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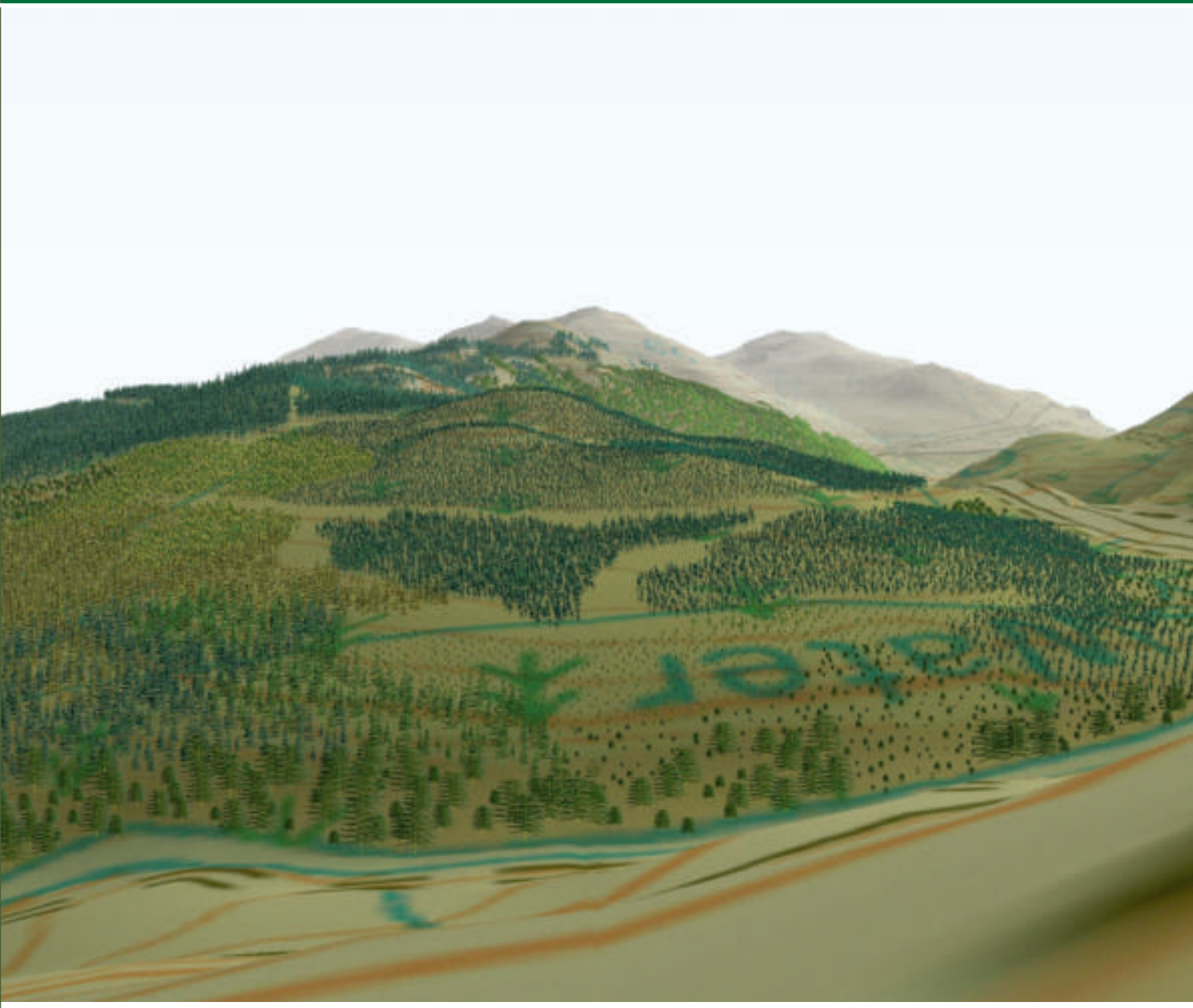

Practice Guide

Design techniques for forest management planning

FOREST SERVICE

Forestry Commission

Practice Guide

Design techniques for forest management planning

Forestry Commission: Edinburgh

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Contents

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Introduction

The British Isles have a great diversity of landscapes that are the result of both natural processes and the long history of human land use. This diversity is reflected in the rich variety of forests and woodlands found across Britain today. Forests and woodlands are important, and often dominant, visual elements in the landscape, which change over time. They have great potential to enhance and enrich the environment and make a significant contribution to landscape quality. They also provide many other environmental, economic and social benefits, and sustainable forest management ensures that the production of these benefits is maintained over the long term.

The UK governments' approach to the sustainable management of forests and woodlands is expressed in the UK Forestry Standard (UKFS) and its supporting series of Guidelines. The UKFS Guidelines on *Forests and landscape* sets out the principles that should be followed to ensure the design of both new and existing forests and woodlands is appropriate to the landscape context and meets the requirements of the UKFS. Although the landscape and visual aspects of the forest design represent just one of many site and woodland management issues to consider, in its broadest sense landscape provides the setting for the planning process.

The requirements for sustainable forest management and the long-term nature of forestry has led to the development of formal forest management plans. These aim to define and communicate forest management proposals and describe the consequences of management activities over time. The planning process, which involves all aspects of forestry, starts with the owner's or manager's objectives and the opportunities and constraints offered by a site. It involves assembling and integrating a wide range of information about the site and its potential. A number of established design techniques are available to assist with this planning process.

Aim and scope

This Practice Guide provides a step-by-step guide to the design techniques used in the forest management planning process. The guidance applies to the creation of new forests and woodlands, whether by planting or natural regeneration, and the management of existing forests and woodlands. Although some aspects of planning are needed for small woods managed as single units or compartments, generally the guidance set out here focuses on larger forest areas, generally of plantation origin (Figure 1), where there is usually a more complex range of issues to be considered, or a longer time period for management activity to be programmed.

Figure 1 The view across Glen Garry in Scotland – this is an extensive forest of plantation origin that is dominant in the landscape.

This may include, for example, felling and restocking over more than one phase, using more than one felling coupe or a range of silvicultural systems.

This Practice Guide applies to forests and woodlands on the public and private estate across England, Scotland, Wales and Northern Ireland. Although forestry is a devolved issue with different strategies and support mechanisms within each country, the aim of this guidance is to present a process which is flexible enough to be applied under a range of different policy as well as environmental and social conditions. So, although the documentation and presentation of a forest management plan may require specific aspects to be considered in response to, for example, an individual forestry strategy or woodland grant scheme, the process to be followed is essentially the same in each case.

The guidance is aimed at forest and woodland owners and managers, forestry practitioners and, especially, all those involved in forest planning and the preparation of forest management plans. An appreciation and understanding of recommended design techniques for forest management planning will be able to help and guide owners, their managers and agents as to the level of sophistication required for a particular forest or woodland. The Guide will also help those evaluating and approving plans and proposals, such as staff involved in grants and licences, regulatory staff, local authorities, and other agencies with a statutory role in the consultation process.

Other guidance on specific aspects of sustainable forest management to support the UKFS and the forest management planning process can be found in the series of Forestry Commission Practice Guides and Practice Notes. See Further reading and useful sources of information and www.forestry.gov.uk/publications for more details.

Forest landscape design

The professional practice of forest landscape design requires an understanding of landscape character and the creative application of visual design principles. For forestry, these principles are set out in the UKFS Guidelines on *Forests and landscape*. Detailed design guidance is also available in a number of key texts (see Further reading and useful sources of information on page 49).

This Practice Guide provides good practice guidance on the design techniques used in *forest management planning*. However, as this also incorporates some specific aspects of the design process (namely the stages of survey, analysis and synthesis) necessary for achieving good visual design, it is complementary to the *forest landscape design* process.

Training and professional assistance in forest landscape design may be available from the Forestry Commission.

For more information, visit: **forestry.gov.uk/ukfs/landscape**

Forest planning in the UK

Forest planning takes place at four main levels in the UK. 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 are addressed:

- Forest management planning applies to a convenient management unit, called the forest management unit. These plans will vary with the scale of the forest and the size and nature of the holding.
- 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 such as forest fires, catastrophic wind damage and accidental spillages occur – usually called the contingency plan.

This Guide focuses on the forest or woodland level, where forest management planning receives direction from the strategic plan and provides the elements to feed into the operational plan.

Forest management planning

The forest management plan is the reference document for the monitoring and assessment of forest holdings and forest practice. It should state the objectives of management and how sustainable forest management is to be achieved. It should also provide a means to communicate forest proposals and engage interested parties. The plan should be proportionate to the scale, sensitivity and complexity of the forest management unit – forest management plans may apply to a discrete forest or woodland, an estate comprising several woodlands, or to a distinct part of a larger forest (see Box 1 overleaf).

At their 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, and 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.

In visually sensitive areas a Landscape and Visual Impact Assessment (LVIA) may be called for as part of the EIA process. Of particular relevance are regional or local authority county/district level Landscape Character Assessments (LCAs) and Historic Land-use/Landscape Assessments (HLAs), which are available for the whole of the UK. Also relevant are the broad-scale international and national designations, such as National Parks, National Scenic Areas and Areas of Outstanding Natural Beauty, and local level designations such as Special Landscape Areas in Scotland and Local Landscape Designations in England. These help to provide a good idea of the scale and magnitude of sensitivities encountered when planning. They also provide valuable information which can directly inform the development of the forest management plan.

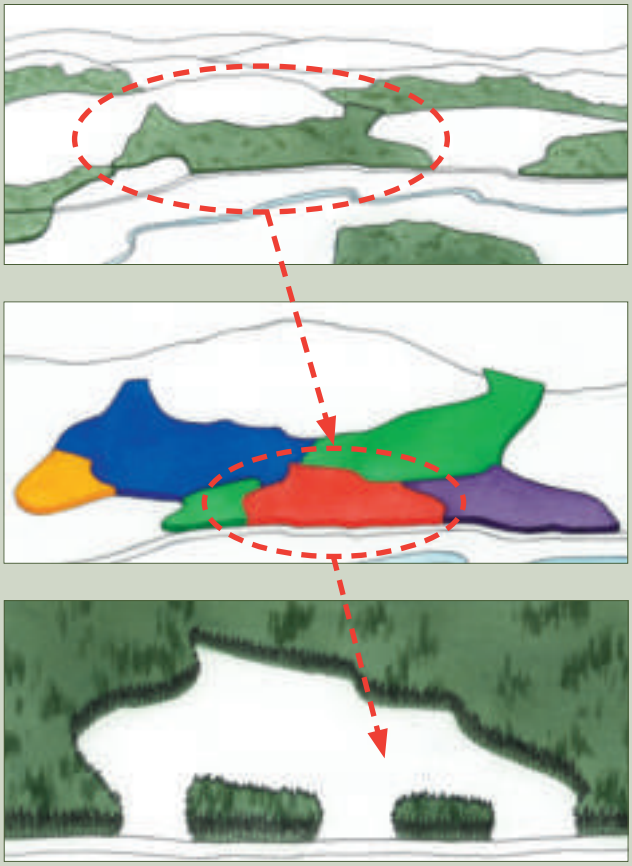
A thorough forest planning overview is helpful to both the regulatory authorities and landowners and managers; it has the advantage of allowing UKFS Requirements and Guidelines to be considered over a larger area and a longer, more appropriate, timescale. The forest

management plan provides assurances of intent and therefore the potential for individual operations within it to be approved with a lighter touch.

The UKFS General Forestry Practice Requirements for forest management plans are:

- 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.
- 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.
- 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.
- 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.
- Consultation on forest management plans and proposals should be carried out according to forestry authority procedures and, where required, the EIA Regulations.
- Forests should be designed to achieve a diverse structure of habitat, and species and ages of trees, appropriate to the scale and context.
- Forests characterised by a lack of diversity due to extensive areas of even-aged trees should be progressively restructured to achieve a range of age classes.
- Management of the forest should conform to the plan, and the plan should be updated to ensure it is current and relevant.
- New forests and woodlands should be located and designed to maintain or enhance the visual, cultural and ecological value and character of the landscape.

Box 1 The relationship between strategic plans, forest management plans and operational plans



A forest management plan for an individual forest or woodland should always be considered in its wider context. **Strategic plans** can provide an understanding of the broader context within which a forest management plan is prepared. The precise balance of objectives for sustainable forest management – for example timber production, biodiversity and recreation provision – will vary from place to place.

Forest management plans occupy an important position, translating strategic planning and management objectives into detailed site operations via the forest level assessment, analysis and design. The forest management plan brings together silvicultural prescriptions and environmental, economic and social factors into a comprehensive plan that aims to deliver long-term benefits through sustainable forest management.

Operational plans implement the forest management plan through a combination of thinning, felling and restocking plans at the compartment, coupe or stand level, felling licences, timber sales and new planting plans. Besides forestry operations, they also inform the management of open ground and the development of special habitats or recreational areas. They are also used as a basis for contract specification, to ensure that contractors meet all their work obligations.

Documenting forest management plans

Forest management plans should be clear, concise and have a logical structure to show the stages of the plan development. Excessive text should be avoided; maps, sketches and tables should be used wherever possible. The plan should be laid out so that someone unfamiliar with the area can appreciate the key messages of the plan and what it is trying to achieve.

Documentation list

The amount and relative sophistication of the documentation needed for a forest management plan will depend on a number of factors, including the:

- size/extent of the forest management unit (the smaller the area the simpler the plan);
- sensitivity of the forest or woodland (the greater the sensitivity the more complex the plan);
- visibility – both external and internal views (greater visibility means more design work);
- time period of the plan (the longer the period the more comprehensive the plan);
- number and complexity of factors (increasing complexity leads to a larger plan).

When following the forest planning process (see the next section), the following components should be prepared, which together form the actual management plan document:

- Ownership and property details.

- Location map showing viewpoints, ownership or plan boundary, neighbouring features, national and local environmental designations, major settlements and transport routes.

- A description of the plan area and its wider landscape context and setting, including:
  - regional landscape character assessment;
  - landscape or other designations and their implications;
  - historic land use/landscape assessment;
  - nature conservation/biodiversity designations and their implications.

- Statement of management objectives.

- Survey map(s) and descriptions: for example physical features, soils, land use, habitat and vegetation types, windthrow risk, existing growing stock, archaeological sites, recreation sites, and roads and access paths (factors covered will depend on the specific context).

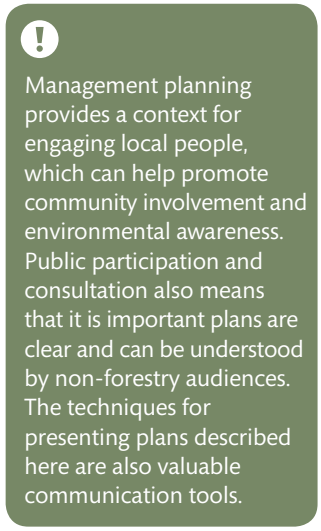
- Analysis map(s), including constraints and opportunities and local landscape character analysis.

- Design proposals plan showing how the design synthesis meets the management objectives and takes account of the analysis, especially the identified constraints and opportunities.

- Plan of the proposed species and open ground (for a new planting project).

- Plan of felling/thinning proposals colour coded by periods of felling, types of low-impact silviculture and retained areas (for a felling/silvicultural operations project).

- Plan of restocking proposals (following on from the felling/thinning proposals) showing different species, open space and any changes to external and internal margins.



Most areas, except the smallest, simplest, least visible or least sensitive will also need annotated panoramic photographs and sketches/visualisations showing analysis, planting design or felling and restocking design for each major viewpoint. This may be specifically requested by the forestry grants and regulatory staff or consultees.

The most sensitive or main views may also benefit from being shown as a sequence of sketches or visualisations demonstrating how the forest will change in appearance over time. This applies both to new planting projects – to show how the new forest or woodland will grow and develop – as well as felling/low-impact silvicultural projects. For such restructuring operations, it is useful to illustrate how the appearance of the existing forest or woodland will change at defined periods into the future.

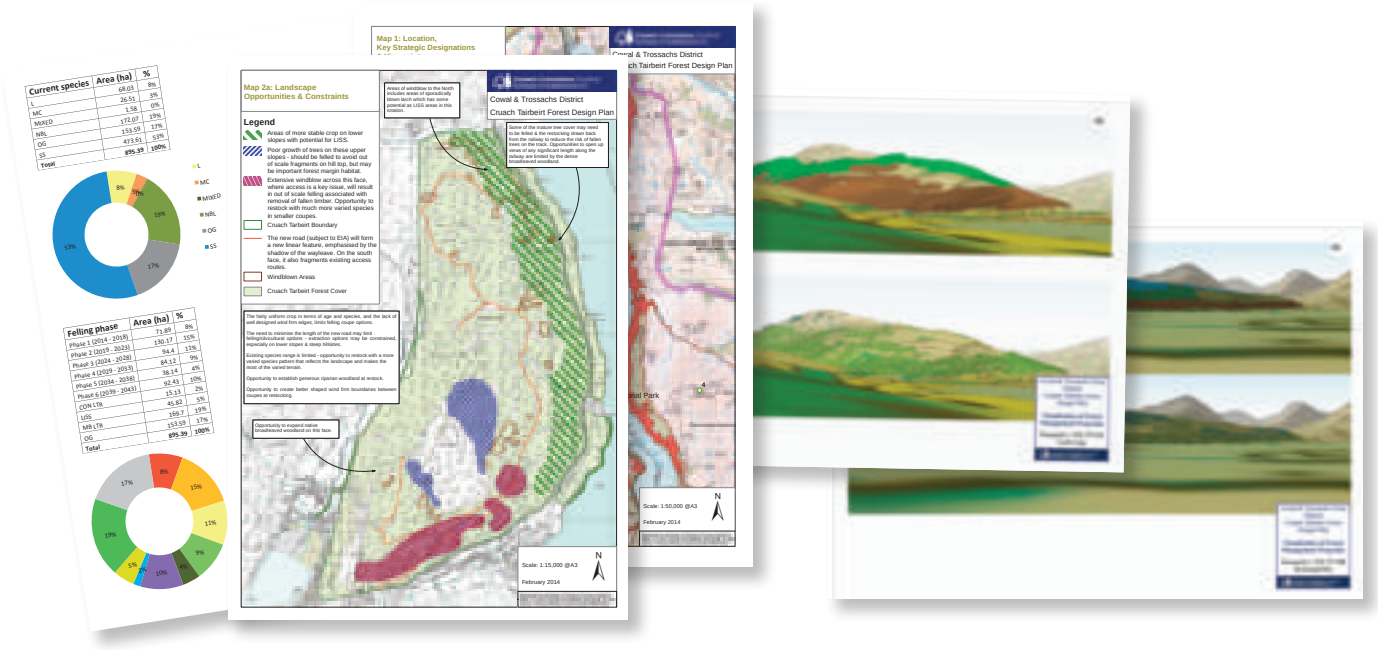
A detailed programme of planting, thinning, felling, low-impact silvicultural operations, restocking and thinning – including information covering activities qualifying for grant-aid in the first operational period – will also be required.

To facilitate brevity of the actual plan, appendices can be used to hold background survey information, visualisation materials, cost analysis and tables or graphs of species proportions, timber volume production or any other information deemed useful or necessary for the full understanding of the forest management plan.

All maps and sketches should be dated and a record of amendments kept up to date. This is essential because plans usually change during their development as a result of consultee comments and they are also likely to be revised during the period they have approval for. A clear system of annotating different versions of text, illustrations and maps with version numbers and dates should be developed. All electronic materials should be safely archived or backed up where they can easily be found in case of data losses.

Figure 2 shows some examples of the documentation of a typical forest management plan included in the documentation list outlined above.

Figure 2 A sample of the types of documents that may be included in a typical forest management plan.



Format choice

Consider the format of plan documentation that will best serve the situation. As almost everything can be made and stored in a digital format, the need for paper copies and standard formats is less important than it used to be; documentation can be digitally formatted to suit a range of end uses (for example, larger paper sizes can be printed for a public meeting or display). For office-based records of forest management plans, consider using the following format:

- Text sections at A4
- Photographs, sketches and smaller maps in A3 or A2 landscape format
- Larger maps at A1 or A0 depending on the necessary scale and the proportions of the area.

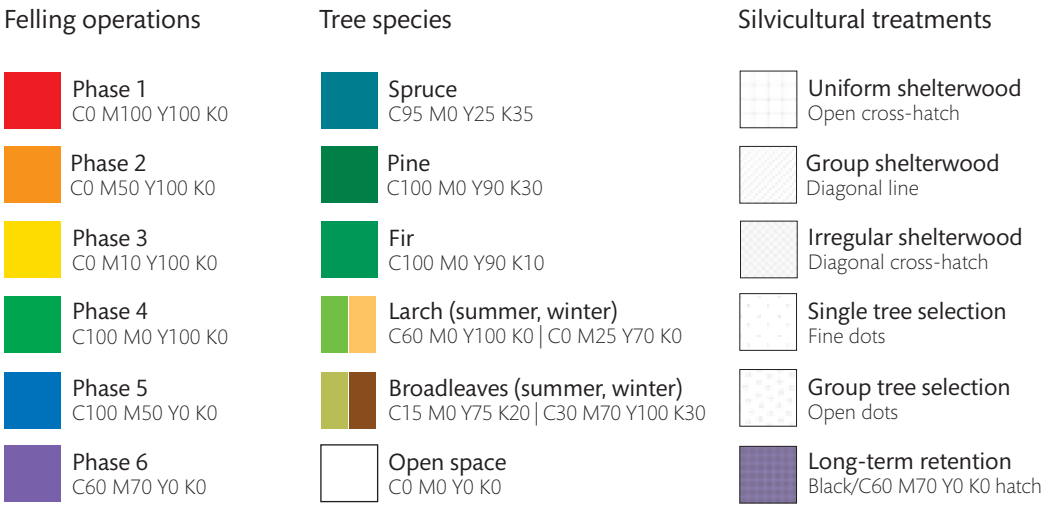
Creating the plan components usually involves working directly in a geographic information system (GIS), which facilitates the production of digital files ready for printing. If hand-drawn maps and sketches are also prepared these should be scanned and added into the report.

Keep documents in their original file format or convert to Adobe Acrobat® pdf (portable document format) files. Compressed pdfs with a smaller file size, which can be sent by email or by using file transfer or sharing programmes, are useful additional options. If the documents do need to be printed for use in meetings or at presentations, the package can be assembled into a single convenient folder, such as an A3 landscape format ring binder, with larger maps folded into a pocket at the back.

Use of standard colours and hatching

It is helpful to use standard colours on maps and plans as well as in sketches or visualisations. Where appropriate, bright contrasting colours should be used for maps and plans so that they look clear on the computer screen and print and photocopy well. Though not universal, a spectrum system has been commonly promoted throughout the UK to show phased felling periods, planting and restocking schemes by species and tree types, and different silvicultural treatments (Figure 3).

Figure 3 Colours and swatches recommended for use in forest management plans and their CMYK values. Swatches for silvicultural treatments can be combined with phase/species colours as appropriate.



Felling phases or silvicultural operations of different time periods can be shown by using solid colours. Hatching should be used to indicate the use of different silvicultural systems at the same time phase. For phased felling periods, use red for the first phase followed by orange, yellow, green, blue and purple. For planting schemes, use colours typical of autumn foliage on species maps, as it is easier to differentiate between them: for example a blue-green for spruce, orange for larch and brown for broadleaves, as shown in Figure 3.

