Regenerative forestry

Forestry and forests for the future

Soil Association

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Foreword

Helen Browning, CEO

With prominent recognition of the role of forests in achieving net zero carbon emissions, and widespread public support for tree planting, there is a huge opportunity for UK forestry in the coming decades. Timber is set to support the decarbonising of the economies of the world and it is estimated that timber demand will rise almost three-fold over the next 30 years.

In the UK, we currently import around 81% of the timber we use.

Only 13% of the UK is defined as forest, compared to 40% in Europe. The Soil Association supports the Committee on Climate Change's target for this to increase to at least 19% by 2050, which modelling has shown is also compatible with a transition to low intensity, agroecological farming in the UK without offshoring our food footprint.

But change is needed if forestry is to play its role to the full. Business-as-usual will not optimise the benefits for the climate, for nature and for people. Non-native coniferous planted forest is the single largest habitat type in Great Britain, making up around half of our forest area. Less than 1% of this planted forest is in favourable ecological condition. All is not well with our native woodland either: only 7% is in good ecological condition. Our woods and forests lack deadwood, veteran trees and open space, and diversity of age, species and structure is limited.

Business-as-usual needs to change for the climate too. When it comes to climate change and forests, we often can't see the soil for the trees. On average, forest soils hold 75% of UK forests' carbon and play a critical role in climate change mitigation and adaptation. Reducing soil disturbance is key, which means adopting less intensive silvicultural systems and maintaining forest conditions, through retaining as much forest canopy as possible.

To optimise the benefits for the climate, nature and for people, we need a new vision of regenerative forestry.

More new forests must be established with careful thought for their location and composition. Fragile soils and valuable habitats must be avoided. New forests must link to other biodiverse habitats, including a site-sensitive mix of species, allowing natural regeneration processes to play a role where appropriate. Integrating more trees into farming systems is vital, both to increase forest cover and to improve the resilience, productivity, and biodiversity of farmland. This will only be achieved if forests are clearly seen to benefit farmers and contribute to the local community and environment.

Existing forests should also be managed to provide more benefits for nature, the climate and people. Those with a narrow range of tree species and ages need to become more diverse to offer a wider range of habitats and niches for wildlife. This needn't impact on the productivity of the forest: mixed stand forests have been found to be as productive as monocultures. Regenerative forestry minimises soil disturbance during planting and harvesting and protects soils with a canopy of trees as much as possible through low impact systems, such as continuous cover forestry. Clearfell should be used sparingly, in small areas and employing practices that minimise damage to soil. These practices should maintain diverse forest conditions for nature and people and generate high quality timber.

The Soil Association has long advocated for more ecological farming, working with the grain of nature in regenerative agroecological systems, with organic farming as the best understood example. Our vision of regenerative forestry brings forestry and farming closer together, and as well as the changes to management of our existing forests, includes an updated approach to how we see forestry and farming as land uses. We believe that, instead of the current artificial separation between the ways that land is managed to feed us and to provide timber and fibre, they must work together much more closely. Foresters need farmers and farmers need foresters, if we are to achieve our shared ambitions for tree planting and woodland cover targets. Trees need to be brought back into our farmed landscapes under agroforestry systems, as farm woodlands and as integrated tree abundant landscapes, because our circumstances demand bold action on a forest and landscape scale.

In this report we call for action from policymakers, forest owners and managers, the forest products sector and civil society to deliver a transition to regenerative forestry and regenerative forest management. Policy makers have an important responsibility to set the regenerative vision for UK forestry and to create the enabling conditions for such a transition. Forest owners, their managers and the forest products sector, alongside welcoming all the opportunities to help decarbonise the economy from increasing forest cover and timber, must also accept the challenge of managing more diverse forests, in a lower impact way for nature and people. Finally, we as citizens, and our representatives in civil society organisations, must accept our responsibilities for consumption and reduce our environmental footprint from forestry, both at home and abroad. Each part of the sector has a role to play in this transition, which can only happen if we work in a collaborative, consensual way, accepting responsibilities alongside opportunities and working together to achieve the changes that are needed.

At the Soil Association, we are optimistic about the future of forests and forestry, and a transition to a more regenerative model. There is government and citizen support for tree planting. Society is increasingly valuing the health and wellbeing benefits of woods and trees, and the benefits of timber as a sustainable material. This should lead to an increased UK forest resource, which, combined with the ingenuity of the professionals operating within the sector, means that a transition to more regenerative forestry is not only possible, but also hugely exciting.

Image: R. Walter

01

Introduction

As a society, we face mounting challenges from a rapidly changing climate and biodiversity loss. Forests cover 13% of the UK; the second biggest land use after farming. As such, forest owners and foresters have considerable power and influence to manage forests for our climate, nature and people.

13%

of the UK is covered by forests, second biggest land use after farming

In many ways this is a golden age for forestry. Timber prices are high. Forest products are prized for their sustainability and as a key resource to replace carbon-intensive materials. Public support for more tree planting is widespread.

Yet our forests are not as healthy or productive as they could be. They increasingly suffer from pests and diseases. The way some of our timber-producing forests are managed has not changed significantly for many years, and there is little public support for and understanding of silviculture practices. Our forests are no longer havens for abundant nature, and face unprecedented threats from drought, storms and even wildfires.

This report explores how forestry could become a more regenerative land use and practice, by changing the way forests are managed and valued in practice and supported in policy. Regenerative forestry would ensure that our forests are fit for the future. It would achieve an even more positive carbon balance from the UK's forests, increase biodiversity, support forestry livelihoods and create spaces for people to enjoy nature. It would help forests build resilience to the risks and pressures they face from a changing climate and societal needs.

The Soil Association believes that we need to manage the potential trade-offs between the production of timber and forests that deliver for climate, nature and people. We don't pretend to have all the answers to this challenge but we hope this report will be a platform from which to start an urgently needed conversation with forest owners, managers and their trade bodies, civil society and government policymakers about a new vision for forestry. It is a vision of regenerative forestry based on a more realistic risk assessment of forestry today and an adaptive practice rooted in ecology.

Need to know

Regenerative Forestry seeks to improve our landscapes as diverse ecosystems adaptive to change, by storing high levels of carbon to help rebalance our destabilised climate; by promoting resilient and adaptive forests to restore our depleted biodiversity; and by generating timber and other products to help mitigate climate change and support meaningful livelihoods

Why the Soil Association?

Trees and forests are at the heart of our work to transform the way we eat, farm and care for our natural world. As both a charity and certification body, we work with farmers, foresters, companies and citizens to ensure forests around the world are protected.

We helped set up the Forest Stewardship Council® (FSC®) in 1993. Since then, we've certified over 25 million hectares of sustainable forest in over 35 countries with the FSC® and the Programme for the Endorsement of Forest Certification (PEFC) Forest Management and Chain of Custody certification.

Our charity arm works with farmers to enable the transition towards farming that's better for the climate, nature and people. A big part of that is agroforestry – the practice of combining agricultural crops or livestock with trees and shrubs to provide healthier soil, higher yields and vital homes for wildlife.

The achievements of forest certification, and the focus on sustainable forestry management since the early 1990's, are to be celebrated. But the Soil Association believes that much more must be done to set out a broader vision for the UK forestry as a land use, to build on and complement these acknowledged improvements at a forest scale in the UK.

02

The case for Regenerative Forestry

Forestry sits within a wider land management pattern that includes farming and conservation. Every effort must be made to accommodate forestry with farming, to learn from conservation, and to engage with the public, so that forestry as a land use, as well as forestry standards and practices, are up to date with the latest science and meet the need for climate and nature resilience.

Forests are important in **tackling the climate crisis** because they store carbon in living trees, play an important role in the carbon cycle through their soils, and provide climate-friendly materials, such as timber and fibre.

On average, forest soils hold 75% of UK forests' carbon[1] and play a critical role in climate change mitigation and adaptation. It is vital that more attention is paid to the dynamic cycles of trees to ensure the continued fertility of forest soil and to strengthen its role in storing carbon, especially on organic soils. Reducing soil disturbance is key, which means adopting less intensive silvicultural systems and retaining as much forest canopy as possible.

Abundant biodiversity in forests is crucial to their productivity, resilience and ability to adapt to climate change. UK planted forests generally have low species diversity, and woodland biodiversity continues to decline.[2] This trend must be reversed, so that there is greater diversity at all levels of the forest. Genetic diversity is needed within each species, across a wider range of tree species (especially relevant in recently planted single species forests), and a greater structural diversity within the stand.

