Forest Condition in Europe 2019 Technical Report of ICP Forests

Online Supplementary Material

Report under the UNECE Convention on Long-range Transboundary Air Pollution (Air Convention)

Alexa Michel, Anne-Katrin Prescher, and Kai Schwärzel (editors)

Contact

Programme Co-ordinating Centre of ICP Forests Kai Schwärzel, Head Thünen Institute of Forest Ecosystems Alfred-Möller-Str. 1, Haus 41/42 16225 Eberswalde, Germany Email: pcc-icpforests@thuenen.de

Recommended citation

Michel A, Prescher A-K, Schwärzel K, editors (2019) Forest Condition in Europe: 2019 Technical Report of ICP Forests. Report under the UNECE Convention on Long-range Transboundary Air Pollution (Air Convention). Online supplementary material, 45 p. Available at http://icp-forests.net/page/icp-forests-technical-report

United Nations Economic Commission for Europe (UNECE) Convention on Long-range Transboundary Air Pollution (Air Convention, formerly CLRTAP) International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests)

http://icp-forests.net





Working Group on Effects of the Convention on Long-range Transboundary Air Pollution



CONTENTS

S1	TREE CI	ROWN CONDITION AND DAMAGE CAUSES – ADDITIONAL MAPS	3
	S1-1	Mean plot defoliation of main tree species in 2018	3
	S1-2	Trends in mean plot defoliation of the main tree species 2011-2018	11
	S1-3	Occurrence of various damaging agent groups in 2018	19
S 2	RESULT	S OF THE NATIONAL CROWN CONDITION SURVEYS	25
	S2-1	Tree defoliation (%) in different defoliation classes from national crown condition surveys in 2018	25
	S2-2	Percentage of moderately to severely defoliated trees (defoliation classes 2–4) between 2009 and 2018 – All species	.29
	S2-3	Percentage of moderately to severely defoliated trees (defoliation classes 2–4) between 2009 and 2018 – Conifers	.30
	S2-4	Percentage of moderately to severely defoliated trees (defoliation classes 2–4) between 2009 and 2018 – Broadleaves	.31
	S2-5	Change of tree defoliation over time (1990–2018) per country	32

S1 TREE CROWN CONDITION AND DAMAGE CAUSES – ADDITIONAL MAPS



S1-1 Mean plot defoliation of main tree species in 2018

Figure S1-1: Mean plot defoliation of Scots pine (Pinus sylvestris) in 2018



Figure S1-2: Mean plot defoliation of Norway spruce (*Picea abies*) in 2018



Figure S1-3: Mean plot defoliation of Austrian pine (Pinus nigra) in 2018



Figure S1-4: Mean plot defoliation of Mediterranean lowland pines (Pinus halepensis, P. pinaster, P. pinea, P. brutia) in 2018



Figure S1-5: Mean plot defoliation of common beech (Fagus sylvatica) in 2018



Figure S1-6: Mean plot defoliation of deciduous temperate oaks (*Quercus robur* and *Q. petraea*) in 2018



Figure S1-7: Mean plot defoliation of deciduous (sub-) Mediterranean oaks (*Quercus cerris, Q. frainetto, Q. pubescens, Q. pyrenaica*) in 2018



Figure S1-8: Mean plot defoliation of evergreen oaks (Quercus coccifera, Q. ilex, Q. rotundifolia, Q. suber) in 2018



S1-2 Trends in mean plot defoliation of the main tree species 2011–2018

Figure S1-9: Trends in mean plot defoliation of Scots pine (*Pinus sylvestris*) between 2011 and 2018. Plots were included if assessments were available for at least 80% of the period.



Figure S1-10: Trends in mean plot defoliation of Norway spruce (*Picea abies*) between 2011 and 2018. Plots were included if assessments were available for at least 80% of the period.

Figure S1-11: Trends in mean plot defoliation of Austrian pine (*Pinus nigra*) between 2011 and 2018. Plots were included if assessments were available for at least 80% of the period.

Figure S1-12: Trends in mean plot defoliation of Mediterranean lowland pines (*Pinus brutia, P. halepensis, P. pinaster, P. pinea*) between 2011 and 2018. Plots were included if assessments were available for at least 80% of the period.

Figure S1-13: Trends in mean plot defoliation of common beech (*Fagus sylvatica*) between 2011 and 2018. Plots were included if assessments were available for at least 80% of the period.

Figure S1-14: Trends in mean plot defoliation of deciduous temperate oaks (*Quercus robur* and *Q. petraea*) between 2011 and 2018. Plots were included if assessments were available for at least 80% of the period.

Figure S1-15: Trends in mean plot defoliation of deciduous (sub-) Mediterranean oaks (*Quercus cerris*, *Q. frainetto*, *Q. pubescens*, *Q. pyrenaica*) between 2011 and 2018. Plots were included if assessments were available for at least 80% of the period.

Figure S1-16: Trends in mean plot defoliation of evergreen oaks (*Quercus coccifera, Q ilex, Q. rotundifolia, Q. suber*) between 2011 and 2018. Plots were included if assessments were available for at least 80% of the period.

