



MANAGING ASH DIEBACK:

Case Studies - Volume 2

Royal Forestry Society in partnership with



June 2022



Ash dieback showing in the canopy - picture credit Forestry Commission



Trees affected by ash dieback can become brittle and unstable - picture credit Forestry Commission

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Information and warnings for the public during works at Coed Cadnant - picture credit Woodland Trust (Ed Midmore)

INTRODUCTION

Ash dieback is caused by the fungal pathogen *Hymenoscyphus fraxineus* and was first identified on ash trees in the UK in 2012. It is now thought to have been present at lower levels since 2005/6 or earlier, having arrived both on imported planting stock and via spore masses blown across the English Channel from mainland Europe.

This document draws together current information to provide examples of interventions some landowners/managers are using to tackle ash dieback, the decisions they made, and the challenges they encountered along the way. All those featured in the case studies are happy to be contacted for further information. Pages 22-23 give details of further on-line guidance and reading.

Ash dieback is present in all counties of England and in large areas of Wales. Experience in mainland Europe suggests the majority of ash trees in woodland infected with the disease could decline and die over the next 10–15 years.

The total cost of ash dieback to the UK is estimated to be £15 billion, half of which will be incurred over the next ten years⁷. Almost one third of this cost arises from safety felling of dead and dying trees and almost two thirds from the loss of benefits provided by trees, e.g. water and air purification and carbon sequestration. The remaining few percent is composed of research and replanting costs as well as a loss of profits to the forestry and nursery sectors which are predicted to be £78 million and £2 million respectively.

⁷Hill L., Jones G., Atkinson N., Hector A., Hemery G., Brown N., 2019. The £15 billion cost of ash dieback in Britain. *Current Biology*. 29 (9), pp. 315–316. [www.cell.com/current-biology/fulltext/S0960-9822\(19\)30331-8#relatedArticles](http://www.cell.com/current-biology/fulltext/S0960-9822(19)30331-8#relatedArticles)

Ecology and symptoms

Symptoms of ash dieback include leaf loss, crown dieback and bark lesions in affected trees.

Spores from the fungus colonise ash foliage which eventually falls to the ground where the fungus overwinters in the central leaf stalk (rachis) before fruiting and releasing more spores in the spring. The fungus often goes on to colonise branches and in some situations the base of tree stems become infected, leading to basal necrosis.

These symptoms can cause mortality directly or stress the tree to the point where it succumbs to secondary pathogens and extreme climatic events. Honey fungus (*Armillaria spp.*) in particular can colonise weakened trees resulting in root or lower stem rot.

Heavily affected trees can become brittle and unstable making them dangerous to climb or to fell by chainsaw. They present a potential hazard particularly along roadsides and in areas of public access.

Away from woodland, and especially in urban settings, low spore levels and a lack of secondary pathogens may mean trees show less signs of infection.



Enrichment planting at Treragin Wood on the site of a former commercial daffodil enterprise - picture credit Treragin Wood



Coed Cadnant - picture credit Woodland Trust



Medium intervention at Priors Park - picture credit Forestry England

What you can do

The approach taken to managing woodland or individual trees affected by ash dieback will depend on individual management objectives, the age and proportion of ash, the site conditions, and the level of infection. Certain approaches to management may not be suitable within ancient woodlands or those woodlands or treed landscapes carrying designations.

There is no approved or efficient preventative or curative treatment (i.e. silvicultural or chemical approach) that will alleviate or mitigate the effects of ash dieback. However there are actions all landowners can take:

- **Planning:** Consider the impacts that ash dieback may have in your woodland. Where possible, update or create management plans and contingency plans to take into account current or future impacts of ash dieback and re-prioritise operations accordingly. Having a felling licence and other permissions in place prior to the worst effects will allow greater management flexibility should the need to fell trees arise.
- **Survey:** Regular surveys are necessary, particularly where there is public access, to identify the progress and impacts of infection and the presence of dangerous trees.
- **Safety:** Safety is a primary objective of all landowners:

Public safety: Trees and woodlands should be risk zoned, monitored and managed to an appropriate

protocol. Monitoring is likely to have to be carried out at increased frequency where ash is adjacent to roads, facilities and areas of public access.

Safety of forestry operators: The woodland owner or manager should ensure all those working with diseased ash trees are aware of the risks and are trained to an appropriate level².

² <https://ukfisa.com/Safety/Safety-Alerts/essential-information-on-the-felling-of-diseased-ash>

- **Restrictions:** The felling of diseased ash within woodlands continues to require a felling licence from the Forestry Commission unless they are dead or pose a real danger. Woodland owners and managers should also be aware of the good practice guidance on European Protected Species and any Tree Preservation Orders on the site.
- **Silviculture:** Where timber production is a primary objective, the best way to reduce future disease impact is to promote fast, healthy growth of selected ash trees and ensure high standards of silviculture. It is also crucial to carry out intensive monitoring to assess the impact ash dieback is having on the timber quality. A decision will often need to be taken regarding premature felling to realise the value of the timber at a certain point. Where biodiversity is more of a priority, suggestions include maintaining potentially tolerant trees as long as possible, promoting conditions for natural regeneration of both ash and other species, and underplanting.
- **Locating tolerant trees:** Ideally, ash trees which appear to be less affected than those around them should be identified when in leaf and promoted in subsequent operations. Consideration should be given to windthrow risk and possible changes in the water table. Natural regeneration from potentially tolerant trees should be encouraged. This may require other operations to be carried out to succeed (deer management, deer fencing).
- **Biosecurity:** Good biosecurity standards should be followed including cleaning/ disinfecting boots and equipment before entering and leaving woods, and sourcing planting stock responsibly. Reporting of



Ash dieback affects canopy - picture credit Forestry Commission

suspected ash dieback is only required in areas where it has not already been reported. Concerns over tree health issues can be reported via TreeAlert³. In Northern Ireland, ash dieback can be reported via TreeCheck⁴, the all-Ireland tree disease reporting tool.

³<https://www.forestresearch.gov.uk/tools-and-resources/fthr/tree-alert/>

⁴<https://www.treecheck.net/twa-ui/#/public/report>

Restocking

Woodland owners and managers can apply for a Countryside Stewardship Tree Health Grant to support the cost of restocking due to ash dieback. Consult the GOV.UK⁵ web pages or speak to your local Woodland Officer to find out if you are eligible. The Royal Forestry Society is also offering restock grants for eligible projects under its Trainhugger and GreentheUK Scheme.

There is no single species that can be a replacement for ash. Choice of restock species will depend on management objectives, site conditions (soil, aspect, climate) and designations. When choosing restock species consider the ecological function that ash trees played within the woodland and seek to mitigate against this loss by choosing a proportion of tree species that fulfil some of these functions.

⁵<https://www.gov.uk/guidance/woodland-tree-health-grant-countryside-stewardship>

Detailed guidance on appropriate species to mitigate the impact of ash dieback from an ecological perspective can be found within the resources part of this document. The Forest Research Ecological Site Classification (ESC) tool⁶ can also help to identify tree species that will be well suited to the site but accurate soil and/or ground vegetation information is essential to achieve reliable outputs.

