The Health of Non-Woodland Trees in England in 2004

By K. V. Thorpe[1], J. Poole, D. R. Rose, J. Rose, N. Straw & C. Tilbury

Summary

Reports of pests, diseases and disorders of trees received in 2004 are reviewed. The data were collated from two sources; from advisory queries processed at the Forestry Commission's two research centres in Surrey and Midlothian, and records received through the Condition Survey of Non-Woodland Amenity Trees. This survey, sponsored by the Office of the Deputy Prime Minister, provides a quantitative basis for monitoring year on year changes in tree condition. Notable occurrences in 2004 were high numbers of leaf and shoot diseases reported to Forest Research's Disease Diagnosis and Advisory Service (DDAS[2]) following the damp spring and an increase in reports of bleeding cankers on horse chestnut.

Introduction

The Condition Survey of Non-Woodland Trees has been operating under a number of slightly different guises since 1993 when it was initially supported by the Department of the Environment. Now, under the jurisdiction of the Office of the Deputy Prime Minister the aims of the survey are to promote people's awareness of the importance of trees in their environment, and also to monitor the condition of those trees. To do this, a team of volunteers survey trees in plots across England on an annual basis during July and August. These trees may be found in public parks and gardens, along road-sides and in the grounds of country estates, many owned by the National Trust.

The 100 plots active in 2004 each contain around 30 trees chosen from a range of common genera (see **Appendix 1** for tree list and **Appendix 2** for an example of the assessment form) and the same trees are assessed each year. Volunteers look for signs of specific pests and diseases listed in the survey instructions, as well as overall indicators of health such as crown density. In most cases a simple scoring system is used to quantify the presence of symptoms. This runs from 0, indicating no symptoms, to 3, the presence of severe symptoms. **Appendix 3** contains data summaries for 2004. Some types of damage, which usually require specialist diagnosis, are not included in the assessments by volunteers, but are recorded in advisory casebook data from Forest Research. In 2004 an additional assessment for 'bleeding cankers' was requested from volunteers on all their trees, due to the increasing incidence of this phenomenon, especially on horse chestnuts in some parts of the UK. Volunteers were also asked to look for any insect exit holes, whereas in previous

[1] Tree Health Division, Forest Research, Farnham, Surrey GU10 4LH. Email katherine.thorpe@forestry.gsi.gov.uk
[2] DDAS, Tree Health Division, Forest Research, Farnham, Surrey, GU10 4LH. Tel 01420 23000

years records had been restricted to D-shaped holes. The latter are indicative of just one type of beetle (the family Buprestidae), and these are found on very few genera in the UK - oak (*Quercus*), thorn (*Crataegus*), and very rarely on willow (*Salix*).

In addition to these 'volunteer' plots, crown densities of oak (*Q. robur* and *Q. petraea*) and beech (*Fagus sylvatica*) are monitored by Forest Research Technical Support officers in a set of separate plots across England. These provide an amenity tree comparison with the Forest Condition Survey. This latter survey is conducted by Forest Research annually as part of a wider European project. The crown density scoring system used in this amenity tree survey is a simplified version of that used in the Forest Condition Survey. Crown transparency of chosen trees is estimated in 5% classes by reference to a standard set of photographs of 'ideal' trees (Innes, 1990; Innes & Boswell, 1991), and can be used to provide an index of tree condition.

This note is a summary of the reports received in 2004 from 80 plots, augmented by information from sources including DDAS. The latter information drew upon advisory casebook data from woodland as well as non-woodland trees. Some of the tree problems covered in these reports have been described in Tree Damage Alerts and these are listed at the end of this Note.

Weather Overview 2004

The year began with a period of unsettled, wet and windy weather, followed by snow at the end of January. Although February was mostly mild, dry and sunny the worst flooding in 30 years in North Wales and Cumbria left 50 000 people without power, and shut the M6 motorway for a time. March followed with warm, rather sunny and dry weather, turning wetter with periods of unsettled weather at the beginning of April. After a period of warm sunny weather the month ended with heavy rain and hail. The damp spring led to an increased incidence of shoot and leaf diseases particularly in the south of England. May started wet and thundery but was warmer than average, which further encouraged the proliferation of leaf/shoot diseases.

June was initially settled and warm and several places in southern and eastern England reported maximum temperatures over 30°C, the highest being Cambridge with 31.5°C. The second half of the month was much cooler. One of the deepest depressions ever recorded in June (982 hPa) swept across Wales and northern England bringing very wet and windy weather. Dunkeswell in Devon recorded 34mm of which 22.1mm fell in just 2 hours. Gale

force winds along the English Channel coast on the 23rd resulted in gusts in excess of 50 knots. Trees from the south coast up to the Midlands were damaged by the wind, and salt spray caused further harm along the south coast, penetrating up to 8 miles inland.

July began with cool, unseasonably wet, windy and thundery weather. For example Wittering, near Peterborough, recorded 108 mm of rain in 24 hours on the 8th, and some parts of the southwest of England experienced winds exceeding 60mph. This blustery weather caused significant damage to many trees. There were a few notable hail storms, one in Essex resulting in marble-sized hail! However, the weather turned more settled towards the end of the month with some very warm and humid weather. The hot weather continued into the first week of August, and Marham in Norfolk recorded a night-time minimum of 21.9°C on the 9th, the warmest night there since at least 1957. Torrential rain followed on the 16th which caused devastating flooding in Boscastle (north Cornwall). At nearby Otterham 200 mm of rain fell in 24 hours and neighbouring Lesnewth recorded 65 mm of rain in an hour.

The weather in September was at first fine, settled and very warm, and despite a period of unsettled, rainy weather, overall rainfall was below average, and temperatures were 1.3°C above the 1961-1990 average. The heavy rain which fell throughout October made up some of the deficit, although the month of November was the driest since 1988 (58% of the 1961-1990 average). Illustrating the effect our changing climate is having on wildlife the first frog-spawn was reported in Pembrokeshire in November! However, colder weather towards the end of the month brought frost and snow. December was generally dry for the first two weeks and then more unsettled during the second half of the month with some snow.

For further information visit http://www.bbc.co.uk/weather/ukweather/year_review/ and Climatological Observers Link 2003; ISSN 1350-2158, http://www.met.rdg.ac.uk/~brugge/col.html).

Damage affecting many tree genera

Phytophthora ramorum* and *P. kernoviae

P. ramorum is the organism responsible for the rapid mortality via stem bleeding cankers of a range of oaks native to California and Oregon in the Western United States. In addition to its impact on trees, *P. ramorum* is also responsible for leaf blight and die-back on many shrubs and ornamental nursery stock – particularly *Rhododendron*. Although this organism

has now been found in numerous nurseries in the UK and other European countries, at the time of writing there had only been a few cases of tree infections in the UK. Except for one infection on an American southern red oak (*Q. falcata*) in Sussex, tree infections were confined to Cornwall and bleeding cankers caused by this pathogen were recorded on beech, Turkey oak (*Q. cerris*), southern beech (*Nothofagus obliqua*) and horse chestnut (*Aesculus hippocastanum*). To add a further complication, a second exotic *Phytophthora* was discovered by Forest Research staff in late 2003 infecting beech in Cornwall. This completely new pathogen was initially called *Phytophthora* 'Taxon C,' but has since been named *P. kernoviae*. Further work is currently underway in an attempt to discover its potential host range.

