

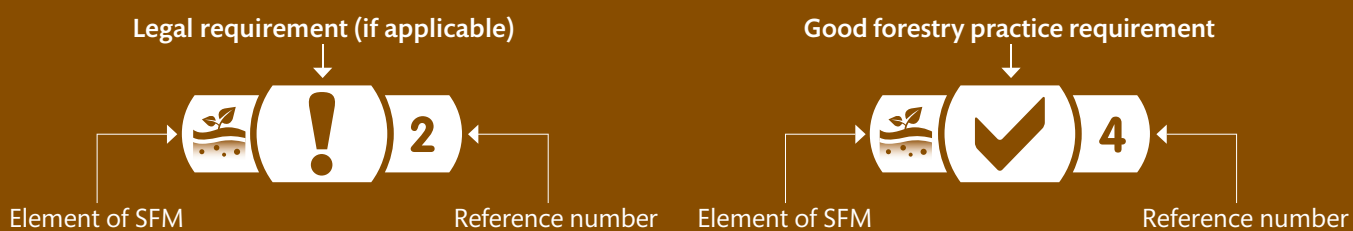
Forests and soil

UK Forestry Standard Guidelines



Key to symbols

UKFS Requirements for sustainable forest management



UKFS Guidelines



Forests and soil

UK Forestry Standard Guidelines

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1. Introduction

Forests and Soil is one of a series of seven Guidelines that support the United Kingdom Forestry Standard (UKFS). The UKFS and Guidelines outline the context for forestry in the UK, set out the approach of the UK governments to sustainable forest management, define standards and requirements, and provide a basis for regulation and monitoring – including national and international reporting.

The UKFS approach is based on applying criteria agreed at international and European levels to forest management in the UK. However, because the history of forestry and the nature of the woodlands in the UK differ in fundamental ways from those of other European countries, a main purpose of the UKFS is to demonstrate that these agreements are applied in an appropriate way to the management of UK forests and woodlands.

The UKFS Guidelines on *Forests and Soil* replaces the *Forests and soil conservation guidelines* published in 1998. This new edition, together with the 2011 editions of the UKFS and the rest of the Guidelines, has been produced to:

- provide an explicit statement of UKFS Requirements for sustainable forest management in line with statements for other land uses supported by EU rural development measures;
- ensure that the UKFS and its supporting Guidelines form an integrated whole by linking the UKFS Requirements through to the different elements of sustainable forest management;
- clarify the status of the UKFS, and the assurances provided by meeting the Requirements through the regulatory process;
- strengthen the role of forest planning;
- incorporate recent developments in legislation, international agreements, and the way forestry activity is monitored and reported;
- incorporate recent advances in the scientific understanding of forestry;
- include national and international initiatives on climate change and the role forests can play in mitigation and adaptation.

The new editions of the Guidelines have also replaced the 'Standard Notes', which gave detailed guidance on forestry practice in the first and second editions of the UKFS.

The UKFS and Guidelines have been developed by the Forestry Commission in Great Britain and the Forest Service, an agency within the Department of Agriculture and Rural Development in Northern Ireland, through an open and consensual process in accordance with government guidance. This has involved many interested parties and the general public in a formal consultation.

The UKFS and Guidelines have been endorsed by the UK and country governments and apply to all UK forests and woodlands. Together with the national forestry policies and strategies of England, Scotland, Wales and Northern Ireland, the UKFS provides a framework for the delivery of international agreements on sustainable forest management, alongside policies on implementation.

The standards for the planning, design and sustainable management of forests and woodlands in the UK use an approach based on internationally recognised science and best practice. The UKFS is the basis of forestry practice for the independent UK Woodland Assurance Standard (UKWAS), which is used for voluntary independent certification. It can also be used for assessing compliance as part of an environmental management system such as ISO 14001.

By meeting the Requirements of the UKFS, forest and woodland owners, managers and practitioners can demonstrate that forestry operations and activities are both legal and sustainable. The main bodies responsible for the regulation and monitoring of the UKFS and Guidelines are the Forestry Commission in Great Britain and the Forest Service in Northern Ireland.

The UKFS Guidelines on *Forests and Soil* is relevant to all those with an interest in UK forests and woodlands, particularly owners, managers and practitioners, and all organisations with responsibilities for forests and woodlands – including government agencies, local authorities, non-governmental organisations (NGOs), charities and trusts.



Healthy soil is a vital component of the forest ecosystem. It provides a strong foundation for trees and plants, and a habitat for many plant, animal and microbial species.

2. Overview of Forests and Soil

Forests and Soil is structured in the same way as the other Guidelines that support the UK Forestry Standard (UKFS). This section sets out the purpose of the UKFS Requirements, explains the role of the Guidelines and how they relate to the UKFS, defines the scope of the series and provides explanations of terminology.

UKFS Requirements

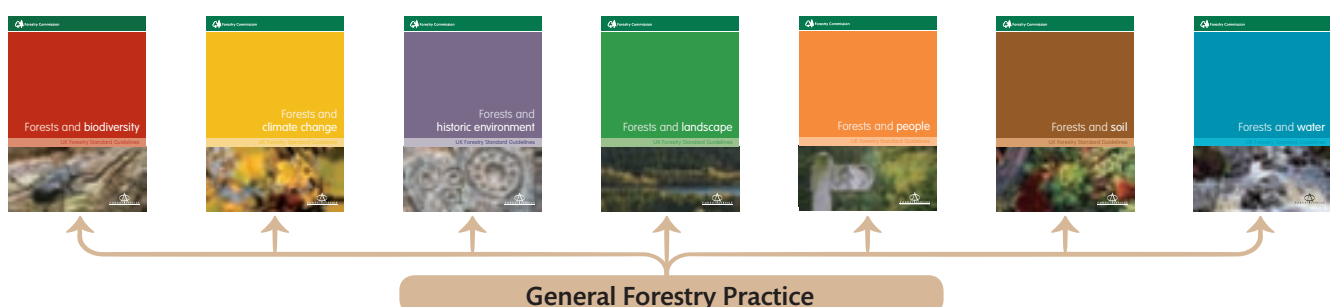
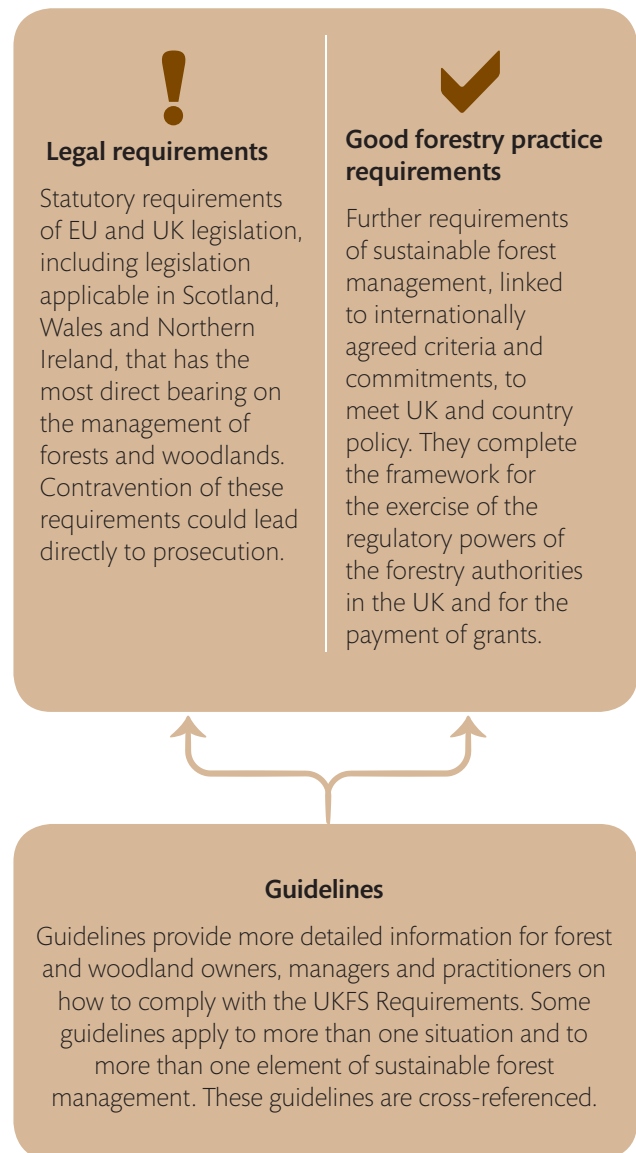
The UKFS Requirements for Soil are set out in Section 5. There are two levels of compliance: **Legal** and **Good forestry practice**. Guidelines for managers on complying with the Requirements for Soil are set out in Section 6.

In addition to soil, there are UKFS Requirements for six other elements of sustainable forest management, each set out in an individual Guidelines publication, categorised as follows:

- Biodiversity
- Climate Change
- Historic Environment
- Landscape
- People
- Water

General Forestry Practice is a further element of sustainable forest management that is covered by the UKFS itself, as it is common to soil and the other elements of sustainable forest management. Requirements for General Forestry Practice apply in most forestry situations, for example planning and operations.

For completeness, and so that these publications stand alone, the UKFS Requirements and Guidelines for General Forestry Practice are set out in Appendix 3 of each of the Guidelines publications.



Purpose of the UKFS Guidelines

The series of UKFS Guidelines explains the principles of the various elements of sustainable forest management in further detail, sets out how the UKFS Requirements can be met, and points to sources of practical guidance. Each of the UKFS Guidelines covers a different element of sustainable forest management and is based on current, relevant research and experience.

The purpose of the UKFS Guidelines is to provide:

- a statement of the UKFS Requirements relevant to that particular element of sustainable forest management;
- guidance and advice for those managing forests and woodlands on how to meet these Requirements;
- the basis for assessing proposals, management operations and activities to ensure the sustainability of UK forests and woodlands.

Scope and application

The UKFS and supporting series of Guidelines have been developed specifically for forestry in the UK and apply to all UK forests. The UKFS and Guidelines are applicable to the wide range of activities, scales of operation and situations that characterise forestry in the UK. The relevance of the Requirements and Guidelines will therefore vary according to the circumstances of the site, particularly the size of the forest or woodland, the scale of operation, and the objectives of the forest or woodland owner.

The UKFS and Guidelines encompass the entire forest environment, which may include open areas, water bodies such as rivers, lakes and ponds, and shrub species in addition to the trees themselves. They apply to the planning and management of forests within the wider landscape and land-use context, and to all UK forest types and management systems, including the collective tree and woodland cover in urban areas. The scope of the UKFS and Guidelines does not extend to the management of individual trees (arboriculture), orchards, ornamental trees and garden trees, tree nurseries, and the management of Christmas trees.

Some aspects of forest management lend themselves to 'yes or no' compliance, but most do not, and the UKFS

and Guidelines have not attempted to condense all the complexities of forest management into an over-simplistic format. The UKFS and Guidelines have therefore been written to be interpreted with a degree of flexibility and applied with an appropriate level of professional expertise.

It is also recognised that forest and woodland management is a long-term business and, while management opportunities should be taken to effect improvements, it may take more than one rotation to achieve some of the Requirements. In assessing whether the Requirements have reasonably been met, the overall balance of benefits or ecosystem services will be taken into account.

Definitions and terms

The UKFS and Guidelines apply to all UK forests. The term **forest** is used to describe land predominately covered in trees (defined as land under stands of trees with a canopy cover of at least 20%), whether in large tracts (generally called forests) or smaller areas known by a variety of terms (including woods, copses, spinneys or shelterbelts). The alternative term **woodland** has local nuances of meaning so it is used in the text where it is more appropriate, but for the purposes of the UKFS and Guidelines the meaning is synonymous with forest. **Forestry** is the science and art of planting, managing and caring for forests.

Short rotation coppice (SRC) and **short rotation forestry (SRF)** are both included within the scope of the UKFS and Guidelines, whether managed as part of a forest or as an agricultural or stand-alone regime. Although requirements for site selection and environmental protection for SRC and SRF will be the same as for other types of forestry, there will be differences in how other requirements can be met, particularly in the case of SRC, but the principles given in the UKFS will be applied.

Some UKFS Requirements and Guidelines are expressed as maximum or minimum proportions of the forest. In these cases the area in question is the **forest management unit (FMU)**. The FMU is the area subject to a forest management plan or proposal. This area is selected by the owner and/or manager and will be determined by the nature of the forest, the proposed operations and management objectives. Extensive FMUs have the advantage of allowing a strategic approach to be taken in

achieving UKFS Requirements, both in terms of the area covered and the timescale.

For the UKFS Requirements the term **must** is used to reflect a **legal requirement**, whereas the term **should** is employed for a **good forestry practice requirement**, which recognises that there may, in exceptional cases, be reasons for divergence.

UKFS **guidelines** are concerned with greater detail and therefore use a range of imperative terms appropriate to context. For unacceptable practice or management, the term **avoid** is used, meaning ‘keep away’, ‘refrain from’ or ‘prevent from happening’. Where specific maximum and minimum values or proportions are defined, they refer to the forest management unit and serve as a starting point for assessing compliance with the Requirements. However, because UK forestry encompasses a variety of activity, the relevance of guidelines will vary and, as with good forest practice requirements, there will be exceptional situations where a reasonable case for divergence can be made.

Detailed definitions of terminology specific to the UKFS Guidelines on *Forests and Soil* can be found in the Glossary.

Box 2.1 Guidance on good practice and reports of research to support the UK Forestry Standard can be found in the Forestry Commission technical publications series.





Some of the best areas of
undisturbed soils in the UK are
found in ancient woodlands.

3. Introduction to forests and soil

Soil is an important component of the forest ecosystem. It is a complex and variable medium comprising mineral particles, organic matter, water, air and living organisms. The characteristics of soil largely determine the nature of the flora and fauna that sustains the world's terrestrial biodiversity and its productive potential. It is a vital resource that must be used in a sustainable way to ensure it can continue to perform its many functions.

Geology, topography and climate all play a part in creating the many different soil types found across the British Isles, which often vary within short distances. The physical, chemical and biological properties of soils are continually modified by a number of natural processes, which include leaching, waterlogging and the addition and decomposition of organic matter. Soil is a valuable habitat in itself and it forms a living system that includes organisms belonging to many plant, animal and microbial species.

The actions and complex interactions of soil biota help to maintain the nutrient, energy and water flows that support the forest ecosystem (Figure 3.1). Soils provide an important filtering and buffering action that protects other parts of the ecosystem from pollution and damage and they can be a major source or sink of carbon dioxide and other greenhouse gases. Some of the least disturbed soils in the UK are found in ancient woodlands, since they have been untouched by agriculture for hundreds of years.

