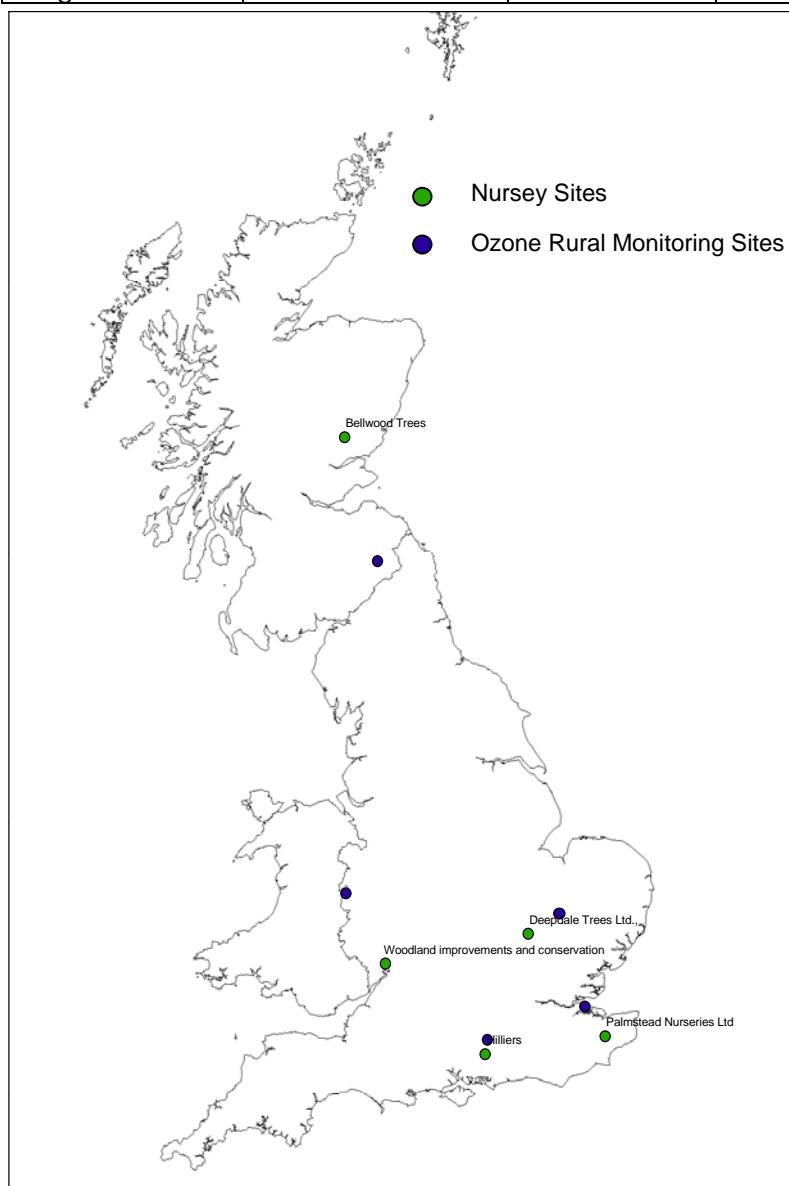


Appendix 1 Site Details

UK Site Locations

NURSERY	Hilliers	Bellwood	Deepdale	Palmstead	Huntley
ADDRESS	Hilliers Nurseries Farnham Road Liss Hants England	Bellwood Trees Brighton-of Ruthven Meigle Perthshire Scotland PH12 8RQ	Deepdale Trees Ltd Thithe Arm Hatley Road Potton Sandy Bedfordshire SG19 2DX	Palmstead Nurseries Ltd Harville Road Wye Ashford Palmstead TN25 5EU	Woodland Improvements & Conservation Ltd Newent Lane Hartley Gloucestershire GL19 3HG England
LATITUDE	51:02:07	56:37:33	52:07:45	51:11:04	51:52:42
LONGITUDE	0:54:19	3:09:38	0:11:52	0:55:39	2:24:42
ALTITUDE	70 meters	65 meters	50 meters	30 meters	60 meters
Nearest Ozone Automatic Station	Alice-Holt ST486268	Bush Estates NT2445636	Cambridge	Rochester	Powys SO298901
Passive sampler	Gradko	Gradko	Gradko	Gradko	Gradko
Irrigation	Yes	Yes	Yes	Yes	Yes



Italian Site Locations

NURSERY	CURNO	CESPEVI	CASENTINO
ADDRESS	Regional Forest Nursery – Lombardia Via Galileo Galilei, 2. 2403 Curno (Bergamo)	CESPEVI (Centro di Sperimentazione per il Vivaismo) Via Ciliegi 51100 Pistoia	Vivaio di Boboli Via Provinciale 8, 52018 Castel San Niccolò Arezzo
LATITUDE	45°41'	43°56'	43°44'
LONGITUDE	9°37'	10°54'	11°45'
ALTITUDE	250 m asl	60 m asl	450 m asl
Nearest ozone Automatic Station	In the nursery	PISTOIA (2 Km, Urban)	AREZZO (30 Km) Urban
Passive sampler	PASSAM	PASSAM	PASSAM
Irrigation	Drop	Drop	Drop

