GLOUCESTERSHIRE TREE STRATEGY

Gloucestershire Local Nature Partnership

SEPTEMBER 2020

Environment Committee
20 April 2021

PURPOSE:

The purpose of this Tree Strategy is to guide and inform tree planting, growing and new woodland creation in Gloucestershire. We need to ensure that existing and future initiatives are delivered as a network of complementary projects. This coordination will help avoid duplication, inefficiencies, and biosecurity breaches, ensuring we grow "the right tree in the right place, for the right reasons" and commit us to sustainable woodland management.

This document is to be reviewed within the wider context of the Gloucestershire Local Nature Partnership's (GLNP) emerging Natural Capital Mapping, Local Nature Recovery Strategy and Strategic Green Infrastructure Framework for Gloucestershire.

VISION:

A THRIVING NETWORK OF SUSTAINABLY MANAGED TREES AND WOODLANDS COVERING AT LEAST 20% OF THE COUNTY, DELIVERING RESILIENCE AND CONNECTIVITY FOR PEOPLE, WILDLIFE AND THE ECONOMY.

GUIDING PRINCIPLES:

1. Establish the right tree in the right place for the right reason, through both active planting and natural regeneration as appropriate

2. Nurture lifelong connections between trees and people, recognising health and wellbeing benefits

3. Champion the recovery of the county's nature and wildlife, aiming for at least 20% canopy cover by 2030

4. Support Gloucestershire to become Net Carbon Zero and be resilient to the impacts of climate change

5. Consider alternatives to tree planting and woodland creation when investing in carbon sequestration

6. Promote the economic use of woodland to provide sustainable materials that will fund and support the ongoing positive creation and management of woodlands

7. And finally – continue to ensure that existing woodlands and important trees are promoted, protected and well-managed.

DRIVERS:

There are numerous different but complementary drivers for tree planting and woodland creation in Gloucestershire, and nationwide:

ASH DIEBACK RESPONSE

Gloucestershire is set to lose millions of ash trees due to a devastating fungal disease – up to 95%. Urgent action is needed to plan for mitigating the impacts of this. See our position statement for more details or Appendix 3.

CARBON SEQUESTRATION

We cannot plant our way out of the climate and ecological emergencies. Whilst woodland creation and restoration of other natural carbon stores is necessary, it should be considered supplementary to reducing carbon emissions to zero by 2030, rather than be the main mechanism.

CLIMATE CHANGE ADAPTATION

We are already and will increasingly experience drier, hotter summers and cooler, wetter winters. Trees and woodlands in the right place can moderate air quality and extreme temperatures.

PLACE-MAKING

The Gloucestershire Local Nature Partnership (GLNP) has consistently advocated for a strategic approach to the implementation of high-quality green infrastructure. Growing trees near where people live and work is proven to increase sense of place, boost productivity and deliver improved health and wellbeing, with greater property value.

HEALTH AND WELLBEING

Growing trees near where people live and work is proven to deliver improved health and wellbeing and increase sense of place.

HABITAT RESILIENCE

There is currently an ecological crisis, with levels of biodiversity plummeting nationwide. Gloucestershire must act swiftly to reverse these declines, of which trees play a vital part through carefully planned creation and connectivity.

NATURAL FLOOD MANAGEMENT (NFM)

Trees and woodland are excellent at slowing the flow of water in upper catchments, holding water in the landscape for longer to reduce peak flows and subsequently minimise or prevent flooding.

COMMERCIAL TIMBER PRODUCTION

The direct economic benefits of growing trees and woodlands may be longer term than many other benefits, but nonetheless drive many stakeholders. Woodland creation also supports other rural economic activities.

RECREATION

Providing sufficient access to green spaces for recreation is vital to improve societies health and wellbeing, preserving the high nature value of alternative sites and delivering economic activity through eco-tourism.

FOOD PRODUCTION

Agroforestry is of increasing value and will be a driver for many landowners.

THE RIGHT TREE IN THE RIGHT PLACE, FOR THE RIGHT REASONS.

glos nature

GLOUCESTERSHIRE
LOCAL NATURE PARTNERSHIP

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Introduction

1. Why is a Tree Strategy needed?

1.1. Forestry and woodlands are an important part of the Gloucestershire landscape and have been managed as a sustainable resource for centuries. The Office for National Statistics calculates that the market- and non-market benefits of woodlands have a total annual value of £3.3billion in England[1]. In this sense they are a key natural asset, delivering vital services for people, the economy and nature.

1.2. There are numerous different but complementary drivers for tree planting and woodland creation in Gloucestershire, and nationwide:

- Ash dieback response[2]
- Carbon sequestration
- Climate change adaptation: moderating air quality and extreme temperatures
- Place-making and wellbeing
- Habitat resilience through creation/connectivity/appropriate management
- Natural Flood Management
- Commercial timber production
- Recreation and education
- Food production

1.3. We cannot plant our way out of the climate and ecological emergencies. Whilst woodland creation, and restoration of other natural carbon stores is necessary, it should be considered supplementary to reducing carbon emissions to zero by 2030, rather than the main mechanism. Carbon emissions data for the county is incomplete, so presently tree growing should be considered mitigation of non-reported emissions.

1.4. The purpose of this Tree Strategy is to guide and inform tree planting, tree growing and new woodland creation in Gloucestershire. We need to ensure that existing and future initiatives are delivered as a network of complementary projects. This coordination will help avoid duplication, inefficiencies and biosecurity breaches, ensuring we grow 'the right tree in the right place for the right reasons' and commit us to sustainable woodland management.

