Forestry England

Westonbirt, The National Arboretum

Forest (Arboretum) Design Plan 2021-2030

Westonbirt Forest Design Plan 2021-2030

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1. Introduction

Forest Plans are intended to set a long-term direction for sustainable land management activities, balancing social, environmental and economic objectives. This plan covers the management and intended use of all land within the National Arboretum, an internationally important collection of trees and landscape, now managed by Forestry England (part of the Forestry Commission and the wider Defra group).

2. Background

"...the wonderful collection of trees and shrubs for which Weston Birt is so famous in the botanical world, were formed by Mr Holford . . . and will be a lasting memorial, not only of his wide knowledge, but also of his almost unerring taste as a landscape gardener."

(from R S Holford's obituary in: Wilts and Gloucestershire Standard 27th February 1892)

In 2003, Nicholas Pearson Associates Ltd, environmental planners and landscape architects, produced a comprehensive historic landscape survey of, and restoration plan for, the original Westonbirt Estate. **The Westonbirt Arboretum and Gardens Historic Landscape Survey and Restoration Plan** drew on a wide range of primary and secondary sources. In 2004, a valuable, additional source came to light, namely a notebook by Robert Stayner Holford (1808-1892), instigator of the arboretum. Besides providing confirmation of key dates, the notebook detailed the original routes into, and around, the arboretum. This information added substantially to the understanding and appreciation of the development of the arboretum.

In 2005, the Forestry Commission took the historic survey and restoration plan a logical step further and considered it as the basis of its own, more detailed, landscape plan. The 2003 restoration plan had already made reference to the 'historic design character' of the estate. The arboretum at Westonbirt is indeed more than a 'mere' collection of trees and shrubs - its actual *layout*, or design, has its own merits. Westonbirt is proof of R S Holford's 'almost unerring taste as a landscape gardener' (this is taste in the sense of style). The Forestry Commission appreciated that R S Holford employed a particular style in his planting, and that the appeal of the present arboretum lays in recognizing and continuing that planting style. The **Statement of Significance** was written in 2003 and updated in 2011, and adds further insight into the wider Westonbirt estate and Holford legacy.

The **Westonbirt Arboretum Landscape Plan** starts off by explaining the original planting style adhered to by R S Holford - a style that had strong links with the picturesque style as advocated by the landscape gardener William Sawrey Gilpin (1761/2-1843) and his mentor, the author and Herefordshire landowner, Sir Uvedale Price (1747-1829).

The landscape plan then identifies seven distinct landscape types (or 'landscape characters') that occur in the original arboretum. Holford's 'picturesque planting style' applies in particular to five of the seven landscape types, with the remaining two types being either formal or functional plantings. Ways are suggested, according to landscape

type, of maintaining and developing these various areas, in keeping with R S Holford's original intention.

The seven Westonbirt landscape types are defined as follows:

1. Original plantation within which are created open glades with informal ornamental planting
2. Informal ornamental planting along the rides and walks, that cut through the original Silk Wood, Down Covert and Down Plantation (creating so-called 'ribbon planting')
3. Specific clump and specimen planting *within* original arboretum boundaries
4. Specific clump and specimen planting on open down
5. Woodland cover
6. Shelterbelt
7. Formal avenue planting

According to W S Gilpin, the celebrated artist and landscape gardener, the guiding principles of landscape design can be grouped under: *variety, intricacy* and *connection*. These remain the key elements that lay at the heart of the picturesque style of gardening at Westonbirt, both for today and in the future.

Crucially, the arboretum was passed to the government in lieu of death duties in 1956, at which point the Forestry Commission were charged with managing Westonbirt on behalf of the nation. The Forestry Commission is the government department responsible for protecting, expanding and promoting the sustainable management of woodlands, while increasing their value to society and the environment. Since this time, the arboretum has been developed as an important recreational and educational centre.

Of paramount importance is always how the arboretum and its landscape is used and enjoyed by people, both for today and in the future. Management objectives are naturally varied, but at heart should always be the need to provide essential social benefits, such as wellbeing, health, volunteering, engagement, learning and a rewarding visitor experience.

3. Purpose of the Plan

This plan will confirm the methods of land management required to support the stated objectives within ***'Our Place in a Changing World'* - a 10-year vision for Westonbirt, The National Arboretum** (2019-2029). The **Westonbirt Strategic Operational Plan** will contain more detail in terms of how each these objectives and associated key commitments will be met, and this plan sets out the required land management to achieve these wide-reaching aims and objectives.

Put quite simply, the overall aim of the arboretum is to achieve stated Our Mission, which is **"to connect people with trees, to improve the quality of life"**.

Critically, this plan must enable us to both manage the arboretum appropriately, and engage people fully in our management processes and with the collection more broadly. For specific engagement plans and projects, please refer to the **Engagement Strategy**, **Community Strategy**, **Diversity and Inclusion Strategy**, **Volunteer Strategy**, **Interpretation and Arts Strategy**, and **Education Strategy**.

4. Site Description

The overall land area of Westonbirt, The National Arboretum was 240ha, but with the acquisition of neighbouring land in 2019, this has now increased to a total of 253ha.

Description	Description	Management Implications	Proposals
Location	Gloucestershire, about 3 miles south-west of Tetbury. Main focuses of population within 30 miles – Bristol, Bath, Swindon, Cheltenham and Gloucester (refer Map 1).	Popular attraction within a 1-hour drive of large urban population. Large seasonal influx of visitors contrasts with rural location.	Plan aims to maintain and develop the 'picturesque' landscape and infrastructure within a Cotswolds setting.
Tenure	Forestry England (Forestry Commission) freehold.	Full control over access except public rights of way (PROWs). Not to be dedicated under Countryside Rights of Way (CROW) legislation since a pay-to-enter facility.	Development of newly acquired land to be decided as part of ongoing overall Master Planning exercise and consultation.
Physical environment	130m altitude, prevailing SW wind from Bristol Channel. Rainfall c. 850mm. Climatic Zone 7. Soils vary from acid sandstone-derived loam of Atrim series to shallow oolitic limestone.	Soil variability increases range of exotic plants able to grow. Moderate exposure means tender exotics require shelter.	Planting to take account of edaphic and other physical variability. Shelter planting to be planned and maintained. Character of historic shelterbelts to be conserved.
Landscape setting	Wholly inside Cotswolds AONB. Close to busy A433. Relatively flat area on Cotswold plateau.	Views of arboretum from surrounding areas tend to be oblique. Prominent view from A433.	Avoid operations that result in sudden or long-term degradation of inward views. Maintain quality of view from A433 (shop window).

5. Arboretum Management (refer map 6)

The site comprises 107ha arboretum, which encompasses areas in both the Old Arboretum and Silk Wood.

The area now designated as arboretum developed from 1830's through to late C19, and extended into the ancient woodland of Silk Wood from 1875, with further expansion from 1960's. The combination of landscape quality and botanical diversity make it one of the finest tree collections in the world, and most of the original layout of planting remains along with many of the original trees. Sensitive management is required to preserve historical features and ensure sustainable long-term landscape quality.

Like any other large botanic garden, ongoing maintenance and development will involve the removal of certain trees, however, the regular addition of between 100 to 250 healthy new specimen plants every year, will ensure that future generations can enjoy the living botanical collection and historic landscape.

Arboretum areas are divided into numbered sections for remedial management purposes (from Section 1 to Section 61), with the aim of a 5-year cycle to pay close attention to all the botanical specimens within approximately 11 sections per annum. Individual plant health care needs will be met and appropriate arboricultural works undertaken within each section, whilst at the same time maintaining the historically significant and picturesque landscape. No large-scale felling is planned, rather just the removal (thinning) of trees in poor health or for aesthetic/landscape reasons.

Westonbirt works collaboratively with both a national and international network of partner organisations and institutions, including many acclaimed arboreta and botanic gardens, as well as adhering to recognised standards such as the Darwin Technical Manual for Botanical Gardens. A range of corporate membership with active participation is held, which includes Botanic Gardens Conservation International (BGCI), International Plant Sentinel Network (IPSN), UK Botanic Garden and Arboreta Collections Consortium (UKBGACC), and the Arboricultural Association (AA). Westonbirt has attained and continues to maintain the very highest accreditation with ArbNet, at Level IV. ArbNet is an interactive, collaborative, international community of arboreta and tree-focused professionals, which facilitates the sharing of knowledge, experience, and other resources to help arboreta meet their institutional goals and works to raise professional standards through the ArbNet Arboretum Accreditation Program. Level IV arboreta are all world-renowned and highly regarded tree-focused institutions.

5.1 Species Composition

Mixed exotic coniferous and deciduous trees and shrubs from across the temperate world, the living collection usually contains a constant of approx. 15,000 botanical specimen plants, many of which are rare and endangered in the wild. The living collection includes over 2,700 taxa (species, sub-species, varieties and cultivars), and over 700 threatened plants with a conservation status. Every specimen plant is individually numbered and mapped, with precise plant records held within our IrisBG botanical database. IrisBG is one of the most comprehensive integrated software solutions available, which has been specifically designed as a complete collection management system for botanical gardens.

Our botanical plant records are also available to be interrogated on-line, by both professionals and the general public alike, via our Arboretum Explorer facility: https://westonbirt.arboretumexplorer.org/.

5.2 Thinning Operations

It is intended that all the numbered sections with areas designated as arboretum, will be visited formally for remedial work ('gardening on a grand scale') twice within the period of this 10-year plan (refer Map 6).

Other operations involving removal (thinning) will result due to tree safety inspections or tree work that arises due to health and safety concerns. As and when required, the encroachment of woodland trees and vegetation will be thinned/cut back to ensure that botanical specimens are not supressed. Felling does not take place to produce timber, but any felled trees will be utilised either on site in the first instance or sold in line with Forestry England guidance.

5.3 Jackson Avenue

The important historic feature of Jackson Avenue in the Old Arboretum (see Map 6) will need major restoration due to its age and declining condition, including felling of mature moribund avenue trees and replanting with suitable botanical specimens, most likely during the period covered by this plan. A separate Avenue Management Plan will be written and consulted upon with visitors, stakeholders and any interested parties in due course, with the intention that the avenue can be restored to mark the bicentenary of the arboretum in 2029. This will be used as an opportunity to engage visitors and the local community with our landscape management, and hopefully provide opportunities for participation in some way.

5.4 General Proposals

Description	Management Implications	Proposals
Arboretum – Old Arboretum, Silk Wood arboretum areas. Old Arboretum developed from 1830s through to late C19. Extended into ancient woodland of Silk Wood from 1875. Further FC expansion 1960s *to the present day.* The combination of landscape quality and botanical diversity make it one of the finest tree collections in the country and internationally important. Most of the original layout of planting remains along with many of the original trees. The layout of paths and rides is of particular importance, both as the framework for the landscape and as visitor access routes.	Sensitive management required to preserve historical features and ensure sustainable long-term landscape quality. Ensure that open spaces are retained, without inappropriate in-fill planting, as they are an essential part of the designed landscape. Ensure the safety of everyone on site through appropriate and well-informed management of trees. Ensure landscape management and new planting facilitates interpretation and engagement, looking at sensory planting beyond the visual elements of picturesque landscape where possible. Develop opportunities to enable more people to engage with arboretum management on a practical level, and increase understanding.	Continue to research chronology and layout of original Holford planting. Adherence to the original 19th century planting style with new planting. Where appropriate, the use of plants cloned from originals. Where possible recreate, restore or maintain original glade and ride structure. Refer to collection and tree management policies and landscape plan. Develop education programmes/placements and other engagement activities, to forge closer links and raise profile of landscape planning. Potentially develop further upgrading of path surfaces to hard paths through Silk Wood to provide more inclusive access. Re-development of interpretation in the Propagation Unit. Continue to offer student arborist work-based placements.

6. Woodland Management (refer map 7)

The site comprises 61ha ancient semi-natural woodland.

The woodland is made up of ancient semi-natural woodland with small 19th Century plantations on the northern fringe.

The National Vegetation Classification (NVC) is one of the key common standards developed for the country nature conservation agencies, and includes tables with Native Woodland Types, where each type comprises major and minor tree and shrub species. The woodland at Westonbirt is primarily classified as type W8 (lowland mixed broadleaved

woodland with dog's mercury), where ash is the major species throughout the range, and field maple is major species locally or in part of range. There are smaller woodland areas of type W10 (lowland mixed broadleaved woodland with bluebell), W14 (beech-oak woodland with bramble) and W12 (beech-ash woodland with dog's mercury).

The woodland generally has a history of active management by coppicing going back to 1292, but this ended in 1930's. Coppicing of 22ha re-commenced in 1979 and is still underway with coppice workers active today (see Section 7. Coppice). Under the previous forest design plan, areas of PAWS (plantations on ancient woodland sites) were restored with conifer felling and allowing natural regeneration, whilst other broadleaf areas were thinned, however, there has been no recent woodland work until 2020.

In 2015, Forest Research colleagues confirmed the presence of Chalara ash dieback, and the decline in the health of woodland ash trees has since been rapid. A new and comprehensive **Woodland Management Plan** (refer Appendix 2) has been written by Forest Research, with various silvicultural management practices identified for each of the woodland compartments in Silk Wood, together with restocking recommendations. This plan has now been formally approved by Forest Services, in order for the required thinning and felling operations to take place.

It is hoped that we will be able to share our experience in managing this disease with other woodland owners and interested parties, and we have also developed an accompanying **Communication Plan** to raise awareness and to tell the story to the wider public. We will develop a Community Woodland area to enable the full involvement of people in replanting, to help tell the wider Silk Wood story and engage people with woodland management in the long term (e.g. through ongoing surveying and practical conservation).

All operations will adhere to the latest industry best practice, and comply with Forestry England guidance and Forest Services regulation, especially **Note 046 'Managing Ash in Woodlands in Light of Ash Dieback'**. The safety of people, including visitors, staff, volunteers, and contractors is obviously a high priority.

6.1 Species Composition

Mixed native broadleaf types: W8; W10; W12; and W14 – as specified under the Native Woodland Types within the National Vegetation Classification (NVC).

6.2 Thinning Operations

Chalara dieback of ash (*Hymenoscyphus fraxineus*) is now extremely wide-spread, and the **Woodland Management Plan** contains comprehensive details regarding planned thinning, felling and restocking operations within the period of this plan. Dead/dying trees that present a direct safety risk to people will be felled within the 61ha of woodland, usually due to close proximity to rides and open glades with high levels of public access. Felling operations will produce timber, and this will be sold at roadside and recorded in line with Forestry England guidance.

6.3 General Proposals

Description	Management Implications	Proposals
Woodland in Silk Wood – including plantations. Made up of Ancient woodland with small 19th Century plantations on northern fringe. It is primarily classified as W8 (ash/maple) woodland with smaller areas of W10, W14 and W12. The woodland has a history of active management (coppicing) going back to 1292. This ended in 1930s. The woodland is of considerable wildlife value with an impressive list of flora and fungi recorded. Much of this ecology relies on the network of open rides and glades. Parts of area now plantation or arboretum due to: • Expansion of the arboretum between 1875 and 1881 along main drives. • Expansion of the arboretum since 1956. • Various Forest Research plots developed during 1960s to 1980s. • Attempted commercial coniferisation in northern half during 1960s – now removed.	Fragmentation of woodland into semi-natural and plantation elements had produced an incoherent landscape. Cessation of active coppicing has left legacy of 'outgrown' canopy with impoverished under-storey. The ancient semi-natural character makes the biodiversity value of greater significance than in other areas of the arboretum. This contribution to biodiversity makes sensitive management a priority. Management of open areas is of great importance, particularly sward management by mowing and ride-edge maintenance. Ensure the safety of everyone on site through management of trees. Engage people in the Silk Wood Ash Project through engagement, interpretation, and volunteer opportunities. Improve accessibility through a section of native woodland, to enable participation and to raise the profile of native woodland.	Maintain ancient 'natural' character of Silk Wood including its landscape quality, biodiversity and, where compatible with other objectives, some productivity. Maintain high levels of dead wood wherever compatible with safety. In particular, aim to leave minimum 3 standing and 3 fallen dead trees per ha. Also, dead limbs over 15cm diameter. Adopt management systems in response to the woodland cover present to best meet arboretum objectives. Where practical, silviculture should reflect historical precedents and provide exemplars of good management for interpretation, training and other purposes. Refer Westonbirt **Woodland Management Plan**, and **Coppice Restoration & Management Plan.** Refer to the **Communication Plan** and **Community Woodland Plan**. Develop a sensitive boardwalk through the community woodland area, for accessibility and increased participation. Develop biological and social science opportunities, through university and other links.

7. Coppice Restoration and Management (refer map 7)

The site comprises 22ha of actively coppiced coups, with a hazel (*Corylus avellana*) under-story and common oak (*Quercus robur*) standard over-storey.

This coppice needs to be economically self-sustaining to be viable, and this is best achieved by short rotation (6 to 8 year) hazel and 15 to 20 year fuelwood coppice. Other arboretum objectives require that the short rotation hazel is managed as coppice-with-standards rather than simple coppice. Thinning of the oak standards is continuous in order to reduce and maintain a canopy cover to no more than 20%. The **Coppice Restoration and Management Plan** contains more in-depth detail, and it is also referred to in the afore-mentioned approved **Woodland Management Plan**.

7.1 Coppice Objectives

The coppice programme has a number of objectives which are interdependent, and their various needs have to be balanced within the management plan:

1. Economic – to provide a sufficient income for the number of workers needed to manage the coppiced areas.
2. Landscape – to provide continuity with the traditional landscape.
3. Biodiversity – to support the rich flora and fauna associated with coppice-with standards.
4. Heritage – to provide opportunities for the interpretation of the historical forms of management practiced in Silk Wood.
5. Training – to provide the venue and materials for training in coppicing and related woodland crafts.
6. Community - to provide meaningful activities for groups engaged in the arboretum's community engagement and volunteering programmes, which aims to build participants' self-reliance and esteem and widen access/inclusion.

7.2 Species Composition

Mixed native deciduous trees, predominantly hazel (*Corylus avellana*) and common oak (*Quercus robur*).

7.3 Thinning Operations

Cutting of hazel stools within coups on rotation and general thinning of oak standards. Dead/dying ash trees will be thinned/removed where they are considered to present a health and safety risk. Standard trees will be replaced through selection of appropriate natural regeneration and protection with tree shelters against mammal damage.

8. Downland Management (refer map 8)

The site comprises 34ha of open downland, and this may be divided into unimproved (biodiverse) and improved grassland.

The Downs contain a number of old trees, some 19th C. exotic ornamentals, others pre-parkland relic hedgerow trees. The age profile of these trees is weighted towards the mature and over-mature end of the age scale, and we aim to ensure long-term ornamental tree cover on the Downs, by retaining veterans and planting a limited number of replacements as needed. The **Westonbirt Flora & Sward Management Plan** has been developed over many years, in association with Forest Research and expert botanists, as well as Flora Group volunteers and Fauna Group volunteers, who undertake the monitoring and surveying of key management species.

8.1 Operations

All trees and shrubs within these areas are considered as botanical specimens, and as such will therefore be managed in line with other areas designated as arboretum.

8.2 General Proposals

Description	Management Implications	Proposals
Downland – the Downs may be divided into unimproved (biodiverse) and improved grassland across the site. Unimproved grassland is situated to the south and west on sloping ground along the valley-sides. These are species-rich with a number of orchids of particular note. The 'middle downs' are more productive and have been used in recent years for events and car parking. They are an integral part of the historic landscape and are bordered to the north by a ha-ha, and truncated in a section near the dew pond. The Downs contain a number of old trees, some 19th C. exotic ornamentals, others pre-parkland relic hedgerow trees. The age profile of these trees is weighted towards the mature and over-mature end of the age scale.	Require distinctive management to maintain historic and biodiversity values. Unimproved areas' contribution to biodiversity makes sensitive management a priority. The prominence of the parkland trees lends them to particular landscape importance. The Downs economic value for events and parking must be carefully weighed against their central position in the historic landscape. An ongoing maintenance programme is required to ensure continued and future use for events and parking. Ensure the safety of everyone on site through management of trees. Engage visitors in biodiversity and land management, through volunteering, interpretation and engagement activities.	Carefully plan events and car parking to minimise impact, and continue with a tailored programme of maintenance, including grass cutting of event and parking areas to maintain a healthy sward, but with due regard to conservation value. Maintain distinctive downland landscape and historical features Maintain wildlife value of unimproved grassland by appropriate cattle grazing *and grass cutting* regimes. Continue cattle grazing under licence with appropriate breeds and stocking levels. Refer **Flora & Sward Management Plan**. Develop partnerships e.g. with Cotswold AONB and universities, to further develop biodiversity, scientific objectives, understanding and engagement with people.

9. Site Infrastructure

The site comprises 9ha of infrastructure, including staff houses, buildings and car parks. Any trees and shrubs within these areas are considered as botanical specimens, and as such will therefore be managed in line with other areas designated as arboretum.

10. Site Development and Future Master Planning (refer map 9)

The site has undergone significant development of infrastructure in the previous decade, aimed at improving the sense of arrival and visitor experience, with the addition of a new Welcome Building, Treetop Walkway, the relocation of the visitor car park and restoration of the former parking area on the Downs. Staff facilities have also been greatly improved with the addition of a new Tree Management Centre, where operational teams are based.

However, further progress is needed to ensure that our facilities befit an internationally important arboretum and visitor attraction. The unexpected opportunity to acquire 13ha of neighbouring land and the accompanying Silk Wood House presented itself in recent years, and the subsequent purchase was undertaken jointly by Forestry England and the Friends of Westonbirt Arboretum charity.

The key areas where potential development can be considered and undertaken are not within areas designated as arboretum, woodland or downland. Instead, they are the central office hub and learning zone, the area in and around The Sleights houses, and now the acquired adjoining land and Silk Wood House property. We are yet to decide exactly how these areas are to be developed as identified on Map 9, and any future development will be subject to an ongoing master planning exercise and appropriate stakeholder consultation and engagement.

In particular, The Silk Wood House and accompanying land purchase offers a rare and exciting opportunity for new development, as well as improving our ability to better tell stories, and possibly tell different stories outside the confines of the historic grade one listed landscape. Naturally the development in whatever shape and form will be tree related, and provide amazing engagement tools, as well as having a practical, scientific or conservation purpose.

To date all our submitted planning applications have been approved, due to the sensitive nature of our developments and our appreciation of the landscape, and this theme will continue.

11. Scientific Study

The site comprises 7ha of formal forest trial plots, which are managed by Forest Research.

All trees within these plots are currently part of the European REINFFORCE (Resource INFrastructures for monitoring, adapting and protecting European Atlantic FORests under Changing climatE) Interreg Project. The REINFFORCE project pools the capacity of 12 forest organizations and research institutes along four countries (Portugal, Spain, France, and United Kingdom) to face the transnational issue of the adaptation to climate change

impacts on Atlantic forests. The trees within these plots were planted from 2012 onwards, and the only operational activity planned will be vegetation management, restocking of young trees, and removal of any dead/dying trees in line with ongoing project objectives. We would like to open-up the trial plots to the public at some point, with interpretation on climate change and relevant research. We will also consider providing better access with a low-key woodchip path through some of the old Douglas fir trial plots in Silk Wood, as a way to engage visitors in forestry trials.

However, the entire Westonbirt site is continually used as an essential scientific reference and valuable resource by a wide variety of research organisations, institutions and educational establishments. A vital role of Westonbirt, both today and in the future, is to enable scientific study and research using our trees, everything associated with these trees, and crucially our meticulous plant records, detailed mapping and archive material.

We will continue to grow our understanding of the entire Westonbirt site through various means and collaboration with partners, including as Forest Research. Examples of this are recent soil analysis and surveying, and Lidar (Light Detection and Ranging) terrestrial and tree canopy mapping (see Map 10).

There is significant opportunity to further link scientific activities with our Learning & Participation Team activities, by working with universities to support student dissertations, MSCs and PHDs, as well as potentially offering placements to encourage the next generation into environmental and other related career paths. We will look to develop our Science and Research Strategy in conjunction with future site development, to not only facilitate varied and wide ranging on-site scientific study and research, but also to better offer potential opportunities for engagement.

12. Recreation, Participation and Learning (refer map 4)

Westonbirt's popularity continues to grow and the site attracts approx. 550,000 visits per annum, including events, whilst the Friends of Westonbirt Arboretum charity has an increasing membership of approx. 36,000.