Figure 3.1 Dead and decaying wood and leaf litter is an important source of organic material for soil.



Forest soils

For the purpose of the UKFS Guidelines, 'forest soils' are defined as those soils supporting forests and woodlands, including post-industrial, or brownfield, soils that are being restored. Historically, British forests tend to have survived on, or have been planted on, ground of generally poorer quality than agricultural land, for example steep slopes, seasonally waterlogged peats and gleys, infertile podzols and ironpan soils. A small proportion of forests are located on better, well-drained brown earth soils, particularly in England and Wales. Woodlands created in recent decades for social and environmental reasons have often been established on a wider range of soil types, including restored or brownfield soils.

Forest soils are slightly acidic, unless underlain by calcareous rock. Inputs of atmospheric pollutants, particularly sulphur and nitrogen, can have significant impacts on acidity and also on nutrient status. Forest soils naturally have a high organic or carbon content, on average about 75% of total organic carbon contained in the forest. Climate change has the potential to affect forest soil function both directly and indirectly. Rising temperatures can accelerate mineralisation rates and soil nutrient availability, while nutrient leaching may be enhanced by higher winter rainfall. Increasing soil moisture deficits in summer could decrease both nutrient uptake by trees and leaching losses. The risk of physical soil disturbance may increase as a result of greater winter waterlogging and windthrow, especially if the frequency of storm events increases. All of these effects will have implications for the nutrient and carbon balance of forest soils.

In general, woodland soils have low and infrequent levels of disturbance, particularly under continuous cover management systems. However, some forest management activities, for example planting, harvesting, and moving and stacking timber (Figure 3.2), can have impacts on forest

Figure 3.2 Some forestry operations can damage the structure of soils unless good practice is followed.



soils. Engineering works, such as the building of roads and bridges involve soil movement and disturbance. More subtle changes to forest soils can be induced by species choice, stocking density and brash management. Some forestry practices, for example cultivation and drainage, may also result in a short-term loss of soil carbon until this is replaced over the rotation as forests grow (see the UKFS Guidelines on *Forests and Climate Change*).

Brownfield soils

Brownfield soils are those that have been used for industry or development in the past. They are likely to have been substantially modified physically, chemically and biologically by their previous use. Forests provide a way of reclaiming post-industrial areas and establishing a productive and environmentally beneficial resource. However, the restoration of brownfield sites can present a range of problems: the soils can be very acidic or very alkaline, contain toxic compounds or low levels of organic matter, and be either too compact or too loose. Successful restoration often requires intensive management and the importation of soil or soil-forming materials from elsewhere.

Forest soils and ecosystem services

The term ‘ecosystem services’ is derived from the UN Convention on Biological Diversity. It describes how ecosystems and the biodiversity contained within them produce a range of resources useful to people. Forest soils

provide a number of ecosystem services including:

- A store of carbon: organic matter is accumulated in the soil itself and in the wider forest ecosystem that soil supports.
- A growing medium for trees: forest soils provide physically and chemically for tree growth and forest products.
- Water management: the high infiltration capacity of most forest soils helps to reduce rapid run-off, with potential benefits for managing local flooding and controlling or abating diffuse pollution.
- A historical archive: forest soils may contain archaeological and palaeo-environmental evidence of the past.
- Revitalisation of derelict or neglected land: the establishment of woodland and development of forest soil on derelict or neglected land can play a vital role in economic regeneration, particularly in and around towns (Figure 3.3).
- Habitat creation and restoration: forest soils support the creation and restoration of habitats, both for priority woodland species and soil biodiversity.

Maintaining these ecosystem services remains a challenge, and work is underway to develop methods for assessing the specific role of soils in their delivery. The Guidelines therefore draw on the principles of the UKFS that embrace the concept of sustainable forest management.

Figure 3.3 Establishing woodland on brownfield sites can revitalise damaged soils.



4. Policy and context

The UK is a signatory to several long-standing international agreements and processes specifically aimed at the protection and sustainable use of soil. In addition to the European Soil Charter, which recognises that soil is a limited resource that is easily destroyed, there is a range of other agreements on environmental protection that offer indirect protection to soils.

This section provides further background, and gives an overview of the main developments relevant to forests and soil. Further details of legislation and conventions are provided in Appendix 1 – UK and country-level strategies and delivery mechanisms are summarised in Appendix 2.

International agreements

Soil protection has featured in a range of international agreements, including the 1992 Earth Summit, the UN Convention on Biological Diversity, and the Forest Europe process (formerly the Ministerial Conference on the Protection of Forests in Europe). General guidance on forest soils is included in the 1993 Helsinki agreement, and soil protection is included under Criterion 5 of the 1998 Pan-European Level Operational Guidelines. The importance of soils in the global carbon cycle is reflected in the UN Framework Convention on Climate Change (UNFCCC) and also in the Kyoto Protocol.

Soil protection in Europe

The European Soil Charter was signed by the Committee of Ministers for the Council of Europe in May 1972. This was a significant step in that it recognised that soil was a precious asset of limited supply and it committed signatories to develop soil protection and conservation policies. In particular, the Charter promotes the protection of soils against erosion and pollution, and specifically mentions the need for farmers and foresters to apply methods and practices to preserve soil quality. The Charter also emphasises the value of soil mapping or inventories, and highlights the importance of raising public awareness of soil as a valuable resource. In 2003 the EU Committee of Ministers agreed a new charter for the Protection and Sustainable Management of Soil that built on the 1972 Charter and other policy developments.

The European Commission subsequently adopted a Thematic Strategy for Soil Protection, including proposals for a Framework Directive for Soils in 2006. The proposed Directive set out common principles for protecting soils across the EU, with a focus on reducing erosion, the decline in organic matter, salinisation, compaction, landslides, contamination and sealing. However, environment ministers have not yet agreed to the proposal and it remains unclear if and when further work will take place.

Soil protection in the UK

In England, the Natural Environment White Paper: *The natural choice: securing the value of nature* includes the objective that, by 2030, all of England's soils are managed sustainably and degradation threats tackled successfully, in order to improve the quality of soils and to safeguard their ability to provide essential ecosystem services and functions for future generations. Soil management in forests has a clear role in delivering this.

In Scotland, the *Scottish soil framework* sets out the visions for soil protection and formally recognises the important services soils provide to society. Key outcome targets are the protection of biodiversity and soil organic matter, the reduction of erosion, soil contamination and greenhouse gas emissions, and better water quality through improved soil management. Protecting the environmental quality of water and soil resources are two of the seven key themes in the *Scottish forestry strategy*.

In Wales, the *Natural environment framework – a living Wales* aims to address the protection of soil and soil carbon. Monitoring of the carbon content of soils, especially organic soils, is proposed in the context of climate warming, which has the potential to deplete carbon stocks. Particular issues in relation to forestry

4. POLICY AND CONTEXT

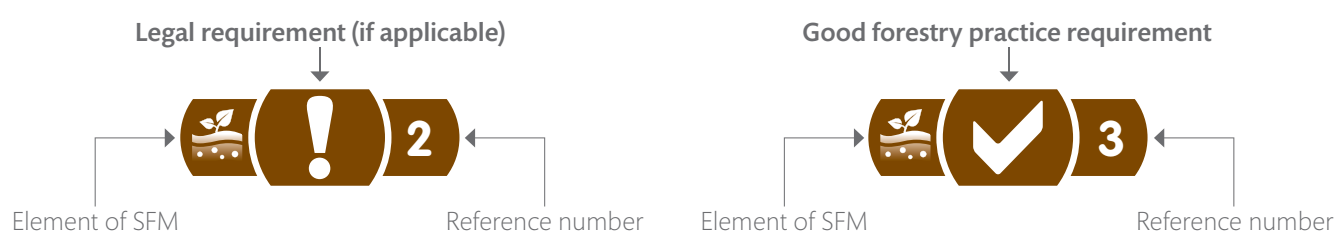
include the importance of ensuring that the increased use of woodfuel as a source of bioenergy does not deplete or impair the acid neutralising capacity of the soil. The assessment of the role that forests, woodlands and trees can play in the management of flood risk, diffuse pollution and soil erosion are the main forestry actions proposed in the plan. In *Woodlands for Wales*, the Welsh Assembly Government's *Strategy for woodlands and trees*, the increased development of renewable energy based on wood and the protection of soil carbon are strategic objectives.

5. UKFS Requirements: Soil

The UKFS Requirements for Soil are set out in this section (see Section 2 for further information). The UKFS Requirements for General Forestry Practice are given in the UKFS itself and in Appendix 3 of this publication.

Key to symbols









Requirements



Cross-references

Cross-references may be made to the other elements of sustainable forest management (SFM), where the Requirement is common to more than one subject.







-  General Forestry Practice
-  Forests and Biodiversity
-  Forests and Climate Change
-  Forests and Historic Environment
-  Forests and Landscape
-  Forests and People
-  Forests and Soil
-  Forests and Water

The UKFS Requirements outline the main legislation and are intended as a source of advice. You are advised to consult the relevant statutes for more information and the definitive legal text.









Waste management

Waste management regulations apply to sewage sludge and other waste materials (such as waste soil, bark, wood or other plant material) that may be applied to forest or other soils (as set out by the Waste Management Licensing Regulations 1994 (as amended for England, Wales or Scotland), and the Waste Management Licensing Regulations (Northern Ireland) 2003 (as amended)). Any operations involving the above must be registered with the regulatory authority. Sewage sludge may be applied to forest land, providing this results in ecological improvement and does not cause levels of potentially toxic elements in soils to exceed those permitted under the Sludge (Use in Agriculture) Regulations 1989 (as amended). There are exceptions from the Waste Management Regulations for the application of materials not considered to be 'waste', such as brash, and exemptions for wood ash up to defined amounts, providing these ameliorate the soil.

-   **1** The regulatory authority must be consulted prior to the application of wastes to forest soils, including sewage sludge, waste soil or compost, waste wood, bark or other 'listed substances'. Conditions applied to permissions or licences, including 'relevant objectives', must be complied with.   **11**

Control of pesticides







The Control of Pesticides Regulations 1986 (as amended) provide details of pesticides subject to control and prescribe approvals required for supply, storage and use, including aerial application. Users of pesticides are required to take all reasonable precautions to protect the health of humans, animals and plants, safeguard the environment and, in particular, avoid the pollution of water.

-   **2** Where a designated site or priority habitat or species might be affected, appropriate regulators and conservation agencies must be consulted prior to the aerial application of pesticides and the use of pesticides in or near water, and, where appropriate, authorisation obtained.   **5**
-   **3** All those employed to use pesticides must be trained to the required standard or their work supervised by a certified person. Operators must fully comply with instructions on pesticide product labels.   **6**

Soil properties



The physical structure of a soil affects the movement of gases, water and nutrients. A good structure is vital for soil fauna and the growth and reproduction of trees and other flora. Ancient woodlands in particular are a valuable resource of relatively undisturbed soils, which are likely to be of high biodiversity value. The nature and structure of soil is strongly influenced by the amount and quality of organic matter present and by the inorganic constituents of the soil matrix. These also determine the chemical properties of soils, including soil fertility. Forest management, as well as changes in environmental conditions, can have impacts on fertility through influencing the availability of nutrients and the capacity of soils to buffer adverse effects.

Soil micro-organisms play a vital role in the retention, breakdown and incorporation of organic matter and influence soil structure and porosity. Soil microbial activity is also directly linked to carbon and nutrient cycles and breakdown of pollutants. A decline in levels of soil organic matter can lead to an increase in the susceptibility of soil to compaction, lower infiltration rates, and possibly increased run-off or erosion. Climate change projections of rising temperatures could accelerate mineralisation rates and soil carbon loss.

-   **1** The quality of forest soil should be protected or enhanced in terms of its physical, chemical and biological properties.
-   **2** Forest soil fertility levels should be maintained to safeguard the soil's character and productive potential.
-   **3** Forest operations should be planned and managed to avoid damage to soil structure and function; should damage occur, reinstatement measures should be undertaken and adverse effects mitigated.

Environmental protection

Forest management activities such as cultivation and drainage can affect neighbouring land and water users through run-off and erosion. Soil disturbance can cause the loss of soil carbon – increasing greenhouse gas emissions and reducing soil carbon stocks.

-   **4** The environment adjacent to forests should not be subject to adverse effects due to water run-off, contamination or erosion arising from forest management practices.

6. UKFS Guidelines: Soil

Guidelines on meeting the UKFS Requirements for Soil are set out in this section. Guidelines on meeting the UKFS Requirements for General Forestry Practice are given in the UKFS itself and in Appendix 3 of this publication.

Key to symbols









Guidelines



Cross-references

Cross-references may be made to the other elements of sustainable forest management (SFM), where the Guideline is common to more than one subject.



-  General Forestry Practice
-  Forests and Biodiversity
-  Forests and Climate Change
-  Forests and Historic Environment
-  Forests and Landscape
-  Forests and People
-  Forests and Soil
-  Forests and Water

The table below introduces factors important for forests and soil. The Guidelines that follow provide more information on how to comply with the UKFS Requirements, grouped by the factor headings.

Factor	Importance for soil
Acidification	Acid deposition and other acidifying inputs can adversely affect soil biodiversity, soil fertility, tree growth and water quality.
Contamination	Contamination can prevent tree growth, reduce soil biodiversity and affect water quality and fisheries.
Compaction	Compaction reduces the permeability of soil and can inhibit tree growth, increase erosion and reduce soil biodiversity.
Disturbance	Disturbance affects soil characteristics and can result in erosion and leaching together with the oxidation of organic matter, which leads to carbon loss.
Erosion	Erosion reduces the soil resource, and can irreversibly damage soil productivity and result in the loss of carbon. It can affect water quality and damage aquatic habitats.
Fertility	Fertility has a major influence on the productivity of forest ecosystems and the composition of the vegetation and soil organisms.
Organic matter	Organic matter has a large influence on the physical, chemical and biological properties of the soil, as well as forming a major carbon store.