Revising and updating

Because forest management plans are designed to be long term, they will invariably need to be revised upon completion of each review period (usually every 5 years). Unforeseen circumstances, such as damage to the forest by high winds or a pest or disease outbreak (Figure 4), will force the reconsideration of the management strategy for the affected area and require a revision to the plan. It is therefore advisable for all plans to be prepared with eventual alterations, updating and amendments in mind.

Amendments are easiest when all data recording, especially the mapping, is carried out digitally, for example using a geographic information system (GIS). However, careful records should be kept to ensure that all changes made can be tracked over the period of the plan. It is also advisable to take progress photographs from the same viewpoints as used at the start of the planning process. These will help document the implementation of the plan and judge the results. Also, accurate records should be kept of amendments and updating for when monitoring under the UKFS takes place, as these provide evidence of the need for changes to the original plan and their rationale (see the section on page 88 of the UKFS on Monitoring).

Figure 4 Forests infected with tree diseases such as *Phytophthora ramorum* may have to be felled prematurely and restocked with alternative species. It is therefore important that forest management plans can cope with such alterations. This is an aerial view of infected larch at Glentrool in Dumfries and Galloway.

The process of forest management planning

While the process of forest management planning is generic, and can be successfully applied in all circumstances, there are some variations in detail depending on the individual forest or woodland and the management activities involved. This section sets out the framework for the forest management planning process and the variations in techniques used at different stages of the process designed to suit specific requirements and circumstances (e.g. whether the forest management plan is being prepared for a new planting project or whether it is focused on management – such as felling or thinning operations and restocking in an existing forest).

The forest management planning process presented in this Guide aligns with that outlined in the UKFS (see Table 6.1, page 52 of the UKFS). However, while the stages are the same, some are divided into sub-sections which provide more detail on aspects such as new planting and felling and restocking. The document produced by following this process will form the basis of the forest management plan. The forest management planning process is cyclical and many plans will be revisions of earlier versions rather than new ones.

The seven stages of planning

The process of producing a forest management plan can be organised into seven distinct stages:

1. Scoping
   The scoping stage involves drawing up a set of objectives that describe the key factors that are to be covered by a forest management plan. These may be predefined or developed as a result of consultations with different interest groups.

2. Survey
   The survey stage involves collecting comprehensive site information that covers all possible factors affecting the outcomes of forest management plan objectives.

3. Analysis
   The analysis stage involves analysing survey information to identify key factors which have the greatest influence on meeting plan objectives. These are extracted from the collected survey information and their interrelationships are considered together.

4. Synthesis
   The synthesis stage involves developing one or more potential forest design solutions that have the potential to meet the objectives from the outcome of the analysis. These are then evaluated and the most appropriate design is worked up in more detail to provide the basis for the forest management plan.

5. Implementation
   This stage involves implementing the approved forest management plan, over an agreed time period, through a series of operational plans.

6. Monitoring
   This stage involves monitoring operational progress and, if necessary, adjusting the plan.

7. Revision
   This is the final stage, and involves the revision of the plan after an appropriate interval.

1. Scoping

Scoping is the stage at which management objectives are developed. It also involves a preliminary search for stakeholders relevant to the development of the proposed plan, information on any concerns or issues they have, and the subsequent incorporation of these concerns and issues into a refined set of objectives (see example in Table 1).

Setting objectives

One of the aims of strategic planning is to help determine the objectives that are appropriate to individual forest management plans. Sustainable forest management is concerned with multipurpose objectives but this does not mean that every objective can or should be given equal weight in every forest or woodland. In many cases the appropriate balance of objectives will be determined, rather than selected, by the location, character and ownership of the forest as well as prevailing forestry policy and the expectations of a range of stakeholders. The precise objectives for any particular forest management plan will depend on:

- Meeting the legal and good practice requirements set out in the UKFS and its supporting Guidelines (e.g. the protection of watercourses or archaeological sites as well as objectives for wood production, improvement of landscape, provision of recreational opportunities, enhancement of nature conservation and climate change mitigation). Even where public funding is not involved, legislative and regulatory requirements constrain the way in which objectives can be pursued.

- Site or other physical limitations affecting the capacity of a forest or woodland to supply certain products or services, for example the supply of a particular type of timber, provision of some forms of recreation, or ability to support the habitat of a particular animal or bird, due to soil, location or climate.

- The owner's objectives for managing the forest. For the public forest estate, these are the same as national policy objectives, while in the case of a private owner they might, for example, include sporting use, revenue requirements or capital appreciation. For a non-government organisation these will be the strategic aims of the organisation, such as to provide for wildlife habitats or recreational access.

Environmental Impact Assessment

At this stage it is also worth establishing whether an Environmental Impact Assessment (EIA) is likely to be required by the regulatory authority for a particular project (including afforestation, deforestation, forest roads or forest quarries). This may become clearer by the end of the scoping exercise by which time specific issues of significance will have been raised. If an Environmental Statement does need to be prepared the process closely follows that of forest management planning. The presentation of the analysis stages and the final plan can be closely related to the assessment of the various impacts that have been identified for inclusion in the Statement. In sensitive areas, the regulatory authority may specifically request that a Landscape and Visual Impact Assessment (LVIA) is carried out as part of the EIA process. This requires an assessment of two related sets of effects: those on landscape character and other landscape resources (such as designations), and those on visual amenity. Visual impacts are normally evaluated using a set of visualisations taken from an agreed set of viewpoints of varying sensitivity (see *Guidelines for landscape and visual impact assessment* for more details).

Table 1 Example presentation of forest management plan objectives for a site.

Resource	Objective	Indicator of objective being met
Timber	• To maintain an even flow of timber over time	• Timber volumes leaving the forest are within a range of ±10% of 10 000 m^3 per year subject to price fluctuations
Financial	• To maintain a positive cash flow over time	• Revenue exceeds expenditure each year • Timber is felled close to maximum net present value ±5 years
Sporting	• To maintain and enhance sporting values	• Bags of pheasants increase year on year • Revenues from stalking increase by 5% per year
Water	• To protect and enhance watercourses and the riparian zone	• All watercourses are open with scattered trees and clumps
Landscape	• To improve the quality of the landscape	• Existing shape and scale problems are corrected over time • Species and age class diversity increases • The special qualities of the landscape are protected and enhanced
Biodiversity	• To enhance nature conservation values • To protect peregrine nesting	• Species and structural diversity increases • Open space increases to 20% • Broadleaves increase to 5% sited on good soils and riparian areas • Cliff nesting site is protected • 1% of oldest, windfirm stands are maintained to old growth
Access and recreation	• To increase public access in south of forest • To maintain Rights of Way • To maintain good access for effective management and for emergency services	• New forest access point and marked trails constructed • Rights of Ways can be followed without obstruction • Public are kept away from shooting areas during the season • Road network extended to forest adjacent to high fire risk heath
Archaeology	• To enhance the protection of features	• The two tumuli are cleared and access to them created

- Demands made on the forest apart from those expressed by the owner. These might include the issues or demands expressed through the scoping process or by other stakeholders.

Such limitations may, however, not be confirmed until after the analysis stage when the original set of objectives may need to be modified. Once the objectives have been determined they should be recorded clearly and agreed with the client. A useful way of expressing objectives is in the form of a table, see for example Table 1.

Stakeholder analysis

Stakeholder analyses are used to identify the key communities of interest in the forest or woodland. They are useful for identifying the main issues which may guide the development of objectives or otherwise form constraints or opportunities that should feed into the process at the analysis stage. Usually, scoping includes a face-to-face meeting or series of meetings with interested parties from whom information and knowledge about issues can be obtained (although if impractical it can also be done by an exchange of letters or emails).

If the stakeholder analysis is part of a formal process, the scoping meeting is usually chaired by the relevant regulatory authority. Notes from the meeting should be incorporated into the plan text (entire notes can be placed in an appendix) and used to inform the plan objectives.

2. Survey

Once the objectives are agreed the collection of relevant survey information can begin. The general checklist provided in Table 2 will be useful although the relevance of particular categories of information and the degree of detail required will vary from place to place. Some aspects will be common to all plans, while others will be more specific to particular forest and woodland types, their locations and context, or the type of management proposal – for example new planting or felling and restocking (see Appendix 1 for further details).

Thorough familiarity with the area of the forest or woodland subject to the plan is essential. Site visits should not only focus on the planning area itself but also explore the surrounding landscape. This is important in order to understand the wider setting and context for the forest or woodland and establish any key external viewpoints from where the forest is visible (Figure 5). Photographs should be taken both to establish a comprehensive record of such visits and to obtain panoramic images of the views from important viewpoints.

Baseline information can be obtained from a range of sources: Ordnance Survey maps, aerial photographs, inventories carried out for management purposes, data from other agencies and the local authority or from expert knowledge. Specially commissioned surveys may also be needed and local experts and enthusiasts such as bird watchers or botanists may also be able to contribute information of value.

When recording the survey material, use clear keys and colour codes. Make sure that maps overlay accurately. If possible, use a geographic information system (GIS) to store, analyse and present the information; different layers can be created according to the categories presented in Table 2, which can then be interpreted separately or in combination (see Design techniques on page 41).

Record survey information on good quality maps at the planning scale – usually 1:10 000. For very large areas, 1:25 000 scale may be more appropriate and for smaller sites, 1:5000.

Figure 5 The wider landscape setting for this conifer forest on the south side of Loch Ness in the Scottish Highlands includes important (and much photographed) views from Castle Urquhart on the north side of the loch.

Table 2 Checklist of information needed for the survey stage.

Category	Information class	Information type
All forests and woodlands	Legal	• Ownership and legal boundaries • Legal access points
All forests and woodlands	Physical	• Surface geology • Topography (contours) • Drainage and watercourses • Soils/ecological site classification • Areas disturbed by mineral workings and landfill • Sites of geomorphological interest (Geological SSSI) • Infrastructure (powerlines, pipelines, masts, wind turbines, public roads) • Water supply catchments
All forests and woodlands	Biodiversity	• Important extensive habitats • Sites of specific wildlife conservation value • National Vegetation Classification (NVC) maps • Sites of Special Scientific Interest (SSSI) • Territories of specific wildlife species
All forests and woodlands	Historic environment	• Scheduled and Unscheduled Ancient Monuments • Other archaeological sites • Historic features • Gardens and designed landscapes • Associations with historical persons or events
All forests and woodlands	Recreation	• Accessibility and transport to and from the area • Actual and potential recreational use, routes and facility locations • Rights of way
All forests and woodlands	Landscape	• Visual context of the area, i.e. how it is seen within the wider landscape and on approach from public roads • Landscape designations (national or local) • Visibility of the planning area from external viewpoints and their sensitivity • Viewpoints from within the planning area and key features of those views • Elements of visual diversity within the area • Visual detractors
All forests and woodlands	Forest protection	• Presence of pests and diseases or risk of them • Need to protect trees against grazing or browsing damage • Fire risk and prevention measures
Felling and replanting/ low-impact silvicultural systems	Timber production	• Growing stock inventory • Windthrow risk/hazard • Economic felling ages or terminal heights at the onset of windthrow • Potential for applying low-impact silvicultural systems • Access roads and potential harvesting systems
Upland forests including new plantation forests; felling and restocking of existing conifer forests; new native woodlands; PAWS conversions of non-native trees to native woodland	Red deer management	• Deer numbers • Patterns of summer and winter use • Deer fence lines – current and potential • Deer control glades
Community woodlands; woodlands in and around towns	People	• Local user groups and other stakeholders and their views about the area • Users and their status such as demographic or ethnic group • Linkages with other recreation areas nearby • Anti-social activities and sense of safety • Special local places
Lowland new native woodlands	Biodiversity/historic environment	• Valuable hedges and ancient field patterns • Single trees, copses and hedgerow trees
Upland new native woodlands	Natural regeneration potential	• Sources of seed for natural regeneration • Existing areas of regeneration • Potential native woodland types (using NVC) • Areas to be kept open or low-density woodland
Upland new conifer forest	Species selection	• Ecosystem site classification

3. Analysis

The next stage is the analysis of the survey information. This is an important stage and it needs to be done well. The key thing to remember is that not all the information collected has immediate relevance to what is being planned. The information should be sifted layer by layer to identify what is important. Analysis is about asking the question, 'What does this survey information mean to the site and the management objectives?'.

The analysis stage should be divided into several parts depending on the relative importance of the issues identified. The main type of analysis for all plans is the constraints and opportunities analysis. Depending on the type of project and its location, analyses of local landscape character, potential native woodland types and the historic environment may also be needed.

Constraints and opportunities analysis

As noted above, it is important to be selective about what information is considered important and what is not relevant at the scale of planning being undertaken. One powerful technique is to determine those factors which reduce freedom of action (constraints) and those which allow greater flexibility (opportunities). For example:

- Constraints might include poor soil, low yield class, high windthrow risk, physical obstructions, presence of infrastructure and protected sites.

- Opportunities might include soils with high nutrient content, warm wet conditions, high yield class, low windthrow risk and existing advanced regeneration.

Constraints and opportunities can be 'sieved out' on annotated maps (Figure 6a) and, where the visual appearance of the landscape is important, also illustrated on perspective sketches (Figure 6b). Transferring map-based information onto photographs and perspective views can be difficult but there are techniques available to help with this (see Design techniques on page 41).

If the survey information is held in a GIS as a series of layers it is relatively easy to identify and map the various factors clearly and accurately on a combined map. The spatial pattern of constraints and opportunities expressed in the maps can also provide an initial structure for the Synthesis stage.

The constraints and opportunities for a site should also be tabulated for ease of understanding, and assessing and comparing their potential influence. Matrices such as the example in Table 3 are useful for evaluating a forest design, as this should take account of, and work around, the constraints while maximising the opportunities.

Landscape character analysis

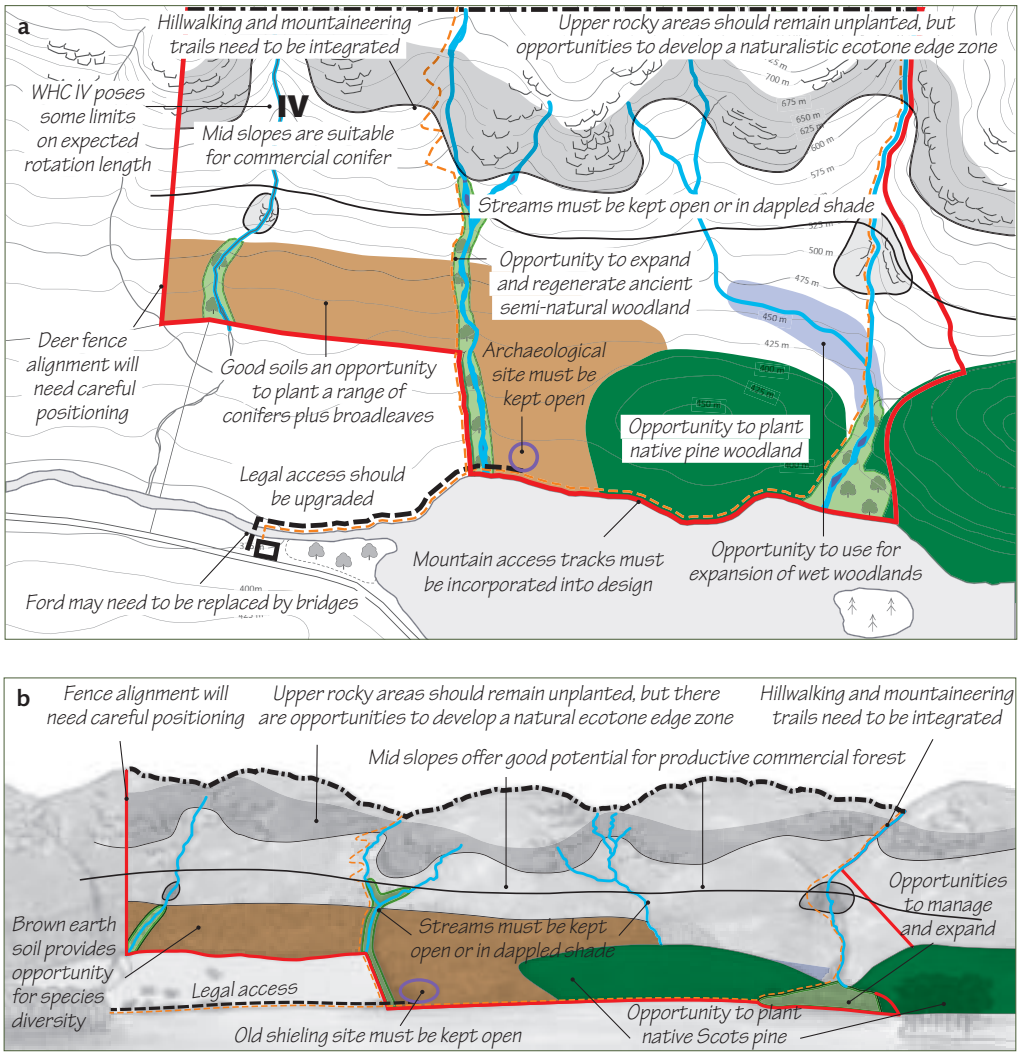
Where the forest or woodland is visible or important in the landscape it should be designed so that it relates to the character of the surrounding landscape (see the landscape design principles in the UKFS Guidelines on *Forests and landscape*).

The appropriate Landscape Character Assessment for the area within which the forest lies should always be consulted, and a local, more detailed landscape character analysis for the entire plan area set in its wider context should be prepared. There are two parts to this: the landform analysis, and the landscape character description.

Table 3 Example matrix for setting out constraints and opportunities in tabular form (see also Figure 6).

Factor	Constraint	Opportunity
Ownership boundary	• Shape of boundary/fence line conflicts with landform	• To design woodland to reflect landform with managed open ground integrating with adjacent land use
Rights of way	• Access tracks through site and up onto high hill ground	• To integrate tracks into forest design with appropriate detail so that they enhance the experience for walkers
Watercourses	• Watercourses and riparian woodland divide site	• To provide crossing points for access and operations • To expand and integrate riparian woodland into the forest design as a semi-permanent framework
Soils	• Poor soils and rocky high ground limit the extent of planting	• To develop a naturalistic ecotone at the upper margin that integrates with the commercial forest on the better soils lower down the slope
Biodiversity	• Currently limited to isolated patches of riparian woodland	• To use the variety of soils and ground conditions to develop diversity and encourage habitat networks
Archaeological sites	• Old shieling site to lower level site access point	• To provide appropriate access and landscape setting
Windthrow risk	• Windthrow hazard class IV on high ground	• To design a sustainable pattern of future felling coupes to ensure the development of windfirm edges
Wildfire risk	• Potential wildfire risk on high ground due to fuel loading and wind direction	• To develop wildfire resilience measures and reduce fuel loading in susceptible areas

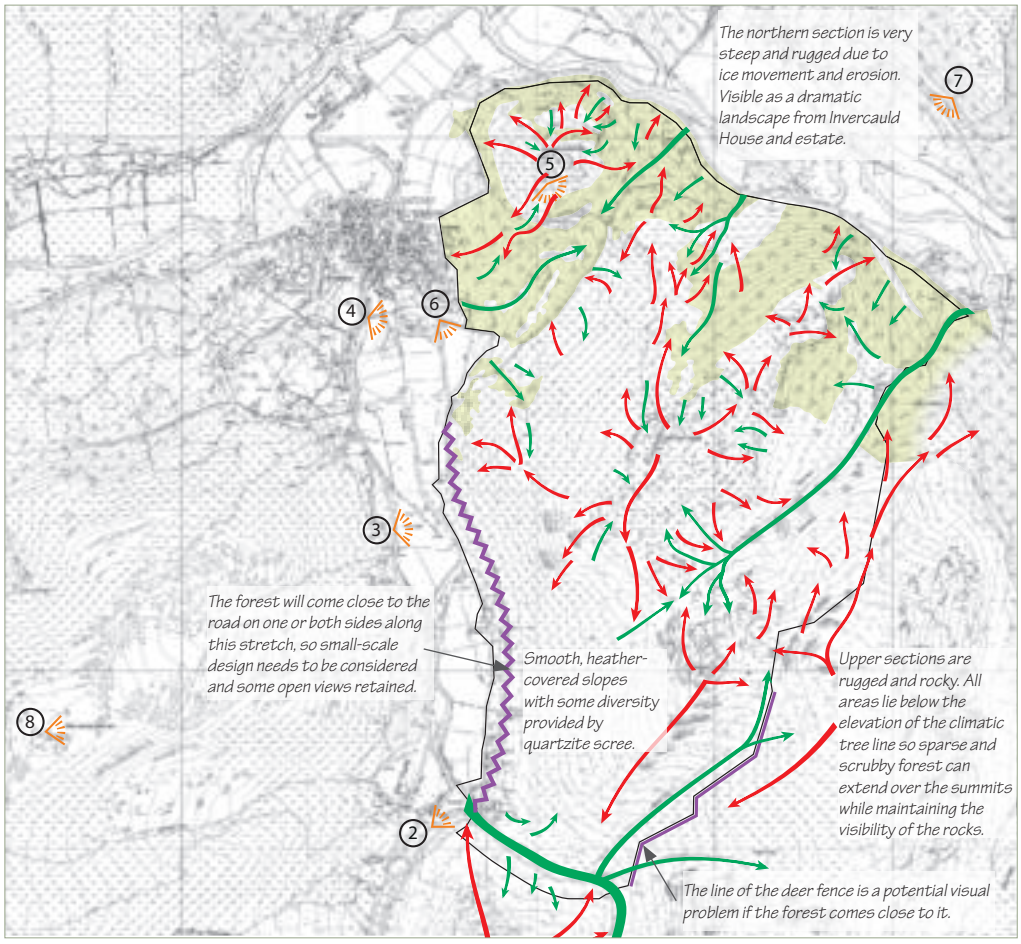
Figure 6 An example constraints and opportunities analysis in plan (a) and in perspective (b).



The technique of **landform analysis** is based on the concept of 'visual forces in the landscape' (as described in the UKFS Guidelines on *Forests and landscape*). It uses red and green arrows to express convexities and concavities in the landform (red arrows representing visual forces that 'draw the eye' down ridges and green arrows representing those that draw the eye up valleys and gullies) as shown in Figure 7. The technique is very useful for forest design in landscapes that have some topography (see page 24) but unnecessary in flatter areas with less landform.