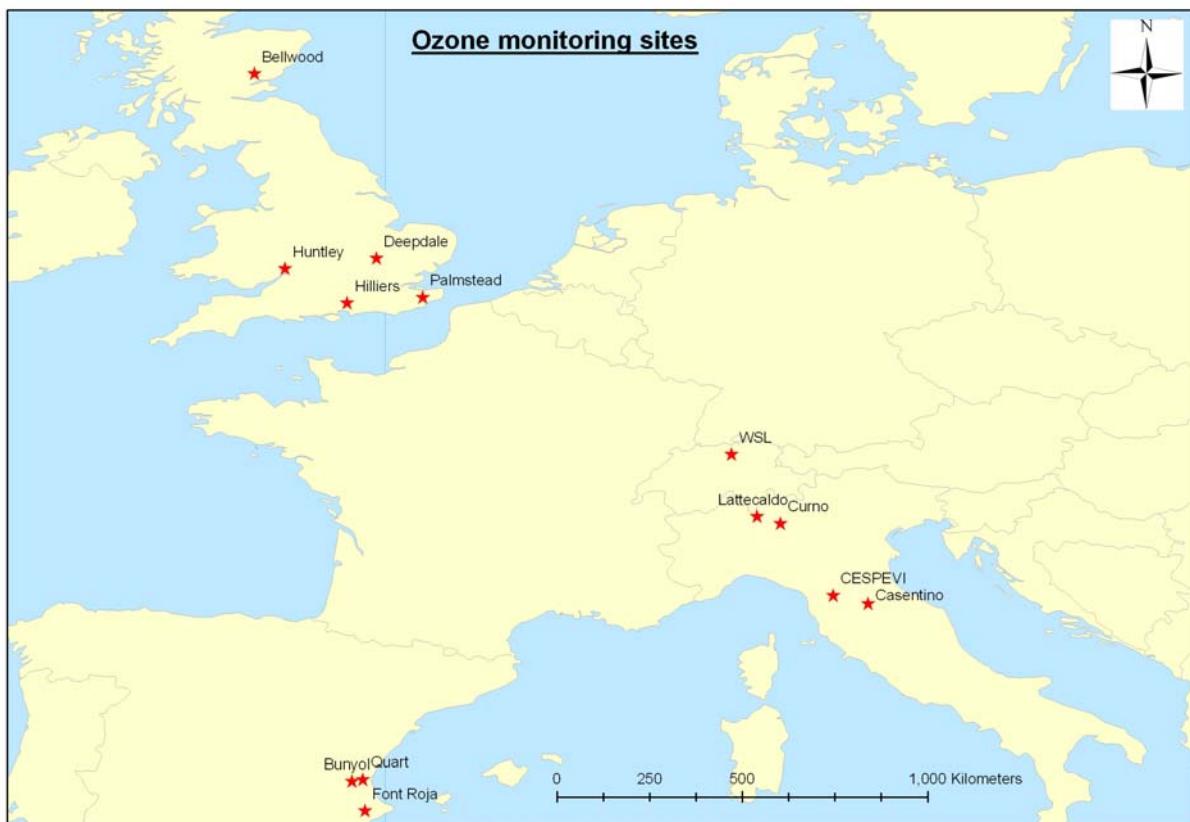
Swiss Site Locations

NURSERY	Lattecaldo	WSL
ADDRESS	Lattecaldo 6835 Morbio Superiore Switzerland	WSL 8903 Birmensdorf Switzerland
LATITUDE	45°51'	47°21'
LONGITUDE	'09°03'	27°24'
ALTITUDE	600m	553 m
Nearest ozone Automatic Station	On site real time monitoring	On site real time monitoring
Passive sampler	Passam ag	Passam ag
Irrigation	No	No

Spanish Site Locations

NURSERY	Font Roja	Quart	Bunyol
ADDRESS	Font Roja Natural Park Nursery Alcoi Province of Alicante Spain	Quart de Poblet Quart Nursery Quart Province of Valencia Spain	El Fleix Nursery Bunol Province of Valencia Spain
LATITUDE	38°40'1.8	39°28'33.6	39°24'02.4
LONGITUDE	0°32'11.2	0°31'11.0	0°47'07
ALTITUDE	1015 m	83	320 m
Nearest ozone Automatic Station	Alcoi	Quart de Poblet	Caudete de las Fuentes
Passive sampler	Ogawa	Ogawa	Ogawa
Irrigation	Yes	Yes	Yes

Appendix II Location of Nurseries in Europe



Appendix III List of species assessed at each site.