Our continuing popularity and the number of visitors we welcome each year, provides a unique opportunity to engage people on the importance of trees and the environment to society, and also on a more personal level. Far from being something carried out by 'tree management experts' in isolation, management of the landscape can be done in a manner that engages people fully; enabling them to participate actively in the process through consultation, interpretation and volunteering, so that the decisions we make are made in partnership with the public (wherever they may be) and as befits our National status.

The site comprises several miles of hard paths, woodchip tracks and grass rides. Encroachment of vegetation will generally be managed by felling or pruning back to maintain access. Woodland rides are managed for access, but also to increase habitat diversity, and the present network of open rides will be managed in line with our underpinning management plans to encourage rich native flora and fauna.

12.1 General Proposals

Description	Management Implications	Proposals
Popular visitor venue of local and regional significance, attracting over 550,000 visits per year. The arboretum's rich history and botanical diversity make it a unique cultural resource. It is highly valued for its aesthetic qualities of tranquility, beauty, calm etc. It also represents a valuable 'shop window' and 'flagship' for Forestry England and its work more widely. The Friends of Westonbirt Arboretum has become one of the largest bodies of its kind in the country, providing a valuable conduit for public involvement and support for the arboretum. A number of events and courses take place related to trees and wood.	Visitors provide the main source of income by charge for entry, in addition to an annual grant from FOWA in leu of an entry charge. Sensitive development of visitor facilities, events programme and interpretation is essential to maximise benefits without detracting from the arboretum's values and in line with Forestry England's recreation matrix. Possible conflicts between diverse objectives. There remains a large potential for developing the arboretum's value for education, health and well-being promotion. Greater public involvement in management operations, through advanced consultation, discussion and events.	Principles of economic, social and environmental sustainability to govern all areas of management. Continue to develop events programme to utilise the arboretum's potential to connect people with trees via artistic, musical and cultural events, whilst having due regard to the arboretum's unique environment. Develop regular practical volunteering to: (a) provide progression for young people; (b) provide a green gym and social prescribing offer. Develop plans for a new engagement 'hub' for scientific exploration, engagement with visitors in real decision making, and interpretation regarding arboretum management and work in action. Build workshop programme to include more rural skills – joined up programming with Westonbirt Woodworks and the resident woodland coppicers. Refer recreational, learning and participation plans and policies. Set up regular joint working group between engagement and tree teams for discussion on collections development, e.g. planting to consider positioning, species selection to ensure inclusion and access for all.

12.2 Rights of Way

Westonbirt is a pay-to-enter visitor attraction and is exempted from dedication under CROW (The Countryside and Rights of Way Act 2000). However, all operations will take account of the public rights of way that cross the site (see Map 4), and clear PRoW (Public Rights of Way) signage will be maintained and inspected at regular intervals.

13. Conservation

The current **Westonbirt Conservation Management Plan** was prepared by consultants for the whole Westonbirt Estate, and with input from all the modern-day estate owners. It was written in 2009 and updated in 2011, and this plan is due to be formally reviewed in 2021. The plan is intended to provide a clear direction for the conservation and management of the registered Westonbirt estate, as a scientific tree collection, heritage estate, ecologically valuable habitat and as a greatly appreciated landscape.

The arboretum site has two distinct conservation roles:

- Engaging people and communities intellectually, emotionally and practically with local and global issues, relating to conservation of tree species and forest habitats, to support personal and societal change - fulfilling Global Strategy for Plant Conservation target 14, UN Sustainable Development Goals, DEFRA 25 Year Environment Plan etc.

- Conservation of rare species and habitats: contribution to national and local biodiversity by management of lowland woodland and calcareous grassland.

All forestry and arboricultural operations will take account of issues of biodiversity and habitat conservation, ensuring the monitoring of important habitats for nature conservation. We will work in co-operation with other bodies to record and monitor flora, fauna and fungi. We will seek to identify important species and habitats, and continue to refine management processes and work methods to enhance biodiversity. The newly proposed and soon to be established role of Wildlife & Conservation Ranger will be tasked with overseeing much of this work.

14. Designation (refer map 2)

Westonbirt is registered as Grade One with The Historic England 'Register of Parks and Gardens of Special Historic Interest in England', for its historical significance.

The Forestry England estate covers only part of the Grade One designated landscape, and a coherent management of the whole historical landscape requires co-operation between various owners. Regular dialogue with other estate owners will be maintained to co-operate in the development of landscape preservation projects. The **Statement of Significance** is a joint statement that has been previously agreed by all estate owners.

15. Threats

Our woodland, living botanic collection and historic landscape, and ultimately our ability to attract visitors, are all under threat from climate change and pests and diseases, both present and emerging. The advent of Chalara ash dieback is an example of how devasting the impact of a disease can be to our trees. Our highly skilled and well-trained staff undergo continual professional development, to ensure that we maintain awareness and constantly develop knowledge. Regular site inspections are carried out in order to detect the first sign of any potential issues, and we work closely with colleagues at Forest

Research, and in particular the Tree Health & Diagnostic Advisory Service (THDAS). Westonbirt is a member of the International Plant Sentinel Network (IPSN), which has been developed to facilitate collaboration amongst institutes around the world, with a focus on linking botanic gardens and arboreta, and plant health scientists. The aim will be for these institutes to work together in order to provide an early warning system of new and emerging pest and pathogen risks.

16. UK Woodland Assurance Scheme (UKWAS) Compliance Table

	Forest Plan Area (ha)	Forest Plan Percentage	Forest District Area (ha)	Forest District Percentage
Total area	253	100%	253	100%
Total Wooded area	83	33%	83	33%
Natural Reserves – Plantation	0	0%	0	0%
Natural Reserves – Semi-Natural	253	100%	253	100%
Long-term Retentions and Low Impact Silvicultural Systems (>1%)	83	33%	83	33%
Woodland - Area of conservation value (>15%) including designations: ASNW	61	24%	61	24%
Woodland - Coppice area	22	9%	22	9%
Arboretum area	107	42%	107	42%
Number of botanical specimen plants within Arboretum area	15,000	100%	15,000	100%
Downland area	34	13%	34	13%
Forest Research Trial Plots	7	3%	7	3%
Site Infrastructure area	9	4%	9	4%
New Acquisition of neighbouring land (Silk Wood House)	13	5%	13	5%

17. Duration and Review

This forest design plan was written in 2021 and the term of the plan will be a 10-year period until 2030. It may be reviewed at any time in accordance with increased knowledge and/or changing circumstances. However, a formal mid-term review will take place after 5 years, principally by the Curator and Arboretum Director, and involving other parties as appropriate and needed.

Edits and revisions will be made as required and logged below.

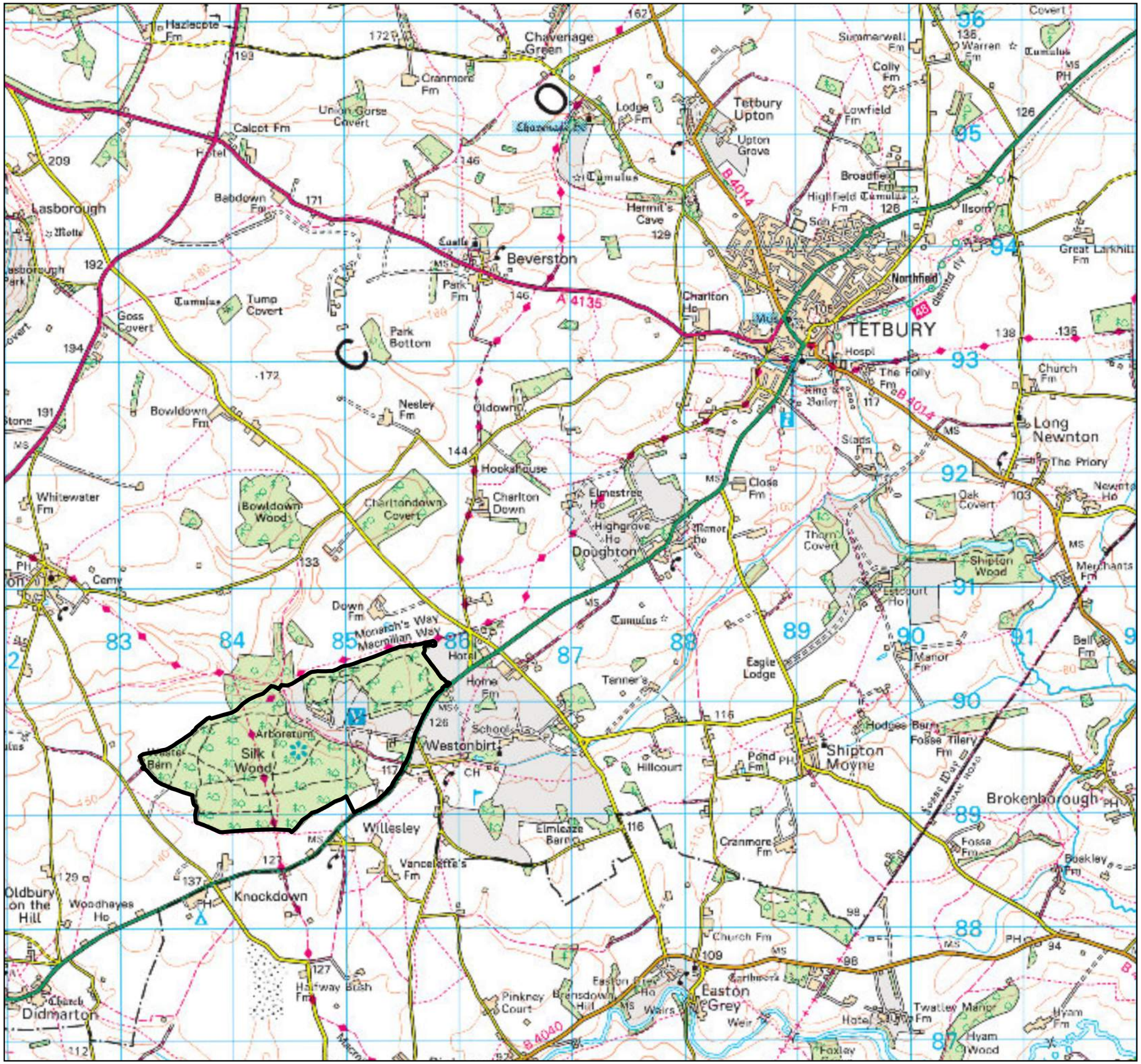
Date	Chapter/Section	Comment	Initials

This forest design plan supersedes all previous forest design plans written before 2021.

Where formal Forestry England and Westonbirt plans, policies and guidance are referred to, these are noted in **bold text**.

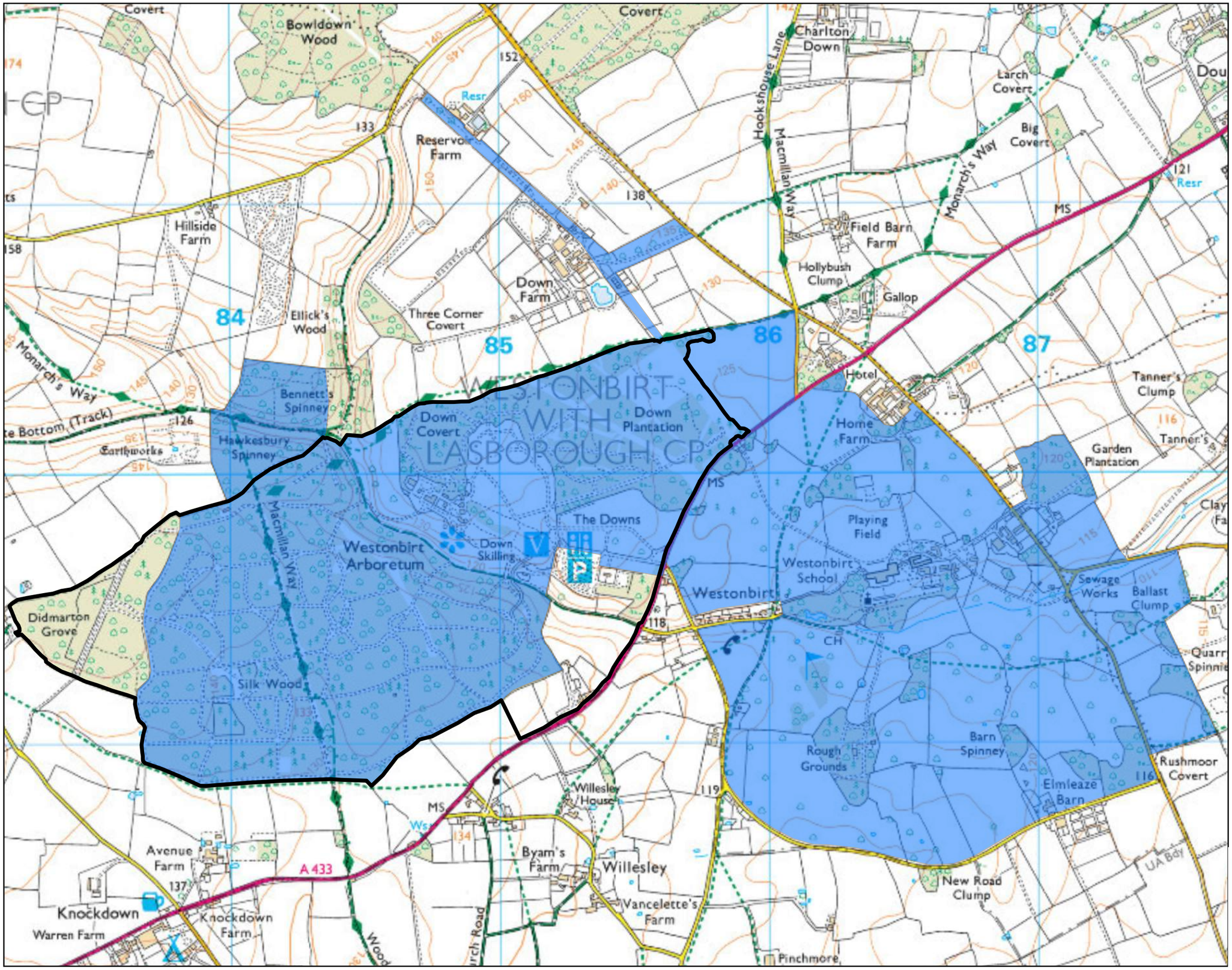
Forestry England

Map 1 - Westonbirt Arboretum location



Forestry England

Map 2 - Historic England designated landscape



Owned by Forestry England

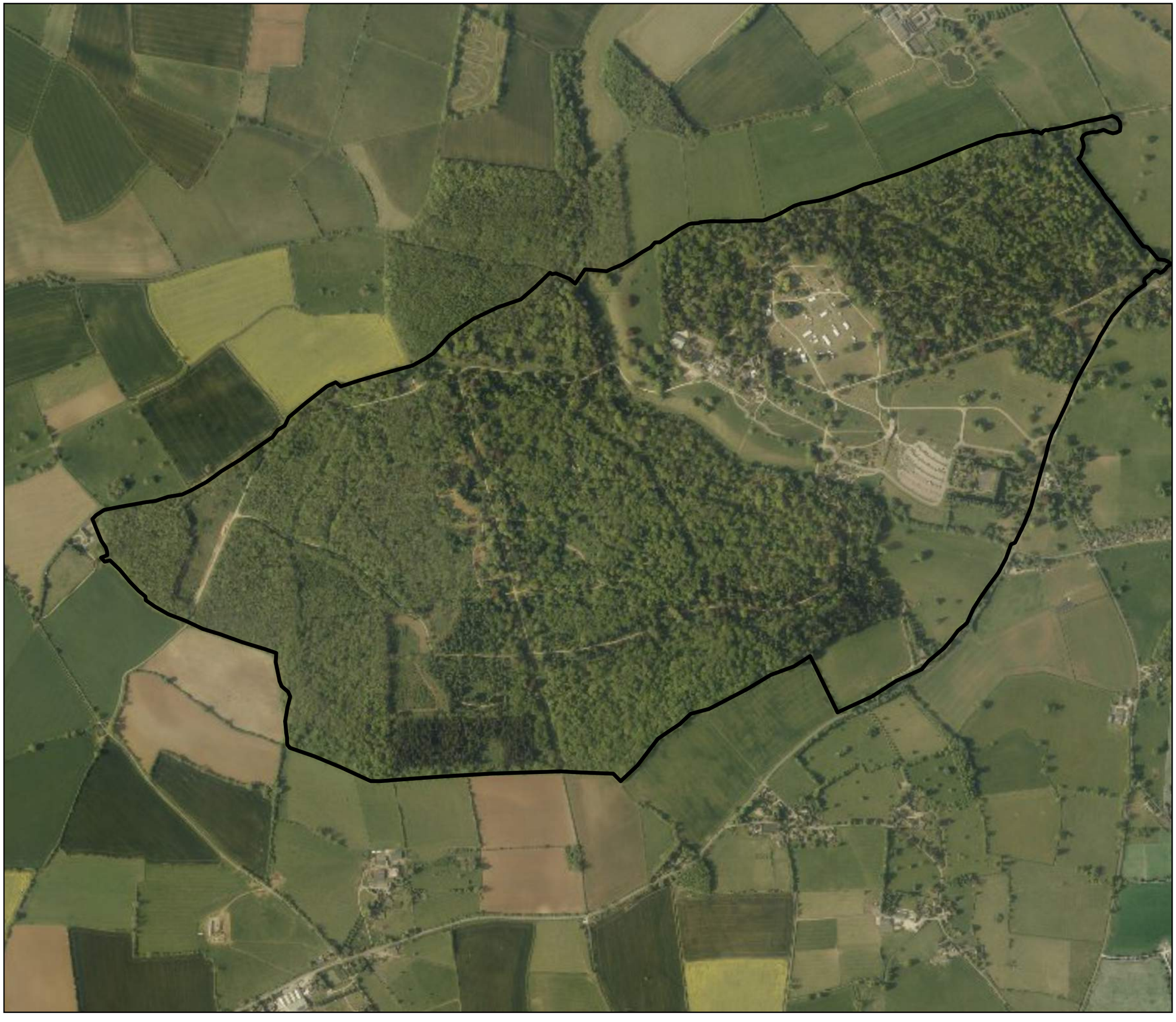
Grade 1 Listed, Historic England

0 1 2 4 Kilometers

Forestry England forests and woodlands have been certified in accordance with the UK Woodland Assurance Standard (UKWAS)

FSC www.fsc.org FSC® C123214 The mark of responsible forestry

PEFC PEFC/18-40-1001 Promoting Sustainable Forest Management www.pefc.org

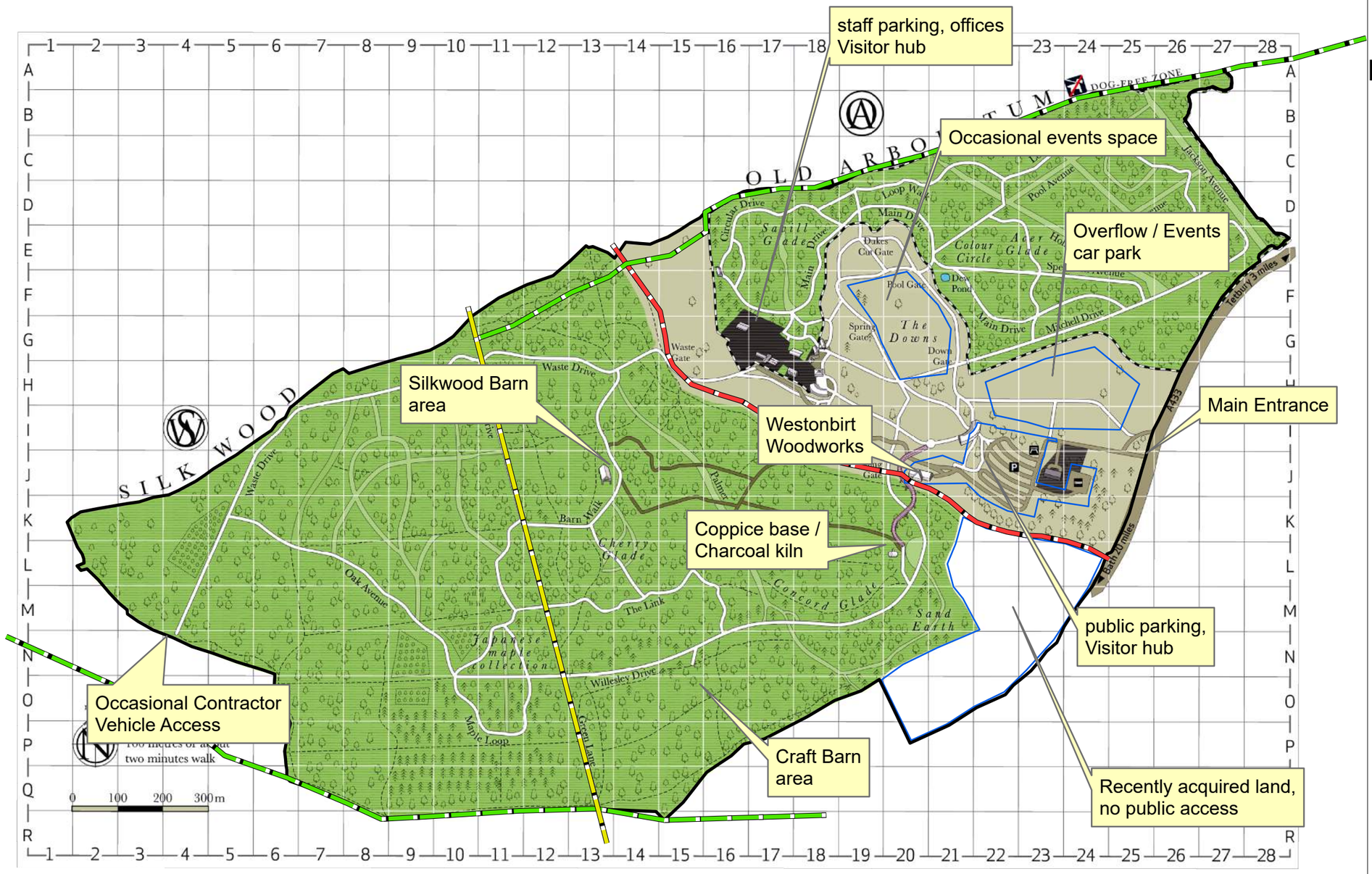


Forestry England

Map 3 - Aerial site view

Forestry England

Map 4 - Recreation and Public Rights of Way

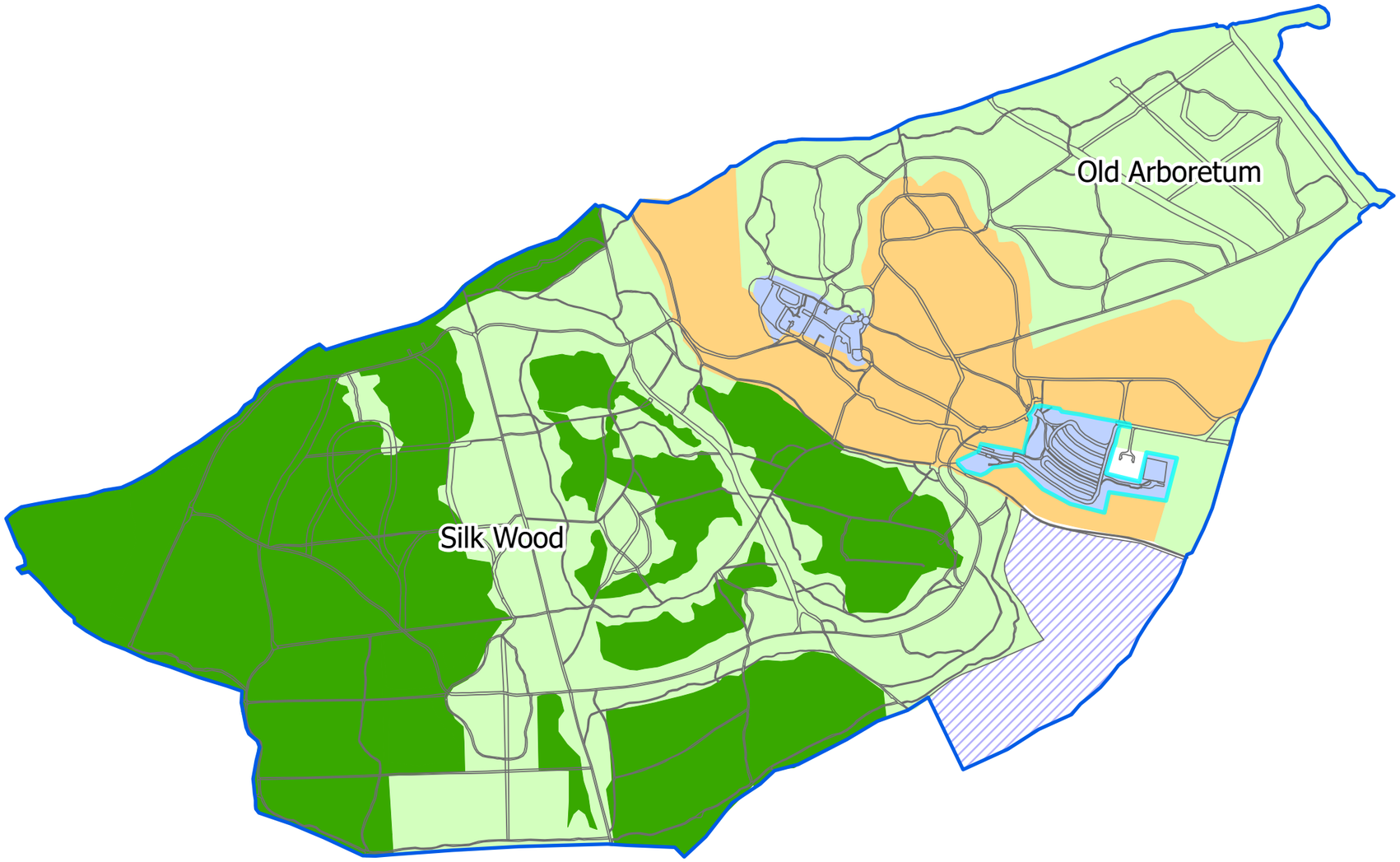


Legend

- Bridleway
- Footpath
- Restricted byway

Forestry England

Map 5 - Landscape components



Legend

- Central area, buildings and car parks
- Arboretum
- Downs
- Woodland
- Silkwood House newly acquired land
- The Sleights, rented by staff