⁶<http://www.forestdss.org.uk/geoforestdss/>

Use trees bought from responsible and sustainable sources with a known provenance. Plant Healthy⁷ is a certification scheme that makes it easy to ensure trees purchased are responsibly sourced. If restocking with native trees, the Forest Research report 'Genetic considerations for provenance choice of native trees under climate change in England'⁸ identifies factors which may influence

the risk, suitability and desirability of the use of local versus non-local seed under climate change. The unprecedented rate of climate change suggests that in some situations trees from a more southerly provenance may be a useful addition to spread risk. The Forest Research Climate Matching tool⁹ makes it easier to visualise these climatic changes when planning.

⁷<https://planthealthy.org.uk/>

⁸<https://www.forestresearch.gov.uk/publications/geneticconsiderations-for-provenance-choice-of-native-trees-underclimate-change-in-england/>

⁹<https://www.forestresearch.gov.uk/tools-and-resources/fthr/climate-matching-tool/>

The prevalence of deer and grey squirrels can impact the success or failure of any restocking and this must be taken into account. Choosing species well suited to the soil nutrient and soil moisture regimes of the site is crucial to encourage long-term resilience.

Sites should only be worked in conditions which will avoid compaction and/or erosion.

Regeneration from a stand using coppice shoots from infected felled trees is not recommended as recent observations in East Anglia have shown that over 80% of coppiced ash dies within four years.

Looking ahead

Research suggests that some ash trees (1-5 %) will have genetic tolerance to the fungus.

Clones taken from these trees are being planted as an archive to provide material for a breeding programme to generate stocks of resilient native ash to plant in the future.

The Living Ash Project¹⁰ is keen to hear of trees showing tolerance to the disease in areas of otherwise high infection.

¹⁰<https://livingashproject.org.uk/>



Infected mature ash - picture credit Landmarc



Caledon Estate - picture credit Caledon Estate

1. CALEDON ESTATE, COUNTY TYRONE, NORTHERN IRELAND

Enrichment planting and planting after clearfell

Key points

- Estate dating back to 1700s with extensive commercial and amenity woodland
- Woodland block plantings to enhance landscape aesthetics and biodiversity
- Differing approaches to ash dieback management for roadside trees, hedgerow trees and within woodland blocks

Background

Caledon Estate dates back to the 1700s and has a range of commercial woodland (comprising of mainly Sitka spruce), amenity woodland and parkland. The whole estate covers approximately 1011ha (2500 acres), 404.6ha (1000 acres) in forestry, 485ha (1200 acres) in agricultural use, and the remaining parkland/amenity areas. The altitude is 50-60m above sea level.

The landscape character of the area outside the demesne is mainly agricultural (grazing) interspersed with small woodland copses. No constraints or sensitivities apply.

Ash dieback was first recorded in young trees 2015 but it was not until 2020 that it spread widely across the estate. There is no public access to the estate, with access allowed only by invitation. In previous years ash from the estate has been used for hurling sticks.

Management of ash dieback

A risk assessment of the estate's roadside trees was undertaken in 2021. It identified more than 150 trees, many of them diseased ash but some veteran chestnuts of concern which would need to be felled. Traffic light systems on the roads were set up to avoid road closures on two busy roads.

However, where ash trees in field hedgerows pose no health and safety risk they have been retained to see whether any will prove tolerant.

In two woodland blocks, ash dieback has had a major impact:

Block one is a 1.98ha area which straddles the Derrycourtney Road. Here ash was present at 50% amongst beech, oak, sycamore and elm. It was selectively felled in 2021 alongside some poor quality Norway spruce.

Block two is a 0.45 ha area surrounded by agricultural land which had been 100% ash as a timber crop. This was replanted using intimate species mixes.

A third area of 0.11ha primarily of chestnut which were shedding limbs was also clearfelled because of health and safety concerns. This was also replanted using intimate species mixes.

Ash dieback is a widespread problem not only for Caledon Estate but also the wider land stewardship community because as the disease progresses the weakened and brittle trees may pose a significant public safety hazard. All timber was marketed to local firewood merchants and processors.



Clearfelled ash - picture credit Caledon Estate



Ash dieback showing in the canopy - picture credit Forestry Commission



Enrichment planting - picture credit Caledon Estate

Species choice

Caledon Estate opted for a diversity of tree species to increase resilience based on species that have been tried and tested elsewhere across the estate. The trees were grown in the Republic of Ireland and the planting was carried out in February and March 2022.

Hedgerow trees were not replaced, leaving space for other existing species to expand.

Block 1 was planted at a density of 1,200/ha with:

- 40% beech
- 40% oak
- 10% wild cherry
- 10% hazel

Block 2 was planted at a density of 2,500/ha (2m x 2m spacing) with

- 30% oak
- 30% beech
- 20% Scots pine
- 10% wild cherry
- 10% hazel

The third block where sweet chestnut had been prevalent was planted with:

- 30% oak
- 30% beech
- 20% Scots pine
- 10% wild cherry
- 10% hazel

The Forest Research Ecological Site Classification (ESC) tool for species suggested to be suited to predicted future climate over the next 30-50 years does not yet cover Northern Ireland.

Grants and support

Caledon Estate successfully applied for a new tree planting grant* for Royal Forestry Society (RFS) and Royal Scottish Forestry Society (RSFS) members delivered in partnership with Trainhugger*. The grant requires applicants to demonstrate planting aims to increase resilience to pests, diseases, or climate change. The estate did not apply for a tree health grant.

**<https://rfs.org.uk/trainhugger/>*

Management

Grey squirrels are not prevalent locally and deer in the areas surrounded by farmland are limited, and controlled. No individual tree protection was required initially but the site will be monitored.

Weed control and beating up will be required to achieve satisfactory stocking and establishment to Year 5. Establishment will be monitored after Year 5.

Further information

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Purpose-built machinery allowed safer, more efficient tree felling near road sides - picture credit Forestry England

2. CASTLE NEROCHE, BLACKDOWN HILLS, DEVON/SOMERSET

Woodland around a scheduled monument and alongside busy B roads

Key points

- Castle Neroche is a secondary planted woodland situated around Castle Neroche Scheduled Monument
- Thinning the ash alongside two busy B roads using purpose-built machinery allowed safer, more efficient tree felling. Full road closures were employed during the works
- It is a very popular recreational site and a former hunting forest

Background

Castle Neroche is an ecologically diverse woodland situated around the Castle Neroche Scheduled Monument, on the periphery of the Blackdown Hills escarpment. Like Priors Park SSSI (see page 14), it is managed by Forestry England within the Blackdown Hills Forest Plan area, as part of a cluster of woodlands stretching across the border of Devon and Somerset.

Castle Neroche is a very popular recreational site, home to a Norman motte and bailey castle which is located on the site of an earlier Iron Age hillfort where some of the earthworks are still visible.

The woodlands in the Neroche complex have a rich history and were once ancient hunting forest. The result is large amounts of historic wood pasture with oak dominated Lowland Mixed Deciduous Forest which contains a high proportion of ash on the steep scarp slopes.

The site is intersected by two B-roads which drop down into the valley from the top of the Blackdown Hills, wooded either side by mature ash which were becoming noticeably affected by ash dieback. To assess the health of the ash at these roadside locations, regular condition surveys were

carried out, monitoring the health of the ash trees based on crown condition. The monitoring was carried out alongside full tree safety surveys of all roadside trees in the woodland, allowing Forestry England staff to build up a picture of the areas of ash which pose the highest risk.