1.5. Government's England Tree Strategy, which sets out policy approaches to meet Government's targets, is currently out for consultation and is expected to be published later this year. The draft Strategy advocates a natural capital approach to ensure woodland expansion happens in a way that best responds to interrelated challenges of climate emergency, biodiversity loss, ecological breakdown, poor catchment health, flood risk, economic, equality and wellbeing challenges. The draft Strategy also proposes a role for 'empowered and informed' local partnerships in localising its approach.

1.6. There is also a need to link people who want to plant and grow trees with the various funding streams as well as critically to those who own land where the nurturing of trees is both appropriate and sustainable. Whilst this document does not outline a plan for doing this, it is considered vital for the LNP to promote and facilitate such an approach. Organisations such as the

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[1] https://www.ons.gov.uk/releases/uknaturalcapitalwoodland
[2] https://www.gloucestershirenature.org.uk/post/glnp-ash-dieback-position-statement.

Stroud Valleys Project, Woodland Trust, National Farmers Union, Gloucestershire Wildlife Trust and Farming and Wildlife Advisory Group who have relevant experience should be supported to scale-up their efforts. The Gloucestershire Local Nature Partnership (GLNP) is developing a Natural Capital Investment Trust to coordinate the brokering of demand- and supply-side partners in the creation of new woodlands.

1.7. This document has been co-created by partners of the Gloucestershire Local Nature Partnership (see www.gloucestershirenature.org.uk<mark>Error! Reference source not found.Error! Reference source not found.</mark>). It is designed as a high-level document to guide a consistent approach to trees by all LNP partners. It may also serve as an educational document for a wider group of stakeholders, including farmers and land-managers, businesses and members of the public/community groups.

1.8. This document is to be viewed within the wider context of the GLNP's emerging Natural Capital Mapping, Local Nature Recovery Strategy and Strategic Green Infrastructure Framework for Gloucestershire.

Vision and Targets

2. Vision

2.1. A thriving network of sustainably managed trees and woodlands covering at least 20% of the county, delivering resilience and connectivity for people, wildlife and the economy.

2.2. The 25 Year Environment Plan sets a target of 12% tree cover by 2060. This is out of step with the UK Government's Committee for Climate Change (CCC) suggestion of an increase in woodland cover to 19% nationally by 2050[3].

2.3. As Gloucestershire already has a higher proportion of tree cover than the national average, as well as strong ambitions to lead, partners have agreed to adopt an ambitious target of 20% tree cover by 2030.

3. Annual Targets

3.1. To achieve this vision, annual targets are important to build age diversity, as well as placing a focus on long term sustainable woodland management. The UK Government has set a target of the year 2025 by which to raise annual woodland creation to 30,000ha across England.

3.2. The below figures represent extrapolation of the 20% target based on land area alone. While these are helpful to set an initial direction and highlight the scale of the challenge, work is needed to localise targets according to spatial prioritisation, guided by the Nature Recovery Network mapping produced by Gloucestershire Wildlife Trust, and the Natural Capital Mapping developed by the GLNP.

Table 1. Current and target total woodland cover, and trees required to deliver.

	CURRENT WOODLAND Ha	CURRENT WOODLAND %	20% land cover (Ha)	Ha needed to reach 20% by 2030	Trees needed to 20% (based on 2,000 trees/Ha)
GLOUCESTERSHIRE (270,678ha)	36,490	**13.48%**	54,135	17645	35,290,343

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[3] https://www.theccc.org.uk/wp-content/uploads/2018/11/Land-use-Reducing-emissions-and-preparing-for-climate-change-CCC-2018-1.pdf

Table 2. New woodland needed per District.

	CURRENT WOODLAND Ha	CURRENT WOODLAND as a % of total area	New woodland needed to reach 20% trees cover county-wide, representing a 50% increase in tree cover per District (Ha)
Forest of Dean	13646	24%	6599
Stroud District	5391	11%	2607
Cotswold District	13648	11%	6600
Tewkesbury Borough	3398	8%	1643
Gloucester	163	3%	79
Cheltenham	242	5%	117

NB the above data is from the Nature Recovery Network mapping and does not include in-field trees, street trees or hedgerows. We are expecting new data later this year which may show an uplift in existing tree cover across the county.

Spatial targeting

4. Nature Recovery Network

4.1. Reaching 20% tree cover will include a diversity of habitats – including woodlands, orchards, wood pasture, riparian trees, hedgerows, and street trees – as part of a wider mosaic of habitats that best support nature recovery.

4.2. Agroforestry – integrating trees in farming systems – is a powerful way of enhancing natural capital while supporting farm productivity. Less sensitive areas, such as marginal farmland, might be more appropriate for productive forestry. The Nature Recovery Network (NRN) (see Figure 1) will be used to identify areas where woodland creation will have the most benefit for biodiversity. This zoning approach should be considered a key priority when supporting woodland creation projects. This NRN will also highlight priority habitat areas where we should NOT afforest, such as species rich grassland.

5. Natural Capital Mapping

5.1. The GLNP's Natural Capital Mapping (Figure 2) spatially illustrates where multiple benefits can most effectively be delivered by trees and woodlands, considering opportunities for enhancing natural capital to deliver improvements in air quality, flood risk, water quality, soil health, local climate regulation and access to green space for people.