Country	Huntley	Palmstead	United Kingdom	Deepdale	Belwood	Hilliers	Lattecaldo	WSL	Switzerland	Spain	Quart	Bunyol	Casentino	Italy	Cespevi	Curno
Nursery																
European sensitive species																
<i>Abies cephalonica</i>																
<i>Acer campestre</i>	+	+	+	+	+						+					
<i>Acer granatense</i>																
<i>Acer monspessularum</i>											+	+	+			
<i>Acer opalus granatensis</i>										+	+	+				
<i>Acer platanoides</i>	+	+	+	+	+	+										
<i>Acer pseudoplatanus</i>	+	+		+									+	+		
<i>Acer saccharinum</i>				+	+											
<i>Ailanthus altissima</i>																
<i>Alnus glutinosa</i>	+	+	+	+	+	+										
<i>Alnus incana</i>	+	+	+	+	+	+										
<i>Alnus viridis</i>	+	+														
<i>Amelanchier ovalis</i>																
<i>Arbutus unedo</i>						+					+	+				
<i>Berberis vulgaris</i>	+															
<i>Betula alba</i>																
<i>Betula pendula</i>	+	+	+	+	+	+		+								+
<i>Betula pubescens</i>																
<i>Buxus sempervirens</i>	+	+	+	+	+	+						+				
<i>Carpinus betulus</i>	+	+	+	+	+	+	+									+
<i>Cornus alba</i>																
<i>Cornus mas</i>													+	+		
<i>Cornus sanguinea</i>								+			+					
<i>Corylus avellana</i>	+	+	+	+	+	+		+				+				
<i>Crataegus laevigata</i>	+		+													
<i>Crataegus monogyna</i>	+	+	+	+	+	+					+	+				
<i>Crataegus oxyacantha</i>																+
<i>Euonymus europaeus</i>	+	+														
<i>Fagus sylvatica</i>	+	+	+	+	+	+	+	+					+	+		
<i>Frangula alnus</i>																
<i>Fraxinus angustifolia</i>				+	+	+							+			
<i>Fraxinus excelsior</i>	+	+	+	+	+	+									+	+
<i>Fraxinus ornus</i>										+	+	+	+			+
<i>Fraxinus pennsylvanica</i>																
<i>Fraxinus spp.</i>																
<i>Hippophae rhamnoides</i>																
<i>Juglans nigra</i>	+					+								+	+	
<i>Juglans regia</i>	+	+	+	+	+	+					+	+				

Sorbus aria	+	+	+	+	+			+	+			
Sorbus aucuparia	+	+	+	+	+				+	+		
Sorbus chamaemespilus												
Sorbus domestica											+	
Sorbus mugeotii												
Sorbus torminalis									+	+		
Symporicarpos albus												
Taxus baccata	+	+	+	+	+			+	+	+		
Tilia cordata	+	+	+	+	+		+					
Tilia platyphyllos	+	+	+	+	+							
Tsuga canadensis												
Tsuga heterophylla												
Ulmus glabra	+		+				+		+			+
Ulmus minor												
Vaccinium myrtillus												
Vaccinium uliginosum												
gaultherioides												
Valeriana montana												
Viburnum lantana	+	+							+	+	+	+
Viburnum opulus	+					+				+	+	
Viburnum tinus		+	+							+		
Viburnum x bodnantese												
Vinca difformis												
Other Populus (clones)	+		+									

Other assessed species not on European list

Alnus area		+										
Chamaerops humilis										+		
Ilex aquifolium									+	+		
Juniperus communis										+		
Juniperus oxycedrus									+	+		
Juniperus thurifera										+		
Laurus noblis									+			
Lonicera implexa										+		
Lonicera xylosteum							+					
Myrtus communis										+		
Phyllirea angustifolia										+		
Picea glauca					+							
Pistacia lentiscus										+		
Prunus mahaleb							+					
Rhamnus lycioides										+		
Rosmarinus officinalis										+		
Ruscus aculeatus								+		+		
Quercus faginea								+	+	+		
Quercus ilex								+	+			
Salvia mariolensis								+				
Sorbus latifolia										+		
Tetraclinis articulata									+			
Thymus sp								+				

Table IV Assessments Dates

United Kingdom									
Sampling period	Diffusion tube monitoring periods					Visible Injury assessment			
	Hilliers	Deepdale	Palmstead	Bellwood	Hilliers	Deepdale	Palmstead	Bellwood	Huntley
1	07/04/2006	07/04/2006	07/04/2006	10/04/2006					
2	21/04/2006	20/04/2006	19/04/2006	02/05/2006					
3	05/05/2006	10/05/2006	05/05/2006	17/05/2006					
4	19/05/2006	29/05/2006	22/05/2006	29/05/2006					
5	05/06/2006	02/06/2006	01/06/2006						
6	23/06/2006	15/06/2006	16/06/2006		+	+			
7	03/07/2006	06/07/2006	29/06/2006						
8	16/07/2006	18/07/2006	17/07/2006						
9			28/07/2006						
10	14/08/2006	09/08/2006	09/08/2006	26/06/2006					+
11	24/08/2006	24/08/2006		31/08/2006				+	
12	10/09/2006	11/09/2006	11/09/2006						
13	22/09/2006	25/09/2006	21/09/2006		+	+			

Spain							
Sampling period	Diffusion tube monitoring periods				Visible Injury assessment		
	Bunyol	Font Roja	Quart	Bunyol	Font Roja	Quart	
1	04/05/2006	12/05/2006	04/05/2006	+	+		+
2	16/05/2006	17/05/2006	18/05/2006	+			+
3	01/06/2006	31/05/2006	01/06/2006	+	+		+
4	15/06/2006	14/06/2006	15/06/2006	+			+
5	28/06/2006	28/06/2006	29/06/2006	+	+		+
6	13/07/2006	12/07/2006	13/07/2006	+			+
7	27/07/2006	24/07/2006	27/07/2006	+	+		+
8	11/08/2006	09/08/2006	10/08/2006	+			+
9	23/08/2006	23/08/2006	24/08/2006	+	+		+
10	07/09/2006	06/09/2006	07/09/2006	+			+
11	21/09/2006	20/09/2006	21/09/2006	+	+		+
12	05/10/2006	04/10/2006	05/10/2006	+			+
13	19/10/2006	18/10/2006	19/10/2006	+			+