FSC www.fsc.org FSC® C123214 The mark of responsible forestry

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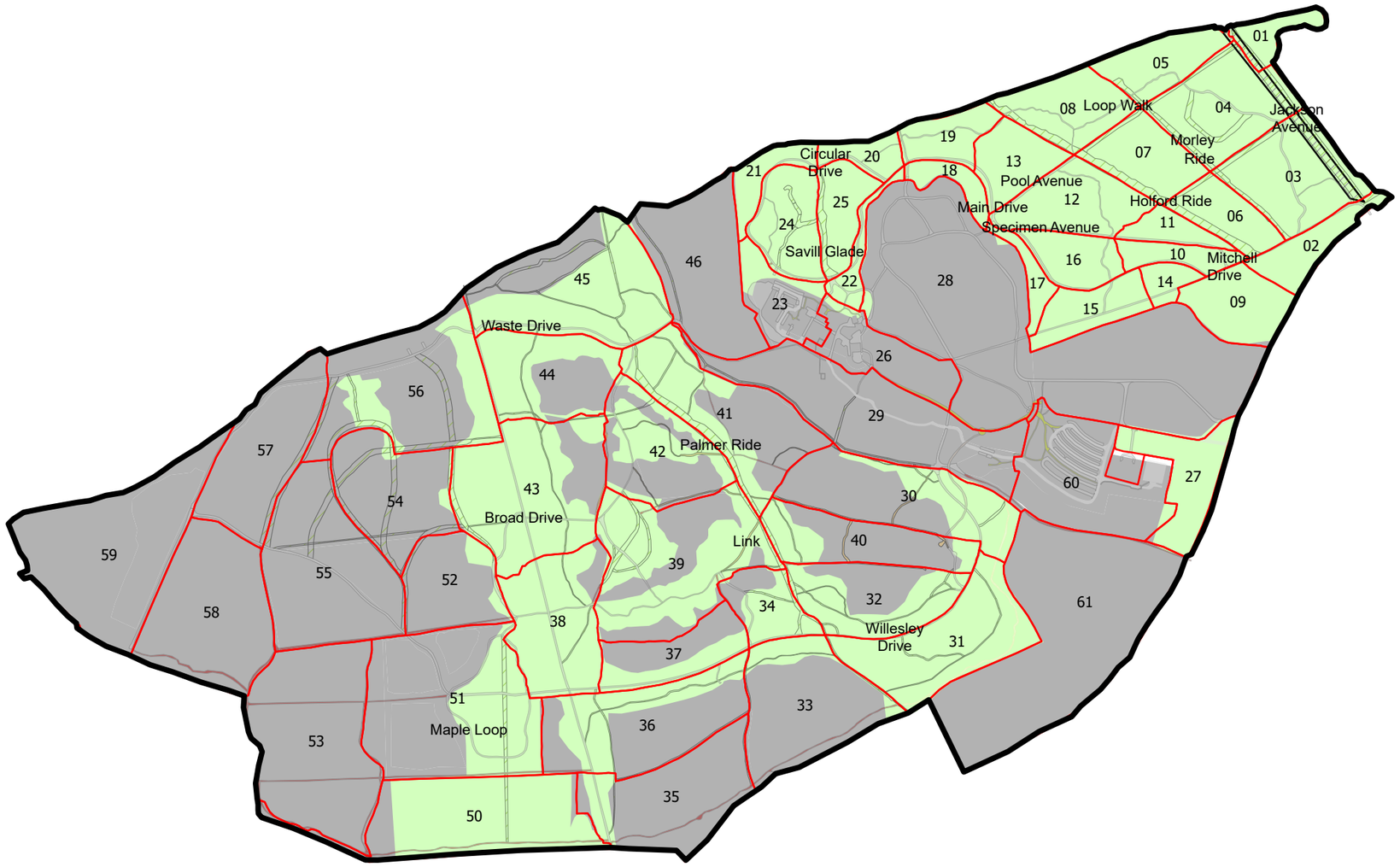
PEFC PEFC/18-40-1001 Promoting Sustainable Forest Management www.pefc.org

Forestry England

Map 6 - Site Analysis Arboretum

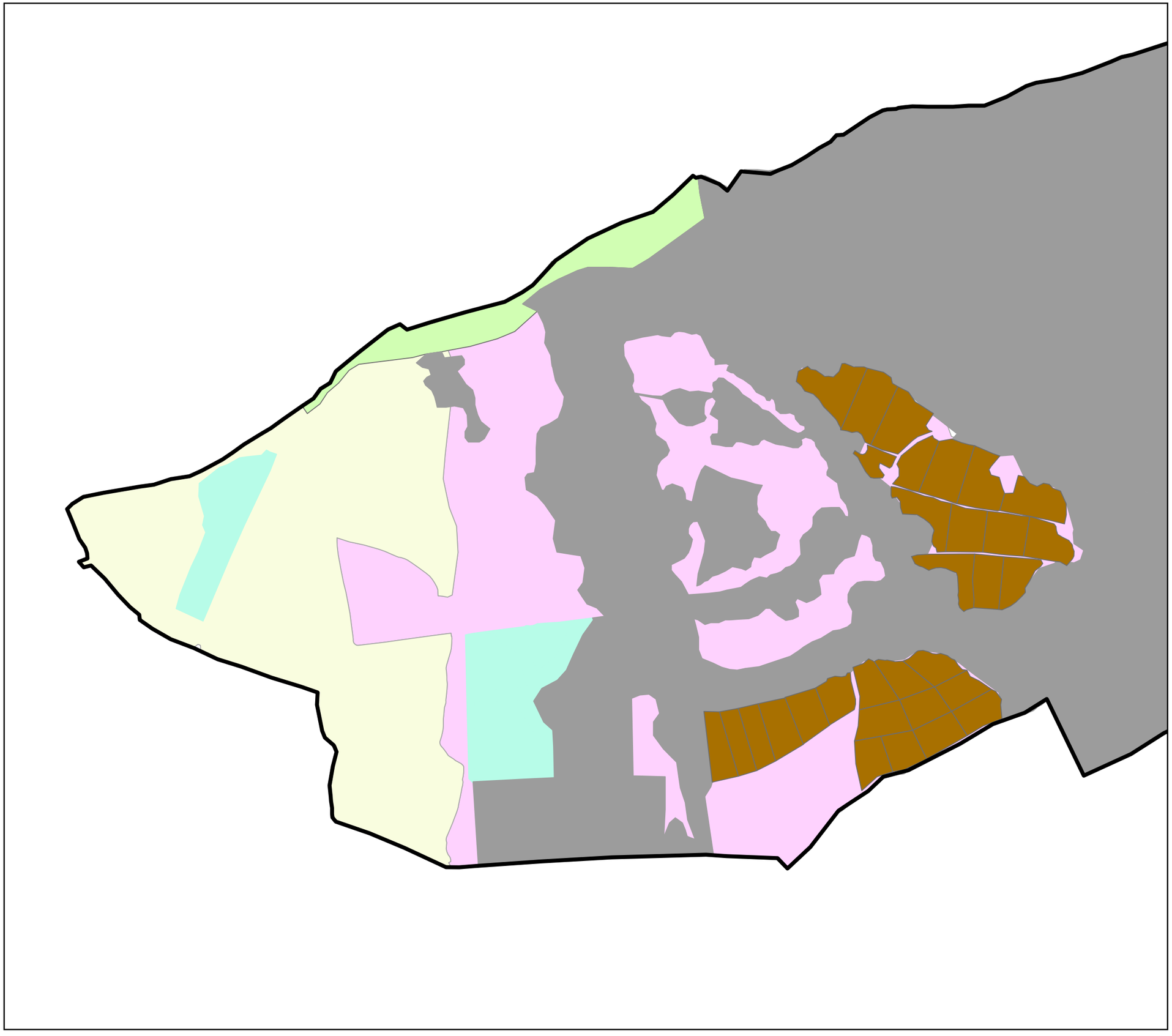


Legend

- Arboretum
- All other areas

Forestry England

Map 7 - Site Analysis
Woodland



- 19th Century plantation
- Forest Research plots
- Coppice
- Ancient & Semi-Natural Woodland
- Ancient Replanted Woodland
- arboretum; downs; Other

FSC www.fsc.org FSC® C123214 The mark of responsible forestry

Forestry England forests and woodlands have been certified in accordance with the UK Woodland Assurance Standard (UKWAS)

PEFC PEFC/18-40-1001 Promoting Sustainable Forest Management www.pefc.org

Forestry England

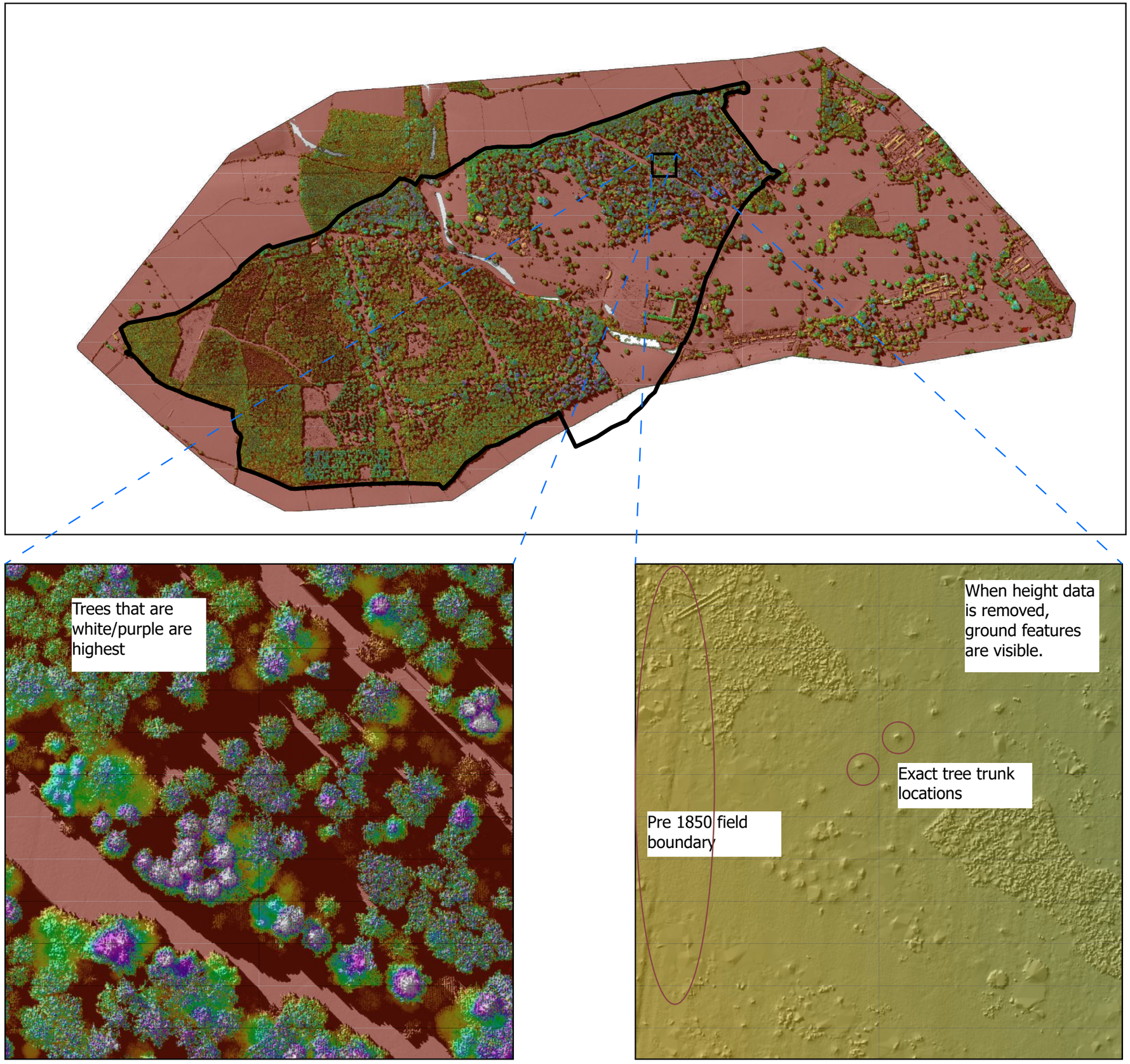
Map 8 - Site Analysis Downs

Forestry England

Map 9 - Future Development Areas

Forestry England

Map 10 - Lidar



Forestry England forests and woodlands have been certified in accordance with the UK Woodland Assurance Standard (UKWAS)

Forestry Commission

To James Simpson
Director of Operations
Forestry England
Bristol Business Park
620 Coldharbour Lane
Bristol
BS16 1EJ

Forestry Commission
Bristol Business Park
620 Coldharbour Lane
Bristol
BS16 1EJ

Tel: 0300 067 4000

30 January 2020

Dear James Simpson,
Cc. Neville Geddes

Reference: FL-FE-THIN-2020-30

Forestry England 10 year thinning licence 2020 - 2030

I hereby authorise a sustainable programme of thinning[1] within the Forestry England Estate across England during a 10 year period commencing from the **31st January 2020**.

All statutory designations, including Tree Preservation Orders must be identified on land subject to this licence, and the necessary consents, licences or permissions obtained from the appropriate statutory body prior to any proposed felling works.

Yours sincerely,

Richard Greenhous
Director of Forest Services

[1] Refer to PDN2 for FS' definition of thinning – See Roots page 'Forest Plans'

Forestry Commission England

Woodland Management Plan

To be completed by the plan author:		
Woodland or Property name	**Westonbirt Arboretum – Silk Wood**	
Woodland Management Plan case reference	**1171**	
The landowner agrees this plan as a statement of intent for the woodland		**Yes**
Plan author name	**Chris Reynolds – Forest Research**	

For FC Use only:				
Plan Period *(dd/mm/yyyy - Ten years)*	**Approval Date:**	**9/12/2020**	**Approved until:**	**9/12/2030**
Five Year Review Date	**9/12/2025**			

Revision No.	Date	Status (draft/final)	Reason for Revision

Template user support:

The functionality in this version of the management plan template has been downgraded to ensure compatibility with Word 2003. This document is not protected and as such rows can be added & deleted or copied and pasted from tables where needed.

UK Forestry Standard management planning criteria

Approval of this plan will be considered against the following UKFS criteria.
Prior to submission review your plan against the criteria using the check list below.

	UKFS management plan criteria	Minimum approval requirements	Author check ☑
1	**Plan Objectives:** Forest management plans should state the objectives of management and set out how an appropriate balance between social, economic, and environmental objectives will be achieved.	• Management plan objectives are stated. • Consideration is given to environmental, economic and social objectives relevant to the vision for the woodland.	Yes/No
2	**Forest context and important features in management strategy:** Forest management plans should address the forest context and the forest potential and demonstrate how the relevant interests and issues have been considered and addressed.	Management intentions communicated in ***Sect. 6*** of the management plan are in line with stated objective(s) ***Sect. 2***. Management intentions should take account of: • Relevant features and issues identified within the woodland survey (***Sect. 4***) • Any potential threats to and opportunities for the woodland, as identified under woodland protection (***Sect. 5***). • Relevant comments received from stakeholder engagement and documented in ***Sect. 7***.	Yes/No
3	**Identification of designations within and surrounding the site:** For designated areas, e.g. National Parks or SSSI, account should be taken of landscape and other sensitivities in the design of forests and forest infrastructure.	• Survey information (***Sect. 4***) identifies any designations that impact on woodland management. • Management intentions (***Sect. 6***) have taken account of any designations.	Yes/No
4	**Felling and restocking to improve forest structure and diversity:** When planning felling and restocking, the design of existing forests should be re-assessed, and any necessary changes made so that they meet UKFS requirements. Forests should be designed to achieve a diverse structure of habitat, species and ages of trees, appropriate to the scale and context. Forests characterised by a lack of diversity, due to extensive areas of even-aged trees, should be progressively restructured to achieve age class range.	• Felling and restocking proposals are consistent with UKFS design principles (for example scale and adjacency). • Current diversity (structure, species, age structure) of the woodland has been identified through the survey (***Sect. 4***). • Management intentions aim to improve / maintain current diversity (structure, species, and ages of trees).	Yes/No
5	**Consultation:** Consultation on forest management plans and proposals should be carried out according to forestry authority procedures and, where required, the Environmental Impact Assessment Regulations.	• Stakeholder engagement is in line with current FC guidance and recorded in ***Sect. 7***. The minimum requirement is for statutory consultation to take place, and this will be carried out by the Forestry Commission.	Yes/No

		• Plan authors undertake stakeholder engagement (ref FC Ops Note 35) relevant to the context and setting of the woodland.	
6	**Plan Update and Review:** Management of the forest should conform to the plan, and the plan should be updated to ensure it is current and relevant.	• A 5-year review period is stated on the 1st page of the plan. • ***Sect. 8*** is completed with 1 indicator of success per management objective.	Yes/No

Section 1: Property Details

Woodland Property Name		Silk Wood	
Name	Mark Ballard - Curator	Owner	
Email	mark.ballard@forestryengland.uk	Contact Number	0300 067 4857
Agent Name (if applicable)			
Email		Contact Number	
County	Gloucestershire	Local Authority	Cotswold District
Grid Reference	ST 8387 8978	Single Business Identifier	
What is the total area of this woodland management plan? (In hectares)		149.6 Ha	
You have included an Inventory and Plan of Operations with this woodland management plan?		Yes	
You have listed the maps associated with this woodland management plan?		Yes	
Do you intend to use the information within this woodland management plan and associated Inventory and Plan of Operations to apply for the following?		Felling Licence	Yes
		Thinning Licence	No
		Woodland Regeneration Grant	No
You declare that there is management control of the woodland detailed within the woodland management plan?		Yes	
You agree to make the woodland management plan publicly available?		Yes	

Section 2: Vision and Objectives

To develop your long-term vision, you need to express as clearly as possible the overall direction of management for the woodland(s) and how you envisage it will be in the future. This covers the duration of the plan and beyond.

2.1 Vision

Describe your long-term vision for the woodland(s). (*Suggest 300 words max*)

To maintain this important woodland within the local landscape through ongoing appropriate silvicultural management based on continuous cover forestry with the understanding that ash as a main species will decrease or fail over time. This will be achieved by maintaining the current coppice program; regular thinning and regeneration of older stands through selective and clear felling.

Strive to maintain a balance of species and age class with ash being conserved where ever possible. Over time this will ensure a healthy woodland capable of tolerating and adapaing to a changing climate and any pest and disease threats.

Forestry operations will be undertaken on a commercial basis to generate income. This income will be reinvested in further works to enhance the conservation and landscape values of Silk Wood. There should be no net cost to any forestry, conservation and landscape operations.

Develop the wildlife value of the woodland by careful and considered management taking note of wider conservation aims associated with species and habitat targets on the surrounding farmland and objectives in the Cotswolds National Character Area profile.

Manage and develop the specimen collections in Silk Wood to the standards expected of a high quality botanic garden and enable public engagement at every opportunity.

Develop Silk Wood's diverse landscape in a way that supports a dynamic and inclusive engagement programme that enables people to understand and actively engage in the management of Silk Wood; tell the story of its history; increases awareness of the threats to woodland in a changing world, and the benefits of woodland to better health and wellbeing.

Continue invlovement in the important role of research into forestry by mainataining existing research trials and developing new opportunities alongside the Forestry Commissions, Forest Research agency.

Maintain a safe environment for staff and visitors

2.2 Management Objectives

State the objectives of management demonstrating how sustainable forest management is to be achieved. Objectives are a set of specific, quantifiable statements that represent what needs to happen to achieve the long-term vision.

No.	Objectives (include environmental, economic and social considerations)
1	Environmental: Maintain the woodland cover and ecosystems by:

No.	Objectives (include environmental, economic and social considerations)
	• Managing the gradual decline of ash as a major species by use of appropriate silvicultural systems and maximising opportunities for ash regeneration and the continued presence of ash. • Bring into active management all the woodland areas within Silk Wood to ensure their long-term survival. • Using natural regeneration wherever possible with additional enrichment planting as appropriate, taking into consideration provenances suited to the expected future climatic conditions. • Adopt quality management practices that conserve ancient woodland soils • Improving the ride network and adding new open space • Managing existing and increasing deadwood habitat • Identify and safeguard existing and potential veteran trees • Ensuring wildlife habitat and protected species are identified and operations planned and timed to minimise impact • Adapting a forward-thinking policy taking into consideration potential climate change impacts • Promoting understanding of sustainable silvicultural and good arboricultural practices to demonstrate their environmental value • Monitor and evaluate the changes to improve knowledge
2	Economic: To manage the woods on a cost neutral basis by: • Ensure a steady income by careful planning and undertaking work over a realistic deliverable time scale. • Taking opportunities to maximise income by identifying high quality products and marketing them appropriately. • Showcasing the value of sustainable timber production and use of timber to society and the environment • Planting improved tree species and some non-native high value broadleaves to ensure future income streams and to demonstrate to other managers viable silvicultural options • Ensuring adequate control measures are adopted to prevent damage by deer, rabbits and other vermin
3	Social: To enhance the social aspects of the woodland by: • Managing the specimen collections in silk wood to the highest internationally accepted standards • Developing the collection by planting new specimens to enhance and add value to the existing collection and ensuring survival into the future • Maintaining the network of rides and paths to enable access to all • Managing and safeguarding historic features within the woodland e.g. wood bank • Maintaining the landscape in a way that respects and enhances the Grade 1 Registered Park and Garden and Ancient Woodland designations. • Enabling people to play an active part in the management of Silk Wood through community programmes and volunteering

No.	Objectives (include environmental, economic and social considerations)
	• Providing opportunities and healthy woodland activities that support better mental health and wellbeing
4	Learning: Develop learning opportunities within Silk Wood to: • Provide better accessibility. • Raise the profile of native woodland. • Deepen people's relationship with Silk Wood (particularly local people) and connect them with the management story. • Encourage and enable personal / societal change to promote a more sustainable future • Enable other professionals to benefit from our experience

Section 3: Plan Review – Achievements

Use this section to identify achievements made against previous plan objectives. This section should be completed at the 5-year review and could be informed through monitoring activities undertaken.