6. Beyond Carbon Sequestration

6.1. There are several other areas where woodland creation and tree growing would deliver multiple benefits beyond carbon sequestration. Such opportunities for multiple benefits should be prioritised but biodiversity benefits should be built into all opportunities (Figure 3):

- Supporting river catchment management to help to reduce flood risk downstream
- Storing water within the landscape to mitigate against water scarcity
- Prevention of soil erosion
- Planting areas (especially for productive forestry) of low agricultural, biodiversity and/or development value to ensure real benefits for society, the economy and the environment.
- Focussing on areas where incentives are higher for landowners

- Targeting built-up areas where multiple gains of community engagement, public health investment, natural flood management, urban cooling and air quality improvement exist (see also the LNP's Green Infrastructure Framework)
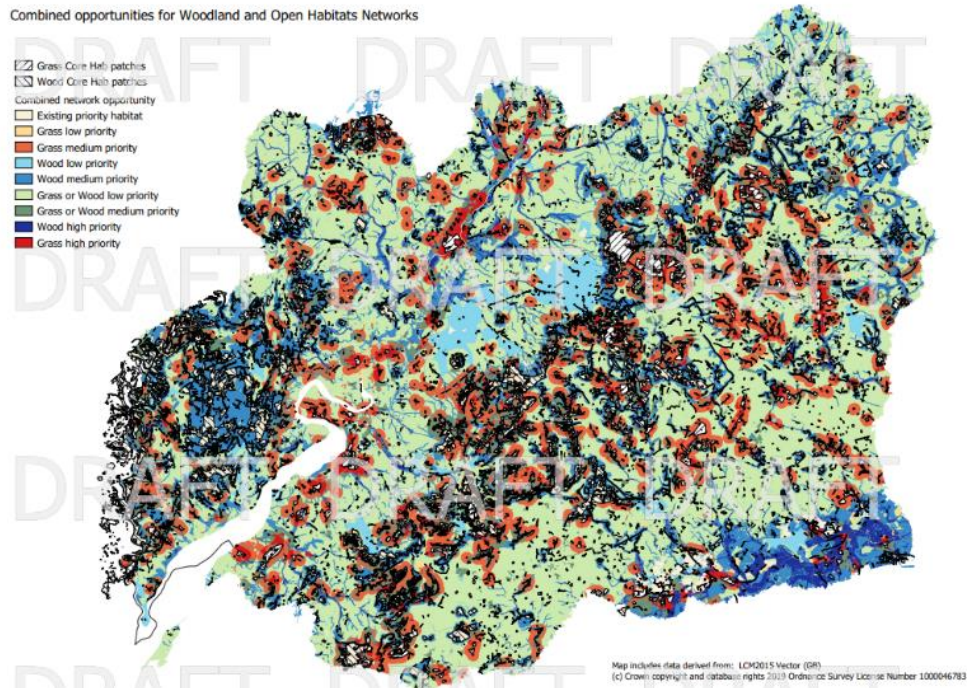- Trees for food: the importance of agroforestry, orchards and fruit trees in urban areas.

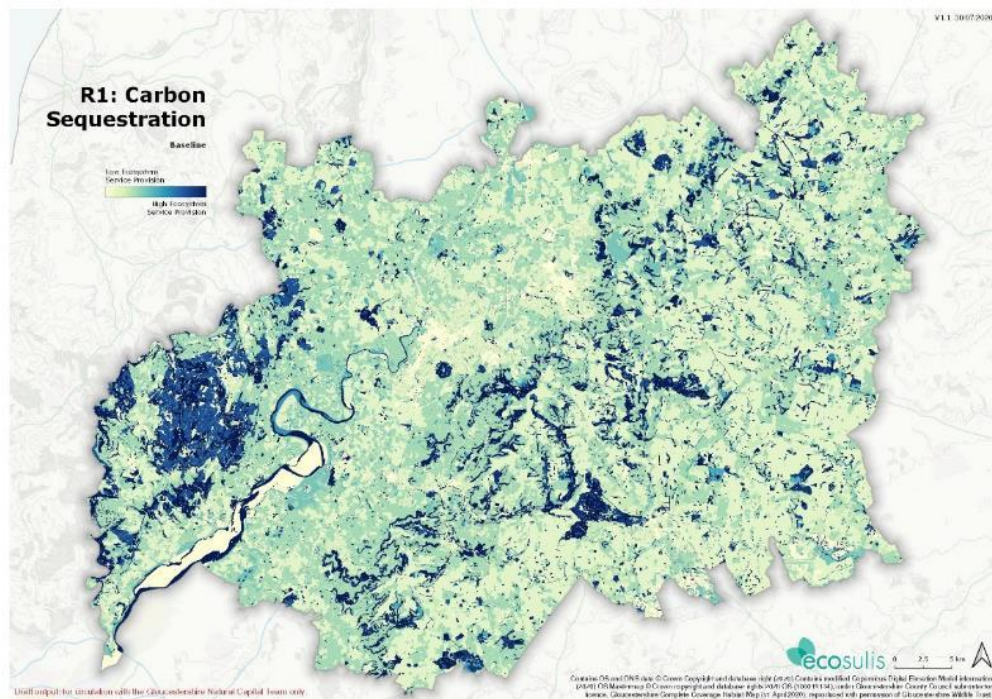*Figure 1. Output from the Nature Recovery Network Mapping*

Figure 2. Output from the Natural Capital Mapping showing the current carbon sequestration ability of habitats in Gloucestershire

6.2. Expanding the urban forest and trees outside woods would provide additional opportunity for planting and canopy cover and would help meet several drivers and benefits identified. The CCC also recommends significant expansion of trees outside woods, including agroforestry and hedgerows[4].

6.3. Commercial forestry will also be part of the mix. When looking at productive woodland, another useful tool to guide decision-making is the forestry forestergis.com/Apps/MapBrowser. This helps with an understanding of where the Woodland Grant Scheme is prioritised.