Italy						
Sampling periods	Diffusion tube monitoring periods			Assessment dates		
	Casentino	Cesprivi	Curno	Casentino	Cesprivi	Curno
1	12/04/2006	12/04/2006	12/04/2006			

2	27/04/2006	27/04/2006	27/04/2006			
3	09/05/2006	09/05/2006	09/05/2006			
4	23/05/2006	23/05/2006	23/05/2006			
5	06/06/2006	06/06/2006	06/06/2006			+
6	21/06/2006	21/06/2006	21/06/2006			
7	04/07/2006	04/07/2006	04/07/2006	+	+	
8	18/07/2006	18/07/2006	18/07/2006			
9	02/08/2006	02/08/2006	02/08/2006			
10	16/08/2006	16/08/2006	16/08/2006	+		
11	30/08/2006	30/08/2006	30/08/2006		+	+
12	12/09/2006	12/09/2006	12/09/2006			
13	26/09/2006	26/09/2006	26/09/2006			

Switzerland		
Sampling periods	WSL	Lattecaldo
1	8/8/2006	14/7/2006
2	13/9/2006	15/8/2006
3		22/9/2006

Appendix V UK Nurseries



Bellwood Nurseries



Huntley



Palmstead



Hilliers



Deepdale

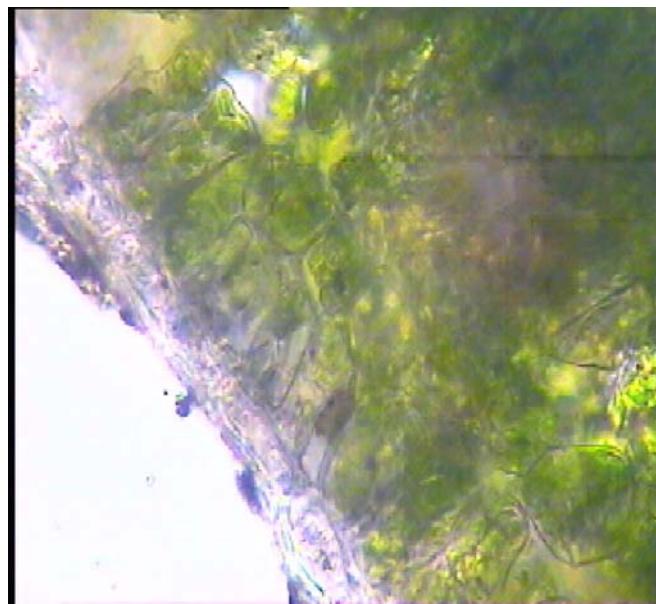


Appendix VI Photographic evidence UK

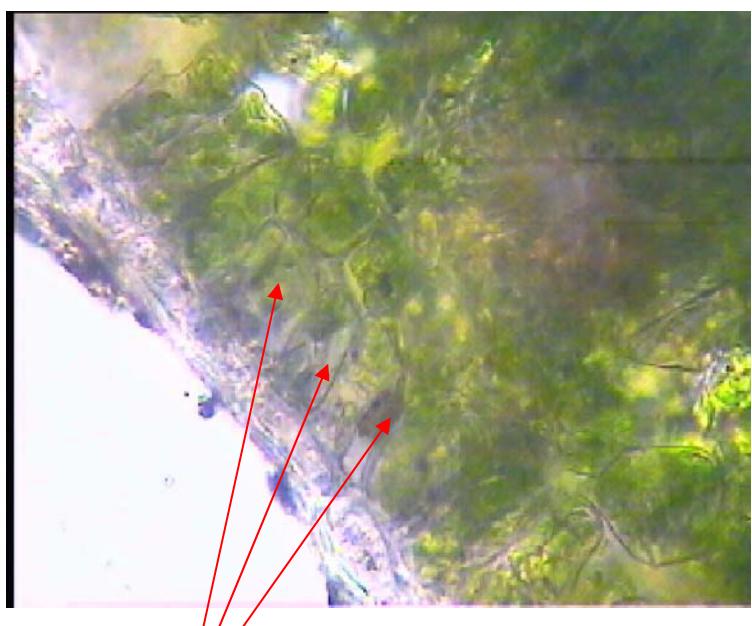
Hilliers



Phototropic response by *Fagus sylvatica* at Hilliers in late September



Section of *Fagus sylvatica* leaf (upper surface) taken from area of leaf not displaying phototropic response showing undamaged tissue.



Section of *Fagus* leaf (upper surface) showing damaged tissue (arrowed) taken from area of leaf demonstrating phototropic response.



Ozone induced stippling on *Liriodendron tulipifera* at Hilliers (late September).

Huntley

Bronzing on *Alnus viridis*



Bellwood

Stippling on *Liriodendron tulipifera*



Stippling on *Alnus incana*



Palmstead



Viburnum lantana



Populus clone in hedge



Prunus avium showing interveinal bronzing.



Alnus area displaying interveinal bronzing.

Deepdale

Non ozone induced stippling on *Liriodendron tulipifera* (damage is clearly visible on lower surface).