Objectives	Achievement

Section 4: Woodland Survey

This section is about collecting information relating to your woodland and its location, including any statutory constraints i.e. designations.

4.1 Description

Brief description of the woodland property:

Westonbirt National Arboretum can be broadly divided into 3 landscape areas which make up the Grade 1 Westonbirt Registered Park and Garden. The eastern end is a formal landscape established in 1829 by the Holford family. It is planted with specimen trees and shrubs and is locally known as the old Arboretum. The central area is an open wood pasture landscape. Silk Wood occupies the western end of the site. The expansion of the specimen collection into Silk Wood started at the end of the 1800s and has continued to date. The Forestry Commission took ownership in 1956.

Silk Wood is 140 m above sea level and has a mean annual rainfall of 640 mm and mean annual temperature of 11°C. The soils are brown earths overlying limestone to a depth of around 60 cm. Texture is a mixture of clay and loam and pH ranges from 5.1 to 6.4 (Hutchings and Wilson, 1998).

The woodland is c 150 ha of which 50% is woodland the remainder being formal specimen plantings, road and path networks and several Forest Research trials. The area of Silk Wood is mainly Plantation on Ancient Wood site (PAWS) with the far western blocks Ancient Semi Natural Woodland (ASNW). The woodland cover can be broadly divided into 2 main silvicultural systems. Active coppice and high forest managed under continuous cover.

Restoration of a coppice regime started in 1978 and now accounts for about 16.5 ha of the managed woodland. The regime is hazel (*Corylus avellane*) with oak standards. The coppice cut is on an 8 to 10-year cycle. Coppiced areas require protection from deer during the early years.

The main woodland blocks are mixed broadleaf with the general NVC category of W8; although this does vary across the site. Pedunculate oak (*Quercus robur*) and ash (*Fraxinus excelsior*) are the dominant tree species. Ash is present in all the woodland blocks either as a proportion of an intimate mix or as the major tree species (> 40% of the stems).

The mixed woodland blocks mainly run down the centre of Silk Wood. These are isolated and surrounded by open ground with specimen plantings. Management has tended to be piecemeal with felling of individual trees or small groups around the edges of these blocks for safety or

landscape development. Consequently, these blocks tend to have a sinuous edge and a random shape. There is also a network of hard paths throughout this area.

The bulk of the woodland dominated by ash form a contiguous block at the west end of Silk Wood. There is a network of grass rides and paths dividing the individual compartments and there is good access for heavy vehicles by forest roads. Records show that the last management interventions were 1960 and 1970 with the majority in 1970. Work appear to have been a combination of thinning and felling. On site observations would suggest work prior to this was c WW1 and WW2.

Ash in all the woodland compartments is heavily infected with 'chalara', ash die-back (*Hymenoscyphus fraxineus*). There are trees scattered throughout that show either low or little infection that should be retained as part of any management prescriptions. There are scattered large wild cherry (P*runus avium*) and remnant elm (*Ulmus spp.*)

Large old oaks are scattered throughout the blocks offering potential for deadwood habitat and roost / nesting opportunities for birds and bats. There is an overgrown and generally hidden historic wood bank running north / south through silk wood.

There has been a long association with Forestry Research in Silk Wood evidenced by the experiment name of Westonbirt 1 being given to the whole site. There are records of 32 formal experiments the majority of which are now closed but their legacy in the form of individual or groups of specimens are still present. The latest active experiments are Westonbirt 31 & 32 which are mixed conifer and broadleaf trials of species for future forestry in Britain. The role of Westonbirt Arboretum and Silk Wood as an important site for Forestry Research is recognised and the ability to continue research opportunities into the future should be assured.

4.2 Information

Use this section to identify features that are both present in your woodland(s) and where required, on land adjacent to your woodland. It may be useful to identify known features on an accompanying map. Woodland information for your property can be found on the Magic website or the Forestry Commission Land Information Search.

Searches undertaken by using local reports and surveys and by accessing the National Biological Network (NBN) Gateway (visited 19-09-19). Lists based on 2 km radius of centre of wood.

https://records.nbnatlas.org/explore/your-area#51.6070137|-2.2163950999999997|13|ALL_SPECIES

Feature	Within Woodland(s)	Cpts	Adjacent to Woodland(s)	Map No
Biodiversity- Designations				
Site of Special Scientific Interest	No		No	
Special Area of Conservation	No		No	
Tree Preservation Order	No		No	
Conservation Area	No		No	
Special Protection Area	No		No	
Ramsar Site	No		No	
National Nature Reserve	No		No	
Local Nature Reserve	No		No	
Other (please Specify):	No		No	
Notes				

Feature		Within Woodland	Cpts	Map No	Notes
Biodiversity - European Protected Species					
Bat	Records from survey by Gloucestershire Bat Group	Yes	ALL		Common Pipistrelle - *Pipistrellus pipistrellus* Soprano Pipistrelle - *Pipistrellus pygmaeus* Noctule - *Nyctalus noctula* Leisler's - *Nyctalus leisleri* Serotine - *Eptesicus serotinus* Brandt - *Myotis brandti* Whiskered - *Myotis mystacinus* Barbastelle - *Barbastella barbastellus* Lesser - Horseshoe *Rhinolophus hipposideros* Brown log-eared - *Plecotus auritus* Bechstein's - *Myotis bechsteinii* Bat boxes are present on the ride edge of compartment SW4 and SW5 and were last monitored in 2018 by Glos bat group. There is no evidence of them having been used to date. They should be considered during any forest operations.
Dormouse		Yes	ALL		Habitat appears suitable but a previous survey using 'hair tubes' produced no records. There are 5 records on the NBN Gateway for visual observations prior to 1995 but no records since
Great Crested Newt		No			GCN have been recorded in the ponds associated with the old arboretum and

				downs a considerable distance from Silk Wood. 2 records on NBN from 1984 on edge of compartment SW19 outside of wood.
Otter	No			No running water or large water bodies so unlikely to be present. No records on NBN for the site
Sand Lizard	No			Not suitable habitat not likely to be present
Smooth Snake	No			Not suitable habitat not likely to be present
Natterjack Toad	No			Not suitable habitat not likely to be present
Biodiversity – Priority Species				
Schedule 1 Birds Species:	No			Adjacent agricultural land and consequently areas of the woodland are highlighted on Magic Map as priority areas for several bird species. • Priority species target area for Corn Bunting, Grey Partridge, Tree Sparrow, Lapwing. • Arable Assemblage Farmland Birds
Mammals (Red Squirrel, Water Vole, Pine Marten etc)	No			No records on NBN
Reptiles (grass snake, adder, common lizard etc)	No			No records on NBN
Plants	Yes	ALL		Rich plant community throughout the woodland and internal ride grass areas. Notable local species is Spreading Bellflower (*Campanula patula*). NBN lists 306 species records but this does include some specimen trees. There is an ongoing monitoring program undertaken by volunteers and supervised by Forest Research.
Fungi/Lichens	Yes	ALL		377 species are recorded on the NBN although the Cotswold Fungus Group have recorded 1300 species at Westonbirt.
Invertebrates (butterflies, moths, beetles etc)	Yes	ALL		Priority species may be present but there are limited records available. NBN has recorded 607 species in the wider area.
Amphibians (pool frog, common toad)	Yes			Likely to be present. However, there is no standing water
Badgers	Yes	ALL		Badgers are present in the woodland and several setts have been highlighted. Any forest management will take these into consideration
Historic Environment				
Scheduled Monuments	No			
Unscheduled Monuments	No			
Registered Parks and Gardens	Yes	All excluding SW5, 6 & 7		Westonbirt Grade 1 - 1000457 https://historicengland.org.uk/listing/the-list/list-entry/1000457
Boundaries and Veteran Trees	Yes	ALL		Veteran and potential veteran trees identified throughout the woodland but not yet mapped.
Listed Building on adjoining land	Yes	SW6		Adjoining land on western edge of woodland. WASTE BARN AND ADJOINING STABLE AND ANIMAL SHELTER https://historicengland.org.uk/listing/the-list/list-entry/1153174
Woodbank	Yes	SW5 & SW7		There is a wood bank running along the eastern edge of comps SW5 and SW7 this

				appears to extend along the southern edge of Silk Wood
Artificial Fox earth	Yes			Southern edge of Palmer Ride adjacent to old native species collection
Landscape				
National Character Area (please Specify): **NCA Profile:107. Cotswolds (NE420)**				
National Park	No			
Area of Outstanding Natural Beauty	Yes	All		Cotswolds AONB http://www.landscapesforlife.org.uk/about-aonbs/visit-aonbs/cotswolds-aonb
NCA link:	Yes	All		http://publications.naturalengland.org.uk/publication/5900626?category=587130
People				
CROW Access	No			
Public Rights of Way (any)	Yes	Silk Wood		Bridle way and Macmillan Way long distance path. Running through centre of wood. This is partly a permissive path
Other Access Provision	Yes/No			Entry to site is by payment
Public Involvement	Yes	All		Public access across the whole site Friends organisation https://www.fowa.org.uk/
Visitor Information	Yes	All		https://www.forestryengland.uk/westonbirt-the-national-arboretum
Public Recreation Facilities	Yes	All		Path track network, restaurants, visitor centre, toilets, Friends visitor building, education facilities
Provision of Learning Opportunities	Yes			Dedicated team and expansive program https://www.forestryengland.uk/westonbirt-the-national-arboretum/learning-westonbirt
Anti-social Behaviour	No			
Other – Parish Boundary	Yes	All		The central N/S ride in Silk wood is a parish boundary dividing Didmarton CP to the west and Westonbirt with Lasborough CP to the east
Water				
Watercourses	Yes	B1-B7		Occasional watercourse usually after heavy rain running down valley along boundary of coppice area B
Lakes	No			
Ponds	No			Seasonal catchment in sinkholes no permanent water
Other (please Specify):	Yes	All		Ditch and drain network throughout site. Only occasional water after heavy rain

4.3 Habitat Types

This section is to consider the habitat types within your woodland(s) that might impact/inform your management decisions. Larger non-wooded areas within your woodland should be classified according to broad habitat type where relevant this information should also help inform your management decisions. Woodlands should be designed to achieve a diverse structure of habitat, species and ages of trees, appropriate to the scale and context of the woodland.

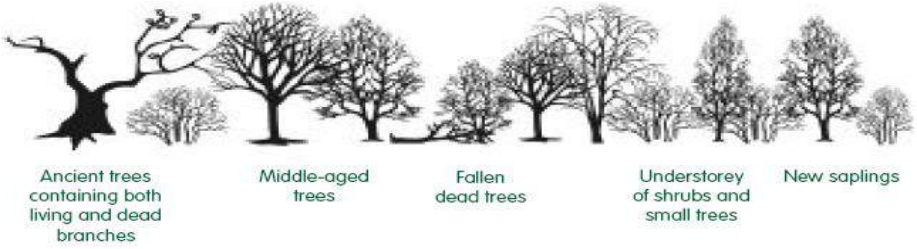
Feature	Within Woodland	Cpts	Map No	Notes
Woodland Habitat Types				
Ancient Semi-Natural Woodland	Yes	See notes		All R1, SW1, 2, 3, 5, 6, 7, 8, 9 and parts of SW10, 14, 15, 23
Planted Ancient Woodland Site (PAWS)	Yes	See notes		Part of SW10, 14, 15, 23 and all SW11, 13, 16, 17, 18, 19, 20, 21, 22, 24 plus all coppice areas
Semi-natural features in PAWS	Yes	All listed		All woodlands have a species mix associated with ASNW but do include non-native trees as specimens or groups
Lowland beech and yew woodland	No			
Lowland mixed deciduous woodland	Yes	All listed		Generally mixed broadleaf with occasional conifers in places
Upland mixed ash woods	No			
Upland Oakwood	No			
Wet woodland	No			
Wood-pasture and parkland	No			On all of adjacent Arboretum estate
Other (please Specify):	Yes/No			
Non-Woodland Habitat Types				
Blanket bog	No			
Fenland	No			
Lowland calcareous grassland	Yes	All rides and open arboretum areas		Most of the open grassland could be classed as lowland calcareous but it much depleted
Lowland dry acid grassland	No			
Lowland heath land	No			
Lowland meadows	No			
Lowland raised bog	No			
Rush pasture	No			
Reed bed	No			
Wood pasture	No			
Upland hay meadows	No			
Upland heath land	No			
Unimproved grassland	No			
Peat lands	No			
Wetland habitats	No			
Other (please Specify):	No			

4.4 Structure

This section should provide a snapshot of the current structure of your woodland as a whole. A full inventory for your woodland(s) can be included in the separate Plan of Operations spreadsheet. Ensuring woodland has a varied structure in terms of age, species, origin and open space will provide a range of benefits for the biodiversity of the woodland and its resilience. The diagrams below show an example of both uneven and even aged woodland.

Woodland Type (Broadleaf, Conifer, Coppice, Intimate Mix)	Percentage of Mgt Plan Area	Age Structure (even/uneven)	Notes (i.e. understory or natural regeneration present)
Coppice – Mixed broadleaf	11%	Even	Mostly hazel coppice with oak standards
Mixed Broadleaf	39%	Uneven	Mixture of mature MB woodland with rich mix of tree and shrub species. Variable age structure
Research Sites	3.5%	Even	Research trial sites planted in 2012. MB and MC mainly non-native forestry species
Arboretum	41.5%	Uneven	Mixture of specimen broadleaf and conifer trees and shrubs. Generally open grown trees
Rides and tracks within woodland	5%		Ride & roads within woodland blocks

Uneven-aged woodland – many wildlife habitats because of high diversity



Even-aged woodland – tidy but of low diversity

Section 5: Woodland Protection

Woodlands in England face a range of threats; this section allows you to consider the potential threats that could be facing your woodland(s). Use the simple Risk Assessment process below to consider any potential threats to their woodland(s) and whether there is a need to take action to protect their woodlands.
Note: To add more tables, Copy the table and Paste below.

5.1 Risk Matrix

The matrix below provides a system for scoring risk. The matrix also indicates the advised level of action to take to help manage the threat.

Impact	High	Plan for Action	Action	Action
	Medium	Monitor	Plan for Action	Action
	Low	Monitor	Monitor	Plan for Action
		Low	Medium	High
		Likelihood of Presence		

5.2 Plant Health

Threat – 'chalara', Ash Dieback - *Hymenoscyphus fraxineus*	
Likelihood of presence - high	Already present and causing extensive and progressive die-back. It is already having a major impact on the safety and health of the woodland
Impact - high	Major impact as ash is a very high component of the stem and volume figures for many of the compartments. In addition, the ash collection of different species and cultivars is situated in Silk Wood adjacent to compartment SW16. Many of these are infected and there is the potential of losing this genera and several associated members of the *Oleaceae* family
Response	• See details under Appendix 2 – Ash management options in Westonbirt Silk Wood • Identify, mark and retain any ash that are showing apparent resilience or little die-back • Remove infected ash from ride and track sides within at least 1 tree length to reduce health and safety concerns from falling trees. • Thin some compartments to allow light and air movement and encourage regeneration • Selective fell areas of heavily infected ash and replant / regenerate • Allow ash to regenerate and provide opportunity for possibly resistant seedlings to grow • Maximise income from the sale of any good quality timber butts • Spread future plantings of ash specimens throughout wider collection • Engage with visitors to ensure that they understand the work being undertaken and encourage them to participate further in our woodland culture

Threat – *Phytophthora ramorum*	
Likelihood of presence - medium	PR has been found and controlled on another area in the old arboretum.
Impact - high	Potential to cause the death of certain specimen trees and potential for infecting overstorey plantings of larch.
Response (inc protection measures)	• Monitor for presence by regular health checks – already in place as visited regularly by Forest Research tree health team • Maintain and manage the pasteurisation facility for forestry and arboricultural residues at the northern end of Silk Wood in compartment SW23 • Ensure biosecurity protocols are in place and used when visiting the sites • Engage with visitors to ensure that they support Keep it Clean campaign and take responsibility for their own actions to reduce the risk of spreading pests and disease

Threat – *Dendroctonus micans* – Great Spruce Bark Beetle	
Likelihood of presence - High	The beetle is already present onsite and has caused the death of several specimen spruce.
Impact - Medium	It has the potential to cause the death of more specimen spruce trees which would lessen the overall value of the arboretum collection and mean that spruce may not be planted in the future.
Response (inc protection measures)	• Monitor for presence by regular health checks – by staff or as part of the regular monitoring by Forest Research tree health team • If found arrange for release of the biological control *Rhizophagus grandis* by Forest Research and monitor.

Threat – General	
Likelihood of presence - Low	There are a number of potential pests and diseases that could devastate the woodland and tree collection if they arrived on site.
Impact - High	A number of diseases e.g. *Xylella* could potentially kill most of the trees onsite and the arrival of a pest e.g. Oak processionary moth could have major public health implications
Response (inc protection measures)	• Ensure up to date biosecurity register and plan is agreed, and all staff are aware of it. • Monitor for presence by regular health checks – by staff or as part of the regular monitoring by Forest Research tree health team • Ensure staff are up to date with potential diseases and pests through regular training. • Link with other botanic gardens and the Sentinel Network to be forewarned of any issues elsewhere.

	• Engage with visitors to ensure that they support Keep it Clean campaign and take responsibility for their own actions to reduce the risk of spreading pests and disease

5.3 Deer

Likelihood of presence - high	Roe, Muntjac and occasional fallow have been recorded -the latter according to records on the NBN gateway
Impact - high	There is evidence throughout all the woodlands of deer browsing which is reducing regeneration and probably affecting the herb / flower mix. Specimen trees are also vulnerable to browsing and fraying. Coppice areas already require protection in the early years and future work will involve replanting or encouragement of natural regeneration. The research trial areas have all been fenced against deer.
Response (inc protection measures)	• Instigate a program of deer culling and maintain network of deer glades and high seats • Maintain deer fence around research areas • Undertake protection of newly planted trees using tubes or other suitable protection methods • Erect temporary fences around larger areas of coppice or coupes for natural regeneration • Monitor for damage and respond as required • Use any venison in the restaurants at Westonbirt

5.4 Grey Squirrels

Likelihood of presence - high	Grey squirrels are omnipresent throughout Silk Wood.
Impact - high	Squirrels have the potential to damage remaining trees once ash has been thinned out. This could increase the pressure on a range of other sensitive tree species both within the woodland blocks and amongst the planted specimens.
Response (inc protection measures)	• Instigate a program of control. This is likely to be by shooting as trapping would be difficult due to the high numbers of visitors who will interfere with traps • Monitor for damage and respond as required • Trial the Good Nature squirrel traps

5.5 Livestock and Other Mammals

Threat - Rabbit / Hares	
Likelihood of presence - high	Rabbits and hare can be found throughout the woodland blocks.
Impact - high	Browsing of young newly planted trees and regeneration is likely and will lead to losses. Additional damage can occur to valuable specimens. The research trial areas have all been fenced against rabbits.

Response (inc protection measures)	• Instigate a program of control by shooting where required • Maintain rabbit fence around research areas • Undertake protection of newly planted trees using tubes or other suitable protection methods • Erect temporary fences around larger areas of coppice or coupes for natural regeneration • Monitor for damage and respond as required

Threat – Cattle	
Likelihood of presence - high	Cattle are used to graze the down-land in the adjacent wood pasture to the east of Silk Wood. This is part of the annual cycle of grassland management
Impact - low	Ingress by cattle is unlikely but possible and would likely be picked up and rectified quickly. Browsing could occur on trees near to the main gateways
Response (inc protection measures)	• Ensure cattle are regularly monitored • Check the effectiveness of fences, gates and cattle grids regularly • Have a plan in place to remove cattle from the woodland

5.6 Water & Soil

Threat - Soil damage and erosion during forest operations	
Likelihood of presence - high	Forest soils are delicate and ancient woodland soils are present across this woodland. Careful planning and timing of operations is essential to minimise damage. The soils generally drain well but can hold pools of water where compacted. Erosion should be a minor issue
Impact - high	There will be a lot of harvesting work being undertaken over a relatively short time scale, so some damage is inevitable.
Response (inc protection measures)	• Undertale operations when soils are dry • Create a permanent network of operational felling and extraction routes. This will limit damage to a relatively small surface area and could create additional diverse micro-habitats for fauna and flora. • Undertake operations with low ground pressure equipment whenever possible

Threat – Fuel / oil spillage during forest operations	
Likelihood of presence - high	'Spot' pollution from forestry machinery is a threat and will be planned for in the hazard planning of any operations.
Impact low	Likely to effect very small areas
Response (inc protection measures)	• Ensure fuelling and maintenance areas are away from water courses • Include forest operations in any pollution plan • Ensure all operators have spill kits available and know how to use them

5.7 Environmental

Threat to Woodland - Wind	Silk wood is exposed to wind on most sides and therefore vulnerable to wind damage. Fortunately, the woodland is mainly broadleaf, and the soils allow for good anchorage and windblown is uncommon.
Likelihood of presence - low	Very little evidence of wind blow within woodland. There is a good windfirm edge around the entire site
Impact - low	Minor issue in current condition
Response (inc protection measures)	• Maintain windfirm edge to woodland • Pocket felling within woodland to minimise operational exposure

Threat to specimen collection – wind	Many of the specimen plantings are open grown trees made up of mature conifers and broadleaves. These have large crowns and consequently large sail areas with the potential for wind blow. Proposed work in the adjacent woodlands that currently provide a degree of shelter will need to be diligently planned.
Likelihood of presence - high	There is likely to be a higher level of wind blow within the woodland blocks after operations have occurred.
Impact - high	The potential to lose old valuable specimen trees some of which may be irreplaceable
Response (inc protection measures)	• Maintain windfirm woodland edge wherever possible • Retain ash and other trees to assist with protection where they do not create a safety risk

Threat to woodland - Invasive Species	The nature of any botanical collection is the inclusion of potentially invasive trees and shrubs. Some specimens planted in Silk Wood will have the potential to become invasive
Likelihood of presence - medium	Invasive tree species are present. The frequency of seed production and alignment of the right conditions for regeneration are infrequent.
Impact - low	Likely to be single or small patches of regeneration
Response (inc protection measures)	• Monitor for regeneration of invasive species • Remove if likely to become established with the woodland blocks

5.8 Social

Threat - Rights of Way	Access via any rights of way network should be maintained and kept open
Likelihood of presence - high	A bridle way and Macmillan long distance path runs through the centre of Silk Wood. There is also a public footpath running along the southern boundary of the wood

Impact - low	There are few woodland blocks that are adjacent to the bridle way. There should be no impact on the external right of way unless blocked by falling trees from within the wood.
Response (inc protection measures)	• PRW's are kept open and well signed if any operations are taking place. • Monitor trees / woodland adjacent to the PRW's for any safety issues and respond promptly

Threat - permissive access	An extensive network of rides, paths and roads exists throughout Silk Wood.
Likelihood of presence - high	There is unimpeded access and all routes are well used.
Impact - low	There is little impact by visitors
Response (inc protection measures)	• Maintain access in good condition suited to access requirements • Use signage for any temporary closures

Threat – engagement activities such as trails and events	Soil compaction / reduced biodiversity / impact on landscape
Likelihood of presence – high	We have almost 600,000 visits to the arboretum/annum; around 70% visit Silk Wood. Our activities can increase visitation to particular areas
Impact – Low	There is little impact by visitors
Response (inc protection measures)	• OSA system to ensure consultation with Collections team • Move trails / activities around to spread visits • Maintain good hard / woodchip path network

5.9 Economic

Threat (Timber forecasting, markets, products, operational costs etc)	The focus of the work in Silk Wood is to manage the woodland with the rapid impact of 'chalara', ash die-back and bring the woodlands back into regular management.
Likelihood of presence - high	A large amount of work will take place over a short period
Impact - high	There will be quick changes to the wood based on carefully planned operations around the current rate of ash decline. If ash declines faster than expected plans may need to change and overall delivery of agreed operations rescheduled or brought forward.
Response (inc protection measures)	• Prioritise operations to make the most of any income opportunities. • Monitor decline of ash • Provide good packages of work for contractor efficiency • Produce flexible plans and expect the unexpected

5.10 Climate Change Resilience

Threat - Uniform Structure	Silk Wood is made up of a diverse species mix of varying ages. Ash is the dominant species follow by POK. Previous operations have created an even age structure in the ash with the majority being in the region of 50 years old. Similarly, the oaks are generally 200 to 210 years of age and of low timber quality but high conservation value.