Management of ash dieback

Forestry England identified the ash along the roads intersecting the woodland at Castle Neroche as being particularly high risk. At these sites there was a high proportion of ash which was in poor condition and leaning over the road, creating a tunnel in places. Forestry England decided to pro-actively remove the ash from these roadside locations, retaining ash elsewhere within the woodland which would be assessed on a tree-by-tree basis as part of the normal management cycle.

Approximately 600 trees were identified for removal at roadside as part of a thinning operation, targeting the areas of the woodland where public safety was most at risk from ash dieback. Forestry England undertook a tender exercise to achieve the best value for the operation. Overall, this was obtained by purpose-built machines. Forestry England found that these operated much more efficiently than teams of hand-cutters (resulting in reduced costs) and were more nimble than traditional timber harvesters which have a limit on reach, as they generally deal with larger trees felled at ground level.

Road closures

Forestry England opted for a full road closure at both locations to enable the machinery to work continuously along the roadsides. The contractor carrying out the works employed purpose-built machinery with rubber tyres, which could be used on the road surface. Manoeuvrability offered by working from the road with a full road closure



Approximately 600 roadside trees were identified for removal where public safety was most at risk - picture credit Forestry England

allowed safer, faster, more efficient tree felling to occur. The purpose-built machine had the advantage of a protected, fully-enclosed cab which could be raised up to enhance visibility into the woods whilst working and ensures operator safety. This is more important than ever, as it is understood that ash affected by ash dieback can become brittle and unstable.

The harvester has a long-reach boom, which can extend 10-15m into the stand from the road. It also has the capability to dismantle trees with a strong grab, allowing the machine to take off branches and remove the tops out of trees, lower them and place them on the ground (timber harvesters are less able to support a falling tree as the head rotates with the tree rather than retaining it in an upright position).

Forestry England helped facilitate the contractor to obtain the necessary road closure on sections of highway linking Taunton to the Blackdown Hills, each having an ash dominated roadside tree-lined strip. Ash that was immediately adjacent to the road was identified for removal, alongside any ash trees which were set back from the road but were leaning towards it. These two categories of trees were dismantled down to ground level and the area left to coppice up and naturally regenerate. The timber was cut, chipped and removed from site. This was important as watercourses run either side of the road and the chip had the potential to cause pollution or a blockage. One section of road contained over 500 trees and was completed in two weeks, meaning 50 trees per day were felled.

Balancing costs

There was the potential to recover some timber from the operations (estimated to be approximately 50m³), however Forestry England decided that the presence of timber stacks on site, and facilitating the movement of timber at this location, posed logistical challenges which would have slowed the operation down considerably. The lost value of the timber was outweighed by the additional cost of a prolonged road closure making it more

cost-effective for Forestry England to immediately chip the material and sell the lower value product instead.

Forestry England chose to manage the declining ash in this way due to the speed and volume of the traffic along these busy B roads, and the volume of ash trees present which posed a higher risk. The proportion of ash was such that it wasn't possible to manage a tree-by-tree decline whilst ensuring roadside and operator safety over time. This would also have meant numerous shorter traffic management interventions, increasing frustration and inconvenience to road users on this critical road link.

By approaching the management of diseased ash as a forestry operation, Forestry England found this saved a considerable amount of time which would have otherwise been spent managing individual tree safety issues along the roadsides. After visiting the woodland at Castle Neroche following the storm events of spring 2022, Forestry England were able to see the efficacy of the felling works, noting how the works had completely reduced the risk of ash trees falling on to the road.

Retained species

The site was left with non-ash species being retained, resulting in an attractive heavy thin leaving an open woodland edge which then proceeds to a denser woodland with oak, hazel, willow, birch and some ash present.

Further information

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Coed Cadnant – picture credit Woodland Trust

3. COED CADNANT, CAERNARFON, NORTH WALES

Community woodland planted as part of the 'Woods On Your Doorstep' project

Key points

- 3.82ha woodland planted under the 'Woods On Your Doorstep' project
- Extensive thinning operation to remove approximately one third of the ash trees along the public footpaths and rides
- The use of horse logging was an opportunity to engage the local community in woodland management

Background

Coed Cadnant is a well-established 3.82ha native woodland, planted by the Woodland Trust in 1999 across five fields of rough grazing. The fields were planted under the 'Woods On Your Doorstep' project, with participation from the local community at the heart of the scheme. Situated on the sloping valley sides of the Afon Cadnant close to a number of Caernarfon's housing estates and the local primary school, Coed Cadnant provides informal recreational access for the local community through a network of footpaths. These link the woodland with the meadows on the valley bottom and a small community orchard planted as a Millennium feature.

The woodland features ash as the principal tree species with oak and birch as secondary species. They are growing on nutrient rich, brown earth alongside a mixture of other native species which will develop to form a dense shrub understory. Typical woodland flowers are beginning to establish from the nearby hedge-banks, which are of conservation interest. Ash is also present in the hedge-banks bounding the new woodland, alongside mature oak, hazel and blackthorn.

The key management objectives at Coed Cadnant focus on developing a diverse, native woodland which provides recreational amenity and landscape benefits for the local community, alongside the biodiversity benefits of woodland creation on the previously improved grassland habitat. Of the 3.82ha woodland, 70% of the species planted were ash, which had been growing exceptionally well over the past 20 years until the woodland became affected by ash dieback.

Management of ash dieback

The woodland management plan for Coed Cadnant indicated that the first of the planned thinning operations wasn't scheduled to take place until 2030. However, the condition of the ash was rapidly declining. Due to heavy public access within the wood, the Woodland Trust made the decision to thin the ash in areas where public safety was identified as being most at risk. In 2020/2021, an extensive thinning operation was carried out in the woodland using local contractors to remove approximately 1/3 of the ash trees along the public footpaths and rides.



Information signage for the public at Coed Cadnant -picture credit Woodland Trust

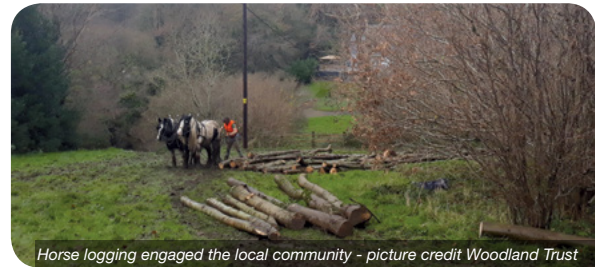


Affected ash can become brittle and unstable - picture credit Forestry Commission

The thinning operations focussed on areas where the oak was growing well, opening up the space around these trees to promote growth and provide further opportunities for the hazel coppice to flourish alongside natural regeneration of species such as aspen. The Woodland Trust referred to operational guidance from the Forestry Commission to develop an agreed process for the management of trees affected by ash dieback across a number of Woodland Trust sites. Where levels of canopy decline were observed to be greater than 50%, the Woodland Trust identified these trees for removal along the public access routes. Ash located beyond the immediate areas of high public access has been retained and the decline will be monitored over time, observing its condition for any potential tolerance to the disease.

