



Moray and Aberdeenshire Forest District

## Ben Aigan

Forest Design Plan



Plan Reference No: FDP 13

Plan Approval Date:

Plan Expiry Date:

# Ben Aigan Forest Design Plan 2013-22

## FOREST ENTERPRISE - Application for Forest Design Plan Approvals in Scotland

### Forest Enterprise - Property

Forest District:	Moray & Aberdeenshire FD
Woodland or property name:	Ben Aigan
Nearest town, village or locality:	Rothies
OS Grid reference:	NJ315488

### Areas for approval

	Conifer	Broadleaf
Clear felling	94ha	
Selective felling		
Restocking	207ha	53ha
New planting (complete appendix 4)		

1. I apply for Forest Design Plan approval\*/~~amendment approval~~\* for the property described above and in the enclosed Forest Design Plan.

2. \* I apply for an opinion under the terms of the Environmental Impact Assessment (Forestry) (Scotland) Regulations 1999 for ~~afforestation~~\*/~~deforestation~~\*/ roads\*/ quarries\* as detailed in my application.

3. I confirm that the initial scoping of the plan was carried out with FC staff on

July 2012
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4. I confirm that the proposals contained in this plan comply with the UK Forestry Standard.

5. I confirm that the scoping, carried out and documented in the Consultation Record attached, incorporated those stakeholders which the FC agreed must be included.

6. I confirm that consultation and scoping has been carried out with all relevant stakeholders over the content of the of the design plan. Consideration of all of the issues raised by stakeholders has been included in the process of plan preparation and the outcome recorded on the attached consultation record. I confirm that we have informed all stakeholders about the extent to which we have been able to address their concerns and, where it has not been possible to fully address their concerns, we have reminded them of the opportunity to make further comment during the public consultation process.

7. I undertake to obtain any permissions necessary for the implementation of the approved Plan.

Signed .....  
Forest District Manager

Signed .....  
Conservator

District Moray & Aberdeenshire FD

Conservancy Grampian

Date .....

**Date of Approval** .....

**Date approval ends:** .....

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**Forestry Commission Scotland**  
Coimisean na Coilltearachd Alba

**Environmental Impact Assessment**

**Determination Enquiry Form**

**Complete this form to find out if you need consent, from the Forestry Commission (under the EIA Regulations 1999), to carry out your proposed work.**

Section 1 Proposed work							
Please put a cross in the box to indicate the type of work you are proposing to carry out. Give the area in hectares and where appropriate the percentage of conifers and broadleaves.							
Proposed work	cross	Area in hectares	% Conifer	% broadleaves	Proposed work	cross	Area in ha
Afforestation					Forest roads		
Deforestation					Forest quarry	X	2.6
Location and District			Ben Aigan, Moray & Aberdeenshire				

**Please attach map(s) showing the boundary of the proposed work and also give details of the operations.**

Section 2 Property details	
Property Name	Ben Aigan
Grid Reference (e.g. AB 123/789)	NJ315488
Local Authority	Moray
Nearest Town	Keith

Section 3 Applicant's category (please put a cross in one box)				
PE	Personal occupier		PU Public ownership	X
BU	Business occupier		OT Other	
VO	Voluntary organisation		CT Crofting tenant	

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Section 4 Applicant's type <i>(please put a cross in one box)</i>			
LS Lessee		OW Owner	X
TE Tenant		TR Trust	

Section 5 your agent or woodland manager's details					
Title	Mr	Initials	M	Surname	Reeve
Organisation	Forestry Commission Scotland				
Address	Moray & Aberdeenshire FD,				
Portsoy Road					
Huntly			Postcode	AB54 4SJ	
Tel No	01466 794161		Mobile	07990 802879	
Fax	01466 794986		e-mail	mark.reeve@forestry.gsi.gov.uk	
Is this the address for correspondence?			Yes	X	No

Section 6 Applicant's details					
Title		Initials		Surname	
Organisation	Forestry Commission Scotland				
Address	Moray & Aberdeenshire FD,				
Portsoy Road					
Huntly			Postcode	AB54 4SJ	
Tel No	01466 794161		Mobile		
Fax	01466 794986		e-mail		
Is this the address for correspondence?			Yes	X	No

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<b>Section 7 Sensitive Areas: Give the area of the proposal that is covered by any of the following designations</b>	
<b>Sensitive Area as listed in “Schedule 2” of the 1999 EIA Regulations Area (ha)</b>	<b>Area in hectares</b>
a. Sites of Special Scientific Interest (SSSI) or Proposed Sites of Special Scientific Interest (PSSSI)	-
b. SSSI's with a Nature Conservation Order (Section 29 of the Wildlife and Countryside Act 1981)	-
c. National Park (NP)	-
d. The Broads	-
e. World Heritage Site	-
f. Scheduled Ancient Monument (SAM)	-
g. an area designated as National Scenic Area	-
h. Area of Outstanding Natural Beauty (AONB)	-
i. “Natura 2000” site – (European network of special areas of conservation and special protection areas under the Wild Birds Directive)	-

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## Forest Design Plan Summary

This plan is a review of Forestry Commission Scotland's management of Ben Aigan Forest in the Spey Valley.

The purpose of the plan is to set out the management objectives and prescriptions for the forest for the next ten years in detail, and in more broad terms for the following twenty years, which will fulfil the requirements of the UK Woodland Assurance Scheme.

The forest design plan balances our obligation to provide an economically viable, sustainable, quality timber resource while providing creative measures for health and well being, coherent landscape design and the environmental and ecological improvement of the land we manage.

The occurrence of Dothestroma Needle Blight (DNB) has had a significant impact on the amount and timing of clearfelling in this block. This, along with the "very poor" soil types in parts of this block, has also had an impact on the species choice for restocking. This has dictated that some of the area will be restocked with a mixture of Sitka Spruce and Japanese Larch, as a nurse in the near future. It is hoped that as our knowledge and management of DNB improves future restocking will be able to be undertaken with Scots Pine to fit with the poor soil nutrients and the biodiversity benefit of this native species.

Advantage has been taken of the limited areas with better soils to plan the planting of other appropriate species, including broadleaves, either for timber production or to increase the biodiversity of the block by planting appropriate native woodland areas.

Much of the mature crops on the north west face are planned to be managed under Low Impact Silvicultural Systems (LISS). This fits with the existing crops and the site conditions. It also addresses the issue of landscaping by reducing the impact of clearfelling to the sites where the conditions are not suitable for LISS, such as where the crop is not suitable or the ground is too steep for regular thinning to be undertaken, which is essential for the successful implementation of a LISS system.



## 1.0 Introduction

Refer to Map 1: Location.

### 1.1 Setting and context

Ben Aigan is situated in a very prominent position (NJ315488) overlooking the river Spey and the communities of Rothes (3 km to the east), Mulben (1.5 km to the northeast) and Craigellachie (3 km to the south) in Moray. The block covers most of Ben Aigan hill (471 metres) on the eastern flank of the Spey valley.

The block covers an area of approximately 1425ha and is made up of mostly mature Sitka spruce and Scots pine, which are both of a low yield class.

Ben Aigan and the surrounding landscape have been identified by both the Moray Council local plan and the SNH landscape character assessment, as an area of great landscape value (AGLV).

The main stays of the local economy are agriculture and distilling, while tourism also plays an important role, including the Malt whisky trail that runs along two sides of the block. The Speyside way is an additional tourism draw. This is one of only four long distance routes in Scotland and it runs through the plan area.

The existing design plan is characterised by a series clearfells design to fit in with the landform to create a block that fits well into the local landscape.

### 1.2 History of the forest

Prior to 1940 there was only 40ha of woodland in the current Ben Aigan block. In the 1950's nearly 500ha were added, with 130ha in the 1960's, 160ha in the 1970's and finally 320ha in the 1980's. Up to 1970 Scots Pine was the predominantly planted species but since then Sitka Spruce has become the most planted species.

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1920 Ordnance Survey map extract- Most of Ben Aigan not yet planted.

## 2.0 Analysis of previous plan

The previous FDP was approved in June 2002 and was therefore due to expire in June 2012. However an extension for one year was obtained and therefore this approval runs out in June 2013.

The existing plan is very brief, with little detail; however the main objectives stated are included in the table below, along with the progress made to date on their achievement and how this will be carried forward into this new plan.