6.4. It is appropriate to consider landscape character and historic environment when assessing a site's suitability for trees/woodland. In such instances, guidance should be sought from Natural England's National Character Area Profiles and the County Landscape Character Assessment descriptions.
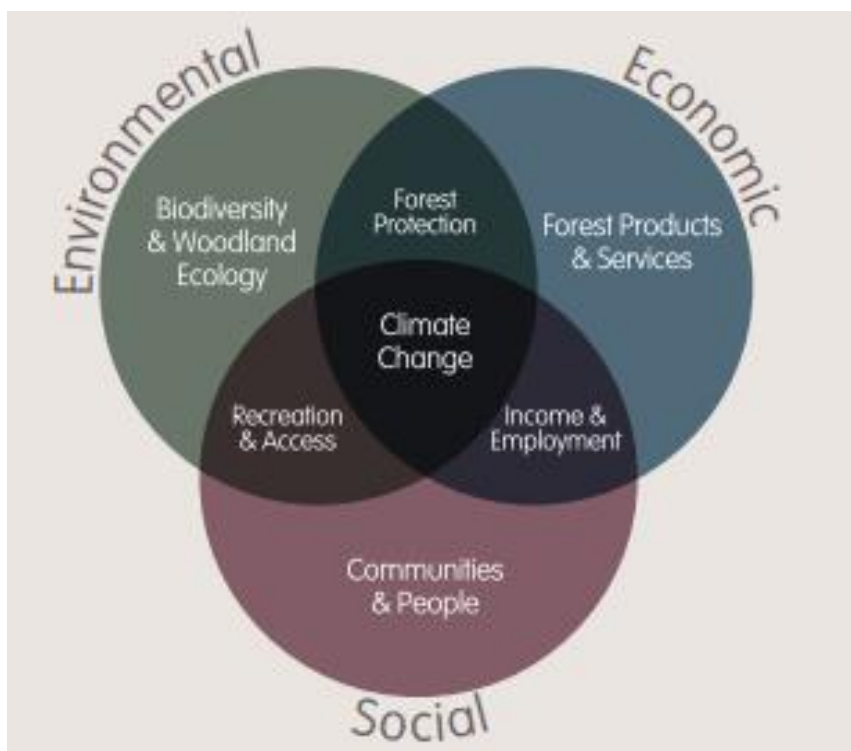
Figure 3. The multiple benefits of trees

Approaches to tree growing

7.   Working with Landowners

7.1. Two approaches to woodland creation and tree growing exist and the choice of which method to use (or in combination) must be taken on a case by case basis – these are either natural regeneration, or planting. The final decision will clearly need to be made by the landowner as each

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[4] https://www.theccc.org.uk/publication/land-use-policies-for-a-net-zero-uk/

approach will be dependent on the individual circumstances: working closely with landowners is key to delivering the vision. Direct seeding is also a possibility where the site's seed stock is poor.

8. Natural Regeneration

8.1. Natural Regeneration (Figure 4) is the process by which natural processes are allowed to operate upon the land. The term rewilding is often used to describe such a process. However, projects can only really be said to be truly 'rewilding' if they "restore ecosystems with enough space to allow nature to drive the changes and the living systems, which provide the ecological functions on which we all depend."[5]

Figure 4. Natural Regeneration on a farm in Gloucestershire (image used with kind permission of Sarah Wells, FWAG SW.)

8.2. In practice, most 'rewilding' projects require some management. In this country the absence of top predators allows larger herbivores (such as deer) to overgraze land and in many cases will precluding natural regeneration of woodland. Therefore, assuming an abundance of a local native seed source, erecting deer fences can help to redress the balance, allowing woodland to establish itself. The speed at which land will become woodland if appropriately fenced will again depend on a site by site basis, but it can be assumed to be longer than if that land was planted with tree whips.

8.3. Encouraging natural regeneration of our native species is key to developing genetic diversity and phenotypic elasticity (the range of conditions in which an individual can thrive) to support localised adaptation to climate change. Genetic diversity is likely to be even more important than species diversity to build resilience to changing conditions and manage the spread of disease.

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[5] https://www.rewildingbritain.org.uk/rewilding/rewilding-principles

8.4. The ambitious vision of 20% woodland cover by 2030 will require a combination of natural regeneration and planting, as partners do not have the resources required to plant over 3million trees per year.

9. Planting

9.1. Planting can be a good option of establishing tree cover. It is also useful for speeding-up the establishment of valuable mature trees in hedgerows. Planting will be the approach most often taken in urban and peri-urban environments, for small areas, and in areas where significant deer fencing is considered inappropriate or unfeasible. The Woodland Trust have guidance to follow for planting[6], but issues that need to be carefully considered are soil type and depth, species/cultivar and origin of trees or shrubs to be used, planting density, deer or rabbit protection, and aftercare management.

9.2. The type of trees one decides to plant depends primarily on the landowner's objectives, site suitability and resilience to climate change and pests and diseases. Practitioners should look for a diversity of species, age, and structure appropriate to the location. All trees should be UK-sourced and grown if possible, for biosecurity reasons – importing stock should be a last resort, and subject to the most stringent biosecurity screening. Native species should be prioritised where appropriate, with a predominance of broadleaved varieties. However, consideration should be given to the planting of alternative species in certain instances, to allow for climate change adaptation of our tree mix.

9.3. Current UK nursery provision will not be able to provide the numbers of trees needed for current national planting aspirations. To ensure availability of locally grown trees, priority should be given to expanding nursery provision through both expansion of existing nurseries and the creation of new ones. This approach will also have significant benefits for the local economy.

9.4. Areas over 5 hectares need to go through an Environmental Impact Assessment process (2ha. in AONBs)[7]. The Forestry Commission's Low Risk map is a helpful indicative tool in the appropriateness of a site for woodland creation.