Despite largely employing mechanised harvesting when working with trees affected by ash dieback to ensure operator safety, the Woodland Trust opted to harvest the timber at Coed Cadnant through motor-manual chainsaw felling and extraction by horse logging. This method was chosen over mechanised extraction as the site has limited access to permit forwarders, and the Woodland Trust wished to avoid use of heavy machinery which could cause damage to the footpath network. By taking a proactive approach to the felling works, the Woodland Trust were confident that experienced contractors would be able to work safely whilst felling the young trees infected with ash dieback.

Wet weather towards the end of 2020 made the ground conditions unsuitable for extracting the timber, even by horses, and so contractors returned to the site in summer 2021 to retrieve the timber when there was a lower risk of soil disturbance. The Woodland Trust viewed the use of horse logging as an opportunity to engage the local community in woodland management. Interpretation and signage were installed at the site to provide information about ash dieback, the need for the month-long felling operations and the reason for reduced access.



Horse logging engaged the local community - picture credit Woodland Trust

The public were invited to observe the timber extraction using horses in a bid to raise public awareness of woodland management operations. Opening up the stands in close proximity to the public access routes had the added benefit of improving visibility into the woodland, making for a more welcoming environment for visitors. Coed Cadnant has experienced anti-social activity in the past and so it is hoped that by retaining a feeling of openness along the access routes, this will help to deter such activity and enhance walkers' feeling of safety. The Woodland Trust opted to chip the branch material to avoid the build-up of deadwood in areas close to people's homes and businesses, given the history of fire-setting on the site.

Future management

Looking ahead, condition surveys will be undertaken to monitor the progression of ash dieback and the subsequent impact upon tree safety. The frequency of such surveys will depend upon the amount of ash present in each location, and the level of public access. In areas which are identified as high-risk zones, a survey will be conducted annually. Areas which experience less frequent access and are located further from the footpath network will be buffered by the establishment of blackthorn and bramble to deter access into the ash stands. The long-term objectives of the site look towards establishing a woodland with a diverse range of native species across a mixture of age classes. Natural regeneration and coppicing will replenish the woodland, whilst open areas such as grassy glades will provide an important habitat for species such as butterflies.

Further information

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Ash felling on the MOD Salisbury Plain Training Area - picture credit Landmarc

4. MINISTRY OF DEFENCE (MOD) SALISBURY PLAIN TRAINING AREA (SPTA), WILTSHIRE

Planning ahead for both felling and restocking

Key points

- Public engagement has played a major role in managing ash dieback on public boundaries
- Vigorous regeneration following ash removal, particularly of hazel coppice, has reduced need for some restock
- Additional felling licences have been required for works outside the agreed management plan
- Planning ahead has been key for both felling and pre-ordering restock trees

Background

The Salisbury Plain Training Area (SPTA) encompasses 38,678ha, 99% within Wiltshire and 1% (approximately 420ha) within Hampshire. It is owned and managed by the MOD with Landmarc Support Services managing the forestry resource on behalf of the Defence Infrastructure Organisation (DIO).

Alongside its military training purpose, SPTA is run as a mixed agricultural estate with arable and livestock tenant farmers making up over 31,000ha of the overall management structure. 20,000ha of the SPTA is designated a Site of Special Scientific Interest (SSSI), Special Area of (SAC) Conservation and Special Protection Area (SPA).

The woodland area of SPTA includes small copses and larger areas of woodland, some of which interconnects. These are comprised of 60% broadleaf and 40% conifer. The broadleaf element is 60% ash and beech with other species, predominantly oak, sycamore, hazel and cherry making up the remaining 40%. The conifer element

is 55% Scots pine and 15% Corsican pine, whilst the remaining 30% is made up of Norway spruce, Douglas fir, western red cedar, western hemlock and grand fir.

Soils are mostly calcareous soils overlying chalk with an element of greensand in the north west of the SPTA and clay in the south east.

Management objective

Ongoing woodland management is planned in advance to fit around military training requirements. Safety for those undertaking training, for other users of the estate and along the public highways is a primary objective.

Management of the woodland within the MOD estate is through Long Term Forestry Management Plans (LTFMP), endorsed by the DIO and approved by the Forestry Commission, NRW (Natural Resources Wales), Forestry and Land Scotland and Natural England. It follows sustainable forestry principles and any income generated is reinvested back into the estate to for restocking and woodland maintenance.

As the majority of the estate is designated as a SSSI, forestry works must adhere to all ecological principles and legislation. Before ash works commence, detailed bat and ecological surveys are taken. Restocking is focussed on species diversity which aims to mitigate climate change impacts and future proof the woodlands.

Impact of ash dieback

Ash dieback is now prevalent across the whole estate. Since ash works began at SPTA in 2019 over 40,000 trees have been felled (35,000 tonnes of timber realised). This is thought to represent approximately half of the ash that may need to be removed and plans are already well advanced for felling and restocking in 2022/23.



Ash dieback in a mature tree add - picture credit Landmarc

Annual surveys monitor the spread of the disease and classify risk status, which informs the felling programme. However, where risk is minimal (to training activities and public access) the infected ash will be retained.

This planning has been key to ensuring contractors are available when felling approval is obtained and to give plenty of time to procure trees for restocking. Where possible, ash dieback felling has been carried out alongside planned harvesting in other woodland compartments with timber going into the supply chain (logs, firewood, biomass etc).

Works which have fallen outside the LTFMP felling approvals have required additional felling licences. These include trees in hedgerows forming boundaries to public highways or around training features and tenant farms. Along the A345 alone more than 800 diseased ash trees had to be taken down for safety reasons in 2021. These were also found to be infected with honey fungus (*Armillaria*) which added to their instability.

Public engagement

Planned woodland management across the estate often takes place in areas not open to the public. Ash dieback however has impacted on woods and trees outside the closed military training area and that has meant communicating with wider audiences.

Public meetings, notices and media communications have played a key role, involving tenant farmers, parish, town and county councils in discussions on the works especially around the requirement for temporary road closures. Landmarc feels works carried out by themselves and other landowners, as well as impacts of recent storms, have increased public awareness and acceptance of the need to fell ash in certain situations.

Species choice

Working with DIO foresters and ecologists, Landmarc has used a wide range of reference documents to support their decisions around restock species which may help the woodlands adapt to climate change. These included GOV.UK guidance on 'Managing

ash dieback in England' and the Forest Research Ecological Site Classification (ESC) decision making tool for species likely to be suited to the site in 30-50 years' time.

Originally, the woodlands planted 50-60 years ago were ash/conifer plantations. Today, the woodlands will be restocked as truly mixed woodland including oak, beech, hazel coppice, sycamore, hornbeam, wild service tree and small leaved lime. These species were agreed with both Natural England and the Forestry Commission as part of LTFMP and individual felling licence discussions. They are species that were either already present, or are other native species which are considered to be compatible with key site factors for this location. This approach is compatible with SSSI designations and adds more diversity and resilience for the future. The inclusion of some sycamore is being considered as a tree which supports biodiversity and can support a range of ash-associated species.

Vigorous natural regeneration, particularly of hazel, following ash removal has meant restock requirements have reduced, however, success of the regeneration will be dependent on site conditions and the level of deer predation.