Healthy, biodiverse and resilient forests are productive forests. They **provide a living** to the UK's thriving forestry industry, increase rural employment opportunities and support the wider economy. Our **physical and mental health and wellbeing** are improved when we get out into nature, and people develop deep attachments to trees. Most people prefer forests that consist of mature trees managed in low impact ways,[3] so forests should be managed to realise these wider benefits, whilst supporting the production of high-quality timber.

As well as regenerative forestry practices in existing forests, the regenerative potential for forestry as a wider land use must be recognised. Globally, most

On average **75%** of UK forests' carbon is held in forest soils

Greater diversity at all levels of the forest required

Our mental health is improved by being in nature

Image: R. Walter

41%

of (mostly broadleaved) forests in England are left unmanaged

countries have set a course for net zero carbon emissions, and forestry will play a vital role in this, both as living habitats and by delivering timber and other forest products. UK forestry is in a strong position to make an important contribution to achieving a net zero carbon strategy. There is already a significant forest resource, and there is strong consensus for increased forest cover. Increasingly, policymakers are appreciating the whole system potential for forests and their forest products and services for climate mitigation and wider wellbeing benefits.

Need to know

It is crucial for our forests to produce timber, and we need more of them, but they must also be resilient to climate change, conserve carbon stocks, actively promote biodiversity, seek to integrate with the wider landscape ecology, accommodate the needs of the local community, and support local livelihoods.

These productive forests would look significantly different to even-aged conifer forests, and would also go beyond what is currently required under the UK Forestry Standard and UKWAS certification.

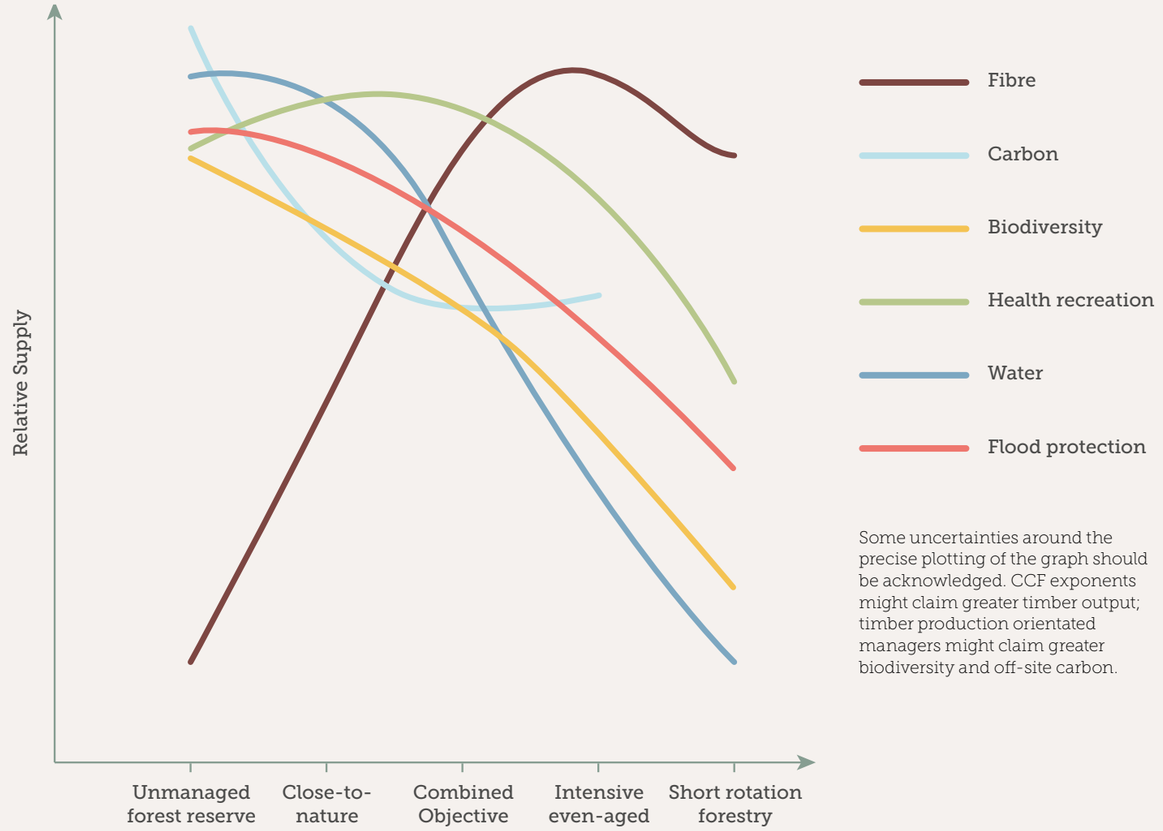
At the other end of the management spectrum are 'neglected' woods, including the 41% of (mostly broadleaved) forests in England, left unmanaged.[4] These woods can also support the core values of climate, biodiversity and people. Some can be left as non-intervention woods that conserve late-successional biodiversity, especially where old-growth characteristics are already present. In other cases they might seek to improve their resilience to climate change and their biodiversity by thinning to diversify age structure and initiate regeneration.

This would also generate small-scale forestry work and supply local markets.

The graphic opposite illustrates the potential trade-offs between the production of fibre and other ecosystem services. Beyond a certain point, more fibre production means less carbon storage, biodiversity and public amenity; lower water supply and quality; and reduced flood protection. To manage these trade-offs, a mixed landscape of minimal intervention, close-to-nature management where natural processes are mimicked and integrated management, where multiple objectives are achieved across all zones of the forest, offers the optimum blend of management systems for climate, nature and people. Although the inclusion of carbon mitigation from harvested wood products might alter the carbon balance for intensive even-aged and short rotation forestry, both typically managed through clearfelling, there remain significant trade-offs for the other services from these approaches which tend to be delivered in smaller zoned areas of a forest, rather than across all parts of the forest.

To achieve a better carbon balance and increase abundance of nature, whilst ensuring strong livelihoods in the forestry industry, more even-aged forests should be managed as continuous cover forestry, working with natural processes and integrated management to deliver multiple objectives from all areas of the forest. Some unmanaged woods will continue to benefit from being left undisturbed, where late-successional processes and species communities can thrive, whilst building up greater in-forest carbon stocks through these forests achieving their biological potential.

Impact of forest management approaches on the relative supply of ecosystem services (adapted from Sing et al,[5] 2018)



Some uncertainties around the precise plotting of the graph should be acknowledged. CCF exponents might claim greater timber output; timber production orientated managers might claim greater biodiversity and off-site carbon.

Description	Management Intensity
Unmanaged forest reserve	Interventions restricted to recreation provision (e.g. car parks and trails) and protection from browsing
Close-to-nature	Interventions mimic natural processes, e.g. long rotation lengths, harvesting by single stem and group selection
Combined objective	Limited interventions to deliver timber and other ecosystem services in an integrative (not zoned) approach. Longer rotations at or above maximum mean annual increment
Intensive even-aged	Interventions follow production goals:single-aged monocultures or small per cent admixtures species, typically harvested by clearcut. Rotation lengths at a below maximum mean annual increment
Short rotation forestry	Intensive management for maximum biomass production, single-aged monocultures grown on short rotations (~20 years), whole tree harvesting to maximise volume