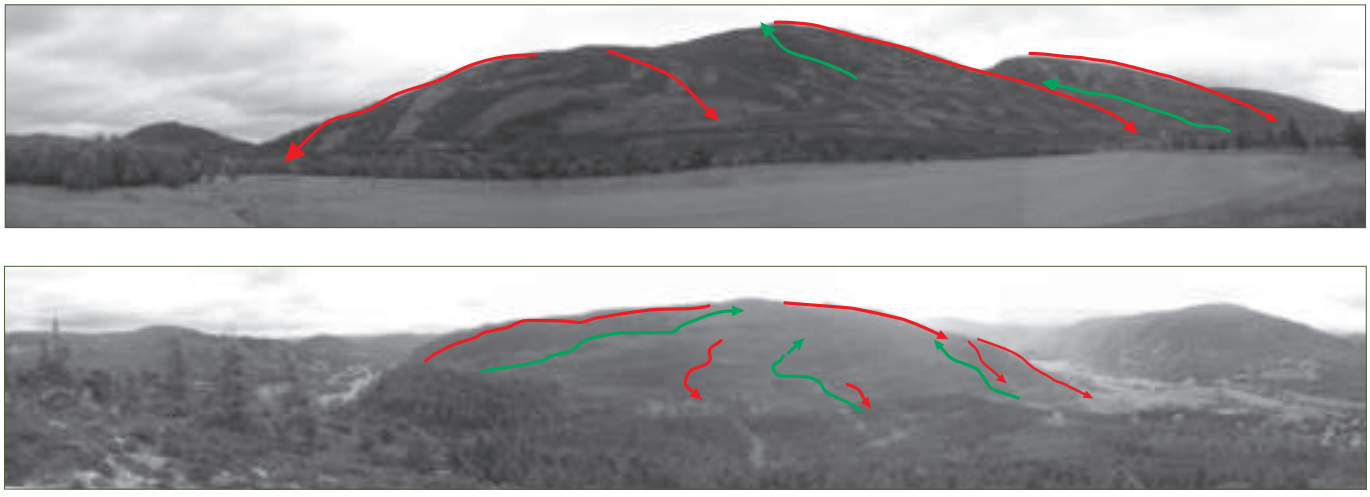
Figure 7 Landform analyses are recorded in both plan (a) and perspective (b).

(a) Landform convexities and concavities are picked out from contours on the map. Stronger landform features will have thicker arrows than weaker ones.



Courtesy of Scottish Woodlands

(b) Landform convexities and concavities are then plotted on selected panoramic photographs taken from key viewpoints: the top photograph has been taken from Viewpoint 1 (just off map to the south), the bottom photograph from Viewpoint 5 (top centre of plan looking south).



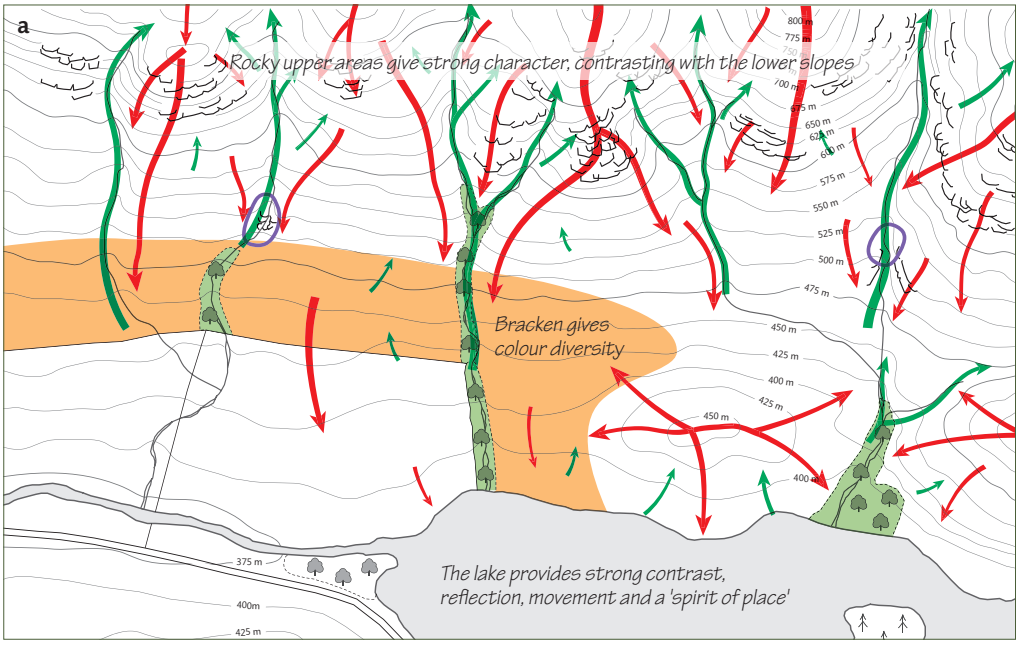
The **landscape character description** records the key aspects which form the landscape character in addition to the landform. It should include the following aspects:

- The shape and relative scale of the landscape, landform and other patterns (such as field enclosure or woodlands) evident in the landscape.
- The actual and potential elements of visual and ecological diversity, such as open ground, water, native woodland, rock outcrops, species diversity, archaeology, stands of old trees.
- Any problems with the current layout of an existing forest or woodland, such as shapes of species layout, felled areas, the external margins or ride and compartment boundaries.

Where appropriate, and particularly for larger projects, different landscape character zones should be defined. This will help inform the forest planning process, contributing essential information about where the forest design should differ, perhaps as a result of contrasting landforms, land cover patterns, forest types or distinct visual compositions.

The purpose of recording this information in perspective as well as plan is to help with the design of the forest where working in perspective is a vital part of the approach, as will become clear in later sections. Figures 8a and b shows an example of the full combined landscape character analysis for a typical area. Figure 9 shows a large project area divided up into separate landscape character zones.

Figure 8 An example of a landscape character analysis at the forest management plan level in plan (a) and perspective (b). Note that annotations, landform arrows and other symbology should be clear and consistent. Keys should be provided where needed.



Landscape character description

This medium to large-scale landscape is part of the 'rugged mountains and valleys' character type. Key aspects include dramatic rocky peaks, moraines and moraine-dammed lakes in glaciated valleys and the diversity of vegetation, colour and texture. Mountains are generally rounded in shape, but due to hard rock there are stony outcrops which give a distinct texture and colour that adds to landscape diversity. The lower slopes are smoother with different vegetation and some agricultural fields. Rounded, smoother moraines also feature. The lake offsets the rugged slopes with its plain surface, offering reflection, movement and space. Two waterfalls present dynamic elements when in spate.

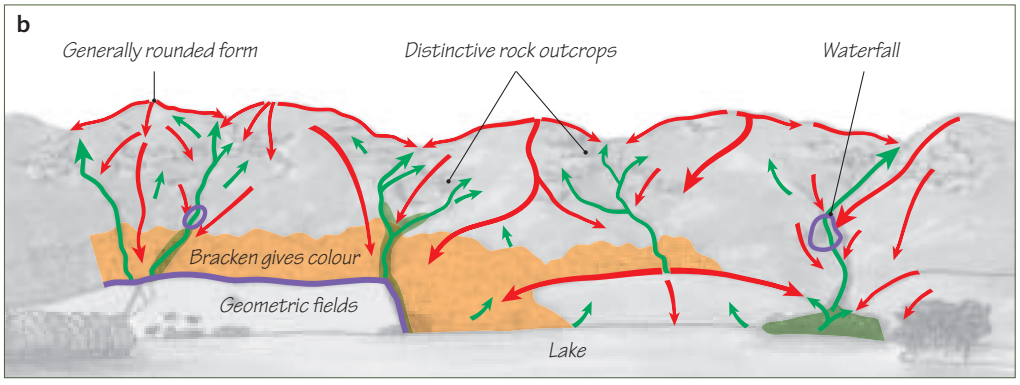
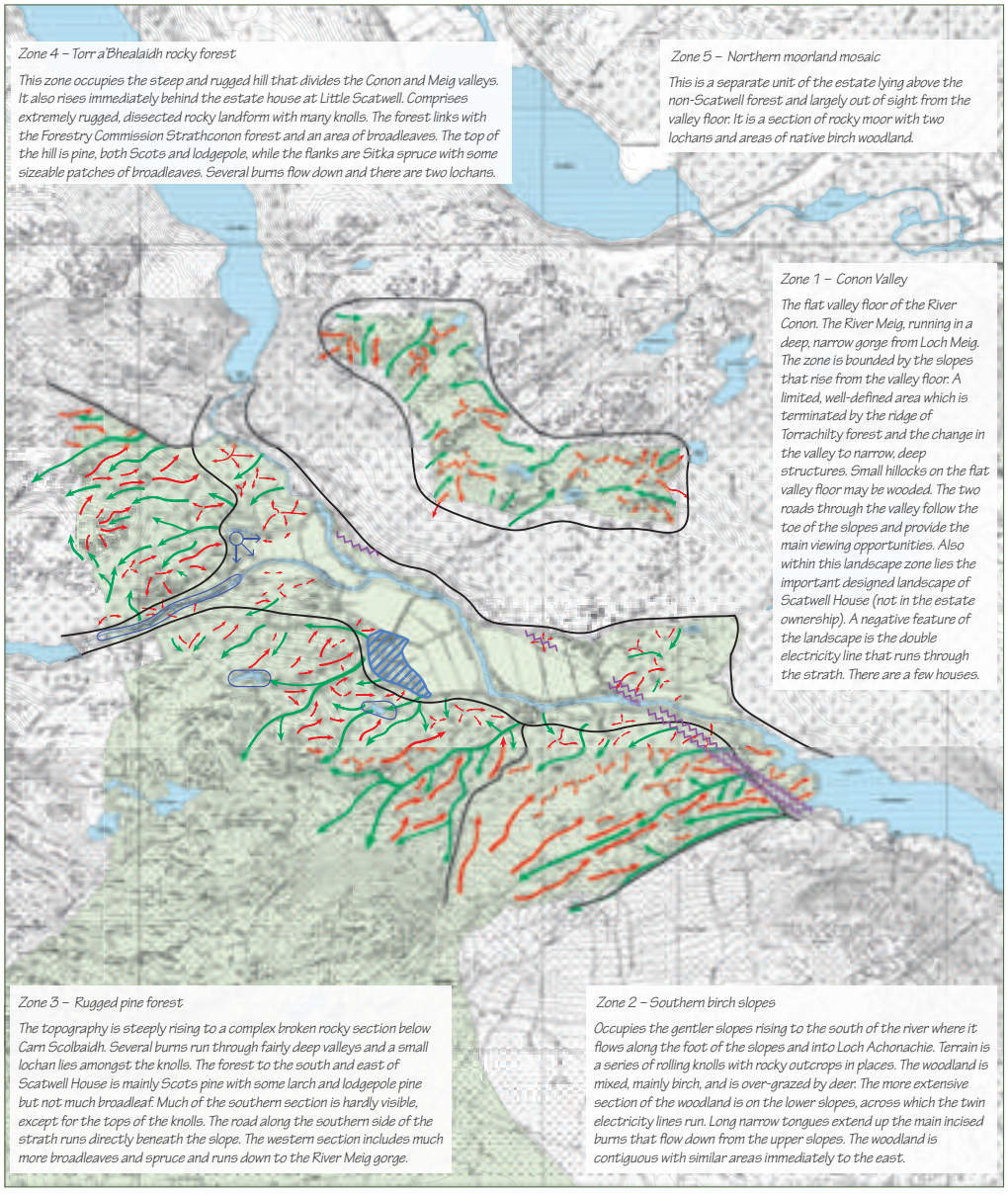


Figure 9 An example of a plan level landscape character analysis for Strathconnan in the Scottish Highlands: (a) shows the location of the site and key viewpoints; (b) shows the analysis and different character zones.

a

b

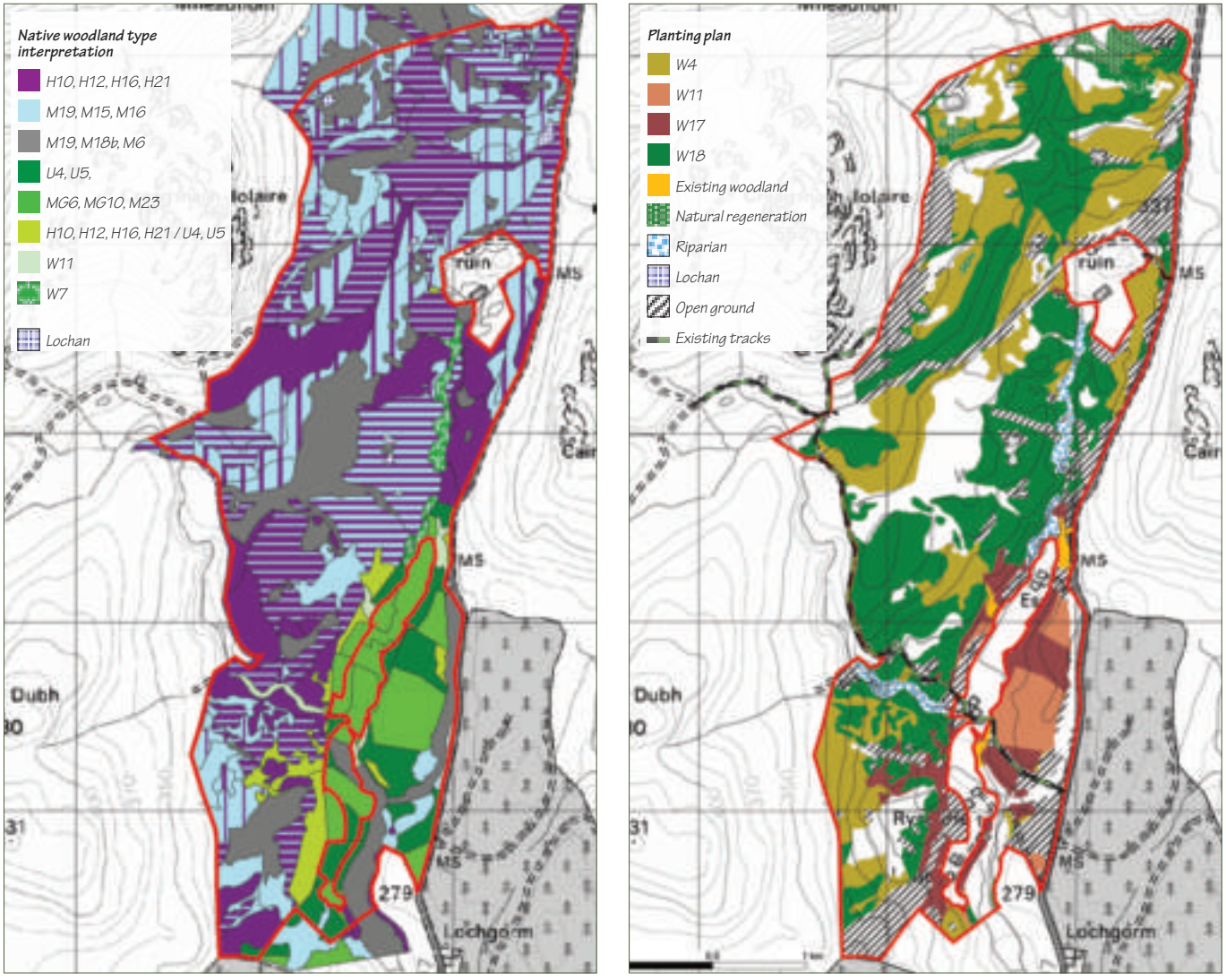


Analysis of potential native woodland types

In projects where the focus is on the creation or expansion of new native woodland, especially where it is being developed on semi-natural vegetation, consider commissioning a National Vegetation Classification (NVC) survey to assess the potential woodland types associated with specific soil, hydrology and vegetation at the site. This can be valuable for helping to define the parameters of the eventual woodland design, by giving an idea of the potential mosaic pattern and scale of diversity of different native woodland types.

Maps showing these areas, supplemented by a table of the possible native woodland types, sub-types and species mixes, should be prepared by the NVC surveyor or the woodland manager using available NVC information. Such surveys might also include the identification of important areas that should be left as open ground, for example mires. Figure 10 shows an example ecological analysis of an area mapped into different NVC potential new native woodland types for use in the design synthesis.

Figure 10 An example of an ecological analysis of an area in Morayshire, Scotland (left), and potential native woodland types (right) based on National Vegetation Classification precursor vegetation. The scheme boundary is shown in red.

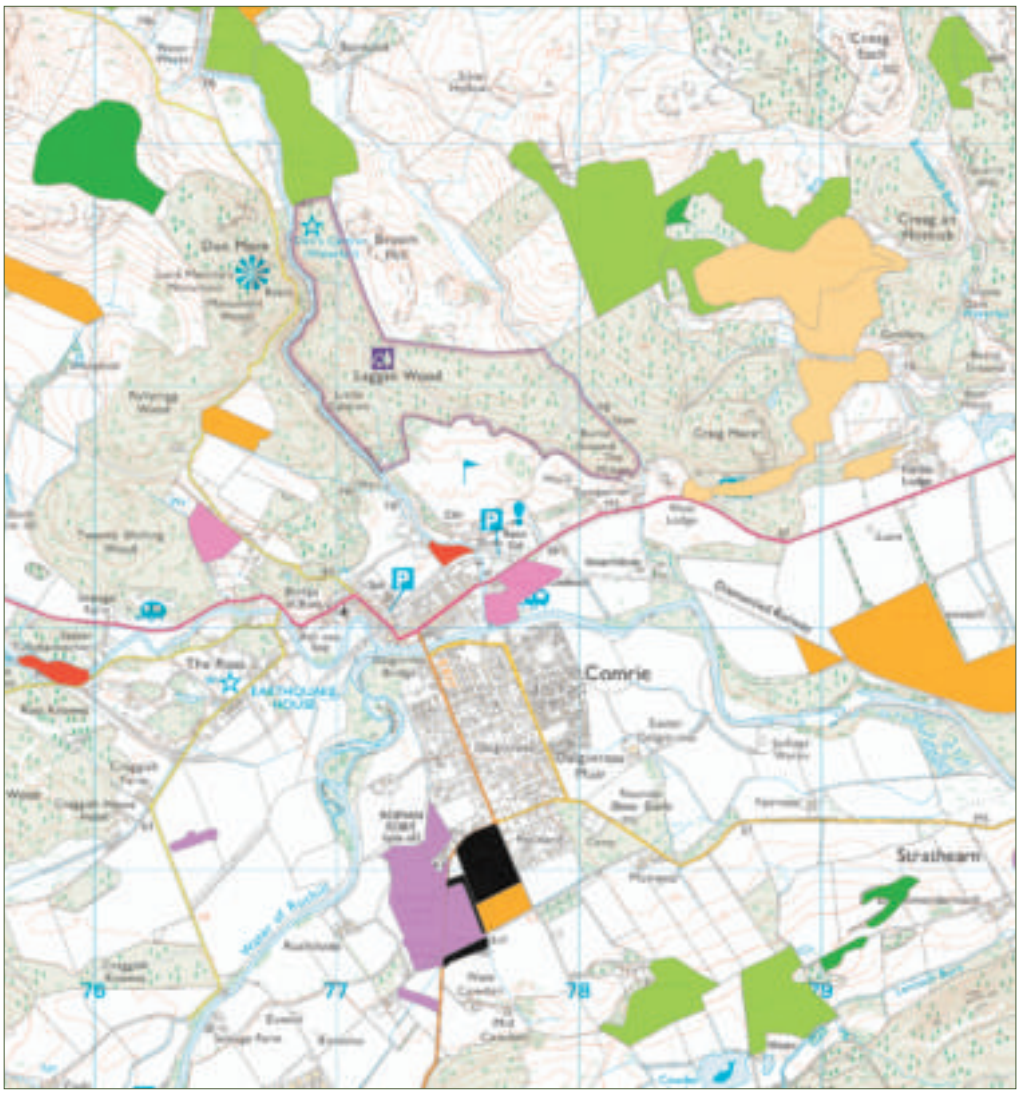


Analysis of the historic environment

Consideration of the historic environment (Figure 11) forms part of the forest management planning process in both new woodlands and the redesign of existing woodland. An analysis of the historic environment is more than the identification of archaeological remains (e.g. from surveys or national and regional records). It should also include assessments of:

- the contribution that settlement and field enclosure patterns and communication routes have made to the spatial layout of a landscape;
- the relationship between archaeological features and the wider landscape, such as the prospect from hillforts and visual corridors along communication routes such as Roman roads;
- natural features, such as veteran trees, hedges and hedgerow trees. Besides their intrinsic value to the cultural landscape, their layout and position may indicate an historic purpose as components of a designed landscape or ancient wood pasture.

All known archaeological features should be mapped and evaluated in terms of their spatial area (including buffer zones for their protection) and unique characteristics. For a project involving the management of existing woodland, archaeological features may be hidden among trees. Besides ensuring the careful removal of trees that may be jeopardising the survival of features, the opportunity could be taken in the management plan to reveal and interpret them.



Courtesy of RCAHMS

Figure 11 At the landscape scale, an appreciation of the cultural dimension of a landscape can be made by close evaluation of an Historic Land-use Assessment, such as this one showing relict land use for the area around Comrie in Scotland. Alternatively, old maps and aerial photographs can reveal important and persistent historic features.

Key: evidence of previous land uses that have fallen out of use but still influence the appearance of the present-day landscape.

4. Synthesis

In forest management planning, the term 'synthesis' refers to the procedure where the objectives and analyses are integrated together – firstly in a general way (the concept) and then at the more detailed levels appropriate for the articulation of a forest management plan. The synthesis stage comprises several steps, each of which contributes towards the development of the plan. There may be several iterations and different options may need to be evaluated at each step.

Design concept

Having completed the analysis but before embarking on the design of the forest or the design of felling coupes, it is worth considering the various broad options appropriate for the forest or woodland in a conceptual way – rather than going straight into the detail of what to plant or where to harvest. This step also helps to clarify the main features and character of the future forest or woodland as required after the entire plan has been implemented. The concept can take the form of a 'zoned' design strategy, based on:

- Local landscape character zones (where appropriate and usually for extensive areas).
- Areas where there are different mixes of objectives from one part of the woodland to another, such as places with a focus on biodiversity, recreation or commercial benefits.
- Areas where different combinations of survey factors (which emerged from the constraints and opportunities analysis) determine different approaches to layout and silviculture.

These zones should be mapped, and each presented as a numbered area with a line delineating their general extent. A short statement should be written for each zone, defining the balance of objectives, the key issues arising from the analysis and the main guiding principles for the design. These principles should include:

- the contribution of the forest to the surrounding landscape;
- the shapes and scale of the felling and planting patterns;
- species mixtures and proportions of forest and open ground;
- the application of different silvicultural systems.