S1-3 Occurrence of various damaging agent groups in 2018

Figure S1-17: Occurrence of damaging agent group Abiotic factors in 2018

Figure S1-18: Occurrence of damaging agent group Direct action of man in 2018

Figure S1-19: Occurrence of damaging agent group Fire in 2018

Figure S1-20: Occurrence of damaging agent group Fungi in 2018

Figure S1-21: Occurrence of damaging agent group Game and grazing in 2018

Figure S1-22: Occurrence of damaging agent group Insects in 2018

S2 RESULTS OF THE NATIONAL CROWN CONDITION SURVEYS

S2-1 Tree defoliation (%) in different defoliation classes from national crown condition surveys in 2018

Participating	No. of sample	Defoliation	classes				
country	trees	0 none	1 slight	2 moderate	3 severe	4 dead	2-4 mod
		(%)	(%)	(%)	(%)	(%)	dead (%)
A d							
Andorra	г	20.0	00.0	0.0	0.0	0.0	0.0
Broadleaves	ر ۱۹۷	20.0 F 0 F	80.0 7 F O	0.0	0.0	0.0	U.U
	204	50.5	22.7 26.7	4.9	0.4	0.4	5.0
All liees	207	57.0	50.7	4.0	0.4	0.4	5.0
Relaium-Flanders							
Broadleaves	804	9.0	65.4	20.6	3.5	1.5	25.6
Conifers	677	6.2	74.3	18.1	0.6	0.8	19.5
All trees	1481	7.7	69.5	19.5	2.2	1.2	22.9
Belgium-Wallonia							
Broadleaves	201	27.0	37.2	25.2	10.7	0.0	35.8
Conifers	165	9.6	29.0	56.4	5.0	0.0	61.4
All trees	366	19.2	33.5	39.3	8.1	0.0	47.3
Bulgaria							
Broadleaves	3169	30.8	47.4	18.2	2.2	1.4	21.8
Conifers	2427	24.6	30.3	34.2	6.6	4.2	45.0
All trees	5596	28.1	40.0	25.1	4.1	2.6	31.9
Croatia	2014	72.0	70.4	25.2	2.4	0.5	27.0
Broadleaves	2014	32.8	59.4 26.0	25.2	2.1	0.5	27.8
	56Z	26.Z	26.8 77 F	36.Z	10.8	0.0	47.0
All liees	25/6	51.8	57.5	20.9	5.5	0.4	50.8
Cyprus							
Broadleaves	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Conifers	367	15.5	51.0	28.6	3.0	1.9	33.5
All trees	367	15.5	51.0	28.6	3.0	1.9	33.5
Czechia							
Broadleaves	1183	21.4	43.0	33.5	2.0	0.2	35.6
Conifers	3731	11.4	25.6	56.7	6.1	0.2	63.0
All trees	4914	13.8	29.8	51.1	5.1	0.2	56.4
Denmark							
Broadleaves	867	32.3	37.7	27.0	3.0	0.0	30.0
Conifers	1184	48.7	36.1	13.6	1.5	0.1	15.2
All trees	2051	41.7	36.8	19.3	2.1	0.1	21.4

Participating	No. of sample	Defoliation classes							
country	trees	0 none	1 slight	2 moderate	3 severe	4 dead	2-4 mod		
		(%)	(%)	(%)	(%)	(%)	dead (%)		
Estonia	7.42	(7.0	70.4	2.0					
Broadleaves	342	63.8	32.1	2.0	0.4	1./	4.1		
Conifers	2062	47.1	45./	5.9	0.8	2.6	9.3		
All trees	2404	49.4	42.0	5.5	0.8	2.5	8.5		
Franco									
Broadloavos	6917	10.6	ZU 2	50.2	<u> 9</u> 7	0 3	500		
Conifers	3802	10.0 29.9	30.5	30.2 35 A	0.J 4 7	0.5	40 0		
	10744	174	30.0	45 0	6.9	0.4	52.2		
All lices	107 11	17.7	50.4	45.0	0.7	0.5	J Z.Z		
Germany									
Broadleaves	4027	22.4	40.5	33.3	3.2	0.7	37.1		
Conifers	5840	31.6	45.6	21.3	1.1	0.4	22.8		
All trees	9867	27.8	43.5	26.2	2.0	0.5	28.7		
Greece									
Broadleaves	618	68.6	17.0	10.5	2.0	2.0	14.4		
Conifers	317	32.2	41.7	25.2	0.9	0.0	26.2		
All trees	935	56.3	25.3	15.5	1.6	1.3	18.4		
Hungary									
Broadleaves	1693	27.0	26.3	36.5	8.6	1.7	46.8		
Conifers	176	22.2	25.6	36.4	10.8	5.1	52.3		
All trees	1869	26.5	26.2	36.5	8.8	2.0	47.3		
Italy									
Broadleaves	3335	14.7	41.1	35.5	5.8	2.1	43.4		
Conifers	114/	45.6	31.2	21.4	2.6	1.1	28.1		
All trees	4482	22.1	38.6	31.9	5.0	2.1	39.0		
l atria									
Latvia	410	(1	0 - 1	0.7	0.5	0.0	0.0		
Dioduleaves	410	0.1	00.1 01.7	ö.) 7 (0.5	0.0	0.0 7.0		
	1510	14.0	01.J 01.J	5.0 4 7	0.1	0.2	5.7 5 1		
All liees	1720	12.0	02.2	т./	0.2	0.2	J.1		
l ithuania									
Broadleaves	2467	21.8	64 0	11 5	15	12	14 2		
Conifers	4138	11.7	67.2	20.2	0.5	0.4	21.1		
All trees	6605	15.5	66.0	17.0	0.9	0.7	18.5		
Luxembourg									
Broadleaves	774	17.1	43.2	34.8	4.3	0.7	39.7		
Conifers	426	58.5	25.4	13.4	1.2	1.7	16.2		
All trees	1200	31.8	36.9	27.2	3.2	1.0	31.3		
Montenegro									
Broadleaves	888	16.1	49.1	31.9	2.9	0.0	34.8		
Conifers	288	25.7	43.4	21.2	9.7	0.0	30.9		
All trees	1176	18.5	47.7	29.2	4.6	0.0	33.6		

