13 Tree felling and woodland clearance

Context

13.1 The nature of British, but particularly English, woodland has been shaped by centuries of clearance and management of what woodland did survive.[1,2] Usually management contributes to maintaining and enhancing the environmental values of a wood, but sometimes there is the potential for conflict. Our woodland has for the most part been managed through different felling regimes in the past; the environmental impacts of current felling operations tend to be site-specific, depending on factors such as topography, scale, shape and location of felled areas, the extent of soil and vegetation disturbance, and the restocking methods and species used.

13.2 There are about 1,127,000 ha of woodland in England,[3] much of which may contribute to landscape, historic, biological and social values, as well as to wood production. Non-timber values tend to be highest for ancient and broadleaved woodland.[4]

13.3 Within the UK, 5.1% of the total forest area is designated SSSI; this includes 23% of the total ancient and semi-natural woodland resource.[5] As of June 2009, a total of 6,554 ha of forest and woodland SSSI (approximately 11%) are in unfavourable condition due to inappropriate management.[6] Lack of management has been identified on a number of these as being the contributory factor.

13.4 Current policies and objectives for forestry in England are set out in the Government's strategy for England's Trees, Woods and Forests.[7]

Current practice

13.5 Currently, only about 25% of the annual wood increment from native woodland (approximately 60% from conifer forests) is harvested.[8] Some increased felling could have potential benefits in terms of increased open space in the woods, although it would not be desirable for the whole of the annual increment to be cut because of the environmental value of both fallen and standing dead wood.

13.6 Felling contributes to the value of woodland, directly, through providing returns from the wood harvested, and indirectly through affecting the structure of the woodland; this in turn may influence game shooting, landscape, access and biodiversity.

13.7 In most instances where there is felling within a woodland, there is a presumption that the area will be restocked (through planting or natural regeneration). The Forestry Act (1967)[9] includes a presumption against deforestation, and the UK is party to various international conventions designed to reduce deforestation and promote expansion of forest cover (United Nations Framework Convention on Climate Change, Kyoto).[10] An exception is where there is clearing of trees to restore open habitats. A new policy framework for this is in development.[11]

13.8 Felling systems have been classified by foresters in various ways,[12] but here the following groupings are used:

- 'Traditional management' covering coppicing and pollarding.
- 'Commercial forestry', as widely practised now, is based on clear-fells (>0.5 ha, but usually several or many hectares) or, less often, group-fells (0.1-0.5 ha).[13,14,15]
- 'Continuous cover', a term used for systems where the gaps created are about the size of one or two individual trees (<0.25 ha) although they may, in shelterwood systems, be widespread across a stand.
- Felling of individual trees outside woods, usually as an incidental part of other activities, for example hedge management, part of planned development or for safety reasons, where there is a perceived serious risk from falling branches or main trunks.

Industry trends

13.9 Prior to the mid-nineteenth century, the timber demand was mainly for small broadleaved poles;[16] now our main needs are for coniferous timber and wood products, and approximately 85% of what we use is imported.[17] Mature straight single stems that can then be cut to size are valued more than a large number of small stems; hence the shift from traditional coppice regimes to the various high forest systems.

13.10 A potential major new market for small/poor quality broadleaved wood may be wood-fuel. The Government Wood-fuel Strategy[18] has the target of harvesting 2 million tonnes by 2020, a renewable source of energy sufficient to meet the needs of 270,000 homes, or the equivalent of a reduction in CO_2 emissions from fossil fuels of 400,000 tonnes carbon per annum.

13.11 Coppicing usually involves small patch cutting (usually <3 ha), of relatively young growth; hence short rotations (<30 yrs), with restocking by stump regrowth.[19] A similar system, but involving harvesting between eight and 20 years is used in short rotation forestry, which is designed for energy generation from biomass. Unlike short rotation coppice, only the stem wood is extracted for use; the bark and side shoots are left in situ.[20] Short rotation coppicing of willow and poplar is considered in the chapter on 'Energy crops - biomass'.