In the first year of planting following felling, 65,000 trees were planted and Landmarc is drawing up tenders for 2022/2023 (which will be in the region of 40,000 stems), with more to follow in 2023/24.

In other regions, where conifers have also been harvested they are being replaced with an expanded palette to include spruces, firs, pines, western hemlock, western red cedar and redwoods as well as an increased percentage of mixed broadleaves, to diversify the woods and help them adapt to climate change.

A few ash veteran trees, primarily in hedgerows, appear to be showing some tolerance to ash dieback and are being pruned, monolithed or retained where safe to do so in the hope they will survive.

Grants and support

As works are on MOD land, the works do not qualify for existing grants.

Further information

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5. PRIORS PARK, BLACKDOWN HILLS, SOMERSET

Deploying medium and non-intervention methods

Key points

- Priors Park is an ash dominated Site of Special Scientific Interest (SSSI). The Ancient Semi-Natural Woodland, which also contains some Planted Ancient Woodland Sites (PAWS), extends along steep scarp slopes. Forestry England employed a medium intervention management approach, thinning the ash and re-planting in the worst affected areas to allow the woodland to rejuvenate
- Ash on the opposite side of the valley was identified as an area of non-intervention and will serve as a control against which to assess the efficacy of the operation

Background

Priors Park lies within the Blackdown Hills Area of Outstanding Natural Beauty (AONB). Like many of the woodlands within the forest plan area, Priors Park is a distinctive landscape feature with dense, ash-dominated woodland extending along steep scarp slopes. It comprises both ancient and secondary woodland and Planted Ancient Woodland Sites (PAWS) planted with conifer species during the 20th century to address the national shortage in timber supply.

Priors Park is rich in ecology, a designated SSSI W8 Priority Lowland Mixed Deciduous (ash/birch) woodland which provides important habitat for a number of flora and fauna including impressive displays of Herb-Paris (*Paris quadrifolia*). The management objectives for the site include action to protect and enhance areas of Ancient Semi-Natural Woodland and restore areas of PAWS woodland in line with the Forestry Commission guidance, 'Keepers of Time'.

Management of ash dieback

Ash within the woodland began expressing symptoms of ash dieback on both sides of the valley at the time when the Forest Management Plan indicated harvesting works were due to be carried out.

- **Medium intervention area**

After consulting operational guidance from the Forestry Commission and Natural England, it was decided that an operation would be carried out to thin 50% of the woodland on one side of the valley, targeting the removal of ash trees displaying more advanced symptoms of crown dieback. The aim of the operation was to improve the condition and composition of this section of the woodland and to allow underplanting of a mixture of native species to increase species diversity.

The intention was to employ a medium intervention management approach. Forestry England aimed to re-plant the areas where the removal of diseased ash resulted in glades being formed large enough to allow adequate light to support the new trees. This would allow the woodland to rejuvenate and to retain the condition of the woodland overall, as the disease progressed through the ash.

Priors Park supports public access through a network of footpaths. Ensuring public safety by targeted removal of ash in the high usage areas helps to maintain that access into the future.

- **Non intervention area**

The ash on the opposite side of the valley was identified as an area of non-intervention due to there being limited access into this part of the woodland, but also because this approach would serve as a control against which to assess the efficacy of the intervention.



Ash canopy thins as a result of dieback - picture credit Forestry Commission

- **Non intervention area (continued)**

Where mature trees of other species were present (e.g lime, oak and wych elm), the thinning operations focused on opening up the canopy around these trees, improving conditions for growth, encouraging seeding and subsequent natural regeneration.

Hazel and hawthorn are important components of the woodland understory at Priors Park, and Forestry England ensured these areas remained intact during the operations by directional felling of the ash. Forestry England were aware that once the mature ash was removed, light levels on the forest floor would increase, and so keeping the existing understory intact was key to managing presence of brambles and other ruderal species which could limit natural tree regeneration.

The woodland at Priors Park is managed under a low impact silvicultural system, employing continuous cover forestry (CCF) techniques to achieve a diverse forest structure. This lent itself to the underplanting techniques as defined in the Forest Research guidance, which helped Forestry England to understand how best to introduce new native species into a CCF system. Guidance from the Forestry Commission and Natural England on 'Managing woodland SSSIs with ash dieback', helped Forestry England to plan the works to protect and enhance the features of Ancient Semi-natural Woodland. The aim of the intervention was to retain an attractive woodland which is in keeping with the local landscape character of the AONB, whilst providing an ecologically diverse habitat, resilient to climate change, pests, and diseases.

Management of ash within the SSSI

Consultation with Natural England and Forestry England staff was undertaken late 2019, with a view to start works in late summer 2020. In preparation for the works beginning, the access track within the woodland was improved to allow harvesting machinery to access the stand and to facilitate extraction of the timber. During harvesting, Forestry England employed a tracked excavator-

based machine which exerted a much lower ground pressure. This helped to minimise soil disturbance.

Works had begun thinning ash along the sides of the access track when the weather turned, and heavy rain made it difficult to extract the timber on the steep scarp slopes without risking damage to the soil. The decision was made to stop works until the weather improved. The weather window and other timing constraints did not coincide again until the summer of 2021, when it was possible to work the site to completion. Although this presented operational and logistical challenges, Forestry England's priority was to ensure minimal ground disturbance during the harvesting operations to protect the ground flora, one of the main features of the SSSI.

Species choice

In the winter of 2021, Forestry England began restocking the small coupes which had been opened up by thinning the ash (totalling 2.91ha). Species included in the underplanting operations were native species including lime, locally frequent wild service, oak, hazel, and hawthorn. The site is in a sheltered location with moist soils which should be able to support a variety of species when looking forward to a future climate.

In the areas of Priors Park where there were management interventions, Forestry England intend to compare the general woodland condition, especially that of the ash and the ground flora, with the opposite side of the valley to evaluate the success of the operation. Forestry England will use this information to inform their future management of ash across the Blackdown Hills Forest area. The hope is, that by diversifying the range of species in the CCF system, this builds in inherent resilience against future disturbances and helps to enhance the ecological condition of the woodland where it was declining due to ash dieback.

Further information

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Peppers Wood replanted - picture credit Phillip Saunders

6. RAMSCOAT WOOD, BUCKINGHAMSHIRE

Post WWII planting in the Chilterns transitioning to Continuous Cover Forestry

Key points

- The need to fell ash extensively in a mixed compartment transitioning to Continuous Cover Forestry (CCF) has overtaken a plan to fell in small groups
- Small leaved lime has been included in the restock mix for the first time to increase diversity and deter grey squirrel
- Productive hardwood timber remains the main objective alongside carbon sequestration and encouraging wildlife

Background

Ramscoat Wood is just over 23ha and was largely planted post World War II. It lies within the Chiltern Area of Outstanding Natural Beauty (AONB) and has been owned by Philip Sanders for around 25 years. He has been transitioning to a Continuous Cover Forestry (CCF) regime as mature trees have been harvested.

The woodland is on a sloping hillside of clay and flint soil above chalk. Within Ramscoat Wood, the 6ha Peppers Wood compartment is situated on a north-east facing slope and contains a 1.2ha sub-compartment featuring the most diverse mix of species across the site – ash, wild cherry, hazel, whitebeam and wych elm. Elsewhere in Ramscoat Wood are compartments of hazel coppice, mature beech and an avenue of wild service trees.