country trees 0 none 1 slight 2 moderate 3 severe 4 dead 2 4 mod. Norway Bradlarves N/A	Participating	No. of sample	Defoliation classes								
(%) (%) (%) (%) (%) (%) (%) (%) dead (%) Norway Bradlexves N/A	country	trees	0 none	1 slight	2 moderate	3 severe	4 dead	2-4 mod			
Norway N/A N/A<			(%)	(%)	(%)	(%)	(%)	dead (%)			
Norway N/A N/A<											
Broadleaves NVA NVA <th< td=""><td>Norway</td><td>N1 /A</td><td>N1 / A</td><td>N1 / A</td><td>N1 / A</td><td></td><td>N1 / A</td><td>N1 / A</td></th<>	Norway	N1 /A	N1 / A	N1 / A	N1 / A		N1 / A	N1 / A			
Conners 10271 48.8 55.7 12.9 2.4 0.3 15.3 Poland Broadleavers 14850 14.8 64.1 19.2 1.1 0.8 17.2 Poland Broadleavers 14850 14.8 64.1 19.2 1.1 0.8 17.2 Rep. of Modova Broadleavers NA NA<	Broadleaves	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
Alt trees 102/1 48.0 35.7 12.9 2.4 0.3 13.5 Poland		10271	48.8	55./ 75.7	12.9	2.4	0.5	15.5			
Polaid Frequencies 14850 9.3 7.5.5 1.5.6 1.0 0.6.8 12.1.1 Conifers 2.5610 9.3 7.5.5 15.6 1.0 0.7 18.6 Rep. of Moldova Broadleaves N/A N/A <td< td=""><td>All liees</td><td>10271</td><td>40.0</td><td>55.7</td><td>12.9</td><td>2.4</td><td>0.5</td><td>15.5</td></td<>	All liees	10271	40.0	55.7	12.9	2.4	0.5	15.5			
Num 14850 14.8 64.1 19.2 1.1 0.8 21.1 Confers 25610 9.3 73.5 15.6 1.0 0.6 17.2 All trees 40460 11.3 70.0 16.9 1.1 0.7 18.6 Rep. of Moldova Broadleaves N/A	Poland										
Doubles 1250 9.3 73.5 13.6 1.0 0.6 17.2 All trees 40460 11.3 70.0 16.9 1.1 0.7 18.6 Rep. of Moldova NA NA NA NA NA NA NA NA Broadleaves N/A N/	Broadleaves	14850	148	64 1	19.2	11	0.8	21.1			
All trees 40460 11.3 70.0 16.9 1.1 0.7 18.6 Rep. of Moldova Broadleaves N/A	Conifers	25610	9.3	73.5	15.6	1.0	0.6	17.2			
Rep. of Notdova N/A	All trees	40460	11.3	70.0	16.9	1.1	0.7	18.6			
Rep. of Moldova N/A											
Broadleaves N/A N/A <th< td=""><td>Rep. of Moldova</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>	Rep. of Moldova										
Conifers 62 62.9 24.2 9.7 0.0 3.2 12.9 Romania	Broadleaves	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
All trees 62 62.9 24.2 9.7 0.0 3.2 12.9 Romania Broadleaves 4807 48.9 35.3 13.5 1.7 0.6 15.8 Conifers 1093 64.1 25.6 9.0 1.3 0.0 10.3 All trees 5900 51.7 33.5 12.6 1.7 0.5 14.8 Serbia	Conifers	62	62.9	24.2	9.7	0.0	3.2	12.9			
Romania Broadleaves Conifers 4807 48.9 35.3 13.5 1.7 0.6 15.8 Gonifers 1093 64.1 25.6 9.0 1.3 0.0 10.3 All trees 5900 51.7 33.5 12.6 1.7 0.5 14.8 Serbia Serbia Serbia Serbia Serbia Serbia Serbia Serbia Serbia 1.2.1 0.0 10.2 Multrees 2614 69.6 18.3 9.5 2.5 0.1 12.1 Conifers 354 81.6 8.2 6.2 4.0 0.0 10.2 All trees 2968 71.0 17.1 9.1 2.7 0.1 11.9 Stowakia Storadleaves 2775 14.0 47.6 36.2 1.8 0.4 38.4 Conifers 14126 8.7 41.7 44.2 4.7 0.8 49.7 Storadleaves 594 14.7 34.3 29.0<	All trees	62	62.9	24.2	9.7	0.0	3.2	12.9			
Romania 55.5 1.7 0.6 15.8 Broadleaves 4807 48.9 35.5 1.7 0.5 103 All trees 5900 51.7 33.5 12.6 1.7 0.5 14.8 Seroia <th<< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<<>											
Broadleaves 4807 48.9 35.3 13.5 1.7 0.6 15.8 Conifers 1093 64.1 25.6 9.0 1.3 0.0 10.3 All trees 5900 51.7 33.5 12.6 1.7 0.5 14.8 Serbia	Romania										
Conifers 1093 64.1 25.6 9.0 1.3 0.0 103 All trees 5900 51.7 33.5 12.6 1.7 0.5 14.8 Serbia	Broadleaves	4807	48.9	35.3	13.5	1.7	0.6	15.8			
All trees 5900 51.7 33.5 12.6 1.7 0.5 14.8 Serbia Broadleaves 2614 69.6 18.3 9.5 2.5 0.1 12.1 Conifers 354 81.6 8.2 6.2 4.0 0.0 10.2 All trees 2968 71.0 17.1 9.1 2.7 0.1 11.9 Storakia Broadleaves 2275 14.0 47.6 36.2 1.8 0.4 38.4 Gonifers 142.6 8.7 41.7 44.2 4.7 0.8 49.7 All trees 3701 12.0 45.3 39.3 2.9 0.6 42.7 Storatia Broadleaves 694 17.9 48.3 26.5 6.3 0.9 33.7 Storatia Broadleaves 694 17.9 48.3 26.5 6.3 0.9 33.7 Storatia Broadleaves 694 17.9 48.3 26.5 6.3 0.9 33.7 Storatia Broadleaves 7472 17.5 </td <td>Conifers</td> <td>1093</td> <td>64.1</td> <td>25.6</td> <td>9.0</td> <td>1.3</td> <td>0.0</td> <td>10.3</td>	Conifers	1093	64.1	25.6	9.0	1.3	0.0	10.3			
Serbia Serbia Broadleaves 2614 696 18.3 9.5 2.5 0.1 12.1 Conifers 354 81.6 8.2 6.2 4.0 0.0 10.2 All trees 2968 71.0 17.1 9.1 2.7 0.1 11.9 Stovakia Encadleaves 2275 14.0 47.6 36.2 1.8 0.4 38.4 Conifers 142.6 8.7 41.7 44.2 4.7 0.8 49.7 All trees 3701 12.0 45.3 39.3 2.9 0.6 42.7 Stovenia Encadleaves 694 17.9 48.3 26.5 6.3 0.9 33.7 Gonifers 362 24.6 35.1 33.7 3.3 3.3 40.3 All trees 1056 20.2 43.8 29.0 5.3 1.7 36.0 Spain Encadleaves 7472 17.5 60.1 18.5	All trees	5900	51.7	33.5	12.6	1.7	0.5	14.8			