13.12 Felling with no restocking, primarily for biodiversity purposes, has taken place over about 4300 ha on the Forest Enterprise (FE) estate.[21] In addition, about 3900 ha has been felled without a restocking condition outside FE land between 1997 and 2005. Most of these applications were for small areas, but many of the larger examples were on Sites of Special Scientific Interest (SSSI) and hence also likely to be restoration projects.[22] There is also an ongoing but unknown amount of (generally) small-scale clearance for development.

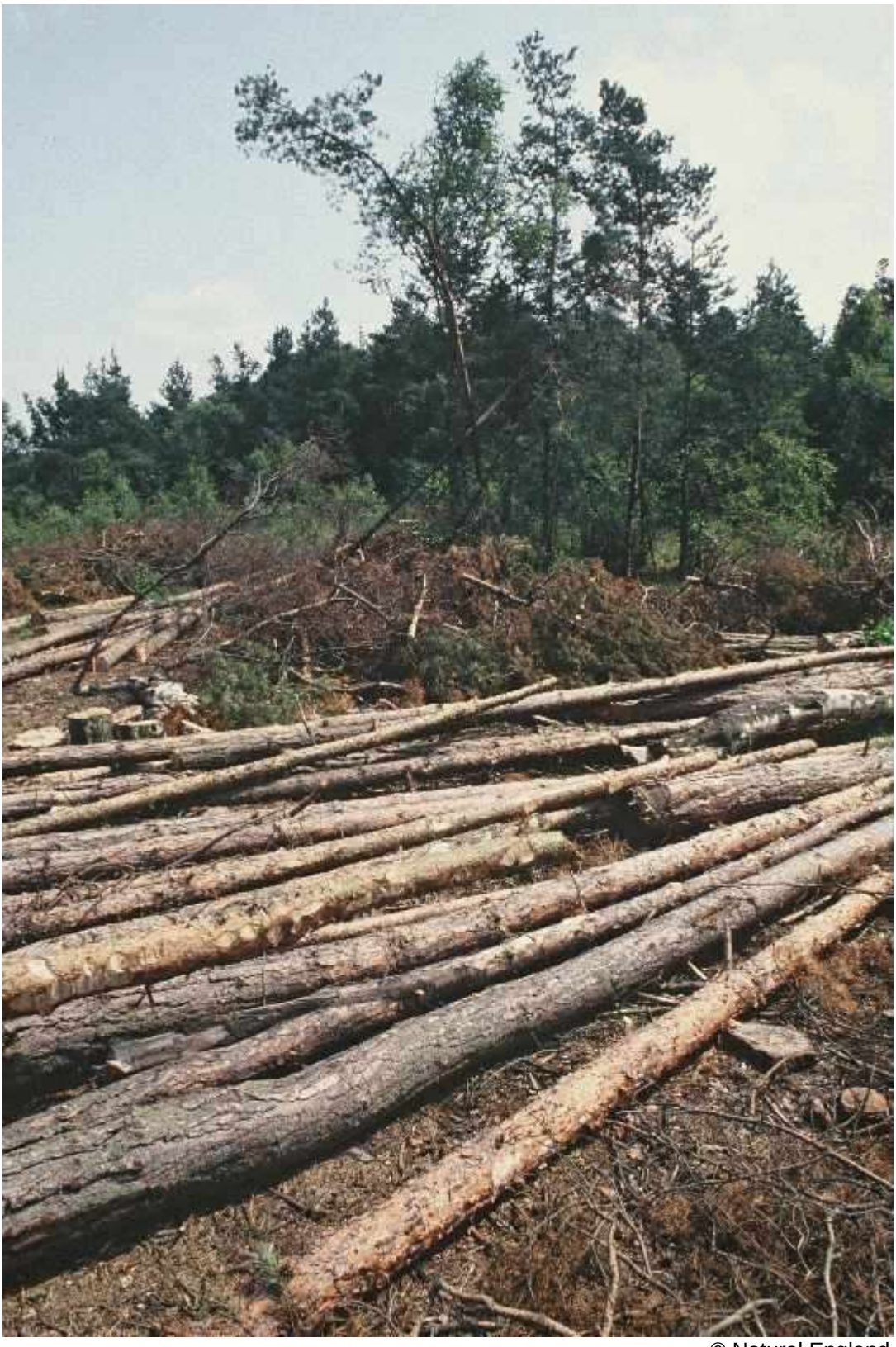

Plate 9 Felled pines for habitat enhancement

13.13 For current incentives, advice and regulation for woodland and forest managers, see Annex I to this chapter.

Key impacts

13.14 There are numerous possible variations and intermediate forms of felling system. Despite claims sometimes made that one or other system is 'close to natural', none of these systems necessarily produces the structure and composition of woodland that would exist under natural woodland dynamics.[23]