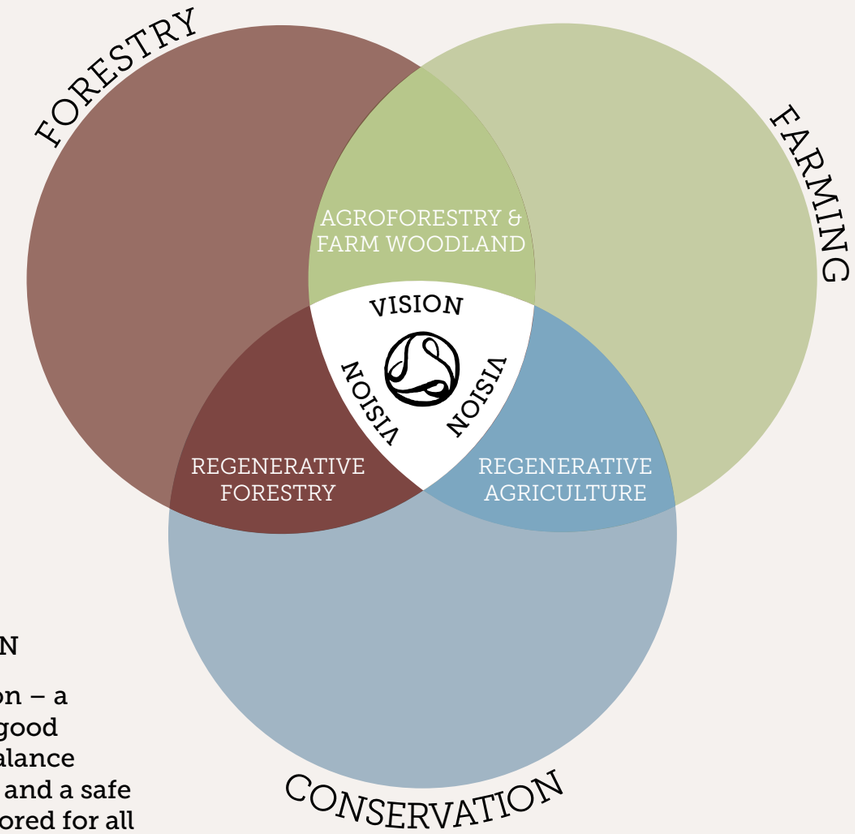
Image: R. Walter

03

The Soil Association vision for **Regenerative Forestry**

Forestry may not have a large impact on the economy, but it is prominent in the physical and social landscape, and needs to become even more so, through increased forest cover and integration with farming systems. Regenerative forestry fits into a wider restoration culture[6] that is growing across many sectors, including businesses, local councils, scientists, civil society, academics and communities. Priorities for forestry should include avoiding damaging practices; restoring damaged habitats; encouraging sustainable production practices and promoting widespread ecological regeneration.

Forestry, farming and conservation



VISION

Regeneration – a world with good health, in balance with nature and a safe climate restored for all

Forestry, farming and conservation are often seen as incompatible in our landscapes – more of one means less of the others. In the UK, farmland has replaced forests over the millennia, and in the last 50 years increasingly intensive farming has led to steep declines in biodiversity.[7] Today about 72% of the UK is farmland, 13% is forest, and 11% is protected for conservation,[8] although there is some overlap. This segregated approach to land management has developed in response to short-term drivers, but does not have a long-term future.

Finding the right balance between these land uses at a landscape scale, and especially the synergies between them, will bring huge benefits to each, creating regenerative landscapes of great value to society.

The Soil Association has long advocated for more natural farming, working with the grain of nature in regenerative agroecological systems, with organic farming as the best understood example. There are many benefits to bringing trees back into farmed landscapes as farm woodlands and under agroforestry systems.[9] Our vision of regenerative forestry brings forestry and nature closer together and complements our work on regenerative agriculture and agroforestry. – because our circumstances demand bold action on a landscape scale.

A blueprint for regenerative forestry

In setting out our vision, the Soil Association aims to start a conversation about the future of forestry and what do forests that deliver for climate, nature and people look like? What action is needed to get there? We are keen to work with others to find the right answers and our many years of experience in forest certification, agriculture and wider conservation put us in a good position to challenge current orthodoxies in forest policy and practice, to propose our vision of regenerative forestry for the future.

Regenerative forestry principles

The Soil Association proposes that forestry as a land use can be regenerative and that individual forests can be managed regeneratively. But only when the following principles are applied:

1. Regenerative forestry is a whole system approach, delivering benefits for climate, nature and people, both within the forest and from forest ecosystem services outside the forest.

2. Regenerative forestry is an integrated approach to deliver the ambitions for more trees, by ensuring new forests are diverse and resilient, and integrated into our wider farmed landscape through mainstream adoption in farming systems.

3. Regenerative forestry is resilient and adaptive and takes care of the forest itself, so that benefits for climate, nature and people can be provided for the long-term.

4. Regenerative forestry is a set of improved forest management practices that deliver optimal outcomes across the whole forest and avoids spatial intensification in some zones. The whole forest must deliver for climate, nature and people, whether actively managed or non-intervention, planted or regenerated.

5. Regenerative forestry supports high levels of engagement by people and delivers strong livelihoods. Regenerative forestry is rewarded for the market products and wider ecosystem services it delivers for climate, nature and people.

Image: R. Walter

Regenerative forestry operates at both a land use scale and as an adaptive practice, rooted in ecology. It seeks to improve landscapes, so they become diverse ecosystems adaptive to change. It does this by storing high levels of carbon to help rebalance our destabilised climate; by promoting resilient and adaptive forests to restore our depleted biodiversity; and by generating timber and other products to support climate mitigation and meaningful livelihoods.

Regenerative forestry adopts a whole system approach. It recognises the importance of forest ecosystems and the many goods and services they provide. In practice, this means ensuring that benefits and trade-offs are assessed across the whole system (in and beyond the forest), to make optimal and balanced decisions. Timber is an important part of the system and long-term uses provide a significant potential carbon store beyond the forest. The importance and value of timber and carbon storage will increase as the world moves towards net zero, providing more opportunities for economic, climate, biodiversity and societal gains.

Regenerative forestry can be an integral part of the wider landscape restoration that is so necessary: bringing back to depleted land an increased level of forest cover; restoring lost habitats and species and supporting livelihoods. It requires the planting of more diverse forests to increase forest cover and more trees integrated into farming systems and the wider farmed landscape. Like regenerative and organic farming, regenerative forestry generates products for our use, and does so whilst improving the conditions within which it operates, and in a way conducive to human wellbeing. New forests must be established with careful thought for their location and composition. Fragile soils and valuable habitats must be avoided. These forests must link to other biodiverse habitats, including a site-sensitive mix of species, allowing natural processes as much as possible. Introducing more trees to farmland is vital both to increase forest cover and to improve its productivity, biodiversity and resilience to extremes of future weather, with trees playing a role in protecting farmland from rain, wind and sun. This will only be achieved if forests are clearly seen to integrate with, and contribute to, the local community and environment.

Regenerative forestry ensures the resilience and adaptive capability of the forest itself. Management objectives, whether achieved through active management or non-intervention, planting or regeneration, must ensure the forest's own future. This requires a realistic risk assessment of predicted climate change and a strategy to ensure the UK's forests can deliver climate mitigation benefits, whilst adapting as ecosystems to a changing climate. Diversity is fundamental to ecological resilience of the forest, as is the diversity of landscapes.

Regenerative forestry is a set of improved forest management practices that deliver optimal outcomes for climate, nature and people. These practices ensure that our forests are diverse by species and age structure, principally managed by low impact systems (such as continuous cover forestry). There must be minimal soil disturbance during planting and harvesting, avoiding planting on organic soils, and protecting soils with a canopy of trees as much as possible. These practices help to protect forests from damage and threat, whilst maintaining diverse forest conditions for nature and people, and generate high quality timber.

Regenerative forestry practices consider carbon storage at every stage of a forest's growth – in forest soils, living trees and harvested wood products. Regenerative forestry practices also restore depleted biodiversity – restoring and establishing ecosystems with a greater diversity of species, genetics, structure and age.

Regenerative forestry works for people. It provides much needed timber and fibre for society and supports the supply chain that delivers these products. It involves high levels of engagement with people and supports many livelihoods, boosting local and rural economies. It also generates landscapes that people love, and which benefit their health and wellbeing. Finally, regenerative forestry is rewarded for both the market products and wider ecosystem services that it provides. Accounting more fully for the benefits of trees, and the costs of business-as-usual, will greatly favour a regenerative approach to forestry as a land use, and value the specific contribution any individual forest managed regeneratively can provide.

Evaluating regenerative forestry practices

Key questions to ask that identify regenerative forestry practices:

1. Is this stand or forest in a better condition than before?
2. Is it locking up carbon in soils, trees and timber?
3. Is it home to more nature?
4. Is it supporting local people and livelihoods?
5. Is it contributing to a diverse and ecologically functional landscape?
6. Is it more resilient?
7. Can it continue to do all this for the foreseeable future?

04

UK forests in 2022

Terms and definitions

Some forestry related terms are used interchangeably and in different ways. For the purposes of this report we use the following typology:

Forest refers to all land with more than 20% tree cover.

Woodland refers to native broadleaved woodland and native pine woodland.

Planted forests refers to usually predominantly non-native conifer (often these are called plantations).

Stand refers to a specific area of trees distinguishable from adjacent areas.

UK land use is dominated by farming (72%),[10] followed by forest at 13%.[4] This is far below the European average of about 40% forest. About half of the UK's forest area is conifer, and nearly half of this is Sitka spruce (from North America). Non-native coniferous planted forest is the single largest habitat type in Great Britain, accounting for 1.29 million ha (42% of UK forests).