Both pathogens are thought to spread aerially in rainsplash and mist. When trees are affected with the lethal form of infection, symptoms include bleeding cankers on the main trunk and major branches. The latter symptoms can be confused with the widespread, but local decline and mortality of oaks, and although certain *Phytophthora* spp. have been implicated in this so-called 'oak decline,' *P. ramorum* and *kernoviae* are not involved.

Despite the current limited distribution of *P. ramorum* and *P. kernoviae* these pathogens have caused major concern in the UK, and as a consequence, they formed the basis of 34% (a total of 239) of queries received by DDAS at Alice Holt in 2004. Most of these queries related to bleeding cankers on trees, but in no case was the causal agent found to be either one of the two exotic *Phytophthora* spp. - current advice is that unless an affected tree is in the vicinity of rhododendrons showing signs of foliage blackening and wilting, it is highly unlikely that the tree has been infected by *P. ramorum* or *P. kernoviae*. However, it is important to remain vigilant. The following web sites contain further information:
http://www.forestry.gov.uk/pramorum
http://www.defra.gov.uk/planth/pramorum.htm
http://www.defra.gov.uk/planth/pestnote/newram.pdf

Phytophthora bleeding canker

As mentioned above, the greater awareness of the two exotic *Phytophthora* pathogens led to an increase in the reports received by DDAS concerning bleeding cankers. Many cases of bleeding canker were reported on horse chestnut (refer to later section) but many were also reported on beech (the culprits being predominantly *P. citricola* and *P. cambivora*), oak (*P. cambivora*) sycamore (*P. citricola*) and Norway maple (*P. citricola*).

Insects

In 2004 there were widespread reports of mottled umber caterpillars (*Erannis defoliaria*) causing damage on a range of broadleaf trees including oak, birch (*Betula* spp.) and hawthorn (*Crataegus monogyna*). The pale yellow adult female are wingless and lay up to 100 eggs each between October and January. The caterpillars are hairless and grey-brown with a black line down the back. They feed on young leaves and then pupate from June to October, after which time they emerge and begin the cycle once more. Severe infestations by the moth can look alarming, as trees can be completely defoliated, but because the damage occurs early in the growing season, trees do recover and re-flush.

Mammals

Ecology Division within Forest Research receives many queries each year relating to mammals - often damage caused by various mammals to trees. Between April 2004 and March 2005 310 queries were processed of which 27% related to damage caused by deer, and related fencing issues, and 21 and 3% involved controlling grey squirrels and rabbits respectively. This very much mirrored reports received throughout the same period in 2003-4. Around half of the queries derived from the forestry sector (both private and public) and 40% came from local authorities, and the press/education sector. There was an increase in conservation-related enquiries during 2004-5, and an increasing awareness of the spread of non-native species such as wild boar, the racoon-like coati and edible dormouse.

Abiotic agents

Very few trees (0.5%) were reported to have been affected by salt or herbicide damage during the survey. Symptoms can include foliage yellowing or whitening and leaf distortion or reduction in size. Although the damage can look alarming most trees will recover unless contamination is repeated over many years.

Reports received by DDAS suggested that many cultural problems concerned excessive root pruning of root-balled planting stock. When examined these trees had virtually no fine roots and the root-balling was clearly well below the standard set out in BS4043 (Anon 1989)

General crown condition

Information on crown condition in 2004 came from three sources – the survey conducted by the volunteers on a range of species, a specific survey of amenity oak and beech conducted by Forest Research personnel, and the Forest Condition Survey – a survey again carried out by Forest Research personnel, forming part of a larger European project on commercial forestry stands.

The volunteers' plots - crown thinness was recorded on 38% of trees forming the volunteers' plots. Measures of thinness differed significantly between species (p=0.002; see Appendix 3) and across England (see Figure 1 a&b). Willow (*Salix*) and thorn (*Crataegus*) seemed to be worst affected. Although scab may be a cause of the poor willow condition, reasons for crown thinning on hawthorn are not clear. Reports of premature leaf fall were lower than in 2003, and similar to 2002. Differences among species were significant (P<0.001) and, as in 2002, plane (*Platanus*) suffered the highest levels of leaf drop. Coupled with high scores of crown browning on plane (31%) it is likely that this is linked to high levels of anthracnose infection in the spring of 2004.

The amenity oak and beech survey - 43 beech and oak crown condition plots were monitored by Forest Research personnel in 2004 (see Figure 2 a&b). As in 2003, leaf curling was again evident on a number of beech plots. The cause of this is not certain and may vary from location to location. In some coastal areas strong winds early in the summer brought salt-laden winds 7 or 8 miles in land, and this affected beech and lime (*Tilia* spp.) in particular. Another possible cause of leaf curling is aphid damage early on in the season when the leaves are still developing and can easily be damaged. Overall, crown condition was very similar to 2003 with some signs of poor condition, particularly in the oaks. In over half of the oak plots (59%) the average crown density was between 25-50% poorer than that of an 'ideal' tree (Innes, 1990) the rest lying between 10 and 25%. On average oaks scored 26%. In contrast, only 10% of beech trees fell within the 25-50% crown density bracket whilst 90% showed only slight decreases in crown density (10-25%). On average beech scored 21% which was similar to 2003. Logistical problems prevented some plots towards the western side of the country being surveyed in 2004, but in the remaining plots there was no pronounced geographic variation in crown condition of either beech or oak.

The Forest Condition Survey (Hendry *et al*., 2005) - many species of commercial significance are assessed across mainland Britain, including oak and beech. Oaks showed a slight improvement in condition compared with 2003 figures, although overall crown

densities were still lower than they had been in 1999 due to the rapid deterioration which occurred in 2002. Most trees (78%) displayed a 21-50% reduction in crown density, and average condition was slightly poorer in the East Midlands.

Following abundant masting on 79% of surveyed trees, beech condition deteriorated slightly compared with 2003. 71% of trees showed between 21 and 50% decrease in crown density. Although premature leaf drop was less prevalent in 2004 than the previous year, it was still recorded on 16% of the trees, and it is likely to be a number of years before some beech fully recover from the abnormally dry summer of 2003 during which time other damaging events may occur. The slight decline in beech condition was more noticeable in the East Midlands England.

A comparison of the results obtained from the amenity and woodland surveys of oak and beech indicates no major differences in condition. Many oaks showed significant signs of crown thinness, but the woodland survey picked up a slight increase in the condition of oaks, whilst amenity trees remained in much the same condition as 2003. Woodland beeches suffered a slight decline in condition when compared with the previous year, but this was not mirrored in the appearance of beech trees in amenity plantings. Slight changes in condition are more likely to be picked up in the much larger Forest Condition Survey, whilst only relatively large changes will be noticeable in the smaller amenity plot assessments.