Acidification

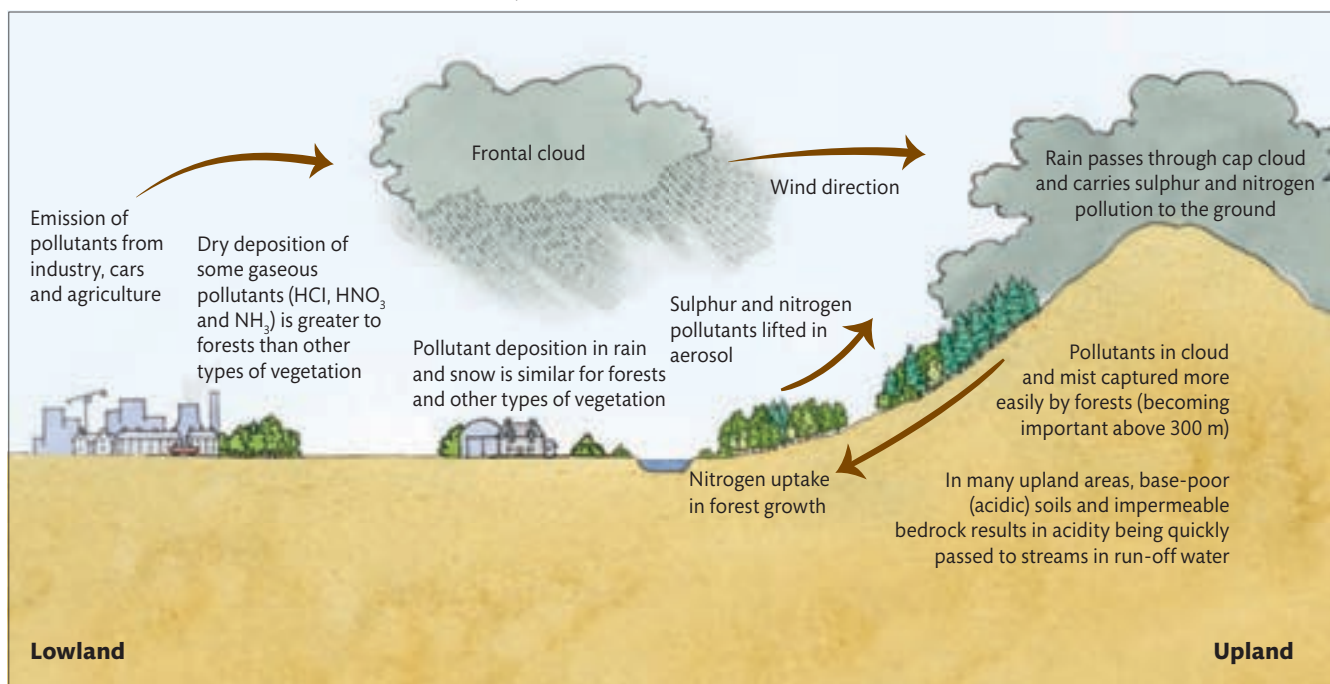
Forests and woodlands in the UK tend to occur on poorer soils that, particularly in the uplands, are often characterised by their natural acidity. Long-established woodlands on neutral soils usually develop a marginal acidity of surface layers due to the enrichment of the soil with organic matter. This natural acidity reflects normal forest processes and rarely leads to any adverse effects.

However, the addition of acidity to the environment, largely from atmospheric pollution, can result in soil acidification (Figure 6.1). This leads to a gradual depletion of calcium and other soil base cations from the surface layers and a reduction in the natural ability of soil to neutralise or buffer acidic inputs. Enhanced soil acidification generally has adverse effects, leading to:

- decreased pH of water draining from the soil, which can harm aquatic organisms;
- increased aluminium and heavy metal mobilisation, which can be harmful to tree roots and aquatic organisms;
- a reduction in tree growth and changes to the ground flora;
- a change in the predominant groups of soil organisms.

The highest deposition of acidifying compounds that will not cause chemical changes leading to long-term harmful effects on the ecosystem structure and function is called the critical load. Where acid inputs exceed the critical load, ecosystem changes can pose significant risks to both soil and water quality. Critical load exceedance of acidity for forest soils is currently defined in terms of risk of damage to tree roots from aluminium toxicity.






Figure 6.1 Interactions between forests and acid deposition.



The most acidified areas in the UK are in the uplands, where base-poor, slow-weathering rocks and soils coincide with high pollutant inputs in the form of large volumes of moderately polluted rainfall. Emission control has resulted in major reductions in pollutant inputs, and in the areas of woodland affected, this is projected to continue. However, modelling and monitoring data predict that soil recovery may take decades and could be further delayed by nitrate leaching and climate change (see the UKFS Guidelines on *Forests and Water*).

Whole-tree harvesting and the removal of harvesting residues represents an additional drain on the ability of soil to buffer acid deposition. Acid-sensitive soils are most at risk. Artificial and non-permanent measures can be taken to combat soil acidity, including the application of limestone or wood ash. However, these can also have detrimental effects and advice from the relevant regulatory authority is advisable before they are used. Repeated cropping for short rotation forestry or coppice could also lead to the acidification of sensitive soils if base cations are not replaced by soil treatments.

On brownfield land that has been restored but may have residual contamination, the oxidation of minerals containing sulphur (e.g. pyrites) can cause acidification on some sites. Potentially toxic elements, including aluminium, become more mobile as acidity increases, thereby increasing the risk of damage to tree roots and the contamination of drainage waters. These effects can be countered by adding alkaline materials.

-  **1** Avoid filling trenches, created for mounding on restock sites, with fresh brash.  **7**
Note: The above only applies to soils classified as at high risk of increased acidification and/or to catchments of water bodies identified by the water regulatory authority within the River Basin Management Plans as failing or at risk of failing good status due to acidification.
-  **2** On soils classified as at high risk of increased soil and water acidification (regardless of water body status) avoid short rotation forestry or short rotation coppice, and the harvesting of whole trees, forest residues and tree stumps.  **4**
-  **3** On brownfield sites, consider ameliorating excess soil acidity by incorporating alkaline soil additives.











Contamination

Contamination arises when soils become contaminated from the introduction of waste or polluting substances that cause instability and harm. Potential contaminants of forest soils include fuel oils, lubricants, pesticides and other chemicals, sewage sludge and inorganic nutrients. Pathogens such as faecal coliforms (from sewage sludge) can be a source of microbial contamination. Contaminants can have a range of adverse impacts on soil function and tree growth, water quality and public health. Any contamination is particularly injurious where biodiversity values are high, such as in ancient semi-natural woodlands.

It is a requirement of the UKFS that a contingency plan is in place in case of spillages to help limit incidents and ensure clean-up procedures are effective. It is also a legal requirement to have permission before some potential contaminants (e.g. sewage sludge) are applied or the aerial application of pesticides (see Waste management, page 12).

On brownfield sites, woodland offers a beneficial land-use option for site restoration. Some industrial sites have high levels of contaminants and dealing with them is a complex area where specialist advice will be required. This will involve checking that any restoration obligations have been implemented or are enforceable prior to acquiring land for woodland establishment.

Erosion on contaminated brownfield sites can be a problem that can affect the surrounding environment. Contamination is often variable across the site and can be difficult to manage. The establishment of trees can protect soil from disturbance and, through rooting and the build up of organic matter, can improve soil structure and reduce the risk of erosion. Some tree species have a high tolerance to contaminants and selected clones can remove potentially toxic elements from the soil and accumulate them within the woody biomass.

-  **4** Avoid the contamination of forest soils and have contingency plans in place to deal with accidental spillage and pollution.
-  **5** Minimise the use of pesticides and fertilisers in accordance with Forestry Commission and Forest Service guidance.  **23**  **13**  **57**
-  **6** Place any waste or recovered oil in an impermeable container and remove from the site for disposal at a suitable licensed site.  **69**
-  **7** Where it is necessary to store fuel oils on site temporarily, use double-skinned or bunded, securely lockable tanks.  **67**
-  **8** When restoring brownfield sites, take particular care with existing contaminants and seek specialist advice in dealing with them.

Compaction










Soil compaction is an increase in soil bulk density and a reduction in pore space due to compression. This affects the movement of water and air through the soil, reducing water infiltration and storage, and increasing the risk of water run-off and erosion. Compaction may also affect the growth and functioning of roots and soil organisms, which in turn can adversely affect tree stability and growth.

Natural processes such as freeze–thaw cycles, wetting–drying cycles and root penetration can mitigate compaction, and in some situations these processes can restore soils to their original condition over time. However, on some soil types, compaction is virtually irreversible.

The ground pressure of heavy machines used for harvesting or forwarding timber can compact the soil and cause rutting, particularly with frequent passes over a sustained period and when logs are skidded along the ground. Compaction to topsoil can usually be ameliorated, but damage to the subsoil (greater than 20 cm depth) is more difficult to rectify. Brownfield sites are often subject to repeated vehicle traffic during restoration, leading to severe compaction. Soils with a previous history of intensive grazing can be compacted and agricultural ploughing sometimes leads to a compacted layer just below

the reach of the plough. Soil stacked temporarily, for example for road construction and mineral extraction, can become compacted if it is stacked too high and for too long.

Compaction, leading to rutting and erosion, can be minimised by good planning and management of forest operations, such as using extraction routes made from layers of fresh brash to spread the load. A well-designed road infrastructure, with stacking and turning areas, will help minimise skidder haul tracks and other incidental causes of compaction on forest soils. Machine choice and working method affects the ground pressure and the risk of damage. Wheeled vehicles pose the greatest risk, but the use of chains, lower tyre pressures and controls on the frequency and speed of vehicle movements can reduce this. Tracked vehicles exert less ground pressure, while cable extraction poses virtually no risk of compaction and is the least environmentally disruptive for particularly sensitive sites. Dry soils have a greater bearing capacity than wet soils and so harvesting in dry periods reduces the risk of compaction. Compacted soils may require remedial treatment, such as subsoiling, carefully matched to the depth of compaction to minimise the extent of disturbance.

-  **9** Minimise compaction, rutting and erosion during forest operations by selecting the most appropriate working method for site conditions; monitor operations and modify, postpone or stop procedures if degradation starts to occur.  **30**  **36**
-  **10** On sites vulnerable to compaction and erosion, consider the weather and aim to carry out operations during dry periods; plan ahead for changes in the weather that could affect site conditions.  **32**  **37**
-  **11** Maintain adequate brash mats throughout extraction operations.  **31**
-  **12** Where compaction has occurred and will affect tree growth or lead to other detrimental effects, apply remedial treatment, but minimise the soil disturbance involved.

Disturbance

Soil disturbance is defined as any activity that mixes or moves soil material. Disturbance affects a wide range of soil characteristics and processes by altering the continuity of soil pores and the relative position of soil material. A number of forest operations and engineering works disturb the soil.

Cultivation disturbs the soil to improve tree growth by preparing a favourable planting site and lowering the water table. This increases nutrient availability and improves drainage and permeability. It also reduces the competition from weeds and can increase soil temperature to favour rooting. Drainage operations also result in soil disturbance and are carried out to collect and remove excess water, particularly water arising from cultivation channels.









Although soil disturbance can assist with forest management, it can also have a range of undesirable and potentially detrimental effects. These include:

- releasing greenhouse gases through the oxidation of soil organic matter;
- damaging soil structure and increasing the risk of erosion;
- leaching of nutrients and contaminants;

- destroying paleo-environmental and archaeological remains.

Removing tree stumps creates much soil disturbance but on some sites this may be necessary for tree health reasons, such as controlling the fungal pathogen *Heterobasidion annosum*. Stump removal may also be considered to provide a source of biomass for fuel; in this case, a risk-based assessment is required to take account of soil type, the potential for soil damage and carbon loss through oxidation. Stump removal can only be considered sustainable where it can be demonstrated that the nutrient status will be maintained and that greenhouse gas releases do not exceed the carbon dioxide benefits from using stumps as fuel.

On brownfield sites, topsoil is often moved, stored and then re-applied to restored areas. In undertaking all these operations, minimising handling and general soil disturbance will help limit detrimental effects.

-  **13** Minimise the soil disturbance necessary to secure management objectives, particularly on organic soils.  **4**  **17**
-  **14** Consider the potential impacts of soil disturbance when planning operations involving cultivation, harvesting, drainage and road construction.  **6**  **18**
-  **15** Avoid removing stumps unless for tree health reasons or where a risk-based assessment has shown that adverse impacts can be reduced to acceptable levels.  **3**

Erosion










Soil erosion results in a loss of rooting medium, including nutrients and organic matter. This has a number of potentially detrimental effects to the forest environment, downstream water bodies and surrounding areas. These include water pollution through sedimentation, increased run-off and loss of habitat. Most soil erosion caused by with water flows, but wind can also erode soil. Trees can be useful as windbreaks in exposed areas with light soils and to stabilise windblown sands on the coast. Erosion is a natural process, but it can be increased by poor forestry practice and is likely to be worsened by the wet winters and dry summers that are the anticipated result of a changing climate. In contrast, well-managed forests can stabilise soil and protect it from erosion.

Erosion is likely where ground vegetation is lost, and ruts and water channels develop. These concentrate and accelerate water flows. The aim of forest drainage is to encourage percolation through the soil and to channel excess water slowly away. Drains designed to intercept water and lead it at a shallow gradient to seepage zones and buffer areas will minimise erosion. Ground vegetation is particularly important near watercourses to help prevent soil erosion; excessive tree shade can lead to bare, eroding river banks (see the UKFS Guidelines on *Forests and Water*).

On steeper slopes, trees and shrubs can have an important role in reducing the risk of landslip. The binding action of roots increases soil strength and the canopy helps intercept rainfall and mitigate its impact on the ground. Continuous cover silviculture or other low-impact silvicultural systems, which maintain a protective cover of vegetation, can help

to reduce the risk of slope failure and erosion. Clearfelling has the opposite effect by removing the protective canopy and causing the death of tree roots.

The risks of soil erosion, together with those of compaction and disturbance, can be minimised through forest planning, at both a forest and site level. The choice of silvicultural system, design of riparian areas and timing and arrangement of felling coupes, all affect the risks. At a site level, planning detailed arrangements and contingencies for operations such as forest cultivation and drainage, harvesting and engineering will help ensure erosion does not become a problem (see the UKFS Guidelines on General Forestry Practice – Appendix 3).

-  **16** Address the risks of soil erosion as part of the forest and operational planning processes.
-  **17** Aim for a mix of shaded and lightly shaded habitat within the riparian zone – around 50% canopy cover on average but guided by local circumstances and the requirements of priority species.  **30**  **80**
-  **18** On steep slopes where there is a risk of slope failure or serious erosion, consider alternatives to clearfelling.  **31**  **35**
-  **19** Consider planting woodland to protect erosion-prone soils and intercept sediment-laden run-off.  **9**

Fertility










Soil fertility is defined as the availability and balance of nutrients required for plant growth. The availability reflects the soil conditions as modified by nutrient inputs and outputs. Nutrient inputs include the breakdown of organic matter, the weathering of mineral particles, water inflows, atmospheric deposition and the application of fertilisers. The principal losses are from the removal of timber and harvest residues from the site, soil leaching and erosion, and gaseous emissions.