Stippling observed on
Prunus avium



Alnus glutinosa



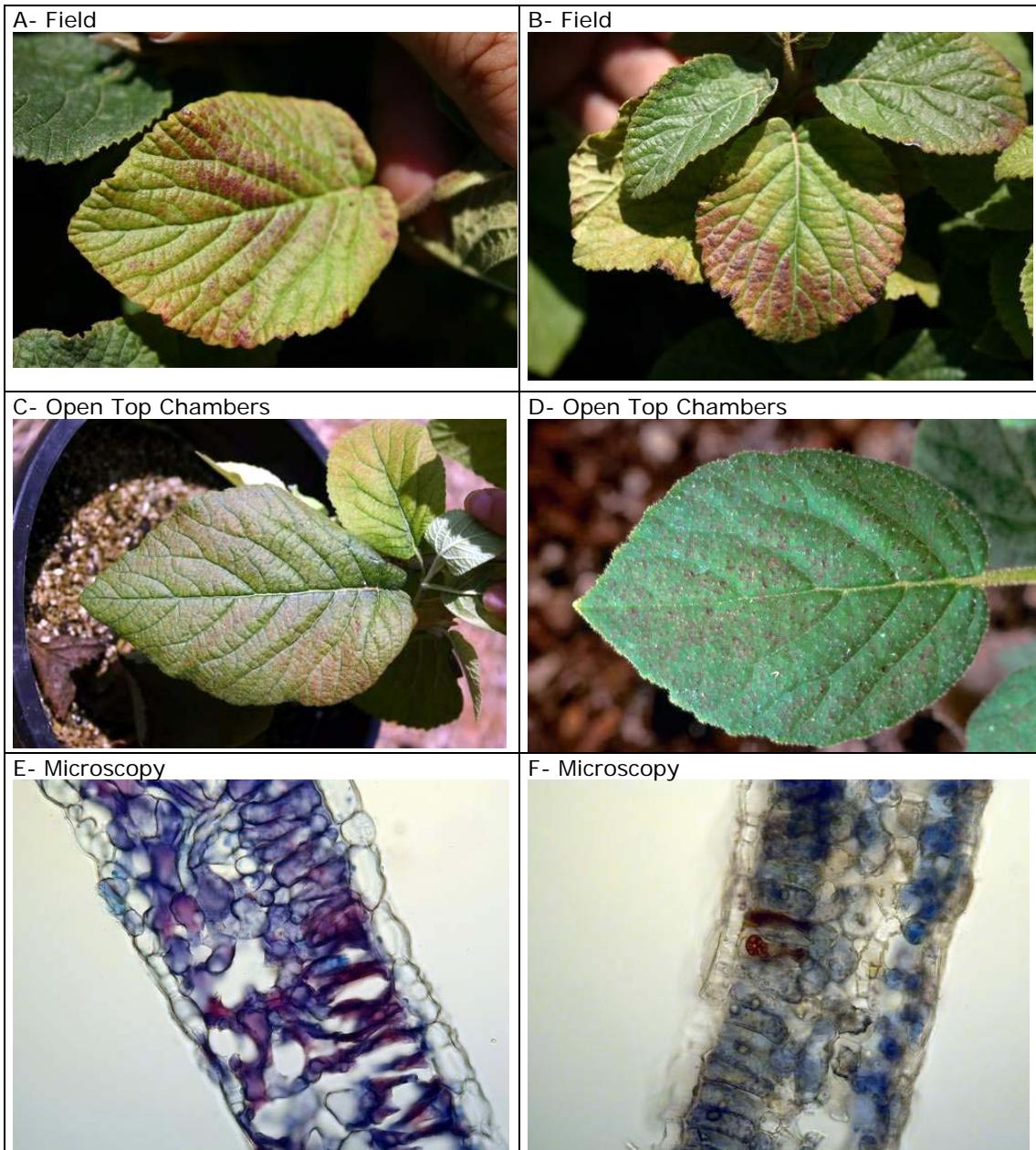
Intervenial chlorosis on *Quercus robur*



Chlorotic mottling on *Pseudotsuga menziesii*



Appendix VII Photographic evidence Spain



Confirmation of ozone induced visible injury in *Viburnum lantana* A) Bunyol Nursery: ozone injury in August. B) Bunyol Nursery: ozone injury in August; shade effect. C) Ozone injury induced in Open Top Chambers in Valencia. D) Incipient ozone injury induced in Open Top Chambers in Valencia. E) Field samples collected in August 2006 in Bunyol Nursery, observed by microscopy; note that alterations do not occur in the epidermis, but are affecting the palisade parenchyma (collapsed cells), a main target of ozone.



Figure 5. Confirmation of ozone induced visible injury in *Prunus spinosa* A) Font Roja Nursery: ozone injury in August, note the age effect. B) Font Roja Nursery: detail of ozone injury in August. C) Ozone injury induced in Open Top Chambers in Valencia. D) Ozone injury induced in Open Top Chambers in Valencia, note the age effect. E) Field samples collected in August 2006 in Font Roja Nursery, observed by microscopy; note that alterations do not occur in the epidermis, but are affecting the palisade parenchyma (collapsed cells), a main target of ozone.

