
South	$R_{div.eff}$	0.003 (± 0.004)	Grand Luberon : -0.07(± 0.06) Lagarde: -0.11 (± 0.08) Ste Baume: -0.08 (± 0.13)
	$R_{c.div.eff}$	0.008 (± 0.004)	Grand Luberon : -0.08 (± 0.05) Lagarde: -0.19 (± 0.08) Ste Baume: -0.21 (± 0.12)

16

17 Linear models tested to explain $R_{div.eff}/R_{c.div.eff}$ with a proxy of stress gradient, i.e. maximum beech height, for every stand with the northern (North) and southern

18 (South) parts of the gradient taken separately. North includes plots in Mont Ventoux, Vercors and Bauges and South includes plots in Luberon Lagarde, Grand

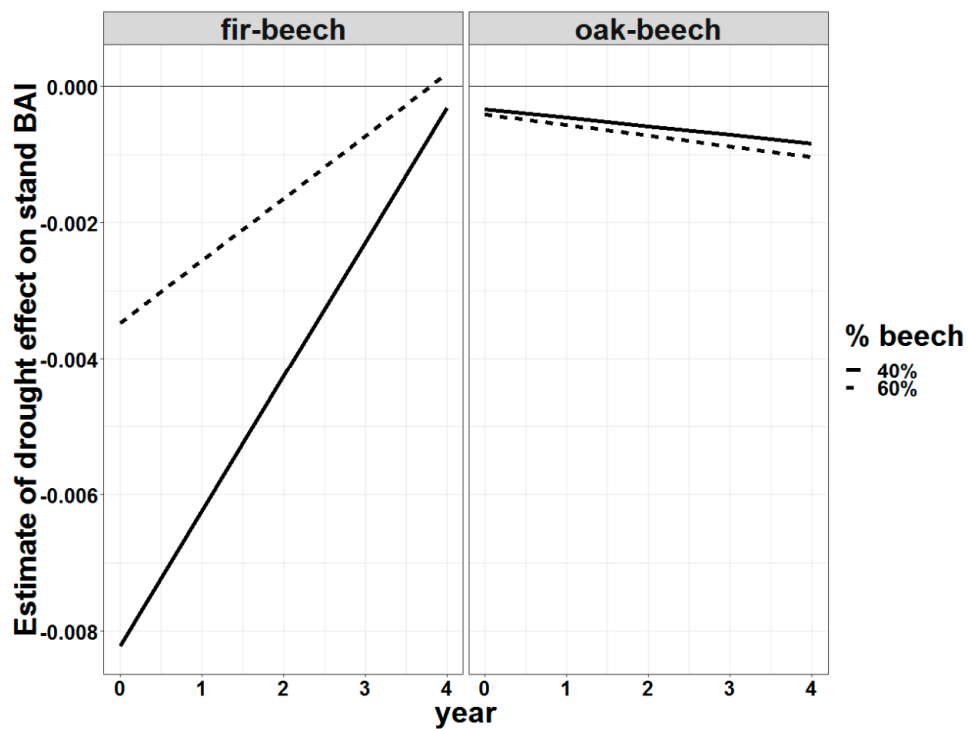
19 Luberon and Sainte-Baume. Significant p-value with t-test at the 0.1 level are represented in bold.

Appendix E

a)

Dataset metrics	beech-fir stand Estimate (\pm SE)	beech-oak stand Estimate (\pm SE)
<i>BA</i>	0.003(\pm 0.005)	-0.0001(\pm 0.003)
<i>phet</i>	-0.031(\pm 0.024)	0.021(\pm 0.008)
<i>lag_{intercept} (SPEI_y)</i>	-0.018(\pm0.005)	-0.0001(\pm 0.005)
<i>lag_{slope} (SPEI_y)</i>	0.004(\pm0.002)	-0.0001(\pm 0.002)
<i>lag_{intercept} (SPEI_y):phet</i>	0.024(\pm0.011)	-0.0004(\pm 0.011)
<i>lag_{slope} (SPEI_y):phet</i>	-0.005(\pm 0.004)	-0.0002(\pm 0.004)

b)



39 a) Linear models tested to explain BAI for mixed stand with beech-fir stand (plots in Mont Ventoux,
 40 Vercors and Bauges) and beech-oak stand (plots in Luberon Lagarde, Grand Luberon and Sainte-Baume)
 41 taken separately.

$$42 \quad BAI_{s,t,p,y} = c_{0,s} + c_1 * BA_p + c_2 * phet_p + a_0 * lag_{intercept}(SPEI_y) + b_0 * lag_{slope}(SPEI_y) + a_1 * lag_{intercept}(SPEI_y) : phet_p$$

$$43 \quad + b_1 * lag_{slope}(SPEI_y) : phet_p + d_t + d_{p,t} + e_{s,t,p,y}(1)$$

44 where t , p , and y are respectively the triplet, the plot and the year. $c_{0,s}$ is site dependent intercept (s
 45 corresponding to one of the different site Bauges, Vercors, Ventoux, Grand Luberon, Luberon Lagarde or
 46 Sainte-Baume). BA_p is the total basal area and c_1 is the respective fitted coefficients. $phet_p$ is the beech
 47 proportion for plot p and c_2 the respective fitted coefficients. d_t and $d_{p,t}$ are respectively the triplet random effects
 48 and plot nested in triplet random effects and $e_{s,t,p,y}$ is the residual normal error. a_0 and b_0 represent respectively
 49 the immediate growth reduction due to drought (resistance) and the linear recovery over time (recovery). a_1
 50 and b_1 represent respectively interaction between beech proportion and the immediate growth reduction due
 51 to drought (resistance) and interaction between beech proportion and the linear recovery over time (recovery).
 52 This model was fitted separately per stand type – i.e. monospecific beech, fir and oak stand, and beech-fir and
 53 beech-oak mixed – and region – North (for Bauges, Vercors, Ventoux) and South (for Luberon Lagarde, Grand
 54 Luberon and Sainte-Baume) - with *lme* and DLNM with R software (R version 3.3.0).

55 b) Graphic representation of resistance and recovery. The intercept of each line represents the mean
 56 response of stand BAI during a year with a significant drought stress, i.e. stand *resistance*, and the slope of
 57 each line represents *recovery* of stand productivity during four years after the stress. We considered both
 58 mixed stands separately. Different beech proportion is represented by different lines: dotted line for 40% of
 59 beech and continuous line for 60% of beech.

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61 **Appendix F**

		Fir part of stand BAI		Total stand BAI	
Years considered	site	Mixed stand	Fir stand	Mixed stand	Fir stand
Dry years	Bauges	0.017(±0.006)	0.038(±0.006)	0.030(±0.008)	0.038(±0.006)
	Vercors	0.013(±0.004)	0.025(±0.009)	0.022(±0.005)	0.025(±0.008)
	Ventoux	0.011(±0.004)	0.021(±0.006)	0.018(±0.005)	0.022(±0.007)
All the years	Bauges	0.310(±0.164)	0.662(±0.093)	0.493(±0.197)	0.652(±0.110)
	Vercors	0.284(±0.080)	0.552(±0.163)	0.453(±0.106)	0.543(±0.162)
	Ventoux	0.219(±0.090)	0.408(±0.122)	0.349(±0.112)	0.409(±0.125)

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63 Stand basal area mean (±standard error) by site (in Bauges, Vercors and Ventoux) and stand (mixed stand vs
 64 monospecific stand), for only dryest years (three first lines) and all the years (three lines after), for only fir
 65 part of stand BAI (two first column) and total BAI (two column after). Student test between mixed and
 66 monospecific stand with p-value <0.05 are in bold.

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