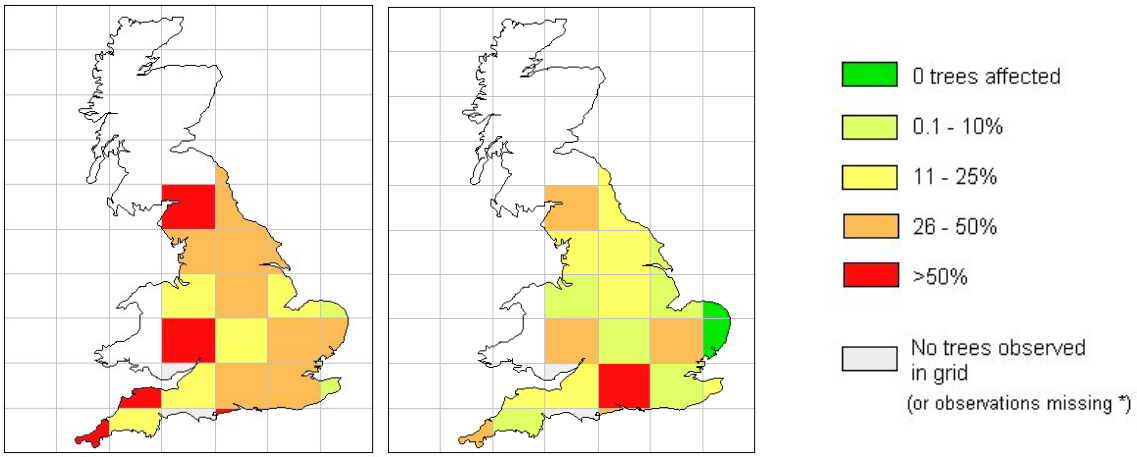


Figure 1: a) Incidence of apparent crown thinning and **b)** premature leaf fall within observers' plots across England in 2004 (data illustrate the % of trees in each plot scoring 1 or more)

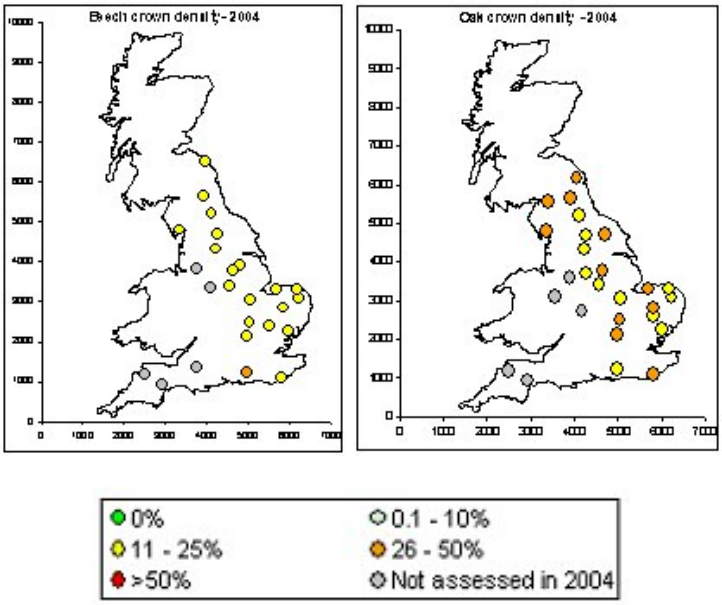


Figure2: The Crown condition of **a)** beech trees and **b)** oak trees in plots within England in 2004. (Note: 0% density indicates a complete crown and 100% a completely defoliated crown)

Problems affecting individual genera or species.

***Acer* – Sycamore and Norway maple**

Enquiries received by DDAS and reports from volunteers suggest large numbers of sycamore (*A. pseudoplatanus*) were affected by aphids in the spring of 2004 (63% of the surveyed trees). Early feeding damage caused by the sycamore aphid (*Drepanosiphum plantanoidis*) results in the formation of smaller than normal leaves which give rise to apparently sparse canopies over the summer months. Affected leaves can also look rather yellow and chlorotic. There is no apparent long-term effect on tree health, although studies carried out in the 1970's suggest wood production in the stem can be reduced. Aphids were especially common in the south of England, but conspicuous numbers were apparent as far north as Yorkshire. Sycamores were certainly more adversely affected than Norway maple (*A. platanoides*) but aphids were still recorded on 33% of the latter.

Volunteers are asked to report signs of tar spot which is caused by the fungus *Rhytisma acerinum*. This causes dark spots to form on the leaves. In 2004 levels of tar spot were fairly high (see Figure 3), with positive reports on 66% of sycamores (mean score 1.0). As volunteers are also asked to score leaf spots and blotches on all of their trees in the survey it was gratifying to see that the leaf spot/blotch scores for sycamore perfectly matched the tar spot scores, coming in at 66% again! Tar spot causes the leaves to drop slightly early and where, in some incidences, it was combined with heavy aphid attack earlier in the year,

some trees experienced complete premature defoliation. However, even badly affected trees usually recover.

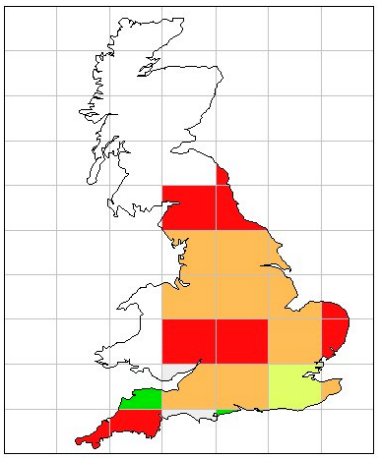


Figure 3: The recorded incidence of *Acers* affected by tar spot in England (for key see Figure 1)

In the 2004 survey the Latin name of the insect pest *Pulvinaria regalis*, otherwise known as horse chestnut scale, was used in the assessment forms to help to clarify that this insect affects more than just horse chestnut! Many tree species can be successfully colonised, and in 2004 more Norway maple were colonised than any other species (51%). As expected, reports were also high on horse chestnut (25%) and lime (*Tilia*; 29%), and in some parts of the south-east and East Anglia unusually large individual scales were reported on both *Acer* spp. and limes. Lower colonisation was observed on sycamore (22%). As found in previous years, this insect was significantly more common in urban than rural areas, and in particular levels were highest in the north of England with over 25% of trees affected in most areas.

As predicted, following the record high temperatures in the summer of 2003, several cases of sooty bark disease on sycamore were reported to DDAS. In one noteworthy case in a 3.5 ha sycamore stand in Northamptonshire 40% of trees died following infection with *Cryptostroma corticale*, the causal agent of sooty bark disease. However, only 3 out of 49 amenity tree plots resulted in positive sightings and generally speaking this remained a fairly uncommon disease in 2004. This was surprising in view of the disease's previously documented relationship with hot summer weather in the year prior to appearance of symptoms in the tree (Young, 1978).

Aesculus – Horse Chestnut

Bleeding cankers once again featured heavily in 2004 with over 80 cases reported to DDAS. Of all the species assessed by volunteers horse chestnuts exhibited the highest numbers of trees affected by bleeding canker (47 trees: 18%). The current estimate is that between 35

000 to 50 000 trees are affected throughout the country. *Phytophthora citricola* and *P. cactorum* were isolated from some samples, but many failed to yield any pathogens on culturing. It is possible to confuse horse chestnut bleeding canker with Phytophthora root disease, although the latter results from infection of the roots and root collar by *Phytophthora* species. Although some of the lesions may extend up the trunk, resulting in bleeding spots, this is distinct from the aerial lesions caused by *P. cactorum* and *P. citricola* which are thought to have a role in the classic horse chestnut bleeding canker. New research suggests the bacterium *Pseudomonas syringe* may also be implicated in the development of bleeding cankers, but further research is needed to clarify the situation. At present, if readers are aware of bleeding canker on horse chestnuts in their vicinity Forest Research would be grateful for this information which can be submitted via the dedicated web pages or email see:
http://www.forestresearch.gov.uk/bleedingcanker
bleedingcanker.survey@forestry.gsi.gov.uk)

The horse chestnut leaf miner, *Cameraria ohridella*, continued to spread from its initial *locus* in London, and in 2004 was found in many locations in SE England. However, in most outlying areas the number of mines on horse chestnut leaves was very low. Severe defoliation still appears to be restricted to the west or central London areas of Wimbledon/Barnes/Holland Park/Richmond. It is highly likely that there are large populations of miners in Oxford and Stratford-on-Avon, as the moth was well established there by 2003. However, there have been no further reports from these areas. For the most up-to-date maps showing the distribution of *C. ohridella* throughout the UK, and further information on the pest, refer to the Forest Research web site (see http://www.forestresearch.gov.uk)

Mildew on horse chestnut (*Erysiphe flexuosa*) remained at levels similar to those found in 2003 (5.3%, mean score 0.1). It appears therefore that this relatively new host/'pathogen' combination is not yet widespread.