Fertility has a major influence on the productivity and health of woodland ecosystems. Communities of woodland flora and fauna also largely reflect soil fertility. In accordance with principles of sustainability, the UKFS seeks to minimise the use of chemicals in forestry. In some UK forests, particularly plantations established on nutrient-poor soils, fertiliser applications were sometimes initially required for young trees to become established. In recent years fertiliser usage in established forests has declined because nutrient deficiencies are less common in subsequent rotations. There is also less new planting on marginal, infertile sites. The main use of fertiliser in forestry now is for the restoration of brownfield land. A small number of forest sites receive applications of sewage sludge or other recycled organic materials such as compost.

The loss of nutrients can undermine the long-term productivity of forest sites. The majority of nutrients, which are contained within the crown and foliage, are normally left on the site at harvesting. However, whole-tree harvesting, and the removal of forest residues such as brash and tree stumps, can contribute to a net loss of fertility and impoverish the soil. The removal of forest residues by burning or harvesting of woody biomass under short rotation coppice and short rotation forestry systems can similarly deplete fertility. Depletion is most

likely to occur where naturally infertile and shallow soils coincide with high rainfall. A risk-based assessment will be needed when these operations are proposed to ensure fertility is not compromised.

In general, forests and woodlands are effective at retaining nutrient inputs. Problems occasionally arise where fertiliser has been applied and the run-off or leaching of nutrients leads to eutrophication or enrichment of watercourses. This is most likely when heavy rain follows fertiliser application, especially on steep topography. Atmospheric nitrogen deposition can sometimes exceed the absorption capacity of woodland, leading to soil nitrogen saturation and nitrate-enriched run-off.




-  **20** Ensure the removal of forest products from the site, including non-timber products, does not deplete site fertility or soil carbon over the long term and maintains the site potential.  **7**  **7**
-  **21** Choose tree species and silvicultural systems that are well suited to the site and, with the exception of short rotation forestry or short rotation coppice, do not require continuing inputs of fertilisers.  **44**
-  **22** Minimise the use of inorganic fertilisers and confine these to areas where analysis clearly shows management benefits, in accordance with a nutrient and soil management plan.  **45**
-  **23** Plan any fertiliser applications to minimise the risks of nutrient loss.  **46**

Organic matter

Soil organic matter is made up of compounds that originated from living organisms, and is distinct from inorganic or mineral material. It includes plant and animal residues at various stages of decomposition, substances produced by plant roots, roots themselves and living soil organisms. The organic matter content of soil affects:

- physical properties – including structure and water-holding capacity;
- chemical properties – including carbon content and the retention of nutrients and contaminants;
- biological properties – including the nutrients and energy available for plants and animals.

Forests can increase soil organic matter and ecosystem carbon through large inputs of decomposable material such as foliage, woody material and fine roots. However, soil organic matter can be impoverished through disturbance, erosion, forest fires and the harvesting or burning of brash and stumps. Cultivation and drainage pose a particular risk of depleting the organic content of peaty soils through soil drying and oxidation. Following the Guidelines set out in this Section will help ensure soil organic matter is retained.

-  **24** Avoid establishing new forests on soils with peat exceeding 50 cm depth and on sites that would compromise the hydrology of adjacent bog habitats.  **5**  **5**



25

Avoid burning brash and harvesting residues unless it can be demonstrated that it is a management necessity, all the impacts have been considered, and the necessary approvals obtained.



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11

7. Implementation and monitoring

The revised edition of the UK Forestry Standard and its supporting series of Guidelines have not changed the legal framework for forestry or introduced new regulations. The aim is to provide greater clarity by outlining the scope of relevant existing regulations, and using these, together with the principles of sustainable forestry, to define forest management requirements in a more explicit way.

This section explains the mechanisms for regulating forestry in the UK and ensuring that forests are managed sustainably according to UKFS Requirements.

The regulatory framework

The Forestry Commission has a range of powers under the Forestry Act 1967 (as amended) through which the primary regulatory powers over forestry in Great Britain can be exercised. In Northern Ireland, the equivalent role in respect of the Forestry Act (Northern Ireland) 2010 is performed by the Forest Service, an agency within the Department of Agriculture and Rural Development. Some legislation is specific to forestry, but much legislation of relevance to forest and woodland owners and managers has wider application to any land management activity. The implications for forest managers of the main statutes of relevance are set out in the UKFS Requirements (Section 5).

Forestry policy in England, Scotland, Wales and Northern Ireland is the responsibility of the respective governments. Their forestry policies and strategies set out the priorities and programmes agreed in each country. For the public forest estate, policy is applied directly by the Forestry Commission and the Forest Service. For other forests, policy is implemented through a range of regulatory instruments and incentives. The forestry authorities also fund research and provide advice and guidance to support policy development. Increasingly, forestry policy is delivered through or in partnership with a range of other departments of government, agencies and organisations.

Felling

Under the Forestry Act, it is illegal to fell trees in Great Britain without prior approval, although there are exceptions for trees below a specified size, dangerous trees, and very small-scale felling operations. Cases of

illegal felling are rare, but suspected cases are investigated, and prosecution may ensue. Where trees are subject to designations, for example on Sites of Special Scientific Interest, the consent of the relevant statutory authorities is required for management activity. In addition, deforestation for the purposes of conversion to another type of land use may be subject to the Environmental Impact Assessment Regulations (see below).

In Northern Ireland, the Forestry Act (Northern Ireland) 2010, with its provisions for felling licences and felling management plans, now aligns more closely with Great Britain.

Restocking

There is a presumption against the removal of woodland and the loss of forest cover in the UK, and it is normally the case that felling approval is granted subject to restocking. Restocking is required as a policy priority linked to a number of national and international commitments to prevent forest losses worldwide and to mitigate the effects of climate change. In Great Britain, the Forestry Commission may serve a Restocking Notice, which requires restocking and establishment to take place.

In Northern Ireland, granting of a felling licence will be subject to conditions set out in a felling management plan, which may refer to the restocking of the land with trees. In addition, a restocking notice may be served following unauthorised felling. This provision of the Forestry Act will come into operation when subordinate legislation is made. There are some special cases in the UK where trees can be established elsewhere (usually referred to as compensatory planting) or permanently removed.

The permanent removal of trees may be sanctioned if there are overriding environmental considerations, for example to allow the restoration of important habitats;

such projects have to be individually assessed, taking into account the practicality of restoration, together with the implications for future management.

The removal of trees may also take place to enable development, authorised under the planning regulations, to proceed. Such developments may include alternative sustainable land uses such as windfarms or hydroelectric schemes. In such cases, all the arguments, including impacts on climate change through loss of forest cover, will need to be addressed within the framework of woodland removal policies at country level and the planning legislation. As deforestation is involved, an Environmental Impact Assessment is likely to be required.

Environmental impacts of forestry

Proposals for new planting (including short rotation coppice and Christmas trees), deforestation, and the construction of forest roads and quarries come under the forestry provisions of the EU Environmental Impact Assessment (EIA) Regulations. The Forestry Commission and the Department of Agriculture and Rural Development in Northern Ireland are responsible for the implementation of the Regulations, and will advise applicants about their scope and whether there is likely to be a need for an EIA. Forestry proposals that may have significant environmental impacts will require an EIA before approval is granted.

If an EIA is required, the applicant must prepare a comprehensive forest management plan, together with an exploration of the potential environmental impacts – this process will involve appropriate specialists. The applicant must submit an Environmental Statement to the forestry authority, and this and the EIA will be made available to the public and to the various statutory environmental authorities. The Forestry Commission or Department of Agriculture and Rural Development will take account of any comments received before making their decision.

The Environmental Liability Directive (2004/35/EC) establishes a common framework for liability with a view to preventing and remedying damage affecting the land, including damage to animals, plants, natural habitats and water resources. The Directive is the first EC legislation whose main objectives include the application of the 'polluter pays' principle. It requires those responsible for

the most significant cases of environmental damage to take immediate action to prevent the damage occurring and to put right damage where it does occur.

Consultation on forestry proposals

The forestry authorities make provision for anybody to comment on forestry proposals before a decision is reached. The mechanisms for doing this vary across England, Scotland, Wales and Northern Ireland, and with the significance and extent of the proposal. Consultation is extensive where an Environmental Impact Assessment is involved. The minimum consultation requirement in Great Britain is that clearfelling applications, forest management plans (for the public forest estate and for other woodlands) and grant applications are entered on the Public Register of New Planting and Felling. The arrangements for viewing the Register are on the Forestry Commission website at: www.forestry.gov.uk/publicregister.

In addition to the Public Register, local authorities and other statutory bodies are sent details of proposals under formal consultation and notification procedures. This process ensures a wide range of views is taken into account. The majority of applications, often with amendments, are approved through this process. If objections are lodged and sustained, the Forestry Commission may ask for advice from an advisory committee, and/or refer to the appropriate forestry minister before arriving at a decision. The above procedures do not negate the requirements for forest and woodland owners to consult other statutory agencies with regard to particular woodlands, for example the conservation agencies in the case of Sites of Special Scientific Interest.

Plant health and forest reproductive material

The Forestry Commission and the Forest Service also exercise legal powers to prevent the entry and spread of non-endemic pests and diseases of trees, under the 1967 Plant Health Acts. Trade in forest reproductive materials (seed, plants or cuttings) is also controlled under the 2002 Forest Reproductive Material Regulations (as amended), which implement the EU Directive 1999/105/EC on the marketing of forest reproductive material.

Meeting UKFS Requirements

The UKFS Requirements in Section 5 provide the basis for assessing whether the UK Forestry Standard has been implemented. Guidelines for forest and woodland managers on meeting the Requirements are given in Section 6 of this publication for Soil, and in the rest of the Guidelines series for the other elements of sustainable forest management. The numbered Guideline points will enable an assessment to be made as to whether the relevant Requirements of the UKFS have been achieved.

The current regulatory mechanisms for forestry allow two options for the approval of forest and woodland management proposals:

- Felling licences
- Forest management plans

The forestry authorities also provide incentives to encourage the creation of new woodlands and the management of existing woodlands. The payment of grants is conditional on meeting UKFS Requirements.

Felling licences

The felling licence is a straightforward statutory instrument that gives permission to fell trees and is separate from the offer of incentives. There are many situations where a felling licence will be the most appropriate way to get approval for forestry proposals. Felling licences offer proportionate and expedient regulation to suit many UK situations, particularly where management activities are of limited scope, modest impact or infrequent occurrence.

In Northern Ireland, a felling management plan will be an integral part of a felling licence under the Forestry Act (Northern Ireland) 2010.

A felling licence gives the owner the legal authority to proceed on the basis of the discrete operational area and activity involved. The licence requires the applicant to submit a range of information and to exercise good forestry practice. However, the licence does not extend to the wider context and area covered by a forest management plan – as a result, there will be UKFS Requirements and Guidelines that are not relevant or applicable to the individual licence area.

While the Requirements and Guidelines that are relevant or applicable to the licence area must be complied with, the limited scope of a felling licence necessarily restricts the levels of assurance that can be provided in relation to sustainable forest management. Accordingly, the minimum levels of UKFS assurance provided by a felling licence will be confined to the discrete operational area and defined as:

- Legality.
- Environmental suitability to the site.
- Conservation of high-value habitats and protected sites.
- Protection of society values and the provision of opportunities for public comment.
- Protection of the forest area through a replanting condition.

Forest management plans

The forest management plan provides a more comprehensive basis for assessment that extends beyond the discrete operational area. This area is defined as the forest management unit (FMU). Forest management plans set proposals in a broader context, both in the area covered and over time. They also provide a clear statement of intention and allow proposals to be communicated to others. Forest management plans will be assessed for approval, monitored and periodically updated and their approval renewed. All publicly owned forests are managed using forest management plans which are available for public comment. The level of assurance provided by a forest management plan will therefore extend to all the UKFS elements of sustainable forest management applicable to the FMU.

Incentives

The Forestry Commission and the Forest Service offer a range of incentives for woodland creation, woodland management and related activities. Each country in the UK has grant programmes aimed at supporting the delivery of their forestry policies and strategies. For forests and woodlands that are not part of the public forest estate, most planting, natural regeneration and some management operations take place with the assistance of grants and through the approval of a forest management plan. However, the approval required by the Forestry Commission or the Forest Service to proceed with proposals may be separate from the offer of a grant.

In Great Britain, the offer of incentives for forestry will be conditional on meeting the UKFS Requirements. This will have to be demonstrated through the submission and approval of a forest management plan. In Northern Ireland, there is no general requirement for forest management plans at the current time. However, essential planning information including maps, a statement of objectives and establishment prescriptions is required for forest and woodland grant applications.

Monitoring

Monitoring is carried out at a strategic level, which is used for international and national level reporting, and at the level of individual forests and woodlands, to check that agreed proposals are being implemented.

Strategic reporting

The UK is committed to international agreements on sustainable forest management and these require countries to report at intervals of about five years on indicators developed by the Global Forest Resources Assessment (GFRA) and Forest Europe (formerly the Ministerial Conference on the Protection of Forests in Europe). These indicators show the extent and condition of forests and woodlands, together with environmental, social and economic aspects of sustainable forest management.

The range of reportable indicators was greatly increased for the GFRA in 2005 and 2010 and for the Ministerial Conference on the Protection of Forests in Europe in 2007. These, together with indicators at country level, now form the main basis for strategic monitoring that has superseded the earlier UK Indicators of Sustainable Forestry. Forestry also features in other international indicator sets on which the UK reports, such as those for the UN Convention on Biological Diversity (UNCBD) and the UN Framework Convention on Climate Change (UNFCCC).

A range of mechanisms provides data for this monitoring and reporting. For indicators concerned with UK forests, the national forest inventories, where the total forest and woodland resource is comprehensively assessed, have been the main source of data. Additional data are provided by a range of research plots across the UK that are used for environmental monitoring, and which form

part of international co-operative programmes. Aspects covered include biodiversity, forest health, air pollution and climate change.

In the UK, each of the country forestry programmes or strategies has developed a set of performance indicators linked to strategic priorities. Where regional strategies exist within countries, indicators can also be linked to their strategic aims. These country indicators also draw upon existing statistics and surveys (for example, the current National Forest Inventory), and projects such as the Native Woodland Survey of Scotland will improve the scope of data collection and future reporting.

In Great Britain, the Forestry Commission has prepared a digital base map for all woodlands over 0.5 hectares, as part of the National Forest Inventory. This will ensure that monitoring will take place against definitive woodland areas. A sample survey, based on the digital map, will be undertaken for all these woodlands and data collected on species, structure, timber potential, and a range of environmental attributes. (A separate survey has been proposed for woodlands less than 0.5 hectares.) New technologies, including remote sensing, will enable the forestry authorities to carry out further checks on forest management and ensure the woodland map and associated survey data are regularly updated. In Northern Ireland, the Forest Service is in the process of completing an analysis of data on woodland area and type and will, in the future, provide and maintain a register of woodland.