Likelihood of presence - high	A uniform structure exists in many compartments within the high canopy species
Impact - high	The loss of one species due to disease will have a large impact on the woodland composition and the associated biodiversity.
Response (inc protection measures)	• Maintain a wide variety of species and age classes reflecting the current structure • Encourage regeneration wherever possible • Introduce additional species both native and naturalised in any planting operations

Threat – Limited Provenance	The species present will be adapted to the site and may not be able to adjust to rapid climate change and the associated changes to site conditions. Many of the canopy species such as POK and ash may have been planted in the past.
Likelihood of presence - high	There may be provenances of some species from other areas within or outside of the UK that could provide some resilience
Impact - high	Climate predictions would indicate a change of site conditions over time and likely change to species success both negatively and positively
Response (inc protection measures)	• Encourage natural regeneration of all species to allow naturally adaptable progeny to survive • Introduce a range of additional species that would likely arrive within these woodland over time given the right opportunities • Source seed for existing species from more southerly provenances both within the UK and throughout its natural European range • Introduce near natives and species that would have arrived in the UK if a land bridge with Europe were still present and consider those species not able to recolonise northern Europe after the last ice-age

Section 6: Management Strategy

This section requires a statement of intent, setting out how you intend to achieve your management objectives and manage important features identified within the previous sections of the plan. A detailed work programme by sub-compartment can be added to the Plan of Operations.

Management Objective / Feature	Management Intention
Environmental: Maintain the woodland cover and ecosystems by:	
1. Managing the gradual decline of ash as a major species by use of appropriate silvicultural systems and maximising opportunities for the continued presence of ash 2. Bring into active management all the woodland areas within Silk Wood to ensure their long-term survival.	To achieve these ojectives a number of silvicultural options will be undertaken. The operations will structurally diversify the woods; provide long-term landscape continuity; promote habitat development; conserve cultural interest; create open space and forestry infrastructure and render marketable timber and fuelwood materials for sale. Forestry Commission England, **Operations Note 046: Managing ash (Fraxinus excelsior) in woodlands in light of ash dieback (Hymenoscyphus fraxineus)** was used as a basis for decision making. The operations include: **Coppice** – The existing coppice areas will continue under the current management regime. This is detailed in a separate coppice woodland management plan Appendix 1 and will not be detailed further in this plan. Information will be included in the Inventory, Plan of Operations. **Thinning** - Areas of closed and closing canopy high forest will be thinned to sustain the best trees for timber development, disease resistance and adaptation to climate change. Thinning will not exceed 30% canopy area unless a specific objective requires a higher level of intervention, which will be stated in the Plan of Operations. Thinning will help maintain the diverse storey and structure of the woods and encouage a diversity of tree species to develop. At the same time, declining mature timber trees will be removed from the wood as part of the thinning operations, where there is an appreciable market value for the timber, as long as it is regarded safe to do so, with regard to possible bat roosts or other important micro-habitats. **Felling / selective felling** – A programme of selective felling and regeneration will be part of the mix of operations as detailed in the Plan of Operations. Felling coupes will generally not exceed 0.25ha in selective felling areas and will be targetted on areas of weaker canopy and poorer trees. More extensive areas may be clear felled to achieve wider goals of species diversification or where compartments are so small that the removal of ash will leave very little standing

	Ride side thinning – A major part of the early operations is safety work required to mitigate potential issues from dying ash adjacent to rides. Failing ash will be felled within in one tree length of all the ride network. Other species will be left where possible to maintain occasional shady rides. Other rides may require opening up by removal of the majority of trees of all species especially if the non-ash trees are unbalanced or unhealthy. More detailed descriptions of the different management options to be undertaken in Silk Wood are detailed in Appendix 3. Fire and wind risks will be considered in planning interventions Alternative methods of managing the Ash woodland are considered further and in more detail under Educational opportunities below. This includes opportunities for demonstration of various silvicultural systems for sustainable woodland management based in various publications and advisory information published to date.
Using natural regeneration wherever possible with additional enrichment planting as appropriate taking into consideration provenances suited to the expected future climatic conditions.	Regeneration will mainly be through natural regeneration supplimented by planting of native, honorary native and deciduous exotic species that best suit the site to provide further diversification. The decision to plant may be left until thinning / felling operations have occurred as replanting may not be required if sufficient undertorey or regeneration is present. Any planting is likley to be in groups or scattered across the woodlands and will be in the form of 'enrichment' to gradually introduce new species and develop a wider age range. Larger scale restocking in a more formal forestry style may be required were ash has failed completely and there is little or no chance of regeneration or replacement by the existing understorey. Attention will be given to provenance and origin to select UK south and south eastern stock as well as that to the south in continental Europe. Where available, plants will also be chosen from selected and improved sources for timber production. Ash and other native species naturally regenerating from seed or coppice regrowth will be accepted into the regeneration. All regeneration sites will be appropriately protected and maintained to ensure effective establishment and future growth. This will include selective formative and high pruning.
Integrating Forest Developments types into long-term management	The idea of Forest Development Types (FDTs) is widely used in forestry practice in Germany to design and manage site adapted mixed stands. The main idea of FDTs is that they provide *a long-term vision of how the species composition and structure of a*

	forest stand is intended to develop. At present, there is no equivalent tool in Britain but a project in Forest Research is currently developing the concept for application in Britain. When the project has been completed, we will attempt to use FDTs for selected areas of Silk Wood. At a time when we are trying to increase the resilience of the forest estate the idea of FDTs could be a useful tool for forest planners and managers.
Seeking opportunities to conserve ancient woodland soils	Soils within ancient woodland are a precious and fragile resource. Every effort will be taken to minimise any damage during forestry operations. Timing of forestry work should take advantage of the drier summer months. A network of permanent operational and extraction routes will be established within the woodland blocks. These will be used for any subsequent operations and will minimise the overall impact on the forest soils. Undertaking work over the summer period has the potential to impact on bird nesting. The public perception of this issue is greater than the actual effect and careful planning and survey will reduce any impact. Messages on the long-term benefits to habitat and additional bird nesting opportunities should be built into any publicity and educational messages.
Improving ride network and additional open space	Thinning will be used as an opportunity to maintain and develop ride and glade open space and to carefully open up any known or new features of archaeological, historical or cultural interest.
managing existing and increasing deadwood habitat	Thinning also helps with deadwood habitat development, in that brash where approriate, will be piled into habitat piles, individual trees will be felled and left on site and where appropriate tree ringbarking will be used to develop further standing deadwood, initially this will be limited until the impact of ash dieback is better understood.
identifying and safeguard existing and potential veteran trees	As part of the operational planning process existing and potential veteran trees of all species will be identified, mapped and highlighted before any operation takes place. Thinning will be used as a tool to gradually open up identified veteran or potential veteran' trees, without overexposing them.
Ensuring wildlife habitat and protected species are identified and protected and operations timed to minimise impact	Forestry operations will be planned and executed in a way so as to minimise the risk to protected species, such as EPS, badgers and nesting birds, as well as to features such as the ancient woodland soil and ground flora. To build biodiversity gains into all forestry operations, as outlined above.
Adapting a forward think policy taking into	The biggest, long-term threat is probably that associated with climate change and the interplay with new and advancing pests

consideration potential climate change impacts	and diseases, and the main response to that will be continued diversification, as described above.
Promoting understanding of sustainable silvicultural / arboricultural practices in society to foster support for better environmental management more widely	Develop SW11-13 specifically to facilitate public engagement with silvicultural practices including giving them a say in how we develop this area. Provide more practical / education opportunities to support students at all levels to study different silvicultural systems for sustainable woodland management. This will include work experience and led activities. Continue to incorporate engagement aims into our operations to ensure integration of works with an evolving interpretation / arts programme to foster public understanding and advocacy for sustainable woodland management Work in partnership to grow opportunities for people to undertake research using Silk Wood
Monitor and evaluate the changes to improve knowledge	Undertake baseline vegetation survey. Encourage ongoing monitoring via use of volunteer group. Archive plans and operational records for future reference.
Economic: To manage the woods on a cost neutral basis by:	
Ensuring a steady income by careful planning and undertaking work over a realistic deliverable time scale.	An inventory and general survey will be undertaken to provide background information to inform decisions when planning any work (Appendix 2). This will be input into an agreed Inventory and Plan of Operations. This will allow any approved contractor the opportunity to budget effectively and market any produce to maximise income.
Taking opportunities to maximise income by identifying high quality products and marketing them appropriately.	The woodlands contain a number of high value timber trees. Wherever possible saleable logs of cherry, ash, oak and any other quality hardwood should be identified and harvested if removal does not compromise the integrity of the stand. Silvicultural thinning operations should identify and maintain any trees that show future potential as a high value product.
Showcasing the value of sustainable timber production and use of timber to society and the environment	Continue to develop Westonbirt Woodworks to utilise wood from ongoing management of Westonbirt Support Coppice workers and develop public engagement programme with their work Continue to develop interpretation offer to support messages around sustainable timber production and benefits of using wood as a material and for carbon sequestration
Planting improved tree species and non-native high value broadleaves to ensure future income streams and to	Where available, plants will be chosen from selected and improved sources for timber production. This will help develop a longer-term timber resource for sale or use within Westonbirt Arboretum. Ensure the database clearly records location and details of planting stock.

demonstrate to other managers viable silvicultural options	
Ensuring adequate control measures are adopted to prevent damage by deer, rabbits and other vermin	Vulnerable specimen trees and planted areas will be protected using fencing or suitable barriers. Protection will include annual, managed deer culls to take reasonable actions to keep the deer pressure at a sustainable level on and near the estate, working with neighbours, where possible, to deliver benefits at a landscape scale. Grey squirrel impact monitoring will take place and lawful lethal population control will be undertaken where damage is occurring or expected to occur, to reduce this to tolerable levels. This will; need to be carefully considered as any control will be visible to public scrutiny.
Social: To enhance the social aspects of the woodland by:	
Managing the specimen collections in silk wood to the highest internationally accepted standards	The National Arboretum is managed by a dedicated team of highly skilled Arborists supported by a Curator, Collection Manager, Propagator and Dendrologist. In order to maintain a robust and purpose-built recording system, Iris BG is a plant records database that provides essential information on individual specimens including location, collection, propagation and planting history as well as any tree safety information on those that pose a higher than normal risk to Arboretum users. This database is managed by a Plant Records Officer. The high standards adopted at The National Arboretum are already recognised through accreditation schemes such as Arb Net. Continued Professional Development opportunities for all staff to improve skills and knowledge at practical and consulting levels.
Developing the collection by planting new specimens to enhance and add value to the existing collection and ensuring survival into the future	Annual planting programmes are delivered as a result of a strict accessions policy. This policy ensure only plants that meet Arboretum aims and objectives are selected, these being those plants with • Heritage and Historical Value • Plants of Landscape Interest • National Collections • Education and Learning • Science and Research • Conservation
Maintaining the network of rides and paths to enable better access to all	The woods are well served by grass rides and tracks. These will be maintained in good order, through ongoing repairs and the regular cutting of grass swards. Ride edge vegetation will also be cut on rotation where appropriate The public rights of way will be maintained open and in a safe condition.

	As part of the community woodland area we will develop a network of woodchip paths to improve / encourage access into Silk Wood's native woodland areas
Managing and safeguarding historic features within the woodland e.g. wood bank	The wood bank should be properly mapped, and potentially damaging operations identified. This feature could be opened up where appropriate and used as an educational opportunity to highlight the ancient history of Silk Wood.
Maintaining the landscape in a way that respects and enhances the Grade 1 Registered Park and Garden and Ancient Woodland designations.	Ongoing management of The National Arboretum is guided by the natural landscape and its historical importance. Maintaining the picturesque landscape as emphasised by W.S.Gilpin is a key obligation at Westonbirt. Maintenance of three distinct areas within the arboretum boundaries, Old Arboretum, The Downs and Silk Wood along with their recognised features shall continue. Manage the woodland in line with the Managing Ancient and Native Woodland in England Practice Guide FCPG201
Enabling people to play an active part in the management of Silk Wood through community programmes and volunteering Providing opportunities for healthy woodland activities that support better mental health and wellbeing	Use development of SW11-13 to offer more practical opportunities to people to get involved in managing / monitoring Silk Wood through volunteering Existing community projects such as Community Coppice will continue. Continue to use Silk Wood to support the Active Forest programme. Develop new community initiatives to further utilise Silk Wood for wellbeing.
Maintaining public safety	Tree based safety risk management will be continued to safeguard visitors on the land and public rights of way.
Learning: Develop learning opportunities within Silk Wood to:	
Provide better accessibility	As part of SW11-13 community woodland area we will: • develop network of woodchip paths to improve / encourage access into Silk Wood's native woodland areas • involve more of our close neighbours and community so they feel a sense of belonging
Raise profile of Silk Wood's native woodland to give it equal status with our ornamental areas	Develop a vibrant interpretation / arts offer to engage visitors with Silk Wood's story in a manner that highlights the values of trees and woodland to society and the environment

Deepen people's relationship with Silk Wood (particularly local people) to connect people with the management story in Silk Wood Encourage and enable personal / societal change to promote a more sustainable future	Use SW11-13 to • allow full public involvement in all stages of its development from initial planning and replanting through to ongoing care, monitoring and use • provide long term participation opportunities that showcase the importance of woodland management • develop a vibrant interpretation / arts offer to engage visitors with Silk Wood's story in a manner that highlights the values of trees and woodland to society and the environment • develop specific areas in planting such as glades to facilitate broad range of activities from silent spaces to natural play For more detail available in the Engagement Strategy and associated plans
Enable other professionals to benefit from our experience	Take opportunities to showcase the work to other professionals via onsite visits or publications when possible

Section 7: Stakeholder Engagement

There can be a requirement on both the FC and the owner to undertake consultation/engagement. Please refer to Operations Note 35 for further information. Use this section to identify people or organisations with an interest in your woodland and to record any engagement that you have undertaken, relative to activities identified within the plan.

Work Proposal	Individual/ Organisation	Date Contacted	Date feedback received	Response	Action
Forest Research colleagues have been closely involved in this project from the outset, providing valuable advice and even authoring the Woodland Management Plan.	Forest Research	Ongoing	Ongoing	Forest Research continue to be closely involved and provide regular feedback.	Continued assistance throughout the planning, forestry operations, restocking and monitoring.
A full programme of engagement and interpretation has been underway over the last few years, designed to highlight the issue, warn of change, and seek views. The '*Silk Wood Chalara Project - Communications Plan*', and accompanying Action Plan detail how this is being achieved. It has led to a wide variety of engagement and	• Westonbirt Staff • Visitors • Friends of Westonbirt Arboretum (FOWA) • Local residents and neighbours • National Arboreta Advisory Committee • Other interested parties • Partner organisations • Ash Woodland Owners	Ongoing	Ongoing	We are continuing to actively engage with a wide-ranging audience, from visitors and the general public, to fellow professionals and woodland owners. We are looking to share our experience so that others can be better informed and learn from our experience.	The Communications Plan objectives are: • Coverage in three national publications – preferably Horticulture Weekly, Gardeners World, etc. • Coverage in six local media outlets – preferably Points West, ITV news by the end of Autumn. • To promote understanding of what Chalara Ash Dieback is and Westonbirt's role in research into further understanding the disease and how to manage it.

communications such as '*Chalara Ash Dieback in Silk Wood - What you need to know'.*					• To promote understanding and engagement with the fact that the landscape of Silk Wood will be changing and the reasons behind this.
The main stakeholder engagement will take place through the formal consultation of the Westonbirt Forest Design Plan 2020-2030, as this Wood Woodland Management Plan is an essential component and is referred to for all aspects of management for all our woodland areas. We are following the Forestry England '*Engage your stakeholders: a practical guide*' in this respect.					

Section 8: Monitoring

Indicators of progress/success should be defined for each management objective and then checked at regular intervals. Other management activities could also be considered within this monitoring section. The data collected will help to evaluate progress.

Management Objective/Activities	Indicator of Progress/Success	Method of Assessment	Frequency of Assessment	Responsibility	Assessment Results
Maintain the woodland cover and ecosystems	Woodland recovers and survives	Visual over time – photo records	Annually spring or summer	FOWA Volunteers	By management team supported by FR
Manage the woods on a cost neutral basis	Balance sheet	Records of income and expenditure	Annually	Management team	Self-assessed and reviewed by management
Enhance the social aspects of the woodland	Increased interest in work and active engagement programme	Visitor surveys	TBC	Engagement team	Self-assessed and reviewed by management
Develop learning opportunities within Silk Wood	Increased interest in work and active engagement programme	Visitor surveys	TBC	Engagement team	Self-assessed and reviewed by management
Impact of deer on regeneration	Deer having no impact on regeneration	FR to develop assessment protocol including fenced and unfenced areas	Spring / Autumn TBC	FR and FOWA Volunteers	FR to review and report annually including any management recommendations
Development of flora and fauna on new forest rides	Increased number of ride species	Baseline at start and annual survey	TBC	FR and FOWA Volunteers	FR to review and report annually including any management recommendations

UK Forestry Standard woodland plan assessment
For FC office use and approval only:

UKFS management plan criteria	Minimum approval requirements	Achieved	Review notes
Plan Objectives: Forest management plans should state the objectives of management and set out how an appropriate balance between social, economic, environmental objectives will be achieved.	• Management plan objectives are stated. • Consideration is given to environmental, economic and social objectives relevant to the vision for the woodland.	**Yes**	
Forest context and important features in management strategy: Forest management plans should address the forest context and the forest potential and demonstrate how the relevant interests and issues have been considered and addressed.	Management intentions communicated in ***Sect.6*** of the management plan are in line with stated objective(s) in ***Sect. 2***. Management intentions should take account of: • Relevant features and issues identified in the woodland survey (***Sect. 4***). • Any potential threats to and opportunities for the woodland, as identified under woodland protection (***Sect. 5***). • Relevant comments received from stakeholder engagement are documented in ***Sect. 7***.	**Yes**	
Identification of designations within and surrounding the woodland site: For designated areas, e.g. National Parks or SSSI, particular account is taken of landscape and other	• Survey information (***Sect. 4***) identifies any designations that impact on woodland management. • Management intentions (***Sect. 6***) have taken account of any designations.	**Yes**	

sensitivities in the design of forests and forest infrastructure.			
Felling and restocking to improve forest structure and diversity: When planning felling and restocking, the design of existing forests should be re-assessed, and any necessary changes made to meet UKFS requirements. Forests should be designed to achieve a diverse structure of habitat, species and age range of trees, appropriate to the scale and context. Forests characterised by a lack of diversity, due to extensive areas of even-aged trees, should be progressively restructured to achieve age class range.	• Felling and restocking proposals are consistent with UKFS design principles (for example scale and adjacency). • Current diversity (structure, species, age structure) of the woodland has been identified through the survey (***Sect. 4***). • Management intentions aim to improve / maintain current diversity (structure, species, and ages of trees).	**Yes**	
Consultation: Consultation on forest management plans and proposals should be carried out according to forestry authority procedures and, where required, the Environmental Impact Assessment (Forestry) Regulations.	• Stakeholder consultation is in line with current FC guidance and recorded in ***Sect. 7***. The minimum requirement is for statutory consultation to take place, and this will be carried out by the Forestry Commission. • Plan authors undertake stakeholder engagement (ref FC Ops Note 35) relevant to the context and setting of the woodland.	**Yes**	
Plan update and review: Management of the forest should conform to the plan, and the plan	• A 5-year review period is stated on the 1st page of the plan	**Yes**	

should be updated to ensure it is current and relevant.	• ***Sect. 8*** is completed with 1 indicator of success identified per management objective		

Approved in Principle *This means the FC is happy with your plan; it meets UKFS requirements.* *a) You can use it to support a CS-HT or other grant application.* ***b) You do not yet have a licence to undertake any tree felling in the plan.***	**Name (WO or FM):** **Sam Negus**	**Date:** **18/11/20**
Approved *This means FC is happy with your plan; it meets UKFS requirements, and we have also approved a felling licence for any tree felling in the plan (where required).*	**Name (AO, WO or FM):** **Sam Negus**	**Date:** **9/12/20**