Ancient Woodland accounts for some 26% of UK forest area and 3.4% of UK land area. Of this, about 61% is Ancient Semi-Natural Woodland (ASNW) and 39% has been planted over (usually with conifers or beech), making a Plantation on Ancient Woodland Site (PAWS).[11]

The UK's native woodlands have a limited range of species, due to severance from the European continent some 8,000 years ago. Even this diversity is under pressure from centuries of human selection and preferential browsing by mammals. Low species diversity makes UK forests less resilient to climate change, extreme weather, pests and diseases.[12]

Management status and forest condition

The forest services of the UK's four nations own or manage 27% of forest area in the UK, all of which is considered to be 'in management', with the rest in private ownership.

Forestry Commission (FC) data from 2020's National Forestry Inventory shows only 59% of forests in England are actively managed, some way short of the two-thirds target set in 2012.[13] The Inventory compares all forests to a benchmark of ASNW in good condition and reports that only 7% of native woodland in Britain is in good condition, 92% is in intermediate condition and 1% in unfavourable condition.[14] In particular, native woodlands are lacking in deadwood, veteran trees and open space.

For planted forests the figures are less than 1% in favourable ecological condition, 95% in intermediate condition and 5% unfavourable. These stands also lacked deadwood, veteran trees and open space.

Consumption of forest products

The UK produced almost 11 million m3 of roundwood timber in 2019 (92% conifer softwood), imported 50 million m^3 and exported four million m^3. Therefore, the country's apparent timber consumption was about 57 million m^3. Imports account for 81% of timber consumption.[4]

In broadleaved woodland, only 10% of hardwood increment is harvested at present.[15] *Grown in Britain* estimates that there could be an additional hardwood harvest of six million m^3/yr for the next 40 years.[16]

In 2019, UK timber imports cost $8.6 billion and placed the country just ahead of Japan and Italy as the world's second largest net importer.

China was the largest with $42.3 billion. About 18% of UK timber imports (8.9 million tonnes) were wood pellets for fuel, an annual increase of 11%. These imports of wood create a massive footprint overseas, some of it from high-risk countries with poor environmental protections.[17]

Need to know

Timber is set to play a critical role in decarbonising the economies of the world and it is estimated that timber demand will rise almost three-fold over the next 30 years.[18] Given the long-term nature of tree growth and limited available land, timber prices are likely to continue to increase.

Imports account for **81%** of timber consumption

Image: R. Walter

The policy environment

Over the past 100 years, UK forest policy has aimed to restore our depleted forests. In the early and mid-20th Century this focused on building an industrial conifer resource, and since the late 20th century it has focused on restoring the quality and extent of broadleaved woods. In recent decades a significant driver of forest policy has been climate change, in which forests are mobilised to sequester CO_2 both in their current management and by planting extensive new forests.

The latest policy driver has arisen because the UK has left the EU Common Agricultural Policy (CAP) as a result of Brexit. The government's 25 Year Environment Plan (2018)[19] sets out a vision for the future, albeit not ambitious enough for many. Some aspects of the plan will be implemented by UK policies and programmes, whilst other policy areas are devolved and responsibility rests with the Scottish Government, Welsh Government and Northern Ireland Executive. In England the plan is partly enabled through the Agriculture Act 2020.[20] Direct subsidy payments to farmers will be phased out from 2021-2027, and new payments for 'public goods' will be introduced, such as environmental improvements, animal welfare and soil protection. This is the Environmental Land Management (ELM) scheme now being trialled.[21] As most agriculture and forestry policy is devolved, there are parallel developments in Scotland, Wales and Northern Ireland. As forests provide a range of unrewarded public benefits, the forestry sector broadly welcomes the 'public money for public goods' developments.

The UK Environment Bill, currently making its way through parliament, also lays the foundation for a Nature Recovery Network, a national network of wildlife-rich places to increase and restore nature.[22]

UK Environment Bill

> The Environment Bill is "a key vehicle for delivering the bold vision set out in the 25 Year Environment Plan ... to bring about urgent and meaningful action to combat the environmental and climate crisis we are facing."
>
> UK Government, 2020[23]

> "Confor [Confederation of Forest Industries] consider the most beneficial policy for forestry and woodland in the bill is the intention to put the Government's 25 Year Environment Plan, including increased tree planting targets, on a statutory footing"
>
> Confor, 2019[24]

Threats to the forest

UK forests are facing unprecedented stress on a number of fronts, which threaten the forests themselves, the plants and animals that depend on the habitats they provide, and the livelihoods of the people who work in forestry.

Climate change

Climate change affects UK forests by lengthening the growing season, exposing trees to increased risk of frost damage, widening the range of temperatures (continentality), whilst increasing soil moisture deficit and wind damage.[25] By mid-century, extreme hot summers are expected every other year.[26] The Third UK Climate Change Risk Assessment forecasts high risks for soils and natural carbon stores from higher temperatures, heavier rain and increased wildfires.[27] British foresters need to adequately prepare for this onslaught, by being aware of climate change projections, planning for resilience and understanding tree species suitability and the influence of soils.[28]

Biodiversity loss

In the UK and across the world, biodiversity is declining at an unprecedented rate, and the pressures driving the decline are intensifying. The Biodiversity Intactness Index shows that the UK is well below the threshold for biological integrity and 29th lowest out of 218 countries.[29] Whilst countries such as Canada and Finland have retained nearly 90% of their biodiversity, the UK is left with just 50%.[30]

Pollution from nitrogen deposition

Trees purify the air of pollution. When nitrogen and sulphur are released into the air from industrial and agricultural activity, it is intercepted by trees, due to their height, roughness of canopy and the large surface area of their leaves and needles.[32]

Some of the nitrogen is used by trees for growth, which produces a short-term boost, but also causes a nutritional imbalance in the trees and increases susceptibility to insect attack and drought. Where nitrogen deposition exceeds biological demand and soil storage capacity, it makes its way to the forest floor and leaks out as nitrate, where it favours nitrogen-loving flora, has detrimental effects on mycorrhizal fungi[25] and causes increased aluminium toxicity to tree roots. The leaking nitrate also contaminates water, leading to eutrophication and algal growth.[33] Some 95% of UK forest area exceeds nitrogen critical load.[34]

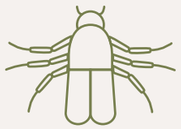
> **"None of the Aichi Biodiversity Targets have been fully met [either globally or in the UK], in turn threatening the achievement of the Sustainable Development Goals and undermining efforts to address climate change."**
>
> The Secretariat of the Convention on Biological Diversity[31]

Image: Kayes Wood, Nottinghamshire with permission of B.Mason

Herbivory

A major consequence of biodiversity loss in the UK is the unchecked abundance of herbivores such as wild deer, which have no predators. These animals thrive in open landscapes, often sheltering in the small pockets of available forest. The small increases in forest cover have benefitted the wild deer population, as have milder winters and winter cereals.[11] As a consequence, there may be more deer now than at any time for the last 1,000 years, threatening habitats and other wildlife.

Woodland Sites of Special Scientific Interest (SSSIs) are often found to be in unfavourable condition because of excessive browsing by deer and uncontrolled livestock (especially in Scotland), as well as uniform structure and invasive species.[35] Browsing prevents young trees from being recruited into the stand, thereby preventing the natural regeneration of the forest.



Pests and diseases

There has been an exponential rise in serious pests and diseases affecting UK forests since the 1990s. In conifer forests Dothistroma Needle Blight affects Scots and Corsican pine, and Phytophthora ramorum affects larch. Broadleaves have been blighted by the Oak Processionary Moth and more recently Ash Dieback. This rise has matched the increase in plant imports, with the damage caused outweighing the market value of imported plants by up to 50 times.[11] Warmer winters and more humid springs, caused by the changing climate has also favoured pests and diseases.[26]

All forests suffer pests and diseases to some extent, but such epidemics indicate a catastrophic breach of natural defence mechanisms and a deep imbalance in our ecological systems.

Whilst deer browse trees at ground level, grey squirrels strip bark higher up on the stem and in the crown of maturing trees. This deforms the stem and can lead to dieback, ruining the tree for timber, costing some £37 million per year and limiting quality silviculture.[36] Grey squirrels also out-compete native red squirrels, effectively driving them out of much of lowland Britain.

The drive to plant new forest

Increasing the amount of forest has long been on successive government agendas. However, in practice, it has been difficult to achieve because of the host of other factors at play, including rival land uses, conservation concerns, aesthetic concerns and cultural history. As the climate emergency becomes ever more serious, the current government has identified new forests as one way to drawdown excessive atmospheric carbon. Alongside the governments of the four nations, influential external bodies have set targets for existing and new forests in the UK.