Monitoring of individual forests and woodlands

Within the framework of the UKFS, the Forestry Commission in England, Scotland and Wales and the Forest Service in Northern Ireland will develop their own approaches to assessing forestry proposals for approval and verifying their implementation. These approaches will be informed by the nature of forests and woodlands in each country and risk factors associated with non-compliance.

The UKFS Requirements and Guidelines provide explicit statements against which proposals can be checked and their implementation monitored. The approval and monitoring regime will extend to individual forests and woodlands, but, as with all aspects of compliance, a risk-based approach appropriate to the context will be

taken. This will reflect the relevance and importance of the various elements of sustainable forest management, and individual Guidelines.

The implementation of forest management plans will be checked by the forestry authorities for grant payment purposes and again periodically as plans are amended or revised. At intervals, active forest management plans will be updated and formally re-submitted for an assessment of implementation to date and approval. Inspections will be based on a proportion of approved plans, selected at random, and the remainder based on the perceived risk profile of non-compliance.

Inspectors will offer advice on meeting the UKFS Requirements and allow the opportunity for remedial work to be carried out. However, where there are serious or persistent departures from UKFS Requirements, and these are not remedied, approved plans may be suspended and grants may be reclaimed. Where there is failure to meet the legal requirements, legal action may ensue.

Operational plans are a requirement of good forestry practice (see General Forestry Practice – Appendix 3), and the forestry authorities may ask to see these on site visits and more formally when forest management plans are due for renewal. Other UK regulatory authorities and organisations responsible for environmental standards, water quality, health and safety and employment may carry out checks to provide assurance of operational and legal compliance. As with other aspects of forest monitoring, the authorities will take a risk-based approach.

In addition, a new representative sampling survey will be introduced as a general audit on the implementation of UKFS Requirements and the systems in place. Taken together, these various measures will give assurance that the UKFS is being applied for the forest resource as a whole and, on the basis of a risk-based sample programme, will give assurance for individual woodlands.

Monitoring and forest certification

The processes of government regulation and independent forest and woodland certification will remain distinct. However, the forestry authorities will take account of certification in adopting a risk-based approach to monitoring. The UK Woodland Assurance Standard

(UKWAS), which is used as the basis of independent certification in the UK, draws on the UKFS and is compatible with the UKFS Requirements. UKFS monitoring will therefore be done with a lighter touch where additional assurance is provided by independent certification. All the forests and woodlands managed by the Forestry Commission and the Forest Service are independently certified and this will similarly be taken into account in the monitoring regime.

Evidence of legality and sustainability

For the majority of timber production in the UK, certification can be used to provide evidence that timber and wood products are legal and sustainable. For forests and woodlands that are not certified, the UKFS may be used to provide a risk-based approach to demonstrating legal and sustainable forest management. All active forest management plans will be regularly assessed and renewed against the UKFS Requirements, but checks on the detailed implementation of plans will be undertaken on a sample basis. As with certification, evidence will also be needed that links products to the forest covered by the management plan (see Section 4 of the UKFS). Where a felling licence is issued but a forest management plan is not in place, the levels of assurance will be lower and extend to legality and the aspects of sustainability outlined under Felling licences (see above).

Further reading and useful sources of information

Detailed information and resources for the UK Forestry Standard and each of its supporting series of Guidelines can be found at:

www.forestry.gov.uk/ukfs
www.forestry.gov.uk/ukfs/biodiversity
www.forestry.gov.uk/ukfs/climatechange
www.forestry.gov.uk/ukfs/historicenvironment
www.forestry.gov.uk/ukfs/landscape
www.forestry.gov.uk/ukfs/people
www.forestry.gov.uk/ukfs/soil
www.forestry.gov.uk/ukfs/water

Forestry Commission and Forest Service publications

Forestry Commission publications can be viewed and downloaded from: www.forestry.gov.uk/publications

Forest Service publications can be viewed and downloaded from: www.dardni.gov.uk/forests-service/publications

Other publications

Soil: a precious resource. Environment Agency, Bristol. (2007).

State of the environment soil quality report. SEPA, Stirling. (2001).

Sustainable use of soils. Royal Commission on Environmental Pollution, London. (1996).

Forestry Commission and Forest Service websites

Soil

For research information on **forests and soil**:
www.forestry.gov.uk/fr/soilsustainability

General

For information on **forestry statistics**, including forestry facts and figures: www.forestry.gov.uk/statistics

For information about the **National Forest Inventory**:
www.forestry.gov.uk/inventory

For information about **forest research**:
www.forestry.gov.uk/forestresearch

For information on **plant health** and biosecurity issues:
www.forestry.gov.uk/planthealth

For information and guidance on **Environmental Impact Assessments**: www.forestry.gov.uk/eia
www.dardni.gov.uk/forests-service/environment

For information and guidance on **felling**:
www.forestry.gov.uk/felling
www.dardni.gov.uk/forests-service

For information and guidance on **grant schemes**:
www.forestry.gov.uk/grants
www.dardni.gov.uk/forests-service

To view the **public registers** on grants and felling applications, and Environmental Impact Assessments:
www.forestry.gov.uk/publicregister

Other useful websites

www.environment-agency.gov.uk
Environment Agency (England and Wales)

www.naturalengland.org.uk
Natural England

www.sepa.org.uk
Scottish Environment Protection Agency (SEPA)

www.snh.gov.uk
Scottish Natural Heritage

www.ccw.gov.uk
Countryside Council for Wales

www.doeni.gov.uk/niea

Department of the Environment Northern Ireland

www.soils.org.uk

British Society of Soil Science

www.cranfield.ac.uk/sas/nsri

National Soil Resources Institute

www.hutton.ac.uk

James Hutton Institute (formerly the Macaulay Land Use Research Institute (MLURI))

www.soilassociation.org

Soil Association and Soil Association Scotland

www.metoffice.gov.uk

The Meteorological Office

www.legislation.gov.uk

All enacted legislation and revisions for the United Kingdom, Scotland, Wales and Northern Ireland.

International context

www.eea.europa.eu

European Environment Agency (EEA)

<http://eusoils.jrc.ec.europa.eu>

European Soil Portal

Contact addresses

Forestry authorities

Forestry Commission (GB)
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www.forestry.gov.uk

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www.forestry.gov.uk/england

Forestry Commission Scotland
Silvan House
231 Corstorphine Road
Edinburgh EH12 7AT
T: 0131 334 0303
E: fcscotland@forestry.gsi.gov.uk
www.forestry.gov.uk/scotland

Forestry Commission Wales
Welsh Assembly Government
Rhodfa Padarn
Llanbadarn Fawr
Aberystwyth SY23 3UR
T: 0300 068 0300
E: fcwenquiries@forestry.gsi.gov.uk
www.forestry.gov.uk/wales

Forest Service
Department of Agriculture and Rural Development
Dundonald House
Upper Newtownards Road
Ballymiscaw
Belfast BT4 3SB
T: 02890 524480
E: customer.forests@ardni.gov.uk
www.dardni.gov.uk/forests-service

Soil authorities

Environment Agency
National Customer Contact Centre
PO Box 544
Rotherham S60 1BY
T: 03708 506 506
E: enquiries@environment-agency.gov.uk
www.environment-agency.gov.uk

Scottish Environment Protection Agency
Erskine Court
Castle Business Park
Stirling FK9 4TR
T: 01786 457700
E: info@sepa.org.uk
www.sepa.org.uk

Environment Agency Wales
Cambria House
29 Newport Road
Cardiff CF24 0TP
T: 0870 8506506
E: enquiries@environment-agency.gov.uk
www.environment-agency.gov.uk

Department of the Environment Northern Ireland
Clarence Court
10–18 Adelaide Street
Belfast BT2 8GB
T: 028 9054 0540
E: enquiries@doeni.gov.uk
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Forest Research

Forest Research is the agency of the Forestry Commission and the UK leader in forestry and tree-related research.

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Appendix 1 – Legislation and conventions

World Soil Charter

www.fao.org

The World Soil Charter calls for a commitment on the part of governments, international organisations and land users in general to manage the land for long-term advantage rather than for short-term expediency. Special attention is called to the need for land-use policies which create the incentives for people to participate in soil conservation work taking into account both the technical and socio-economic elements of effective land use.

Agenda 21

www.un.org

Agenda 21 is the programme of action that came out of the United Nations Conference on Environment and Development (UNCED), the 'Earth Summit', which was held in Rio de Janeiro in 1992. It is a comprehensive plan of action to be taken globally, nationally and locally by organisations of the United Nations system, governments and major groups in every area in which humans impact on the environment.

Convention on Biological Diversity

www.cbd.int

The Convention on Biological Diversity (CBD) was opened for signature at the United Nations Conference on Environment and Development (UNCED) which was held in Rio de Janeiro in 1992, and came into force in 1993. Its overarching aim is to conserve the world's biodiversity. Refer to the UKFS Guidelines on *Forests and Biodiversity* for further information.

Forest Europe

www.foresteurope.org

Forest Europe, formerly the Ministerial Conference on the Protection of Forests in Europe (MCPFE), has passed several resolutions relevant to soil conservation.

European Soil Charter

<https://wcd.coe.int>

In 1972 the European Commission Committee of Government Ministers, including the UK, recognised the increasing biological deterioration of the soil in many parts of Europe and adopted a charter for soil protection. Among other things the charter recognises that:

- soil is a precious asset;
- soil is a limited resource which is easily destroyed;
- farmers and foresters must preserve the soil's quality;
- soil must be protected from erosion and pollution.

Thematic Strategy for Soil Protection

www.ec.europa.eu

The European Commission adopted the Thematic Strategy for Soil Protection, including proposals for a 'Framework Directive for Soils', in 2006. The proposed Directive (not yet in force) lays down a framework for the protection and sustainable use of soil.

Integrated Pollution Prevention and Control Directive

www.ec.europa.eu

The aim of EU Directive 2008/1/EC, known as the IPPC Directive, is to prevent or reduce pollution of the atmosphere, water and soil, as well as the quantities of waste arising from industrial and agricultural installations, to ensure a high level of environmental protection.

Environmental Liability Directive

www.ec.europa.eu

The objectives of this legislation include the application of the ‘polluter pays’ principle. Directive 2004/35/EC on environmental liability with regard to the prevention and remedying of environmental damage establishes a common framework for liability with a view to preventing and remedying damage to animals, plants, natural habitats and water resources, and damage affecting or contaminating the land.

United Nations Framework Convention on Climate Change

www.unfccc.int

The UNFCCC forms the basis of international law in respect of climate change. Refer to the UKFS Guidelines on *Forests and Climate Change* for further information.

Kyoto Protocol

www.unfccc.int

The Kyoto Protocol is an international agreement linked to the UNFCCC. It highlights the fact that soil is a major carbon store, worthy of protection wherever possible.

Control of Pesticides Regulations 1986 (as amended)

www.legislation.gov.uk

These Regulations provide details of pesticides subject to control and prescribe approvals required for supply, storage and use, including aerial application.

Waste management legislation

www.legislation.gov.uk

The following regulations bring into force the waste management licensing system under Part II of the Environmental Protection Act 1990, which is designed to control the disposal of waste materials, including sewage sludge, waste soil, and waste wood, bark and other plant material.

- The Waste Management Licensing Regulations 1994
- Waste Management Licensing Regulations (Northern Ireland) 2003

The Sludge (Use in Agriculture) Regulations 1989 (as amended) – this Regulation implements EU Council Directive 86/278/EEC on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture.

Sludge (Use in Agriculture) Regulations (Northern Ireland) 1990 SR 245 – this Regulation bans the use of sewage sludge from treatment plants in agriculture, unless certain requirements are met including specified pH levels, no fruit or vegetable harvesting and no soil and groundwater pollution. (Not available online).

Appendix 2 – Strategies

Soil – general

The natural choice: securing the value of nature (2011). HM Government.

Safeguarding our soils: a strategy for England (2009). Defra, London.

The Scottish soil framework (2009). Scottish Government, Edinburgh.

Natural environment framework – a living Wales. Welsh Assembly Government, Cardiff.

Soil – forestry related

The Scottish forestry strategy (2006). Forestry Commission Scotland, Edinburgh.

Woodlands for Wales: the Welsh Assembly Government's strategy for woodlands and trees (2009). Welsh Assembly Government, Cardiff.

Northern Ireland forestry. A strategy for sustainability and growth (2006). Northern Ireland Forest Service, Belfast.

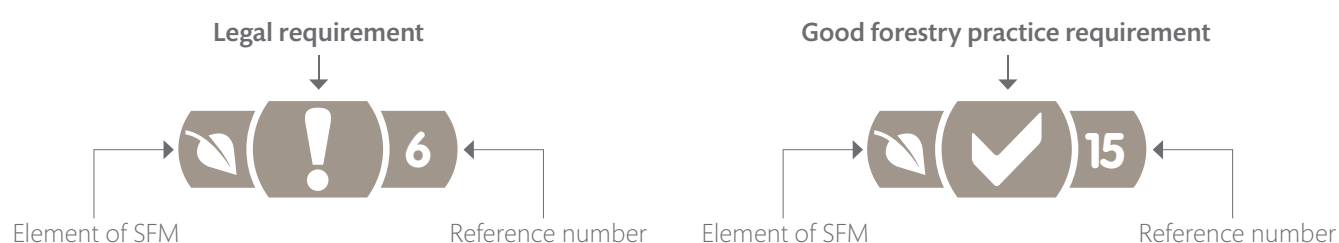
Appendix 3 – General Forestry Practice

General Forestry Practice Requirements

This section replicates the Requirements for General Forestry Practice set out in the UKFS (see Section 2 for more information). General Forestry Practice is covered by the UKFS itself and not by an individual Guidelines publication because the Requirements and supporting Guidelines describe aspects of management that apply to most forest and woodland situations and that are common to the other elements of sustainable forest management (SFM).

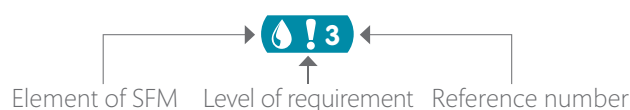
Key to symbols









Requirements



Cross-references

Cross-references may be made to the other elements of sustainable forest management, where the Requirement is common to more than one subject.