Silk Wood Compartments

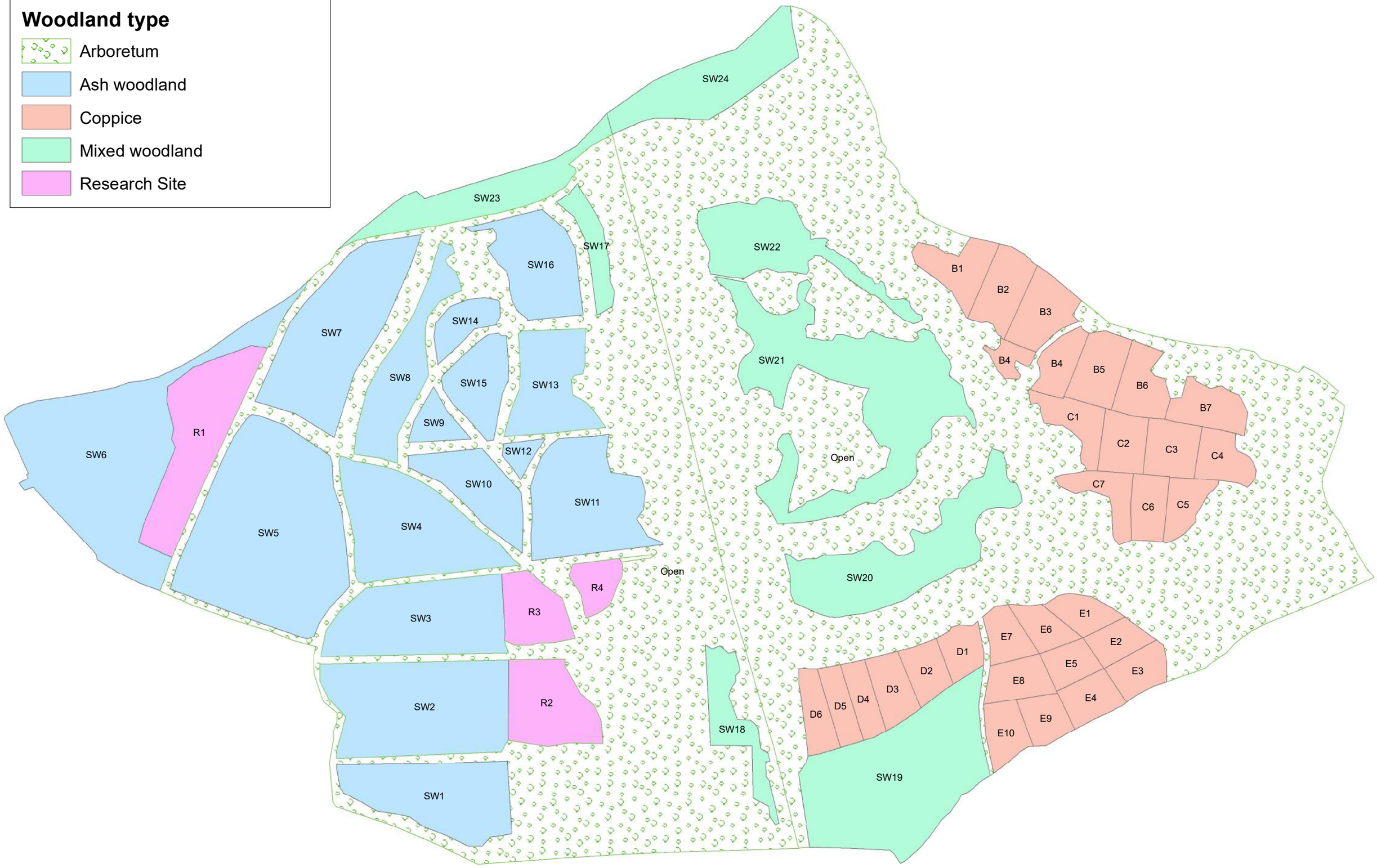
Silk_Wood

Woodland type

- Arboretum
- Ash woodland
- Coppice
- Mixed woodland
- Research Site

0 125 250 500 Meters

Map 1



Silk Wood - felling proposals

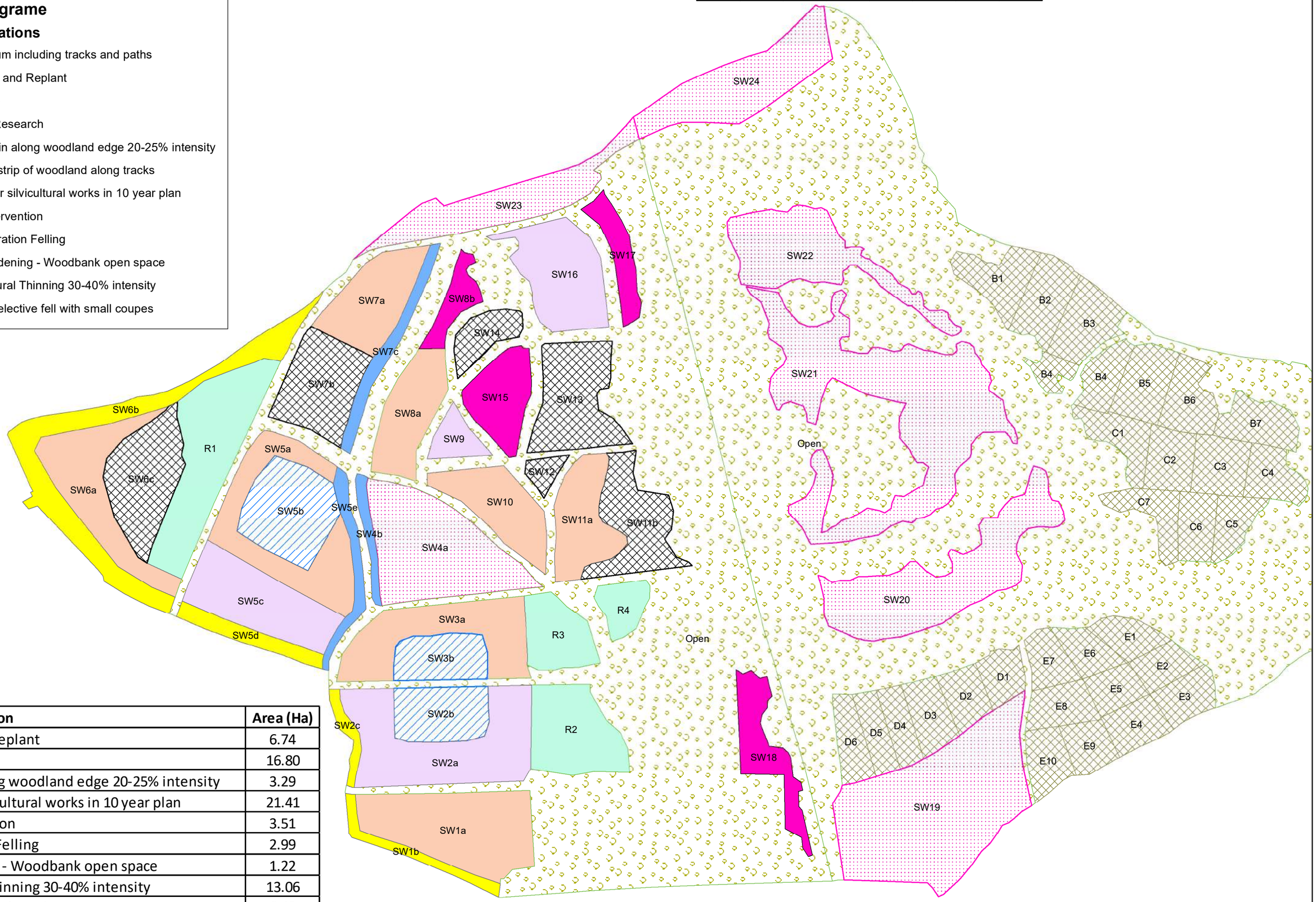
Felling programe

Felling operations

- Arboretum including tracks and paths
- Clearfell and Replant
- Coppice
- Forest Research
- Light Thin along woodland edge 20-25% intensity
- Narrow strip of woodland along tracks
- No major silvicultural works in 10 year plan
- Non Intervention
- Regeneration Felling
- Ride Widening - Woodbank open space
- Silvicultural Thinning 30-40% intensity
- Thin - Selective fell with small coupes

0 125 250 500 Meters

Map 2



Forest Operation	Area (Ha)
Clearfell and Replant	6.74
Coppice	16.80
Light Thin along woodland edge 20-25% intensity	3.29
No major silvicultural works in 10 year plan	21.41
Non Intervention	3.51
Regeneration Felling	2.99
Ride Widening - Woodbank open space	1.22
Silvicultural Thinning 30-40% intensity	13.06
Thin - Selective fell with small coupes	6.43
Total	**75.46**

Silk Wood Felling

Roads & Tracks

TYPE

- Metalled
- Track

Felling Proposals

Operation

- Arboretum
- No Action
- Thinning
- Coupe Felling
- Clearfelling

0 125 250 500 Meters

N

SW24
SW23
SW22
SW21
SW17
SW16
SW8b
SW7a
SW14
SW7b
SW8a
SW15
SW13
SW9
SW12
SW11
SW10
SW6a
SW6c
R1
SW5a
SW5b
SW5e
SW4b
SW4a
SW5c
SW5d
SW3a
SW3b
R3
R4
Open
SW20
SW2c
SW2b
R2
SW2a
SW1a
SW18
SW19
Open
B1
B2
B3
B4
B4
B5
B6
C1
C2
C3
C7
C6
E1
E6
E7
E2
D1
E5
D2
E8
E4
D3
D4
D5
D6
E9
E10

Woodland Property Name: Westonbirt Silk Wood

Sub-Cpt Record

Felling
(information required to produce a ten year felling licence, compliant with EUTR & CPET Category B)

Restocking

FC Cpt	Silk Wd Cpt	Area (Ha)		Species	Desig-nations	Area to be felled (ha)	Type of Felling	Spp: Identify species that are more than 20% of the total felling volume, at or below 20% record as MB or MC						Est Volume (m3) con	Est Volume (m3) bdlv	Timing yrs 1-5 =A, 6-10 = B	Notes	Restock area (ha)	Percentage of open space	Spp: Species to be restocked %: Percentage of restock area, split by species										Total % including open space (must equal 100%)	Stocking Density (Stems Per Hectare)	% Established by natural regeneration
		Gross	Net																	Spp.	%	Spp.	%	Spp.	%	Spp.	%	Spp.	%	Spp.	%			
1	*a*	*0.90*	*0.77*	*JL/SS/MC*	*PAWS*	*0.75*	*CF*	*JL*	*SS*	*MC*				*175*		*A*		*0.75*	*15.0*	*OK*	*70*	*SLI*	*15*							*100*	*1250*	*0*
2	*a*	*1.15*	*0.98*	*OK/AH*	*TPO*	*1.00*	*T*	*OK*	*AH*						*15*	*A/B*		N/A															
1001k	SW1a	2.44	2.44	AH/POK/MB	ASNW, RP&G	2.44	T	AH	POK	MB					100		Silvicultural Thinning 30-40% intensity	N/A															
1001k	SW1b	0.39	0.39	AH/POK/MB	ASNW, RP&G	0.39	T	AH	POK	MB					16		Light Thin along woodland edge 20-25% intensity	N/A															
1001e	SW2a	2.55	2.55	AH/POK/MB	ASNW, RP&G	2.55	SF (RF)	AH	POK	MB					140		Thin - Selective fell with small coupes	0.38	0.0	MB	100										100	1100	50
1001e	SW2b	1.05	1.05	AH/POK/MB	ASNW, RP&G	0.00											Non Intervention	N/A															
1001e	SW2c	0.21	0.21	AH/POK/MB	ASNW, RP&G	0.21	T	AH	POK	MB					8		Light Thin along woodland edge 20-25% intensity	N/A															
1001h	SW3a	1.91	1.91	AH/POK/MB	ASNW, RP&G	1.91	T	AH	POK	MB					85		Silvicultural Thinning 30-40% intensity	N/A															
1001h	SW3b	0.85	0.85	AH/POK/MB	ASNW, RP&G	0.00											Non Intervention	N/A															
1001g	SW4a	2.71	2.71	AH/BI/MB	PAWS, RP&G	0.00											No major silvicultural works in 10 year plan	N/A															
1001g	SW4b	0.24	0.24	AH/BI/MB	PAWS, RP&G	0.24	FO	AH	MB						21		Ride Widening - Woodbank open space	0.00	100.0												100		
1001c	SW5a	1.88	1.88	AH/POK/MB	ASNW	1.88	T	AH	MB						125		Silvicultural Thinning 30-40% intensity	N/A															
1001c	SW5b	1.61	1.61	AH/POK/MB	ASNW	0.00											Non Intervention	N/A															
1001c	SW5c	1.78	1.78	AH/POK/MB	ASNW	1.78	SF (RF)	AH	MB						164		Thin - Selective fell with small coupes	0.30	0.0	MB	100										100	1100	50
1001c	SW5d	0.49	0.49	AH/POK/MB	ASNW	0.49	T	AH	MB						27		Light Thin along woodland edge 20-25% intensity	N/A															
1001c	SW5e	0.44	0.44	AH/POK/MB	ASNW	0.44	FO	AH	MB						120		Ride Widening - Woodbank open space	0.00	100.0												100		
1001d	SW6a	1.73	1.73	AH/EM/WCH/MB	ASNW	1.73	T	AH	MB						80		Silvicultural Thinning 30-40% intensity	N/A															
1001d	SW6b	2.20	2.20	AH/EM/WCH/MB	ASNW	2.20	T	AH	MB						85		Light Thin along woodland edge 20-25% intensity	N/A															
1001d	SW6c	1.58	1.58	AH/EM/WCH/MB	ASNW	1.58	CF	AH	MB						450		Clearfell and Replant	1.58	0.0	MB	100										100	1100	50
1001f	SW7a	1.39	1.39	AH/MB	ASNW	1.39	T	AH	MB						65		Silvicultural Thinning 30-40% intensity	N/A															
1001f	SW7b	1.46	1.46	AH/MB	ASNW	1.46	CF	AH	MB						190		Clearfell and Replant	1.46	0.0	MB	100										100	1100	50
1001f	SW7c	0.54	0.54	AH/MB	ASNW	0.54	FO	AH	MB						70		Ride Widening - Woodbank open space	0.00	100.0												100		
1001n	SW8a	1.24	1.24	AH/MB	ASNW, RP&G	1.24	T	AH	MB						50		Silvicultural Thinning 30-40% intensity	N/A															
1001n	SW8b	0.46	0.46	AH/MB	ASNW, RP&G	0.46	SF (RF)	AH	MB						24		Regeneration Felling	0.10	0.0	MB	100										100	1100	100
1001y	SW9	0.39	0.39	AH/OK/MB	ASNW, RP&G	0.39	SF (RF)	AH	MB						40		Thin - Selective fell with small coupes	0.10	0.0	MB	100										100	1100	50
1001q	SW10	1.24	1.24	AH/OK/MB	ASNW:PAWS (50:50), RP&G	1.24	T	AH	MB						70		Silvicultural Thinning 30-40% intensity	N/A															
1001i	SW11a	1.23	1.23	AH/POK/MB	PAWS, RP&G	1.23	T	AH	MB						45		Silvicultural Thinning 30-40% intensity	N/A															
1001i	SW11b	1.36	1.36	AH/POK/MB	PAWS, RP&G	1.36	CF	AH	MB						300		Clearfell and Replant	1.36	0.0	MB	100										100	1100	50
1001z	SW12	0.20	0.20	AH/OK/MB	PAWS, RP&G	0.20	CF	AH	MB						60		Clearfell and Replant	0.20	0.0	MB	100										100	1100	50
1001o	SW13	1.61	1.61	AH/POK/MB	PAWS, RP&G	1.61	CF	AH	MB						340		Clearfell and Replant	1.61	0.0	MB	100										100	1100	50
1001w	SW14	0.53	0.53	AH/POK/MB	ASNW:PAWS (50:50), RP&G	0.53	CF	AH	MB						110		Clearfell and Replant	0.53	0.0	MB	100										100	1100	50
1001s	SW15	1.01	1.01	AH/POK/MB	ASNW:PAWS (50:50), RP&G	1.01	SF (RF)	AH	MB						65		Regeneration Felling	1.01	0.0	MB	100										100	1100	100
1001m	SW16	1.71	1.71	AH/POK/MB	PAWS, RP&G	1.71	SF (RF)	AH	MB						110		Thin - Selective fell with small coupes	0.25	0.0	MB	100										100	1100	50
1001v	SW17	0.58	0.58	AH/POK/MB	PAWS, RP&G	0.58	SF (RF)	AH	MB						40		Regeneration Felling	0.10	0.0	MB	100										100	1100	100
1001t	SW18	0.95	0.95	AH/POK/MB	PAWS, RP&G	0.95	SF (RF)	AH	MB						70		Regeneration Felling	0.14	0.0	MB	100										100	1100	100
1003c	SW19	4.71	4.71	AH/POK/MB	PAWS, RP&G	0.00											No major silvicultural works in 10 year plan	N/A															
1003d	SW20	2.98	2.98	AH/POK/MB	PAWS, RP&G	0.00											No major silvicultural works in 10 year plan	N/A															
1003b	SW21	5.20	5.20	AH/POK/MB	PAWS, RP&G	0.00											No major silvicultural works in 10 year plan	N/A															
1003e	SW22	2.05	2.05	AH/POK/MB	PAWS, RP&G	0.00											No major silvicultural works in 10 year plan	N/A															
1001l	SW23	1.72	1.72	AH/POK/MB	ASNW:PAWS (50:50), RP&G	0.00											No major silvicultural works in 10 year plan	N/A															
1003f	SW24	2.04	2.04	MB/MC	RP&G	0.00											No major silvicultural works in 10 year plan	N/A															
1005e	B1	0.73	0.73	HAZ/POK/MB	ASNW, RP&G	0.73	FC	HAZ	MB						5		Coppice - nominal figure as HAZ would not require a felling licence - vol to cover other trees	0.73		HAZ	90	MB	10								100	1100	100
1005b	B2	0.78	0.78	HAZ/POK/MB	ASNW, RP&G	0.78	FC	HAZ	MB						5		Coppice - nominal figure as HAZ would not require a felling licence - vol to cover other trees	0.78		HAZ	90	MB	10								100	1100	100
1005a	B3	0.81	0.81	HAZ/POK/MB	ASNW, RP&G	0.81	FC	HAZ	MB						5		Coppice - nominal figure as HAZ would not require a felling licence - vol to cover other trees	0.81		HAZ	90	MB	10								100	1100	100
1005d	B4	0.75	0.75	HAZ/POK/MB	ASNW, RP&G	0.75	FC	HAZ	MB						5		Coppice - nominal figure as HAZ would not require a felling licence - vol to cover other trees	0.75		HAZ	90	MB	10								100	1100	100

Certificate of Approval for Tree Felling

This is to certify that tree felling under

Forest Plan ref.
1171-Westonbirt Arboretum – Silk Wood

has been approved by the Forestry Commission as being in accordance with Government policy for the sound management of a renewable resource.

This certificate is valid only for the period of the felling approval.

Signed .....

Forestry Commission Officer

Date 9th December 2020 .....

- Draft -

Coppice Restoration &

Management Plan for

Silk Wood,

Westonbirt Arboretum.

Coppice Management Plan for Silk Wood

Contents

Introduction

The overall Arboretum Management (Forest Design) Plan 2011 requires some forty five acres (18 hectares) of Silk Wood to be brought into coppice management. This coppice needs to be economically self-sustaining and, in the early 21st Century, this looks best achieved by short rotation (6-8 year) hazel and 15 – 20 year fuelwood coppice.

Other arboretum objectives require that the short rotation hazel is managed as coppice-with-standards rather than simple coppice. This is principally the need to fit with the picturesque landscape style where some over-storey is helpful in providing transition from the Downs and open areas, also the desire to produce some large dimension timber for use in arboretum buildings and structures.

Objectives

The coppice restoration programme has a number of objectives. These are interdependent and their various needs have to be balanced within the plan. However, economic sustainability is key, at least for the people who work the coppice - 'a wood that pays is a wood that stays'.

1. Economic – to provide a sufficient income for the number of workers needed to manage the coppiced areas.
2. Landscape – to provide continuity with the traditional landscape.
3. Biodiversity – to support the rich flora and fauna associated with coppice-with standards.
4. Heritage – to provide opportunities for the interpretation of the historical forms of management practiced in Silk Wood.
5. Training – to provide the venue and materials for training in coppicing and related woodland crafts.
6. Community – to provide meaningful activities for groups engaged in the arboretum's community programme which aims to build participants' self-reliance and esteem.

Background

Mitchell (*1968, Westonbirt in Colour, Forestry Commission Guide, HMSO, ISBN 9780117100268*) reported records of coppicing in Silk Wood dating back to 1292, although his source cannot currently be found.

Records that *are* available from the early 19th century suggest that the understory was cut on an approximately 18 year rotation. This seems indicative of a system producing a mixed resource: tan bark, small constructional material and fuel.

Coppicing is said to have ceased in Silk Wood in the 1930's. This seems unusual as the demands of the Second World War meant that a majority of woodlands were actively cut at some point during the forties and early fifties, and that there was an abrupt cessation of many types of woodland management around this time. Further research would be useful to confirm the historical background of the site.

What is certain is that in 1979 the Forestry Commission and the Gloucestershire Trust for Nature Conservation began re-cutting some of the derelict hazel on a ten year cycle. Part of this was in the south western corner of the Arboretum, part on the bank to the west of Skilling gate (*J E J White, Hazel Coppice at Westonbirt, 1981. ISBN 0 85538 094 2. Westonbirt Arboretum Leaflet No. 2.*). It is not known for how long this continued.

At the beginning of the 1990's, Ralph Hardy recommenced cutting along the bank to the west of Skilling Gate and continued up until about the year 2000. No standards were removed nor hazel restocked during this period.

In 2002 Phil Hinton recommenced cutting on Ralph Hardy's 4 and was joined in 2003 by Brian Williamson. Some restocking of the hazel was undertaken by layering (and occasionally planting) and thinning of the standards commenced in 2005/6. The length of rotation is now either six or seven years, but is expected to stabilise at seven years.

In addition to the above, two separate blocks over towards Waste Drive have been cut, partially thinned, but not restocked at all. These have now been taken out of coppice management.

The current situation (as at winter 2017/18)

Due to the decline and eventual cessation of cutting in the 20th century, the (predominately) oak over-storey had aged and grown up to form an almost closed canopy. Its age structure is very even (most trees seem to be around 130/150 years old) with virtually no young specimens and an increasing number of moribund ones.

Hazel growth has suffered because of the heavy shade and an indeterminable number of stools will have died and vanished for the same reason.

Layering has started to improve the hazel density, though much remains to be done. Thinning of the oaks has admitted more light, leading to an improvement in quality of the hazel re-growth but also a rapid expansion of bramble. Recruitment of oak is taking place through natural regeneration (there was a very good acorn year in 2007 and another in 2017) and some scattered replanting (probably around 15 – 20 whips in total). The natural regeneration does not seem to be producing oak of good quality, however.

Whilst the bramble is something of a problem at this stage of the restoration, it is expected that the increasing density of hazel will greatly reduce its impact on future management.

Late summer cutting of the bramble in the later years of the rotation (fifth and sixth) would reduce it to a residual state.

Deer browsing is an on-going problem. Not only does it affect the quality of the resulting hazel rods, but it allows the bramble to scramble up into the damaged hazel, dragging some stems down and shading the closer cropped ones. Whilst deer will browse bramble quite heavily in some circumstances, it appears that the two species present in the Arboretum (muntjac and roe) will preferentially browse the hazel and ignore the bramble. Temporary fencing has (since 2015) proved effective at controlling browsing on coupes in the first year following cutting. Some measure of protection from browsing will have to be effective if the coppice is to be viable in the long run and the form of fencing described in appendix 6 may prove to be the solution.

The STIHL Treetop Walkway opened in 2016 and 'lands' adjacent to the eastern end of rotations C and D, with the result around two thirds of all visitors to the arboretum pass by this area. Total visit numbers are around 500,000 per year. To take advantage of this the coppice compound was moved from the 'Link' path in coupe B4 to coupe C4 in order to be adjacent to the end of the walkway.

Also during the Heritage Lottery and Friends funded 'Westonbirt Project' a community activity programme was commenced and a community shelter and associated facilities (e.g. compost toilet and pizza oven) were created in the derelict coppice, coupe D1. Participants in the community programme undertake coppice activities in rotations D and E.

Chalara dieback of ash is a rapidly developing issue in the arboretum and its probable impact is discussed in appendix 7.

The future

To continue the restoration programme, a number of things need to happen.

1. The hazel must continue to be cut (on the appropriate rotation) and restocked. Stools should be between 4 and 8 ft apart (see appendix 4 for notes on good practice). Much emphasis should be placed on the genetic quality of the restocking, hence layering and stooling from good existing stools is advised

2. Thinning of the oaks needs to continue to reduce canopy cover to no more than 20%

3. Recruitment of new standards by natural regeneration or occasional planting needs to continue until stocking densities reach those shown in appendix 1, Table A. Since there is no point in growing low grade timber, some planting of stock from a good provenance source is desirable.

4. Management of other woody species (ash, maple, birch, holly, spindle etc) needs to be considered on a coupe by coupe basis. Chalara resistant ash will be left where

possible, unsafe ash will be removed. Cherry is an acceptable standard as an alternate to oak, birch may be left to age 30 as a mid-storey firewood species. Other species less economically useful can be left for biodiversity or amenity (field maple, holly, spindle, dogwood etc.)

5. Whilst the coupe boundaries for the 'B' and 'C' rotations have been settled, those for the other rotations will need to be drawn as they are brought back in-hand (see page 7 for coupe map) and ordered into logical rotations subject to ability to work them. Coupe objectives will also need to be defined. 'B' and 'C' are productive short rotation hazel with oak (and cherry) standards. However for D and E at present the primary objective for those coupes is to support the community and volunteer programmes while active coppice workers are nearly fully occupied on rotations B and C. In D and E there may be a case for some long rotation fuelwood and, possibly, some specific wildlife management.

6. Individual coupe needs should be identified and reviewed on regular basis (see Appendix 2) i.e.:
    a. increasing stool density
    b. thinning standards
    c. deer protection
    d. bramble control

7. Review appropriate ride management for operational and visitor access.

8. Development/establishment of 'work stations'. The main workstation in coupe C4 at the end of the Walkway is now well established with charcoal kiln and retort and is a useful demonstration area. However, it needs a permanent shelter for workers and equipment, also a drying shelter for material to be charcoaled. Consideration will need to be given as to whether a further compound is created to serve rotations D and E or whether material is moved to the existing compound.

9. FC will provide a retort charcoal kiln which will be made available for use by the coppicers that hold working contracts. The coppicers will maintain the kiln.