10. Consultation

10.1. As any land use change has the potential to be contentious, it is recommended that larger schemes are carried out following community engagement and consultation. There are many organisations who can help with this process, including Gloucestershire Rural Community Council and the Association of Parish and Town Councils. Similarly, many community members may wish to get involved in planting and ongoing management, and there are examples of successfully engaging volunteers to plant large areas in a short time for low cost. This has the added benefits for public health and wellbeing and raising awareness of issues such as flood risk, biodiversity, and climate change.

Management

11. Ensuring Survival

11.1. Tree planting in general, and woodland creation in particular, is not a one-off activity. It is the start of a long-term investment in growing and maintaining trees for long term-benefit. Trees need

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[6] https://www.woodlandtrust.org.uk/plant-trees/advice/
[7] https://www.gov.uk/guidance/assess-environmental-impact-before-you-create-new-woodland

managing and maintaining to ensure they survive, develop to maturity, and continue to deliver maximum services to society.

11.2.   UKFS compliance, as the legal standard for forestry management in the UK and Forestry Commission awards grants subject to its acceptance, should be assured in all cases[8], with UKWAS considered as a desirable management standard[9].

11.3.   Deer and squirrel damage are common factors that will inhibit woodland creation. Some thinning or pruning or coppicing of young trees might be needed to get the best woodland (or orchard/ plantation) results. Tracks, rides, and woodland paths may also require regular management to keep them open if they are to be regularly accessed by the landowner, forester or the general public.

11.4.   A woodland managed to maximise growth rates will sequester more carbon more quickly than one left unmanaged[10]. Currently, 42% of woodlands in the UK are unmanaged[11]. A management plan for each creation/planting site will be necessary and will be site specific.

11.5.   Potential exists for community ownership and management and should be explored and encouraged where appropriate.

Funding

12. Sources of investment

12.1.   Public money alone is not sufficient to realise the vision outlined in this document. Fortunately, the list below shows there are multiple potential funders/investors[12]:

- Agri-environment schemes (Countryside Stewardship[13], WGS[14]/ELMS/Nature for Climate fund,)
- LEP – major growth projects required to demonstrate carbon neutrality
- County & District Councils (budgetary contributions as part of a climate emergency response)
- Environment Agency
- Forestry Commission (various funds[15])
- Woodland Trust[16]
- Biodiversity Net Gain offsetting
- Community Infrastructure Levy
- Section 106 (especially with NDPs)
- Timber trade federation
- Corporate funding (offsetting, carbon credit schemes)

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[8] https://assets.publishing.service.gov.uk/government/.../file/687147/The_UK_Forestry_Standard.pdf
[9] http://ukwas.org.uk/
[10] Growing trees to sequester carbon in the UK – answers to some common questions. CANNEL, M.G.R., 1999. Forestry, Vol 22, No 3.
[11] https://www.cla.org.uk/sites/default/files/PDF%20Documents/CLA%20Woodland%20Summary%20final.pdf
[12] https://assets.publishing.service.gov.uk/government/... /file/844836/Woodland_grants_and_incentives_overview_table_-_Nov._2019.pdf
[13] https://www.gov.uk/guidance/woodland-creation-grant-countryside-stewardship
[14] Capital funding for the creation of new, productive woodland for carbon sequestration. For schemes of 10 hectares or more. More here: https://www.gov.uk/guidance/woodland-carbon-fund
[15] https://www.gov.uk/guidance/create-woodland-overview
[16] https://www.woodlandtrust.org.uk/plant-trees/large-scale-planting/

12.2.   A Natural Capital Investment approach is being developed in Gloucestershire. This will enable multiple funding streams to be utilised to deliver multiple benefits through a wide range of delivery partners whilst ensuring delivery of this strategy. This approach will help match public investment with the large and growing potential for investment through corporate offsetting.

Beyond Trees

13. Land-use Changes

13.1.   The Committee on Climate Change (CCC) identifies that increasing woodland cover in the UK to 19% would capture 10% of residual emissions (those emissions that cannot be decarbonised). Land use change is required to 'offset' the other 90% of residual emissions. Wider land-use change is also crucial to addressing the ecological crisis and reversing biodiversity declines. Rewarding alternative land-use changes (other than tree-growing) without impacting on food production is vital if we are to achieve net zero whilst not off-shoring agricultural emissions. Agroforestry has great potential to provide multiple benefits through mixed land use[17].

Many land-use changes have a much lower carbon cost (£/tCO₂e) than afforestation (see Appendix 1Appendix 1) and should be considered or prioritised alongside woodland creation[18].

13.2.   The key land-use intervention that has significant potential for carbon storage at a much lower cost than woodland creation is wetland creation (see Appendix 1). The Severn Estuary is a vital ecosystem and natural capital resource for the region. The creation of natural functioning wetlands on the floodplain such as to the north of Gloucester has the potential to deliver multiple benefits such as reducing flood risk, sequestering carbon, habitat creation and connectivity and public amenity provision. Natural climate solutions such as natural flood management are consistent with the Local Nature Partnership's Strategic Green Infrastructure Framework as well as some emerging Local Development Plans.

13.3.   Storing carbon in the soil (or potentially peat in wetlands) is a long-term solution that can deliver multiple benefits. Land use and land management changes such as organic conversion enhance soil condition, water quality, reduce run-of (and therefore flood risk) and enhance biodiversity.

13.4.   Like organic conversion, extensively grazed species-rich grasslands are also excellent carbon sinks, storing carbon in the soil whilst also offering benefits to biodiversity and pollination services. The Cotswolds is a mosaic of habitats including woodland, farmland, and pasture. Investment in this natural capital by increasing the area of permanent pasture while reducing the intensiveness of grazing can represent a very effective way of delivering these multiple benefits.