-  General Forestry Practice
-  Forests and Biodiversity
-  Forests and Climate Change
-  Forests and Historic Environment
-  Forests and Landscape
-  Forests and People
-  Forests and Soil
-  Forests and Water

The UKFS Requirements outline the main legislation and are intended as a source of advice. You are advised to consult the relevant statutes for more information and the definitive legal text.

General compliance



All occupiers of land and parties engaged in commercial activities are subject to a range of laws and regulations. Some are of special relevance to land-based activities in general and others are more specific to forestry. Compliance with the law is fundamental to the UKFS, and the main legislation of most general relevance to forestry is outlined in this section. More specific legislation is outlined under the relevant elements of sustainable forest management and in the supporting series of Guidelines.

-  **1** Forestry activities and businesses must comply with all relevant laws and regulations.
-  **2** Operations must be authorised by the legal owner.
-  **1** Reasonable measures should be taken to ensure no illegal or unauthorised activity takes place within the forest or woodland.
-  **2** Forestry activities and businesses should comply with relevant codes of practice and industry guidelines.

Forest protection



The Forestry Act 1967 conveys wide powers to control felling and provide assistance to promote the interests of forestry, the development of afforestation, and the production and supply of timber in Great Britain. The Forestry Act was amended by the Wildlife and Countryside (Amendment) Act 1985 and, in Scotland, by the Nature Conservation (Scotland) Act 2004 to take account of wider environmental considerations and to incorporate the concept of ‘a reasonable balance’ between the interests of forestry and the environment. In Northern Ireland, the Forestry Act (Northern Ireland) 2010 conveys wide powers to promote afforestation and sustainable forestry, to protect the environment and to promote recreational use. There are also powers to regulate felling.



The Town and Country Planning Acts do not apply to forestry activities themselves, as they are not defined as ‘development’. The exception is where development, for example housing, is proposed on a woodland site, in which case the planning procedures apply. Local authorities (in Northern Ireland, the Planning Service of the Department of the Environment) can apply Tree Preservation Orders (TPOs) and designate Conservation Areas to protect trees that are important in the landscape. Owners are notified of these designations. Local authorities may apply planning conditions to protect existing trees or plant new ones as part of the development consent. They may also enter into ‘planning gain’ agreements for additional woodland creation or protection. In areas with landscape designations, forest roads and quarries that do not form part of an approved afforestation scheme may be subject to planning controls. Areas of woodland are material considerations in the planning process and may be protected in local authority Area Plans. These plans pay particular attention to woods listed on the Ancient Woodland Inventory and areas identified as Sites of Local Nature Conservation Importance (SLNCIs).



-   **3** Where required, proposals for felling or thinning must be submitted to the appropriate forestry authority for approval. Following felling, restocking will normally be required.



Note that:



- Submission for approval can be done as an integral part of a grant application.
- There are a number of exceptions: trees under a specified size, trees proved to be dangerous, fruit trees and small-scale felling may not require a felling licence. Priority habitat restoration proposals may not require restocking.
- Forestry authority approval is not required if trees are included in development approval under the Town and Country Planning Acts or other planning legislation.
- EC Directive 97/11 provides *inter alia* that deforestation for the purposes of conversion to another type of land use may be subject to the Environmental Impact Assessment (Forestry) Regulations.
- In Northern Ireland, the Forestry Act (Northern Ireland) 2010 regulates the felling of trees growing on land of 0.2 hectares or more, through granting of felling licences which include felling management plans to control necessary replanting.

-   **4** Before felling and pruning trees, a check must be made to ensure there are no Tree Preservation Orders or Conservation Area designations. Permission must be obtained from the relevant authority to fell or prune trees subject to Tree Preservation Orders or notification made where Conservation Areas have been applied.

-   **5** The impacts of forestry on the environment must be taken into account in the submission of forestry proposals.

-   **3** There is a presumption that forest land should not be converted into other land uses; guidance on the exceptional situations where woodland removal may be possible is available from country forestry authorities.

-   **4** The capability of forests to produce a range of wood and non-wood forest products and services on a sustainable basis should be maintained.

-   **5** Forests should be protected from the time of planting or restocking to ensure successful establishment and long-term viability.





Environmental impact

EC Directive 85/337/EEC is transposed into UK legislation by the various Environmental Impact Assessment (EIA) Regulations, which apply to afforestation – including short rotation coppice and Christmas trees, deforestation, and the construction of forest roads and quarries. The regulations require the forestry authority to determine whether a proposal may have a significant effect on the environment, and where this is the case the proposer is required to prepare an Environmental Statement.

-   **6** Environmental Impact Assessment (EIA) Regulations must be complied with; where an EIA is required, all the relevant environmental impacts must be considered by the proposers and the requirements for public consultation must be met.


Plant health and biosecurity

The Plant Health Act 1967 identifies the Forestry Commission as the competent authority in Great Britain, as regards the protection of forest trees and timber, and empowers the Forestry Commissioners to make orders to prevent the introduction and spread of forestry pests and diseases. The Plant Health (Forestry) Order 2005 lays down a number of conditions and prohibitions to support these objectives. In Northern Ireland, under the Plant Health Act (Northern Ireland) 1967, the Department of Agriculture and Rural Development is the competent authority for these purposes, and the Plant Health (Northern Ireland) 2006 and the Plant Health (Wood and Bark) Order (Northern Ireland) 2006 support these objectives.

-  **7** Statutory orders made under the Plant Health Acts to prevent the introduction and spread of forest pests and diseases must be complied with; suspected pests and diseases must be reported to the forestry authority if they are notifiable, and access must be given to Plant Health Inspectors and their instructions followed.
-  **6** Managers should be aware of the risks posed by pests and diseases, be vigilant in checking the condition of their forests and take responsible measures to combat threats to tree health.
-  **7** Information should be reported to the forestry authority that might assist in preventing the introduction or spread of forest pests and diseases.
-  **8** Suspected pests and diseases should be investigated, reported to the forestry authority and biosecurity control measures recommended by the forestry authority carried out.

Forest reproductive material

The Forest Reproductive Material (Great Britain) Regulations 2002 implement EU Directive 1999/105/EC in Great Britain and provide a framework for controlling plant materials used in forest establishment. A voluntary scheme is also in place to cover native species and other species commonly planted for forestry purposes. In Northern Ireland, the Forest Reproductive Material Regulations (Northern Ireland) 2002 are applied through the Forest Service, an executive agency within the Department of Agriculture and Rural Development. The Forest Service maintains a National Register of Basic Material for Northern Ireland.

-  **8** For species covered by Forest Reproductive Material Regulations, only certified material can be used for forestry purposes.





Forest planning

Forest planning takes place at a number of levels. The highest level is the strategic plan, which defines the broad objectives of the owner and how these can be met across the forest estate, which sometimes comprises several forest areas. Beneath this are the three levels at which the UKFS Requirements should be addressed:

- Forest planning applies to a convenient management unit, called the forest management unit (FMU). These plans will vary with the scale of the forest and the size and nature of the holding – usually called the **forest management plan**.
- Operational planning is concerned with the operational detail of how proposals will be implemented at site level – usually called the **operational plan** or site plan.
- Contingency planning ensures that procedures are in place and can be enacted should unforeseen events occur, for example, forests fires, catastrophic wind damage and accidental spillages – usually called the **contingency plan**.



Forest management plan

The forest management plan is the reference document for the monitoring and assessment of forest holdings and forest practice. It is also used for communicating proposals and engaging with interested parties. The plan itself should be proportionate to the scale, sensitivity and complexity of the forest management unit (FMU).

-   **9** Forest management plans should state the objectives of management, and set out how the appropriate balance between economic, environmental and social objectives will be achieved.
-   **10** Forest management plans should address the forest context and the forest potential, and demonstrate how the relevant interests and issues have been considered and addressed.
-   **11** In designated areas, for example national parks, particular account should be taken of landscape and other sensitivities in the design of forests and forest infrastructure.
-   **12** At the time of felling and restocking, the design of existing forests should be re-assessed and any necessary changes made so that they meet UKFS Requirements.
-   **13** Consultation on forest management plans and proposals should be carried out according to forestry authority procedures and, where required, the Environmental Impact Assessment Regulations.
-   **14** Forests should be designed to achieve a diverse structure of habitat, and species and ages of trees, appropriate to the scale and context.
-   **15** Forests characterised by a lack of diversity due to extensive areas of even-aged trees should be progressively restructured to achieve a range of age classes.
-   **16** Management of the forest should conform to the plan, and the plan should be updated to ensure it is current and relevant.
-   **17** New forests and woodlands should be located and designed to maintain or enhance the visual, cultural and ecological value and character of the landscape.

Operational and contingency plans

Operational plans can make forest practice more efficient and ensure that important site features are known about and protected in advance. Contingency plans address potential threats to the forest environment and accidental events, such as spillages, and help prevent or remedy environmental damage.

-  18 Operational plans should be in place before major operations such as harvesting and engineering works take place.
-  19 Where appropriate, contingency plans should be in place for dealing with actual and potential threats to the forest and environment.

General Forestry Practice Guidelines

This section replicates the Guidelines for General Forestry Practice set out in the UKFS (see Section 2 for more information). General Forestry Practice is covered by the UKFS itself and not by an individual Guidelines publication because the Requirements and supporting Guidelines describe aspects of management that apply to most forest and woodland situations and that are common to the other elements of sustainable forest management (SFM).

Key to symbols









Guidelines



Cross-references

Cross-references may be made to the other elements of sustainable forest management, where the Guideline is common to more than one subject.



-  General Forestry Practice
-  Forests and Biodiversity
-  Forests and Climate Change
-  Forests and Historic Environment
-  Forests and Landscape
-  Forests and People
-  Forests and Soil
-  Forests and Water

The table below introduces factors important for general forestry practice. The Guidelines that follow provide more information on how to comply with the UKFS Requirements, grouped by the factor headings.

Factor	Importance for general forestry practice
Forest planning process	
Forest management plans	Forest management plans allow a manager to demonstrate that all relevant aspects of sustainable forest management have been considered. They provide a basis for monitoring and assessment.
Operational plans	Operational plans help to ensure safe and efficient working practices on a site and the protection of the forest environment.
Contingency plans	Contingency plans set out what happens in the event of accidents, unexpected or unplanned events so damage to the forest environment can be minimised.
Forest planning considerations	
Forest productivity	The UK is committed to maintaining or increasing its forest area, and to enhancing the environmental, economic and social values of forest resources.
Forest structure	Diverse forests provide a range of benefits and are more resilient to changing environmental conditions.
Silviculture	A range of silvicultural systems are available to meet management objectives and add to structural diversity.
Felling and restocking	Opportunities are presented at felling and restocking to restructure age classes and to redesign forests to meet UKFS Requirements.
Mammal damage	Wild mammals and domestic livestock can cause damage to forests and woodlands, particularly at the establishment stage. Some such as deer require co-operative action for effective control.
Pests and diseases	Forests and woodlands in the UK are experiencing unprecedented levels of threats from a range of pests and diseases; climate change is expected to exacerbate levels of damage.
Use of chemicals	Chemical pesticides and fertilisers can be an important management tool in some situations but they can cause damage to the environment if used inappropriately.
Fencing	Fencing can have major impacts on wildlife, landscape, archaeology and access.
Forest roads and quarries	Forest roads, quarries and associated works can be highly visible in the landscape and are subject to Environmental Impact Assessment.
Harvesting operations	Harvesting operations are resource intensive and can also have a significant environmental impact both on the forest and surroundings.

Forest planning process

Forest management plans

At its most simple, the details required for a forest or woodland grant or felling application can provide the basis for the forest management plan. This basic plan will be appropriate for the majority of low-key and small-scale proposals, and provides an approach that is proportionate to the risks of the operations involved.

For extensive or sensitive areas, a more comprehensive approach is required. Additional information will need to be collected to ensure that all the relevant issues have been addressed. The most significant proposals may come under the Environmental Impact Assessment (EIA) Regulations, and will require comprehensive analysis.

A thorough forest planning overview is helpful to both the regulatory authorities and landowners and managers; it has the advantage of allowing UKFS Requirements and Guidelines to be considered over a larger area and a longer, more appropriate, timescale. The forest management plan provides assurances of intent and therefore individual operations within it can be approved with a lighter touch.

Some UKFS Requirements and Guidelines are expressed as maximum or minimum proportions of the forest. In these cases the area in question is the forest management unit (FMU). The FMU is the area subject to a forest management plan or proposal. This area is selected by the owner and/or manager and will be determined by the nature of the forest, the proposed operations and management objectives. Extensive FMUs have the advantage of allowing a strategic approach to be taken in achieving UKFS Requirements, both in terms of the area covered and over time.

The process of producing a forest management plan can be organised into seven distinct stages (Table A3.1).

Table A3.1 The process of producing a forest management plan.

Stage	Objective	Activities and/or sources of information
Scoping	Development of management objectives	Owner's objectives, the potential of the site, UKFS Requirements and Guidelines, forestry strategies, policies and plans at country, regional and local level, forestry frameworks.
	Analysis of interests or 'stakeholder analysis'	Consideration of all potential interests, including those of specialist interest groups and the local community.
Survey	Collection of information	A comprehensive exercise to collect and map all the information about the site and its location, including any statutory constraints. Meetings held at this early stage with stakeholders and those with specialist knowledge will help identify all the factors involved and alert interested parties to the proposal.
Analysis	Assessment of survey information	The survey information is evaluated in the light of project objectives, allowing the potential of the site to be assessed.
Synthesis	Development of a design concept	The broad concept for the forest design is formulated from the information that has been collected and analysed, including the visual aspects.
	Development of a draft management plan	The design concept is refined and developed into a draft management plan. The draft forms the basis of consultation with interested parties. Several drafts may be required in an iterative process.
	Finalisation of the plan and submission for approval	The draft is amended, refined and firmed up into a final forest management plan.
Implementation	Development and implementation of work programmes	Operational plans are developed from the forest management plan and work programmes are implemented.
Monitoring	Evaluation of progress	Indicators of progress are checked at regular intervals. Data are collected and recorded to evaluate management.
Review	Periodic updates of the forest management plan	Work done on the plan is recorded, and at regular intervals the plan is updated to keep it current. Periodically (usually at five-year intervals) the plan is thoroughly reviewed and updated.



1 Produce a clear forest management plan to demonstrate that all relevant aspects of sustainable forest management have been considered and to provide a basis for implementation and monitoring. The plan should:

- state the objectives of management, and how sustainable forest management is to be achieved;
- provide a means to communicate forest proposals and engage interested parties;
- serve as an agreed statement of intent against which implementation can be checked and monitored.