There is a public footpath in the valley bottom, just outside the wood, and a public byway close to the area of restock.

Management objectives

The primary objective is to plant productive hardwood timber while encouraging a mix of native

broadleaved trees that will fit into the landscape, whilst being resilient to pests, diseases and climate change.

CCF has been adopted to increase structural and species diversity.

In addition, Philip Sanders wishes to have a woodland that stores carbon and benefits wildlife.

The presence of grey squirrel, edible dormouse (*Glis glis*), roe and muntjac deer and the potential for vigorous bramble growth have influenced restock and establishment plans.

The impact of ash dieback

In the past five years ash dieback has progressed rapidly, infecting not just young trees but mature trees as well.

In February 2021 all the ash in Peppers Wood, around 400 tonnes, was felled. Protecting the public who use a public byway close to the Peppers Wood restock site was a key consideration.

The timber found a ready market locally at one of the few remaining handmade brick manufacturers in the UK who fires local clay using a wood burning kiln.

If ash dieback had not been present, Peppers Wood would have been selectively felled to develop glades where natural regeneration of all existing species, including ash, would have been encouraged. Philip Sanders expects to revert to CCF transition as the woodland continues to develop following restocking.

Restock and species choice

An approved Woodland Management Plan has been in place since May 2014. Felling and restocking adhere to UK Forestry Standard. To supplement natural regeneration, Philip Sanders and manager John Morris consulted the Forest



Restock species have been chosen for their ability to withstand predicted impacts of climate change - picture credit Philip Saunders

Restock and species choice (continued)

Research Ecological Site Classification (ESC) tool for guidance on which species may be suited to the area's future climate over the next 30-50 years. They also drew on knowledge of local species which grow well.

The restock plan has proved a good opportunity to introduce new species to the area. One such species is small leaved lime, which was chosen because it is likely to be resistant to both changing climatic conditions and grey squirrels.

Restocking Peppers Wood was completed in February 2022. 40-60cm cell grown trees were purchased and planted as mixed species groups in openings produced by felling ash at a spacing of 1100/ha. They are protected by 1.2m tree shelters. More than 660 trees have been planted, including:

- 100 wild cherry
- 160 small leaved lime

Both the above species are considered less likely to be damaged by grey squirrels than many tree species. Small leaved lime will also provide firewood.

Plus

- 160 English oak
- 80 hornbeam (local species)
- 40 Italian alder
- 40 wild service trees
- 40 whitebeam
- 40 field maple

Trees were planted to supplement natural regeneration from the existing mix of wild cherry, whitebeam, hazel and wych elm, as agreed in the Forestry Commission approved management plan. The aim is to create a diverse and resilient broadleaved woodland that fits in to the landscape, is rich in wildlife and grows some useful timber.

The trees were sourced from a reliable UK nursery with known provenance. They will be spot weeded for the first two years to aid establishment.



Restocking completed in February 2022 - picture credit Philip Saunders

Challenges

Delays in receiving tree stock which had been ordered in advance meant tree planting was delayed from the end of 2021 to early 2022, however the restocking was achieved well within the planting season.

Grants and support

Philip Sanders successfully applied for a new tree planting grant* for Royal Forestry Society (RFS) and Royal Scottish Forestry Society (RSFS) members delivered in partnership with GreenTheUK. The grant requires applicants to demonstrate planting which aims to increase resilience to pests, diseases, or climate change.

Restocking elsewhere in the wood has included a line of 82 alternate Norway maple and small leaved lime as a wind break, for carbon sequestration and for timber production. The aim is to thin the Norway maple out to leave a line of lime trees at final spacing.

**<https://rfs.org.uk/trainhugger/>*

Further information

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Strong's Spinney internal park view post planting. Healthy lime, beech and understorey of yew and holly were retained. - picture credit Peter Glassey

7. STRONG'S SPINNEY, BURGHLEY PARK, CAMBRIDGESHIRE

Mature ash in an historic landscape

Key points

- The mature ash at Strong's Spinney became affected by ash dieback in 2019. It was unthinned and in poor condition, located next to the B1081 road into Stamford.
- Health and Safety, and preservation of the aesthetics of the Capability Brown historic landscape are primary objectives of Burghley's woodland management operations.
- Species choice for re-stocking was guided by Forest Research's Ecological Site Classification system.

Background

Burghley Park in Cambridgeshire comprises of gardens and parkland spanning some 520ha. The park features the continental 'axial formalist' design of George London and Moses Cooke between 1690 and 1702, and then the more naturalistic landscape design of Lancelot 'Capability' Brown between 1756 and 1780. The landscaping of Burghley Park was Brown's longest commission. Landscaped vistas throughout the park frame the Elizabethan architecture of the main house.

The treed landscape and the surrounding park woodlands are contrived to enhance both the casual and formal visit to the park. The Bottle Lodges were built to celebrate the Cecils' elevation from Earls of Exeter to Marquesses of Exeter in 1801. The woodland surrounding the Bottle Lodges are of particular importance in this section of the park, which was added around the time of Brown's commission in the late 1800's.

Chabonel Wood and Strong's Spinney were originally planted during the late 18th / early 19th century to compartmentalise Brown's new

Low Park extension. Preserving the aesthetics of the Capability Brown historic landscape is a primary objective of Burghley's woodland management, as Chabonel Wood provides the southerly backdrop which frames the internal park view to the Bottle Lodges. Directly opposite, Strong's Spinney provides the northerly frame of this internal landscape view as you approach the Bottle Lodges from the park. Strong's Spinney also provides an important visual, easterly frame to the Georgian town of Stamford from the Old North Road, the B1081. There is no public access into Chabonel Wood or Strong's Spinney, but health and safety across the estate is a priority.

Management of ash dieback

Around 40% of the two woodland compartments were comprised of ash with some outstanding examples of mature 19th century trees, especially in the Chabonel wood. The remainder comprised of sycamore, horse chestnut and hornbeam, with approximately 20% of the area remaining as open space following windblow. Ash dieback was first observed on ash regeneration elsewhere on the estate in 2017/18. This resulted in a harvesting operation in Chabonel Wood in 2019 which removed the mature ash in the compartment whilst it was still healthy, in order to maximise its value.

Restocking of Chabonel Wood took place during the winter of 2020, guided by Forest Research's Ecological Site Classification decision support system. A diverse mixture of species including small leaved lime, hornbeam, pedunculate oak, black walnut, Turkish hazel, wild service and Norway maple was agreed to help build resilience against future pests, diseases and climate change.

Shortly after the re-stocking operations concluded in the Chabonel wood, the decision was made to remove all of the ash at Strong's Spinney in 2021, together with all of the diseased horse chestnut and poor, pole-stage sycamore (many of which were affected by the fungal pathogen



View of the B1081 post felling, after replanting - picture credit Peter Glassey

Cryptostroma corticale). The ash constituent was largely located next to the B1081 road into Stamford and the trees were unthinned and ‘very drawn’ but were in a younger age cohort than the ash at the Chabonell wood. Burghley decided that the suite of species present were not going to provide the estate with a long-term, healthy woodland.