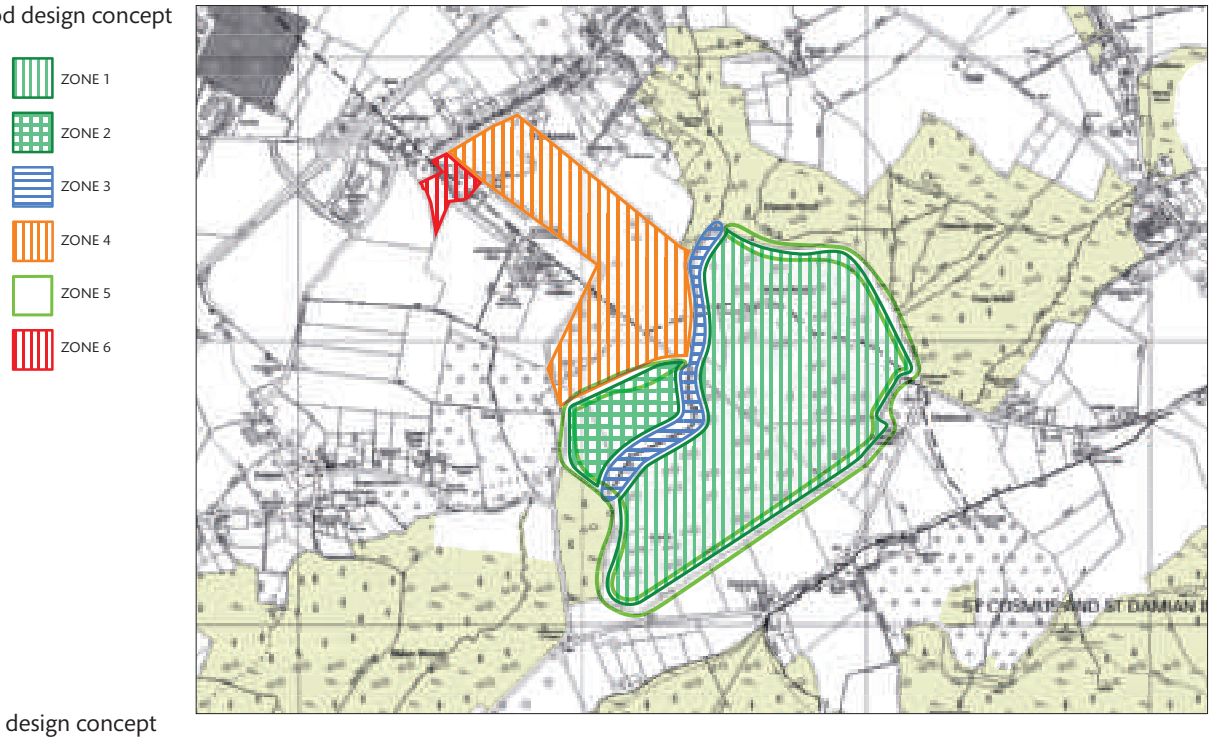
It is important to check the emerging concept against the original objectives. If it seems to meet them fairly well this should provide the required confidence to proceed to the sketch design stage. It may not be necessary to present the concept in perspective. Figures 12a and b show examples of map-based concepts for new planting and a felling and replanting project.

Sketch designs

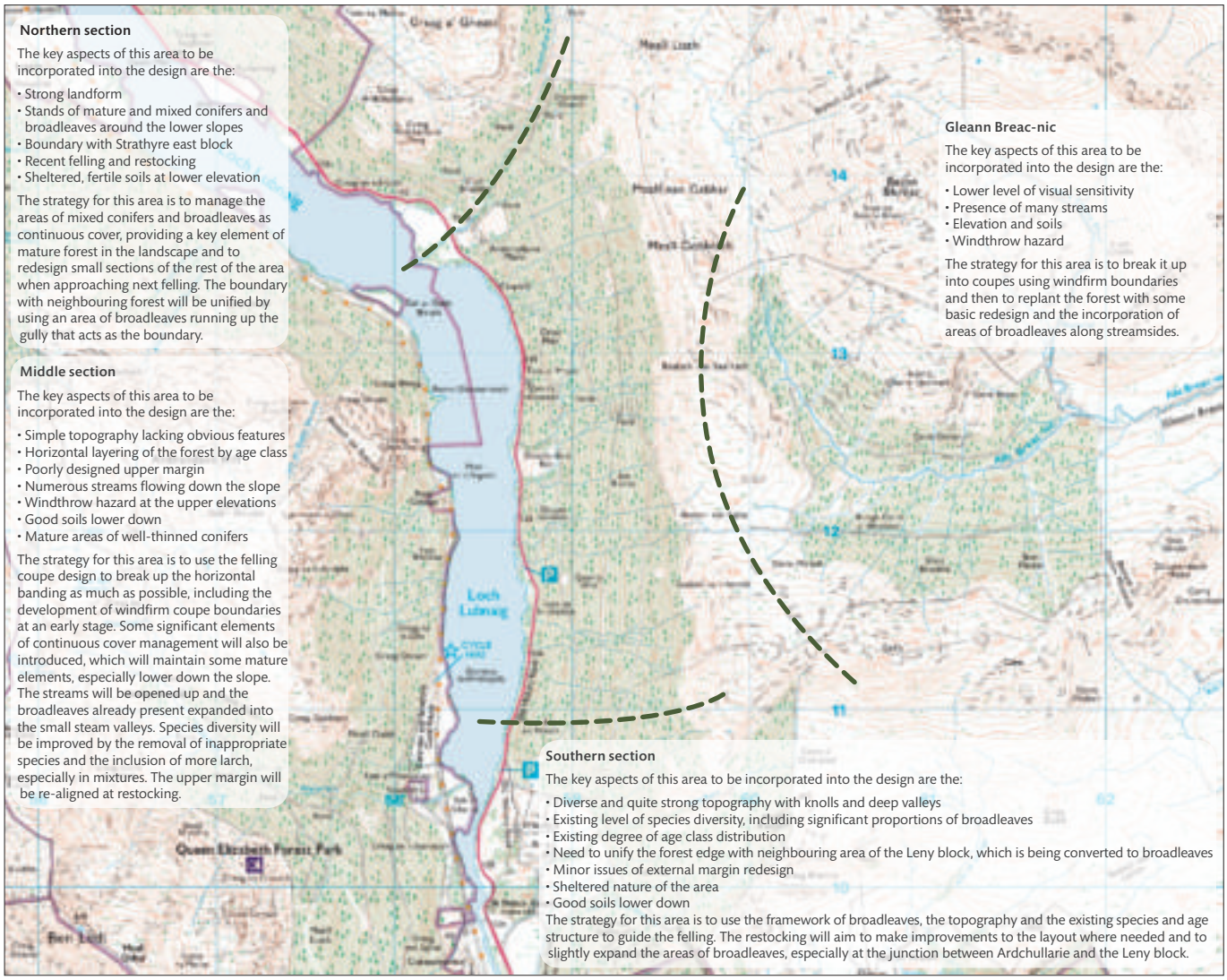
The concept should now be worked up by sketching the way the forest and its spatial components are to be laid out to fit the concept. This will be informed by the constraints and opportunities analysis and the local landscape character analysis. It is at this stage that the use of the perspective view as well as the map is most valuable in order to make sure that the visual design aspects are taken into account. Testing and developing how the forest will look when seen from the selected viewpoints is crucial for ensuring that the appropriate visual quality is achieved. Start either by testing design proposals worked out initially in plan and then modifying them via the perspectives, or by illustrating the design in perspective – especially by using the landscape character analysis as a guide – and then testing it and modifying it on plan as it evolves. Either way, the process is one of trial and error, erasing and redrawing shapes until the design appears both practical and appropriate in the landscape.

Figure 12 An example of a design concept map with (a) self-contained zones where different woodland approaches are appropriate; and (b) an example for a felling and replanting project, where different treatments relate to different parts of the landscape.

(a) Victory Wood design concept



(b) Ardchullarie design concept



The approach to sketch design and the factors to be taken into account will vary depending on whether the project is for new planting or the management of existing woodlands – involving, for example, some form of felling and restocking. There are special requirements associated with different variants of each and these are the subject of the next sections. While key aspects of forest landscape design are outlined, there is insufficient space to describe the specific design details and it is best to refer to other sources of guidance where these are explained in more detail (see Further reading and useful sources of information).

Design of new woodlands

Designing the layout of a new forest or woodland involves developing a pattern of shapes on the landscape to be planted with different tree species, mixtures of species or mixtures representing specific native woodland types – as well as a series of internal open spaces of various kinds. A key objective should be to reinforce local landscape character by the establishment of a positive relationship between the planted area and the surrounding landscape.

The main visual factors that should be taken into account in a new planting design are the combined influence of the landform, semi-natural vegetation patterns and field enclosure patterns. The scale of the woodland within the landscape is also important. The relative importance of each factor varies from place to place as described in the UKFS Guidelines on *Forests and landscape*.

There are three main aspects to new planting design which are common to any woodland type:

- the design of the external shape of the forest or woodland as a whole in its landscape setting;
- the design of the species units within this broad shape;
- the design of the range of internal open spaces.

Ideally these stages are carried out in sequence, as they involve increasingly detailed design, as shown in Figure 13. The following sections describe some of the different aspects of design in more detail for different landscape types.

Methods of new woodland design

The method of designing a new forest or woodland is to use the various analyses, the concept and the viewpoint photographs and then, with a pencil and some tracing paper overlays, to start sketching out some potential shapes for the whole area.

- If starting in plan, transfer the draft planting shapes to perspective at an early stage and modify them as necessary in perspective before interpreting them back to the plan.
- If starting in perspective, use the main viewpoint as the starting point then interpret the design both to plan and to any other key viewpoints to test how it will look from there.

Start by designing the external margins using the main influences, be they landforms or enclosure patterns, while also considering the relative scale of the landscape and proportion of the scene that the new woodland will occupy. Subdivide this main shape into the species pattern, also considering landform, scale and proportion, and finally add the detail of the internal open spaces.

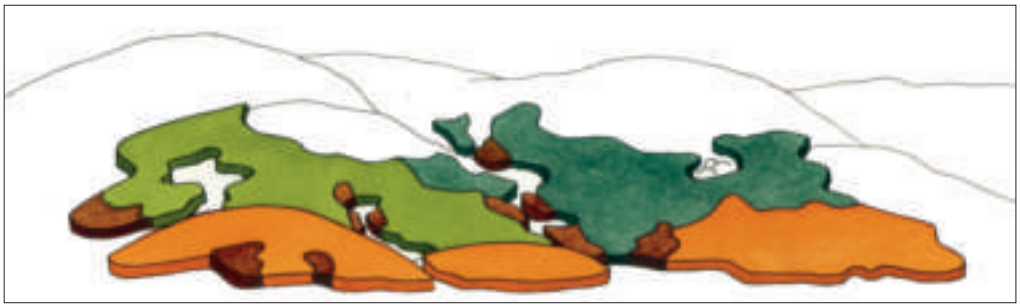
Do not be tempted to design the shapes directly in a GIS as this does not offer enough flexibility for modification, especially when the species and internal open spaces are added. Only use the GIS for mapping the shapes once the design has been finalised. Tracing paper overlays are useful to try out different shapes and to modify the design until a satisfactory relationship of the component parts is achieved.

Figure 13 The three main aspects of new woodland design: (a) external margin shape; (b) the species units; and (c) internal open space.

(a) The first stage is the design of the external shape of the forest or woodland as a whole in its landscape setting.

(b) The second stage is the design of the species units within this broad outline.

(c) Finally, internal open spaces are planned.



Design in landscapes with dominant landform

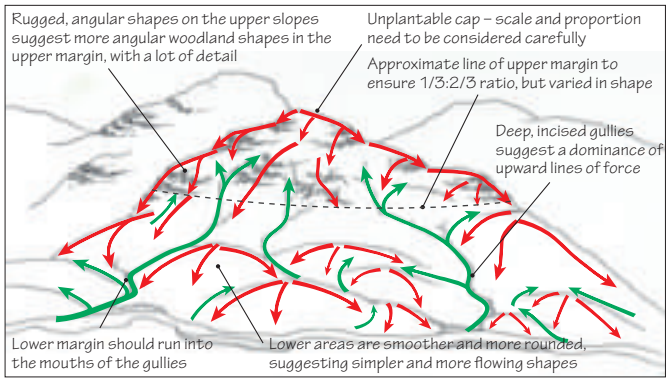
Where landform is the dominant influence in the landscape the lines of visual force (see page 16) provide the main guidelines for achieving organic shapes that relate to landform. Following the main lines of force gives the overall structure to the forest while following the minor lines can add to detail (Figure 14). The shapes of each section of the external margin should also reflect the different influences that may be present. For example:

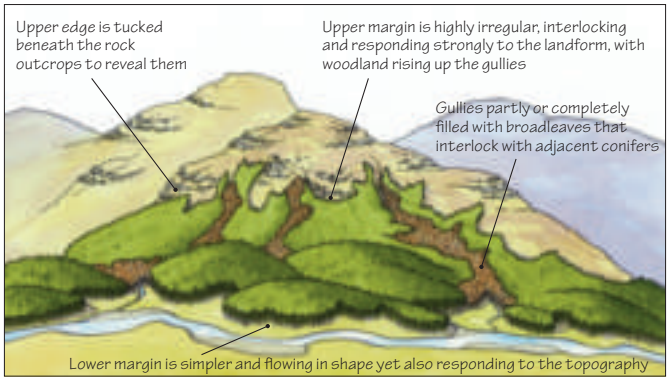
- At the upper margin of a forest on high ground the line should rise strongly in the hollows and descend on the ridges. If the terrain is rugged the lines can be rather angular in shape while if it is softer and more rounded this should also be reflected in the shapes.
- If the forest area has a distinct side margin, perhaps at an ownership boundary, this needs to avoid a vertical alignment in favour of a sweeping diagonal line which also follows landform while descending the slope.
- If the forest has a lower margin running along the foot of a slope in open land this should also relate to the local landform.
- If the lower margin is adjacent to fields or hedgerows then this enclosure pattern should be incorporated, reflecting a transition from agriculture, through forest to open hill, for example.

Where the new forest is not planted to the skyline or over a ridge, the scale of the open area or 'cap' should be carefully adjusted, using the 'rule of thirds' if possible (see UKFS Guidelines on *Forests and landscape*). A strongly interlocking shape is also ideal. The scale and proportion of the open cap should be tested and checked from different viewpoints.

The rule of thirds can be used to resolve the visual balance between elements such as woodland and open ground. When a landscape, or part of it, is seen as divided into two major elements, a ratio between them of one-third to two-thirds is usually the most satisfying visually.

Figure 14 The influence of different landscape elements on the design of a new woodland in a landscape with dominant landform.





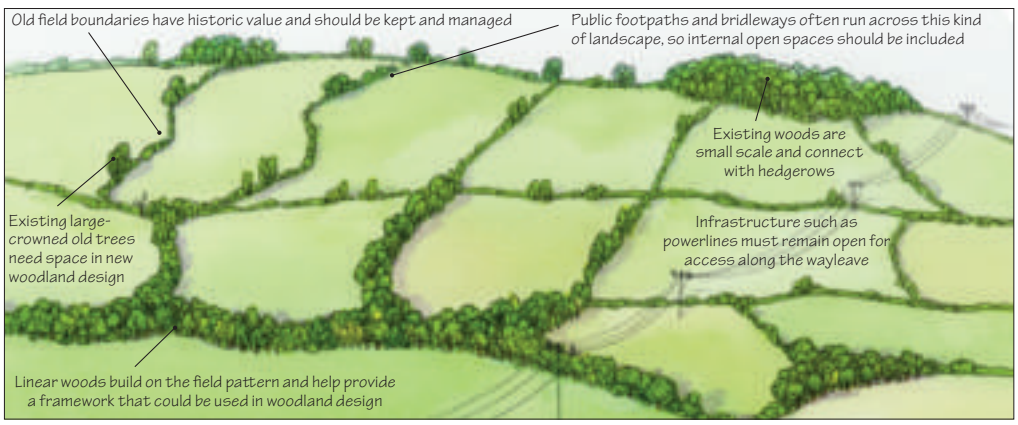
Design in landscapes with weaker landform

In less hilly, rolling or flat landscapes forest shapes will not stand out so much and it may be difficult to design in perspective. In these situations it is best to start designing in plan and then create perspectives from this for testing the design and modifying it as necessary. Some key points to bear in mind are:

- There is less likely to be an upper margin in this kind of landscape as the forest or woodland will probably extend over and 'clothe' the lower ridges.
- Where there is relatively weak landform and where the ownership boundaries are strongly regular, the external margin may be designed to follow the general pattern of the field boundaries while still forming organic shapes within them. These will tend to be seen as shaped edges of trees as the woodland matures.
- In woodlands in and around towns consider adjusting the external shape in much more detail to take account of the presence of roads, houses and other features, and to ensure that views, shade and privacy are taken into account.

In summary, in landscapes with weaker landform, the landscape character analysis in both plan and perspective should be the guiding force for the woodland design. The constraints and opportunities analysis also has an important role to play, for example in defining areas which cannot be planted even if the landscape suggests it would be appropriate to do so. This may be significant when designing the species pattern – and especially the internal open spaces – as these may be heavily influenced by areas which cannot be planted for a range of reasons. Figures 15 and 16 show some of the aspects which should be taken into account in designing new woodlands in landscapes where landform is weaker.

Figure 15 The influence of elements such as field patterns and other aspects which affect the design of woodlands where landform is not a dominant factor.



An elevated view over a rolling landscape of small-scale hedged fields and linear or clumped woods. Large-scale woodland planting would alter the character of this landscape. New planting could either be 'top down', expanding the existing small woods, or 'bottom up', extending the pattern of linear woods.

Figure 16a An oblique aerial view of an area to be planted in a landscape with little landform.

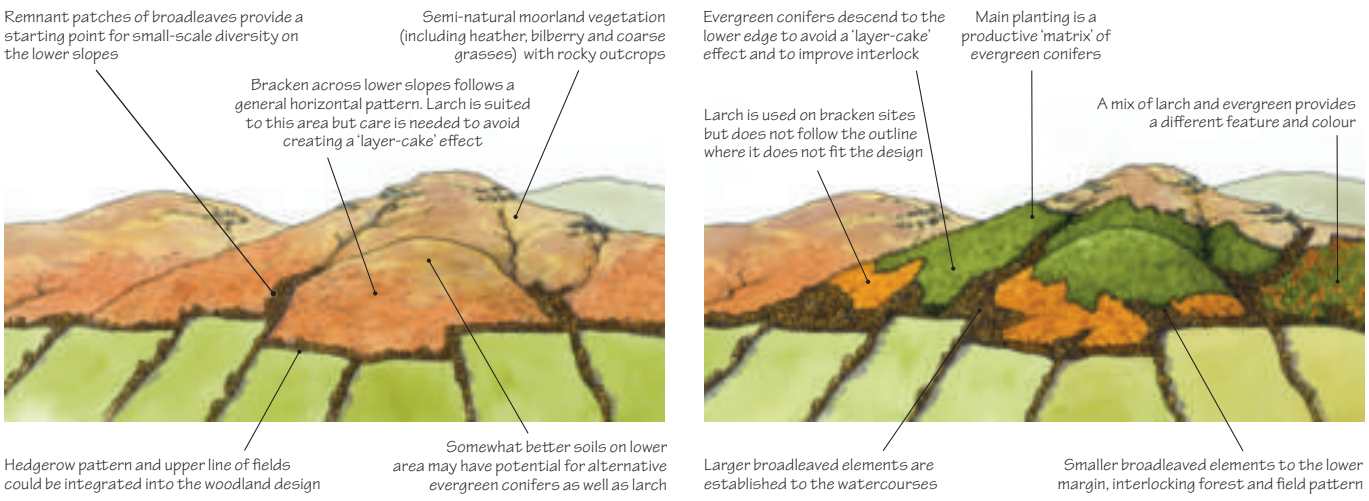
Figure 16b A sketch of the same view illustrating how the proposed woodland will relate to the surrounding agricultural landscape.

Design of species patterns in conifer forests

As the overall shape of the forest or woodland develops, the pattern of species, species mixtures or native woodland types can be designed into this framework. Here too the influence of landform can be important, while the existing vegetation patterns may also have a major influence. Consider the following aspects:

- If the forest is going to consist mainly of conifers then the current pattern of semi-natural vegetation may help determine how much species diversity is appropriate and where to plant certain species such as larch to ensure that the natural colours found in the landscape are appropriately reflected (Figure 17).
- Scale and proportion are also important and the rule of thirds may be applied here too to ensure a good balance across the landscape.
- Smaller areas, especially broadleaved elements, can be used to link with external features such as patches of broadleaved woodland or hedgerows. This will increase the degree of unity between the new forest and the wider landscape.
- Smaller features should be concentrated along the lower slopes while larger-scale species shapes should be concentrated more in the upper areas, especially when forming forested caps over the top of skylines.

Figure 17 The range of aspects to consider when designing a species pattern in a new conifer forest.

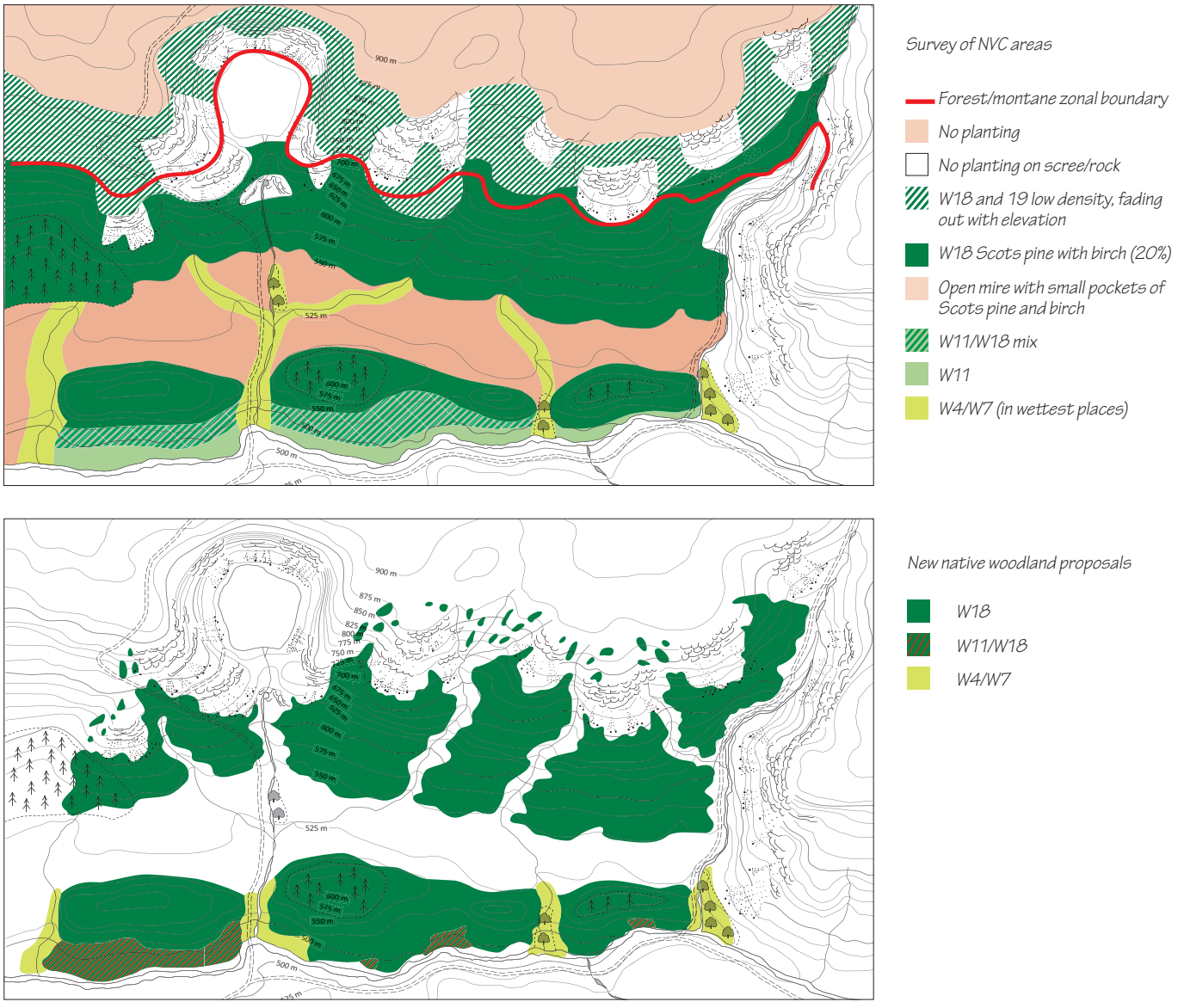


Design of native woodland species patterns

Designs for new native woodlands should be based around the pattern of National Vegetation Classification (NVC) woodland types and species mixtures as analysed by the NVC survey. This pattern is also likely to reflect the landform to some extent as this tends to affect the distribution of soils and drainage and thus semi-natural vegetation. New native woodlands may also benefit from seed sources from mature trees in or next to the area and there may be some existing natural regeneration to be taken into account. In this case use the NVC types as a basis and modify them as needed to ensure that the shapes are compatible and work together. Some woodland types may be different ecologically but appear very similar in the landscape.

