



*Environmental
Factsheet
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FOREST DAMAGE IN EUROPE



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What surveying shows

NATIONAL INVENTORIES of the scale and distribution of forest damage have been carried out in some countries in Europe since 1983. Since 1986 most countries have coordinated their surveys on the basis of a system devised within the framework of the International Co-operative Programme on Assessment and Moni-

toring of Air Pollution Effects on Forests, under the Executive Body of the UN ECE Convention on Long Range Transboundary Air Pollution. A task force headed by Germany is responsible for the detailed planning and coordination.

The sixth European-wide coordinated assessment of damage under

this program was made in 1991. Of the twenty-seven countries involved, twenty-four carried out studies both of conifers and broad-leaved trees, while three confined their surveys to conifers only.

More than 160 million hectares were surveyed, representing about three-quarters of the total forested area of Europe. For various reasons in 1991 the state of the forest was not assessed in Byelorussia, the Ukraine, Latvia, Bulgaria, Turkey, and Croatia.

The method used is to assess sample trees for damage in accordance with the following five-class system:

Class 0	0-10% defoliation	none
Class 1	11-25%	slight
Class 2	25-60%	moderate
Class 3	60%–	severe
Class 4	100%	dead

Defoliation intensity is employed as a means of showing the trees' general state of health. Some countries combine defoliation and discoloration of needles and leaves in their judgements.

It is difficult however to determine just when a tree is to be regarded as damaged. From experience gained during the last three years of the survey work it has now been concluded that a loss of foliage of up to 20-25 per cent is not necessarily a sign of deteriorating vitality. Conifers regulate the amount of their foliage according to the availability of moisture or nutrients or as a response to favourable or unfavourable weather conditions. Also broadleaved trees that have lost foliage as a result of late frost or insect attack may replace part of the loss with new leaves or compensate for it without showing any reduction of growth.

Consequently Class 1 defoliation is considered more as an early warning stage than an indication of reduced vitality.

In Table 1 the extent of defoliation is shown in the ranges moderate to severe (Classes 2-4) and slight to severe (1-4). In the full report, ratings are shown for different species and age groups of the coniferous and broadleaved trees. In 1991 18.5 per cent of the total of



broadleaved were in defoliation classes 2-4, while the corresponding figure for conifers was 24.4 per cent.

The following reports on damage to individual species refer to the 1990 surveys, the information

for 1991 not yet having been published.

OAK TREES (*Quercus robur*) more than 60 years old were found to have suffered in particular. In the former East Germany, for instance, 83 per cent of the older trees were

Table 1. Intensity of defoliation in 1991, in per cent of the trees affected. For all tree species, unless marked * for conifers only.

	Moderate to severe (Classes 2-4)	Slight to severe (Classes 1-4)
United Kingdom	56.7	94.0
Poland	45.0	90.8
Czechoslovakia	41.3	75.9
Denmark	29.9	58.5
Portugal	29.6	52.5
Estonia*	28.0	65.0
Russia*	26.0	67.2
Germany	25.2	64.2
Lithuania	23.9	75.4
Luxembourg	20.8	44.2
Norway	19.7	50.6
Hungary	19.6	51.7
Liechtenstein	19.0	68.0
Switzerland	19.0	68.0
Belgium	17.9	56.6
Netherlands	17.2	47.5
Greece	16.9	48.2
Italy	16.4	41.6
Finland	16.0	35.5
Slovenia	15.9	37.1
Ireland*	15.0	46.2
Sweden	12.0	45.3
Yugoslavia	9.8	25.2
Romania	9.7	38.4
Austria	7.5	45.4
Spain	7.3	35.7
France	7.1	23.6

classified as moderately to severely damaged (Classes 2-4). In Czechoslovakia and the United Kingdom the percentages were 63 and 55 per cent respectively.

CORK OAK (*Quercus suber*) was the species showing the greatest defoliation, 42 per cent of the trees placing in Classes 2-4.