How much new forest is needed?

Trees and forests form a significant part of the Committee on Climate Change's strategy to achieve net zero by 2050. The Committee noted that a "transformation is needed in the UK's land while supporting UK farmers." It has advised the government to plant 50,000ha/yr of trees by 2050, or even 70,000ha/yr with favourable conditions. This would increase forest cover in the UK from 13% now to 15% by 2035, and 19% by 2050.[37]

Need to know

The Soil Association supports the Committee on Climate Change's high level of ambition but advocates for a stronger role for trees in its vision for agroecological farming: a farmer-led tree revolution with 5% of agricultural land under agroforestry by 2030 and 10% by 2040, with half of all farms implementing some form of agroforestry. In addition, we call for the current 1 million hectares of farm woodland, which is approximately one-third of all UK forest cover, to double by 2050. This would be almost two-thirds of the Climate Change Committee's target for increased forest cover.

Other planting targets include Confor, which advocates for 40,000ha/yr by 2030. The Woodland Trust accepts the Committee on Climate Change target of 19% cover. Friends of the Earth and Zero Carbon Britain advocate doubling UK forest cover to around 26%.

Government plans for new and existing forests

The England Trees Action Plan 2021-2024[36] highlights the role of tree planting and protecting and improving existing woodland, as part of the UK government's approach to achieve net zero. The Plan builds on the 25 Year Environment Plan, with an ambition to plant about 7,000 ha per year to reach at least 12% forest cover in England, an increase of 10% on current figures.

The Scottish Government is aiming to increase forest cover from 18.7% to 21% by 2032. Annual targets are currently 12,000/ha/yr, rising to 18,000ha/yr by 2024/25.

In response to the climate crisis, the Welsh Government has committed to create a National Forest across the country and seems aligned to the Committee on Climate Change targets for Wales of an additional 180,000ha by 2050, with 43,000ha by 2030. The most recent published target in 2018 was only for an additional 2,000ha/yr from 2020-30.

However, compared to these ambitions, over the whole of the UK in 2019-20, 13,700ha were planted, with 11,050ha in Scotland, 2,340ha in England and 80ha in Wales.[4]

The government intends that trees and woodland will form a core part of the Nature Recovery Network across England, and contribute to the commitment to protect 30% of our land for nature by 2030. It says this will be achieved by including existing National Parks and Areas of Outstanding Natural Beauty. However, these are designated for landscape, not wildlife, and so are not adequate mechanisms to protect and enhance nature. Because of this, the true figure for protected land currently in a good state for nature could be closer to 5%.[38]

Forestry standards and voluntary forest certification

Forestry in the UK operates according to the principles of Sustainable Forest Management originating from the UN Forest Principles of 1992, as expressed in the UK Forestry Standard (UKFS), first published in 1998 (latest edition in 2017).[39] Sustainable Forest Management suggests a practice that can continue indefinitely. However, the UK is a massively deforested and depleted land[40] where biodiversity is roughly half of what it once was[30] and to date sustainable forest management has had little impact on restoration or reforestation.

Forestry practice has improved dramatically over the last 30 years. Until the late 1980s it was thought acceptable to plough deep peat, plant over valuable habitats, eradicate native species regeneration from commercial plantations and establish monocultural blocks on the landscape. These practices are now discouraged, or even prevented, and modern forestry incorporates some restorative measures. However, there needs to be a further shift in understanding of what sustainable forestry looks like if it is to meet the challenges of climate, biodiversity and public benefit. This must lead to a step change in forestry practice.

Beyond the government standards, voluntary forest certification provides assurance that forests are sustainably managed, with FSC[41] and PEFC[42] as the leading schemes worldwide. In the UK, these are combined into the UK Woodland Assurance Standard (UKWAS), to which 43% of UK forests, covering 82% of softwood harvesting, are currently certified.[4]

The Soil Association helped set up the FSC in 1993, and has been active in forest certification ever since. Our focus on forests complements our pioneering work in organic agriculture, and is integral to achieving our vision to protect the health of the soil, sustain ecological cycles, ensure fair relationships, and care for the wellbeing of current and future generations.

Key forest certification issues where the standards have most actively evolved over the last 20 years include high conservation values, community interests and chemical usage. However, whilst forest certification has been hugely instrumental in setting standard requirements and providing independent assurance, it is a voluntary and iterative process. It should not be relied on to set a long-term vision for UK forestry.

The Soil Association believes it is possible to manage UK forests, in particular the timber producing forests planted in the 20th Century, to achieve a better carbon balance and increase abundance of nature, whilst ensuring strong livelihoods in the forestry industry. Our vision of regenerative forestry – founded on the core principles we propose for UK forestry and forests, and based on a wealth of evidence – is a way to do just that.

1993
Soil Association helped set up FSC certification

43%
of UK forests are UKWAS certified

82%
of softwood harvesting is UKWAS certified

19%
Committee on Climate Change high-level ambition for forest cover by 2050

Key takeaways

1. Forestry, farming and conservation are sometimes seen as conflicting land uses and are rarely integrated.
2. Much of our forest is in poor ecological condition.
3. Forests and forestry practice face challenges from changing climate, biodiversity loss, and public understanding and acceptance.
4. The UK has a significant forest product footprint; much of this is overseas and we are the 2nd biggest importer of forest products, due to our consumption and limited homegrown supply.
5. There are significant ambitions for increased forest area.
6. Forestry standards and voluntary forest certification have improved environmental and social standards but cannot be relied on to establish a long-term vision for the UK's forests.

05

Forestry for climate, nature and people

In this section we summarise the evidence we reviewed to draw our conclusions and to develop our vision for regenerative forestry. A companion publication, Regenerative forestry – the evidence explores in more detail the reasons why changing forestry practice is necessary, focusing on the three key issues of climate, nature and people.

Forestry fit for the climate

Trees and forests are being mobilised in the battle against climate change and there has been a surge of interest in tree planting. Whilst this attention is welcome, simply relying on trees to offset carbon emitted elsewhere is misguided. Trees cannot save us from climate chaos – only drastic cuts in greenhouse gas (GHG) emissions can do that. Partly because of the way they are managed and the age class structure, at present our forests sequester only 4% of our emissions; however with the required emission reductions achieved and forest cover expanded to 19% by 2050, our forests could sequester up to 24% of the residual emissions.[43]

Forest soils

Soils provide the fertile ground from which all terrestrial life springs, and play a key role in storing carbon, which circulates in dynamic exchange between air, trees, mycorrhizal networks, soil, soil organisms and water. Healthy soils sequester carbon, but where soils are degraded, of poor quality or eroded they release it into the atmosphere.

Despite being the very foundation of our civilisation and a crucial tool in tackling the climate crisis, soils are hidden from view in forests and suffer from serious neglect. The greatest impacts of forestry on soils occur by physical disturbance during drainage, planting and harvesting, with risks of soil erosion, compaction, nutrient removal and soil water changes. Soils can be vulnerable to erosion where they are on steep slopes, when vegetation is removed leaving soil exposed and when compaction causes increased surface runoff.

Saving our Soils – in forests as well as on farms

The Soil Association has long championed the fundamental importance of soils for sustaining life, and today healthy and fertile soil is recognised as the foundation for farming and forestry.

A recent report, Saving our Soils,[44] identified seven ways to maintain and improve soil health on farms. They are all broadly applicable to forestry:

- **monitor soil health**
- **increase levels of plant and animal matter in the soil**
- **reduce tillage and chemicals**
- **maintain protective cover**
- **bring more trees into farmland**
- **reduce compaction**
- **use long and diverse crop rotations**

Image: R. Walter

Care for the soil has not historically been the guiding principle of UK forestry. Over the last century, the UK model for increasing forest cover and timber production was largely based on planting upland sites, where wet soils, low in nutrients, were cultivated to grow industrial conifer crops. Peaty soils were drained and ploughed to enable reliable establishment within short timeframes, followed by productive yields. The modified sites were planted with a narrow range of productive species. Single species forests still account for 55% of UK forests,[45] with Sitka spruce covering some 22%.

As these trees were all planted together, they tend to be felled together in the clearfell/restock (CF/R) silvicultural system which dominates UK forestry. Whilst these methods have certainly expanded forest cover and produced a lot of timber, it is increasingly recognised that soil disturbance is a major problem, not just for the health of the forest, but also for the release of soil carbon.