As in previous years many horse chestnuts were affected by horse chestnut leaf blotch caused by the fungus, *Guignardia aesculi*, (59%, mean score 0.8). This manifests itself as large brown, yellow-ringed blotches on the leaves, and heavy infestations can lead to crown discolouration (32% yellowing and 31% browning, mean score 0.4 in both cases). It also results in the high proportion of trees recorded as being affected with 'dark spots and blotches' (65%, mean score 0.8). A quarter of trees also exhibited signs of crown thinning which could be related to the leaf-curling and withering associated with heavy *G. aesculi* infection, or marginal leaf scorching which is caused by bacterial infection.

***Betula* spp. – Birch**

There were many cases of weeping lesions on birch trunks and it is highly likely that this is the result of the previous year's drought, despite the generally wet summer experienced in 2004. Birch scored the second highest in terms of trees affected by crown yellowing (31%, mean score 0.3) and had fairly high recorded levels of premature leaf fall (30%, mean score 0.3).

***Chamaecyparis lawsoniana* – Lawson Cypress**

Only 8 out of the 80 plots for which data were collected contained Lawson cypress. Their crown condition appeared good with much lower scores for thinning and discolouration than in previous years. No significant problems were reported on this species in 2004.

***Crataegus* - Thorns**

In agreement with reports from 2003, once again thorns (and *Prunus* spp. – 43%) suffered the highest recorded incidence of bark damage (46% in comparison with last year's 47%). It is still not clear why this may be. Insect exit holes were apparent on the bark of 10% of trees assessed and if these areas of the tree were under stress and becoming moribund, it is likely that they were caused by cerambycid beetles. If the exit holes were markedly D-shaped they could be the emergence holes of jewel beetles of the species *Agrilus sinuatus*. This species develops in *Crataegus*, *Sorbus* and *Cotoneaster*, however, it is fairly rare (Figure 4).

Fireblight was only seen rarely – on 6% of trees. Along with willows (*Salix*) there were significantly more reports of crown thinning on this species (53%) compared with the others in the survey. Rust was also reported on 12% of trees, which is not a particularly high value, but higher than in 2003 (5%), and higher than all the other species except willow and oak (see later). Species of *Gymnosporangium* infect hawthorn and rowan (*Sorbus aucuparia*) trees, utilising juniper (*Juniperus* spp.) as the alternate host. Symptoms include typical rusty red/brown spots on leaves, and rust on hawthorn can cause distortion of haws and some branches. However it does not appear to be detrimental to the health of the tree.

***Fagus* - Beech**

Few specific problems were reported on beech in England, although it is noteworthy that many trees in Scotland were in markedly poor condition with signs of crown thinning,

dieback, and weeping stem lesions. This could be the result of the previous year's drought. Although beech is not usually affected by *Armillaria*, severe stress, such as that caused by drought, can increase a tree's susceptibility to the fungus. Similarly, stressed trees are more vulnerable to beech bark disease. The beech scale insect, *Cryptococcus fagisuga,* which is implicated in beech bark disease, was reported on 19% of beech in the survey, and in around one third of the plots (see Figure 5).

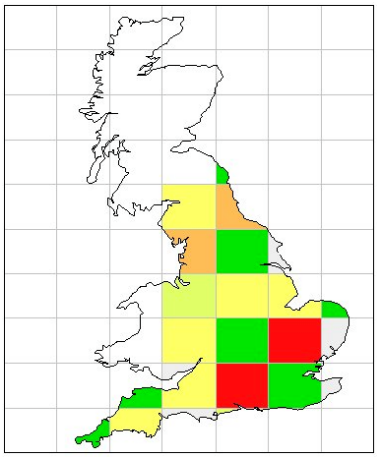


Figure 4 (left): Bark removed from the main trunk of a hawthorn tree reveals a gallery created by a larva of *Agrilus sinuatus*. The sinuous nature of its excavations gives rise to the species name and **Figure 5 (right):** The recorded incidence of beech scale insects on trees in plots across England in 2004 (for key see Figure 1)

Meripilus giganteus was particularly prevalent this year forming fruit bodies at the base of beech trees, although none of the trees involved had failed. Dark spots and blotches were common on the leaves of 47% of trees (mean score 0.6) and could be related to infection by the fungus *Apiognomonia erabunda*. This also affects oaks and can lead to striking spotting and blotching on leaves, although it is unimportant in real terms.

***Fraxinus* - Ash**

Survey results indicate that ash was in relatively good condition throughout 2004 although fruit bodies were recorded on a number of trees (8%). Without samples it is difficult to say categorically what these may have been but ash can be susceptible to *Inonotus hispidus Ganoderma adspersum* and *G. applanatum*, *Perenniporia fraxinea* and *Pholiota squarrosa*. Reports of *I. hispidus* fruit bodies were higher in 2004 than normal and this fungus in particular is important as it can lead to stem breakage. In general the presence of brackets which are identified as belonging to decay fungi certainly indicate a closer examination of the tree might be required, if soundness is a health and safety issue in that location.

Native ash species in the US have recently been threatened by the accidental introduction from Asia of a beetle called the emerald ash borer (*Agrilus planipennis*; See Forest Research Exotic Pest Alert). It has recently been found causing tree mortality within 2-3 years in the North American States of Michigan, Ohio, Indiana and Ontario. As yet, there is no evidence to suggest it has found its way into the UK but with the increasing global market in imported wood, wood packaging and dunnage there is a risk it may be introduced. In the US damage caused by the beetle larvae feeding under the bark has been seen to cause general yellowing/thinning of foliage, and dieback of branches and crowns (usually from the top down). It is important to note that root and butt rots affecting ash in the UK (see above) can cause late flushing, thinning foliage and eventual decline and death. In addition ash can suffer from a specific syndrome known as ash dieback. This causes twig and branch dieback especially in dry eastern parts of England. This has been more fully described in previous reports (see also Hull & Gibbs, 1991). In the amenity tree survey many trees did exhibit marked crown thinning (average score 0.7), equating to 49% of trees. The susceptibility of European ash species (*F. excelsior* and *F. angustifolia*) to the emerald ash borer beetle is currently unknown, but as ash makes up a large proportion of our broadleaf tree cover in the UK it is important to be vigilant. If trees exhibiting pronounced decline are also found to harbour signs of the emerald ash borer (bright green beetles and D-shaped exit holes for example), it is important to contact Forest Research's Tree Health Division (Tel: 01420 22255/ Fax: 01420 23653) or the Forestry Commission Plant Health Service Tel: 0131 314 6414.