13.15 Many habitats have evolved with the management systems that have been used at their location.[24] The impact of felling (including individual tree management and coppicing) on the woodland appearance, historic, and nature conservation values depends on the size of the individual coupes (areas cut/to be cut), how they are distributed in space and time, when the cutting takes place, what is done with any cut material (including extraction methods) and how the cut area is restocked (if at all).[25] The significance of the impact also depends on the history and composition of the stand. What is appropriate in one site may not be in another.

13.16 Felling may be driven by conservation objectives; the most appropriate system to adopt will then depend on the woodland structure that is sought. In Thetford, clear-fells provide large areas of open ground that are used by wood-larks and nightjars;[26] in many ancient woods there are species associated with open space and dense young growth which is well-provided by coppice;[27,28] in other sites maintaining closed humid conditions (such as can be achieved with continuous cover) may be best for dead wood associates or ground living bryophytes. Species that depend on dead wood would profit more from a management system which encourages standing deadwood to be left in situ.

13.17 There are areas where woods and forests may be cleared to restore open habitats such as heathland or grassland, as part of the Biodiversity Action Plan (BAP) process. Under current forestry policies (including commitments under international conventions), there is a general presumption against such clearance unless there are other strong benefits.

13.18 Between 1997 and early 2005, there were 44 applications to restore large areas (>20 ha) of open ground by tree removal. Of those, 43 were driven by biodiversity objectives (40 of which were on SSSIs), and only one was for landscape considerations. There may also be small-scale clearance for development purposes.

13.19 The greenhouse gas budget of mature woodlands is complex and much can depend on the soils. Mature trees can compress peaty soils and contribute to a lower water table. Removal, for example, of conifers on peat soils can allow the water table to rise, restoring some of the peat function and eventually carbon sequestration in the peat. This may in part be offset by the increased production of methane due to increased waterlogging.[29]

13.20 Poorly managed felling can result in movement of soils by erosion. Release of nutrients depends on the rate of breakdown of the litter layer, whether harvest residue (brash) is removed, and the vegetative growth that establishes after timber extraction.[30,31]

13.21 For further factual background to this section, see Annex II to this chapter.

Summary of impacts

Biodiversity

13.22 Clearance of woodland may be encouraged for biodiversity purposes where the potential for creating a high-value non-woodland habitat outweighs the benefits of the current/future woodland habitat.

13.23 Tree removal can affect some microclimates, for example shading over streams.

13.24 Many woodland habitats and species benefit from the variety of structure that is created through the felling and restocking process in managed woodland.

Resource protection

13.25 Increased pressure to take account of sustainability issues, including use of wood as a fuel, is likely to lead to more felling in future.

13.26 Felling trees is not *per se* an important contributor to carbon emissions. Following felling there may be some increased loss of carbon from more rapid litter breakdown, but the carbon taken up by the felled trees remains within the timber until that is broken down.

13.27 Removal of trees from peat soils can allow the water table to rise, slowing peat oxidation and contributing to reduction in rates of soil carbon loss.

13.28 The pattern and scale of felling, and the extraction process, are key factors in the associated soil erosion and compaction risks.

Greenhouse gases

13.29 Mature trees hold large quantities of carbon but sequester comparatively little.

13.30 Timber extraction may only represent a comparatively small return of carbon to the atmosphere: wood does not release CO_2 until it decomposes or is burnt. The oxidation of leaf litter and surface soil biomass in felled areas will add to net emissions in the short term. Where regrowth or restocking does not take place, there is a potential net loss of 50 t C/ha.

Landscape

13.31 Tree felling or clearance can be damaging to landscape but, equally, the removal of ill-sited trees or unsuitable tree species may contribute to an overall enhancement.