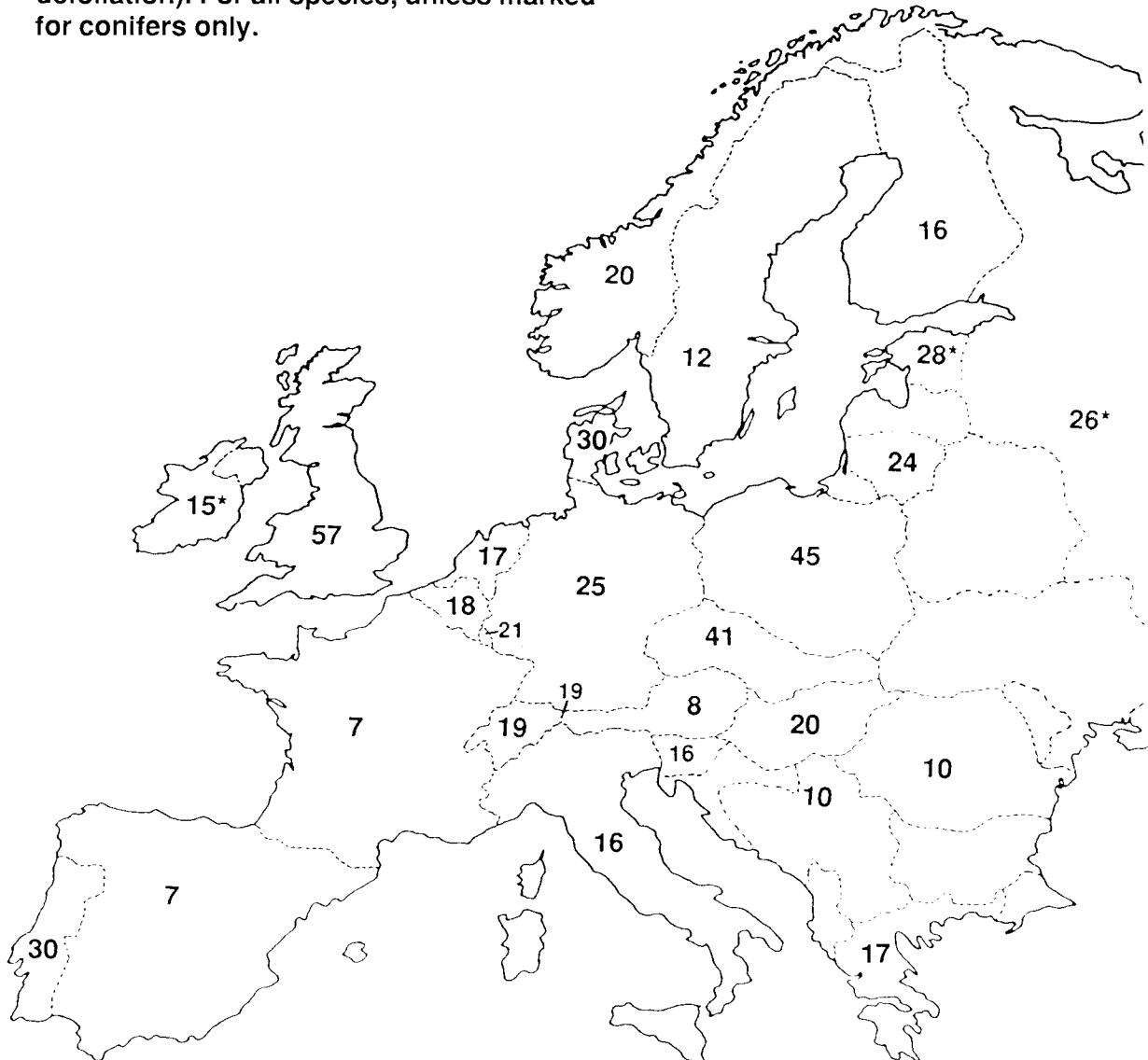
COMMON BEECH (*Fagus sylvatica*) have suffered particularly in East Germany, Byelorussia and the UK, where 67, 54 and 53 per cent of trees more than 60 years old were moderately to severely damaged.

Also as regards NORWAY SPRUCE (*Picea abies*), trees over 60 years old were considerably more defoliated

than younger ones, and in several countries more than 25 per cent of such trees were placed in Classes 2-4. In Byelorussia and Denmark the proportion was over 60 per cent.

FIR (*Abies alba*) still remains the most affected species in Central Europe. In Poland 77 per cent of the

Intensity of defoliation 1991. Percentage of trees in defoliation Classes 2-4 (>25 per cent defoliation). For all species, unless marked * for conifers only.



fir trees over 60 years of age were found to be moderately to severely defoliated. In the 1989 annual report it was said that in Bulgaria the trees had died in 25,000 hectares of a total area of fir forest of 30,000 hectares.

SCOTS PINE (*Pinus sylvestris*) 60 years and older were most badly affected in Byelorussia and Latvia, 61 per cent of the trees falling into Classes 2-4.

From 1990 to 1991 the number of all sample trees with a defoliation greater than 25 per cent increased from 20.8 to 22.2 per cent, which

means that the number of trees considered as damaged has risen by nearly 7 per cent within a year.