If the site of the new woodland has recently been under intensive agriculture there may be no NVC types to use. In this case interlocking organic shapes of species mixtures or patterns of woodland type should be designed using whatever landform there is. This can be a challenge as it is much easier to design shapes when there are definite features to follow. Figure 18 shows an example of how to interpret the NVC potential woodland types into a design which also takes other factors into account.

Figure 18 Using National Vegetation Classification potential woodland types in the design of new native woodlands.



Design of internal open spaces

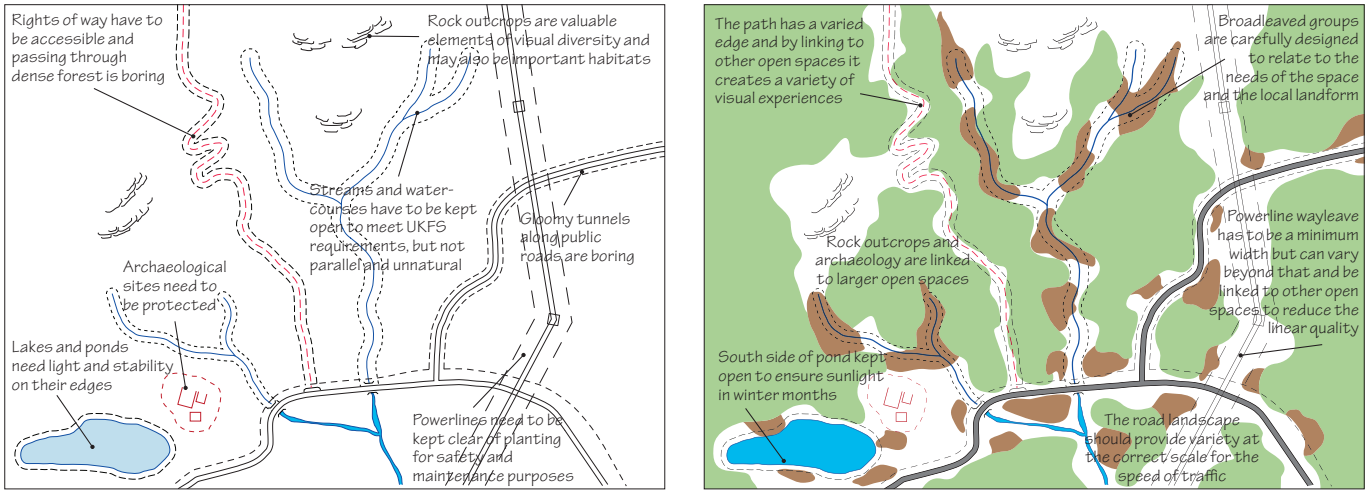
Internal open spaces are the last and most detailed elements to be designed. These may be of many types, forms and scales, each with different requirements. For example:

- woodland corridors such as public or forest roads, rides, footpaths and trails used by cyclists and walkers;
- lakes, ponds, streams and watercourses;
- powerlines, pipelines and other infrastructure with wayleave requirements and specific limitations on planting distances;
- archaeological sites or complexes which could be damaged by tree roots;
- open ground habitats which may have special edge requirements;
- deer control areas;
- recreational sites of various types and sizes;
- open unplanted hill or mountain tops within the ownership and which may also be included in the perimeter fence, if present.

Open spaces should be designed by first identifying all the open areas needed as a result of the constraints and opportunities analysis to meet both the scheme objectives and the requirements of the UKFS. The aim should be to link the open areas together to form a network. The next stage is the design of the edges of the open spaces to reflect the character of the landscape and the other shapes being used in the forest design. If the forest or woodland is regularly used by people, for example, particularly in lowland and urban contexts, the more important the attention to detail of the open spaces becomes and the more human-scale elements should be incorporated.

It is important that open spaces are designed to a suitable level of detail and not left as indicative areas, relying on operational planning to ensure that the correct detail is included. Where linear open spaces such as streams need dappled shade and groups of broadleaves, larger-sized patches of open space should be included in the design. In steep terrain where the shapes of open space will be seen from a distance, these will need to be designed in perspective to ensure they achieve appropriate shape and scale with the wider forest design. In flatter landscapes, the shapes will only be seen internally so the focus can be on how they will be experienced by people passing through them. Figure 19 shows how a pattern of open spaces should be developed and the detail of design which is appropriate in a forest.

Figure 19 Designing different types of open space into a forest at the correct scale and level of detail.



Presentation of the design for new woodlands

New woodland designs should be presented as colour-coded maps showing species, species mixtures or woodland types, using the recommendations on common standard colours and hatches set out on page 7. Maps should be supported by a range of perspective sketches or visualisations from each main viewpoint, both externally and internally, depending on the project. It is good practice to show the sketches in a sequence with the original photograph, the analysis perspectives and then the visualisations. In sensitive areas where views, such as those from houses, will change over time it is a good idea to prepare two sets of views – one at around 5 years, as the trees become established, and one at 20 years, when they are maturing and their height is starting to make a difference. This is useful to demonstrate the rate of change in the landscape and what it means for local people. Figure 20 shows some examples of presentation of a design in perspective and aerial 'bird's eye view'.

'Bird's eye' perspectives provide a good transition between plan and perspective views. They are often useful for public consultation as they can be easier to understand than maps. They also present the 3D quality of the landscape more clearly in flatter landscapes than sketches showing edges only.

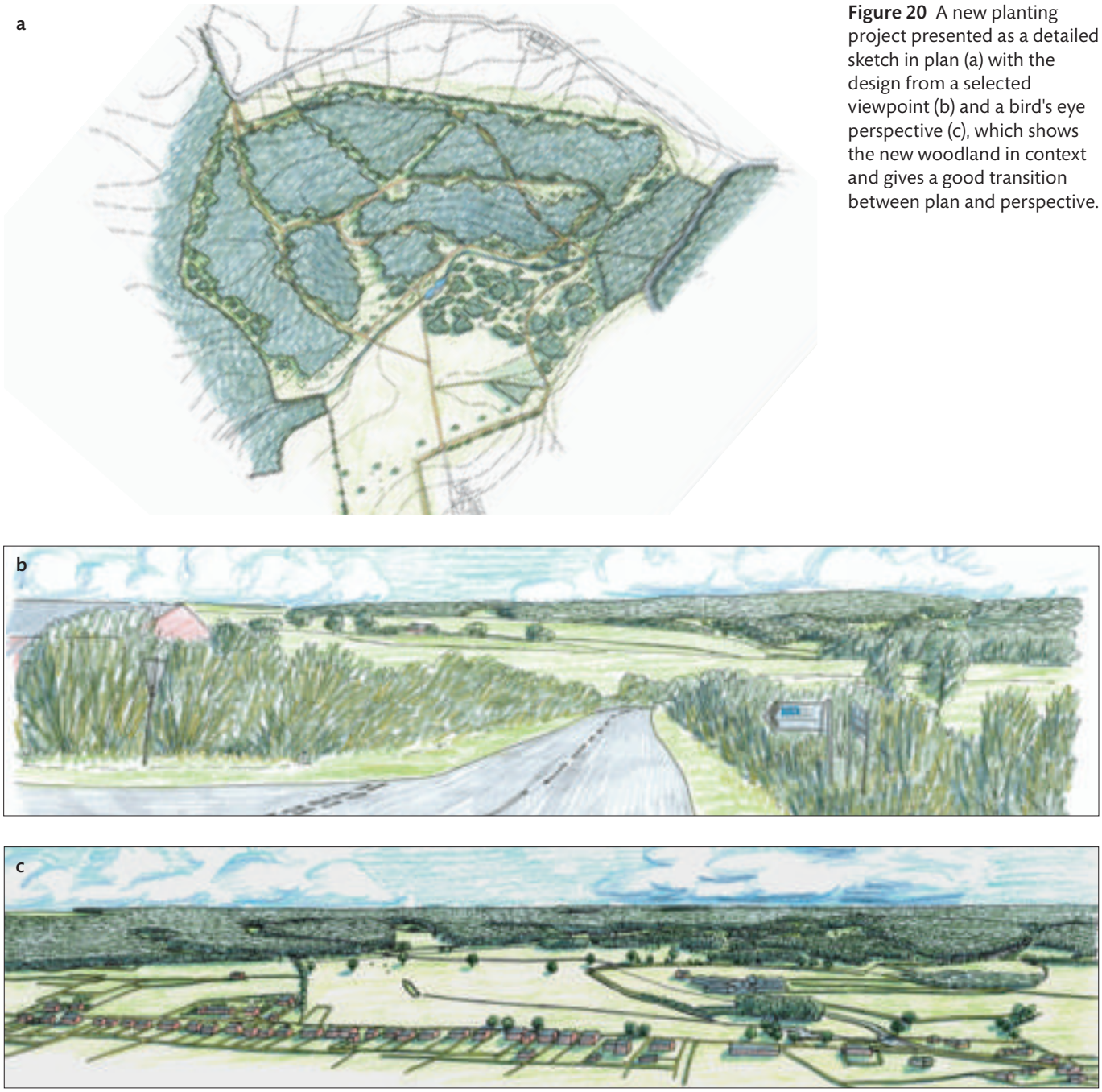


Figure 20 A new planting project presented as a detailed sketch in plan (a) with the design from a selected viewpoint (b) and a bird's eye perspective (c), which shows the new woodland in context and gives a good transition between plan and perspective.

Design for felling and restocking

In forests and woodlands which have reached or are shortly to reach an age when harvesting operations or regeneration fellings are due, good planning is important for three reasons:

- To ensure that opportunities are taken to improve the design of the forest.
- To ensure that the impact of felling coupes in the landscape is reduced.
- To introduce structural diversity to even-aged forests planted with single species.

It is important to design the pattern of felling coupes over the whole forest management plan area for both the short and long term. Areas to be retained either in the long term (20–30 years) or indefinitely (for old growth) should also be included in the plan. In this context a felling coupe is not only the term for an area to be clearfelled, but includes any kind of low-impact silvicultural system where a stand is to be treated differently from another one and which may therefore show up as a distinct shape over time. Such areas should be designed in the same way as for clearfelling, even though their visual impact may be lower, at least in the first stages of silvicultural operations.

The coupe pattern should be based on the landform analysis in situations where:

- the forest is relatively even-aged;
- the timing of felling is flexible;
- the landform is prominent;
- the forest is at low risk from wind damage (for example due to shelter, soils, tree height).

This is where the perspectives of the visual forces analysis are most useful (see page 16).

Methods of felling coupe design

The design of the felling coupe pattern should be approached as follows (see Figure 21a–d):

- Make use of the major lines of force that subdivide the landscape into a number of obvious units (such as hill-top caps, valleys or knolls) for the first breakdown of the forest. Take care to cross skylines at appropriate places (e.g. saddles or breaks of slope).
- Subdivide these large shapes using the next most important visual force arrows.
- Reflect the scale of the landscape in the sizes of coupes: larger towards the summit and smaller lower down the slopes.
- Use the minor visual force arrows to help create interlocking coupes. The type of landform and pattern of semi-natural vegetation should dictate the character of the shapes – for example, rounded and flowing or spiky and angular.

In the same way as described for new planting, use tracing paper laid over the analysis perspectives as a base for the initial sketches. Use the constraints and opportunities analysis to test the practicalities of the early coupe patterns and gradually refine them towards a good balance between all factors.

This ideal design approach described above is not feasible where:

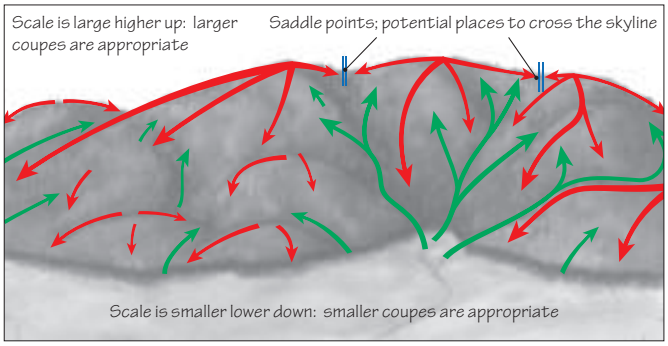
- the plan is a revision of an earlier one which already created structural and spatial diversity;
- the stand structure is less homogeneous and there are age class variations, perhaps due to phased planting or earlier unplanned felling and replanting;
- there are big yield class differences so that some areas are not harvestable while others are fully mature.

In this situation a draft coupe pattern should be developed in plan based on these practical constraints while also trying to ensure a spread of felling phases and creating interlocking, organic shapes as far as possible. The resulting draft coupe pattern should then be tested in perspective as described on page 23 and adjustments made to achieve as good a result as possible. Suboptimal shapes can often be improved when designing the replanting and by the use of internal open spaces (Figure 22).

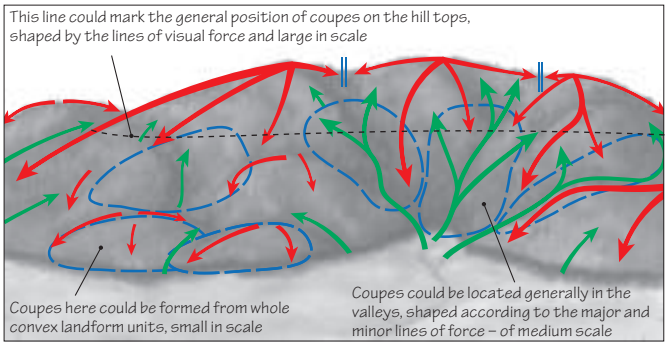
Figure 21 Using the landform analysis to help develop a pattern of felling coupes on a forested hillside.

(a) The forest clothes the whole skyline so felling coupes will be needed that take off the hill tops, avoiding subdivisions.

(b) Landform analysis – in a forest with no significant constraints on coupe design, the landform can provide the main driver for a pattern which reflects the shape and scale of the landscape.



(c) The landform influences the general location and relative scale of coupes at the first stage of design.



(d) The relationship of the coupe pattern to the landform can be seen quite clearly in this sketch.

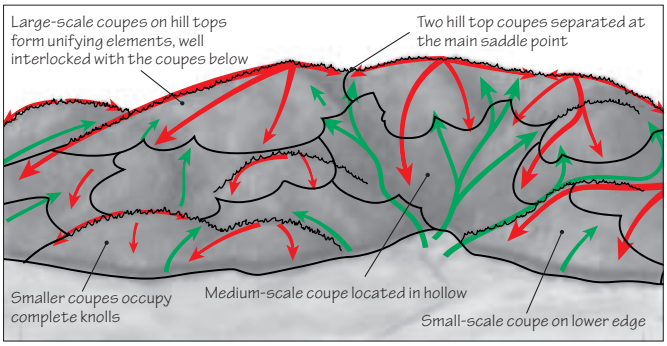
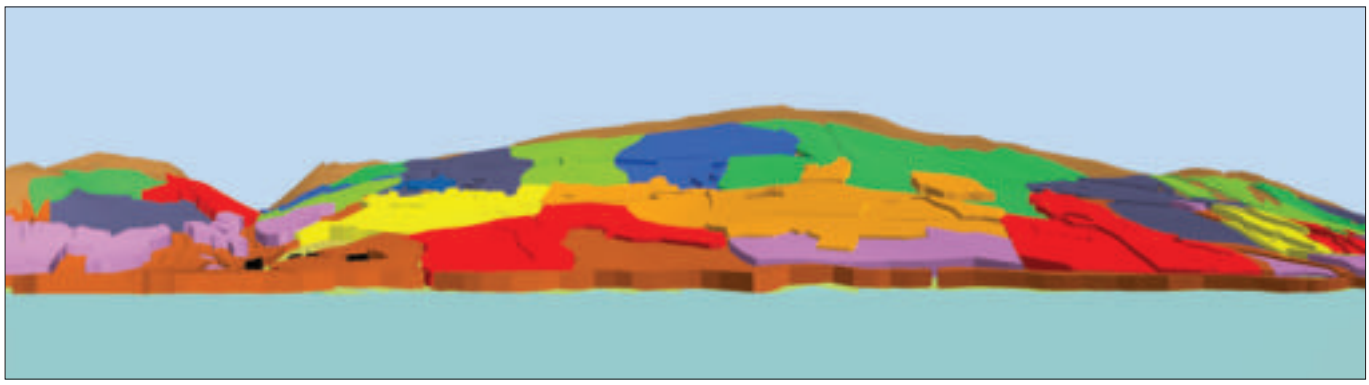


Figure 22 An example of a coupe pattern, which although driven more by stand structure and constraints than by the landform, manages to establish a diverse stand structure and phasing allowing restructuring to develop.

(a) The original landscape from a key agreed viewpoint.

(b) A computer generated model of the proposed felling coupe pattern.



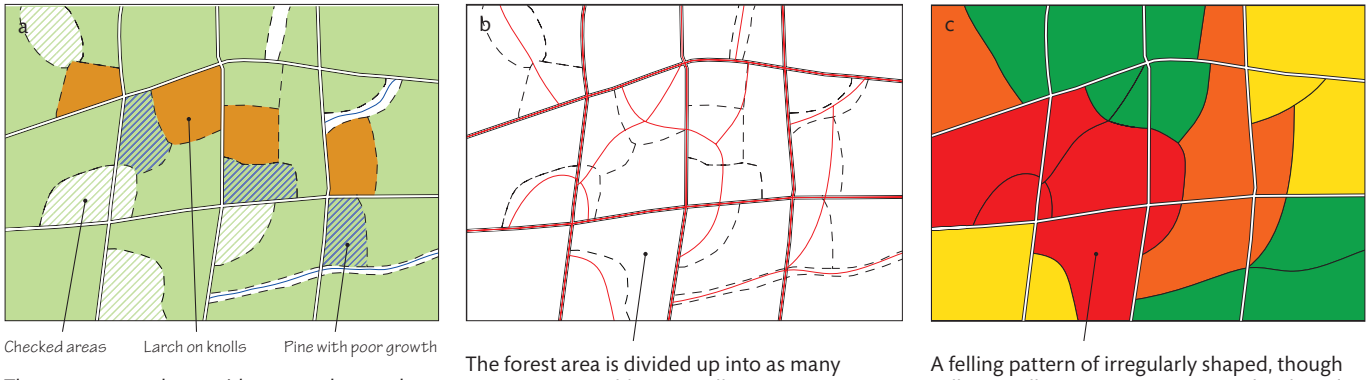
Design in high windthrow risk areas

In landscapes where wind is a serious limiting factor it may be necessary, in order to reduce the risk of further damage, to rely on windfirm boundaries which may not be ideal in environmental or visual terms. There are several options for design in such areas:

- Aggregate combinations of the smallest self-contained units present (that could be harvested independently) to make irregular interlocking shapes.
- Take a risk by felling within a shape where the wind can only blow trees down as far as the nearest green edge.
- Accept poor felling shapes but replant them to a different pattern. It may be better to design the restocking pattern first and to fit the felling into it in such circumstances.

More effort should be put into the design of the restocking pattern so that poor shapes do not continue into the next rotation. Figure 23 shows the method for achieving this approach.

Figure 23 Developing a coupe design for a plantation of even-aged Sitka spruce in an area of high windthrow risk. (a) The main open spaces and green edges are rectilinear and there is a high risk of wind blowing down edges cut through stands. (b) An interpretation of the area as 'minimum harvestable units'. (c) An interlocking coupe pattern based on a combination of these.



There are some places with green edges and stands of shorter or more stable species which might provide opportunities to develop reasonably stable edges, at least for a few years.

The forest area is divided up into as many sections as possible, using all opportunities to identify potentially stable edges based on the information from the stand map. These are 'minimum harvestable units'.

A felling pattern of irregularly shaped, though still generally geometric, coupes is developed by joining together several of the minimum harvestable units shown in (b), then phasing them as normal.

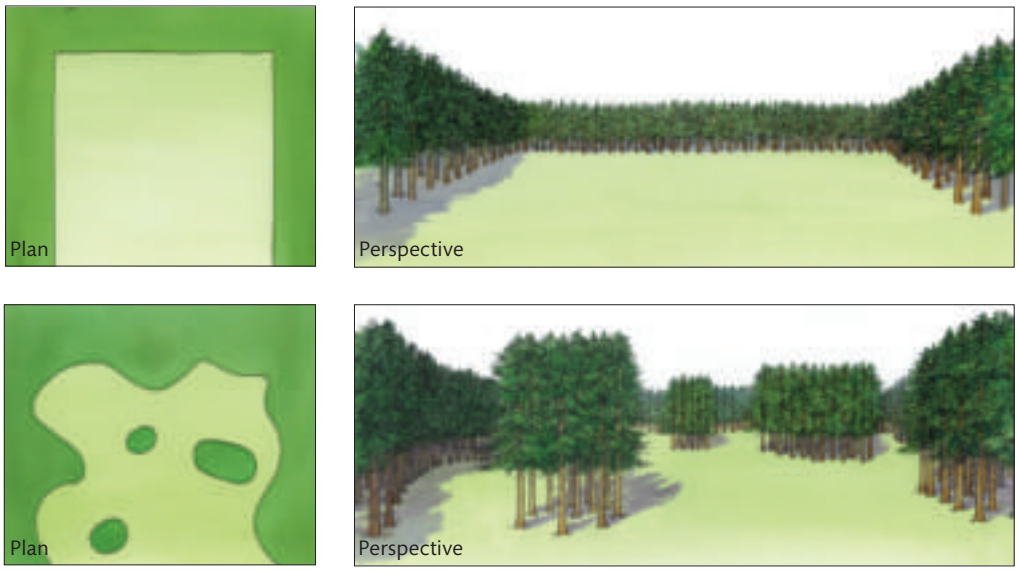
Design in flatter areas

In flatter landscapes external views are usually not so important but internal views of felled coupes are obtained from roads and paths. Organic interlocking shapes are preferred, especially where existing gridiron-like compartment patterns exist. Soil and vegetation changes may be of more use than landform, although even slight variations in topography can contribute to the design. Design in plan and visualise important external and internal views to test the effect. Figure 24 shows how to design shapes with the internal views in mind.