Annex I Current incentives, advice and regulation

Regulation

- *Forestry Commission guidelines*: The Forestry Commission has produced a range of advice covering potential impacts to habitats, soil, water, historic environment and landscape arising from tree and woodland management.
- *Woodland felling*: Most felling within woodland needs a licence from the Forestry Commission, either directly or else through being covered as part of an approved management plan.[32] Local planning authorities are consulted on licence applications to the Forestry Commission via a public register of proposals.[33]
- *Environmental Impact Assessment (EIA)*: If the land is to be cleared, for example to restore heathland, the felling is likely to require EIA determination.[34]
- *Tree Preservation Orders(TPOs)*: The felling of individual trees does not normally require a licence, but individual trees/less often woods may be subject to TPOs that further limit management activity without prior consent.[35]
- *Development control*: Retention and management of trees within development sites may be required as conditions of planning consent, and the Forestry Commission are a non-statutory consultee on planning applications that affect ancient woodland. Local Authorities are expected to take account of the value of ancient woodland and veteran or aged trees for biodiversity in considering development proposals under PPS9.[36]
- *Wildlife and Countryside Act (as amended)*[37] and *Countryside and Rights of Way Act*[38]: Felling within SSSIs (including Special Areas of Conservation (SAC) and Special Protection Areas (SPA)) will normally require agreement (assent/consent) from Natural England.
- *Historic Monuments*: Felling affecting scheduled ancient monuments would be subject to consultation with English Heritage.
- *Biodiversity Action Plan (BAP)*: Most broadleaved woodland falls within the categories listed as priority habitat under the BAP. It therefore falls within the biodiversity duty placed on public bodies under the Natural Environment and Rural Communities Act.[39]

Incentive

- *Grant Schemes*: Support for woodland management under various grant schemes may be conditional on limitations on felling procedures. Work is expected to conform as a minimum to the Forestry Commission's UK Forestry Standard[40] and associated guidelines for Biodiversity, Soils, Water, Historic Environment and Landscape (currently under revision).[41]
- *Voluntary Certification Schemes*: Other conditions may apply if the woods are covered by the UK Woodland Assurance Standard - a voluntary certification scheme.[42]

Annex II Impacts of tree felling on environmental sustainability

Table 15 Impacts of tree felling on environmental sustainability

Habitat quality and diversity	Depending on the size of individual coupes and their spatial and temporal distribution, so different groups of species will be favoured or disadvantaged by different felling systems: • Habitats and species of ancient and broadleaved woodland tend to be favoured by traditional management (such as coppicing) or systems that provide analogous structures.[43] • Where remnants of the former open habitats survive or are to be restored from plantation, large-scale fellings may be more successful in maintaining/encouraging these than small-scale felling because they increase the size of the open habitat patches and reduce the potential for recolonisation.[44] • Continuous cover systems, with their small-scale fellings, are unlikely to provide suitable habitat for the open space specialists, but will favour closed canopy species.[45] • Minimum intervention stands in which no felling occurs will benefit natural processes and the accumulation of dead wood.[46] • Increased management could be a risk to species that depend on shady conditions, tall canopy trees and dead wood, which have tended to increase in the last 50 years.[47] [48] • Felling of individual trees tends to be most significant outside woodland because the individual trees themselves, particularly veteran trees, are critical to the interest, for example in orchards, hedges and parkland.[49]
Species abundance and diversity	Different types of felling favour different species. In addition, some species may be favoured by small amounts of disturbance,[50] although major disturbance of the woodland floor tends always to be damaging: • For species requiring open conditions (such as some woodland butterflies), the aim should be to concentrate coupes such that there is easy movement between them[51]; for species which avoid coupes (such as dormouse), felling should be small-scale and dispersed.[52] • Species that depend on decaying wood and old tree habitats will also be increasingly disadvantaged as the degree of wood removal increases. Specialist dead wood species tend to remain limited to the sites where they have occurred for centuries.[53]

Table continued...