A- Field



B- Open Top Chambers



C- Microscopy

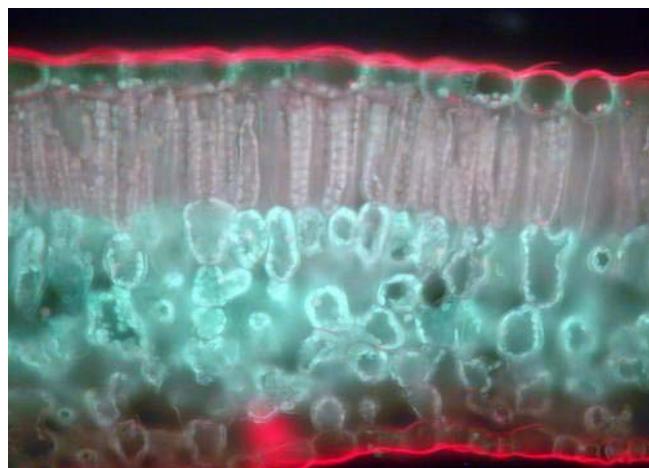


Figure 6. Font Roja Nursery: Ozone-like symptoms in *Fraxinus ornus*, not confirmed as valid ozone symptoms. Despite the resemblances between field symptoms(A) and ozone injury induced in Open Top Chambers in Valencia (B), microscopy analysis showed that mesophyll cells were not altered (C).

Appendix VIII Photographic evidence Confirmed ozone damage for Switzerland:

WSL

Corylus avellana

Robinia pseudoacacia



Rhamnus cartharticus

Ulmus glabra



Prunus serotina

Fagus sylvatica



Populus tremula



Betula pendula



Lattecaldo

Prunus mahaleb



Salix daphnoides



Fagus sylvatica



Carpinus betulus



Populus nigra



Cornus sanguinea



Viburnum opulus

Appendix IX photographic evidence ITALY

Reddening of *Cornus mas* at Casentino in late June



Bronzing seen on *Populus nigra* late June



Reddening of *Prunus serotina* at Casentino in late June



Laburnum anagyroides (affected by Fungi and Aphids at Casentino),



Damage to *Populus nigra* and *Prunus serotina* at Casentino (late August)



Damage seen on *Prunus avium* (late August at Casentino)



Bronzing seen on *Fagus sylvatica* and *Corylus avellana* at CESPEVI



Ozone damage confirmed at CESPEVI on *Fraxinus excelsior* and *Populus nigra*



Reddening observed on *Viburnum lantana* and *Viburnum opulus* at Curno



Ozone damage observed at Curno

Bronzing on *Rhamnus catharticus* and *Morus nigra* very typical of ozone induced injury



Bronzing on *Acer platanoides* and *Acer pseudoplatanus* typical of ozone induced injury

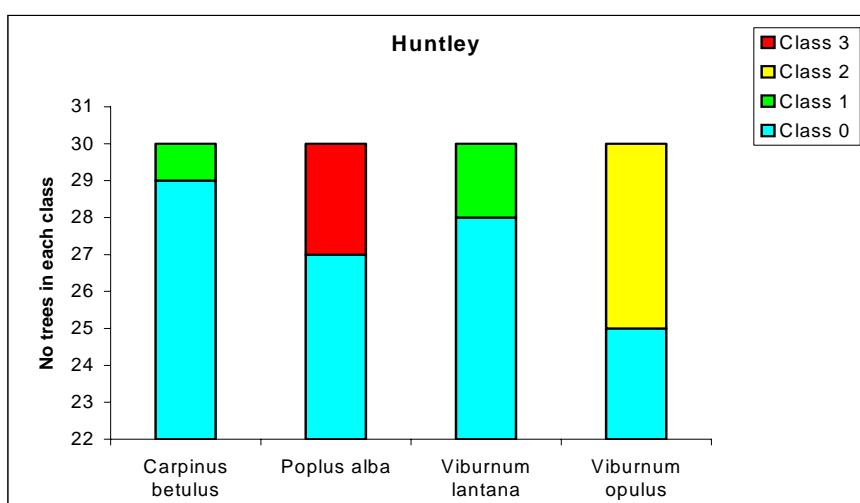
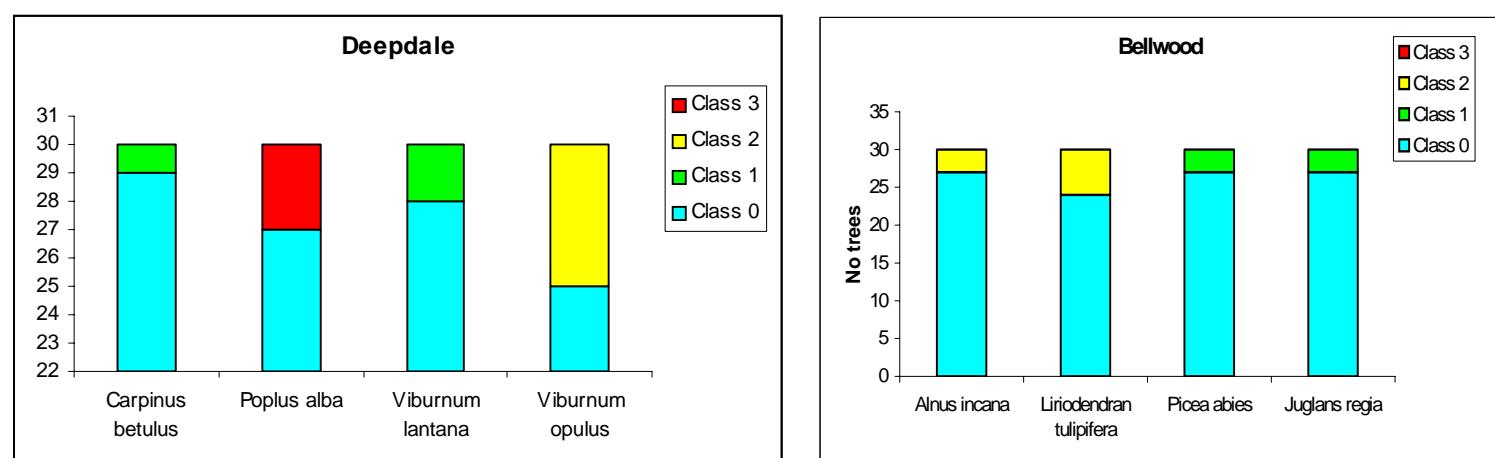
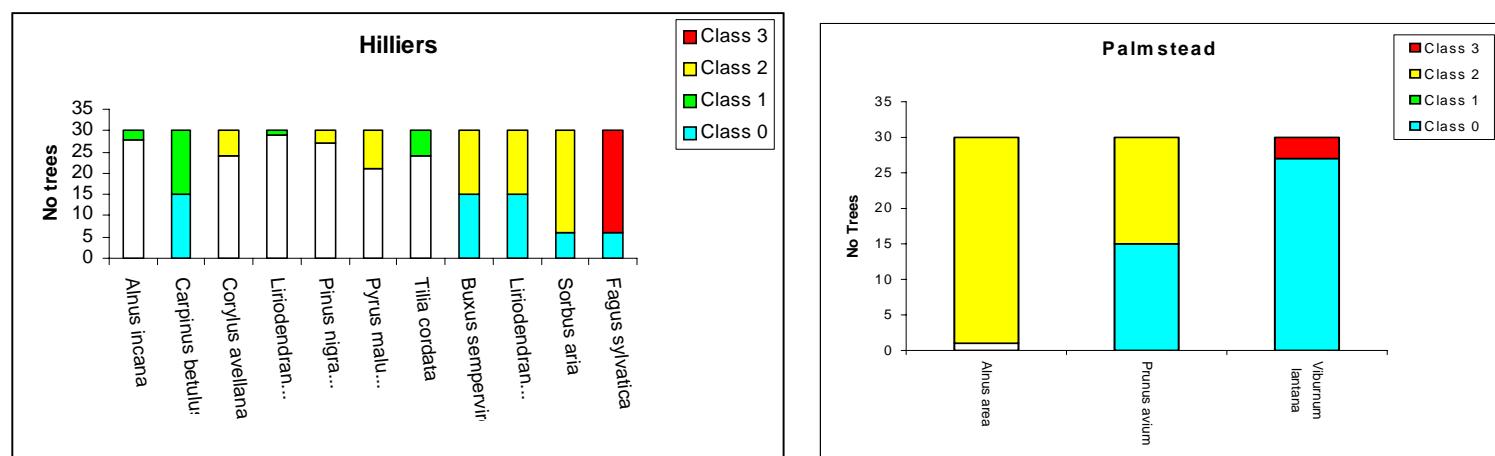