Design in smaller woods

Where the wood is very small it may only be necessary to design two coupes and perhaps an area to be retained. This is obviously a fairly simple task but is still worth doing with consideration for the local landscape and how it is viewed. For the smallest of woodlands it may be better to fell the entire area all at once, though there is no need for a forest management plan in such cases. Figure 25 shows how to consider this.

Figure 24 Designing felling coupes in flatter areas where internal views are important.



There is little diversity or visual interest in this simple, geometric coupe shape when viewed from the adjacent path.

In contrast, this coupe has a more organic shape with foreground retentions, which provide diversity and give a sense of depth to the view.

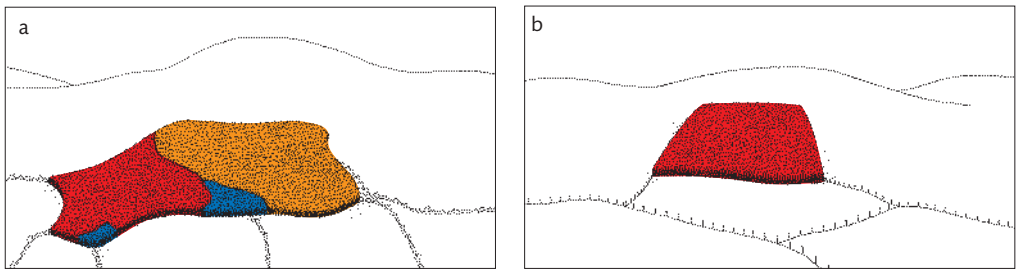


Figure 25 (a) This small wood fits well into the landscape so it can be felled in two phases with a small area retained. (b) This small-scale wood fits poorly into the landscape and would be best felled at one time.

Timing of felling

Having designed the coupe pattern the next decision is the phasing of felling. According to the UK Forestry Standard, the felling of adjacent coupes should be spread over time so that the restocking on the first coupe to be felled has reached a minimum of 2 m in height before an adjacent coupe is felled. This is easier where variations in the age of the standing trees give flexibility or where the site is windfirm. It makes little difference economically to fell over a 10-year period (5 years either side of the optimum), but the stability of the stand may be less certain on some sites, especially if a new edge is opened.

The larger the forest and the more coupes in the design, the greater the choice of timing and spread of age classes. It is worth exploring several possibilities for organising the time sequence, perhaps starting with the least visually sensitive coupes or the most important to open up for biodiversity reasons. In larger plans several dispersed coupes may be felled during a single phase. In order to ensure that a minimum 2 m height difference is achieved, be realistic about the time this takes following felling. The tendency to use 5-year phase intervals in the felling programme may mean that it is difficult to achieve the 2 m height difference, especially if there have been delays in establishing the restocking. In this case either the phase interval should be extended or a two-phase difference between adjacent coupes should be planned so that there is a 10-year interval between them, ensuring a greater likelihood of a 2 m height difference being achieved (Figure 26). In some cases, owing to the existing structure of stands (e.g. age variation, species or yield class), the limitations to possible phasing may tend to dictate some aspects of the coupe pattern and the flexibility to disperse fellings across the forest or woodland may not be as great. However, the 2 m height difference between adjacent coupes is still the aim.

Courtesy of Cawdor Forestry Ltd

Figure 26 A plan of a coupe layout with timings which aim to enable a 2 m height difference at restocking – notice how many of the coupes are phased so that they are not adjacent to the next phase, or only so along a short section of a common boundary.

Felling design using low-impact silvicultural systems

At the coupe design stage the choice of silvicultural system should be considered.

If the whole woodland is being treated as one single system then there are no separate coupes (but see group felling below). If parts of the forest or woodland are to be treated either by different systems – such as partly clearfelling and partly a selection system of some kind – or at different times, then coupe design remains necessary, because the rate of regeneration will cause changes to the canopy structure and these will show up as shapes in the landscape.

The main silvicultural options to consider are:

- Clearfell and replant/naturally regenerate: this is currently the most common option, especially in plantation conifer forests.
- Uniform shelterwood: this resembles slow clearfelling and produces a fairly even-aged successor stand.
- Group shelterwood: this breaks up the canopy using small coupes which gradually amalgamate into one larger, almost even-aged stand.
- Group selection: the canopy is broken by small coupes that create a more irregular effect over time and leads to an uneven-aged stand.
- Single-tree selection: where the forest achieves a wide range of age classes within a stand and the canopy remains closed at all times.
- Minimum intervention for parts of a woodland.

All except the clearfell and replant/naturally regenerate can be classed as 'low-impact silvicultural systems'. The choice of system depends on:

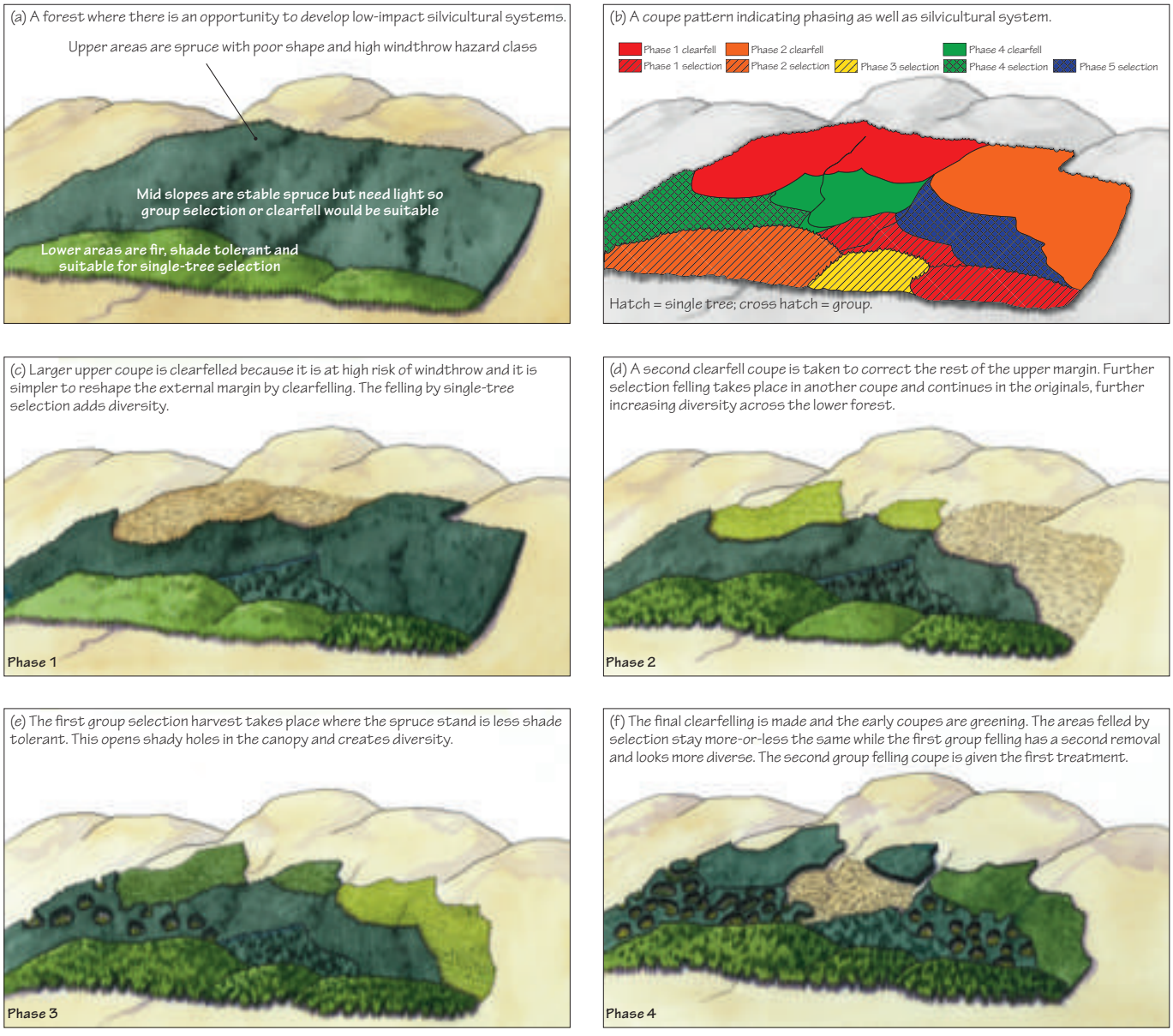
- management objectives;
- species characteristics;
- site conditions;
- degree of management available over the rotation.

If the forest contains design problems associated with the original layout, species composition or smothering of areas which should be kept open, then clearfelling offers the best opportunity to achieve a relatively rapid and sustainable solution. This strategy can also help to restructure a even-aged forest, with low-impact silvicultural systems used in specific areas at first and perhaps extended later in the next rotation. Coupes to be managed by such systems can often be of a larger scale since their impact on the site and landscape is likely to be less.

Landscapes where a slow rate of change is desirable also benefit from the use of low-impact silvicultural systems, such as urban woodlands where sudden, dramatic change in the landscape may not be welcomed by the local community.

Figure 27 shows an example of a forest where different forms of low-impact silvicultural systems together with more traditional clearfelling and replanting are used.

Figure 27 An example of a forest where there is the opportunity to develop low-impact silvicultural systems: (a) is the original forest with some analysis of potential; (b) shows a coupe pattern which indicates phasing as well as suitable silvicultural systems (some clearfell and restock, and some group shelterwood and single-tree selection). These are shown over time in (c)–(f) so that the changing appearance can be seen where the textural changes are the main effect in the single tree selection and the pattern of holes in the group selection.



Preparing coupes in younger stands

There are opportunities to design future felling coupes in many areas of young stands where existing green edges are unlikely to be acceptable as boundaries.

The method is to proceed with coupe design as described above with the aim of making so-called 'severance cuts' along the proposed boundaries. This involves removing trees to a sufficient width to allow stable edges to develop that are less likely to blow down when neighbouring stands are eventually felled. The cut swathe should be a minimum of 20 m wide, and made well before the stand has reached critical height for windthrow. The 'window of opportunity' for these operations is extremely short, for example 17 years for yield class 12 Sitka spruce in Windthrow Hazard Class 6 or 19 years for yield class 16 in Windthrow Hazard Class 5 areas. Forest management plans should therefore be prepared well in advance if stand structure is to be manipulated.

Presentation of the felling design

The felling design should be prepared as a colour-coded map of felling phases with cross-hatching used to show different low-impact silvicultural treatments. In cases where the landscape is visible a series of perspectives showing the visual effects of the coupe pattern and phasing should be prepared. Perspectives may also be needed in flatter areas if there are significant internal views such as those from public roads or recreation routes.

In addition to the colour-coded maps and coupe sketches, some of the most sensitive areas should be shown as a time sequence to demonstrate the visual effect of each phase of felling. This can be extremely useful in communicating the rate of change over time to the public who may not understand the coloured phasing or be able to visualise what the effect of phased felling and restocking will be. The gradual regrowth of the replanted or regenerated areas and the evolution of stands managed under low-impact silvicultural systems should be shown together with any improvements in external shapes or internal open spaces so that the impact of the felling itself is set in a proper context. Figure 28 shows an example of a coupe pattern presented in plan and perspective, supported by the original photograph and the analysis.

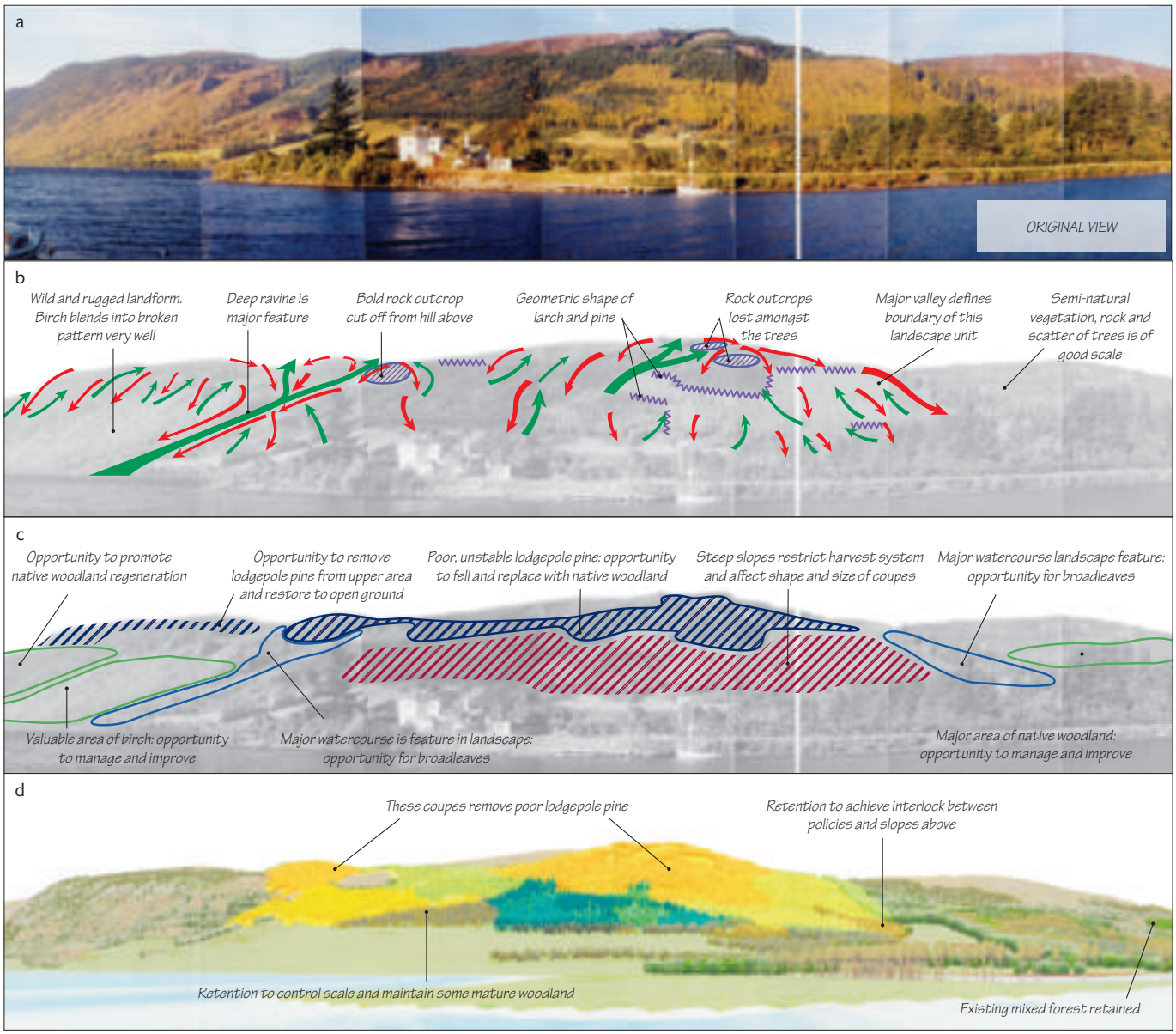
Restocking design

Once the felling pattern has been designed move on to the restocking. If the coupe pattern is already well designed in terms of shape and scale then it is a simple task to assign a new species or mixture of species to a complete coupe and this should be the rule. Exceptions to this are:

- where the external margins need to be redesigned by retreating or advancing from the original boundary;
- where a large coupe needs smaller areas of broadleaves or another species within it;
- where felling shapes could not be designed to fit the landscape, in which case the restocking should resolve this using new shapes (possibly designed ahead of the felling design);
- where open space needs to be created following removal of the existing trees.

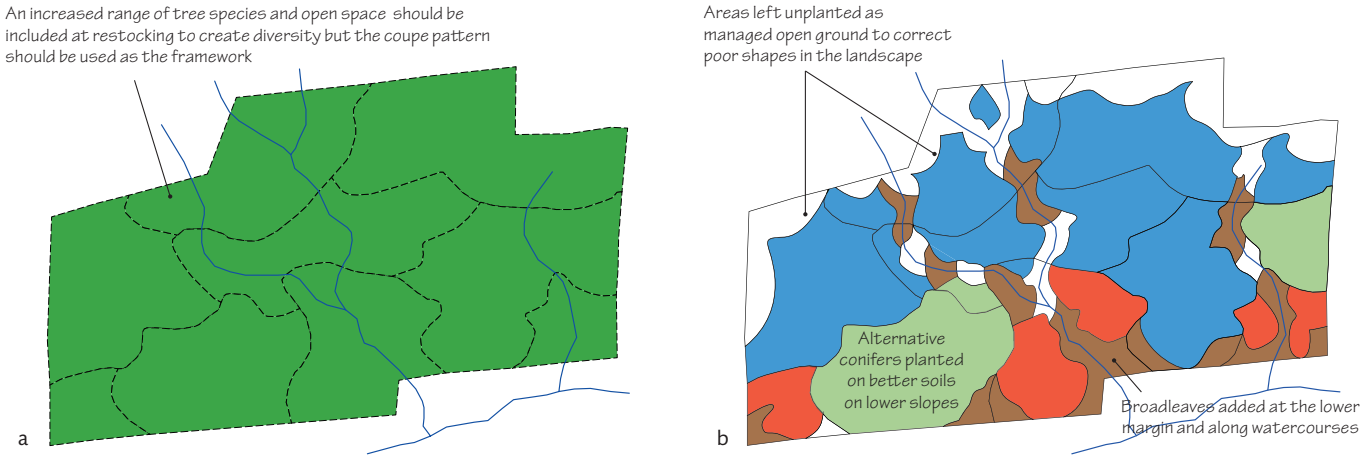
The design should be prepared in the same way as the felling coupe layout, using tracing paper or acetate overlaid on the felling designs and landscape analyses. Figure 29 shows the relationship between a coupe pattern and a restocking pattern, which takes the range of aspects into account.

Figure 28 A sequence of images which show the felling design from a required viewpoint: (a) the panoramic photograph of the perspective view; (b) the landscape character analysis, (c) the constraints and opportunities analysis and (d) the proposed coupe pattern.



Courtesy of Dochfour Estate and Cawdor Forestry Ltd

Figure 29 (a) A coupe pattern overlay (black dashed lines) designed to restructure an evergreen conifer forest lacking in diversity, and (b) a restocking design that is largely based on the felling coupe pattern in (a) except for where smaller elements or corrections to the original layout are needed.



Choice of species

The species to be replanted after felling may not necessarily be equivalent to those used in the first rotation. Opportunities should be taken to diversify areas which originally had single or limited species diversity using a range of trees as single species or in mixtures as appropriate. Use the soil and original vegetation patterns as a guide as well as the considerations of scale and proportion. In some cases the forest may be converted from a more commercial type to native woodland over time, phase by phase, in which case use NVC types as a guide.

Reference should also be made to the UK Forestry Standard series of Guidelines (see Further reading and useful sources of information), all of which provide essential information on general forestry practice and other aspects of sustainable forest management that can help to inform the appropriate choice of species for a sustainable future forest or woodland.

Design of open ground

Often the design of areas to be left open, either pre-existing or newly created following felling, is a more important task than species choice. The attention to detail of their shape is vital in order to avoid parallel-sided watercourses, rides or roads for example. Some spaces may need to be bigger than their minimum requirements (for archaeological site protection, for example) in order to suit the scale of the landscape. The method of design in visible areas is the same as for the design of internal open spaces at new planting: use perspective sketches to ensure that shape and scale are right. It is often a good idea to start with the external margins and then to lay out the species and internal open spaces as described for the design of new woodlands in the previous section.

Correction of previous layout problems

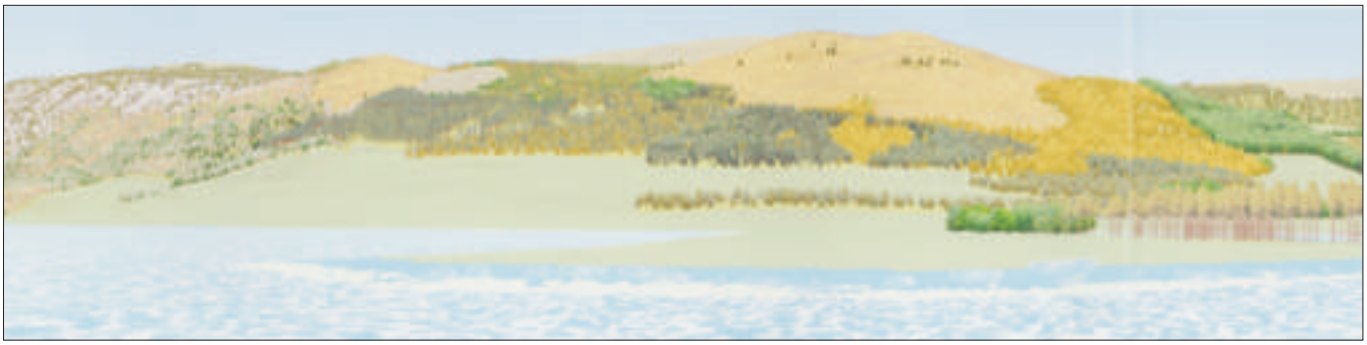
Eradicate previously established geometric rides in compartment layouts by designing new species/coupe shapes to follow the influences of landform and/or vegetation patterns. This may involve adopting a strategy of delaying the restocking of some areas within the new pattern for a period where the previous layout followed a poorly designed shape but was used at felling because it offered a windfirm edge. Newly designed rides or linear open spaces can be used to separate species areas in order to develop new windfirm edges.

Presentation of the restocking design

As for felling, a colour-coded map of the new species pattern and open space is needed. Perspective sketches should be used in visible areas to show how the restocking pattern fits the landscape. This is the culmination of the time series, when these are used, as described above, perhaps with some 5 or 10 years added to the final appearance to show the forest developed beyond the final felling phase. It is important not to show this as if the forest will be all the same age at the end of the plan. Figure 30 shows an example of the presentation of a restocking design in plan and perspective.

Areas where delayed restocking is planned, or where previously stocked areas are to remain as open space, should be identified. Management prescriptions aimed at maintaining them in an open condition or for developing semi-natural vegetation should also be included since the practicalities of retaining open ground in or around the forest may be expensive or difficult to achieve.

Figure 30 A perspective view for the project illustrated in Figure 28, showing the species pattern and the age structure as it would appear following the restocking of the final felling phase.



Courtesy of Dochfour Estate and Cawdor Forestry Ltd

Documentation

Once the sketch design has reached a satisfactory stage of refinement it becomes the key component of the forest management plan around which the associated information – such as statistics on felling areas per phase or species proportions – is assembled. Document the plan according to the guidance given earlier and to any specific requirements of the relevant forestry grants and regulatory body.

Appreciate that people unfamiliar with the forest or woodland will be reviewing the plan and forming an opinion on its quality largely on the basis of what has been presented to them. Careful thought should be given not only to what is included in the plan but also to how it can be communicated to best effect. In particular, be aware that it is not possible to form an opinion on the appearance of the forest in the landscape without perspective sketches or visualisations.

Approval

The forestry authority approves the forest management plan according to the procedures operating at the time it is submitted. As some modifications to the plan may be necessary, perhaps following consultation, remember to date maps and to design the document to allow parts of it to be altered without reworking the whole. Once approval has been given to the first phase of operations, the detailed planning for implementation can proceed.