***Ilex* - Holly**

This was a 'good' year for the holly leaf miner (*Phytomyza ilicis*) as it was recorded in 75% of all plots! Hollies in coastal areas of southern Britain suffered quite high levels of leaf blight caused by *Phytophthora ilicis* over the winter months. This first appears as black leaf necrosis spreading from the leaf tips and margins and infected leaves are eventually shed (Figure 6). Occasionally stem lesions also form and severe infection of the tree can result in total defoliation. Although infections can look very disfiguring there have not been any cases of actual tree mortality caused by *P. ilicis*.

Figure 6: *Phytophthora ilicis* infection of holly leaves

Platanus x *hispanica* - London plane

In 2004 crown browning (31%, mean score 0.3) and premature leaf fall (54%, 0.5) were higher on plane trees than all other species assessed. Both symptoms can probably be partially attributed to infection by anthracnose (*Apiognonomia veneta*) which was relatively common in 2004 following the damp spring. In addition, planes are known to be susceptible to salt damage and, as many trees of this species are planted in urban settings, it is possible that some of the observed symptoms could also be related to salt damage.

Reports of perennial cankers were also significantly higher on plane than all other species, except *Crataegus*, this year, with cankers present on around 17% of trees. This is a significant finding as, although anthracnose will cause small bark cankers to form on infected twigs and small branches it does not commonly result in larger more obvious perennial cankers on the main stems. It is important to emphasise that the trunks of some clones of London plane trees commonly have many naturally-occurring raised burrs, with or without protruding shoots. In contrast, perennating or perennial cankers tend to form flat rings or strips of distorted bark radiating out from a central point of colonisation. They do not cause raised bulges in the bark. There are only a few organisms which could cause perennating cankers on *Platanus*. *Phellinus punctatus* (Figure 7a) and *Ceratocystis fimbriata* are not found in the UK but are found in France (both organisms) and Northern Italy (*C. fimbriata*). The former is extremely difficult to see on the mottled bark of plane trees, and is pale buff, flat and sometimes forms perennating rays, whilst *C. fimbriata* forms sunken elongated or lens-shaped cankers which can become roughened and black with age. *Inonotus hispidus* will colonise, and causes decay on plane in the UK, but it mainly manifests itself as fruit bodies on the main stem rather than perennating cankers on trunk and limbs. For reasons which are as yet unclear it does form blackish, inconspicuous, long narrow cankers on plane

in central and southern France and Germany (Figure 7b) where it is also of great significance from a health and safety point of view. With changes in climate it is possible that the occurrence of all three fungi mentioned above will increase in the UK. If readers notice any such symptoms on plane trees in the locality Forest Research's DDAS would be grateful for photographs and further site details.

Figure 7: a) Resupinate fruit body of *Phellinus punctatus* on plane tree in Perigueux, France. (the white areas show the spore surface) and **b)** a 2m long suspected *Inonotus hispidus* canker on plane tree near Toulouse, France

Populus - Poplar

Poplar trees suffered the highest recorded levels of leaf eating damage in the survey (88% of trees, mean score 1.3). Feeding damage is commonly caused by small shiny beetles called brassy beetles (*Phyllodecta* spp.) and large numbers can cause considerable damage (Figure 8). In terms of spots and blotches on the leaves reports were 30% down on 2003, although patterns varied across the country with Maidenhead recording 0% in 2003 followed by 100% in 2004 and Darlington and Kingston Lacey the exact opposite! Reports of rust infection (*Melampsora* spp.) also varied considerably. This is very much reflected in commercial plantations of poplars where susceptibility to rusts varies widely amongst clones, but also changes from year to year depending on climatic conditions. 24% of trees were affected in 2003 but only 4.3% in 2004 (mean score 0.2 and 0.1 respectively).

Figure 8: Brassy beetles (*P. vitellinae*) feeding on a poplar leaf

In 2004 a particular problem arose on a distinct variety of black poplar known as the Manchester poplar (*Populus nigra* ssp. *betulifolia*) in the Mersey-Humber corridor. This male clone of black poplar has been showing signs of severe defoliation and dieback. The cause is thought to be poplar scab, also known as poplar blight (*Venturia populina*; or the anamorph *Pollacia elegans*), although this fungus is not usually found to cause significant disease on poplar in the UK. The fungus causes dark brown spots and blotches on the leaves and girdling lesions extending around shoots and twigs. Infected leaves shrivel and fall and the tree crown thins throughout the season. Trees are being killed within 3 years. As this type of tree was widely planted in this area up to the 1930's, due to its pollution tolerance, the impact of this disease is having a significant effect on the landscape. There are also health and safety issues to be taken into account as the overall decline caused by the disease can ultimately affect the structural integrity of the tree.

As Manchester poplars are not genetically distinct from the rarer native black poplar there is some concern that the problem could spread to black poplars across England. In addition, some individuals of another commonly planted poplar, the Lombardy poplar (*Populus nigra* cv. 'Italica') have also been found to be affected. However, this species is much less affected than the Manchester poplar or hybrid black poplars, and numbers of reported infections are always low. Generally speaking, the wet spring of 2004 has probably increased the proliferation of this fungus which is known to need a 14 day wet period in the spring during the infection process. Other diseases such as poplar leaf spot (*Marssonina brunnea*) and rusts have also been found on affected trees, and the former may be contributing to their decline. Volunteers in this region of England and neighbouring areas are asked to keep a close eye on any Manchester poplars in their vicinity, and report significant symptoms to DDAS at Alice Holt.

***Prunus* – Cherry**

Bad cherry wilt and spur blight (*Monilinia laxa*) were recorded by DDAS in the spring, and this appeared to be particularly severe on the 'Cheal's Weeping' variety. Flowers shrivel and die, remaining on the tree. Leafy spur shoots become infected and leaves wilt rapidly. Eventually some shoots start to die back and there is profuse gumming from the infected tissue.

Locally in the south of England many trees were affected by cherry leaf scorch *Apiognomonia erythrostoma*. In the summer of 2004 the infection would have been apparent as brown blotches with yellow margins on the leaves. These leaves die but do not fall, and dead brown, withered leaves are left hanging on the tree throughout the winter. The new growth in the following year will cover the infected tissue and trees will completely recover. This high disease prevalence was not reflected across the whole of England though. After the reasonably high incidence of cherry leaf scorch and *Blumeriella jaapii* in 2002 (19 and 25% respectively), there were very few cases overall in 2003 (0 and 13%) and 2004 (2 and 3%).

As in previous years cherries were the species worst affected by bacterial canker caused by *Pseudomonas syringae* pv. *morsprunum* (23%; Figure 9). Cherries also scored second highest for bleeding canker (14%). The bleeding is likely to be a result of infection with *P. syringae*, but it may in some cases also be related to the high levels of exposed wood recorded on 43%, as wounding can lead to pronounced resinosis. Leaf-eating damage was commonly reported on 75% of trees (mean score 0.9).

***Quercus* – Oak**

In 2004 exceptionally large numbers of spangle galls were reported on oak. These attractive galls are caused by *Neurotus quercusbaccarum*, a cynipid wasp (Figure 10). After a decline in recordings in 2003 Knopper galls were again seen on 37% of trees. Although infestations of galls can look spectacular there appear to be no long-term effects on the trees' health. These numerous galls may have affected the recording of leaf blotches which at 57% (mean score 0.7) were higher than many other species.