Major Projects

14. Delivery at Scale

14.1.   The key to unlocking private sector investment in nature-based solutions like woodland creation is delivery at scale. Partnerships are already being developed to create large woodlands,

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[17] https://www.soilassociation.org/farmers-growers/technicalinformation/agroforestry-handbook/
[18] http://publications.naturalengland.org.uk/publication/1412347

such as the Gloucestershire Forest, and Forests without Frontiers. Branded projects such as these are powerful to a sense of place and likely to be more attractive to private investors.

14.2. **Forest without Frontiers:**

- Location: Cross border forestation project between England and Wales
- Total project area is 160,000 ha
- Stage one delivery area is 38,500 ha centred around the Wye Valley Area of Outstanding Natural Beauty and the Forest of Dean
- This will expand the existing visitor space, taking pressure away from the central forest and providing enhanced accessible woodlands for a larger number of communities.
- Aims to expand and connect the existing forest areas to create a mosaic of wooded and open habitats. This will be delivered alongside enhancement of existing ancient woodland that is degrading due to lack of management.
- We anticipate a mean planting density between 1000 and 2000 trees per hectare in new woodland areas.
- Planting will be restricted to broadleaved trees which are native to the UK

14.3. **Great Gloucestershire Forest**

- Location: South Gloucestershire and Gloucestershire, running from Westonbirt Arboretum down to GWT's Lower Woods nature reserve and across the border.
- Total project area is 2300 ha
- Aims to expand one of the largest ancient woodlands in Southern England and connect fragments of ancient woodland over the project area. It will also create a mosaic of wooded and open habitats.
- This will also create a major new recreation space.
- We anticipate a mean planting density between 1000 and 2000 trees per ha in new woodland areas.

14.4. Large scale woodland creation ideas will only be realised through close engagement with landowners and other stakeholders. They are also subject to compliance with the EIA and potentially other processes (see 9.4).

Communication

14.5. Trees have captured the public imagination as part of the climate and ecological emergencies. Therefore, communicating appropriately around this is an opportunity to develop in the general public a wider understanding of the carbon and biodiversity debates with a view to promoting behaviour change across a wide range of issues. Currently the key aspects are that:

- Partners will commit to telling the story of ash-dieback and biosecurity.
- Partners will agree to telling a single message and vision, aligned to this strategy and specifically the guiding principles.
- BBC Radio Gloucestershire to be considered as the lead communications partner.

This strategy has been developed by the Nature Recovery Group of the Gloucestershire Local Nature Partnership, which includes representatives from the following organisations:

Gloucestershire Wildlife Trust
Forestry England
Woodland Trust
Forest of Dean District Council
Cotswold District Council
Gloucester City Council
Gloucestershire County Council
Stroud District Council
University of Gloucestershire
Countryside and Community Research Group (CCRI)
Natural England
Stroud Valleys Project
National Trust
Wye Valley AONB
Farming and Wildlife Advisory Group (FWAG) South West
Cotswold AONB
CPRE
Forestry Commission
National Farmers Union
Wetland and Wildfowl Trust (WWF)
Gloucestershire Rural Communities Council

September 2020

APPENDIX 1. LAND-BASED CLIMATE CHANGE MITIGATION OPTIONS

Research led by Prof. Tom MacMillan, Royal Agricultural University. Figures used with kind permission of South Gloucestershire Council.

Royal Agricultural University — Impact of land use options

We reviewed evidence on a diversity of land use changes, including research on the impact and cost of over 30 variants (e.g. by woodland type, prior land use). As the evidence is patchy and the impact is context dependent, it makes sense to summarise these under broader headings, and the reflect the range of performance.

Option	Mechanism	GHG impact (tCO_2e/ha/yr)	
		Low	High
Woodland creation	Carbon stored in trees and soils	4.3	6.8
Perennial bioenergy crops	Biomass may be used for carbon capture	1.3	2.4
Agroforestry	Lower density trees 'stacked' with farming	0.7	2.2
Hedgerow expansion	More or bigger hedges lock C in plants & soils	0.3	0.8
Grassland reversion	Grassing over arable locks C in soils	1	1
Organic conversion	More soil C & less use of fertiliser	0.5	2.3
Pasture-fed conversion	Lower stocking & less use of fertiliser	0.5	0.5
Farm efficiency	Less use of fertiliser & other inputs	0.2	0.4
Wetland creation	Wetlands absorb C	1.2	4.3

Royal Agricultural University — What are the risks & co-benefits?

Most of the options have wide-ranging co-benefits. Their impact will depend on location and management. The main risk is reducing food yield and so offshoring the GHG impact of production (i.e. it still happens elsewhere). Some options reduce food yield but increase harvestable biomass yield (e.g. timber from agroforestry).

| Option	Natural capital	Nature recovery	Flood managem't	Air quality	Health & wellbeing	Yield
Woodland creation	🟢🟢	🟢🟢	🟢	🟢	🟢	🟡
Perennial bioenergy crops	🟢	🟢	🟢	🟡	🟡	🟡
Agroforestry	🟢🟢	🟢	🟢	🟢	🟢	🟡
Hedgerow expansion	🟢	🟢	🟢	🟢	🟢	🔴
Grassland reversion	🟢	🟢	🟢	🟢	🟢	🔴
Organic conversion	🟢	🟢	🟢	🟢	🟢	🟡
Pasture-fed conversion	🟢	🟢	🟢	🟡	🟢	🟡
Farm efficiency	🟡	🟡	🟡	🟢	🟡	🟢
Wetland creation	🟢🟢	🟢🟢	🟢🟢	🟢	🟢	🔴

Royal Agricultural University

How much do the options cost?

Establishment or conversion costs range widely. For most of the highest cost options, near-full capital grants are available. Some provide stable or raised revenue potential through new markets or value addition, or direct savings. Others offer uncertain carbon or other payments for ecosystem services. Excludes land costs.