Serba Serba Broadleaves 2614 69.6 18.3 9.5 2.5 0.1 12.1 Confers 354 81.6 8.2 6.2 4.0 0.0 10.2 All trees 2968 71.0 17.1 9.1 2.7 0.1 11.9 Slovakia Broadleaves 2275 14.0 47.6 36.2 1.8 0.4 38.4 Gonfers 1426 8.7 41.7 44.2 4.7 0.8 49.7 All trees 3701 12.0 45.3 39.3 2.9 0.6 42.7 Slovenia Broadleaves 694 17.9 48.3 26.5 6.3 0.9 33.7 Gonifers 362 24.6 35.1 35.7 3.3 3.3 40.3 All trees 1056 20.2 43.8 29.0 5.3 1.7 26.0 Spain Example Example 17.5 60.1 18.5	c										
Broadleaves 2614 69.6 18.5 9.5 2.5 0.1 12.1 Conifers 354 81.6 8.2 6.2 4.0 0.0 10.2 All trees 2968 71.0 17.1 9.1 2.7 0.1 11.9 Slovakia Broadleaves 2275 14.0 47.6 36.2 1.8 0.4 38.4 Conifers 1426 8.7 41.7 44.2 4.7 0.8 49.7 All trees 3701 12.0 45.3 39.3 2.9 0.6 42.7 Slovenia Broadleaves 694 17.9 48.3 26.5 6.3 0.9 33.7 Conifers 362 24.6 35.1 33.7 3.3 3.3 40.3 All trees 1056 20.2 43.8 29.0 5.3 1.7 36.0 Spain Broadleaves 7472 17.5 60.1 18.5 2.2 1.7 22.4 Conifers 7408 17.6 59.4 16.7 3.7 2.7 <td>Serbia</td> <td>2(11</td> <td>(0.(</td> <td>407</td> <td>0.5</td> <td>2.5</td> <td>0.4</td> <td>42.4</td>	Serbia	2(11	(0.(407	0.5	2.5	0.4	42.4			
Contres 354 81.6 8.2 6.2 4.0 0.0 10.2 All trees 2968 71.0 17.1 9.1 2.7 0.1 11.9 Storakia Broadleaves 2275 14.0 47.6 36.2 1.8 0.4 38.4 Conifers 1426 8.7 41.7 44.2 4.7 0.8 49.7 All trees 3701 12.0 45.3 39.3 2.9 0.6 42.7 Storenia Broadleaves 694 17.9 48.3 26.5 6.3 0.9 33.7 Conifers 362 24.6 35.1 33.7 3.3 3.3 40.3 All trees 1056 20.2 43.8 29.0 5.3 1.7 36.0 Spain Broadleaves 7472 17.5 60.1 18.5 2.2 1.7 22.4 Conifers 7408 17.6 59.7 17.6 3.0 2.2 2.7 </td <td>Broadleaves</td> <td>2614</td> <td>69.6</td> <td>18.5</td> <td>9.5</td> <td>2.5</td> <td>0.1</td> <td>12.1</td>	Broadleaves	2614	69.6	18.5	9.5	2.5	0.1	12.1			
Alt trees 2966 71.0 17.1 9.1 2.7 0.1 11.9 Stovakia Broadleaves 2275 14.0 47.6 36.2 1.8 0.4 38.4 Broadleaves 2275 14.0 47.6 36.2 1.8 0.4 38.4 Conifers 1426 8.7 41.7 44.2 4.7 0.8 49.7 All trees 3701 12.0 45.3 39.3 2.9 0.6 42.7 Stovenia Broadleaves 694 17.9 48.3 26.5 6.3 0.9 33.7 Storenia Broadleaves 694 17.9 48.3 26.5 6.3 0.9 33.7 Storenia Broadleaves 694 17.9 48.3 26.5 6.3 0.9 33.7 Storenia Broadleaves 1056 20.2 43.8 29.0 5.3 1.7 36.0 Spin Broadleaves 7472 17.5 60.1 18.5 2.2 1.7 22.4 Conifers 7408 17.		554 2079	81.0 71.0	8.Z	6.Z	4.0 2.7	0.0	10.2			
Slovakia Broadleaves 2275 14.0 47.6 36.2 1.8 0.4 38.4 Conifers 1426 8.7 41.7 44.2 4.7 0.8 49.7 All trees 3701 12.0 45.3 39.3 2.9 0.6 42.7 Storenia Broadleaves 694 17.9 48.3 26.5 6.3 0.9 33.7 Conifers 362 24.6 35.1 33.7 3.3 3.3 40.3 All trees 1056 20.2 43.8 29.0 5.3 1.7 36.0 Spain E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E <th< td=""><td>All liees</td><td>2908</td><td>/1.0</td><td>17.1</td><td>9.1</td><td><i>L.1</i></td><td>0.1</td><td>11.9</td></th<>	All liees	2908	/1.0	17.1	9.1	<i>L.1</i>	0.1	11.9			
Broadleaves 2275 14.0 47.6 36.2 1.8 0.4 38.4 Conifers 1426 8.7 41.7 44.2 4.7 0.8 49.7 All trees 3701 12.0 45.3 39.3 2.9 0.6 42.7 Slovenia Broadleaves 694 17.9 48.3 26.5 6.3 0.9 33.7 Conifers 362 24.6 35.1 33.7 3.3 3.3 40.3 All trees 1056 20.2 43.8 29.0 5.3 1.7 36.0 Spain Broadleaves 7472 17.5 60.1 18.5 2.2 1.7 22.4 Conifers 7408 17.6 59.4 16.7 3.7 2.7 23.1 All trees 14880 17.5 59.7 17.6 3.0 2.2 22.7 Sweden Broadleaves N/A N/A N/A N/A N/A N/A N/A N/A All trees 7306 44.7 37.8 15.4 2.0 0.2 17.6 Switzerland Broadleaves 285 16.1 57.3 9.2 1.7 15.7 26.6 Conifers 754 19.7 58.2 14.0 0.3 7.8 22.1 All trees 1039 18.6 57.9 12.5 0.8 10.2 23.5	Slovakia										
Display 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13 1.13	Broadleaves	2275	140	47.6	36.2	18	04	38.4			
All trees 3701 120 45.3 39.3 2.9 0.6 42.7 Slovenia Broadleaves 694 17.9 48.3 26.5 6.3 0.9 33.7 Conifers 362 24.6 35.1 33.7 3.3 3.3 40.3 All trees 1056 20.2 43.8 29.0 5.3 1.7 36.0 Spain Broadleaves 7472 17.5 60.1 18.5 2.2 1.7 22.4 Conifers 7408 17.6 59.4 16.7 3.7 2.7 23.1 All trees 14880 17.5 59.7 17.6 3.0 2.2 22.7 Sweden Broadleaves N/A N/A N/A N/A N/A N/A N/A N/A Conifers 7306 44.7 37.8 15.4 2.0 0.2 17.6 All trees 7306 44.7 37.8 15.4 2.0 0.2 17.6 All trees 754 19.7 58.2 14.0 0.3 7.8 22.1 All trees 754 19.7 58.2 14.0 0.3 7.8 22.1 All trees 1039 18.6 57.9 12.5 0.8 10.2 23.5	Conifers	1426	8.7	41.7	44.2	4.7	0.8	49.7			
Slovenia Number of the stress of the str	All trees	3701	12.0	45.3	39.3	2.9	0.6	42.7			