Theme	Priority (in current approved plan)	Objective (in current approved plan)	Management indicator	Progress to date 1 – Nominal progress 2 – Some progress 3 – Progress as per FDP	Proposed action (in this plan)
Climate Change	High	Increase the area suitable to be managed under LISS.	Thinning of all accessible areas.	2 – Easily thinnable areas have been worked. Additional areas could be thinned with new roads and alternative machinery.	Continue to thin all areas that have been previously worked. Increase the area of thinning by the construction of forest roads. Investigate the opportunities to utilise alternative harvesting machinery and techniques to allow thinning of steep slopes overlooking the Spey.
Timber	High	Maintain a sustainable level of timber production including felling of SLP crops.	Post fell figures recorded in SRP tally with those produced in PF.	2 – Some of the felling coupes identified in FDP completed. Some not felled due to harvesting difficulties of the steep ground.	This will continue to be a major driver in the new plan. Identify coupes where DNB is a major issue and programme these for early removal through a change of felling dates, provided other objectives are not seriously compromised. Identify opportunities for niche marketing for specialised species and sizes and woodfuel markets for lower grade crops.
Business development	High	Improve landscape value with well designed coupes.	Landscape value assessed as high and improvement planned by management of coupes as per FDP.	2 – Some of the felling coupes identified in FDP completed. Some not felled due to harvesting difficulties of the steep ground.	All coupes will be planned to maintain and where possible enhance how the FDP area fits with the landform and surrounding landscape. LISS will be used where possible to limit the visual impact of clearfelling. Increase percentage of broadleaves on better sites for niche markets or local woodfuel.

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Community development	Low	Continue community involvement through liaison over FDP.	Enhanced relationships between FCS and local communities.	2 – Details of community responses to consultation included in consultation record.	The relationship and consultation with local communities and Strathiala Community Council will be maintained during this FDP process but there will be little opportunity to increase it.
Access & health	Medium	Increase the level of recreational use of the block.	A well-managed forest that encourages usage by the public.	3 – Work has been carried out on the cycle trails to improve their quality and marketing. Speyside way has been maintained.	The cycle trails will be decommissioned during the course of this plan due to their low level of use. The Speyside way will continue to be maintained to a high standard. Informal access will be maintained under the auspices of SOAC.
Environmental quality	High	Manage riparian zones to increase native broadleaves.	Riparian zones felled or thinned with a greater proportion of native broadleaves planted or naturally regenerated.	1 – No riparian areas yet cleared or thinned due to difficulty of operations and appropriate harvesting machinery not available. Very steep slopes in places.	The management of the gullies and riparian zones will remain an important driver in the new plan. However there is not such an emphasis on the removal of none native conifers and their replacement with native broadleaves. The important issue will be the retention of the damp humid environment that has lead to the development of an interesting habitat.
Biodiversity	Medium	Establish permanent habitat networks.	NR designated applied at levels appropriate to site conditions and recorded in FDP.	3 – Sites identified as NR recorded in FDP and GIS layers. Work plans produced and operations undertaken to manage sites as appropriate.	Ensure the current NR labels are appropriate to crop and site conditions. Those not appropriate will have designation changed. Additional areas found to be suitable will be designated if site objectives are met by NR prescriptions. Management for the LBAP species of twinflower, osprey, honey buzzard, capercaillie and red squirrel will be an important objective for this plan.



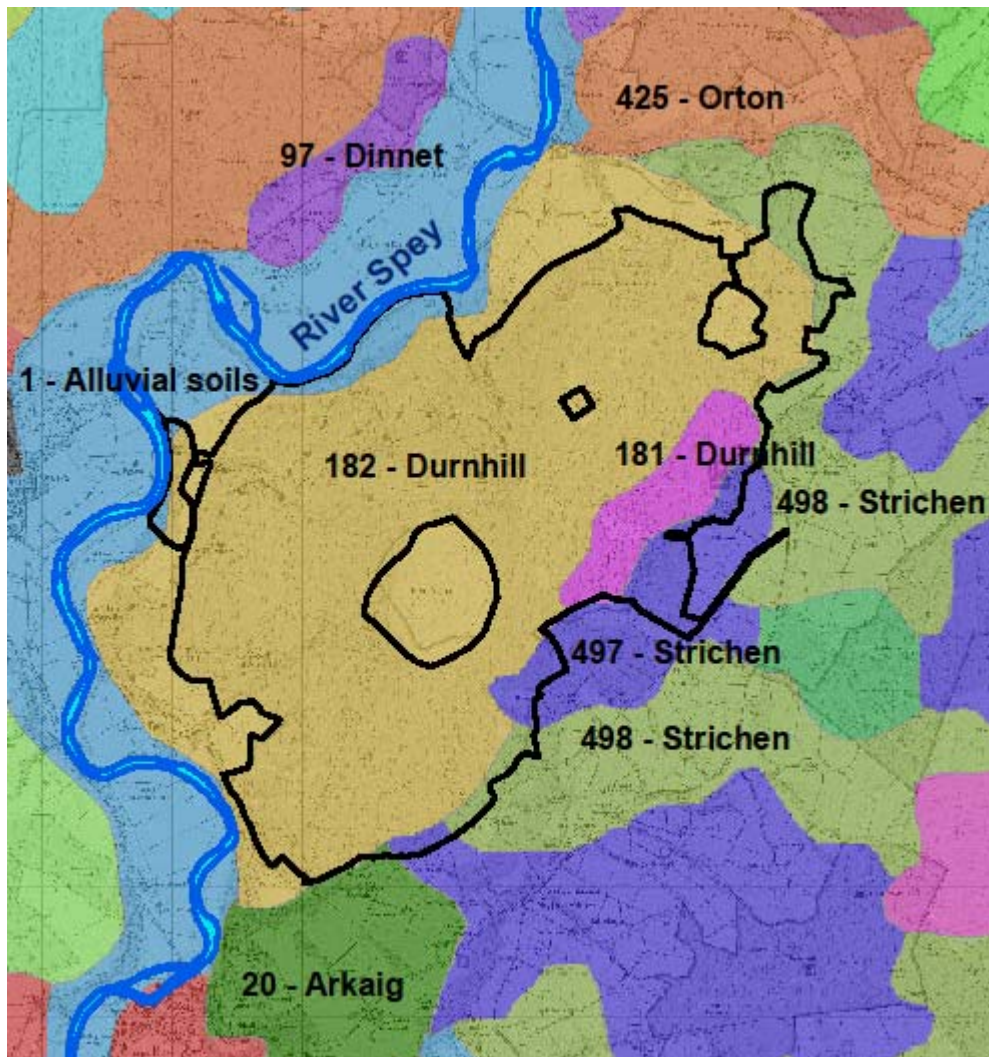
## 3.0 Background information

### 3.1 Physical site factors

Refer to Map 2: Key Features.

#### 3.1.1 Geology, soils and topography

Geology - According to the British Geological Survey Geological Map of the UK the majority of this forest design plan area is underlain by Quartzite and Psammite rocks of the Grampian group, part of the Dalradian Supergroup. These tend to lead to the production of soils with medium to low nitrogen availability.



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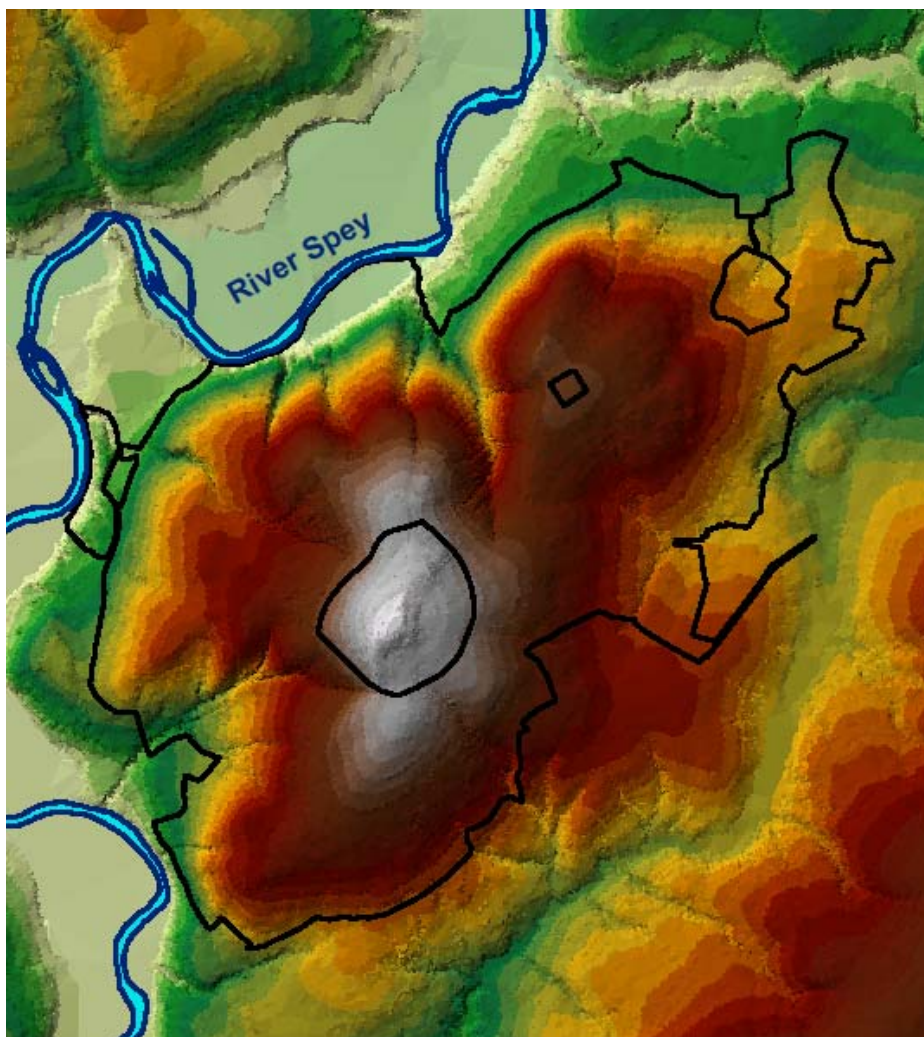
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Soils - The Soil Survey of Scotland map reveals the soil associations underlying Ben Aigan as shown in the map above.