Peat and organo-mineral forest soils

Peat and organo-mineral soils (shallow peat) hold by far the most carbon of any terrestrial habitat and are often important areas for biodiversity, with broadleaved woodlands on organo-mineral soils providing the most ecosystem services.[46]

When cultivated and drained for planting, organic soils dry out, their carbon oxidises to CO_2 and iis released to the atmosphere. At clearfell, exposure to the sun can increase soil temperatures and accelerate decomposition of organic matter, releasing even more CO_2 whilst exposure to rain can cause erosion. Then soil disturbance from mounding for restocking leads to further loss of soil carbon. Therefore, continual rotations of clearfell and restock has consequences for soil carbon beyond the initial afforestation stage.

Depending on the situation (soil type, peat depth, area, slope and tree growth), removing forest altogether and restoring it to peatland (or planting semi-wooded native habitat) may have more carbon benefits.

Although much of our commercial afforestation has traditionally been on deep and shallow peat, the UKFS now includes a specific assumption against planting on deep peat. Scottish Forestry has recently strengthened its guidance[47] to exclude ploughing on soils with an organic layer greater than 10cm because of the risk of soil carbon emissions and the time taken to re-sequester them.

Image: R. Walter

55%

of UK forests are single species

75%

of carbon stock found in the soil

Broadleaved forests hold more carbon per hectare than conifer forests

11%

reduction in soil carbon from Clearfell/Restock

Forests and carbon dynamics

Measuring carbon in living systems is complicated.

Need to know

Carbon sequestration is the incorporation of atmospheric CO_2 into plant tissue and soils, often expressed for forests in tonnes of carbon dioxide per hectare per year (tCO_2/ha/yr).

Carbon storage, or stock, is the amount of carbon in a system, often expressed for forests as tonnes of carbon per ha (tC/ha). 1 tonne of carbon = 3.67 tonnes of CO_2

A comprehensive analysis of all British forests found that carbon stocks in trees, litter and soil averaged about 308 tC/ha, with about 75% of this in the soil.[1] Roughly half of the dry mass of trees is carbon. A forest's period of greatest carbon sequestration is during the period of greatest biomass increment. After this, carbon stocks continue to increase, but at a slower rate.[48]

Broadleaved forests hold more carbon per hectare than conifer forests in the UK. Natural England estimates that mixed native woodland sequesters carbon at about 14 tCO_2/ha/yr at 30 years old, with an average of about 7 tCO_2/ha/yr over 100 years.[49] It found that creating new native broadleaved woodland would be a just as effective sink as non-native conifers, with added benefits of increased biodiversity. Although, Carbon Brief found similar carbon sequestration results[43] for broadleaves, their study suggested conifers sequester 28% more carbon over a 30-year period.

Broadleaved woodland, even under clearfell silviculture (which is unusual for typical broadleaf species), has much longer rotations than conifer forest (about 100 years as opposed to 50 years), so their carbon stocks will be held secure for longer over the critical decades ahead.

Timber from the UK's forests can also store carbon. Productive conifer forests generate most of the the UK's timber, which locks up carbon in harvested wood products. As such, timber is increasingly recognised as an important low-carbon material to replace carbon-intensive materials such as concrete, cement and steel.

Soils and carbon under clearfell/restock (CF/R)

Most forestry in the UK is managed under the Clearfell/Restock system. The negative effects of this forestry practice on soils and their ability to store carbon are well-documented. Conifers trap pollutants from the air and transfer them to the soil and surface water.[50] This causes acidification of soils and water on base-poor sites, and loss of nutrients at clearfell. Clearfelling causes site compaction during harvesting and exposes soils to rain and sun, which leads to soil erosion and disruption to soil micro-organisms. Removing brash also reduces soil carbon. Taken together, CF/R forestry practices can reduce soil carbon by over 11%, taking over 75 years to recover in mineral soils.[51]

Soils and carbon under continuous cover forestry (CCF)

Any type of intensive forestry on very poor soils and organic soils is damaging. But on appropriate sites, there is an alternative to Clearfell/Restock. Continuous Cover Forestry, which provides a continuous canopy of trees, is helpful to forest soils as it moderates the impacts of sun, rain and drought, all factors which are forecast to intensify this century.[52]

Many studies[1,53] have found that CCF is beneficial for soil resilience and can improve its carbon storage. Generally, the more canopy retained during harvesting, the lower the loss of carbon and biodiversity.[54] CCF also helps mitigate nitrate leaching by avoiding large disturbance events and by retaining a young growing component in the stand to take up available nitrate released when felling trees.[55]

CCF silviculture increases resilience in forests by providing more veteran trees, understorey and open space, as well as promoting the natural regeneration of a forest. This is in line with recent recommendations from the UKFS and Natural Resources Wales[56] to improve forest resilience by increasing the diversity of tree species, genetics within species, forest structure and age structure.

Carbon in rewilded and non-intervention forests

In certain situations, rewilding may deliver carbon benefits. Rewilding Britain estimates[57] that although the early scrub stages of naturally regenerating forest only sequester 2.2 tCO_2/ha/yr, this rises to 8.8 tCO_2/ha/yr after 30 years, and 15.0 tCO_2/ha/yr thereafter.

Rewilding approaches sometimes embrace not only natural regeneration of trees, but also grazing livestock as part of the natural ecology. However, livestock grazing can make growth slow and patchy, making it inefficient for woodland establishment and carbon sequestration,[58] although this approach can have significant biodiversity benefits.

A similar approach to rewilding is 'pro-forestation' – allowing existing forests to grow to their full ecological potential. This requires no additional land or intervention and claims to provide a range of other ecological benefits.[59] It is true that mature forests continue to sequester carbon, and pro-forestation is a cheap and effective method of doing so. However, because UK forests tend to lack diversity, management interventions are widely supported as a way to improve their biodiversity.

Image: R. Walter

Planting trees to sequester carbon is effective but many factors influence the impact

Key takeaways

1. To ensure that forests soils are healthy and continue to store carbon, it is vital to rethink how we manage forests to minimise soil disturbance. In particular, peaty and organo-mineral soils are rich in carbon and must be treated carefully.

2. Planting trees to sequester carbon is effective, but requires careful consideration of soil type, existing biodiversity and land-use, tree species, the objectives and management of the woodland, harvesting (or not) of timber, the fate of the harvested wood products, and the timescale.

3. For forests to play a positive long-term role storing carbon, it is necessary to establish resilient mixed species forests and retain carbon in these trees and/or in their harvested wood products.

4. New native broadleaved woodland is a good carbon sink over the long term and has biodiversity benefits. High-yielding conifers sequester carbon faster and have more limited biodiversity benefits.

5. Harvested Wood Products, especially if they have long-term uses (such as construction), make a significant contribution to the carbon balance of forest.

Forestry fit for nature

As has already been established, only 7% of native woodland and 1% of non-native forests (mostly conifer) are in favourable condition. Our forests were fragmented long ago and old trees were removed, along with deadwood. More recently unmanaged grazing, invasive species and pests and diseases have further contributed to poor condition.

UK forests generally have low species diversity, which makes them less resilient to climate change, extreme weather, pests and diseases.[12] Increasing diversity makes forests more resilient, and helps to address the ecological emergency by providing habitats for a wide range of species (many of which are endangered).

Ancient Semi-Natural Woodland (ASNW) is the UK's most species-rich terrestrial habitat and, although it cannot be recreated, the closer forests approach such long-term and diverse conditions, the greater their biodiversity value. Because planted forests form a significant proportion of all UK forests, they need to be managed to contribute to the regeneration of biodiversity in the wider landscape.

Nature in decline

Despite a continued increase in wooded area, woodland biodiversity is in decline.[60] This shows that our new woods are not providing adequate natural habitat, either because they have limited diversity (e.g. non-native conifer) or because they have not had time to develop a complex vegetational structure, which can take a century or more.

The State of Nature 2019 report[61]

The State of Nature 2019 report[61] found a 13% fall in average species abundance, and that 15% of species are threatened with extinction from the UK. The report found that nature in woodland is under pressure from lack of management, overgrazing by deer and nitrogen pollution. The number of specialist woodland birds fell by 25% from 1970 to 2017 and woodland butterfly numbers have fallen by 50% since 1990.

13% fall in average species abundance

15% of species are threatened with extinction from the UK

25% fall in specialist woodland birds from 1970-2017

50% fall in woodland butterfly numbers since 1990

Several studies identify lack of management as a key factor in the decline of some species that prefer lighter conditions. These species are often seeking refuge from a hostile agricultural environment, so there is much to improve in the wider landscape as well.