Figure 9 (left): Bacterial cankers on trunk caused by *Pseudomonas syringae* pv. *Morsprunum* and **Figure 10 (right):** Common and silk button spangle galls on an oak leaf.

Although in total very few fungal fruit bodies or rhizomorphs were spotted on trees during the surveys, oak trees had the highest number of reports (11%). There were signs of *Agrilus pannonicus* beetle attack on one plot only, evidenced by the D-shaped exit holes left by the emerging adults.

Although 16% of oaks were reported to be affected by rust, rust is not particularly common on the *Q. robur* and *Q. petraea* assessed in this survey in the UK. *Cronartium quercuum*, has very occasionally been found on *Q. robur*, Q. *petraea* and Q. *ilex* in the UK and is recorded on Shumard oak (*Q. shumardii*) in the US. However, it can be difficult to diagnose as it looks very much like mite damage rather than a typical rust (or mildew). It is therefore possible that some of the reports of rust on oak are actually related to mildew, caused by (*Microsphaera alphitoides*). This mildew, which is especially common on the lammas growth seen in late summer, leaves a white, furry deposit on the leaves, whilst most rusts tend to leave a yellow/brown pustular coating on the leaves of trees such as poplar and willow (see below).

***Salix* - Willow**

Willows exhibited the highest recorded levels of crown thinning – 60% of trees affected to some degree (average score 0.8), and this may be connected to the high numbers of reports of willow scab (*Pollacia saliciperda*) received by DDAS. This caused severe defoliation and die-back on *S. fragilis* and *S. matsudana* 'Tortuosa' in 2004. Over a quarter of assessed trees also exhibited marked discolouration of foliage (yellowing 28%; browning 22%). This discolouration may have been caused by the relatively high rust scores on willow (24%, mean score 0.3), the highest of all the species assessed. Willows can commonly be affected

by species of *Melampsora* which leave slightly raised brown/yellow dust-like pustules on the upper and lower surface of the leaves, and can cause cankers on current year's shoots. As mentioned in the oak review above, it is common for mildew and rust to be confused. The recording of mildew on the leaves of 11% of willows is more likely to equate to a few more trees being infected by a more common leaf-infecting organism such as rust. Heavy skeletonising damage on the undersides of leaves caused by leaf and flea beetles (and their larvae) could also make leaves appear grey and 'mildewy' in late summer, whilst heavy aphid-feeding can cause a build-up of grey-ish coloured sooty moulds on the excreted honey dew.

Leaves on many of the trees had blotches and dark marks (67% of trees, mean score 0.9) which could be related to insect feeding but could also indicate the presence of scab or anthracnose (*Drepanopeziza sphaeroides*). Anthracnose will cause brown/purple leaf spots, and infected leaves curl and fall prematurely. However it is only serious on golden or common weeping willow. Scab infection causes black spots and leaf shrivelling. The leaves die but stay attached to the tree and affected shoots may be blackened and curve over. Infection is relatively common after the cool wet weather experienced in the spring of 2004. Infection by both pathogens would contribute to the high crown thinning reports described above.

Willows had the highest incidence of insect exit holes (18%). There are a number of species which can live under the bark of willow, and if the holes were at the base of the trunk and large enough to be easily noticed during the assessments they are likely to be the exit holes created by emerging lunar clear wing moths (*Sesia bembiciformis*). This moth can be quite damaging, especially to trees under stress. If the holes were a distinct D-shape they could have been caused by a species of buprestid beetle, *Agrilus viridis*. However, this is a rare and notable species .

***Sorbus* – Whitebeam and Rowan**

Although most trees remain healthy from year to year *Sorbus* was the genus with the lowest survival rate, with 'only' 89% of trees live and present in 2004 compared with the previous year. However, for trees often situated in busy, stressful situations such as city streets this figure is not necessarily unusual. Of these trees, 48% appeared to be suffering from crown thinning (mean score 0.7) and some (29%) also displayed pronounced yellowing, although to a lesser extent than in 2003 (mean scores 0.6 and 0.3 in 2003 and 2004). Many volunteers recorded blotches or dark spots on leaves (63% of trees, mean score 0.8) which could be

the result of infection by the scab of the species *Venturia*. This causes brown or olive green spots and blotches. Very few trees were reported to be suffering from fireblight (1%).

***Taxus* - Yew**

A fairly high proportion of trees showed signs of crown thinning (46%, average score 0.6) and yellowing (21%, mean 0.3). This can be a sign of Phytophothora root rot, often caused by *P. cinnamomi*, but can simply reflect the time of year when the trees are surveyed as, during the late summer there is a natural process of senescence in the old needles. Interestingly there were fewer reports of crown browning than in 2002 and 2003.

***Tilia* - Lime**

Aphid levels were much higher on lime than any other species (68% of trees, mean score 0.8), and most trees exhibited considerable feeding damage on the leaves (82% of trees).

***Ulmus* - Elm**

Although not included in the survey, it is worth commenting that re-growth from English elm (*U. procera*) was once again noticeably affected by Dutch elm disease in 2004. This disease is caused by fungi within the genus *Ophiostoma* (syn. *Ceratocystis*), and it is transferred (vectored) from tree to tree by bark beetles mainly in the genus *Scolytus*. This disease is perhaps most noticeable in roadside hedges where, once trees reach around 12 feet (3.7m), they become vulnerable to attack by the flying beetles. The fungus carried by the beetles spreads within the plant's xylem causing wilting, dieback and eventual death of aerial parts of the tree. Large numbers of dead or dying elms can result in a health and safety hazard, particularly where trees are close to roads. (See TDA98 for further information.)

Summary

Horse chestnut and lime were the most commonly assessed trees as in previous years and Lawson cypress again the most uncommon, being present in only 8 locations. Overall survival of the surveyed trees was good with 97% still present following the 2003 assessment season. *Sorbus* spp showed the lowest survival rate which, at 89%, was still very high. Although the health of most trees was good, over a third (38%) showed signs of crown thinning (Figure 11). However, of these, only 2% fell into the 'severe symptoms' category. There did not seem to be any particular correlation between geographic location

and crown condition as records of thinning were most apparent in plots in the north west, western home counties and the south west, with moderately high levels in the north and south/south-east. Premature leaf fall was significantly more apparent in urban plots, and particularly prevalent on plots in the south (>50%) whilst being rare in the eastern region of East Anglia.

Unsurprisingly perhaps 62% of trees had signs of insect feeding on leaves and nearly half of these exhibited spots or blotches on the leaves. There was very little mildew (6%) or rust (6%) apparent on trees in 2004, and no obvious signs of salt or chemical damage (<1%). The evergreen species assessed in the survey, *Taxus*, *Chamaecyparis* and *Ilex* had the lowest scores for all leaf disorders. Although it is a fairly crude measure, amalgamating all the recordings indicates that *C. lawsoniana*, *T. baccata*, *I. aquifolium* and *Fraxinus* sp. were the 'most healthy' and *Fagus*, *Sorbus*, *Aesculus* and *Prunus* the 'least healthy' in 2004.