If an Environmental Impact Assessment (EIA) has been requested it is usually submitted at the same time as the forest management plan. Ideally, the issues which were raised at the time of the determination of the need for an EIA will already have been addressed by adding a set of statements explaining the scale and magnitude of impact on the relevant resources in the plan.

If a Landscape and Visual Impact Assessment (LVIA) is part of the EIA, the local landscape character analysis should be used together with the regional Landscape Character Assessment (LCA) for the area to test what differences to character are expected to result from the plan and whether these are adverse or beneficial. Similarly, the perspective views should be used to assess the effects on visual amenity from agreed viewpoints. In this case, each viewpoint should be assessed for its sensitivity according to the combination of the three factors of visibility, number of viewers and nature of the viewing experience (see the UKFS Guidelines on *Forests and landscape*). A table can be used to present the assessment of the scale and magnitude of the visual changes as adverse or beneficial for each resource, whether landscape or visual. The section on Design techniques (page 41) provides more information on selecting and recording viewpoints for use in LVIAs.

5. Implementation

Plans are implemented by action on the ground: planting, natural regeneration, silvicultural management, felling and restocking. It is very important to ensure that operational plans are prepared based exactly on the layout and boundaries of the planting areas and designed felling coupes. On the ground these must also be laid out as closely as possible to the approved design. If problems are met on the ground or amendments are to be made to the plan, approval must be sought from the forestry grants and regulatory body before changing the layout or selling the timber. A global positioning system (GPS) can be used to mark out the boundary of a coupe shape fairly precisely, taking accurate coordinates from the GIS. Figure 31 shows a coupe which has been felled according to a design, demonstrating how the appearance matches that of the design.

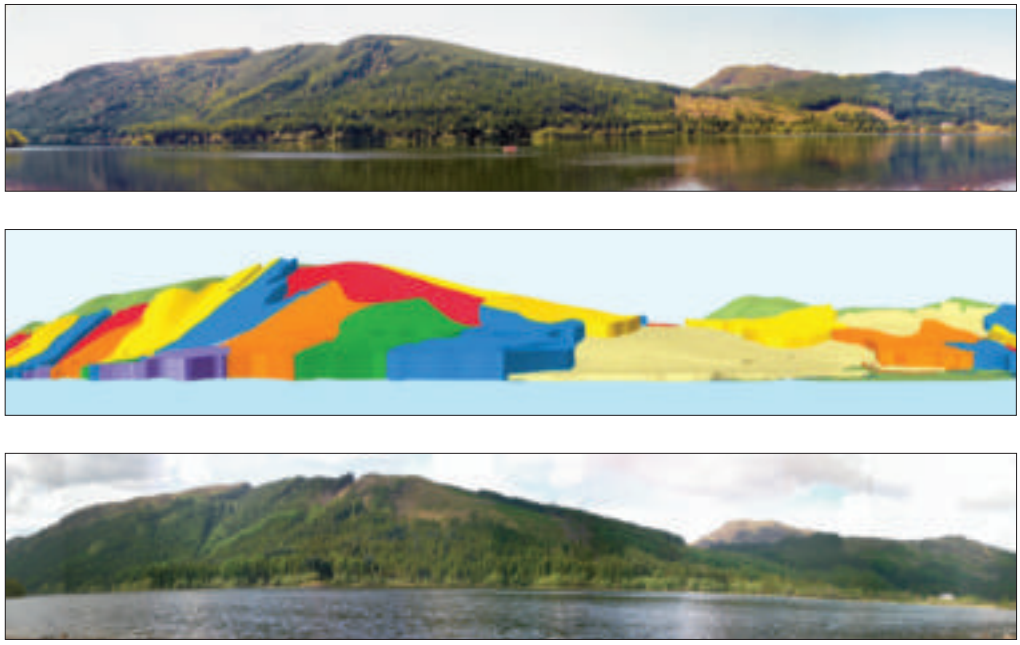


Figure 31 A first phase felling following an approved design: (a) the original view; (b) a computer visualisation showing coupe shapes and phases (the first phase is shown in red); and (c) the actual appearance some years after phase 1 felling.

6. Monitoring

Once the first phase of approved work has been carried out it should be monitored to see how well it achieved the plan objectives. Much can be learned from early experience of implementation, which can be fed back to any revisions necessary before the next phase of action. Records of the work such as photographs from the key viewpoints can be useful to show progress and to test results against expectations. In this way confidence builds up and it will be easier to gain approval and to implement future phases. Refer to the UK Forestry Standard, which contains a section on monitoring.

7. Revision

The final phase of the forest design planning process is revision. This means going back to the scoping stage and working through the whole process once again. Depending on the success of the implementation of the first phase, or on the number of changes needed as a result of policy development, or, for that matter, the effect of unforeseen circumstances, the revision may be relatively minor or it may need a complete reworking of the plan.

Design techniques

This section sets out the recommended design techniques and materials for preparing a forest management plan. Although many aspects of the plan will be generated and stored digitally, it is still preferable to use traditional, manual design techniques for some of the planning stages, such as when preparing analyses, sketch designs and certain aspects of the presentation. Usually, a mix of manual and digital techniques will be used, depending on the scale and nature of the project, available resources, and the experience, skills and preferences of the designer.

How to start

There will be a need for plenty of space to pin up sketches on a wall or pinboard, some large flat surfaces for laying out printed maps and drawings, good light, a computer with photographic editing software, a colour printer and a good quality digital camera. Although not essential, access to geographic information system (GIS) or computer-aided design (CAD) software can reduce production time and help create plans that are to a high professional standard of accuracy and presentation (see Computer-based visualisation tools on page 47).

Basic materials are panoramic photographs, aerial photographs, Ordnance Survey 1:10 000 maps with contours and forest stock maps (if the plan covers existing forests). Colour and black and white photocopies or print-outs of the maps and photographs are useful for sketching out and developing design ideas. Tracing paper for overlays and sketches, a range of felt-tip pens and coloured crayons are also needed.

Choosing viewpoints

Where the forest or woodland is in a highly visible or sensitive location, planning will require the use of a combination of plan and perspective views. An important first task is to identify the viewpoints that will be important for the forest design. It is useful to make a distinction between 'public' viewpoints, such as those from which the landscape is normally visible from houses or footpaths, and those which help us understand and appreciate the wider landscape character. Try to obtain a wide sample of viewpoints, and select the most appropriate for design, planning and presentation purposes. Sometimes the best viewpoints are not immediately obvious, and may best be obtained by, for example, climbing up a hillside or rock outcrop where the view opens out or where obscuring foreground vegetation can be avoided. Figure 32 shows an example of a series of viewpoints for a project in Hertfordshire, selected to reflect different types of view.

The number of viewpoints needed will depend primarily on the scale and nature of the plan and the importance of the area. A forest or woodland site located on a valley side will probably require a series of views taken at intervals along the road following the valley floor, for example. Where the forest covers a hill there may be a need to obtain photographs from all angles. It is a good idea to first scope out the potential viewpoints on a map before setting out to take the photographs. Consider views from houses, roads, paths, well-known viewpoints, and hill or mountain summits.

If a Landscape and Visual Impact Assessment (LVIA) is needed it is advisable to agree the viewpoints with consultees before design work begins so that only the most sensitive are used for the visual impact assessment. Figure 32 and Table 4 show how the sensitivity of each viewpoint should be recorded.

Figure 32 A map showing all the key viewpoints for a project – selected to give a good all-round sample of the landscape. Some viewpoints are along roads, others are from walking paths and some are from residential areas.

Table 4 An example of an assessment of sensitivity from the viewpoints shown in the map in Figure 32.

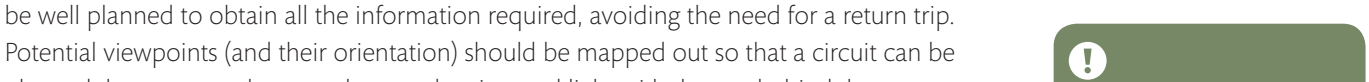
VP	Location	Description	Site visibility	Number of viewers	Sensitivity to change
1	TL17209 10963 Junction of B651 and Coleman Green Lane	This view is the point at which the road enters the site. The landscape is partly hidden by hedges and the horizon is low. The view is seen by everyone driving along this busy route travelling northwards on leaving Sandridge. It represents a major threshold to the proposed forest.	M	H	M
2	TL17422 11204 Part way along Coleman Green Lane	This view is seen by traffic travelling northwards along Coleman Green Lane. This is a fairly quiet road leading to dispersed houses. The road passes through the proposed forest, which will be on either side until the junction with Hammonds Lane. The large trees in the hedges are part of the character while the hedges themselves already provide some screening.	M	M	M
3	TL17341 10757 Looking NNE from backs of houses on the northern edge of Sandridge	This view is one that will be obtained by residents in the houses backing onto the fields to the north of Sandridge. The proposed forest site starts a field away, leaving an open area between it and the houses. At present the view is simple and open but without many features.	M	H	H
4	TL17433 10673 Looking NE from Hertfordshire Way as it leaves Sandridge	This view is partly that gained by walkers using the Hertfordshire Way long-distance footpath and partly by residents of the houses on the northern boundary of Sandridge. The terrain is fairly flat and open with the views contained by hedges or by the woodland in the distance.	M	H	H
5	TL17732 10550 Fairshot Court	This view is from in front of Fairshot Court and is also similar to the view obtained by teachers and pupils at the nearby primary school. The view is quite heavily screened by hedges with large trees. The proposed forest will start one field over.	L	M	H
6	TL17962 10840 Wood looking west along the Hertfordshire Way	This view is looking southwest from the edge of the wood, as experienced by walkers. The proposed forest will occupy the field on the other side of the hedge, making a section of the walk pass through woodland on both sides.	L	M	H
7	TL18313 11257 Looking west from the junction of the Hertfordshire Way and Hammonds Lane	This view looks towards the corner of the proposed woodland, which will be behind the hedge beyond the finger post. It is the view seen by drivers passing along Hammonds Lane towards Sandridge as well as by walkers along the lane as they turn onto the bridleway. The hedges provide significant screening of the view into the site. Woodland already features in the view.	L	M	M
8	TL18622 11343 View down Hammonds Lane from Hammonds Farm looking west	This view, as seen by residents at the farm and by travellers along Hammonds Lane, takes in a considerable area of the proposal although the hedges and hedgerow trees coalesce in the view to screen the middle distance and to reduce the apparent openness of the view. There are also existing woodlands in the view which will act as anchors for the new forest in the landscape.	M	M	H
9	TL18756 11201 From public footpath between Hammonds Lane and Fairfolds	This view is from a higher elevation looking across the middle ground to the far ridge, most of which will form part of the proposed forest, as seen by walkers using the footpath. Woodland is already a feature of the ridge while trees in the hedges provide a 'bosky' feeling to the scene.	H	L	H

Taking photographs

The object of survey photography is to show as much detail of the landscape as possible, especially topography. Since such surveys may involve travelling to a distant site, they should be well planned to obtain all the information required, avoiding the need for a return trip. Potential viewpoints (and their orientation) should be mapped out so that a circuit can be planned that ensures photographs are taken in good light with the sun behind the camera.

The most appropriate camera is a 35 mm digital single lens reflex (DSLR) camera with through-the-lens metering and a 50 mm lens (knowing the focal length of a camera lens is important for generating computer visualisations, especially if these are to be included in an LVIA as part of an Environmental Statement where such data have to be included). Modern compact 'point-and-shoot' digital cameras are acceptable in good light and under front-lit conditions, as long as the image size is more than around eight megapixels, to ensure good resolution for printing and display purposes. Models with manual setting of exposure and shutter speed are preferable to fully automatic cameras so that details of the landscape can be captured using accurate exposure settings which have not been distorted by light from the sky.

Landscape composition cannot usually be encompassed in a single photo frame, so unless the camera has a built-in panorama setting (which many do) take a number of photographs that can be assembled into a single panorama using 'photo-stitch' software (which ensures colour and tonal matching and a seamless join). An overlap of around 25% is needed from one frame to the next – otherwise the panorama software will not work correctly. The format can be 'landscape' or 'portrait' depending on the depth of the scene. Ensure that everything from some sky above down to foreground is included and that the extreme ends of the panorama encompass scenery outside the design area. Figure 33 shows a typical example of a digital panoramic photograph with seamless joins.



A standard 50 mm lens gives a similar perspective to the human eye. Lenses with focal lengths <50 mm are 'wide-angle' because they have a wider angle of view. Lenses with focal lengths >50 mm are known as 'telephoto', and these offer greater magnification due to their much narrower angle of view.

Using photographs

Colour photographs are good for reference purposes but black and white or greyscale versions provide more appropriate backdrops for analysis and colour-coding felling coupes. These can be simply created using photo-editing software by converting colour originals to greyscale. It may also be helpful to adjust the contrast and brightness to get the photograph to show as much as possible of the landscape detail (Figure 34).

The landscape analyses information (see page 14) can either be drawn manually on greyscale photographs or with computer-based vector drawing packages. The latter can be used to create lines and polygons of different colours and degrees of transparency in addition to text annotations.

Figure 33 An example of a colour digital panoramic photograph suitable for use in design.

Figure 34 A panoramic photograph converted to greyscale, with some adjustment of brightness and contrast to show up the details.

Computer-generated drawings are both clear to read and can be saved as digital files, removing the need for scanning from prints. They can also be printed out later at the required size.

Digital techniques are not appropriate for sketch designs, as already noted earlier. Drawing by hand is much better, using suitably sized photographs as a base. A useful technique is to create an A1 size document on the computer and set out the photos enlarged to fit across the sheet (in portrait or landscape format as appropriate). This sheet can then be printed on a large-format printer and each photo then cut out for use in one of the methods described below:

- For the clearest drawing over the photographs, especially if the tones are subtle (even after digital adjustment), use fine-tipped water-soluble pens on acetate overlays (drawings can easily be wiped off if changes are needed to the design (Figure 35). Medium-weight acetate sheets are recommended, although rolls are also available so that longer panoramic photos can be covered with a single piece. The acetate overlay should be secured with masking tape to the rear of the photo. The photos and their overlay should be kept flat or loosely rolled.

- Tracing paper can also be used in the same way and this is easier to draw on with pencils and then to use more layers as necessary. It is a good idea to use a tracing box or light table to ensure the best visibility of the detail through the tracing paper. Tracing paper also comes in rolls of different weights – thinner, more transparent weights are best.

- If printing the photos is relatively cheap then it is also possible to draw directly on them. This may be the alternative way of preparing the analysis perspectives which then need to be scanned for use in digital documents. Some of the quality of the original photos may be lost when scanning from prints, so these need to be as high resolution as possible.

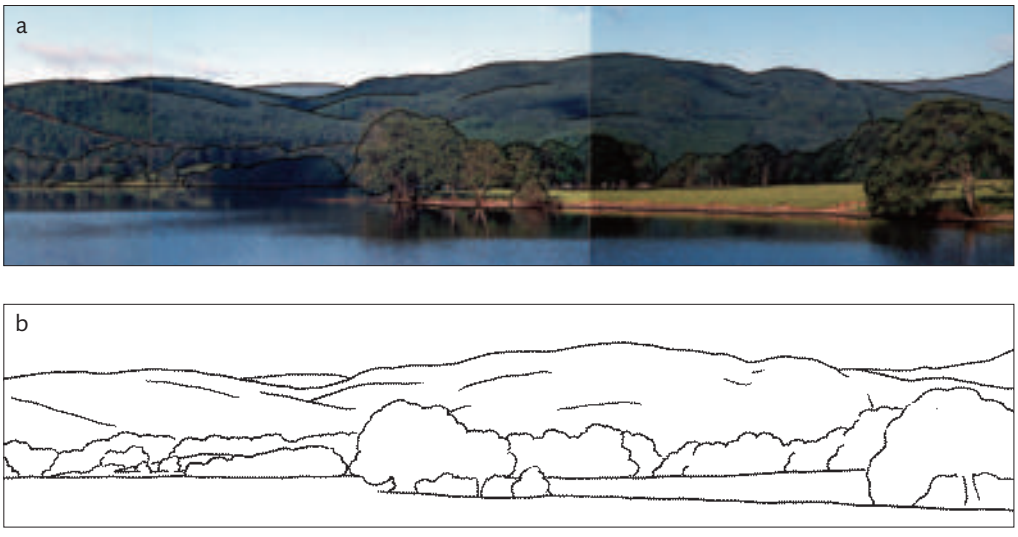


Figure 35 Key landscape features can be traced from colour panoramic photographs (a) using acetate or tracing paper overlays. The resulting outlines (b) can then be photocopied to provide a base for design work.

Maps

Maps are, of course, the main tool used in forest management planning. They are needed at four key stages of the planning process:

- Survey – to show basic site information.
- Analysis – to show the assessments of the survey information.
- Synthesis – to show the design concept.
- Implementation – to record the intentions of work to implement the forest design.

Contour maps are particularly important for visual force analysis (see page 16).

GIS software can be particularly useful during the forest management planning process to capture, store, manipulate, analyse, manage, and present all types of geographical data. The resulting maps can be output as a single layer or combination of layers with colours and hatching that clearly presents the information. The GIS also offers the possibility to 'sieve out' key layers for later analysis (see Constraints and opportunities analysis on page 14).

The landscape character analysis is still best done by hand, interpreting the contours and drawing the landform lines of force arrows in felt-tip pen, although it is possible to digitise lines and show them at different thicknesses. The manually drawn landform analysis should then be scanned and text added within the photo-editing or word processing software.

The final forest management plan maps are best prepared using a GIS so that the operational plans can be directly related to the planting or coupe shapes. The set of standard colours and hatchings (see page 7) should be used for tree species and to colour code felling and restocking phases. Where possible, present all information at the same scale. However, for large projects it may be useful to show the wider context at a smaller scale and then present strategic zones at a larger scale. A scale of 1:10 000 is preferred, but 1:5000 may be more appropriate for smaller woodlands and 1:25 000 for the largest projects. Always ensure there is a scale, a legend and a north point on the map, as well as any copyright licensing information (remember that there are copyright restrictions on re-using material published by organisations such as the Ordnance Survey).

Aerial and satellite photographs

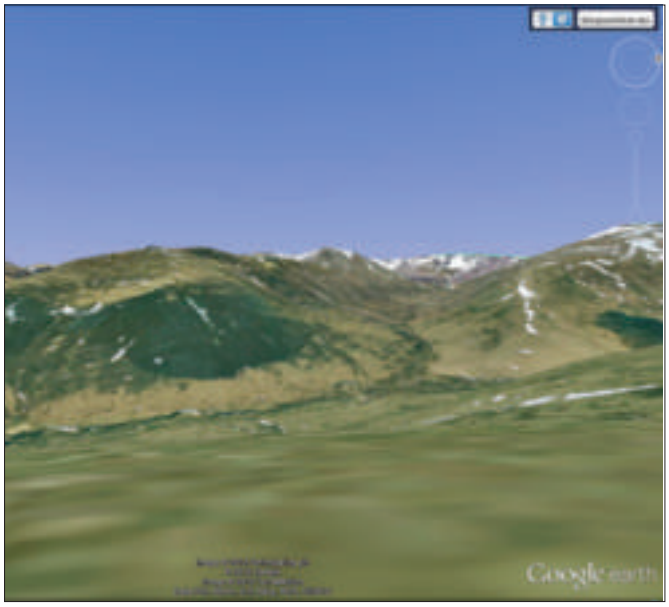
Vertical aerial photographs are very useful for design, especially for translating the design from elevation into map form. If possible the photos should be ortho-corrected to be at the same scale as the maps (ortho-photos). Such photographs are readily available and in any case Google Earth® is often a suitable alternative (and free) source for satellite photographs of a good resolution – just be careful that they are recent ones (Figure 36).

Stereoscopic pairs of aerial photographs emphasise landform and can help pick out subtleties more easily, although they also exaggerate features to some degree. Vegetation and other patterns may be more obvious on aerial photos than on maps and can be related to those visible on panoramic photos.

Oblique aerial photographs are also very useful. They help as an intermediate step in the conversion from perspective to plan. They also make more of the landscape visible so that the design can be resolved more easily in complex landforms. The 3D viewer in Google Earth® is

Figure 36 A high-resolution Google Earth image* suitable for identifying detail for design.

Figure 37 A Google Earth oblique aerial image* may be quite suitable for design purposes.



*If publishing such images it is necessary to follow the rules produced by Google. See www.google.co.uk/permissions/geoguidelines.html

useful for appreciating landform and the patterns of landscapes, especially where there are no existing forests or woodlands (landscape features, such as forests, appear as a 2D layer on these images and look strange when viewed up close). Bird's eye perspectives can be useful presentation tools based on oblique aerial photographs. Figure 37 shows an oblique view from Google Earth which is suitable for design purposes – more for new planting design than for felling and redesign.

Manual design techniques

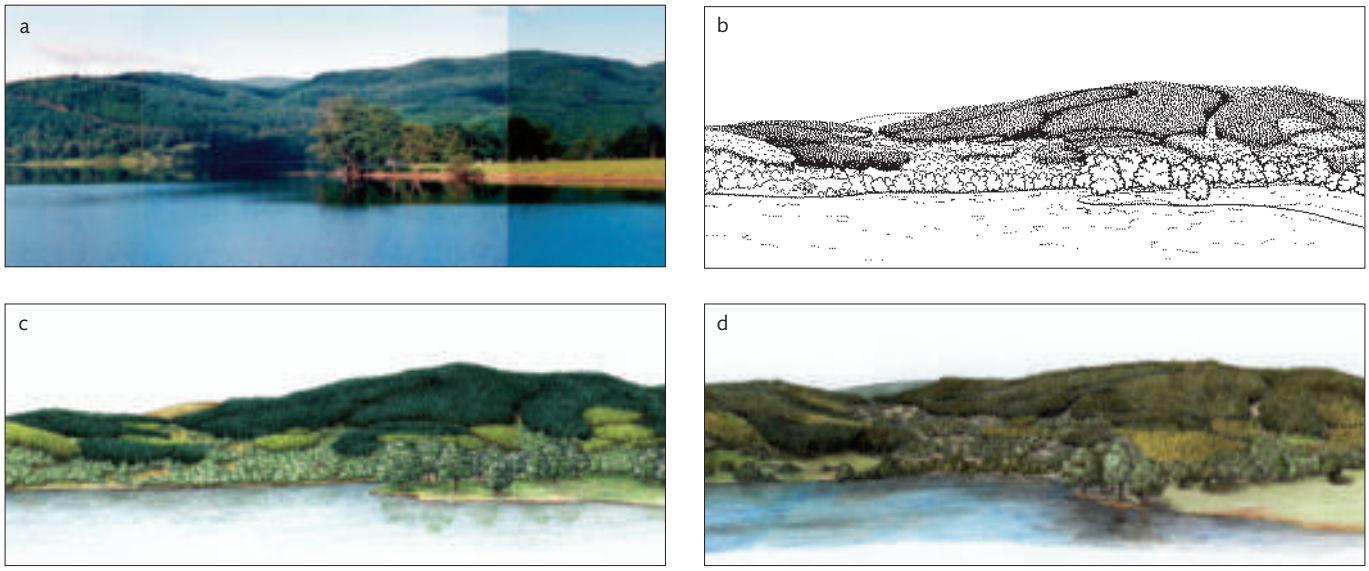
The main method of carrying out a design is with pencil and tracing paper over the top of maps, photos and sketches. Quite a lot can be done in a systematic fashion, starting by identifying the important features, site characteristics, patterns, constraints and opportunities. Another layer over this is then used for sketching shape ideas, erasing and redrawing as necessary until a satisfactory result is obtained.