Operational plans

Operational or site planning helps ensure safe and efficient working practice on site and the protection of the forest environment. The starting point is a thorough assessment that identifies important features to be protected and options as to how the work could be undertaken. From this a detailed operational plan can be developed which sets out the working arrangements for the site, protected areas and other site constraints. It is particularly important that the operational plan is communicated and understood by all those involved.




2 Produce a clear operational plan that is understood by all those working on the site. For major operations, the plan should address:

- potential hazards to workers;
- potential hazards to forest users – by making them aware of operations and putting diversions in place;
- machine access, refuelling and timber stacking;
- how to safeguard sensitive or easily damaged parts of the site;
- how to ensure only the intended trees and shrubs are felled;
- how the site will be left on completion, including the disposal of waste materials;
- how to modify operations in case of bad weather.

Contingency plans

Contingency plans cover what happens in the event of an unexpected or unplanned event. For site operations this may include accidents and dealing with spillages or other problems that could pose a serious risk to water supplies and aquatic ecosystems. The Environmental Liability Directive (2004/35/EC) seeks to achieve the prevention and remedying of environmental damage and reinforces the ‘polluter pays’ principle, making operators financially liable for damage. Contingency plans can also be used to address other threats to the forest, for example fire, extreme weather events such as gales, or outbreaks of pests and diseases.



3 Have appropriate contingency plans in place to deal with risks to the forest, including spillages, pest and disease outbreaks, extreme weather events and fire. 









Forest planning considerations

This section sets out the key forest management issues that should be considered when producing a forest management plan.

Forest productivity

The maintenance of the productive potential of forests includes both timber production, which serves the development of forest industries and economic well-being, and wider non-market benefits and values such as recreation, and other ecosystem services. The essential consideration for the landowner or manager is to ensure that the forest thrives and is not degraded. This includes protecting young trees to make sure they become

successfully established, and protecting the health of forests and woodlands, for example, by ensuring they have the necessary resilience to cope with emerging threats and changing conditions – in particular climate change. It also involves maintaining levels of fertility and site potential for future rotations.


-  **4** Retain or expand the forest area and consider compensatory planting where forest area is lost through land-use change.  **9**
-  **5** Ensure new woodland and replanting becomes established, and young trees are not overcome by competing vegetation.
-  **6** Plan for forest resilience using a variety of ages, species and stand structure; consider the risks to the forest from wind, fire, and pest and disease outbreaks.  **16**
-  **7** Ensure the removal of forest products from the site, including non-timber products, does not deplete site fertility or soil carbon over the long term and maintains the site potential.  **7**  **20**

Forest structure

Ensuring a forest has a varied structure in terms of age, species, origin or provenance and open space will provide a range of benefits. It will endow forests with the resilience necessary to cope with emerging threats and changing climatic conditions, and will provide for flexibility in management options, for example by allowing for modifications to forest practice (see the UKFS Guidelines on *Forests and Climate Change* and also *Forests and Biodiversity* for more information).

Structural diversity can be increased by incorporating open areas and through phased felling and restocking to ensure that, over time, a varied woodland develops. As part of this, some trees can be left as long-term forest cover to produce standing and fallen deadwood. For woods of less than 10 hectares, internal diversity is less important – in these situations diversity can be considered in the context of the landscape setting. There are also some woodlands that derive their particular landscape character or biodiversity value from a principal species and in these situations a case for divergence from the guidelines can be made.

Open space is a key element of diversity within woodland. It can be used to develop permanent internal edges, structural diversity, and flexibility for operational management. Wildlife habitat can be enhanced by developing non-woodland elements, such as streams, ponds, roads, utility wayleaves and rides. Open space is also important for the provision and development of access and recreation.

-  **8** Diversify forest composition so that no more than 75% of the forest management unit is allocated to a single species and a minimum of the following are incorporated:
 - 10% open space;
 - 10% of other species or ground managed for environmental objectives;
 - 5% native broadleaved trees or shrubs.

Note: (i) Where more than one species is suited to the site and matches the management objectives, opportunities must be taken to further diversify the above species composition: this is important in the context of climate change. (ii) In woodlands of less than 10 hectares and in native woods the above proportions may be relaxed providing the adjacent land uses provide landscape and habitat diversity. 🦋 11 ☁️ 23

- 🌿 9 Develop a long-term forest structure of linked permanent habitats, such as riparian woodland, open space and broadleaves. 🦋 19
- 🌿 10 Leave a proportion of standing and fallen deadwood: concentrate it in areas of high ecological value, where there is existing deadwood and where linkages can be provided between deadwood habitats – avoid uniform distribution across the forest management unit. 🦋 23 ☁️ 10
- 🌿 11 Retain and manage existing veteran trees and select and manage suitable individuals to eventually take their place. 🦋 24 🏰 16
- 🌿 12 Manage a minimum of 15% of the forest management unit with conservation and the enhancement of biodiversity as a major objective. 🦋 20

Silviculture

A range of silvicultural systems are available to provide flexibility in meeting management objectives and to add to the structural diversity of the forest. Silvicultural systems with a lower environmental impact than clearfelling are recommended in semi-natural woodland. In the context of climate change, varied silviculture will increase the resilience of forests and may limit the damage caused by extreme events such as gales or pest outbreaks.





- 🌿 13 Consider alternatives to clearfell systems, such as continuous cover forestry, where suitable sites and species combinations allow and management objectives are compatible. 🦋 18 ☁️ 17
- 🌿 14 Maintain a range of stand structures and silvicultural approaches across the forest as a whole, including veteran trees, open-crowned trees, open space and areas of natural regeneration. 🦋 17

Felling and restocking

Many forests, particularly those established in the 20th century, were planted or felled and replanted over a short timescale and have little diversity. Other older woods may have been neglected, leading to the development of a uniform structure. In both cases, felling and restocking presents the opportunity to restructure age classes and improve diversity. In even-aged woodlands, this may involve bringing forward felling in some areas and delaying felling and restocking in others. Following initial restructuring, further age class diversity can be introduced in subsequent rotations, especially where the nature of the forest site limited the initial scope.

Rotational felling also presents a major opportunity to reassess the forest through the forest planning process. Future felling coupes can be identified within a long-term forest structure

defined by open ground, watercourses and semi-natural habitats. The various elements of sustainable forest management, detailed in the UKFS Guidelines, can be addressed and changes made where necessary to bring the forest up to current standards. These may include aspects such as the redesign of buffer areas and drainage systems, extending habitats for biodiversity and addressing forest landscape design.




-  **15** In forests characterised by a lack of diversity due to extensive areas of even-aged trees, retain stands adjoining felled areas until the restocking of the first coupe has reached a minimum height of 2 m; for planning purposes this is likely to be between 5 and 15 years depending on establishment success and growth rates.
-  **16** In upland forests, identify future felling boundaries as part of the long-term forest structure; manage compartment edges to increase stability and make use of permanent features such as watercourses and open space.
-  **17** Take the opportunity provided by felling and restocking to redesign forests to meet UKFS Requirements and address issues such as buffer areas, drainage systems, biodiversity habitats and forest landscape design.
-  **18** In semi-natural woodland, limit felling to 10% of the area in any five-year period unless there are overriding biodiversity or social advantages.

Mammal damage

Forests and woodlands may be subject to damage or degradation due to grazing or browsing mammals, particularly when trees are at the establishment stage. The manager's role is to monitor damage and decide whether intervention is necessary.




In areas where deer pose a threat to the forest and wider environment, deer management plans – often incorporating culling – allow a strategic approach to be taken. Keeping records of both deer culled and levels of damage will help inform plans so they can be refined to give more effective levels of control. Participation and consultation with local deer management groups (where they exist) will help to achieve effective deer management on the appropriate landscape scale. In Scotland, Scottish Natural Heritage advises on the sustainable management of wild deer (formerly performed by the Deer Commission), while the Deer Initiative performs similar functions in England and Wales.

Responsibility for wild deer in Northern Ireland lies with the Northern Ireland Environment Agency of the Department of the Environment for Northern Ireland.

-  **19** Monitor forest damage, and intervene to protect vulnerable trees from browsing and grazing mammals, including voles, deer, rabbits, hares, grey squirrels and livestock.
-  **20** In areas where deer are a threat, develop deer management plans – ideally in co-operation with local deer management groups.  **43**

Pests and diseases

There has been a significant increase in the incidence of pest and disease outbreaks in forests and woodlands in recent years. Climate change is likely to exacerbate these threats in the future. It is vital that all those involved in forest management take a proactive role in monitoring damage, keeping abreast of emerging threats and deciding when intervention is necessary.

-  **21** Consider the susceptibility of forests and woodlands to pests and diseases; take specialist advice and develop strategies for protection.
-  **22** Be vigilant for pests and diseases in forests and woodlands, particularly in urban areas where the risks of new problems are high.  **33**

Use of chemicals




The use of artificial pesticides and fertilisers is generally a last resort in practising sustainable forestry, although they can have more of a role in energy crops, such as short rotation coppice. Pesticides and fertilisers are expensive, and only deployed in a reactive way to protect trees when a problem has been identified or is highly likely. Their use on special sites such as ancient woodland is particularly discouraged.

-  **23** Minimise the use of pesticides and fertilisers in accordance with Forestry Commission and Forest Service guidance.  **13**  **5**  **57**

Fencing

The alignment and design of forest fences can have major impacts on wildlife, access, landscape and archaeology. Fence lines themselves are not usually prominent but they can generate striking textural changes in the landscape through differences in grazing or land use.

A particular problem of fences in upland areas is that they can be invisible to birds such as black grouse. Techniques to mark fences to improve their visibility and to align them so that they avoid obvious flight paths will help minimise collisions. Fencing also needs to be considered in relation to public access: it is illegal to obstruct rights of way and in other areas access can be an important consideration in fence alignment. When fences are replaced or become redundant, removal is a better option than leaving them as they can be a nuisance to livestock, wildlife and people.






-  **24** Consider the impacts of fencing on biodiversity, landscape, archaeology and access, and minimise adverse effects.  **45**
-  **25** Consider removing old and redundant fencing rather than leaving it in place.

Forest roads and quarries

Forest roads, quarries and associated infrastructure works can be highly visible in the landscape and therefore come within the scope of the Environmental Impact Assessment

(EIA) Regulations. In areas with landscape designations, roads and quarries that do not form part of an approved afforestation scheme may be subject to planning controls. Considering important viewpoints, and allowing road alignments to respond to the landform – rather than taking the most direct route – can both ameliorate visual impacts and sometimes reduce the amount of cut-and-fill during construction. The construction of forest roads and the extraction of material accounts for a high proportion of the total energy expended in the forest life cycle, and so has a bearing on the sustainability of the timber grown (see the UKFS Guidelines on *Forests and Climate Change*).

Forest roads and access onto them can disrupt forest drainage systems and cause water and soil problems. It is important that road drainage is designed and functions independently from the main forest drainage network. Where minor public roads and bridges are weak, consideration can be given to how the forest road network can be designed or upgraded, to avoid using public roads for timber transport. In many areas, there are timber transport groups that involve local authorities and advise the forestry industry on preferred routes and the options for using rail or sea alternatives to road transport.
















-  **26** Minimise the adverse visual impacts of forest roads and quarries; blend road alignments with landform, and locate quarries, roads and bridges to respect landscape character, especially in designated landscapes.
-  **27** Design road surfaces, drainage and harvesting machine access points to avoid erosion and other adverse impacts on soils, watercourses and water quality.
-  **28** Plan forest operations, civil engineering and timber transport to minimise energy use; consider using sustainable biofuels.  **12**
-  **29** Consider how forest road networks can be exploited to minimise damage to public roads, and take advice from timber transport groups.

Harvesting operations

Harvesting and extraction operations are resource intensive and can have a significant environmental impact on both the forest and its surroundings. With careful operational planning it is possible to combine good silviculture and cost-efficiency with care for people and the environment. Soil compaction, leading to rutting and erosion, can be minimised by the planning and good management of forest operations, such as protecting extraction routes by using layers of fresh brash to spread the machine load. Machine choice and working method affect the ground pressure and the risk of damage. The potential of damage to soils and the water environment is usually greatest in wet weather and consideration needs to be given to how changes in weather will affect operations.

Burning of forest residues such as brash is generally discouraged and is not acceptable on ancient woodland sites. Other management options are less environmentally damaging, but if burning is the only practical alternative, a written application to the environment agencies will be required under the Waste Management Regulations (as amended). The maximum allowed is 10 tonnes in any 24-hour period. The environmental risks, safety and

potential nuisance of burning should all be taken into account as part of the application. Where felling might have an impact on road users, either from trees coming down or from vehicles emerging onto the highway, safety will need to be considered and liaison with the highway authority is advisable.

-  **30** Minimise compaction, rutting and erosion during forest operations by selecting the most appropriate working method for site conditions; monitor operations and modify, postpone or stop procedures if degradation starts to occur.  **9**  **36**
-  **31** Maintain adequate brush mats throughout extraction operations.  **11**
-  **32** On sites vulnerable to compaction and erosion, consider the weather and aim to carry out operations during dry periods; plan ahead for changes in the weather that could affect site conditions.  **10**  **37**
-  **33** Keep streams and buffer areas clear of brush as far as practicable; avoid felling trees into watercourses and remove them or any other accidental blockages that may occur.  **39**
-  **34** Install culverts or log bridges to avoid crossing and blocking drains; restore the site and drains as extraction progresses.
-  **35** Avoid burning brush and harvesting residues unless it can be demonstrated that it is a management necessity, all the impacts have been considered, and the necessary approvals obtained.  **11**  **25**
-  **36** Liaise with the highway authority when felling near public highways or when lorries emerging onto the highway might pose a threat to road users.