Option	Gross cost/£/ha	Carbon cost/£/tCO$_2$e		Capital grants available	Revenue potential
		@2030	@2050		
Woodland creation	5,600	101	34	🟢	🟡
Perennial bioenergy crops	1,900	103	34	🔴	🟢
Agroforestry	2,000	138	46	🟡	🟢
Hedgerow expansion	1,100	200	67	🟢	🟡
Grassland reversion	100	10	3	🟢	🟡
Organic conversion	175	13	4	🟢	🟢
Pasture-fed conversion	0	0	0	🔴	🟢
Farm efficiency	115	38	13	🟢	🟢
Wetland creation	875	32	11	🟢	🟡

APPENDIX 2. MINDMAP OF GLOUCESTERSHIRE FORESTRY PROJECTS AND PRINCIPLES

Dr. Gareth Parry, Gloucestershire Wildlife Trust
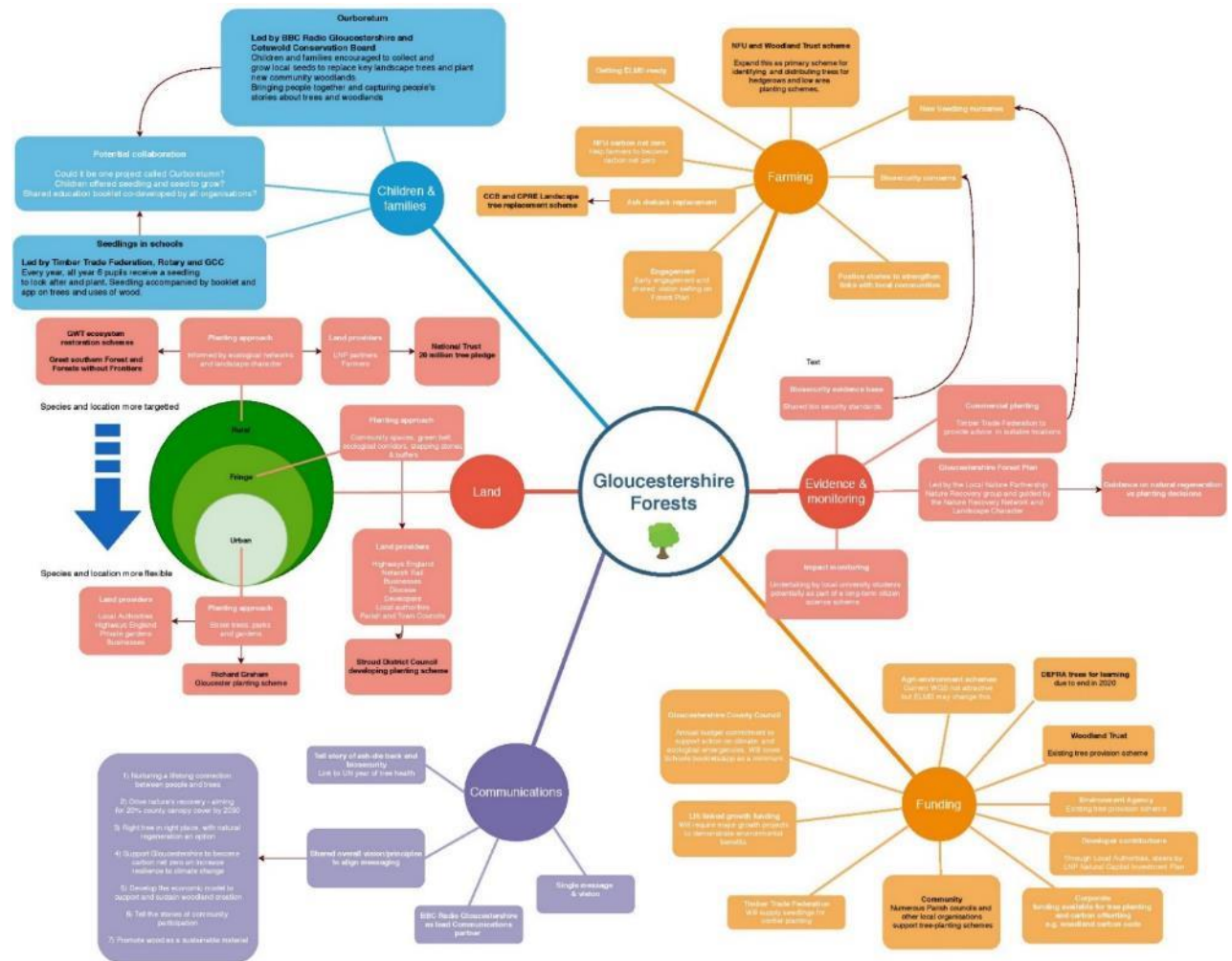
APPENDIX 3. ASH DIEBACK POSITION STATEMENT

The future of Ash is threatened by ash dieback; a disease caused by the fungus (Hymenoscyphus fraxineus), which has a fatality rate of at least 70-85% over a 20-year period [1]. Ash is a common and important tree in woodlands, open habitat and hedgerows. Ash is estimated to account for more than 10% of the canopy in 90% of woodlands in Gloucestershire and in some cases forms 80-100% of the canopy.

First identified in the UK in 2012, by early 2019 the disease had been recorded in 84% of the 10 km grid squares which wholly or in part cover Gloucestershire. This is a 63% increase since 2016, so it is reasonable to assume that ash dieback will soon be ubiquitous across the county.