It is best to use the perspective views as the main design base, not the map, unless the landscape is less visible, flat or parts are hidden. However, using both together is more usual and useful; otherwise transferring sketch to map can be difficult.

Presentation graphics

For presentation purposes use pencil sketches, coloured pencil or felt-tip rendering. These are able to represent realistic impressions of the developing forest and are ideal for public presentation. While they may be basic drawing techniques they remain effective and can be scanned for inclusion in digitally produced reports. Annotations and explanatory comments can be added after scanning. Figure 38 shows several techniques for hand-drawn graphics.

Figure 38 Using an original base photograph (a) together with a visualisation of the expected result, the following techniques are simple but effective: (b) shows a design depicted in pencil; (c) shows the use of coloured pencil which makes it easier to see different species; (d) is rendered in felt-tip pen which also enables different textures to be used depending on the type/thickness of the pen.



Computer-based visualisation tools

The ability to model and visualise forests, woodlands and landscapes using a workstation or personal computer has been around for many years. However, these tools were often only available to design specialists or those organisations able to make a significant investment in information technology. In the last decade, advances in computing, together with an overall reduction in information technology costs, have made these tools more accessible, and developing and presenting forest designs on a computer is now a viable option for most.

There are a wide array of tools available, ranging from free online 3D visualisation tools to specific proprietary software for forest and woodland planning to photo-editing software. Computer software for modelling and visualisation usually takes the form of either a geographic information system (GIS) or a computer-aided design (CAD) system, and both can deliver good results. Generally, the best results will be obtained from a bespoke 3D desktop system, but appropriate results for simpler or smaller scale plans can be achieved from freely available tools and photo-editing software.

Most CAD and GIS systems will support the analysis, synthesis and implementation stages of the forest management planning process by enabling 3D visualisation of the forest and the wider landscape context, allowing the user to test design solutions and create planning options. Systems work by using a digital terrain model as a base, upon which other 'layers' of information can be draped to build a visualisation of the forest or woodland. Supporting information that is relevant to the planning process can be additionally draped to set context and build evidence to inform planning options and illustrate outcomes. These can be produced for a number of viewpoints and can be set to match panoramic photographs.

In simple modelling systems, forests and woodlands are shown as solid layers with a 'thickness' to represent tree height and a colour to show either the felling plan or restocking pattern. The polygons designed to represent felling coupes or planting areas can be saved and exported to the GIS to be used in the compilation of the forest management plan documents. The advantage of this approach is that the design as seen in perspective exactly matches that in plan.

In more advanced 3D software systems the design can be developed digitally in the system and viewed in 3D from many angles very quickly for testing and adjustment. The design can be rendered in 3D with surface shading and trees shown simply as cones or 'lollipops' of different height, colour and density which look quite acceptable as a forest texture in middle ground or distant views, although from close up they are less convincing. Figure 39 shows a coupe pattern as solid shaded polygons and the use of simple tree symbols to depict the replanting.

After a broad impression is achieved, in many 3D software systems the cones or 'lollipops' can be replaced by photo-realistic tree models from the system library for presentation purposes. More advanced software systems can be used to create photo-realistic images which allow Shadows, reflections, skies and 3D features such as buildings can also be added to heighten the realism (Figure 40). Data from GIS, such as species mixture, density and height can also be used to create a realistic rendering from a library of trees, surfaces and objects.

Alternatively, data generated from the 3D systems can be exported to photo-editing software, which can be used to further manipulate the visualisations. Such software has the capacity to produce very realistic results. Photo-editing software (e.g. Adobe Photoshop) can also be put to good use with the original landscape photographs. These are imported to the system and then, by applying a variety of computer graphic tools, forest areas can be 'added' or 'removed', shadows created, colours and tones blended and, in good hands, the results can be extremely convincing.

Because there is a wide array of systems and this field of technology is constantly evolving, it is advisable to select a system with care. Defining the outputs required, and then establishing what would be needed to achieve these outputs in terms of skills, time and money, will help clarify this process, narrowing down which tool or tools to adopt. However, once the initial investment in time to define needs is made, the time involved in producing high quality visualisations will be dramatically reduced.

Figure 39 A forest visualisation using 'Tretop' software (now discontinued): (a) a felling pattern of phased coupes shown as solid polygons; (b) the same area with tree symbols in different colours to provide an impression of the appearance of the forest after felling or planting.

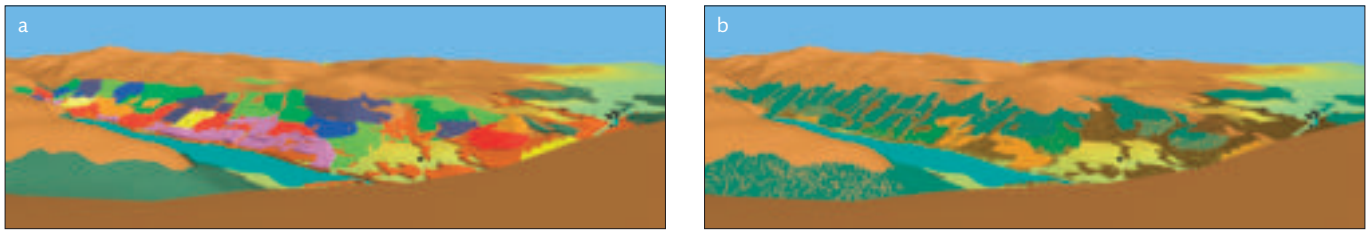


Figure 40 A photo-realistic image created from GIS data using the 3D visualisation software 'Visual Nature Studio' for a project in Wales.

Further reading and useful sources of information

Forestry Commission publications

- The UK Forestry Standard (FCFC001)
- The UK Forestry Standard Guidelines – Forests and biodiversity (FCGL001)
- The UK Forestry Standard Guidelines – Forests and climate change (FCGL002)
- The UK Forestry Standard Guidelines – Forests and historic environment (FCGL003)
- The UK Forestry Standard Guidelines – Forests and landscape (FCGL004)
- The UK Forestry Standard Guidelines – Forests and people (FCGL005)
- The UK Forestry Standard Guidelines – Forests and soil (FCGL006)
- The UK Forestry Standard Guidelines – Forests and water (FCGL007)

Guidance and good practice

- Building wildfire resilience into forest management planning (FCPG022)
- Choosing stand management methods for restoring planted ancient woodland sites (FCPG021)
- Managing deadwood in forests and woodlands (FCPG020)
- Creating new broadleaved woodland by direct seeding (FCPG016)
- Restoration of native woodland on ancient woodland sites (FCPG014)
- Managing ancient and native woodland in England (FCPG201)
- Achieving diversity in Scotland's forest landscapes (FCPG103)
- Conserving and managing trees and woodlands in Scotland's designed landscapes (FCPG102)
- Identifying the historic environment in Scotland's forests and woodlands (FCPG101)

Other publications

- Design for outdoor recreation (Taylor & Francis)
- Designing sustainable forest landscapes (Taylor & Francis)
- Elements of visual design in the landscape (Spon Press)
- Guidelines for landscape and visual impact assessment (Spon Press)
- Practical forestry for the agent and surveyor (Alan Sutton Publishing)
- Protected trees: a guide to tree preservation procedures (Department for Communities and Local Government)
- The design of forest landscapes (Oxford University Press)
- The history of the countryside (Phoenix Press)
- Trees and woodland in the British landscape (Phoenix Press)

Websites

- Forestry Commission – www.forestry.gov.uk/ukfs
- Environment Agency – www.environment-agency.gov.uk
- Scottish Environment Protection Agency – www.sepa.org.uk
- Natural Resources Wales – www.naturalresourceswales.gov.uk
- Northern Ireland Environment Agency – www.doeni.gov.uk/niea

Legislation

Legislation and other regulatory information that should be considered during the forest management planning process can be found at www.forestry.gov.uk/ukfs or in full at www.legislation.gov.uk

Supporting material

A number of worked examples that show the development of the forest management planning process for different landscape types can be downloaded from www.forestry.gov.uk/ukfs/planning. These include:

Urban and community woodlands

Small new community woodland on the edge of an urban area

Mixed agricultural and estate landscapes

Medium-sized new woodland of native species on a gently rolling agricultural landscape
Small to medium-scale predominantly broadleaved woodland in a rolling, enclosed landscape

Forests in flat or undulating landscapes

Medium-scale predominantly conifer forest in a flat landscape

Forests on rolling hills

Medium-scale new mixed conifer and broadleaved forest on a prominent slope and mainly stable soils
Medium-scale predominantly coniferous forest on a prominent slope and mainly stable soils approaching the time of felling and replanting

Forests in upland hill and plateau landscapes

Large-scale coniferous forest on a plateau of high windthrow risk

Forests in mountainous landscapes

New native forest on a steep mountainside
Felling and replanting of a conifer forest in a mountainous landscape

Appendix 1 – Survey information: what to collect

This appendix provides a checklist of the categories of information needed for the survey stage (as summarised in Table 2) and how to collect it. Not all areas will require the same attention to detail, and it may be possible to amalgamate different categories on one or two maps instead of each category being recorded on a single map.

Legal

- Ownership: establish the ownership boundary/fenceline. This may be significant in terms of providing a constraint to designing the layout of new woodland planting to fit the landscape or when changing the external margin of an existing forest to improve the design.

- Legal access: identify specific routes and access points to the site, which limit, for example, road construction and harvesting access.

Physical

- Surface geology: identify the main rock types outcropping at the surface and superficial deposits from glaciations or rivers, old sand dunes or deep peats. This may affect soil type, nutrient status, drainage, tree rooting depth, and the presence of deep or blanket peats which should not be planted. A fully mapped survey is not necessary unless geological information is likely to be an important factor in the development of the forest management plan.

- Topography: obtain a suitable base map with contours to use for landscape character and landform analyses as well as for calculating slopes for road design or planning harvesting. GIS raster bases (e.g. OS 1:10 000) may not always include contours, in which case it is necessary to obtain a contour or height information layer or use paper maps which can later be scanned.

- Drainage and watercourses: map streams and watercourses and consider the implications of the UKFS and its supporting Guidelines on *Forests and water* for the area. Wetlands, mires, lakes and ponds, intermittent streams or seasonal watercourses should also be marked. The need to clear existing trees back from streams should be identified in all existing forests.

- Soils/site types: carry out a basic assessment of soils, which could be from vegetation indicators or landform (there is correlation with slope/form and soil type) or from sampling the site. Site types based on the Ecological Site Classification system (www.forestry.gov.uk/fr/esc) can be more meaningful as they can be related to both choice of timber-producing species and native woodland types. In agricultural areas, soils are likely to be highly modified and contain high levels of nutrients and weed seeds. In urban areas, true soils may be altered or absent on brownfield sites or former mineral works. Compaction may be an additional problem.

- Areas disturbed by mineral workings/landfill: identify any factors that will influence forest and woodland design in areas where new woodlands are proposed as an after-use in urban or post-industrial areas. There may be important issues related to former opencast mining, mineral spoil heaps, reformed quarries or capped landfills, such as a lack of soil or soil forming materials, lack of nutrients, compaction, low pH, a clay cap or toxicity problems.

- Sites of geomorphological interest: identify areas of geomorphological interest, such as geological SSSIs, by checking the databases available from the relevant statutory organisation, and consider the implications for forest management planning.

- Infrastructure: identify and map infrastructure such as powerlines, pipelines, masts, wind energy installations and roads. These may act as significant constraints on woodland planting or other site operations. Record any technical constraints, for example minimum distances that trees can be planted from a powerline of a specific voltage.

- Water supply catchments: identify and map catchment areas for water supplies. In areas where water for settlements is obtained from streams, these areas need to be safeguarded.

Forest protection

- Pests and diseases: establish whether known insect pests or tree diseases are present in the area and assess the potential risks of their introduction into the forest or woodland.

- Mammal damage: assess the presence of different browsing animals, such as deer, their impact on trees and tree regeneration in different areas and the level of control measures (e.g. tree shelters and fences) needed to protect trees and vegetation.

- Deer control: assess deer numbers and establish patterns of movement during summer and winter (routes up and down hills or in from neighbouring estates) to give an idea of the way the stags and hinds use the area and where most pressure might be expected. The early identification of potential deer control areas (e.g. glades) in existing or proposed woodlands is useful so that they can be incorporated into the overall forest design.

- Fencelines (existing and potential): identify suitable locations for fencelines at sites where deer fencing rather than deer control is to be used. Fence lines need careful design based on the knowledge of how deer move, so as to remove pressure on fences and reduce risks of deer being trapped. Alignments also need careful consideration as fences can have significant impacts on landscape design as well as implications for woodland grouse such as capercaillie.

- Wildfire: assess the risk of wildfire from activities such as prescribed burning or vandalism, and the need for prevention measures such as fire breaks, fire ponds and access roads.

Biodiversity

- Important habitats: identify any special habitats or vegetation communities, especially those which are extensive in the area, and the value of all semi-natural vegetation. Significant areas of native woodland will normally require a distinct management plan. Consider the wider context and how the habitats in the forest management plan area can be seen as part of the wider ecological context.

- Wildlife conservation: identify sites of specific conservation value. These areas may form constraints or opportunities for the forest management plan. In agricultural areas, the condition of small copses, hedges and hedgerow trees should be assessed and potential linkages into the wider landscape considered. These may be corridors linking areas of new planting to existing woodlands, since these may be the main features of biodiversity value.

- National Vegetation Classification: use NVC maps to identify important existing vegetation communities which need to be protected from planting.

- Sites/Areas of Special Scientific Interest: obtain information on these from the relevant statutory agency and highlight all aspects likely to affect the planning process.

- Important species: obtain information on important plant and animal species (and territories where appropriate) from the statutory conservation agencies or other relevant organisation. These may be may be associated with very specific sites and, in cases where the species concerned is protected, the information may need to be kept confidential.

Historic environment

- Scheduled and unscheduled ancient monuments: examine records of scheduled and unscheduled sites and monuments. In existing forests, there may be sites already planted over, so an assessment of their state will be needed for restoration purposes. Elsewhere, the implications for planting (such as minimum planting distances) should be recorded.

- Other archaeological sites: survey all potential sites, including those containing industrial archaeology. Special surveys may be needed where archaeological information is sparse (usually a simple 'reconnaissance' supplemented by test pits in potential 'hot spots').

- Historic features: obtain information on any historic features, which may not be classified as archaeological but which have historic interest or importance (perhaps locally). The Historic Land-use/Landscape Assessment for the area should provide information on features such as ancient field patterns, the presence of rig-and-furrow and hedgerow banks.

- Gardens and designed landscapes: identify these from registers or inventories held by the relevant statutory agencies. If information is unavailable, and the proposal involves woodland planting or management within the boundaries of such an area, extensive historical research may be needed.

- Historical associations: establish whether the area has any associations with historical events or famous people such as writers, painters, poets, or musicians (or their works). There may be implications for forest and woodland management of operations affecting specific views, for example. These must be understood and carefully accounted for.

Landscape

- Landscape designations (national or local): identify any designations and the policies for landscape associated with them.

- Landscape character assessments: find the relevant regional or local assessments and check what they say in terms of approaches to woodland planting or redesign which may have relevance and value.

- Visual context: assess the visual context for the site (i.e. how it is seen within the wider landscape and on approach from public roads and paths). Drive or walk around and take photographs to assess the wider landscape context and the experience of people travelling through the area.

- Visual sensitivity: assess the visual sensitivity of the planning area by taking photographs from external viewpoints. These locations should be marked on a map and, if possible, recorded on a GPS to ensure accuracy and to enable the viewpoints to be plotted in GIS or used as a base for visualisations. The assessment should be made on the basis of the visibility of the proposals in the wider landscape.

- Visual diversity: identify the aspects which give an area its visual diversity and which could or should be reflected in the forest design to enhance unity. These may be existing woodland elements, vegetation patterns, rock outcrops, buildings and other features.

- Internal viewpoints: identify key views from within the planning area. These might have a major effect on how people experience the area and need to be protected or incorporated into the design so as to enhance the visitor experience.

- Visual detractors: identify elements or features that detract from the landscape and consider ways in which they could either be removed or screened from sensitive viewpoints.

People

- Accessibility: establish how people travel to and from the area and how easy the forest or woodland is to get to or find. Record the main access roads, actual or potential access points to the woodland, and infrastructure such as railway stations, bus routes and bicycle routes.

- Rights of Way: record any Rights of Way and examine the wider pattern of permissible paths and routes in the surrounding landscape in case improved connections could be made.

- Recreational use: assess how the area is used for recreation (by whom, doing what and when) and what potential it offers according to the local, regional, national or international demand (depending on whether the area is mainly used by local residents, visitors, tourists or a mixture). On private estates, private or commercial sporting may also be part of this survey. In urban and community woodland projects, surveys of the users can help provide an idea of the expected demand for recreation so that this can be planned from the outset.

- Linkages: consider how the site forms part of a pattern of a recreational or green network and how it can add to the overall offer for recreational opportunities in the region.

- Stakeholder groups: identify all relevant community and user groups, societies, associations and others with an interest in the area. Use interviews, questionnaires or focus groups to determine their views about the area and what they would like to see happen to the site.

- Demographics: carry out an assessment of the different categories of users, for example by age, gender, ethnicity or socio-economic status, and consider where the focus of each group lies in residential areas around the site. This study can contribute towards the provision of community facilities at appropriate locations.

- Health and safety: assess how the management status or condition of the site (including evidence of anti-social behaviour) affects the sense of safety and security experienced by users, especially women and children or people from minority ethnic groups.

- Special local places: find out by talking to people in the area if there are any special local places which, if built into the forest design, could strengthen the local sense of identity – ensure that the woodland does not compromise such places.

Timber

- Growing stock inventory: obtain data on the trees that have been established, where available (this may be held in a GIS database), so that a stock map can be prepared showing

tree species composition and year of planting. Use a combination of colours and hatching to distinguish components in mixed stands, yield classes, economic felling ages, or time of stands reaching terminal height in high wind risk areas.

- Windthrow hazard: assess the risk of windthrow (usually determined from an assessment of soil, elevation, aspect/exposure/windiness scores). Windthrow risk may affect the choice of species and whether it is worth replanting the highest risk areas. It will also influence the layout of the forest in terms of future coupe boundaries and the development of windfirm edges. Developing 'terminal height' maps (that show when stands are likely to start blowing over) can be useful to inform decisions on layout and timing of felling.

- Economic felling ages: obtain and map data to show when forest areas should be felled according to the ideal timing from NPV (net present value) calculations. These may differ substantially from the terminal height map.

- Low-impact silvicultural systems: establish the potential to apply low-impact silvicultural systems such as continuous cover forestry, rather than clearfelling and replanting. This should be based on a combination of soil, species, wind risk, seed sources, presence of advance regeneration and other factors so as to assess which silvicultural systems are appropriate.

- Access roads and harvesting systems: identify existing and proposed roads and tracks, areas to be harvested with various equipment, landings, inaccessible areas and terrain obstacles. This will help to develop the most operationally sound solution or show where difficulties lie. If a terrain assessment map exists it should be made available.

Natural regeneration potential

- Seed sources: assess the presence of seed sources, and the likely zones of natural regeneration in the vicinity of such sources, if you are planning to use natural regeneration to restock or establish a forest or woodland.

- Existing regeneration: map existing areas of regeneration to establish what is already developing and to build such information into the forest design.

- Potential native woodland types: identify NVC types to predict likely native woodland types in areas where new native woodland is being proposed or where non-native conifers are to be converted into native woodland.

- Open areas/habitats: assess the impact of NVC information or other surveys of vegetation, mires, heaths or acid grasslands on woodland planting (e.g. if this suggests particular areas should be kept open or limited to low-density woodland).

Glossary

Clearfelling Cutting down of an area of forest (typically the felling of an area greater than 0.25 ha if the coupe is within a larger area of forest). Sometimes small clumps or a scatter or of trees may be left standing within the felled area.

Continuous cover forestry A silvicultural system that maintains the forest canopy at one or more levels without clearfelling.

Coupe An area of woodland that has been clearfelled or is planned for clearfelling.

Design plan The part of a forest management plan that predominantly addresses landscape and visual aspects.

Diversity (visual) The range or variety of different elements in a landscape or design. In a forest these include variety in ages and species of trees and other elements such as open ground or water.

Enclosure An area of land defined by a boundary such as a fence, wall or hedge. The enclosure pattern is the distribution of such boundaries in a tract of landscape.

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) aimed at ensuring that the environmental consequences of projects are evaluated and public opinion taken into account before authorisation is given.

Environmental Statement A statement of environmental effects that is required where an EIA is called for.

Forest management plan (woodland management plan) A plan which states the objectives of management together with details of forestry proposals over the next 5 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.

Historic environment All tangible evidence of past interactions between humans and their environment, incorporating archaeological sites, historic landscapes and natural heritage.

Historic Land-use/Landscape Assessment (HLA) The process of mapping the extent of past and present land-use areas, categorised according to their form, function and period of origin.

Landscape character The distinct and recognisable pattern of elements that occur consistently in a particular type of landscape and combine to describe its essential nature.

Landscape Character Assessment The process of systematic description, classification and analysis of landscape in order to identify, describe and understand its character.

Landscape context The relevant circumstances pertaining to the site, situation and local area. In landscape terms these will include the landscape character, visual sensitivity, distinctiveness, historic and cultural significance.

Landscape and Visual Impact Assessment (LVIA) A process that operates within the overall framework of an EIA. It specifically aims to ensure that all possible effects of change and development, both on the landscape itself and on views and visual amenity, are taken into account in decision-making.

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.

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.

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

Restructuring Diversifying the distribution of age classes of a forest, usually by advancing felling in some areas and retarding it in others. Restructuring is usually associated with wider measures to redesign a forest as part of a forest management plan.

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

Rotation The period required to establish and grow trees to a specified size or condition of maturity. The period varies 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.

Terminal height The top height of a stand when windthrow has affected 40% of the trees.

Visual force The illusion of movement, or potential movement, found in a static image or object.

Visual sensitivity An attribute determined by the visibility of the landscape, the main views of the forest or woodland, by whom and how it is seen, and the value placed on the landscape (e.g. cultural or historic associations).

Windfirm Trees that are unlikely to blow over when exposed to strong winds.

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

Forest management plans are the key reference documents for monitoring and assessing forests and forestry practice in Britain. They define and communicate forest and woodland management proposals, set out how sustainable forest management is to be achieved and describe the consequences of management activities over time. Forest management planning involves assembling and integrating a wide range of information about a site and its potential, and a number of established design techniques are available to assist with this process. This Practice Guide provides step-by-step guidance to the techniques that can be used at each of the seven planning stages. The guidance applies to both the creation of new forests and woodlands and the management of existing forests and woodlands. It is aimed at forest and woodland owners and managers, forestry practitioners and all those involved in forest planning and the preparation of forest management plans. The Guide will also help those evaluating and approving plans and proposals, such as regulatory staff involved in grants and licences, and others with an interest in forestry consultation.

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