The results, when seen over the whole period of the surveys from 1986 to 1991, reveal great variations from one year to another (Table 2). This is as might be expected, since the various factors affecting the vitality of the trees – drought, wind, frost, air pollution, etc. – will vary greatly from year to year. In general it can be said that aged trees and trees standing on high ground will be the worst affected. But recent studies indicate that

considerable defoliation is now increasingly occurring in younger stands as well.

One should also bear in mind that an average figure for a whole country may, for instance, conceal severe damage in the mountain regions, while the lowland forests are still in a good shape. Several thousand hectares of forest on mountain tops in Czechoslovakia, Germany, and Poland are among the most heavily affected.

Although in general a six-year period will not permit any far-reaching conclusions, there seems to be an definite trend in eastern Europe, where there has been a great increase in the reported damage. Some of this increase may of course be due to more careful surveying, as well as to the lifting of censorship. The air-pollutant load of eastern Europe is however extremely high. As for the West, marked increases in damage have been noted in the United Kingdom and Portugal. In other countries there are no clear trend either way.

As the table and map indicate, ailing forests are to be found to a greater or lesser extent in all the countries of Europe, and it is generally agreed that the direct and indirect effects of air pollution are a major cause of the widespread damage.

Further reading: **Forest Damage and Air Pollution.** Annual report of the forest-damage survey in Europe, prepared by the International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests, within the UN ECE Convention on LRTAP. The information here is based on the report for 1990 and a summary for 1991.

* The Convention on Long Range Transboundary Air Pollution under the United Nations Economic Commission for Europe (ECE) was signed in November 1979 and entered into force in March 1983. For further details see Environmental Factsheet No. 2, available from the Swedish NGO Secretariat on Acid Rain, Box 245, S-401 24 Göteborg, Sweden.

Table 2. Results from forest-damage surveys 1986-1991. Percentage of trees in Classes 2-4 (defoliation >25 per cent).

	1986	1987	1988	1989	1990	1991
Austria	4.6	3.6	3.6	4.4	9.1	7.5
Belgium						17.9
- Wallonia	-	9.0*	11.0*	16.6	19.1	
- Flanders	-	12.5	10.4	11.6	8.3	
Bulgaria	8.1	3.6	7.4	24.9	29.1	-
Byelorussia	-	-	-	67.2 ^R	54.0	-
Czechoslovakia	16.4	15.6*	27.4	33.0	46.6	41.3
Denmark	-	23.0	18.0	26.0	21.2	29.9
Estonia	-	-	9.0 ^R	28.5*	20.0*	28.0*
Finland	8.7*	12.1	16.1	18.0	17.3	16.0
France	8.3	9.7 ^R	6.9	5.6	7.3	7.1
Germany						25.2
- former East	-	-	13.8	16.4	35.9	
- former West	18.9	17.3	14.9	15.9	15.9	
Greece	-	-	17.0	12.0	17.5	16.9
Hungary	12.0	6.0 ^R	7.5	12.7	21.7	19.6
Ireland	-	0.0*	4.8* ¹	13.2*	5.4*	15.0*
Italy	1.0 ²	-	-	9.1 ¹	14.8	16.4
Latvia	-	-	-	-	36.0	-
Lithuania	-	-	3.0 ^R	21.5	20.4	23.9
Liechtenstein	19.0	19.0	17.0	11.8	7.1*	19.0
Luxembourg	4.9	7.9	10.3	12.3	-	20.8
Netherlands	23.4	21.4	18.3	16.1	17.8	17.2
Norway	12.0* ²	17.8* ^R	20.8*	14.8*	17.2	19.7
Poland	4.6	-	20.4	31.9	38.4	45.0
Portugal	-	-	1.3	9.1	30.7	29.6
Romania	-	-	-	-	-	9.7
Russia	-	-	-	-	-	26.0*
Slovenia	-	-	-	22.6	18.2	15.9
Spain	13.4	12.6 ^R	7.0	3.3	3.8	7.3
Sweden	2.1	5.6*	10.6	12.9*	16.2	12.0
Switzerland	13.0	15.0	12.0	12.0	17.0	19.0
Ukraine	-	-	-	1.4 ^R	6.4	-
United Kingdom	-	22.0	25.0	28.0	39.0	56.7
Yugoslavia	23.0*	9.5	10.0 ^R	-	-	9.8

* Conifers only.

^R Regional survey

¹ Only trees <60 years assessed.

² 1985 survey.