Slovenia Broadleaves 694 17.9 48.3 26.5 6.3 0.9 33.7 Conifers 362 24.6 35.1 33.7 3.3 3.3 40.3 All trees 1056 20.2 43.8 29.0 5.3 1.7 36.0 Spain State State <thstate< th=""> State <thstate< <="" td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></thstate<></thstate<>											
Broadleaves 694 17.9 48.3 26.5 6.3 0.9 33.7 Conifers 362 24.6 35.1 33.7 3.3 3.3 40.3 All trees 1056 20.2 43.8 29.0 5.3 1.7 36.0 Spain Spain State 7472 17.5 60.1 18.5 2.2 1.7 22.4 Conifers 7408 17.6 59.4 16.7 3.7 2.7 23.1 All trees 14880 17.5 59.7 17.6 3.0 2.2 22.7 Sweden N/A N/A N/A N/A N/A N/A N/A N/A Broadleaves N/A N/A 77.8 15.4 2.0 0.2 17.6 All trees 7306 44.7 37.8 15.4 2.0 0.2 17.6 Switzerland Switzerland Switzerland Switzerland Switzerland Switzerland Switzerland </td <td>Slovenia</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Slovenia										
Conifers 362 24.6 35.1 33.7 3.3 3.3 40.3 All trees 1056 20.2 43.8 29.0 5.3 1.7 36.0 Spain Spain Standleaves 7472 17.5 60.1 18.5 2.2 1.7 22.4 Conifers 7408 17.6 59.4 16.7 3.7 2.7 23.1 All trees 14880 17.5 59.7 17.6 3.0 2.2 22.7 Sweden Standleaves N/A N/A N/A N/A N/A N/A N/A Broadleaves N/A N/A N/A N/A N/A N/A N/A N/A Sweten Switzerland Switzerland 15.4 2.0 0.2 17.6 Switzerland T306 44.7 37.8 15.4 2.0 0.2 17.6 Switzerland Suitzerland Suitzerlan	Broadleaves	694	17.9	48.3	26.5	6.3	0.9	33.7			
All trees 1056 20.2 43.8 29.0 5.3 1.7 36.0 Spain Broadleaves 7472 17.5 60.1 18.5 2.2 1.7 22.4 Conifers 7408 17.6 59.4 16.7 3.7 2.7 23.1 All trees 14880 17.5 59.7 17.6 3.0 2.2 22.7 Sweden Sweden N/A N/A N/A N/A N/A N/A Broadleaves N/A N/A N/A N/A N/A N/A N/A Sweten Sweten Sweten 3.0 2.2 2.7 17.6 Sweten Sweten Sweten Sweten Sweten Sweten Sweten Sweten 15.4 2.0 0.2 17.6 Switzerland T306 44.7 37.8 15.4 2.0 0.2 17.6 Switzerland Switzerland Switzerland Sweten 17 15.7 26.6 Conifers 754 19.7 58.2 14.0 0.3 <td>Conifers</td> <td>362</td> <td>24.6</td> <td>35.1</td> <td>33.7</td> <td>3.3</td> <td>3.3</td> <td>40.3</td>	Conifers	362	24.6	35.1	33.7	3.3	3.3	40.3			
Spain Broadleaves 7472 17.5 60.1 18.5 2.2 1.7 22.4 Conifers 7408 17.6 59.4 16.7 3.7 2.7 23.1 All trees 14880 17.5 59.7 17.6 3.0 2.2 22.7 Sweden N/A N/A N/A N/A N/A N/A N/A N/A Broadleaves N/A N/A N/A N/A N/A N/A N/A M/A Sweden 3.0 2.2 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 <td>All trees</td> <td>1056</td> <td>20.2</td> <td>43.8</td> <td>29.0</td> <td>5.3</td> <td>1.7</td> <td>36.0</td>	All trees	1056	20.2	43.8	29.0	5.3	1.7	36.0			
Spain Broadleaves 7472 17.5 60.1 18.5 2.2 1.7 22.4 Conifers 7408 17.6 59.4 16.7 3.7 2.7 23.1 All trees 14880 17.5 59.7 17.6 3.0 2.2 22.7 Sweden Broadleaves N/A S S											
Broadleaves 7472 17.5 60.1 18.5 2.2 1.7 22.4 Conifers 7408 17.6 59.4 16.7 3.7 2.7 23.1 All trees 14880 17.5 59.7 17.6 3.0 2.2 22.7 Sweden N/A N/A N/A N/A N/A N/A N/A N/A N/A Broadleaves N/A N/A N/A N/A N/A N/A N/A N/A N/A Broadleaves N/A N/A<	Spain										
Conifers 7408 17.6 59.4 16.7 3.7 2.7 23.1 All trees 14880 17.5 59.7 17.6 3.0 2.2 22.7 Sweden N/A	Broadleaves	7472	17.5	60.1	18.5	2.2	1.7	22.4			
All trees 14880 17.5 59.7 17.6 3.0 2.2 22.7 Sweden Broadleaves N/A <	Conifers	7408	17.6	59.4	16.7	3.7	2.7	23.1			
Sweden N/A N/A<	All trees	14880	17.5	59.7	17.6	3.0	2.2	22.7			
Sweden N/A N/A<	C										
Broadleaves N/A N/A <th< td=""><td>Sweden</td><td>N1 / A</td><td>N1 / A</td><td>N1 / A</td><td>N1 / A</td><td>N1/A</td><td>N1/A</td><td>N1 / A</td></th<>	Sweden	N1 / A	N1 / A	N1 / A	N1 / A	N1/A	N1/A	N1 / A			
Conners 7306 44.7 57.8 15.4 2.0 0.2 17.6 All trees 7306 44.7 37.8 15.4 2.0 0.2 17.6 Switzerland Image: Second state st	Dioduleaves	N/A 770(N/A	N/A 77.0	N/A	N/A	N/A	N/A			
Switzerland S7.3 13.4 2.0 0.2 17.5 Broadleaves 285 16.1 57.3 9.2 1.7 15.7 26.6 Conifers 754 19.7 58.2 14.0 0.3 7.8 22.1 All trees 1039 18.6 57.9 12.5 0.8 10.2 23.5		7306	44./ // 7	57.0 ۲7.0	15.4 15.4	2.0	0.2	17.0			
SwitzerlandBroadleaves28516.157.39.21.715.726.6Conifers75419.758.214.00.37.822.1All trees103918.657.912.50.810.223.5		/ 500	-11./	57.0	10.4	2.0	0.2	17.0			
Broadleaves 285 16.1 57.3 9.2 1.7 15.7 26.6 Conifers 754 19.7 58.2 14.0 0.3 7.8 22.1 All trees 1039 18.6 57.9 12.5 0.8 10.2 23.5	Switzerland										
Conifers 754 19.7 58.2 14.0 0.3 7.8 22.1 All trees 1039 18.6 57.9 12.5 0.8 10.2 23.5	Broadleaves	285	16.1	57.3	9.7	1.7	15.7	26.6			
All trees 1039 18.6 57.9 12.5 0.8 10.2 23.5	Conifers	754	19.7	58.2	14.0	0.3	7.8	23.3			
	All trees	1039	18.6	57.9	12.5	0.8	10.2	23.5			