Water level control	• The extent, composition and location of woodland cover affects water yield from a catchment compared with other types of vegetation cover.[54] • In the lowlands, trees, particularly conifers and energy crops, often reduce the water table through increased transpiration/interception losses compared with shorter growing crops.[55] • In broadleaved woods, felling may lead to temporary rises in the water table because of reduced transpiration.[56,57] • In the uplands, tree cover may encourage greater infiltration compared with former sheepwalk,[58] and slow the rate of run-off in some circumstances. Felling therefore can lead to increased or faster run-off. • Appropriately sited woodland may help to alleviate downstream flooding by slowing the rate of water movement.[59]
Sediment loads in water	• Badly organised felling and extraction can lead to increased soil erosion and sediment loads in streams, particularly on slopes; this should be minimised by adherence to Forestry Commission guidelines. Buffer strips may help to trap eroded soils and surface flow.[60,61]
Nutrient loads in water	• Water chemistry may be changed in the short term as a consequence of changes in water flow patterns. • Reduced scavenging of nutrients and pollutants from the atmosphere following felling may entail increased loads reaching water courses.[62,63]
Other pollutants	• Risks from spillage of fuel/lubricants for machinery should be minimised through following best practice. • Removal of tree cover will affect water temperatures and hence conditions for fish.[64,65]

Table continued...

Greenhouse gases	• Reduced sequestration in the short term through harvesting of mature stands should be offset by future growth if the land is restocked.[66] • Mature stands store large amounts of CO_2, and net sequestration is significant.[6768] Younger, more vigorously growing stock sequester more per unit area.[69] • Where trees are felled and the area not restocked, the net effect on carbon stocks depends on the nature of the replacement vegetation and the soils, but will typically represent a loss of about 50 t C/ha.[70] • Cut material remains as stored carbon in the timber products; these may off-set CO_2 emissions from fossil fuels, where the wood is used as fuel, but does contribute to increased CO_2 emission where felled material is burnt on site (in the short term) or left to decay (longer term). Burning material on site may also result in significant emissions of methane and nitrous oxide[71] - powerful greenhouse gases in their own right. • There may be an increase in carbon released to the atmosphere from increased oxidation of the litter layer, or organic matter in underlying soils from increased soil surface temperatures.[72] • Removing (conifer) woodland from peatlands/highly organic soils will raise water tables and reduce rates of soil carbon loss.[73]Methane and nitous oxide emission will increase at the same time.[74] The greenhouse gas balance of the activity is complex and will vary from site to site.
Air quality - chemical pollutants	• There will be reduced scavenging of nutrients and pollutants from the atmosphere immediately following felling.[75]
Air quality - particulates	• There will be reduced scavenging of nutrients and pollutants from the atmosphere immediately following felling.[76]
Soil stability (erosion)	• Some ground disturbance is inevitable during tree felling and the subsequent extraction; the extent of disturbance depends on the scale of the felling, how it is organised and the extraction methods used. This can be minimised by adherence to Forests and Soil Conservation guidelines.[77]
Soil structure	• Reductions in organic matter in litter layers through increased decomposition in felled areas.[78] • Compaction to the soil from use of heavy machinery, particularly along roadsides or log stacking areas.[79] • Trash left from short rotation forestry has been shown to improve some soils, through added biomass and increased soil biological activity.[80]

Table continued...

Landscape character	• Felling patterns can reinforce or, conversely, damage local landscape character.[81] The most appropriate scale of felling depends on the scale and nature of the landscape and whether this is being considered from outside or inside the wood/forest. Thus, small-scale fellings may work well from the point of view of a walker within the wood but, in a distant view, add nothing to the visual diversity of the scene. Large-scale fellings may work well in bold large-scale landscape panoramas, but seem out of place to the walker going through them. • The rate of change is also critical to the landscape impact of felling patterns; the same total area felled over several years may have a different impact to where the felling is done all at the same time. • Loss of individual trees in open landscapes can also have significant effects on landscapes, cf. the change in character of much of the lowlands following the loss of hedgerow trees over the last 40 yrs.
Historic features	• Ancient trees, and specimen trees in historic parkland, may have historic and landscape value in their own right..[82] • Felling can be beneficial in removing trees that may be causing (or will cause in future) damage to or obscuring other historic features above or below ground.[83] Equally, ill-planned felling and extraction may damage such features.

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