The Durnhill (182) association comprises peaty podzols with some freely and imperfectly drained humus iron podzols and gleys. The 181 association is dominated by peaty gleys, with some humus gleys and peat.

Topography – The topography of the design plan area is principally that of a pair of conical hills, separated by a steep gulley, overlooking the Spey valley. The elevation runs from about 50 metres to 400 meters at the top of Ben Aigan hill.

Most of the slopes in the block are reasonably steep but these are cut by gullies that are very steep. The gullies run either directly or indirectly into the River Spey, a very important local salmon fishery and source of water for the whiskey industry.



Topology of Ben Aigan

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## 3.1.2 Water

Ben Aigan is the source of several minor watercourses. Those flowing down the northwest and southwest faces of the block flow directly into the River Spey which is tremendously important for the economy, the local community and the environment of Strathspey and Moray. It is renowned for its purity and is of both national and international importance for its salmon rod fishery, whisky distilling industry and its wildlife. It provides for major domestic and industrial water supplies, as well as a challenging environment for outdoor pursuits. For these reasons a catchment management plan was prepared in 2003 which “sets out a strategic framework for the wise and sustainable use of the water resource, and for the protection and enhancement of water quality and natural heritage within the River Spey catchment”.



River Spey looking down from within Ben Aigan.

Management objective 8.1 of the catchment plan is to “develop a vision for the contribution of woodlands to management of the catchment while promoting and supporting good woodland management practice.” Woodlands are to contribute “towards the objectives of integrated catchment management, addressing both ‘nateness’ and landscape issues while also

benefiting the local economy, communities and recreation interests” and woodland managers should “implement restructuring and appropriate scale silviculture, including continuous cover forestry within the catchment where appropriate”.

The River Spey is an SSSI and SAC see section 3.2 Biodiversity and environmental designations below.



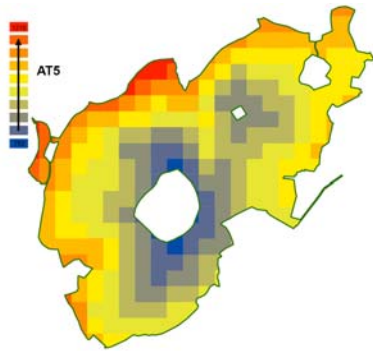
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## 3.1.3 Climate

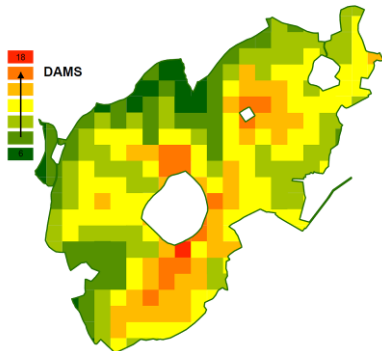
The climate data for the design plan area is obtained from the Ecological Site Classification system (ESC).

The results of interrogating this system gave the following data.

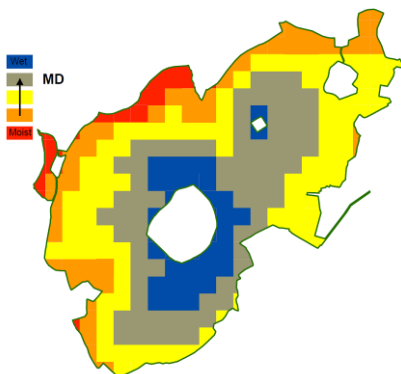
	AT5	DAMS	MD
High ground	724.4	20.4	23.7
Low ground	1206.5	10.1	129.2



**AT5** is the accumulated total of the day-degrees above the growth threshold temperature of 5°, which provides a convenient measure of summer warmth. The results for AT5 place these blocks in the “cool” zone.



**DAMS** is the Detailed Aspect Method of Scoring. This represents the amount of physically damaging wind that forest stands experience in the year. The range of DAMS is from 3 to 36 and windiness is the most likely limiting factor to tree growth at higher elevations in Britain.



**MD** is the Moisture Deficit for the area. Moisture deficit reflects the balance between potential evaporation and rainfall and therefore emphasises the dryness of the growing season (rather than the wetness of the winter or whole year). These results place the blocks on the boundary of the “moist” and “wet” zones.

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These results will be used to help assist in the choice of tree species for restocking in this FDP. Each tree species has tolerances for these and other factors and they can be used to identify species suitable for the site conditions.

Further information on these criteria and the application of ESC can be found in Forestry Commission Bulletin 124 - An Ecological Site Classification for Forestry in Great Britain.

## 3.2 Biodiversity and environmental designations

In 1998, the main stem of the River Spey was notified as a Site of Special Scientific Interest and later became a Special Area of Conservation (SAC), forming part of the Natura 2000 network, which represents some of the finest nature conservation areas in the European Community. The River Spey qualifies as an SAC on account of its internationally important populations of Atlantic salmon, sea lamprey, otter and freshwater pearl mussel.

A very small part of Ben Aigan falls within the River Spey SSSI and SAC designated areas.

There are five UKBAP species found within the plan area we are aware of. These are twin flower, water vole, otter, red squirrel and scottish crossbills.

As well as a UKBAP species the Red Squirrel is one of the six key species identified in the FCS Biodiversity Action Plan. Therefore good forest design and operational practice will be undertaken to benefit red squirrels. This will include the planning forest operations to minimise damage to red squirrel dreys and populations, including survey work to locate dreys prior to felling operations and the planning of the forest structure and composition to specifically suit red squirrels.

## 3.3 The existing forest

### 3.3.1 Age structure, species and yield class

#### Age Structure

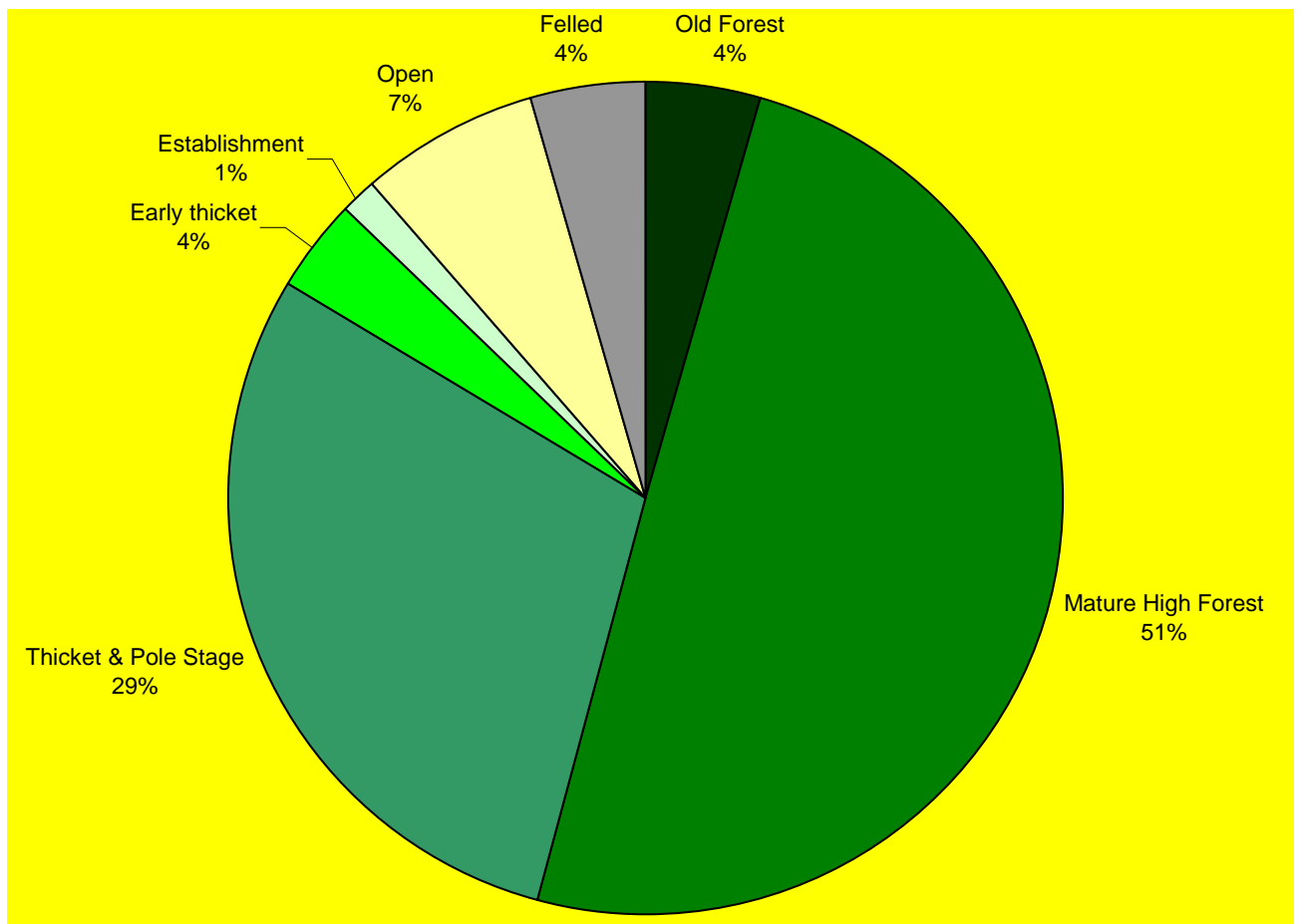
The majority of the design plan area is currently covered with mature high forest. This is due to the current rotation just coming to its economic maturity. A programme of felling and restructuring has been started, hence the areas of establishment and others awaiting restock. However there is currently very little old forest areas.