However, there are also strong ecological arguments for non-intervention in woodland. The damper and more structurally complex the habitat, the more late-successional biodiversity it can support.[62] These specialist species, living and feeding on dead plant material, tend to be rarer and therefore of particular ecological value. So it is also important to conserve old-growth features where they occur, and provide for more, by leaving some areas undisturbed.

In practice, managing forests for biodiversity means creating many different habitats within forests and across the wider landscape, to provide shelter for a wide diversity of woodland flora and fauna.

Biodiversity in planted forests

Planted conifer forests in the UK have been undergoing restructuring to improve their age structure for more than thirty years. However, they still suffer from a number of ecological disadvantages. These non-native tree species often lack connection to the wider landscape ecology; have low diversity of species, habitats and niches; and fail to develop long-term environmental conditions for forest biodiversity. In addition, they are periodically disturbed by clearfelling.

Despite this, our 20th century conifer forests have developed a novel suite of biodiversity over the decades. They are less prone to waterlogging, can have soils with a deep humus-rich horizon and fungal communities, creating sheltered conditions and soils suitable for a wider range of trees and forests in future.[39,63]

However, although studies[64] have shown that conifer forests can host a surprising array of biodiversity, much needs to be done to increase it further. This includes diversity of age (including extending rotation length), species (including more native broadleaves), more open space and linkage, and more deadwood.

More diversity of management is also needed, with greater use of continuous cover management and natural regeneration. There should be more non-intervention areasv close to semi-natural woodland, where biological potential is achieved. Long-term retentions and open space are particularly important for invertebrates, as are deadwood and wet areas.

Some birds thrive in early successional forest and others in mature conifer stands, so diversity of management is important, including limited clearfelling where appropriate. A variety of forest sizes and shapes creates edge habitat beneficial to wildlife.

Image: R. Shaw

Lack of management can be a key factor in the decline of some species that prefer lighter conditions.

Non-intervention in woodland creates damper and more structurally complex habitat, that can support late-successional biodiversity which has particular ecological value

Managing forests for biodiversity means creating many different habitats within forests and across the wider landscape, to provide opportunities for a wide diversity of woodland flora and fauna.

Mycorrhizal fungi have a symbiotic relationship with tree roots delivering essential nutrients

Biodiversity and resilience

A recent review of resilience in British forests[52,63,65,66] highlighted the key role of biodiversity in supporting a forest's ability to cope with change and recover from disturbance. Forests need diversity in the genetic variation within each tree species, across a wide variety of different tree species, and in the structural diversity of the forest; underpinned by biodiversity in the soil and the wider forest.

A healthy soil is as fundamental to improving diversity as it is to storing carbon. In planted conifer forests, the introduction of broadleaves at a stand level introduces broadleaved litter, which promotes the breakdown of the cold and unaerated conifer needle litter. It allows mycorrhizal fungi to help trees to tap water and nutrients, defend against pathogens, protect roots, and store carbon.

Need to know

In a number of studies, mixed stands have been found to be as productive as monocultures[67,68] especially on poor soils.[69,70,71] They also provide more ecosystem services and are more resistant to pests and diseases.
A forest containing diverse tree species and stand structure will also benefit from a wider range of ecological niches, make better use of light and resources, and increase the cycling and retention of nutrients.

Mycorrhizal fungal networks

A forest is far more than the trees – it is a community of life. Mycorrhizal fungi have long been recognised for their symbiotic relationship with tree roots, but the role of mycorrhizal networks in forest ecology and resilience is only now being more widely appreciated. These networks transport carbon, water, nitrogen, phosphorus, micronutrients, stress chemicals and allelo-chemicals between plants of the same and different species, across distances in the tens of metres and over time periods of hours to days. A single fungus can span hundreds of hectares of forest.[72] Forestry practices that damage or erode the soil have profound effects on mycorrhizal networks, which has serious consequences for the health of a forest.

Large 'hub' trees appear to have the most fungal connections and support young seedlings and saplings nearby.[73] In planted conifer forests, where same-age trees are clearfelled, there are no such hub trees, which further reduces the resilience of the forest.

Continuous cover forestry and biodiversity

Need to know

The 'naturalness' of forests can be considered in terms of species, structure and processes, with more natural forests having a greater diversity of species (and of genetics within species), stand structures, and ecological disturbances and processes[74].

In terms of how natural a forest is, CCF scores better than clearfell/restock (CF/R) on most 'naturalness' indicators.[53] CCF tends to have a greater diversity of tree species, and higher genetic diversity within species than planted conifer forests, due to reliance on natural regeneration. This can benefit biodiversity and timber production and is a key factor in forest resilience.[52,75]

The structure of CCF forests supports more biodiversity than planted conifer forests. The greater range of vertical structure and niches is beneficial for bats, moths and some birds of conservation concern.[76,77,78] Avoiding clearfells also reduces the risk of weevil epidemics, so natural regeneration can be established without chemical protection.[79]

Within a forest, CCF clearly offers far greater diversity than either an even-aged conifer forest or an unmanaged woodland. There are gaps with regeneration, middle-aged clumps, mature trees retained for timber, seed and biodiversity. However, CF/R also offers a range of habitats from open ground after clearfell, through thicket, to a degree of mature forest at the end of rotation. This is why it is important to consider the benefits of a range of forest types, processes and disturbance across a whole landscape. To provide habitats for a diversity of flora and fauna, there should be scrubland, early successional forest, intimate diverse stand, mature forest, and old-growth non-intervention areas.

In the uplands, a landscape with both CF/R and CCF seems to favour optimal bird richness and species abundance.[80] Protecting 10% of a forest as 'retention' is considered a minimum for positive ecological response, with more retention providing greater benefits.[81] The size of each forest also has a major influence on its biodiversity, with larger forests offering greater environmental heterogeneity and more ecological niches, and thus supporting a greater range of woodland species.

Nature-based solutions

It is increasingly recognised that addressing climate change and biodiversity must be tackled together to maximise benefits and meet social needs,[82] and forests are well placed to contribute to this multi-benefit approach. Both the British Ecological Society[83] and Kew Gardens[84] have proposed diversifying species and structure in existing forests, to improve their biodiversity and to meet social needs.

Rewilding is another popular strategy for restoring biodiversity on appropriate sites, using naturalistic grazing on former farmland, with reintroduction of beavers and pine martens especially favoured. Simply allowing natural processes to unfold generates much higher levels of biodiversity, often with quite unexpected outcomes.

Mixed stands have been found to be as productive as monocultures. They also provide more ecosystem services and are more resistant to pests and diseases.

Key takeaways

1. The UK's forests, as well as wider landscapes, continue to lose biodiversity.
2. Planted conifer forests have developed their own suite of wildlife but suffer from lack of diversity.
3. Forest diversity, including biodiversity, supports resilience and adaptation.
4. Forest soil condition is important for biodiversity and is damaged by clearfelling and ground disturbance
5. Allowing some woodlands to achieve their biological potential through non-intervention will benefit biodiversity
6. Maintaining forest conditions, by retaining canopy cover and increasing the in-stand diversity of structure, species and tree ages, better supports the development of ecological processes.
7. Mixed stands have been found to be as productive as monocultures. They also provide more ecosystem services and are more resistant to pests and diseases.

Forestry fit for people

Forests create meaningful livelihoods for thousands of people working in forestry and associated industries, and improve people's physical and mental health through access to nature.

An important driver for change in forestry is society's opinion of trees and forests, with environmental issues ranked as the third most important issue[85] facing people in England during Covid-19 (after health and the economy).

This shift of attitude has far reaching implications – not just among the general public, but for the people who work in forestry and their representative bodies, policymakers and civil society. Massive changes in the UK landscape are being proposed to tackle the climate and nature emergencies. Many more trees and forests are required, alongside more intervention in existing forests and closer integration with farmland. This will only succeed with public support, stakeholder engagement, and a trained and skilled forestry workforce.

Forestry

13% of UK land is forest

Forestry contributes Gross Value Added(GVA) of

£2.55bn

to the economy (0.13%)

Forestry contributes to 0.13% of UK employment

16,000
employed in forestry

27,000
employed in primary processing

19%
of our timber needs supplied by UK forestry

20m
tCO_2e per year sequestered by UK forests

References[4,86,87]

Agriculture

72% of UK land is farmed

Agriculture contributes Gross Value Added(GVA) of

£10bn

to the economy (0.5%)

Agriculture contributes to 1.4% of UK employment

476,000
employed in agriculture

60%
of our food needs provied by UK agriculture

46m
tCO_2e emitted per year (10% of our GHG emissions)

References [88,89]

It has been calculated that for every £1 spent on establishing new woodlands, a further £2.79 is returned in economic and social benefits.[90]

Valuing forests

Most commentators agree that the UK timber sector has been a major success story over recent decades. The maturing and harvesting of the substantial new forest resource established in the 20th century has attracted significant investment in harvesting, processing and innovative product development.