Ash dieback will have a significant impact on wildlife and landscape character. In woodlands, ash leaf structure and canopy allow a considerable amount of light to reach the woodland floor, thus facilitating a rich ground flora. Ash trees provide habitat for over 1000 species. Some of these species can only live on ash trees and 50% of such species are at risk of extinction within 100 years [2]. However, a smaller number of species, particularly those associated with deadwood habitats, may thrive in the conditions temporarily created by ash dieback. Given the prominence of ash in hedgerows, ash dieback will also impact on ecological connectivity.

At present there is no way to eradicate the causal agent of the disease and there is little that can be done to prevent its spread. Identifying resistant trees is a major strand of research and the national strategy to address the disease, however, this solution will not be in place before a considerable proportion of ash trees have been lost. Mitigation must also account for the impact that climate change is likely to have on the UK's tree assemblages.

Early experience of our partners highlights particular dangers from falling branches and trees, due to fragile crowns and hidden rot in the base of infected trees. Thus, Health and Safety is a primary concern of partners when considering decisions relating to management of the disease, as reflected by our zoned approach.

A Zoned Approach

GLNP partners acknowledge there is a need to proactively manage the impact of ash dieback on their own landholdings, as well as promoting good management across the wider county. As a core principle, infected ash trees should be left standing except where there is a material safety risk, as guided by the zoning approach outlined below.

Gloucestershire Local Nature Partnership partners will take management decisions relative to their strategic priorities, functions, services and will be dependent upon the specific circumstances. These decisions will be guided by a zoned approach to classification of risk. The risk zones are classified as below:

Major roads (based on both speed and usage)	High Risk
Car parks, minor roads, high-use public facilities and major public rights of way such as national or promoted trails.	Medium Risk
Public rights of way that have medium or low usage and permissive paths.	Low Risk
Areas with no defined footpaths or bridleways but public access.	Very Low Risk

In high-risk locations partners may consider proactively felling ash trees where they would pose an unavoidable and significant threat to public safety. Trees felled early in public places may not show signs of ash die-back disease but works could be advanced so that tree surgeons can operate safely. Delaying action increases risks to the public and can also be likely to incur higher financial and environmental costs.

Mitigating the Wildlife and Landscape Impact

Partners will also seek to take early action to reduce the impact of the disease on landscape character and biodiversity:

- Protected species surveys will be undertaken where necessary and replacement habitat or structures provided if needed;

- Where possible, disease resistant trees will be identified;

- Where appropriate, allow dead wood to remain and new open habitats to be created as ash trees die or are felled;

- Allow natural regeneration opportunities for replacement tree cover and consider planting locally typical native broadleaves if this better serves specified management;

- Replanting would normally be on a 2 for 1 basis for established dead or felled ash trees.

- When planting, partners will source locally grown trees where possible, to avoid the spread of disease.

Strategic Considerations

Partners will consider the following strategic priorities when making decisions about managing Ash Dieback:

- Endeavour to use the loss, management and replacement of ash trees as an opportunity to develop and enhance natural biodiversity, contributing to Gloucestershire's Nature Recovery Network;

- Replanting for Ash Dieback mitigation to be aligned and integrated with, but not counted as, tree-planting for climate change mitigation or woodland creation targets;

- The 'right tree in the right place' is acknowledged so that trees and shrubs will grow well where they are planted, enhance local ecology and contribute to landscape character. Large blocks of trees and shrubs will be considered as well as planting in hedgerows. Trees will not necessarily be planted where trees have died/been felled.

- Consider cross-boundary coordination between parishes, districts and counties where appropriate.

- Work closely with private landowners on adjacent land to communicate how ash die-back can be managed by offering guidance and providing support.

Useful resources

DEFRA Strategy - https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/806872/ash-research-strategy-2019a.pdf

The Tree Council's Ash Dieback Toolkit
https://www.treecouncil.org.uk/Portals/0/Chalara%20docs/The%20Tree%20Council%20Ash%20Dieback%20Action%20Plan%20Toolkit%20FINAL.pdf

Woodland Trust
https://www.woodlandtrust.org.uk/publications/2019/10/managing-ash-dieback-on-woodland-trust-sites

Forest Research
https://www.forestresearch.gov.uk/tools-and-resources/pest-and-disease-resources/ash-dieback-hymenoscyphus-fraxineus/

COVAD Ash Dieback Forum
https://www.cotswoldsaonb.org.uk/wp-content/uploads/2019/11/CoVAD-Ash-Dieback-Information-for-famers.pdf

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[2] S. Mitchell, R.J., Bailey, S., Beaton, J.K., Bellamy, P.E., Brooker, R.W., Broome, A., Chetcuti, J., Eaton, S., Ellis, C.J., Farren, J., Gimona, A., Goldberg, E., Hall, J., Harmer, R., Hester, A.J., Hewison, R.L., Hodgetts, N.G., Hooper, R.J., Howe, L., Iaso, "The potential ecological impact of ash dieback in the UK," 2014.

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ABOUT THE PARTNERSHIP

The Gloucestershire Local Nature Partnership (GLNP) is formed of over 30 organisations from public, private and third sector bodies from across the county, all working together to recognise the importance of embedding nature's value in local decisions for the benefit of nature, people and the economy. Our partnership provides a strong and innovative voice for the environment sector and Local Nature Partnerships are seen by Defra as the key figure in the local delivery of the Government's 25 Year Environment Plan.

GLNP partners include the following organisations:

Gloucestershire County Council
Gloucester City Council
Tewkesbury Borough Council
Forest of Dean District Council
Stroud District Council
Cotswold District Council
Cheltenham Borough Council
CPRE
Gloucestershire Wildlife Trust
National Trust
Gfirst LEP
Natural England
Environment Agency
Forestry Commission
FWAG SW
Woodland Trust
WWT
Royal Agricultural University
University of Gloucestershire

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