A programme of restructuring to create a more diverse age structure was started in the previous plan. This will be reviewed in the light of the suitability of much of the block for LISS management.

Opportunities to retain areas to create old forest will be taken where crop and soil types are appropriate.

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Ages of Trees (years)	Successional Stage	Area	%
0 -10	Establishment	19.4	1%
11 - 20	Early Thicket	51.7	4%
21 - 40	Thicket & Pole Stage	412.3	29%
41 - 60	Mature High Forest	696.8	50%
61+	Old Forest	61.0	4%
	Felled	60.6	4%
	Open space	99.9	7%



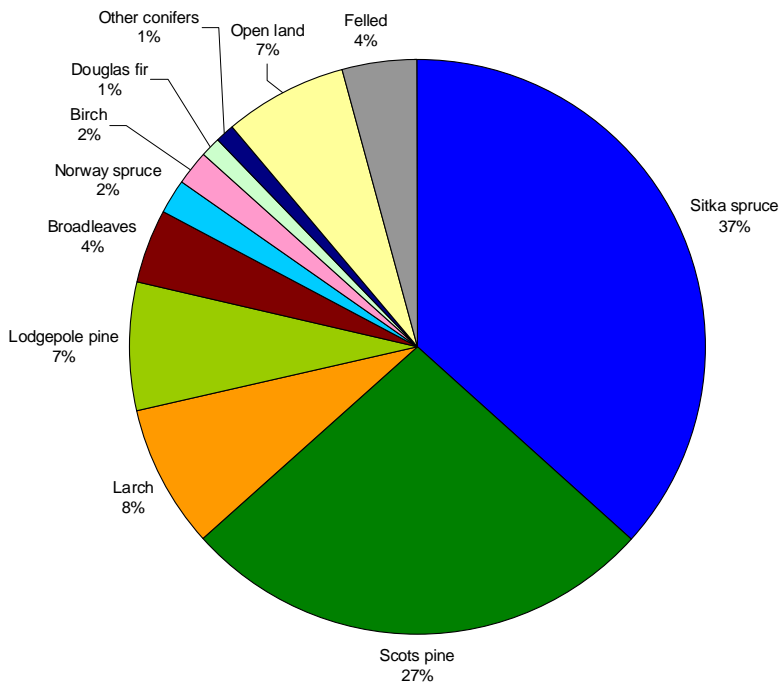
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## Species

Approximately a third of the plan area is stocked with Sitka Spruce. Another quarter is planted with Scots Pine. The remainder of the area is stocked with a range of other species, mostly conifers.

This lack of species diversity is due in most part to the poor soil conditions, and thus the limited range of species suited to the conditions, and the fact that this is only a first rotation block so the diversity has not yet been developed.

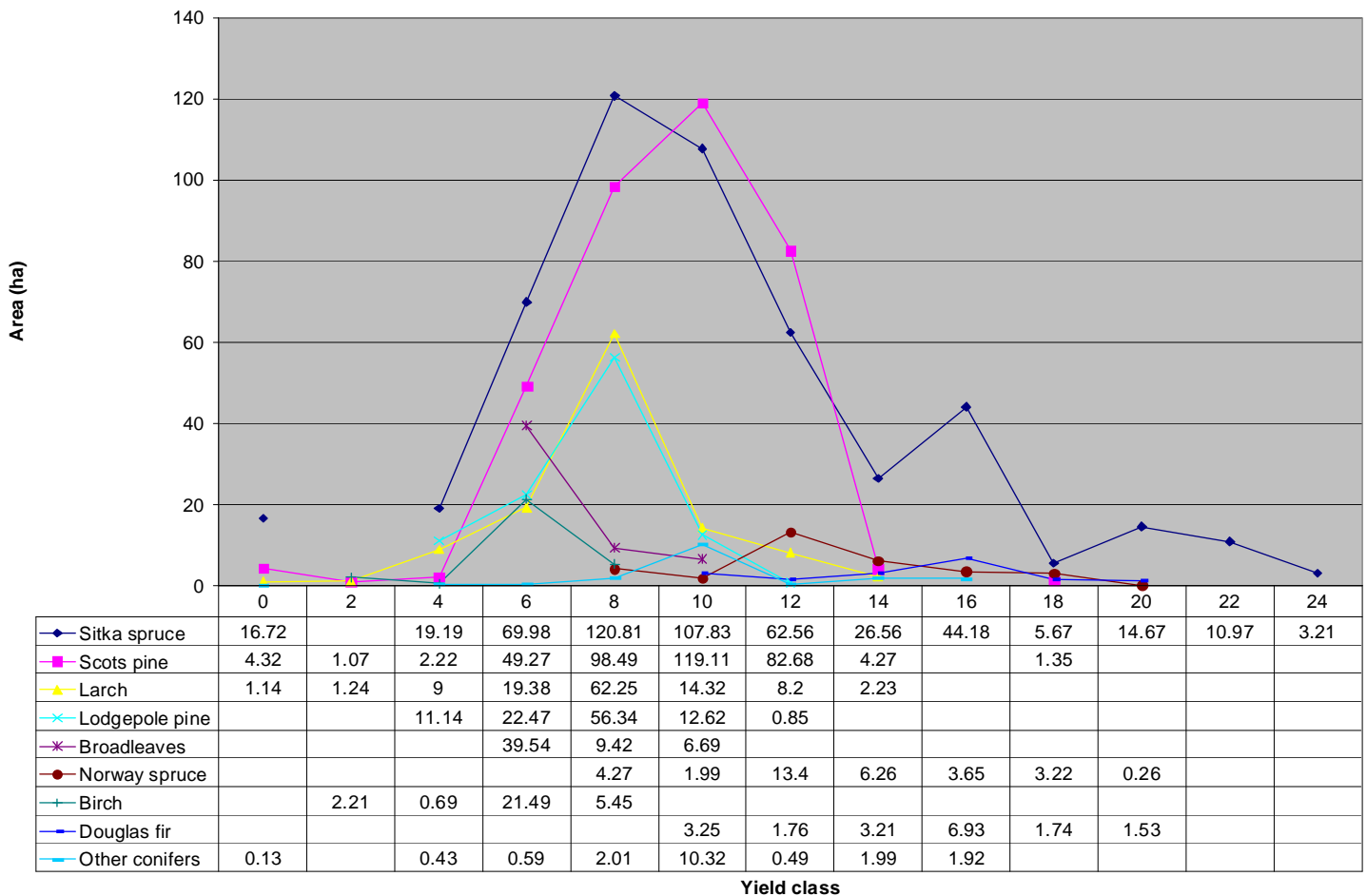
Species	Area (ha)	Percentage
Sitka Spruce	502.4	36%
Scots Pine	362.8	26%
Larch	117.8	8%
Lodgepole Pine	103.4	7%
Other broadleaves	55.7	4%
Norway Spruce	33.1	2%
Birch	29.8	2%
Douglas Fir	18.4	1%
Other conifers	17.9	1%
Open land	99.9	7%
Felled	60.6	4%



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## Yield Class

The yield classes for the various species do not vary greatly, as would be expected across a block with such similar soil types. There are few crops, except Sitka spruce, with yield classes greater than 12. This is mainly due to the poor soil conditions. The average yield class is about 8.