The mature ash trees at Strong’s Spinney had started to become affected by ash dieback in 2019. The progression of the disease during the following two years was very noticeable and this deterioration of the trees in poor form, in addition to the threat of infection by secondary pathogens, led to the estate’s decision to fell. The felling was considered important not just to ensure the safety of the public and those working on the estate, but also for aesthetic reasons, to maintain the condition of the woodland which frames the perimeter of the estate and the historic Bottle Lodges, as well as the approach into Stamford.

The felling operations which were already outlined in the woodland management plan had been accelerated by the presence of ash dieback. Due to the variable drainage of the site, felling operations were timed for late summer to early autumn of 2021 when the soils were at their driest to minimise any ground disturbance. It was possible to dismantle the trees at roadside without closing the B1081, and the ash timber was sold mainly for firewood. The harvesting was carried out by motor-manual chainsaw felling due to the small felling area (1ha) and the drainage issues on site. Managers at Burghley Park were conscious of minimising compaction and reducing the impact on the soil structure.

Species choice

1ha of 50-60 year old trees were felled (40-50% ash) and the area was replanted with approximately 2000 trees using information from Forest Research’s Ecological Site Classification decision support system. The aim of the restocking design was to choose suitable species well



Strong’s Spinney pre felling -picture credit Peter Glassey

matched to the site conditions to build resilience against future pests, diseases, and climate change, whilst enhancing the vista through the woodland into the estate.

Strong’s Spinney contains areas of both wetter and drier ground, and so a suite of species was chosen to reflect the site conditions and to address the issues of pests, disease, and climate change. The species include sessile and pedunculate oak, hornbeam, wild cherry, small leaved lime, Norway maple, aspen, willow (to provide a nectar source), and wild service, with hazel, yew, holly and native woody shrubs planted on the woodland edges.

The objective of all the planting was to enhance the aesthetics of the landscape, and so small group plantings were designed to provide pockets of colour, texture, and interest on the approach to Burghley Park.

The trees on a narrow strip of woodland were retained. This area is characterised by healthy mature plantings of beech, common lime, yew and holly with an understorey of box, aucuba and cherry laurel. This area provides an attractive contrast to the felling and an important refuge for wildlife, as does the retention of monoliths and standing deadwood.

As Burghley Park is a high-profile location, both locally and regionally, consultations were carried out with Stamford town council and through radio interviews with BBC Cambridgeshire. This helped inform local residents and visitors to the park of the requirement for the works and helped the process to go smoothly.

Further information

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Treragin wood - picture credit Stephen Lees

8. TRERAGIN WOOD, CORNWALL

30 year old Farm Woodland Scheme restocking over two planting seasons

Key points

- 30 year old Farm Woodland Scheme converting to Continuous Cover Forestry (CCF)
- Move from selective thinning against ash to selectively felling ash
- Natural regeneration encouraged with supplementary planting over two planting seasons
- Thinning of southern beech (*procera*, with some *obliqua*) and other species were delayed to focus on ash

Background

Treragin Wood is on sheltered slopes and flat land just outside the Tamar Valley Area of Outstanding Natural Beauty (AONB). It is 0.25 miles from the nearest woodland but is connected to surrounding countryside via a woodland stream and hedgerows.

It was planted by owner Stephen Lees and his wife Kathryn in 1991/92 as a structurally diverse wildlife friendly woodland under the Farm Woodland Scheme (FWS). The original mix was 30% ash, 30% southern beech (*procera* with some *obliqua*), 15% wild cherry, 15% English oak and 10% mixed shrubs planted in small groups, often of nine trees, but occasionally in larger groups.

The FWS planting covers 4.6ha, with a further 0.4ha planted under a separate woodland grant. Part of the woodland had previously been a commercial daffodil enterprise and daffodils still flower every year under the tree canopy.

Management objectives

Stephen believes timber and biodiversity can and should co-exist. Income from timber, mainly firewood or biomass, pays for the costs of management.

A woodland management plan was approved in 2017, which adheres to the UK Forestry Standard. The Felling Licence is for 437 cubic metres over 10 years as thinnings. Stephen Lees is likely to apply for an updated felling licence as a regenerative fell and replant is necessary.

Thinning started ten years ago. More recently there has been a move towards Continuous Cover Forestry (CCF), inspired by the Bradford Hutt system used nearby. Coppice regrowth and natural regeneration seek to enhance and protect woodland ground flora and all other ecological attributes on site.

The impact of ash dieback

Ash dieback was first observed in natural regeneration in 2017 and spread to the original planting in 2019. In 2020 the canopies thinned dramatically and a decision was taken to selectively fell ash. Occasional ash trees are healthier and a few are being left, but old pollards in the original hedgerow boundary also show ash dieback.

Nearly 50m³ of ash has been removed in one year – close to the limits stipulated in the felling licence. Stephen expects firewood prices to hold up well in the short term. He is considering using a mobile sawmilling service to plank a small amount of timber.

Felling ash has diverted resources from elsewhere in the wood. Thinning of southern beech and other species has been temporarily delayed.



Part of Treragin Wood used to be a commercial daffodil enterprise -picture credit Stephen Lees

Restocking

The loss of ash is felt not just as a reliable commercial crop but for the biodiversity it supports. Restocking includes a diverse range of species to spread the risk. Stephen has a preference for native broadleaved species but believes inclusion of more southerly provenances will enhance resilience.

There is some natural regeneration, notably of wild cherry, but it is insufficient for a well stocked wood.

Supplementary planting of 1500 trees to replace the ash is planned over two seasons. Trees are being planted in small groups of a single species, focussed in areas where loss of ash is greatest. Around one third of the new trees were planted in the 2021/22 season at approximately 2.5m spacing. The remainder will be planted in 2022/23.

Stephen has consulted Forest Research Ecological Site Classification (ESC) tool for species that are suggested to be suited to the area's predicted future climate over the next 30-50 years and guidance available on GOV.UK on 'Managing ash dieback in England'. He has also considered species known to be growing well locally.

Species choice

Both Douglas fir and western red cedar grow well in a shady Bradford Hutt system. They replace the timber element loss by ash. Both can be marketed locally in small volumes, or milled on site. Scots pine is slower growing, but was selected as the owner wishes to include native species.

Spindle and hazel were chosen because they are under-represented in the wood. Sweet chestnut and beech are family favourites. Others were chosen to spread the risk and with an eye on future income – mainly firewood or biomass - and to give structural diversity from a mix of thinning and/or coppicing.

2021/22 planting season:

- 50 western red cedar
- 100 English oak
- 50 sweet chestnut
- 50 common alder
- 25 hazel
- 50 Douglas fir
- 100 small leaved lime
- 50 sweet chestnut
- 100 beech
- 50 downy birch
- 25 spindle
- 50 Norway spruce

2022/23 will include some of the above plus

- 150 Scots pine
- 150 small leaved lime
- 150 hornbeam
- 150 sessile oak
- 150 black walnut
- 150 elm (*Ulmus glabra*)

Weeding will be by brushcutting of nettles and brambles. The tree canopy suppresses grasses and other species, although the thinning ash is allowing brambles to increase in vigour.

Pest control

Conifers will be grown in 60cm tree shelters to protect against rabbits. The shelters are recycled from other contracting sites with the split down the stake side allowing some ventilation. Tree shelters will be added to broadleaves if rabbit grazing becomes an issue.