Ozone induced bronzing on *Fraxinus excelsior* at Curno



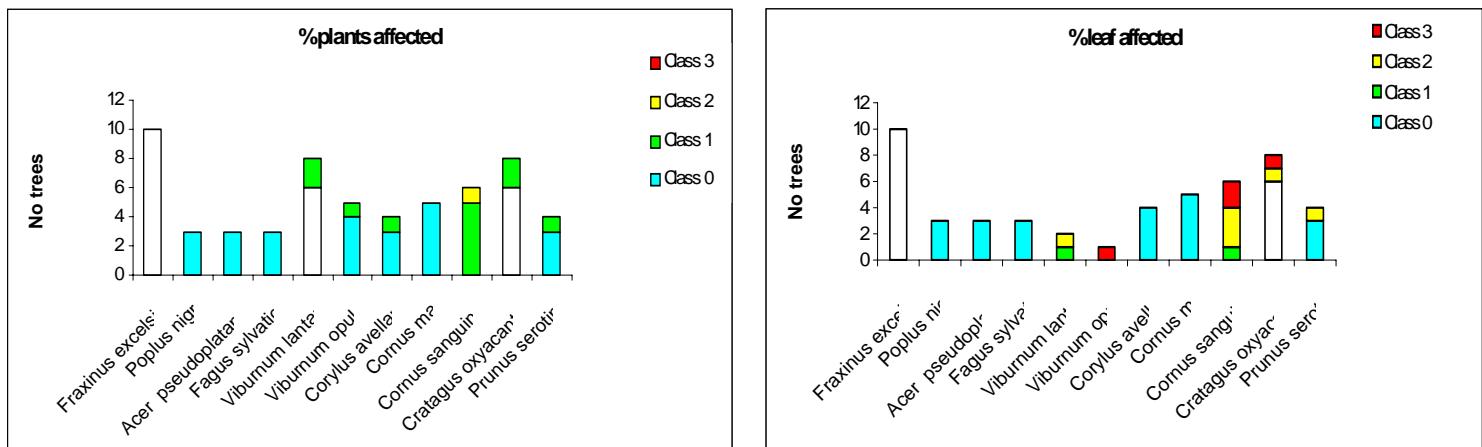
Appendix X Damage summaries for assesses trees in the UK

Percentage affected trees by class.