### 3.3.2 Access

Access to this FDP area is good. (See map 1) The A941 runs to the west of the block and the A95 runs to the southeast. The block has a reasonable forest road network but there are plans for further roading to allow the harvesting of areas near the top of Ben Aigan hill.

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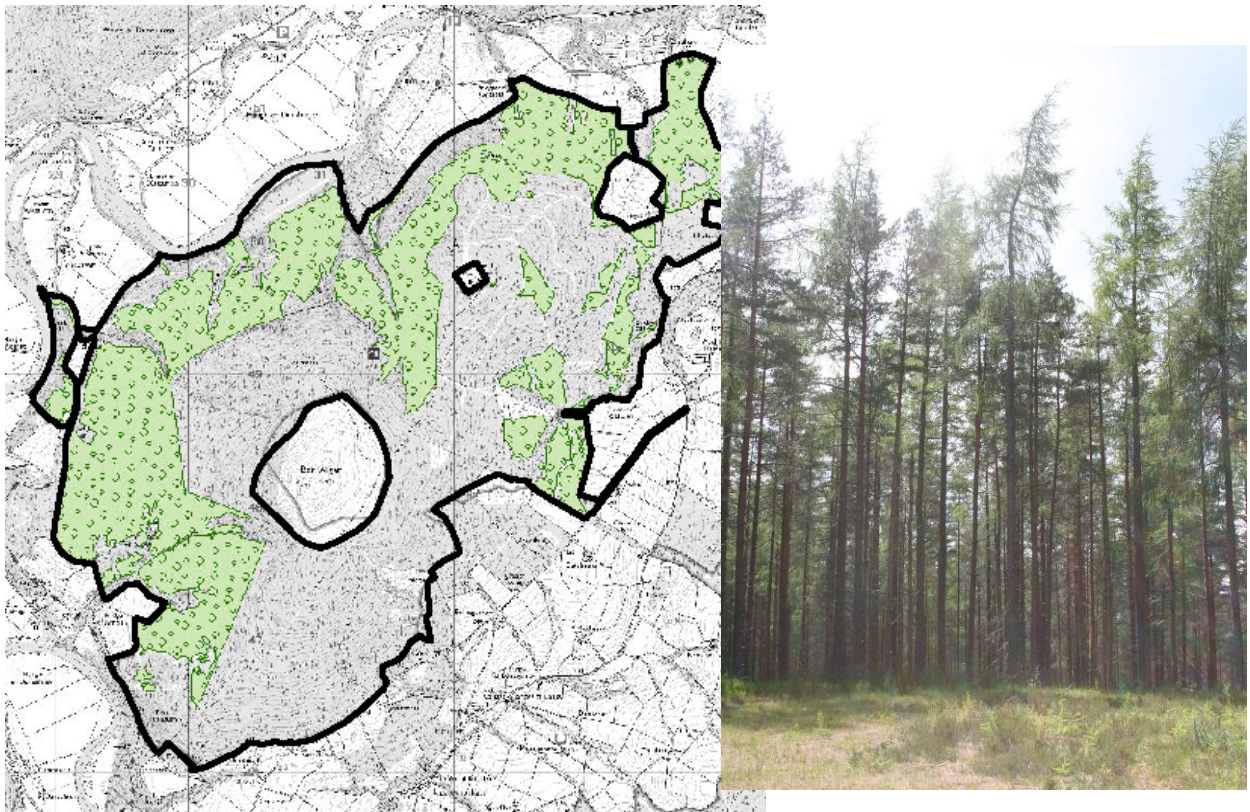
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## 3.3.3 LISS potential

There are large areas of this design plan currently showing potential for management under LISS (Low Impact Silvicultural Systems).

This management system is defined as: 'Use of silvicultural systems whereby the forest canopy is maintained at one or more levels without clear felling.' Under LISS there are no clearfell areas larger than 2 ha.

The main species in Ben Aigan that is suitable for LISS management is Scots Pine that has been well thinned in the past. There are areas of Scots Pine that have not been thinned due to the steep ground that will not be suitable for this management type, neither will many of the Sitka Spruce crops due to their very poor growth.



Areas and crops with potential for LISS management

## 3.3.4 Current and potential markets

The current breakdown of the timber being harvested from this design plan area across the range of sites, species and ages is shown in the table below.

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Material	End product	Percentage
Short roundwood	Chip board, Orientated strand board (OSB), Paper	80%
Fencing	Posts & rails	0%
Short log	Pallets & slats	10%
Log	Construction	10%

The vast majority (95%) of this production is sold into markets in the north east of Scotland, with very little travelling more than 50 miles to the processing facility.

The main change to this is likely to be the increase in material going into the local fuelwood market and the production of hardwood timber, in the longer term. There are currently two biomass plants in Moray and one in Aberdeenshire with approval and these will be looking for approx 350,000m<sup>3</sup> per year.

## 3.4 Landscape and land use

### 3.4.1 Landscape character and value

Scottish Natural Heritage, in partnership with local authorities and other agencies have carried out a National Programme of Landscape Character Assessment. This programme aims to improve knowledge and understanding of the contribution that landscape makes to the natural heritage of Scotland. It considers the likely pressures and opportunities for change in the landscape, assesses the sensitivity of the landscape to change and includes guidelines indicating how landscape character may be conserved, enhanced or restructured as appropriate.

These assessments are considered during all FDP reviews and where appropriate all efforts are made to follow the guidance given, where it matches with current FCS policy.



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The design plan area is covered by Scottish Natural Heritage Landscape Character Assessment No101, Moray and Nairn, produced in 1998 by Turnbull Jeffrey Partnership.

The block is split between the 'Broad farmed valley' and 'Uplands farmland' landscape character types.

The broad farmed valley area is "dominated by the broad, sinuous River Spey, and its distinctive flat floodplain and valley bottom. The valley is contained by a series of convex hills and long spurs...". The valley is dominated by intensive agriculture with scattered pockets of native woodland.



The River Spey from Ben Aigan

The upland farmland comprises broad, gently undulating slopes cut by gently graded valleys. Woodlands make up a small proportion of the area which is mostly pasture with some arable land.



View of upland farmland area. Ben Aigan is not typical of this zone.

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## 3.4.2 Visibility

The visual amenity of Ben Aigan is very high when seen from the Spey valley to the west of the block.



Face of Ben Aigan viewed from the A941.

## 3.4.3 Neighbouring land use

Land use around the woodlands in the plan area is predominantly intensive agricultural of pasture and arable, with some heathland on the higher areas. There are also some areas of privately owned woodland.



Ben Aigan seen from the northwest.

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## 3.5 Social factors

### 3.5.1 Recreation

There are currently several formal recreation facilities provided in Ben Aigan.

There is a car park of the A95 on the east side of the block. From here several waymarked mountain bike routes (Monster trails) start. However these are in the process of being decommissioned due to their low level of use compared to other facilities within the district.



Direction posts in car park.

Additionally the Speyside Way passes through the block. "The Speyside Way is one of four official Long Distance Routes in Scotland. It was first opened in 1981, to run from Spey Bay to Ballindalloch, with a spur to Tomintoul being added in 1990. A northern extension from Spey Bay to Buckie followed in 1999, with the route being further extended from Ballindalloch to Aviemore in April 2000. The route now links the Moray coast with the edge of the Grampian Mountains, generally following the valley of the River Spey." The decommissioned mountain bike routes will be used as diversionary routes for the Speyside Way when the formal route needs to be closed due to health and safety reasons during harvesting operation

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## 3.5.2 Community

Roths and Craigellachie are both sizable settlements close (approx 3 km) to the woodlands in this plan. They are both on the western side in the Spey valley.

Other communities are made up of scattered homes and farms rather than specific villages. Occasionally a group of houses occurs, such as at Mulben.

The forest does not have a strong community usage except for informal recreation.

The FDP area sits on the boundary of two community council areas, Strathspey and Strathisla. Both have been consulted about the contents of this plan and their comments are recorded in the consultation record, appendix 1.

## 3.5.3 Heritage

There are no scheduled monuments in Ben Aigan but 19 non scheduled monuments are located and recorded in the design plan area according to the Aberdeenshire Council Sites and Monuments record. (See map 3 – key features) Further information on sites listed in the table below can be found in the Forestry Commission S.M.R. sheets.



