



## Supplement of

## Impacts on and damage to European forests from the 2018–2022 heat and drought events

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## Supplement

**Table S1:** Differences between the study period 2018-2022 (18-22) to reference period 2010-2014 (10-14), where available. Denoted next to the higher average value ( $\bar{x}$ ) in each cell are the results of the statistical tests: n.a. (not applicable), n.s. (not significant), \* significant (p<0.05), \*\* highly significant (p<0.01), \*\*\* very highly significant (p<0.001). Although we found significant differences in crown defoliation of broadleaf trees for the northern zone, these results are not considered valid as the datasets used do not include the same countries in both groups. Consequently, no significant differences can be reliably demonstrated.

Zone	Crown defoliation [%]		Damaged wood by insects [1000m <sup>3</sup> ]	Burnt forest area [ha]	Tree cover loss [%]		
	Broadleaves	Conifers					
Northern	$\bar{x} (10-14) = 23.3$ n = 7 $\bar{x} (18-22) = 51.9**$ n = 3	$\bar{x}$ (10-14) = 16.9 (n.s.) n = 16 $\bar{x}$ (18-22) = 15.9 n = 10	n.a.	$884.12 n = 20 \bar{x} (18-22) = 1750.8 (n.s.)$	$\bar{x}$ (10-14) = 0.70 n = 25 $\bar{x}$ (18-22) = 1.05*** n = 25		
Central	$\bar{x} (10-14) = 31.29$ n = 30 $\bar{x} (18-22) = 37.11***$ n = 30	n = 23	$\bar{x} (10-14) = 739.22$ n = 20 $\bar{x} (18-22) = 11507.67***$ n = 31	1655.1 n = 27 $\bar{x}$ (18-22) = 1991.1 (n.s.)	$\bar{x}$ (10-14) = 0.39 n = 40 $\bar{x}$ (18-22) = 0.76** n = 40		
Alpine	n.a.	n.a.	n.a.	$\bar{x} (10-14) = 62.3$ n=10 $\bar{x} (18-22) = 110.6$ (n.s.) n=10	n.a.		
Southern	$\bar{x} (10-14) = 26.25$ n = 10 $\bar{x} (18-22) = 34.83*$ n = 9	$\bar{x} (10-14) = 20.02$ n = 8 $\bar{x} (18-22) = 26.99**$ n = 8	n.a.	$\bar{x}$ (18-22) = 50630	0.57		

A pairwise t-test comparing the averages presented in **Table S1** examined whether the observed changes (difference in means) between the two periods (2010-2014 and 2018-2022) are statistically significant. The test results indicate that the difference between the two periods was not statistically significant (p=0.06) for defoliation of both conifers and broadleaves, with a mean difference of 9.4%. The t-test results for forest fire occurrence clearly showed no significant difference (p=0.34, mean difference: 3400.9 ha). However, for tree cover loss, the mean difference of 0.34% was highly significant (p=0.004). A similar statistical test for damaged wood by insects was not feasible due to insufficient data availability.

Table S2a: Forest fires in the Alpine countries (without Slovenia). All data in bold is based on Müller et al., (2020). Data of forest fires in Austria (2003-2022) comes from the Austrian Forest fire database, Institute of Silviculture, BOKU Vienna. Data from France derives from the Prométhée database (<u>http://www.promethee.com</u>) of the Departments Hautes-Alpes, Alpes-de-Haute-Provence, Alpes-Maritimes, and Drôme; the departments of Haute-Savoie, Savoie and Isère, which also belong to the Alps were not available. Data from Germany derives from the Bayerische Landesanstalt für Wald und Forstwirtschaft (LWF), collected by the AELFS (Ämter für Ernährung, Landwirtschaft und Forsten); Bavarian Alps including the foothills of the Alps; fires at military training facilities (Bundesforste) are excluded. Italian data is extracted from the JRC technical reports on forest fire in Europe for the Italian Alpine regions (Valle d'Aosta, Piemonte, Lombardia, Trentino Alto Adige, Veneto, Friuli Venezia Giulia and Liguria) the number of fires in Italy is for wildfires, not forest fires. Data for the Swiss Alps (without the Swiss Mittelland and Jura). Data input for 2022 is not completed.

Coun	Alpine	Mean annual		2018		2019		2020		2021		2022	
try	Forest area	Burnt	Fire	Burnt	Fire	Burnt	Fire	Burnt	Fire	Burnt	Fire	Burnt	Fire
	(ha)	area	events	area	event	area	event	area	even	area	event	area	event
		(ha)		(ha)	s	(ha)	s	(ha)	ts	(ha)	s	(ha)	s
AT	2,892,100	64	122	15	174	19	244	51	234	116	164	551	217
		2003-	2003-										
		2017:	2017:										
		55.3	188.1										
GER	403,600	n.a.	n.a.	3,007	3	1,405	3	0,08	2	0	0	0,05	2
ITA	2,262,300	9,984	1043	1,209.5	323	2,894.7	629	1,802.4	549	1,712.9	593	1360	6259
													.9
CH	992,900	515	105	44.59	93	13.87	63	9.15	49	24.21	46	262.17	98
		2000-	2000-										
		2017:	2017:8										
		118.82	0,83										
FRA	1,409,900	818	213	95		973		653		141		2,078	

Table S2b: Forest fires in the reference period 2010-2014

Coun	20	2010		2011		2012		2013		2014	
try	Burnt	Fire	Burnt	Fire	Burnt	Fire	Burnt	Fire	Burnt	Fire	
	area	event	area	event	area	even	area	event	area	event	
	(ha)	s	(ha)	s	(ha)	ts	(ha)	S	(ha)	s.	
AT	35	144	42	267	40	259	93	197	75	145	
GER											
ITA	469	385	3015	955	3032	1188	1878	502	354	342	
СН	24.74	67	165.24	76	24.59	51	24.21	55	40.96	45	
FRA											