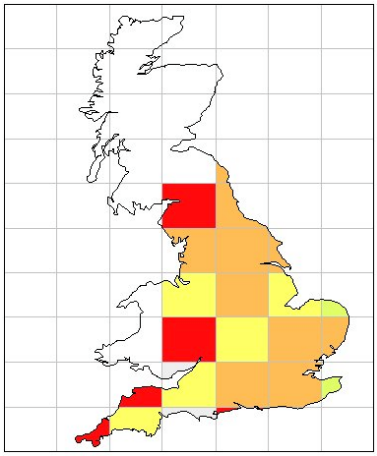


Figure 11: Reported incidence of crown thinness on all trees in plots across England in 2004

(for key see Figure 1)

ACKNOWLEDGEMENTS

This project is funded by the Office of the Deputy Prime Minister. The authors are grateful to all the volunteer observers who collected information for this report, and to colleagues in the Technical Support Unit of Forest Research, who advised and supported many observers throughout England and carried out all the crown density assessments on oak and beech. Thanks are also extended to AAIS for reviewing the text.

References and further reading

Anon. (1989) *BS4043: Recommendations for Transplanting Root-Balled Trees*. British Standards Institution, London.

Anon. (2004). *Exotic pest alert*. *Phytophthora ramorum*: Sudden oak death. Revised edition. Forestry Commission, Edinburgh.

Brasier, C. M. (2004). Sudden oak death (*Phytophthora ramorum*) discovered on trees in Europe. *Mycological Research* **108** (10), 1108-1109.

Brasier, C. M., Denman, S., Rose, J., Kirk, S. A., Hughes, K. J. D., Griffin, R. L., Lane, C. R., Inman, A. J. and Webber, J. F. W. (2004). First report of ramorum bleeding canker on *Quercus falcata* caused by *Phytophthora ramorum* on trees. *Plant pathology* **53**, 804.

Dixon, A. F. G. (1971). The role of aphids in wood formation I. The effect of the sycamore aphid, *Drepanosiphum platanoidis* (Schr.) (Aphididae), on the growth of sycamore *Acer pseudoplatanus* (L.). *Journal of Applied Ecology.* **8**, 165-179.

Hendry, J. J., Poole, E. J., Craig, I. & Proudfoot, J. C. (2005). *Forest Condition 2004*. Forestry Commission, Edinburgh. 8pp.

Hull, S. K. and Gibbs, J. N. (1991). Ash dieback – a survey of non-woodland trees. *Forestry Commission Bulletin 93*. HMSO, London.

Innes, J. L (1990). Assessment of tree condition. *Forestry Commission Field Book 12*. HMSO London.

Innes, J. L. & Boswell, R. C. (1991). Monitoring of Forest Condition in Great Britain 1990. *Forestry Commission Bulletin 98.* HMSO, London.Innes & Boswell, 1991

Lonsdale, D. (1999). *Principles of tree hazard assessment and management*. The Stationary Office, London.

Lonsdale, D. and Wainhouse, D. (1987). Beech bark disease. *Forestry Commission Bulletin 69*. HMSO, London.

Rose, D. R. (1989). Scab and black canker of willow. *Arboriculture Research Note 79/89/PATH*. Forestry Commission, Farnham Surrey.

Straw, N. A & Tilbury, C. (2006). Host plants of the horse-chestnut leaf-miner (*Cameraria ohridella*), and the rapid spread of the moth in the UK 2002-2005. *Arboricultural Journal* **29**, in press.

Straw, N. A. and Bellet-Travers, M. (2004). Impact and management of the horse chestnut leaf-miner (*Cameraria ohridella*). *Arboricultural Journal* **28**, 67-83

Strouts, R. G. and Winter, T. G. (2000). *Diagnosis of ill-health in trees*. The Stationery Office.

Thorpe, K. V., Rose, D. R., Rose J. R. and Tilbury, C (2005). The Health of Non-Woodland Trees in England in 2001 & 2002. *Arboriculture Research and Information Note No. 153*. The Tree Advice Trust.

Thorpe, K. V., Poole, J, Rose, D. R., Rose J. R. , Straw, N. and Tilbury, C (2006). The Health of Non-Woodland Trees in England in 2003. *Arboriculture Research and Information Note No. 154*. The Tree Advice Trust.

Tilbury, C.A. & Evans, H.F. (2002) *Exotic Pest Alert:* Horse chestnut leaf miner*, Cameraria ohridella.* Desch & Dem. (Lepidoptera: Gracillariidae). Forestry Commission, Edinburgh.

Tilbury, C.A. & Plant Health Service (2004) *Exotic Pest Alert.* Emerald ash borer, *Agrilus planipennis* Fairmaire (Coleoptera, Buprestidae). Forestry Commission, Edinburgh.

Trout, R. & Brunt, A. (2005) Report to Corporate Forestry Support: Ecology Division Advisory Service Records April 2004-March 2005. 6pp.

Webber, J. F. (2004). Phytophthora bleeding canker of horse chestnut. *Forest Research Information Note*.

Young, C. W. T., (1978) Sooty Bark Disease of Sycamore. *Arboricultural Leaflet No 3.* HMSO.

TREE DAMAGE ALERTS

The following Tree Damage Alerts (TDAs), which provide information on some of the problems detailed in this Note, were published by The Tree Advice Trust during the period of this report.

TDA 91 Water Relief! (February)
TDA 92 Horse chestnut bleeding canker. (March)
TDA 93 Remember Birds, Trees, Hedges and the Law? (March)
TDA 94 Who is taking the Pith? (April)
TDA 95 Oh *** it, another disease! (May)
TDA 96 Wilting in the Wet. (June)
TDA 97 A Nasty Rotter. (July)
TDA 98 Don't ignore Them! (September)
TDA 99 Small is not always beautiful (October)