Bogmuck Hollow-way



Cummings Wood slate quarries

## 3.6 Pathogens and diseases



A major factor affecting the forest block is *Dothistroma* needle blight (DNB). DNB is an economically important disease affecting a number of coniferous trees, in particular pines. The disease has a world-wide distribution but until recently was mainly of concern in the southern hemisphere. In much of the world, including Britain, it is caused by the fungus *Dothistroma septosporum*. DNB causes premature needle defoliation, which results in the loss of timber yield and, in severe cases, tree mortality. Since the late 1990s the incidence of the disease has increased dramatically in Britain, particularly on Corsican pine. More recently the disease has caused significant damage and death to Lodgepole pine and Scots pine. Due to the extent and severity of the disease on these species there are restrictions on the planting of all pine species on the National Forest Estate.

Reasons for the increase in incidence of this disease are unclear but could be due to increased rainfall in spring and summer coupled with a trend towards warmer springs, optimising conditions for spore dispersal and infection. Such conditions may become more prevalent in Britain over the next 20 years if current trends in climate change continue. On the National Forest Estate disease management is currently focused on silvicultural measures to reduce inoculum loads and the use of alternative, less susceptible species in future rotations.

This is currently a major issue affecting the decisions made in Ben Aigan and how we are going to manage our silviculture to reduce its effects on future

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crops. The aim is to remove the majority of Lodgepole pine infected crops by 2019.

## 3.7 Statutory requirements and key external policies

This Forest Design Plan has been drafted to ensure that planning and operations functions comply with the following legislation and policies:

### Biodiversity

- Conservation (Natural Habitats) Amendment (Scotland) Regulations 2007
- Nature Conservation (Scotland) Act 2004
- Wildlife and Natural Environment (Scotland) Act 2011
- Land Reform (Scotland) Act 2003
- The Water Environment and Water Services (Scotland) Act 2003
- Water Environment (Controlled Activities)(Scotland) Regulations 2011
- UK Woodland Assurance Standard 2008
- UK Forestry Standard 2011 – Forests and biodiversity, Forests and water
- Deer (Scotland) Act 1996

### Climate Change

- The United Nations Framework Convention on Climate Change
- The Kyoto Protocol
- EC Directive 2003/87/EC
- Climate Change (Scotland) Act 2009
- UK Forestry Standard 2011 – Forests and climate change

### Historic Environment

- Ancient Monuments and Archaeological Areas Act 1979
- Planning (Listed Buildings and Conservation Areas)(Scotland) Act 1997
- Treasure Trove Scotland
- UNESCO World Heritage Convention
- European Convention on the Protection of the Archaeological Heritage Valetta 1992
- UK Forestry Standard 2011 – Forests and historic environment

### Forests & People

- Control of Substances Hazardous to Health Regulations 2002
- Employers Liability (Compulsory Insurance) Act 1969

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- Equality Act 2010
- Gangmasters (Licensing) Act 2004
- Health and Safety at Work Act 1974
- Management of Health and Safety at Work Regulations 1999
- Occupiers' Liability (Scotland) Act 1960
- Provision and Use of Work Equipment Regulations 1998
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995
- The Highways Act 1980
- UK Forestry Standard 2011 – Forests and people, Forests and landscape

## Soils

- Control of Pesticides Regulations 1986
- The Waste Management Licensing Regulations 1994
- European Soil Charter
- UK Forestry Standard 2011 – Forests and soil

## 4.0 Analysis and Concept

Refer to Map 4: Analysis and concept.

Theme	Issue	Analysis	Concept
Climate change	Renewable energy	Soil conditions are very poor across most of the block.	Utilise areas of poor growth Sitka Spruce to supplying the local fuelwood market when it reaches a usable size.
	Adapting to climate Change	There are areas suitable for conversion to Natural Reserves to increase carbon capture.	Manage identified areas to create a habitat that requires no further intervention.
	Flood & catchment management	The watercourses that leave the block flow into the River Spey.	Opportunity to manage riparian areas to create areas of woodland that have the least impact on water quality.
Timber	Timber supply	Current crop age and condition allows a planned programme of production to be undertaken across the area.	Following clearfell operations select and plant species appropriate to the site conditions to maintain the highest level of productivity across the area.
	Timber quality	The ground conditions, species and previous policies have limited thinning across some of the area.	Undertake subsequent thinnings to improve timber quality wherever possible.



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	Hardwood timber	There are currently very limited areas of existing broadleaves.	Opportunity to increase the hardwood resource and grow broadleaves at commercial spacing on appropriate sites with the aim of producing fuelwood.
Business development	Tourism	The plan area provides a positive contribution to the local landscape.	Plan and undertake all operations to maintain or increase the positive contribution of the block to the local landscape.
Community development	Community engagement	There is currently a very low level of community involvement within the plan area.	Continue current level of involvement with the various user communities to maintain their interest in the area.
Access & health	Recreation	There is currently provision for formal recreation activities in the plan area.	Rationalise the formal recreation provision to increase the standard on the retained infrastructure.
Environmental quality	Soil, water & air quality	Much of the soil quality across the plan area is very poor and water quality is very important.	Increase the area managed under LISS to reduce impact on soil conditions and water quality.
	Landscape	The plan area provides a positive contribution to the local landscape.	Opportunity to increase the percentage of native species where appropriate to increase blocks landscape value.

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Biodiversity	Species & habitats	Priority species are present within the plan area.	Plan management regimes and operations to improve the ecological value of the plan area.
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## 5.0 Forest Design Plan Proposals

### 5.1 Management

Refer to Map 5: Management.

#### Thinning

See Map 6 – Thinning.

Wherever possible the district will continue to maximise the area managed through thinning and utilise staff/contractor base to further develop professionalism and thinning expertise. FCS policy assumes that all productive conifer crops will be thinned. The only exceptions are where:

- Thinning is likely to significantly increase the risk of windblow;
- A single thinning operation is likely to require an unacceptably large initial investment in relation to the potential benefits due to access or market considerations; and
- Thinning is unlikely to improve poorly stocked or poor quality crops.

In Ben Aigan as much of the area as possible will be thinned in order to improve the timber quality. The main limiting factors to the thinning of the crops in this block are the steep slopes in some areas and the very poor growth rates of the Sitka Spruce on the very poor soils near the top of the hill.

Where Lodgepole pine occurs in mixtures with other crops, and is infected with DNB, it will be targeted for removal during thinning operations.

All thinning decisions will be guided by Operational guidance Booklet No 9 'Managing thinning' and the recent district Thinning Plan.

#### Low Impact Silviculture (LISS)

The main silvicultural system employed in British forestry is 'patch' clearfelling followed by planting or, occasionally, natural regeneration. However, management under LISS is becoming more common. The area of the block managed under a LISS system will be increased where this is practical.

There are many sites within the design plan area that are suitable to be managed under LISS at the present time. Again the inability to economically thin some of steepest slopes is the limiting factor in some areas. This along with the poor quality of some of the Sitka Spruce crops reduces the area

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suitable for LISS management. This situation can be resolved with the choice of appropriate species in the next rotation.

## Clearfell

As stated above the main silvicultural system employed in British forestry is 'patch' clear-felling followed by planting or occasionally natural regeneration. In order that the timber in this plan area is harvested before the onset of windblow on these poor soil conditions clearfell will remain the most appropriate silvicultural system.

Although clear-felling can appear to have a negative impact on landscape and habitat it still an important management system.

Clear-felling, to a degree, mimics natural disturbances such as fire or windblow in a forest and as such allows the forester to alter the even aged structure of the canopy over a relatively short period of time. The adoption of a 'fallow' period before restocking, or natural regeneration establishment, also creates transient open habitat that is exploited by several species such as voles, deer and raptors such as Kestrel, Buzzard and Goshawks in this area.

Where possible the scale of clearfells will be in keeping with the scale and topography of the local landscape. Therefore in some instances large clearfells will be appropriate in terms of scale.

## 5.2 Future Habitats and Species

Refer to Map 7: Future habitats and management.

### Restocking

In common with the majority of FCS estate, most restocking in the FDP area has traditionally taken place within two years of sites being clearfelled. However, many seedlings were badly damaged or killed by an endemic forest pest known as the Large Pine Weevil, *Hylobius abietis*. This species lays its eggs in deadwood/stumps on clearfell sites and the emerging adults feed on the bark of young trees, often with devastating effect on newly planted conifer crops.

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Previously this damage was countered by the planting of seedlings treated with insecticide, followed by 'top-up' spraying of the trees during spring and summer. However Forestry Commission is committed to a policy of chemical reduction on the national forest estate, in line with current European Union directives on chemical use, which has had a significant effect on the way we manage this pest.

From 2008 FCS has introduced a default four-year fallow period for clearfell sites. This allows for the *Hylobius* population to peak and then drop to acceptable levels before restocking is carried out. Fallowing has been shown in studies to be the most effective method of establishing trees without intensive chemical input. Although the default fallow period is four years, restocking may take place sooner if monitoring, using the Forest Research *Hylobius* Management Support System, shows that it is safe to do so. Refer to the district fallow policy for details.