10. Deer control – as per appendix 6. Monitoring, fencing, shooting etc.

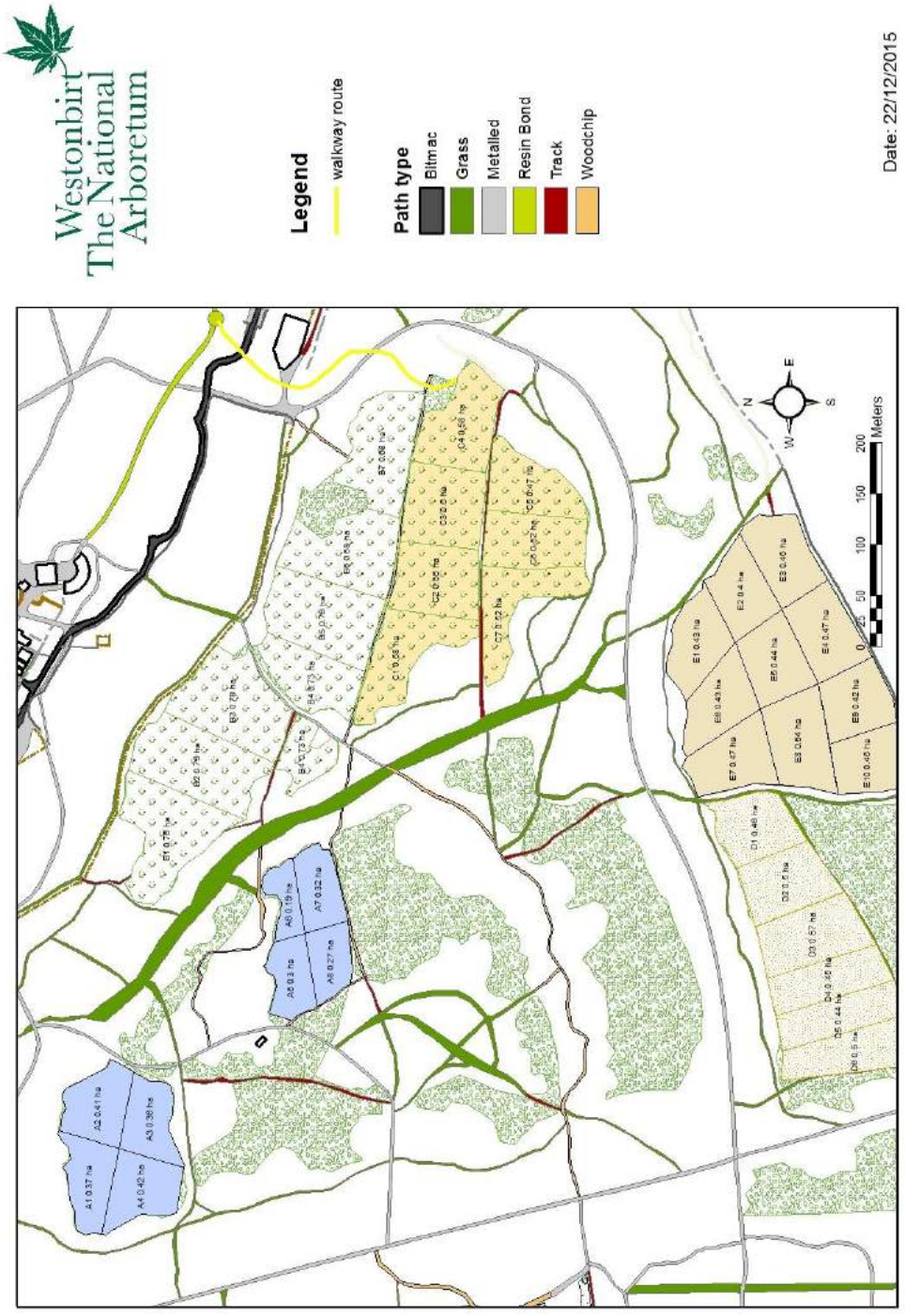
11. Bramble control – is a balance of light (over-storey standards) and stool density. As density of healthy stools is increased to the optimum the over-storey can be reduced to 20% with reduced risk of bramble establishment. In cases of severe bramble it may be flailed the summer before the coupe is cut.

12. Propagation of new hazel stools – as per appendix 4; i.e. improving both stocking density and rod quality by: layering, stooling and the planting of cuttings.

Coupes

Coupe boundaries and numbering systems have changed over the years (see Appendix 11 for old maps).

Currently (2017/18), there are two distinct rotations being worked. ‘B’ (Bank), a linear rotation of seven coupes of 0.75ha each worked west to east and ‘C’ (Charcoal Kilns), a circular rotation of seven coupes of around 0.55ha each worked clockwise.



A history of cuts is at appendix 2.

Rotation ‘A’, two groups of four coupes, one either side of the Silk Wood barn, were cut once over the period 2004 - 2008. There was no restocking and minimal thinning of standards. There are no specific long term intentions for these coupes and they have subsequently been removed from the Management Plan.

Rotation B will have been cut three (at the least) times by the end of the winter of 2016/2017.

Rotation C had developed into something of a patchwork by the end of the winter of 2015/2016. Ongoing work is designed to bring it into the rotation shown on the map (the direction of rotation has been reversed). The two derelict areas (as of 2014/2015) on the western edge of this rotation will be included in future cutting.

The community shelter is located on edge of rotation D adjacent also to rotation E:

Rotation ‘D’ (sometimes known as Derelict) near the junction of Green Lane and Willesley Drive had a first cut from derelict between 2010 and 2015. Some standards were thinned and a moderate amount of restocking of hazel undertaken. It is hoped to re-start cutting around 2017 and that this will be short rotation hazel.

Rotation ‘E’, running parallel with Willesley Drive from sand earth is still largely in its derelict state. Two coupes E7 and D3 were cut (probably in 2007/8). Some thinning of standards was undertaken but no restocking. There is severe bramble growth. This is possibility for a long-rotation fuelwood coppice.

Coupes are currently arranged to be contiguous where possible. This has two major advantages:

1. For wildlife, it enables less mobile species to follow the coppice cycle more readily.
2. For coppice quality, it reduces the edge effect, minimising shading and reducing the pressure of deer browse at the edge.

They have also been laid out between existing rides/pathways to give deer maximum visual exposure to human activity.

Appendix 1: 150 year major woody species management objectives

Table A. (guidelines for restocking the coupes with standards* - at 25 year intervals)

Year	No. standards (by age class) per hectare							
		0 - 25	**25 - 50**	**50 - 75**	**75 – 100**	**100 – 125**	**125 - 150**	**150 +**
	2000	2	---	---	---	---	25+	2
	2025	20 +	---	---	---	---	8	8
	2050	20 +	6	---	---	---	---	6
	2075	20 +	6	6	---	---	---	6
	2100	20 +	6	4	2	---	---	4
	2125	20 +	4	4	2	2	---	2
	2150	20 +	4	2	2	2	2	2

*standards (in this case) will be a mix of oak, ash and cherry in an approximate 2:1:1 ratio. *Note; with the probable demise of most, if not all, of the ash due to Chalara, this mix of standards will need reviewing when the full impact of the disease is known.*

Canopy areas are calculated on an average of: 1m radius for trees up to 25 years; 3m radius for trees between 25 and 75 years; 6m radius for trees older than 75 years.

Table B (the following table offers guidelines for the stocking of coppice stools other than hazel (i.e. maple, holly, ash, oak etc.) per hectare.

	No. old coppice stools per hectare *(age since last cut)*				
		0 – 14yrs	**14 – 28yrs**	**28 – 42yrs**	**42 – 56yrs**
Year	**2000**	20 +	---	---	12 +
	2014	20 +	8	---	6
	2028	20 +	4	2	2
	2042	20 +	2	2	2
	2056	20 +	2	2	2

Appendix 2: Coppice coupe cutting years

At the end of 2016/17, both the 'B' and the 'C' rotations will have reached the end of their numerical cycle (i.e. B7 and C7 will have been cut that winter).

Although the B rotation is laid out in seven coupes, the stool/rod density is still probably not sufficient to justify cutting it over seven years and, if time and labour allow, the aim should be to complete the cutting over six years. It may then be possible to allow the rotation length to move out to the full seven years, although this should be dictated by the size of the regrowth rather than the need to keep to the seven-year boundaries.

The recent management of the C coupes has been very erratic, particularly C1, C2, C3, and C4. Future work should be aimed at bringing the boundaries on the ground in line with those on the map as soon possible. The aim should be to complete the rotation in six or even five years and then to settle in to the aimed seven year rotation (as with the B coupes).

The cutting of the 'B' and 'C' coupes should be phased so that B7 is cut in the same year as C7. This will ensure that the 'C' coupes along the central ride are approximately three years behind their adjacent 'B' coupes and will assist the movement of species away from B7 when it becomes over-shaded.

The D coupes will be ready to cut again with volunteers as of the winter of 2017/18.

B 'Bank' coupes

Coupe No.	**1st Cut**	**2nd Cut**	**3rd Cut**	**4th Cut**
B1a	Uncut			
B1	Early 1990's	2002/3	2009/10	2017/18
B2	Early 1990's	2003/4	2010/11	
B3	Early/mid '90's	2004/5	2011/12	
B4a	Uncut	2005/6*	2012/13*	
B4	Mid '90's	2005/6,6/7	2013/14	
B5	Mid/late '90's	2005/6,6/7	2014/15	
B6	Late '90's	2007/8	2015/16	
B7	Late '90's	2008/9	2016/17	

The precise history of cutting on the bank coupes is uncertain before 2002/3. Ralph Hardy would have cut along the bank at least once during the nineties and it is possible that some of his coupes had more than one cut during that time. What is certain is that no thinning of standards or restocking of hazel was undertaken then.

In 1979, the Forestry Commission, in conjunction with the Gloucestershire Trust for Nature Conservation, started cutting some coppice to the west of Skilling Gate on a ten-year

rotation. It is not known how long this continued or how far along the bank it extended. There must, though, have been some kind of an overlap, both spatially and temporally, between this and Ralph Hardy's cutting.

C 'Charcoal kiln' coupes

Coupe No.	**1st Cut**	**2nd Cut**	**3rd Cut**	**4th Cut**

Appendix 3: (as at winter 2017/18)
Current condition and future management needs by coupe

Condition scores assessed April 2017: A (excellent), B (good), C (recovering) to D (derelict)

Across all coupes the aim is to achieve hazel stool density of approx 2000 quality stools per hectare i.e. 4'-8' spacing. All coupes require some improvement in this regard so this prescription is not repeated in the table below.

Rotation B: coupes worked west to east

Coupe	Last year cut	Condition and comments for management	Next cut
B1	17/18	B: Boundary of B1/B2 marked by tree 41.1008. 1a is a derelict outlier at far west.	1a 18/19; 24/25
B2	11/12	B-:	18/19
B3	12/13	B-: Dense but lots of ash, suckering aspen. Stools better at top, not too many standards. Ancient stool arch either side of pathway on lower slope between B3 and B4 needs retention with perhaps one third of the stems cut once every three years.	19/20
B4	13/14	C: A 'hotch potch'! No deer protection after last cut, too many standards, patchy stool density. Includes old kiln site. Bits of B4a on west side of path are good (B)	20/21
B5	14/15, middle in 15/16	B: Originally two coupes split north and south. Boundary is an old oak stool. Includes some 30 year (1980?) SOK. Tubed oak not growing. First deer fenced coupe. Future: remove standards in middle, encourage young oak to develop.	21/22
B6	15/16, bottom extension 16/17, and small middle area 17/18	B+: A showcase coupe! West boundary marked by tree 30.0540. No deer damage! Good stocking density. 2 x 30yr SOK. Future: need to create some more canopy gaps, one oak with red cross to remove.	22/23
B7	16/17	C: Lots of ash, gaps due to ash; hazel layers won't fill all gaps. Some ash left and P1980s? SOK seem good. Future: Layer in 2017, take some more oak standards. On B6/7 boundary root arch remove 3 limbs. Favour P1980s SOK.	23/24

Rotation C: worked clockwise

Currently working through coupes in 6 years not entirely aligned to boundaries.

Coupe	Last year cut	Condition and comments for management	Next cut
C1	1950s and 17/18	D: Derelict prior to 17/18 cut, big stools, gaps and too many standards. Future: cut remaining derelict area in west in three sections east to west (Phil Hinton?)	18/19, 19/20
C2	12/13 and 17/18	C: West section cut 17/18. Bramble issue, too many standards. Wild cherry to west of cut through path. Future: flail bramble summer before cut, remove oak standards	18/19
C3	13/14 north; 15/16 south	B-: some bramble but ok. Some cherry present. Too many standards, ash and birch. Future: encourage cherry. Fill remaining gaps with hazel. Remove oak standards esp from belt in middle.	18/19 and 19/20
C4	15/16 east; approx. 2012 west	B: Includes kiln and demo/work site. West boundary in line with tree 30.0558. Hazel close layered, some ash. Includes birch and oak, also patch of wold cherry. Future: cut one block 19/20 and reduce oak and birch.	19/20 and 20/21
C5	15/16 north; 16/17 south	B+ in north, B_ in south as gappier stools. Some standards in middle. Future: remove standards.	22/23
C6	16/17	B: Lots of small hazel stools	23/24
C7	Cut east to west in three: 15/16; 16/17; 17/18	C+: Adjacent to 'tipi town' den building area. Too many standards to south. Future: needs layering after current and next cuts.	24/25

Appendix 4: Stool management

New stools produced by layering are better able to compete with established stools than those from the cuttings from stooling or the planting of bare rooted whips. Layering can be used to establish new stools between relatively close spaced existing coppice stools, whereas cuttings or planting are best suited to filling in more open areas where their neighbours will be either other cuttings or new layerings.

It should be noted that the use of layering or of cuttings from a stooling operation gives an opportunity to improve the quality of the coppice as well as the quantity. The planting of whips, whilst probably the quickest way to improve the stocking density, offers no such opportunity. Indeed, the contrary is often the case, with the whips producing hazel that doesn't grow good rods.

It is worth considering the quality of potential rods at some length. For virtually every purpose, the rods need to be as straight and as knot free as possible and as durable as they can be. Whilst hazel cannot be defined as a durable wood in any way, there are differences between the wood from different stools and even a small gain in durability can be noticeable in products for the garden. In situations where the wood is to be worked (i.e. split and twisted as in hurdles or thatching spars) pliability and ease or riving are also important. The quality of rods from an individual stool can best be established by working them, but there are strong visual clues that can be utilised as well. Straightness of form is fairly obvious to even the untrained eye, with a strong apical but reducing the effect of side branching. Bark colour is also very significant. There is very strong anecdotal evidence to suggest that rods with silver/grey barks will work much better than those with reddish/purple barks. The browner and greener barks seem to fall somewhere in between.

When establishing new stools by layering, the existing stools will predetermine the spacing, with 6' (1.8m) being the minimum. When planting into larger clear areas, however, all new plants should be put in at 4' (1.2m) spacings.

The aim should be to produce 12,000 usable rods per acre as quickly as possible. The number of stools per acre is often quoted as the desirable reference figure, but it is of little use unless the number of rods per stool is also known. The good quality copses along the South Downs may have less than four hundred stools per acre, but with thirty or forty usable rods per stool, they are able to produce excellent quality coppice. In Silk Wood, very few of the old stools are producing as many as twenty rods each when first cut, and the newly established ones many fewer. To produce 12,000 rods initially, therefore, it will be necessary to establish many more stools, probably around 800 – 1000 per acre in most coupes. As the coppice matures, the weaker of these stools will be out-competed and, over the coming decades, the number of stools will start to drop as the number of rods that they produce increases.

Hazel should be cut as low as possible not only to encourage straight regrowth, but also to encourage the development of new roots from the base of the new shoots. 2" above ground should be the maximum target height. This may take more than one rotation to achieve on all stools, but once achieved it should be straightforward to maintain. Initially, the goal

should be to ensure that all new stools are cut low. If a certain number (20? 40?) of the bigger stools are also cut down to ground level at each rotation, then the ultimate goal will eventually be attained.

Old hazel stools (40 years+) may not be sufficiently vigorous to respond well to coppicing. Lack of vigour is usually indicated by a lack of sunshoots at the base. In these cases it may be worth cutting the stool very high (2' – 3') initially, to aid the formation of new shoots. The height of the stool can then be reduced at subsequent rotations.

Other species (maple, holly, ash, oak etc).

Numbers for these species are set out in Appendix 1, Table B. Care should be exercised with the numbers of these, as holly and maple in particular will cast a heavy shade and will affect the quality of the hazel. The current recommendations (2010) may need to be amended as the coppice programme proceeds. Holly would appear to be spreading through woodlands generally, and its propensity to self-layer as well as to spread by seed means that it needs to be carefully controlled.

Heights of stools for these species will be largely determined by their existing height. Oak coppice stools in Silk Wood are often 3' or so tall, and ash and maple commonly 18" to 2'. Holly is not common as old coppice stools, but it seems to respond well to being cut low as a young tree.

The reasons for the height of old stools (other than hazel) are unclear. Being cut for larger material than hazel, the increased height may have aided felling by axe. It may also have raised vulnerable young bark (particularly with ash) above the comfortable height of de-barking by voles. It may simply have been upwards 'creep' over centuries of management.

Appendix 5: Bramble control

Bramble is found throughout the derelict coppice in Silk Wood, but the heavy shade cast by the combination of overstood coppice and closed-canopy oak standards means that it is fairly suppressed. Removal of the shade, however, encourages an explosion of growth, both through tip-layering and through the establishment of young seedlings.

In the long term, the re-establishment of a closed hazel canopy will bring the bramble back to something approaching its original state, but in the medium term it will be a very significant hindrance to coppicing and management may be necessary.

The best way to control bramble is by summer cutting, ideally during August or early September. The check to growth caused by cutting at the end of its extended growing period minimises regrowth, reduces the amount of tip-layering to almost zero and should remove that year's seed source (blackberries) before they can ripen. It has the additional

effect of delaying regrowth until the autumn/early winter when it should appear more palatable to deer at a time when other foliage is browning/falling.

Winter cutting, by contrast, whilst it will remove the above-ground growth, is effectively coppicing the plant and encourages extensive growth the following year.

Where resources allow, derelict coupes should be bramble cut for two summers prior to being coppiced. Coupes in the early stages of restoration will benefit from being bramble cut for one or two summers after each coppice cut. In well-established coupes, the shade produced by a closed hazel canopy should all but eradicate the bramble. It will be important for bramble control as well as rod quality that deer are excluded from the coppice during the first season's regrowth.

Volunteers are a particularly useful labour resource for bramble control.

Ride edges should be cut (where resources allow) in the winter of coppicing and for two subsequent summers. The extra light available at the ride edges will encourage the growth of bramble and hence its spread back into the coupes.

Appendix 6: Deer control

Deer browsing is extremely damaging to coppice regrowth. At its worst, heavy browsing over two or three consecutive seasons will kill the stools. Under lesser pressures, it will deform the rods and allow bramble to grow up through the stools, pulling them over and further degrading them.

In Westonbirt, in the first part of the 21st C., there are only two resident species, roe and muntjac. Whilst the degree of culling being undertaken means that browsing pressures are not as high as in surrounding areas, it has still been sufficient to reduce the regrowth from every single stool in all the coupes cut to no more than eighteen inches high in the first year.

In most cases, the hazel then gets away through the bramble in the second year, but the result is that almost all the rods are either dog-legged or bark-damaged (and in most instances, both) as a result of browsing and then further deformed as a result of the bramble growing up through them and dragging them down.

The result is low-quality rods and an infestation of bramble to work through when the coppice is due to be recut.

In the summer of 2015, three trial plots were fenced with a double row of 1m high plastic fencing topped with security tape. It is known that deer are reluctant to jump into small enclosures and this double row of netting attempted to simulate a small enclosure. As of Christmas 2015, all three of these plots seemed to have been successful. There were some incursions into the plot in the 'D' rotation but these were halted early on.

The intention is for these fences to be up for about six months, being erected from June onwards and taken down the around December/January. One good season's growth should take the young hazel above the browsing height of both muntjac and roe.

In the summer of 2016, a further three coupes were fenced. Again, there was a minor incursion into one plot but the other two were untouched. Regrowth was very impressive with the hazel getting well clear of the bramble. There was no detectable damage to the second year growth in the first three plots.

In the summer of 2017, another three areas were fenced. Once again protection has been almost 100% with only one minor incursion, possibly by a deer panicked by humans/dogs given the damage to the netting itself. There does, however, seem to be some minor damage to the bottom of the netting, most probably by rabbit but possibly by badgers.

Exclusion of the deer has made a dramatic difference. The quality of the hazel will be much improved at its next cut but, more significantly, with the hazel getting above the bramble in year one, there should also be a significant reduction in the bramble problem.

In the short term (say six years?) it is important that this method of deer control is maintained. Thereafter, it is possible (but only possible) that the increased area of hazel being cut; the reduction in bramble cover and the increased disturbance by humans and dogs will mean that browsing damage is spread thinly enough around the coppice to be at an acceptable level if fencing is not continued. It is the author's opinion, though, that this will not happen and the deer would simply move in and preferentially browse the hazel over other alternatives.

Appendix 7: Chalara dieback of ash

As at the winter of 2016/17, Chalara is well established in the arboretum and is particularly evident within the young coppice stands. It is likely to progress steadily into the larger trees.

Coppice within existing coupes should be managed as normal, but the expectation must be that most small ash stools will have died by the time that they are recut and that more hazel will need to be layered in to fill the gaps.

Pole stage ash should be cut to favour any specimens ***not*** yet showing signs of the disease. At this early stage it is probable that many of those not yet showing these signs will subsequently do so, but it may be possible to preserve the occasional specimen that does have resistance. A decision can be made at a later date (when they start having a pronounced shade effect on the coppice) as to whether to promote them to standards.

Standard ash should continue to be thinned with the quality of the coppice in mind rather than the survival of the trees.

Ash is a tree that is abundant in Silk Wood. If disease resistant trees are going to be found there will be plenty without the coppice coupes. There should be no need to deliberately favour them within the coppice coupes.

Appendix 8: Layering and stooling techniques

Being authored by Brian Williamson for the National Coppice Federation.

Appendix 9: Productivity

Rods

Hazel coppice falls into four Grades. Grade 1 produces 12,000 plus usable rods per acre; Grade 2, 8000 rods; Grade 3, 4000 rods and Grade 4 less than 4000 rods.
In practice, Grade 4 is derelict coppice and typically would produce many fewer than 4000 rods. Grade 3 is only found in coppice restoration sites. Grades 2 and 1 would be described as working coppice, but Grade 2 would barely be economically viable and would need improving.

The intention in Silk Wood is to bring it to Grade 1 as quickly as possible. The target stool stocking density of between 1.2m and 2.4m could produce as many as 800 – 1000 stools per acre. These would need to support 12 – 15 usable rods each to reach the 12,000 rod target.

As the stools mature the numbers of rods they can support will increase and the total number of rods per acre may climb well above 12,000. Eventually, the coppice will become overstocked and some stools will be out-competed and will die. The best coppices in Hampshire and Dorset may have as few as two or three hundred stools per acre, but these will be supporting dozens of rods each.

This 'maturing' phase of the coppice will offer a second opportunity to improve the overall quality of the hazel. The poorer quality stools can be selected out, allowing the better quality ones to fill their space. This can be easily achieved by cutting the superfluous stools in the late summer of their second or third year of regrowth. The combined effects of deer browsing and shading from their neighbours should be enough to kill them off.

Products

To be economically viable, use must be made of every bit of material available. It should be possible to use virtually everything that comes off a coppice. Possible products include:

Beanpoles and peasticks; hedging stakes and binders; hurdles; thatching spars/gads; straw-bale building rods; Morris dancing staves; walking sticks. Brash can be incorporated into faggots.

Charcoal and firewood can be produced from the early stages of restoration and from the thinning of the standards.

Shingles, laths, post and rail fencing and gates can be made from the better quality cleaving oak removed when thinning the canopy. Other oak butts can be sold-on for milling.

Appendix 10: Flora/fauna monitoring

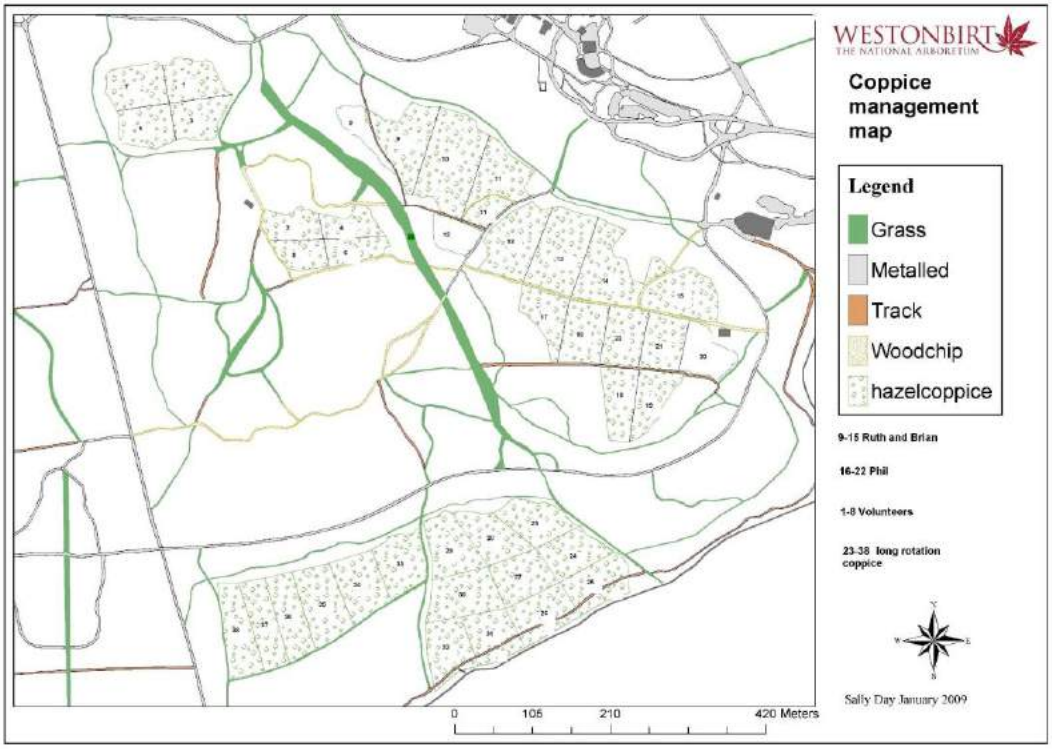
In 2017 spreading bellflower (*Campanula patula*) was present on the eastern edge of coupe C5, but there is expectation it should respond and show in other coupes subject to cutting and weather patterns.