Deer browsing is currently limited, in part due to the regular public use of the wood and presence of dogs. Squirrel control is carried out by shooting and traps.

Grants and support

Stephen successfully applied for a new tree planting grant* for RFS and RSFS members delivered in partnership with GreenTheUK. The grant requires applicants to demonstrate planting which aims to increase resilience to pests, diseases, or climate change. He did not apply for a tree health grant.

<https://rfs.org.uk/trainhugger/>

Further information

Stephen Lees is co-owner of Land and Heritage Ltd, an ecological, landscape and historical consultancy

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FURTHER ONLINE RESOURCES

ENGLAND

Managing ash dieback in England www.gov.uk/guidance/managing-ash-dieback-in-england

Managing ash in woodlands in light of ash dieback www.gov.uk/government/publications/managing-ash-in-woodlands-in-light-of-ash-dieback-operations-note-46

Restocking woodland following loss of ash due to ash dieback www.gov.uk/government/publications/restocking-woodland-following-loss-of-ash-due-to-ash-dieback-operations-note-46b

Managing woodland SSSI's with ash dieback https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/811166/NE_FC_Ash_dieback_SSSI_management_advice_V2_April_19.pdf

Managing ash trees affected by ash dieback <https://www.gov.uk/government/publications/managing-ash-trees-affected-by-ash-dieback-operations-note-46a>

SCOTLAND

Scottish Forestry ash dieback information page <https://forestry.gov.scot/sustainable-forestry/tree-health/tree-pests-and-diseases/chalara-ash-dieback>

NORTHERN IRELAND

Department of Agriculture, Environment and Rural Affairs ash dieback webpage <https://www.daera-ni.gov.uk/articles/ash-dieback>

GENERAL

Ash dieback Forest Research page www.forestresearch.gov.uk/tools-and-resources/fthr/pest-and-disease-resources/ash-dieback-hymenoscypus-fraxineus/

Ash dieback tree owners guide – The Tree Council <https://treecouncil.org.uk/wp-content/uploads/2020/06/Tree-Council-Ash-dieback-tree-owners-guide-FINAL.pdf>

DEFRA ash research strategy <https://www.gov.uk/government/publications/ash-tree-research-strategy-2019>

The Living Ash Project <https://livingashproject.org.uk/>

MANAGEMENT GUIDANCE

Applying for a felling licence <https://www.gov.uk/guidance/apply-online-for-a-felling-licence>

The UK Forestry Standard highlighting the government's approach to sustainable forest management <https://www.gov.uk/government/publications/the-uk-forestry-standard>

Create a woodland management plan <https://www.gov.uk/guidance/create-a-woodland-management-plan>

MyForest - forest planning website <https://myforest.sylva.org.uk/>

HEALTH & SAFETY

The Forest Industry Safety Accord FISA – felling dead ash <https://ukfisa.com/Safety/Safety-Bulletins/felling-dead-ash>

National Tree Safety Group website <https://ntsgroup.org.uk/guidance-publications/>

RESTOCKING

Ecological Site Classification Decision Support tool <https://www.forestresearch.gov.uk/tools-and-resources/fthr/ecological-site-classification/>

Tree Species Database – Forest Research <https://www.forestresearch.gov.uk/tools-and-resources/tree-species-database/>

AshEcol - allows managers to identify ash associated species and which alternative trees species they will also use <https://www.hutton.ac.uk/research/departments/ecological%20sciences/our%20science/biodiversity-and-ecosystems/ash-dieback>

Ecological impacts of ash dieback and mitigation methods <https://www.forestresearch.gov.uk/research/ash-dieback-impact/>

Climate Matching Tool to identify seed sources suited to predicted climate change <https://www.forestresearch.gov.uk/tools-and-resources/fthr/climate-matching-tool/>

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Forest Research's information page on Forest Development Types is a long-term vision of how a forest stand should develop <https://www.forestresearch.gov.uk/tools-and-resources/fthr/forest-development-types/>

Genetic considerations for provenance choice of native trees under climate change in England Policy Advice Note - https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/809733/Policy_Advice_Note_Final180619.pdf

Woodland tree health grants for England <https://www.gov.uk/guidance/woodland-tree-health-grant-countryside-stewardship>

RESILIENCE PLANNING

Tree Health Resilience Strategy <https://www.gov.uk/government/publications/tree-health-resilience-strategy-2018>

Resilience Implementation Framework Forest Research <https://www.forestresearch.gov.uk/tools-and-resources/fthr/resilience-implementation-framework/>

Managing England's woodlands in a climate emergency <https://www.gov.uk/government/publications/managing-englands-woodlands-in-a-climate-emergency>

Managing for Resilience: 12 Case Studies (incorporating the All-England Woodland Resilience Award winners) <https://rfs.org.uk/wp-content/uploads/2022/03/Managing-for-Resilience-2022.pdf>

Resources for Managing Woodland for Resilience <https://rfs.org.uk/wp-content/uploads/2022/03/Resources-for-Managing-for-Resilience-2022.pdf>

BIOSECURITY

Plant Healthy Certification Scheme: A voluntary biosecurity certification scheme for nurseries and horticultural, arboricultural and forestry businesses www.planthealthy.org.uk/certification

DEFRA: The UK Plant Health Information Portal (Web-based portal) contains resources on biosecurity, risk assessment, contingency planning, and reporting and managing threats to plant health. <https://planthealthportal.defra.gov.uk/>

TreeAlert (Forest Research webpage): A web-based form to report signs of tree pests and diseases to Forest Research. <https://www.forestresearch.gov.uk/tools-and-resources/fthr/tree-alert/>

Forestry Commission: Information on measures you can take to prevent tree pests and diseases from establishing and spreading, including putting together a biosecurity kit. <https://www.gov.uk/guidance/prevent-the-introduction-and-spread-of-tree-pests-and-diseases>

QJF ARTICLES

Additional information can be found in a range of articles in the Royal Forestry Society's Quarterly Journal of Forestry. RFS members can log in to access the article online. Non members should call 01295 678588 or email RFSHQ@rfs.org.uk

April 2021 Vol 115 No.2 **Ashes from Ashes (Natural selection for resistance to ash dieback)** by James K.M. Brown and Elizabeth S. Orton

October 2019 Vol 113 No.4 **Exploring Strategies for Responding to Ash Dieback in the UK** by Paul Woodcock, Richard Buggs, Mariella Marzona and Christopher Quine

April 2019 Vol 113 No.2 **Ash Dieback and Associated Vegetation Changes in the Coppice of Bradfield Woods** by Rob Fuller, Dorothy Casey, Markus Melin and Ross Hill

October 2018 Vol 112 No.4 **Rapid Progression of Ash Dieback Disease in an Ancient Wood in the UK** by Anne Edwards & J. Allen Downie

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Jan 2018, Vol 112, No.1 **Risk Assessing for the Likely Loss of Ash** by Joe Alsop, Emma Goldberg
Forest Genetics: A Key to the Future Health of Trees and Forests by Simon Lloyd

July 2017 Vol 111 No.3: **Evaluating Options for Robust Forest Adaption to Climate Change** by Michal Petr & Duncan Ray

April 2017 Vol 111 No.2 **Ash Trees for the Future?** by Jo Clark





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