The species choice for restocking has been guided by the use of the ESC decision support system. This highlighted that for the majority of the block the most suitable restock species are Scots Pine and Downy Birch due to the soil nutrient regime being "very poor". However the issue of DNB highlighted earlier has limited our available choice of restock species even further due to the current restrictions on the planting of pine species on the national forest estate.

There are a few exceptions where the soil nutrient regime is better. All these areas will be taken advantage of to plant other species to increase diversity. However some of these areas are too small and intimately mixed to be map, therefore the final decision on the appropriate planting species or mixture will be taken by the forester on the ground.

Sites that are currently recorded as felled but not yet restocked will be surveyed with plots using the FMM4 protocol. The results of this will inform the decision as to whether enhancement planting, with species appropriate to the site, is essential for successful establishment or if waiting for additional regeneration will produce a stocking adequate for timber production. The final decision and subsequent enhancement planting, if necessary, will be carried out within 8 years of the felling date.

Some of the areas highlighted for broadleaves with easy access will be planted at commercial spacing (2500 stems per ha minimum) and managed for fuelwood production. These sites will require ground preparation and possibly deer fencing. Thinning will also be carried out as appropriate for the crop and

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the final objective. The forester on the ground will take the site-specific decisions, with their intimate knowledge of the individual sites, but they will be guided by the objectives set for the area in the FDP.

## Non Commercial Areas

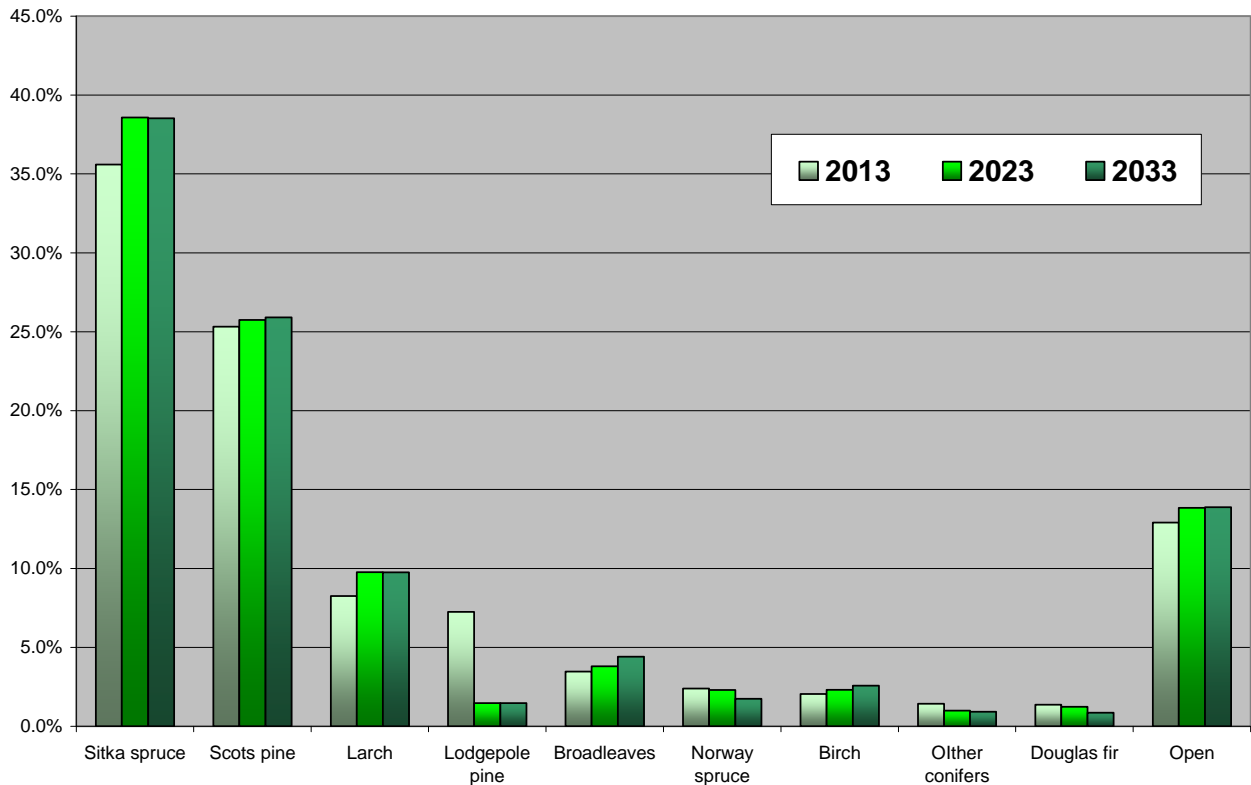
Areas not considered for commercial management will include permanent woodland habitats which will require monitoring to ensure they deliver the required objectives. These are concentrated on the steeper north and west facing gullies. The cool humid conditions found in these areas are starting to develop a variety of habitats from small areas of open water with native broadleaves to windblown conifers providing cover and shelter for many species.



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## 5.3 Species tables

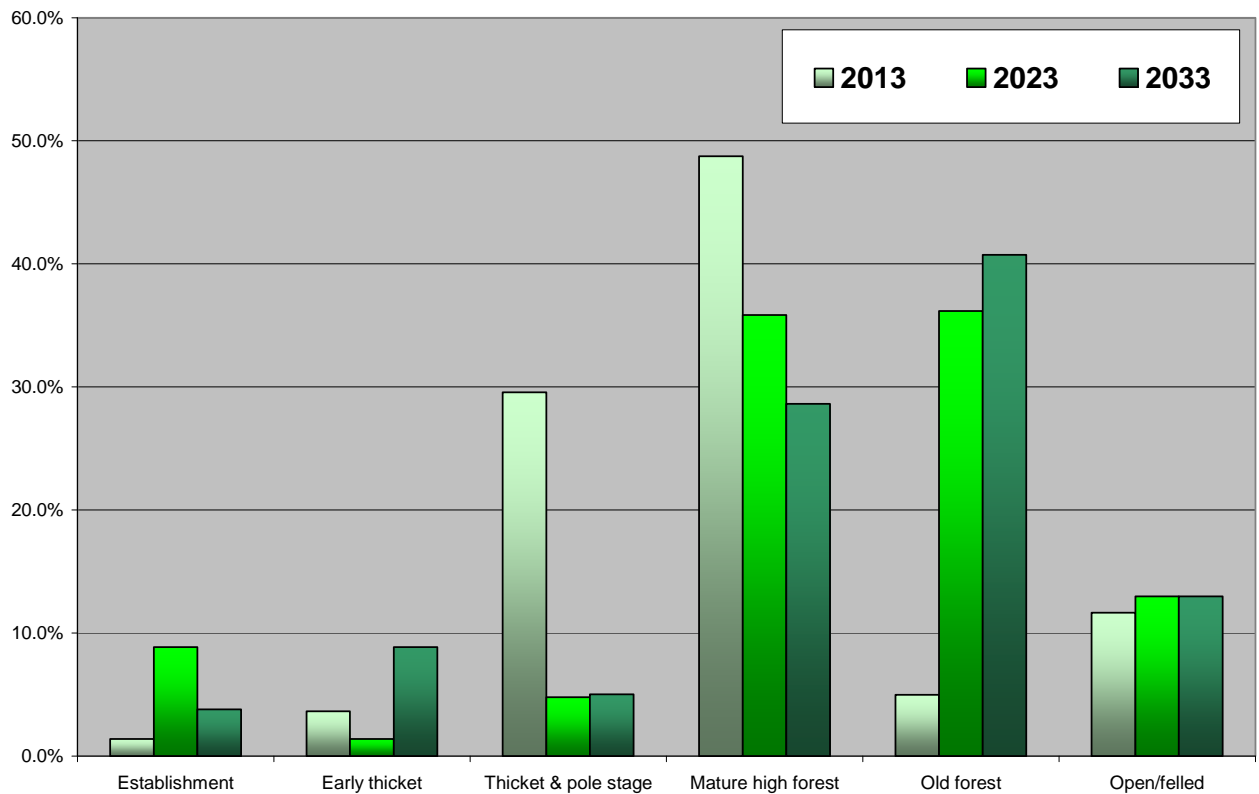
Species	Current species	Projected species 2023	Projected species 2033
Sitka spruce	35.6%	38.6%	38.5%
Scots pine	25.3%	25.7%	25.9%
Larch	8.2%	9.8%	9.8%
Lodgepole pine	7.2%	1.5%	1.5%
Broadleaves	3.5%	3.8%	4.4%
Norway Spruce	2.4%	2.3%	1.7%
Birch	2.0%	2.3%	2.6%
Other conifers	1.4%	1.0%	0.9%
Douglas fir	1.4%	1.2%	0.9%
Open/felled	12.9%	13.8%	13.9%



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## 5.4 Age structure

Age of trees (years)	Successional stage	Current age structure	Projected age structure 2023	Projected age structure 2033
0 - 10	Establishment	1.4%	8.8%	3.8%
11 - 20	Early thicket	3.6%	1.4%	8.8%
21 - 40	Thicket & pole stage	29.6%	4.8%	5.0%
41 - 60	Mature high forest	48.8%	35.8%	28.6%
60+	Old forest	5.0%	36.2%	40.7%
Open	Open space	11.7%	13.0%	13.0%





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## 5.5 PAWS restoration

There are no PAWS in this design plan area.