Participating	No. of sample	Defoliation	classes				
country	untry trees		0 none 1 slight 2 mode (%) (%)		3 severe (%)	4 dead 2-4 mod (%) dead (%	
Turkey							
Broadleaves	5377	43.8	45.2	9.1	0.9	1.0	11.0
Conifers	8580	41.2	48.6	8.6	0.6	1.0	10.2
All trees	13957	42.2	47.3	8.8	0.7	1.0	10.5

Participating	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Change % points
countries		2012	2015	2021	2015	2010		2010	2017/18		
Albania					21.0						N/A
Andorra	6.8	15.3	8.3	5.6	3.4	5.3	4.5	3.4	7.0	5.6	-1.4
Austria		14.2									N/A
Belarus	8.4	7.4	6.1								N/A
Belgium	20.2	22.1	23.5	28.2	27.6	27.5	26.4	26.1	26.6	27.7	+1.1
Bulgaria	21.1	23.8	21.6	32.3	33.5	26.0	26.2	29.9	27.7	31.9	+3.4
Croatia	26.3	27.9	25.2	28.5	29.1	31.5	29.7	28.5	25.6	30.8	+5.2
Cyprus	36.2	19.2	16.4	10.6	8.9	13.3	12.5	35.0	23.6	33.5	+9.9
Czechia	56.8	54.2	52.7	50.3	51.7		52.0	54.3	53.6	56.4	+2.8
Denmark	5.5	9.3	10.0	7.3	4.9	7.0	8.7	14.8	12.9	21.4	+8.5
Estonia	7.2	8.1	8.1	7.8	8.0	6.7	6.7	6.4	5.2	8.5	+3.3
Finland	9.1	10.5	10.6	14.3							N/A
France	33.5	34.6	39.9	41.4	40.1	42.8	43.4	48.6	48.8	52.2	+3.4
Germany	26.5	23.2	28.0	24.6	22.7	26.2	23.8	28.0	22.7	28.7	+6.0
Greece	24.3	23.8				24.8	20.2		20.2	18.4	-1.8
Hungary	18.4	21.8	18.9	20.2	22.4	24.2	24.0	34.6	41.0	47.3	+6.3
Ireland	12.5	17.5		1.0							N/A
Italy	35.8	29.8	31.3	35.7	33.7	30.8	29.8	34.7	39.0	39.0	+/-0.0
Latvia	13.8	13.4	14.0	9.2	6.4	5.1	4.4	5.7	5.3	5.1	-0.2
Lithuania	17.7	21.3	15.4	24.5	19.7	21.7	23.8	21.0	21.1	18.5	-2.6
Luxembourg					33.2		32.6	38.2	30.3	31.3	+1.0
Montenegro					22.7		25.4	27.3	26.6	33.6	+7.0
Netherlands	18.2	21.6									
Norway	21.0	18.9	20.9	18.8	17.7	15.9	16.5	15.5	19.0	15.5	-4.5
Poland	17.7	20.7	24.0	23.4	18.8	18.9	16.7	19.5	20.2	18.6	-1.6
Rep. of Moldova	25.2	22.5	18.4	25.6		19.9	26.1	26.5	28.7		N/A
Romania	18.9	17.8	13.9	13.9	13.6	13.5	13.1	13.4	14.5	14.8	+0.3
Russian Fed.	6.2	4.4	8.3								N/A
Serbia	10.3	10.8	7.6	10.3	14.7	12.4	10.7	11.3	11.8	11.9	+0.1
Slovakia	32.1	38.6	34.7	37.9	43.4		34.5	40.3	32.6	42.7	+10.1
Slovenia	35.5	31.8	31.4	29.1	30.9	38.3	37.8	33.9	37.0	36.0	-1.0
Spain	17.7	14.6	11.8	17.5	16.6	14.9		21.9	27.8	22.7	-5.1
Sweden	15.1	19.2	18.9	15.9	19.9		19.8	16.4	18.2	17.6	-0.6
Switzerland	18.3	22.2	30.9	31.3	26.0	30.6	24.8	25.2	33.7	23.5	-10.2
Turkey	18.7	16.8	13.6	12.4	10.2	11.0	9.5	9.8	8.8	10.5	+1.7
Ukraine	6.8	5.8	6.8	7.5	7.1	6.0	7.1				N/A
United Kingdom		48.5									N/A