Appendix 1: Genera of trees included in the survey

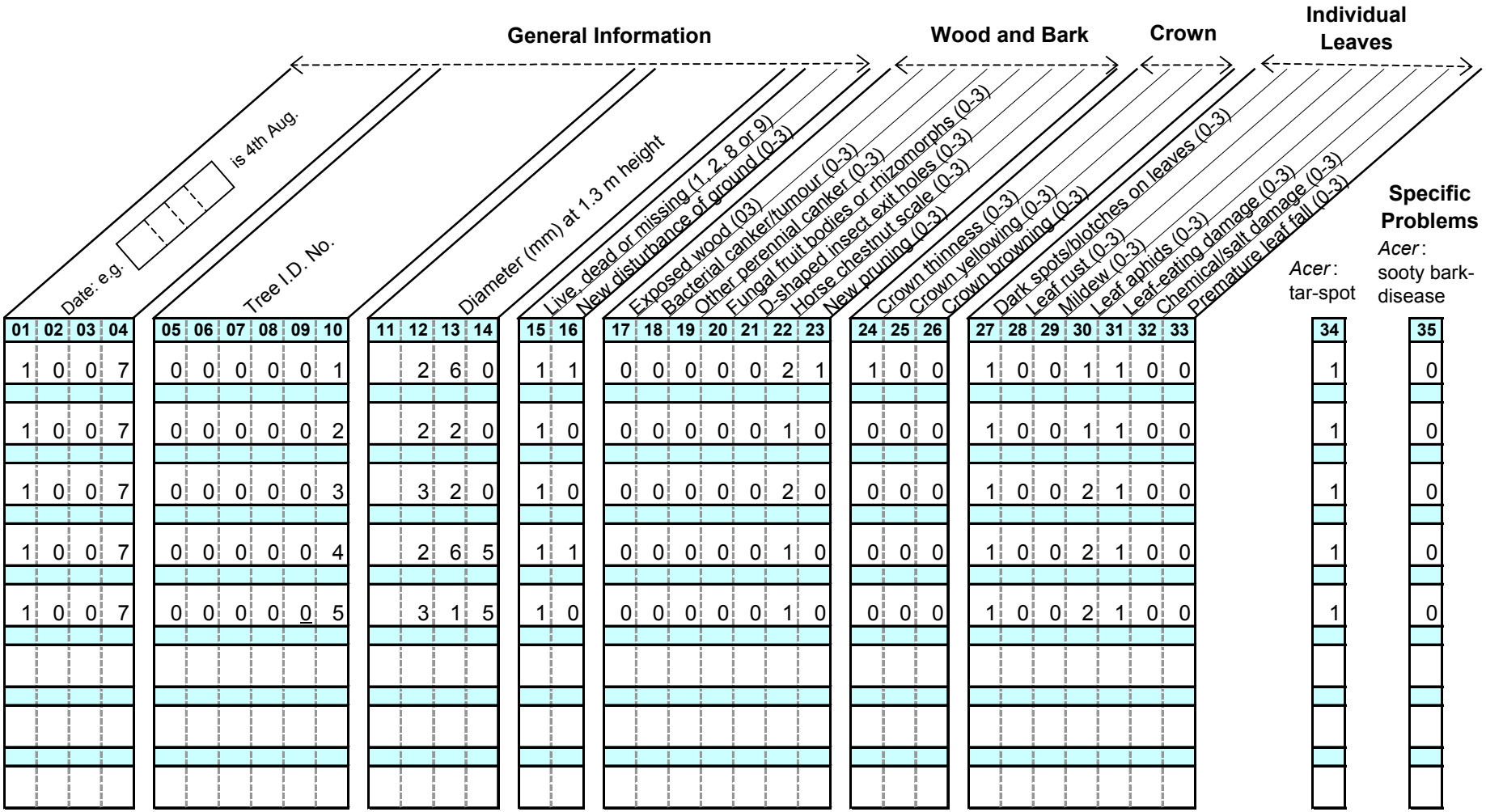
Acer	*Platanus*
Aesculus	*Populus*
Betula	*Prunus*
Crataegus	*Quercus*
Chamaecyparis	*Salix*
Fagus	*Sorbus*
Fraxinus	*Taxus*
Ilex	*Tilia*

Appendix 2
Condition Survey of Non-Woodland Amenity Trees (ODPM)

Year: **2004** ..... Plot Name: Tonbridge Plot No: 163 Observer's name: Kath Thorpe

Sheet No: 1..... of 6..... Tree species: ***Acer pseudoplatanus***: .....

Part A: Annual assessment of all tree species registered for the survey at the above plot



Appendix 3: Data Summaries for 2004

3.1 The figures given in the following table show the mean scores for each category, for each tree species. For example, the crown thinness scores measured on *Tilia* in active plots across England were combined to form a mean score of 0.3 in 2004.

	Disturbance	Exposed wood	Bacterial canker	Perennial canker	Bleeding Canker	Fruit bodies	Insect exit holes	*Pulvinaria* (HC scale)	New pruning	Crown thinness	Crown yellowing	Crown browning	Dark spots	Rust	Mildew	Aphids	Leaf eating damage	Chemical/salt damage	Premature leaf fall
Tree Species																			
Acer platanoides	0.2	0.2	0	0	0	0	0	0.6	0	0.4	0.1	0.2	0.5	0	0	0.4	0.7	0	0.2
Acer pseudoplatanus	0.3	0.2	0	0	0	0	0	0.3	0.1	0.6	0.1	0.2	1.0	0.1	0.1	0.9	0.8	0	0.1
Aesculus	0.4	0.5	0.3	0.1	0.3	0.1	0.1	0.3	0.1	0.4	0.4	0.4	0.8	0.1	0.1	0.4	0.9	0	0.3
Betula	0.3	0.3	0.1	0	0	0	0.1	0	0	0.5	0.3	0.2	0.5	0.1	0	0.4	0.7	0	0.3
Chamaecyparis	0.5	0.4	0	0.2	0	0	0	0	0	0.2	0	0.1	0	0	0	0	0	0	0
Crataegus	0.5	0.9	0.1	0	0	0	0.2	0	0	0.8	0.3	0.2	0.5	0.1	0.1	0.4	0.5	0	0.2
Fagus	0.2	0.4	0.2	0.1	0	0.1	0.1	0	0	0.7	0.3	0.2	0.6	0	0	0.5	0.9	0.1	0.2
Fraxinus	0.4	0.3	0.1	0	0	0.1	0	0	0.1	0.7	0	0	0.3	0	0	0.4	0.7	0	0.1
Ilex	0.2	0.2	0	0.1	0	0	0.1	0	0.1	0.4	0.1	0.1	0.4	0	0	0.3	0.4	0	0
Platanus	0.3	0.1	0.1	0.2	0	0	0	0	0	0.4	0.2	0.3	0.5	0	0	0.2	0.5	0	0.5
Populus	0.3	0.2	0.1	0.1	0	0.1	0.1	0	0	0.5	0.2	0.3	0.4	0.1	0.1	0.6	1.3	0	0.3
Prunus	0.5	0.5	0.2	0	0.2	0	0.1	0	0.1	0.5	0.3	0	0.3	0	0	0.2	0.9	0	0
Quercus	0.2	0.3	0.1	0.1	0	0.1	0.1	0	0	0.5	0.2	0.2	0.7	0.2	0.3	0.6	0.7	0	0.1
Salix	0.4	0.5	0	0.1	0.1	0	0.2	0	0.3	0.8	0.3	0.2	0.9	0.3	0.1	0.5	0.8	0	0..4
Sorbus	0.5	0.5	0	0.1	0	0.1	0.1	0	0	0.7	0.3	0.2	0.8	0.1	0	0.4	0.5	0	0.4
Taxus	0.2	0.4	0	0	0	0	0	0	0.1	0.6	0.3	0.3	0.1	0	0	0.2	0.1	0	0.1
Tilia	0.2	0.2	0	0.1	0	0	0.1	0.5	0.1	0.3	0.2	0.2	0.7	0.1	0	0.8	1	0	0.2
Average Score	**0.3**	**0.3**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.5**	**0.2**	**0.2**	**0.6**	**0.1**	**0.1**	**0.5**	**0.7**	**0**	**0.2**

3.2 Mean scores (0-3) for specific tree problems on 'targeted genera,' in 2004 (where no specific name is given, a number of species are assessed in the survey)

TREE SPECIES	**DISEASE/ INSECT PEST**	**MEAN SCORE**
Acer platanoides	Tar spot	0.2
	Sooty bark disease	0.0
Acer pseudoplatanus	Tar spot	1.0
	Sooty bark disease	0.0
Aesculus	Leaf blotch	0.8
Crataegus spp.	Fireblight	0.1
Fagus sylvatica	Beech scale	0.2
Ilex spp.	Leaf miner	0.8
Prunus spp.	Cherry leaf scorch	0.0
	Cherry leaf spot	0.0
Quercus spp.	Knopper gall	0.5
Salix spp.	Giant willow aphid	0.0
Sorbus spp.	Fireblight	0.0