Following establishment of flora and fauna volunteer groups as part of the Downs restoration it is expected that now the restoration has been secured the flora volunteers in particular will undertake flora surveys in Silk Wood, including of the coppice areas.

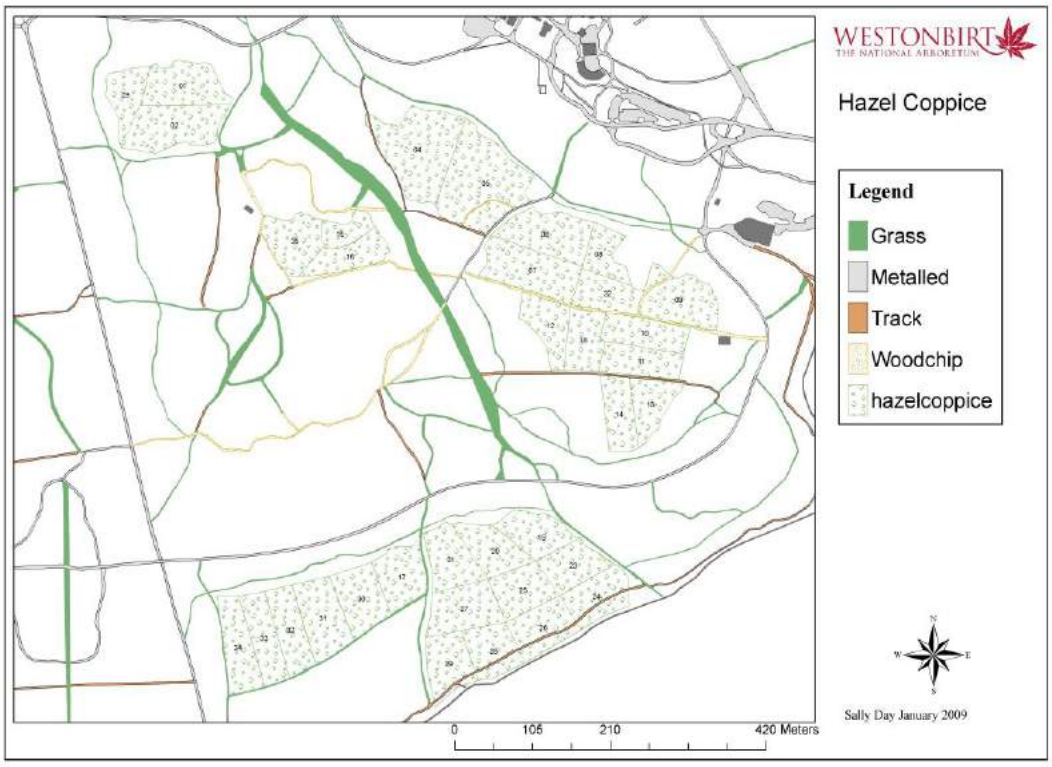
Brian Williamson holds a flora species list on two transects through rotation D.

Appendix 11: Old coupe maps

1. 2009 -2015.



2. Pre-2009.



About the arboretum

Westonbirt, The National Arboretum was founded in the early 19th Century by Robert Holford, a plant collector and visionary who created one of the world's finest tree collections. In 1956, the arboretum came into the care of the Forestry Commission (now operating as Forestry England) to conserve and continue the legacy for future generations.

The Friends of Westonbirt Arboretum charity was formed in 1985. As membership has grown the charity has increasingly helped the work of the arboretum through advocacy, and financial and practical support to unlock a whole range of opportunities to further the role of Westonbirt as The National Arboretum.

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the friends of Westonbirt Arboretum
Registered Charity 293190

Forestry England

Westonbirt, The National Arboretum is cared for by Forestry England and supported by the Friends of Westonbirt Arboretum charity

Our place in a changing world

A 10-year vision for Westonbirt, The National Arboretum

the friends of Westonbirt Arboretum
Registered Charity 293190

Forestry England

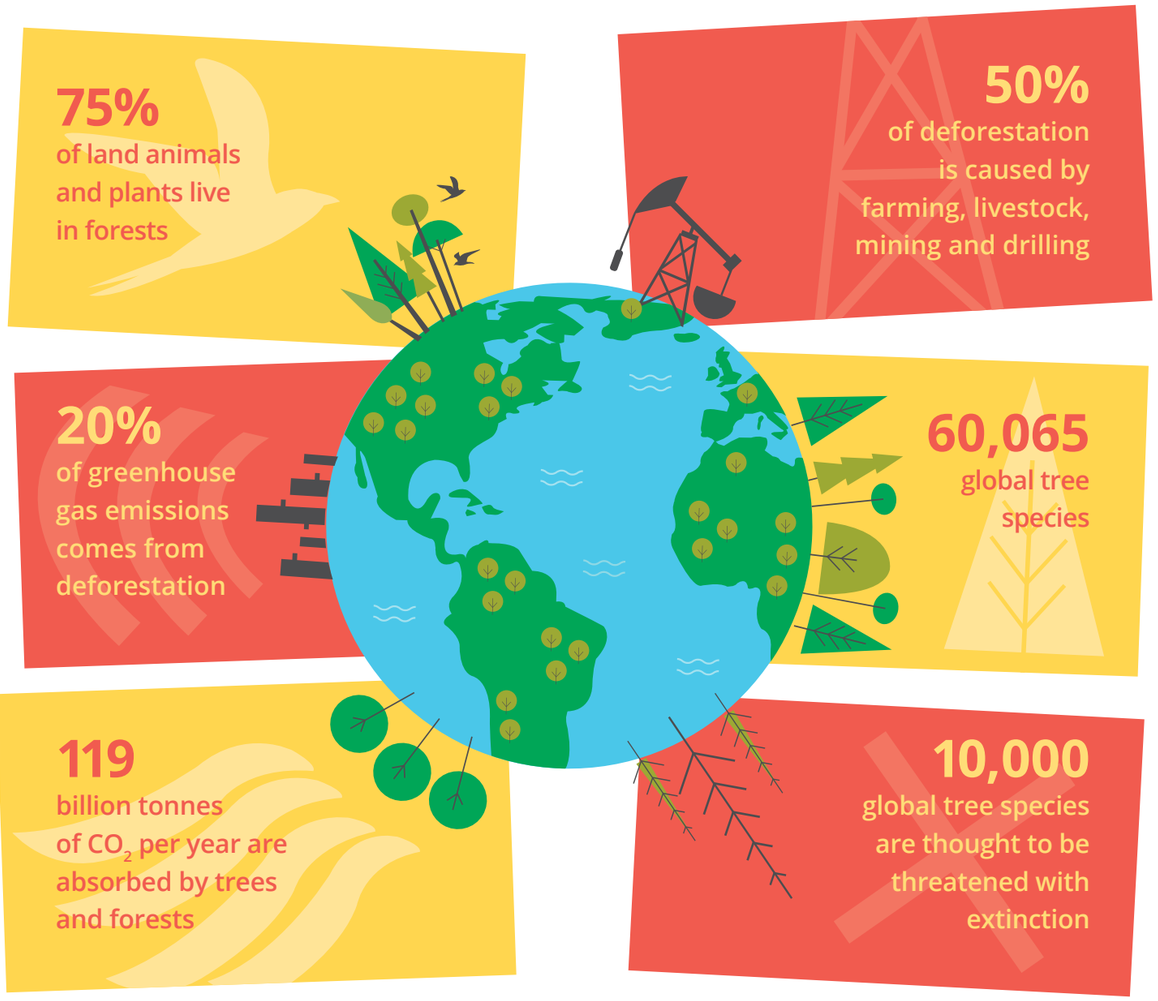
The National Arboretum: a national treasure

Westonbirt, The National Arboretum is a remarkable place; a beautiful and inspiring landscape that people can visit to enjoy and learn about trees. The combination of maturity, species diversity and landscape style creates one of the world's most extraordinary arboreta – and provides us with an iconic status in tree and landscape heritage.

With 15,000 tree specimens, five national tree collections and seasonal activities for all, visitors can come along to Westonbirt throughout the year and be met with a whole new environment as the seasons come and go. There's always something new to discover.

Whether our visitors get involved in workshops, events and guided tours or simply wander around the arboretum, there's something to inspire and delight around every corner. And in terms of science, ours is the perfect collection to research more about our trees today as well as helping to determine what could happen in the future.

A time to act



We are in a time of unprecedented change and increased understanding of the need to act swiftly to address climate change. There is only one proven technology to remove carbon dioxide from the air: trees. Yet trees are also under threat from the effects of climate change and other human impacts. At the same time we have developed a greater appreciation of the wider benefits of trees, particularly for well-being.

Andrew Smith
Forestry England Arboretum Director

As we look forward to the bicentenary of the arboretum in 2029, we set out what we need to achieve over the next decade to confront the challenges our trees face and the importance of connecting people with trees in our changing world. Through realising our 10-year vision for Westonbirt, we are confident the arboretum will continue to flourish and be better able to play its part in tackling these global challenges.

Mike Mintram
Friends of Westonbirt Arboretum Chairman

“From tackling poverty and hunger to mitigating climate change and conserving biodiversity, the positive impacts of forests and trees are fundamental to our existence.”

Food and Agricultural Organization of the United Nations. The State of the World’s Forests 2018

Facing the future

Westonbirt is a living, evolving landscape. As we face the future and a changing world, both environmentally and socially, it’s critical that we are ready to tackle challenges and harness opportunities as they arise.

- Understanding how trees will be affected by climate change, what we can do to manage our existing trees, and identifying which species will be best suited for an evolving environment will be the key to help us adapt our forests for the future.
- We will increase people’s connection with nature, to help them understand the value of trees and to encourage positive action for the future.
- As well as being a national and international asset, the arboretum also plays an important role in the local economy by providing a place to work, learn and enjoy. Our financial sustainability needs to be at the core of our work.
- Together we can safeguard and enhance the arboretum for future generations while also serving the needs of people today.

Our mission

To connect people with trees to improve the quality of life.

Our vision

To be a world leader in trees, inspiring people through education, participation and conservation.

The next 10 years

Our 10-year vision is centred on three key themes: **conservation**, **education** and **participation**. By studying and conserving our trees, sharing our knowledge and encouraging more people to engage with The National Arboretum, we can improve understanding of our natural assets, communicate the important role they play to all life on earth, and get more people benefitting from the positive impacts on health and well-being.

It's about **strengthening the connections between people and trees**. The next 10 years are key to making that happen.

"Our trees are becoming ever more threatened through climate change, disease and human intervention. The time to act is now – we need to address these threats."

Mike Coe, CEO, Friends of Westonbirt Arboretum

Conservation: Protecting our trees for the future

The challenge

The world's leading climate scientists have warned that there is only a decade left to change our behaviours and prevent a climate catastrophe. Trees will play a vital role in the solution to this challenge. At Westonbirt, within our living collection of 15,000 specimens, we have over 100 different species that are classified as threatened and in need of conservation. Unfortunately, native and non-native tree species alike may have little tolerance or resistance to fight against pests and diseases. Together with a changing climate, we anticipate threats to be evolving challenges that we will strive to overcome over the next decade.

Our response

Westonbirt will become an internationally recognised base for scientists to improve and expand our knowledge. We will work with national and international partners to tackle the difficult global challenges our changing world poses to trees and the ecosystems they support.

By predicting what the future may hold, we will identify species adapted to climate change and determine how to protect the trees we already have. To do this we will work to improve our facilities and skills, to enable us to conserve, develop and utilise our unique collection and share our knowledge widely.

A new centre of science and learning will make use of our 'living classroom' and include flexible facilities to host this collaborative work and share the importance and wonder of trees with everyone. To allow this transformation we will look to acquire new land around Westonbirt when the opportunity arises to grow our capacity.

We will also build an understanding of the value and importance of the collection we care for, taking radical action to improve our onsite sustainability.

"The world's response to climate change – in terms of adaptation, mitigation and resilience – must focus more on forests."

Food and Agricultural Organization of the United Nations. The State of the World's Forests 2018

Key commitments

- Develop our tree collection and landscape to make it more relevant to conservation and learning and growing resilience for generations to come.
- Collaborate with others to develop and communicate useful research about trees and their value to society.
- Understand the value of our natural capital to make better informed decisions.
- Become a leader in sustainability to encourage positive action.

Key commitments

- Inspire more people to connect with Westonbirt's heritage to empower them to make positive choices for the future.
- Enable more young people to participate actively to support our future, inspiring them to develop as future leaders.
- Encourage different perspectives to be heard and valued to foster creativity and innovation.
- Support the ongoing learning of all staff and volunteers to increase our effectiveness.

"Young people who spend time outdoors and forge a connection with the natural world are more likely to become environmentally-aware adults."

Botanic Gardens Educational Network

Education: Sharing knowledge to create change

The challenge

In an increasingly urban and technologically advanced society, people are becoming more and more disconnected with the natural environment. As this change happens, they start to lose appreciation of all the critical environmental and social benefits our trees offer. With this loss of appreciation people are less able to act to support the environment and trees.

Our response

Westonbirt is a great place to visit – and it's the perfect setting to learn about our natural environment. By developing innovative activities and events within our new learning facilities we will challenge and inspire people to engage with our natural environment. We will lead the conversation about trees, their role in society and how we can all secure their future.

Our activities will be for everyone; from the youngest visitor, through all life stages to create future leaders, volunteers and members to support our cause. We will also increase our links with academic institutions, enabling them to use the arboretum to apply and translate their research in the real world and communicate this to our visitors.

Over the next decade we will also develop a visitor experience that engages through interactivity and a new focus on the arts. It's about creating exciting and enlightening experiences from which everyone, from visitors to research partners, can learn and be inspired.

Participation: Connecting people with nature

The challenge

In our changing world there is increasing concern that growing sections of society can't, or don't, access natural environments like Westonbirt. They are missing out on the social and natural benefits they provide. With strong evidence linking the benefits of contact with nature on health and well-being, this needs to be addressed. Reduced access to trees can limit society's ability to live in a sustainable way, as they will be unable to understand the future challenges we all face.

Our response

Westonbirt has so much green space, flora and fauna, and we are perfectly placed to boost inclusive participation. We have already done so much, but we will continue to do more to improve access for those groups in most need, forging stronger links with our community partners. We will make sure that people are better able to experience our natural environment through a variety of media, connecting with our trees to improve their mental health and well-being.

Our staff and volunteers are committed to learning and sharing their knowledge with visitors, making every interaction an inspiring one by developing a broader range of talks, tours and interpretation. We will empower people to participate in our development to help shape our decisions.

We will make significant improvements to our outdoor spaces, ensuring they are designed for the needs of all. Our visitor welcome will inspire people to connect with the natural environment, understand the arboretum and join as members in lifelong support of our cause.

We will remodel and expand our central facilities - including café, commercial, exhibition and natural play areas, while continuing to showcase the work of the arboretum. Through this, we will create a more immersive visitor experience.

This will promote happier, healthier lives while conserving our thriving heritage for generations to come.

"The obesity rate of children living in areas with good access to green spaces is 11-19% lower than in those who have limited or no access."

Food and Agricultural Organization of the United Nations. The State of the World's Forests 2018

Key commitments

- Provide a world class and inclusive welcome to positively engage people with the arboretum.
- Raise the arboretum's profile as 'a world leader in trees' to grow support and recognition for our work and enable us to influence decision makers.
- Use the therapeutic benefits of the arboretum to improve people's physical and mental well-being.
- Grow our volunteering and membership, creating advocates for our cause.

Now is the time for Westonbirt, The National Arboretum to respond to the challenges of our changing world. We have the opportunity to demonstrate the critical connections between people and trees.

- This is our 10-year vision. It's an exciting time. Never before has the need to adapt and respond to the future been so great or your support been more vital.

- Working together we will achieve our goals to conserve Westonbirt for future generations, connect more people than ever before with trees, and also make a positive contribution to our global challenges.

Forestry England

Westonbirt, The National Arboretum

STATEMENT OF SIGNIFICANCE

WESTONBIRT, THE HOLFORD ESTATE

ORIGIN

The unique significance of Westonbirt lies in it being the initial vision of Robert S Holford and its connection with the family for more than a century. Robert Holford harnessed his own talents and great wealth, the skills and abilities of his friends, advisers and staff, and several among the great age of the plant collectors, to create a garden and landscape which fused science and the arts, great architecture and inspired arboriculture on a site with soil and climate suitable for a wide diversity of exotic tree species. It is recognised in the English Heritage Register of Parks and Gardens of special historic interest at Grade 1 i.e. of "exceptional interest". The formal garden and Lewis Vulliamy's Grade 1 house and associated estate buildings are of significance in their own right.

The main house, its interiors and other estate buildings demonstrate the same passions and eye for quality, with the use of the latest technology concealed by the same picturesque eye for colour, diversity and high art. The whole remains an exemplar of the period.

NATIONAL ARBORETUM

Westonbirt, The National Arboretum is of international significance, comparable in importance - scientific, historic, arboricultural - with other national collections of artefacts and living organisms. Over the past half-century its already outstanding collection of trees and shrubs has been conserved, expanded and developed mainly with plants of known provenance, including special collections of particular genera. The tree collection, already well-recorded, is now continuously catalogued in exemplary fashion. It contains endangered species and cultivars, many important specimens and comprises a gene bank of world importance.

The tree collection is an essential resource in the search for new tree species suited to a changing climate or to substitute for currently used ones that prove vulnerable to new pests or diseases.

STYLE

The stylistic significance of Westonbirt lies in its disposition of an unmatched collection of woody plants, many unknown hitherto, within a coherent and sophisticated aesthetic design of the highest quality for the house, garden, arboretum, park and wider estate. In design

and style of planting Westonbirt is the product of a highly-talented owner, with remarkable foresight and limitless resources, strongly influenced by W.S. Gilpin, leading promoter of the concept of The Picturesque as a style of planting and laying out of grounds. Holford's distinctive version of this style was adventurous, imaginative and consistently picturesque, always arranging plants according to their visual qualities. The result is a house, garden, park and arboretum, all of great beauty as well as outstanding interest and diversity, where Holford's descendants sought to make changes consistent with his style.

The Holfords of Westonbirt Trust was established in 2006 to help ensure the long-term preservation of the Holford legacy on the school-owned part of the estate.

PUBLIC BENEFIT

The Arboretum contributes strongly to tourism regionally and nationally and is an important generator of local trade and visitor interest. It is enjoyed by hundreds of thousands of visitors annually, being nationally amongst the most popular destinations in its field of interest and by far the most visited in the region. It also attracts repeated visits and strong support locally, appealing to a wide range of visitors across social class and age range, including children, the elderly and the disabled. The qualities and values perceived by visitors to be most closely associated with the Arboretum are "beautiful", "calming", "interesting" and "impressive"; to a lesser extent "picturesque", "rejuvenating" and "educational". The sum total of the Arboretum's recreational and therapeutic value is unquantifiable but must be enormous. Its social benefit is further enhanced and widened by the involvement of The Friends of Westonbirt Arboretum. The charity was formed in 1985 to support the Forestry Commission in maintaining the tree collection and in increasing access by the public for a wide variety of recreation and learning activities.

Due to its modern role as a school, public access to the house and gardens has, by necessity, been limited. However, one of the key aims of the Holfords of Westonbirt Trust is to increase access, and many more people now have the opportunity to visit the gardens.

EDUCATION AND TRAINING

Westonbirt is an important resource for all aspects of education, not least at Westonbirt house with its garden and park, where high standard education for all ages is provided, together with cultural activities and events for a wide audience. With its rich resources - historical, arboricultural, botanical, horticultural, biological, environmental and landscape -the Arboretum has huge potential for education and training of all kinds including school-age education, lifelong learning, practical courses for amateurs, professional training, international research and conferences. It already has an experienced and effective education team. Being one of the largest of its kind, the Friends of Westonbirt Arboretum constitutes an organisation capable of playing a broad role in education and training and, through its support of management, with local involvement generally.

Statement of Significance

NATURE CONSERVATION

Westonbirt contains a wide range of wildlife habitat including species-rich grassland, ancient and semi-natural woodland, wetland, various managed woodland types and a huge diversity of woody plants, including many large and mature specimens. All of these elements contribute to a rich resource of wildlife habitats. The Arboretum manages its land with this in mind as do the other land owners and tenants. Wildlife contributes strongly to the appeal of the Arboretum and to its potential for imparting an understanding of environmental issues of all kinds. The Arboretum is of local importance in wildlife conservation. Historic communal use of Silk Wood is on record.

OWNERSHIP

The house, garden and part of the parkland is owned by Westonbirt School which needs to balance the aims of the school with the demands of conservation. The remainder of the park, including Home Farm, is privately owned and leased on an agricultural tenancy, the tenants needing to balance the pressures of commercial agriculture with conservation. The Arboretum, including The Downs parkland, is owned by the Forestry Commission. As well as needing to conform to the Commission's mission statement, the Arboretum constitutes an exemplar of its purposes, especially in respect of protection, diversification, public understanding, community participation, conservation of landscape and cultural heritage, recreation and economic value.

John Sales
(Oct 2003)

Updated March 2011 by Simon Toomer, Arboretum Director

Forestry England

Westonbirt, The National Arboretum

Policy Structure for Arboretum Management

Mission

'To connect people with trees, to improve the quality of life'

Vision

'Our Place in a Changing World' – a 10-year vision for Westonbirt, The National Arboretum 2019-2029

Strategy

Strategic Operational Plan

Forest Design Plan

2020-2029

Arboretum Management & Botanical Plant Collection Development

- Accession Policy
- Acquisition Policy
- Arboricultural Impact Policy
- Avenue Management
- Collections Policy
- Planting & Establishment Plan
- Propagation Protocols
- Protection of Downland Trees
- Records Policy
- Remedial Cycle Management Plan
- Remedial Section Mapping & Labelling
- Surplus Plants Policy

Landscape Heritage & Style

- Arboretum Landscape Plan
- Historic Landscape Survey & Restoration Plan
- Statement of Significance

Woodland Management

- Woodland Management Plan for Silk Wood
- Coppice Restoration & Management Plan

- Shelterbelt Plan (Old Arboretum)

Environmental Protection

- Biosecurity Policy
- Business Sustainability Plan
- Chemical Reduction Policy
- Conservation Management Plan – to be revised with professional consultants in 2021
- Flora & Sward Management Plan
- Integrated Pest Management Strategy
- Pollution Control Plan
- Pond Management Plan
- Redundant Materials Plan
- Sustainability Action Plan
- Wildlife, Habitat & Conservation Strategy

Science & Research

- Research Strategy for the National Tree Collections

Health & Safety Management

- Chainsaw & HAVS Policy
- Child Protection Policy
- Constraints Map
- Emergency Action Plan
- First Aid Policy
- Local District Health & Safety Plan
- Site Safety Rules
- Tree Safety Management Policy

Recreation

- Arts strategy
- Catering Strategy
- Community Strategy
- Diversity and Inclusion Strategy
- Education Strategy
- Engagement Strategy
- Evaluation Plan
- Events Plan
- Interpretation & Arts Strategy
- Learning & Participation Strategy
- Marketing & Communication Strategy
- Play Philosophy and development Plan
- Volunteer Strategy

Forest Design Plan - Appendix 11

Capital Development

- Westonbirt Project – Downland Restoration Plan
- Westonbirt Project – Management & Maintenance Plan
- Westonbirt Project – Monitoring & Evaluation Plan
- Westonbirt Project - Site Masterplan