S2-2 Percentage of moderately to severely defoliated trees (defoliation classes 2–4) between 2009 and 2018 – All species

Note that some differences in the level of defoliation between participating countries may be at least partly due to differences in standards used. This restriction, however, does not affect the reliability of the trends over time. In some countries there has been a change in the monitoring design at different points in time.

Participating											Change
countries	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	% points 2017/18
Albania					21.0						N/A
Andorra	6.8	15.3	8.3	5.6	3.1	5.4	4.3	3.5	7.1	5.6	-1.5
Austria		14.5									N/A
Belarus	8.3	7.7	5.8								N/A
Belgium	13.6	16.2	15.2	20.3	19.7	22.8	27.9	24.6	26.8	27.7	+0.9
Bulgaria	33.0	31.1	33.3	35.1	40.8	34.1	40.1	39.9	37.0	45.0	+8.0
Croatia	66.5	56.9	45.1	54.7	48.3	49.7	56.0	51.0	35.0	47.0	+12.0
Cyprus	36.2	19.2	16.4	10.6	8.9	13.3	12.5	35.0	23.6	33.5	+9.9
Czechia	63.1	60.1	58.9	56.9	59.2		57.8	60.3	60.3	63.0	+2.7
Denmark	1.0	5.4	5.7	4.6	2.8	5.3	7.4	11.3	11.8	15.2	+3.4
Estonia	7.5	9.0	8.7	6.6	8.5	6.9	6.5	6.7	5.5	9.3	+3.8
Finland	9.9	10.6	11.7	14.6							N/A
France	26.8	27.4	31.9	32.2	33.7	36.6	38.0	39.3	38.8	40.0	+1.2
Germany	20.3	19.2	20.3	19.3	18.1	19.7	20.3	22.3	19.5	22.8	+3.3
Greece	26.3	23.7				26.7	27.2		32.1	26.2	-5.9
Hungary	27.1	35.1	28.7	23.1	23.5	30.7	46.5	52.8	44.9	52.3	+7.4
Ireland	12.5	17.5		1.0							N/A
Italy	31.6	29.1	32.2	31.8	24.2	24.0	22.6	19.6	21.8	28.1	+6.3
Latvia	14.8	15.0	16.0	7.9	6.9	4.8	4.4	4.9	5.3	3.9	-1.4
Lithuania	17.4	19.8	16.3	26.9	23.1	21.1	25.0	21.7	23.5	21.1	-2.4
Luxembourg					17.5	93.3	18.7	17.4	17.7	16.2	-1.5
Montenegro					22.6		26.1	28.1	23.6	30.9	+7.3
Netherlands	14.1	18.9									N/A
Norway	17.9	16.4	17.3	16.1	17.7	15.9	16.5	15.5	19.0	15.5	-3.5
Poland	17.2	20.3	24.2	22.3	17.8	17.2	15.7	17.1	18.4	17.2	-1.2
Rep. of Moldova		33.3	32.1	44.3		29.4		21.6	19.6		N/A
Romania	21.7	16.1	15.9	14.9	13.9	13.7	8.0	10.4	10.7	10.3	-0.4
Russian Fed.	7.3	5.1	10.6								N/A
Serbia	12.6	12.0	11.1	11.0	13.0	14.6	14.5	13.5	12.0	10.2	-1.8
Slovakia	42.7	46.8	46.6	43.5	43.3		49.4	45.6	41.6	49.7	+8.1
Slovenia	38.8	37.8	33.6	31.3	31.3	38.1	41.0	38.6	40.6	40.3	-0.3
Spain	14.9	13.1	10.4	11.4	12.6	11.4		20.9	26.2	23.1	-3.1
Sweden	15.1	19.2	18.9	15.9	19.9	18.8	19.8	16.4	18.2	17.6	-0.6
Switzerland	18.8	20.9	31.5	30.6	23.3	31.7	24.0	24.9	33.4	22.1	-11.3
Turkey	16.0	14.5	11.6	9.9	6.9	7.2	8.6	9.1	8.2	10.2	+2.0
Ukraine	6.3	5.6	6.8	7.5	7.5	6.8	7.9				N/A
United Kingdom		38.6									N/A

S2-3 Percentage of moderately to severely defoliated trees (defoliation classes 2–4) between 2009 and 2018 – Conifers

Note that some differences in the level of defoliation between participating countries may be at least partly due to differences in standards used. This restriction, however, does not affect the reliability of the trends over time. In some countries there has been a change in the monitoring design at different points in time.