However, our land-based industries (whether forestry or farming), despite covering the vast majority of UK land, are economically insignificant under current valuations. They also vary hugely in their GHG balances. Natural capital accounting, which considers the value of land, productivity, carbon and ecosystem services, can address these anomalies in valuing land-based industries.[91]

Studies regularly show that the value of a forest's timber is far outweighed by its ecosystem services such as carbon sequestration, air quality, flood risk prevention, and especially public access. For example, a study in Dorset found that when ecosystem services were properly accounted for, the social and environmental benefits from rural land use was about 10 times more valuable than under conventional accounting.[92] This provides a robust challenge to concerns that new forest cover permanently reduces the capital value of agricultural land. Rather, the natural capital of newly planted land would rise considerably. This may be reflected in a new approach to grant payments, based on 'public money for public goods', which should at last reward the many benefits of forests.

Employment in forestry

The Royal Forestry Society found that employment in forestry grew significantly between 2010 and 2017.[93] However, there are still skill and capacity gaps across the whole sector, with shortages of skilled machine drivers, chainsaw fellers and tree planters especially acute. There has also been a decline in forestry courses in higher education, with a resulting lack of forestry professionals, as reported by the Institute of Chartered Foresters[94] The forestry sector will need substantial investment if it is to deliver better management of existing forests and rapid establishment of new ones. The England Trees Action Plan[36] envisages a skilled workforce, with forestry and arboriculture as important sources of jobs and revenue, particularly in neglected rural areas. The plan, funded by over £500m of the £640m Nature for Climate Fund, also intends for more of our timber to be home grown, strengthening the domestic supply chain.

Forest economics

The UK's recent history of afforestation has not only created a distinctive conifer forest resource, but also a bespoke method of accounting. The tax system (until 1988) permitted switching schedules to avoid payments on both incomes and expenditures. As such, it favoured separate periods of revenues (felling) and costs (planting) and helped establish clearfell/restock as the dominant forest management regime. Continuous cover forestry simply did not fit this economic model.[95] Despite changes to this tax system, CF/R has remained the dominant silvicultural system in the UK.

Without the support of a favourable tax system, this prevailing orthodoxy is surprising since CCF can provide a steady yield of forest products that generates earlier returns, a stable cashflow, higher prices for larger and better-quality logs, and a growing capital value. Early thinnings remove poor quality stems of *all* sizes, so harvested volume tends to be higher than conventional thinning.[96] In later thinnings, removals are focused on larger trees that have reached target diameter, again resulting in higher volumes. With no felling at the end of rotation, the yield of timber thereafter is, in theory, continuous.[97]

CCF saves significantly on establishment costs through use of natural regeneration. This has attracted the attention of investors in Ireland, who are advocating CCF for long-term investment, with comparable (if not better) returns than conventional forestry, as well as reduced environmental impacts and greater resilience to climate change.[98,99]

Despite these benefits, the mainstream forestry sector has been resistant to widespread adoption of CCF. Foresters often perceive the practice to be overly complex and unsuitable, especially for upland crops, despite some evidence to the contrary.[100] This is compounded by historic investment in mills with tight specifications, where larger, better-quality stems are generally thought of as 'oversize'. Because the processing sector is vertically integrating to secure supplies in a volatile rising market, it will demand (or grow) trees to fit its mills.

People and forests

Trees and forests inhabit the public realm, even when they are on private land. They are big, enduring, visible components of our shared space and we develop feelings for them such as admiration, joy, familiarity and love. It is these accumulated values, as well as the wildlife that they support, and the climate benefits they bring, which can be lost when forest conditions are changed dramatically through clearfelling. Surveys consistently show that people would like to see many more forests in the landscape.[101]

Commercial forestry's focus on timber values can be perceived as neglecting these other values. A more integrated approach, embracing environmental and social values, would greatly improve forestry in the public perception, and there are many outstanding examples of this happening.

The British public[3] clearly favour mature forests, with a slight preference for broadleaf over conifer. They also prefer forest reserves and close-to-nature forest management to more intensive even-aged, planted conifer forests. There appears to be little support for upland commercial forestry amongst the public. CCF appears to be the most appropriate management practice to deliver society's preferences, and a number of managers are already applying it.[102]

Key takeaways

1. UK forest industries have attracted significant investment over the last 30 years and on many measures, the forestry sector outperforms UK agriculture as a provider of livelihoods.
2. There are significant skills and capacity gaps across the forestry sector.
3. Forests are an order of magnitude more valuable when natural capital is accounted for, compared to a purely economic assessment.
4. CCF is widely applicable, economically viable and could provide similar volumes of timber for the processing sector as CF/R.
5. People prefer older forest stands and less intensive management.

Image: Clocaenog Forest, Wales © Crown copyright

06

Facilitating a transition to Regenerative Forestry

The Soil Association calls for actions to be taken by policymakers, the forestry industry and civil society to achieve the full potential for forestry as a regenerative land use delivering for the climate, nature and people.

Government and policymakers need to move beyond tree planting rhetoric and facilitate a more integrated approach to land use and land use change across the UK. This means helping to put farmers into the driving seat to achieve the necessary UK tree revolution, working with foresters in an integrated way to deliver increased forest cover, widespread adoption of agroforestry systems and tree abundant landscapes.

Policymakers must also turn their attention to the enabling conditions required to transform all UK forests through regenerative management practices. As successive governments in the 20th century facilitated the massive expansion of single species forestry on challenging upland soils, the same level of research and technical development now needs to be deployed to manage these forests in a very different way for the future. Also, policymakers have a unique opportunity to set the regenerative vision for the government's own forests in England, Scotland, Wales and Northern Ireland. The exemplar public forests that are celebrated in all four nations now need to be replicated across this whole estate.

Key actions for governments and policymakers:

- Develop a joined-up policy framework for land use, which recognises and facilitates the opportunities for farming and forestry to be managed in an integrated way, rather than as rival land uses.
- Use public funding and regulation to reward the benefits to climate, nature and people from integrated land use and the adoption of regenerative forest management practices.
- Align research and technical development priorities to support forest owners to transition to regenerative forest management practices.
- Create a vision for all government owned forests (not just exemplar sites), that embraces regenerative forestry throughout this public resource.

To move towards regenerative forestry governments and policymakers need to:

Forest owners, managers and forest product industries have a pivotal role in achieving the low carbon opportunities from forests and timber. However, these opportunities will only be fully realised if forest owners and managers champion and deliver regenerative forestry practices in existing forests and create new forests that deliver for the climate, nature and people. This means a much wider adoption of integrated management to ensure that multiple objectives are delivered by all forests, and all areas of a forest. It will require a step change in species and age diversity and widespread adoption of lower impact management systems, that maintain forest conditions across the whole forest, retain canopy cover and avoid large scale and routine use of clearfelling practices.

Key actions for forest owners, managers and forest product industries:

- Adopt regenerative forest management practices across the entire forest (moving way away from a zoning approach for management objectives) to deliver optimal climate, nature and social benefits.
- Implement a step change in the species diversity and in-stand age structure of timber producing forests, with a presumption for the maintenance of forest conditions by reducing reliance on clearfelling and the mainstream adoption of lower impact silviculture systems, such as continuous cover.
- Work with, and develop new ways to support, farmers in the integrated management of woodlands and trees within farming systems and the wider landscape.

Civil society organisations have an important role in driving regenerative forestry and forest management, both within the UK and globally, through advocacy for responsible production and sourcing, as well as demand side measures to help mitigate the UK forest footprint. Forest products offer us part of the route out of our fossil fuel dependence; timber is a renewable, climate-friendly alternative to many of our uses of plastic, steel and concrete - but only if the timber is responsibly produced, through regenerative approaches that benefit the climate, nature and people. Producing an increasing proportion of our own timber requirements is a part of meeting our own responsibilities.

Key actions for civil society organisations:

- Promote the wise use of timber, for the best possible purposes. Promote the sourcing of timber from forests assured as being responsibly managed and ensure forest certification standards incorporate regenerative forestry requirements.
- Support UK timber production, as part of the solution to deliver a low carbon future.
- Work collaboratively with policymakers and the forestry sector, to help drive regenerative forestry within the UK and overseas.

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