Glossary

- Acid deposition** The process by which acid pollutants, primarily sulphur and nitrogen compounds derived in part from the combustion of fossil fuels, deposit from the atmosphere to the ground. This can be in particulate form as aerosols or gases (dry deposition), or through indirect input in aqueous solution or suspension, as rain and snow (wet deposition) or cloud water (occult deposition).
- Acidification** A continuing loss of acid neutralising capacity manifested by increasing hydrogen ion concentrations and/or declining alkalinity; the term may be applied to a catchment, waters or soils.
- Agenda 21** A comprehensive United Nations plan of action to tackle the effects of human impacts on the environment agreed at the Earth Summit in 1992.
- Alkaline** The property of a solution to neutralise acids to the equivalence point of carbonate or bicarbonate.
- Ancient semi-natural woodland (ASNW)** Ancient woodland composed of mainly locally native trees and shrubs that derive from natural seedfall or coppice rather than from planting.
- Ancient woodland** Woodland which has been in continuous existence since before AD 1600 in England, Wales and Northern Ireland, and before AD 1750 in Scotland. The term ancient woodland site refers to the site of an ancient woodland irrespective of its current tree cover. Where the native tree cover has been felled and replaced by planting of tree species not native to the site it is referred to as a plantation on ancient woodland site (PAWS).
- Approvals (herbicide or pesticide)** Chemical products, for which usage and methods of application have been approved by the UK Chemicals Regulation Directorate.
- Arboriculture** The management of individual trees, but sometimes used to include the management of trees and woodlands in urban situations.
- Biodiversity** The variety of plant and animal life (species), including genetic variation within species.
- Biosecurity** A set of measures designed to prevent the spread of harmful organisms or diseases.
- Brash** The residue of branches, leaves and tops of trees, sometimes called 'lop and top', usually left on site following harvesting.
- Brown earth** A type of soil having a brown humus-rich surface layer.
- Brownfield (sites)** Land or sites that have been used in the past for industrial activity or development; sometimes abandoned, under used or contaminated by past activities. When work is required to restore them to useful purposes they are also known as derelict land.
- Buffer (area/zone)** An area of land which protects the watercourse from activities on the adjacent land, such as by intercepting polluted run-off. The buffer area will usually include the riparian zone and may extend into the adjacent land.
- Certification scheme** A voluntary scheme that establishes a forest management standard together with an auditing system to verify compliance. Forestry certification schemes are owned by international non-governmental organisations and exist to promote good forest practice. They offer product labels to demonstrate that wood or wood products emanate from well-managed forests.
- Clearfelling** Cutting down of an area of woodland (if it is within a larger area of woodland it is typically a felling greater than 0.25 ha). Sometimes a scatter or small clumps of trees may be left standing within the felled area.
- Compaction** The compression of soil leading to reduced pore space, usually due to the weight of heavy machinery. Compacted soils become less able to absorb and transmit rainfall, thus increasing run-off and erosion.
- Compensatory planting** Creating new woodland on previously unwooded land should an area of woodland be lost due to change in land use.
- Compliance** Acting in accordance with something, particularly in accordance with the law. In the context of this standard, the term 'compliance' refers to meeting the requirements of the UK Forestry Standard.
- Conservation agencies** The statutory nature conservation agencies: Natural England, Scottish Natural Heritage, the Countryside Council for Wales and the Northern Ireland Environmental Agency.
- Contingency plan** A plan of action to address potential threats to the forest such as spillages, pollution, pest attack or wind damage.
- Continuous cover forestry** A silvicultural system whereby the forest canopy is maintained at one or more levels without clearfelling.
- Coppice** An area of woodland in which the trees or shrubs are periodically cut back to ground level to stimulate growth and provide wood products. *see also* **Short rotation coppice (SRC)**
- Copse** A small wooded area historically used for small-wood production, often through coppicing.
- Coupe** An area of woodland that has been clearfelled or is planned for clearfelling.
- Critical load (of acidity)** The highest deposition of acidifying compounds that will not cause chemical changes leading to long-term harmful effects on the ecosystem structure and function.
- Cultivation** Any method of soil disturbance to aid the establishment of trees.
- Development** Change of land use authorised by the planning authorities, usually for building and urbanisation.
- Diffuse pollution** Pollution arising from land-use activities (urban and rural) that are dispersed across a catchment. These are distinct from 'point' sources of pollution associated with discharges of industrial wastes, municipal sewage, and deep mine or farm effluent.
- Ecosystem** The interaction of communities of plants and animals (including humans) with each other and the non-living environment. Ecosystems are considered to be 'in balance' when they remain stable over the long term (hundreds of years in the case of woodland).
- Ecosystem services** The benefits people obtain from

- ecosystems. These include provisioning services such as food and water; regulating services such as regulation of floods, drought, land degradation and disease; supporting services such as soil formation and nutrient cycling; and cultural services such as recreational, spiritual, religious and other non-material benefits.
- Environmental Impact Assessment (EIA)** The process and documentation associated with the statutory requirement under the EU Environmental Impact Assessment Directive 85/337/EEC as amended by 97/11/EC and 2003/35/EC. This introduced a Europe-wide procedure to ensure that environmental consequences of projects are evaluated and public opinion is taken into account before authorisation is given.
- Environmental Statement** A statement of environmental effects that is required where an Environmental Impact Assessment is called for.
- Erosion** The wearing away of the land surface by rain, wind, ice, or other natural or anthropogenic agents that abrade, detach and remove geologic parent material or soil from one point on the Earth's surface and deposit it elsewhere.
- Establishment (period)** The formative period which ends after young trees are of sufficient size so that, given adequate protection, they are likely to survive as woodland at the required stocking density.
- Eutrophication** *see* Nutrient enrichment
- Fertility** The availability and balance of nutrients required for plant growth.
- Forest** Land predominately covered in trees (defined as land under stands of trees with a canopy cover of at least 20%), whether in large tracts (generally called forests) or smaller areas known by a variety of terms (including woods, copses, spinneys or shelterbelts).
- Forest certification** *see* Certification scheme
- Forest Europe** Until 2010 known as MCPFE (Ministerial Conference on the Protection of Forests in Europe), Forest Europe is the pan-European policy process for the sustainable management of the continent's forests. Forest Europe develops common strategies for its 46 member countries and the European Union on how to protect and sustainably manage forests.
- Forest management plan (woodland management plan)** A plan which states the objectives of management together with details of forestry proposals over the next five years and outlines intentions over a minimum total period of 10 years. Forest plans allow managers to communicate proposals and demonstrate that relevant elements of sustainable forest management have been addressed, and can be used to authorise thinning, felling and other management operations.
- Forest management unit (FMU)** The area subject to a forest management plan or proposal. A convenient management area determined by the nature of the woodland, the management objectives and proposed operations. Extensive FMUs allow a strategic approach to be taken to meeting UKFS Requirements and Guidelines.
- Forest Service** An agency within the Department of Agriculture and Rural Development in Northern Ireland responsible for the regulation of forestry and the management of state forests in Northern Ireland.
- Forestry** The science and art of planting, managing and caring for forests.
- Forestry authorities** The Forestry Commission and Forest Service are the principal forestry authorities in the UK. Other bodies also have roles in regulating forestry in particular circumstances.
- Forestry Commission** The government department responsible for the regulation of forestry, implementing forestry policy and management of state forests in Great Britain. Forestry policy is devolved, with the exception of some reserved issues, such as international forestry, plant health and forestry standards, and a range of common issues addressed on a Great Britain basis. The abbreviations FCE, FCS and FCW refer to the respective parts of the Forestry Commission in England, Scotland and Wales.
- Forestry operations** Work or procedures carried out within a forest such as felling, extraction, cultivation and planting.
- Gley** A soil that is permanently or periodically waterlogged, lacking oxygen and characterised by its blue-grey colours, often mottled with orange-red.
- Greenhouse gases (GHGs)** Gases in the atmosphere, both natural and man-made, that absorb and emit thermal infrared radiation emitted by the Earth's surface, the atmosphere itself and clouds. The primary greenhouse gases in the Earth's atmosphere are water vapour (H₂O), carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄) and ozone (O₃). Forests exchange all of these GHGs with the atmosphere to a larger or smaller extent. There are also a number of man-made greenhouse gases. The Kyoto Protocol deals with six of these: CO₂, N₂O and CH₄ as well as sulphur hexafluoride (SF₆), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). Others are dealt with under the Montreal Protocol on Substances that Deplete the Ozone Layer.
- Groundwater** All water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil. This zone is commonly referred to as an aquifer, which is a subsurface layer or layers of rock or other geological strata of sufficient porosity and permeability to allow a significant flow of groundwater or the abstraction of significant quantities of groundwater.
- Infiltration** The entry of water into the soil.
- Ironpan** A soil with a hardened impervious layer, in which iron oxides are the chief cementing agents, that impairs drainage and plant growth.
- ISO 14001** An international standard for environmental management systems (EMS) developed by the International Organization for Standardization (ISO). It can be applied to any industry sector. ISO 14001 requires a company to undertake a review of its environmental impact, and, based on this, to develop a policy, objectives and targets and a programme to ensure they are implemented. ISO 14001 does not set specific performance targets, other than legal compliance, and therefore sector-specific performance

targets can be linked with the standard.

Landscape An area, as perceived by people, the character of which is the result of the action and interaction of natural and/or human factors (Article 1, European Landscape Convention Council of Europe, 2002).

Leaching The removal of soluble elements from one zone in soil to another via water movement in the profile.

Local authority Local government and planning authority.

MCPFE Ministerial Conference on the Protection of Forests in Europe. *see* **Forest Europe**

Mineralisation The production of inorganic ions such as nitrate in the soil by the oxidation of organic compounds.

Mounding The process of forming a small mound on which to plant a tree, thus increasing the aerobic zone of soil and maximising root extension. Hinge mounding is where an excavator scoops out and inverts a mound of soil with one edge of turf remaining intact.

Natural regeneration Plants growing on a site as a result of natural seed fall or suckering. The term is also used to describe the silvicultural practices used to encourage natural seeding and establishment.

Nitrate leaching The removal of nitrate in solution from the soil via water movement, with the potential to contaminate surface water and groundwater.

Notification The process of informing someone (about something). The forestry authorities have various arrangements for notifying interested parties of forestry proposals.

Nutrient enrichment (eutrophication) Excessive richness of nutrients in waters or soils which results in adverse effects on the diversity of the biological system, the quality of the water, and the uses to which the water may be put.

Operational plan The operational details of how planned work will be implemented at site level within the framework of a forest management plan. Also called a site plan.

Organic matter The organic fraction of the soil exclusive of undecayed plant and animal residues.

Peat A largely organic substrate formed of partially decomposed plant material. The Forestry Commission soil classification defines peat as soil having an predominantly organic (peat) layer of depth greater than 45 cm.

Pesticide Any substance, preparation or organism prepared or used, among other uses, to protect plants or wood or other plant products from harmful organisms, to regulate the growth of plants, to give protection against harmful creatures or to render such creatures harmless.

pH A logarithmic index for the hydrogen ion concentration in an aqueous solution, used as a measure of acidity. A pH below 7 is considered to be acidic and one above 7 alkaline.

Plantations Forests that have been planted or sown and are characterised by intensive silviculture treatment to meet a specific objective or limited range of objectives. Plantations lack most of the characteristics of natural forests.

Podzol An infertile acidic soil having an ash-like subsurface layer (from which minerals have been leached) and a lower dark stratum, where organic carbon has accumulated, occurring

typically under heathland and some temperate coniferous woodland.

Productivity (of woodland) The capacity to produce forest goods and ecosystem services.

Public Register Public listing by the Forestry Commission of grant schemes, felling proposals and Environmental Impact Assessments to allow public comment.

Regeneration The regrowth of a forest through sowing, planting or natural regeneration, or regrowth following coppicing.

Restocking Replacing felled areas by sowing seed, planting, or allowing or facilitating natural regeneration.

Riparian Relating to or situated adjacent to a watercourse or water body.

River Basin Management Plan A detailed document describing the characteristics of the basin, the environmental objectives that need to be achieved and the pollution control measures required to achieve these objectives through a specified programme of work.

Rotation The period required to establish and grow trees to a specified size, product, or condition of maturity. The period varies widely according to species and end use, but for conifers in the UK this is usually about 35 years and for broadleaves at least 60 years.

Rutting (vehicle) Making deep tracks in the ground by the repeated passage of the wheels of vehicles.

Semi-natural woodland Woodland composed of mainly locally native trees and shrubs that derive from natural seedfall or coppice rather than from planting. However, the definition varies according to the local circumstances in England, Scotland, Wales and Northern Ireland.

Short rotation coppice (SRC) Trees (usually willow or poplar) typically grown as an energy crop and harvested at intervals of about three years.

Short rotation forestry (SRF) The practice of growing single or multi-stemmed trees of fast-growing species on a reduced rotation length primarily for the production of biomass.

Silviculture The growing and cultivation of trees, including techniques of tending and regenerating woodlands, and harvesting their physical products.

Site plan *see* **Operational plan**

Soil carbon Carbon stored within the soil; primarily associated with the organic component of soil, it can be classified into three main fractions: rapidly cycled carbon stored in microbial biomass and easily decomposed plant residues; slowly cycled stable carbon held through chemical and physical processes for around 100 years; and an inert or passive store which takes more than a thousand years to recycle.

Soil productivity The capacity of a soil to produce a certain yield of crops or other plants with a specified system of management.

Soil structure The combination or arrangement of primary soil particles into secondary units or peds. The secondary units are characterised on the basis of size, shape, and grade (degree of distinctness).

Spinney A small area of trees and bushes traditionally

surrounded by a hedge.

Statutory body(ies) The authorities and bodies responsible for nature conservation (Natural England, Scottish Natural Heritage, Countryside Council for Wales and the Northern Ireland Environment Agency); environmental protection (Environment Agency (England and Wales), Scottish Environment Protection Agency and Northern Ireland Environment Agency); and the historic environment (English Heritage, Northern Ireland Environment Agency, Historic Scotland and Cadw).

Stump removal Harvesting of the basal part of the tree, including most of its woody roots, that remains after felling of the stem/log.

Sustainable forest management The stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity and vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions at local, national and global levels, and that does not cause damage to other ecosystems. (MCPFE 1993)

Water body The basic water management unit defined under the Water Framework Directive for which environmental objectives are set. Water bodies can be parts of rivers, lakes and estuaries, stretches of coastal water or distinct volumes of groundwater.

Watercourse Any natural or man-made channel through which water flows continuously or intermittently.

Whole-tree harvesting The removal from a felled site of every part of the above-ground tree, except the stump.

Windthrow (or windblow) Uprooting of trees by the wind.

Notes



www.forestry.gov.uk/ukfs/biodiversity



www.forestry.gov.uk/ukfs/climatechange



www.forestry.gov.uk/ukfs/historicenvironment



www.forestry.gov.uk/ukfs/landscape



www.forestry.gov.uk/ukfs/people



www.forestry.gov.uk/ukfs/soil



www.forestry.gov.uk/ukfs/water

Practising sustainable forestry means managing our forests in a way that meets our needs at present but that does not compromise the ability of future generations to meet their needs. They will rightly expect that their forests and woodlands offer at least the same benefits and opportunities as we enjoy today. To sustain these expectations, the UK governments have set out the UK Forestry Standard and its supporting Guidelines. At the heart of this approach is the importance of balancing the environmental, economic and social benefits of forests and the recognition that our forests serve a wide range of objectives. The Guidelines publications define sustainable forest management in the UK under a series of subject areas. The UK Forestry Standard requirements have been set out in each and guidance given on how to achieve them.



www.forestry.gov.uk/ukfs/soil



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