Participating											Change
country	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	points 2017/18
Albania					19.0						N/A
Andorra					20.0	20.0	16.7	0.0	0.0	0.0	+/-0.0
Austria		10.5									N/A
Belarus	8.7	6.9	6.4								N/A
Belgium	23.4	24.6	26.7	32.9	29.4	31.4	25.1	27.4	26.2	27.7	+1.5
Bulgaria	12.2	18.2	12.8	29.8	28.0	20.0	15.6	22.3	20.5	21.8	+1.3
Croatia	20.7	21.9	21.5	23.7	25.7	28.1	25.3	24.7	24.0	27.8	+3.8
Cyprus								N/A	N/A	N/A	N/A
Czechia	32.9	32.2	31.2	28.4	25.7		32.7	34.7	31.6	35.6	+4.0
Denmark	10.0	12.1	12.8	10.9	7.9	9.0	10.8	19.7	14.4	30.0	+15.6
Estonia	3.5	2.5	3.0	14.9	5.3	5.7	8.0	5.2	3.3	4.1	+0.8
Finland	4.7	9.2	6.0	12.8							N/A
France	37.1	38.7	44.3	45.9	43.6	46.1	47.0	53.5	54.2	58.8	+4.6
Germany	36.1	29.4	38.0	32.5	29.8	36.1	29.0	35.7	27.5	37.1	+9.6
Greece	5.2	23.9				16.7	11.3		14.6	14.4	-0.2
Hungary	17.1	19.7	17.3	19.9	22.3	23.3	21.4	32.5	40.6	46.8	+6.2
Ireland											N/A
Italy	36.8	30.1	32.7	37.2	37.1	33.4	32.1	39.5	45.0	43.4	-1.6
Latvia	11.6	9.4	8.8	12.9	4.4	6.1	4.2	8.3	5.2	8.8	+3.6
Lithuania	18.4	23.7	13.8	21.0	14.7	22.5	21.9	20.0	17.8	14.2	-3.6
Luxembourg					42.4	34.6	40.3	49.0	37.2	39.7	+2.5
Montenegro					22.8		25.2	27.1	27.6	34.8	+7.2
Netherlands	25.6	26.6									N/A
Norway	31.0	26.8	32.3	27.3	N/A						
Poland	18.5	21.5	23.5	25.5	20.7	21.9	18.4	24.0	23.3	21.1	-2.2
Rep. of Moldova	25.2	22.4	18.4	25.6		19.9	26.1	26.5	28.7	N/A	N/A
Romania	18.3	18.0	13.4	13.6	13.6	13.0	13.9	14.2	15.3	15.8	+0.5
Russian Fed.	4.4	3.2	4.3								N/A
Serbia	9.9	10.7	7.2	10.2	14.9	12.1	10.1	11.0	11.8	12.1	+0.3
Slovakia	24.5	32.9	26.4	33.9	43.5	43.5	24.3	36.5	26.7	38.4	+11.7
Slovenia	33.3	28.1	30.0	27.7	30.6	38.4	35.9	31.1	35.1	33.7	-1.4
Spain	20.7	16.1	13.2	23.6	20.7	18.4		22.7	29.3	22.4	-6.9
Sweden									N/A	N/A	N/A
Switzerland	17.4	25.2	29.6	33.3	31.5	28.0	26.4	25.9	34.7	26.6	-8.1
Turkey	23.4	21.2	17.2	16.8	15.7	17.2	10.8	11.0	9.8	11.0	+1.2
Ukraine	7.2	6.4	6.7	7.5	7.0	5.5	6.3				N/A
United Kingdom		56.1									N/A

S2-4 Percentage of moderately to severely defoliated trees (defoliation classes 2–4) between 2009 and 2018 – Broadleaves

Note that some differences in the level of defoliation between participating countries may be at least partly due to differences in standards used. This restriction, however, does not affect the reliability of the trends over time. In some countries there has been a change in the monitoring design at different points in time.

□ 0-10% □ >10-25% ■ >25-60% ■ >60%

ANDORRA

AUSTRIA

BELARUS

BELGIUM

BULGARIA

CROATIA

Defoliation
□ 0-10% □ >10-25% □ >25-60% ■ >60%

CZECHIA

□ 0-10% □ >10-25% □ >25-60% ■ >60%

DENMARK

ESTONIA

□ 0-10% □ >10-25% ■ >25-60% ■ >60%

FINLAND

FRANCE

GERMANY

□ 0-10% □ >10-25% □ >25-60% ■ >60%

GREECE

HUNGARY

IRELAND

□ 0-10% □ >10-25% □ >25-60% ■ >60%

ITALY

□ 0-10%

LATVIA

LIECHTENSTEIN

□ 0-10% □ >10-25% □ >25-60% ■ >60%

LITHUANIA

□ 0-10%

LUXEMBOURG

MONTENEGRO

□ 0-10% □ >10-25% ■ >25-60% ■ >60%

NETHERLANDS

NORTH MACEDONIA

PORTUGAL

 Defoliation

 □ 0-10%
 □ >10-25%
 □ >25-60%
 ■ >60%

ROMANIA

RUSSIAN FEDERATION

SERBIA

SLOVAKIA

SLOVENIA

SPAIN

SWEDEN

SWITZERLAND

TURKEY

□ 0-10% □ >10-25% □ >25-60% ■ >60%

UKRAINE

□ 0-10%

UNITED KINGDOM

Defoliation
□ 0-10% □ >10-25% □ >25-60% ■ >60%