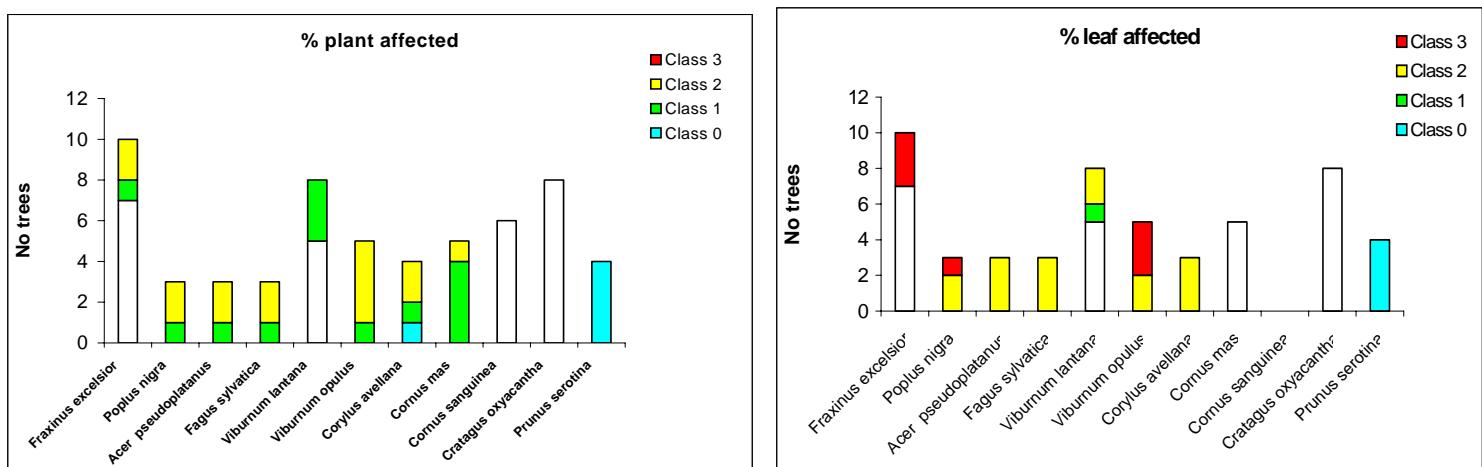


Appendix XII Damage summaries for assesses trees in the Italy

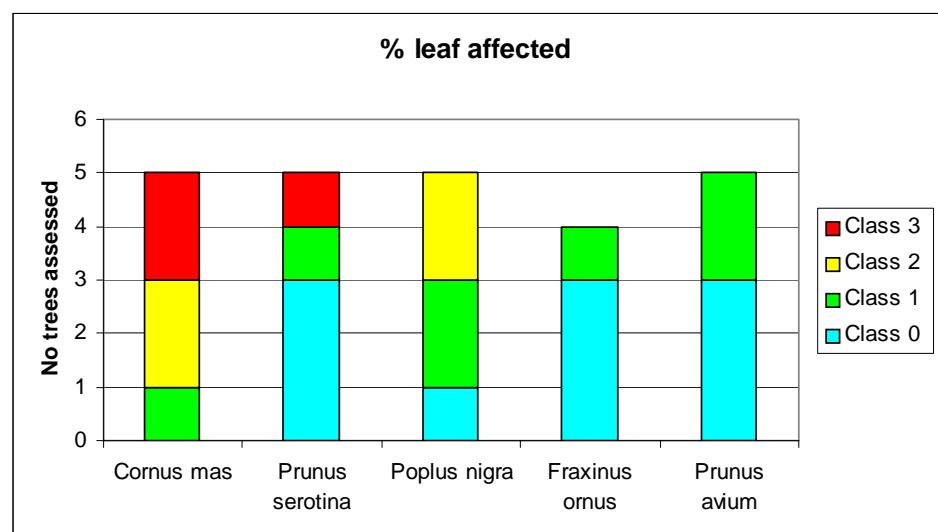
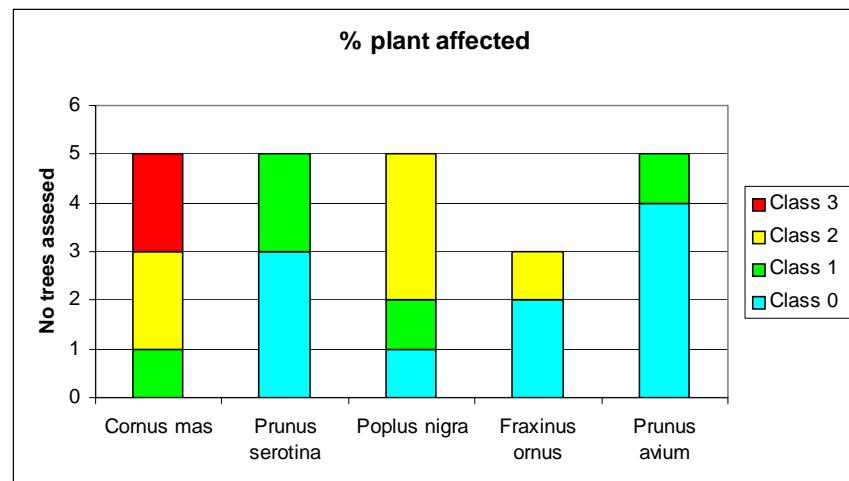
CESP (Jun)



CESP (Aug)



Casentino



CURNO