## 5.6 Management of open land

Areas designated as permanent open space will be limited to the moorland at the top of the hills. In these areas the very poor soil should limit tree regeneration.

In addition there will be a network of transitional open space between the felling and establishment operations. These will provide suitable feeding and breeding habitat for hen harriers and other species.



Area of open moorland with limited Scots Pine natural regeneration.

## 5.7 Deer management

Wild deer on the National Forest Estate (NFE) are managed in accordance with the Scottish Government's strategy "Scotland's Wild Deer a National Approach" and under the auspices of the Code of Practice on Deer Management.

The strategy and Code of Practice takes recognition of the fact that Wild deer are an asset, an integral part of Scotland's biodiversity and provide healthy food and recreational opportunities. The challenge of managing wild deer originates in a need to balance the environmental, economic and deer welfare objectives of the Scottish nation with the objectives of private landowners for forestry, agriculture, sporting and other forms of land use.

The principal legislation governing the management of deer in Scotland and hence on the NFE is the Deer (Scotland) Act 1996.

It is therefore FCS deer policy to;

- Prevent adverse deer impacts on commercial tree crops and the wider habitat. In doing so to carry out deer culling in an exemplary and humane way.
- Work closely with relevant organisations and neighbours to make sure that there are integrated deer management plans which seek to recognise the interests of all parties.
- Take opportunities to optimise income from venison from sporting where this does not conflict with our primary objective of maintaining deer impacts at an acceptable level, in line with Quality Meat Scotland accreditation in the form of The Scottish Quality Wild Venison (SQWV) Assurance Scheme
- Take all practicable steps to slow down the expansion of deer species into areas where they are not currently present.

All deer management will be carried out in accordance with OGB 5 - Deer management.

The aim is to manage deer density safely and humanely at a level which is consistent with acceptable impacts on forests and other habitats. This is likely to be at a density level of 5 to 7 deer per 100 hectares.

Deer cull plans are prepared for each Deer Management Unit and are the responsibility of the Wildlife Ranger Manager.

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## 5.8 Access

There are plans for new forest roads to improve access to the areas near the top of Ben Aigan hill. These are shown on map 5 – Management.

## 5.9 Pathogens

*Hylobius* can cause extensive feeding damage to young trees used to restock clearfell sites but damage is often highly variable. Previously it has not been possible to predict damage and so insecticides have been routinely used to protect the trees to try to safeguard this valuable young crop. However, on clearfells where *Hylobius* numbers are low this treatment may be unnecessary and conversely when numbers are very high the treatment may be unable to protect the trees. Both of these situations result in losses in valuable resources.

The *Hylobius* Management Support System (MSS) is based on a simple monitoring protocol using billet traps to measure *Hylobius* numbers on individual clearfell sites. The numbers recorded are used, with other information entered into the *Hylobius* MSS software, to determine the best way to manage clearfell sites for successful, cost effective and environmentally friendly restocking. This Support System will be used on the vast majority of all restock sites with certain limited exceptions.

DNB Blight will be addressed differently according to the level of the current infection in the crop. The severity of infection and crop symptoms produced range from the dropping of a couple of yield classes to high levels of mortality within the stand. The levels of mortality is the key concern as once dead the integrity of the tree quickly deteriorates to a state where it can not successfully be harvested. Categorisation of infected crop will allow us to prioritise the harvesting of such areas.

The following scale and categorisation has been agreed upon.

1	Below 30% infection	Below 10% mortality
2	Below 30% infection	10% mortality
3	Below 30% infection	10 to 15% mortality
4	Below 30% infection	15% to 20% mortality
5	Below 30% infection	20% and above mortality
6	Over 30% infection	20 to 30% mortality
7	Over 30% infection	30 to 40% mortality
8	Over 30% infection	40 to 50% mortality
9	Over 30% infection	50 to 75% mortality
10	Over 30% infection	75% and above mortality

From this the priorities for felling are as follows:

**Highest: Categories 6 & 7** - Once crops reach category 8 and higher there is a marked reduction of marketable products. Categories 6 & 7 still produce high proportion of timber before its value drops significantly.

**Medium: Categories 8, 9 & 10** - Due to recent fuelwood markets crops at category 8 are now merchantable and operations can break even. A high proportion of crops at level 9 & 10 will not get to roadside due to the trees disintegrating during the felling process.

**Low: Categories 5 and below** - Once the higher level infection crops have been addresses the prioritisation will move to the lower classes taking into account factors such as rate of infection, area felled already etc.

This has lead to the following action plan for dealing with DNB infection:

- Prioritise infected areas to be felled by swapping felling coupes of non infected crops in the current program.
- Include into thinning operations the felling of any infected crops within the area to minimise costs. Amendments to the FDP will be required as specified in the tolerance table for felling such areas.
- Reassess badly affect blocks and consider if a full review is required.
- Due to the restrictions on the planting of all pine species on and close to previously infected sites planting programs will need to be amended to include replacement species suitable for the site conditions.

## 5.10 Critical Success Factors

- Undertake the planned thinning programme in order to allow suitable crops to be managed under LISS.
- Continue to manage the spread of DNB through clearfelling and subsequently restocking with appropriate less susceptible species.
- Undertake the felling coupes as programmed to deliver the landscape improvements intended.

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- Continue with the maintenance of the forest road network to allow forest operations to be successfully completed.
- Construct the planned forest roads to allow the currently inaccessible coupes to be managed.

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## Appendix 1 – Consultation record

Statutory Consultee	Date contacted	Date response received	Issue raised	Forest District Response
Moray Council – Gary Templeton	10.07.12 By email  02.05.13 CD by post	No response to date  No response to date		No response
Scottish Natural Heritage – Jennifer Heatley	10.07.12 By email  02.05.13 CD by post	23.07.12 By email  31.05.13 By email	Ben Aigan is popular with outdoor recreation. Ben Aigan occupies a prominent focal location in Speyside, including the Speyside Way.  No additional comment.	Mountain biking routes to become informal due to low use but they will become part of the alternative routes when the Speyside Way needs to be closed during operations due to health and safety issues.

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Scottish Environment Protection Agency – Bevis Winter	10.07.12 By email  02.05.13 CD by post	No response to date  No response to date		No response
Royal Society for the Protection of Birds – Ian Francis	10.07.12 By email  02.05.13 CD by post	12.07.12 By email	We have few comments. Few Capercaillie sightings in recent years. Forest forms part of a wider network of suitable habitat and Capercaillie should be an issue relevant to the FDP review.  No additional comment.	Proposed extension to LISS management will increase habitat suitable for capercaillie.
Strathiala Community Council	10.07.12 By email  02.05.13 CD by post	No response to date  No response to date		No response
Aberdeenshire Council Archaeology – Claire Herbert	10.07.12 By email  02.05.13 CD by post	12.07.12 By email  10.05.13 By email	Whitley aircraft which crashed on Ben Aigan in 1940. A walkover survey would be advisable to locate the remains. Reference could be made to UKFS Forests and Historic Environment guidelines.	Appropriate pre operation survey will be undertaken and the results recorded.  Reference added to section 3.7

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<p>Duncan Ferguson Operations Manager Spey District Fishery Board</p>	<p>10.07.12 By email</p> <p>02.05.13 CD by post</p>	<p>11.07.12 By email</p>	<p>Ben Aigan borders the River Spey at Delfur , prolific salmon beat. Riparian zones created along watercourse. Upgrading of existing infrastructure and new needs careful to slow run off and not create diffuse pollution issues.</p> <p>No additional comment</p>	<p>Riparian zones to be identified and managed as minimum intervention areas to retain their biodiversity interest. All civil engineering works will be under taken to comply with all UK forestry standards.</p>
<p>Speyside Way Ranger The Moray Council</p>	<p>10.07.12 By email</p> <p>02.05.13 CD by post</p>	<p>No response to date</p> <p>No response to date</p>		<p>No response</p>
<p>Dagmar Gross – Member of public</p>	<p>From public consultation</p>	<p>04.06.13 By email</p>	<p>Fitness trail suggested. Wanted locals to be able to collect firewood free of charge.</p>	<p>No resources to increase recreational infrastructure. Mountain bike trails being decommissioned. A proportion of deadwood is retained as an important habitat. The rest is sold into the local fuelwood market. Health and safety would be a issue.</p>



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Glenda George & Robert Ince- Members of public	From public consultation	10.06.13 By email	Six page letter of detailed comments received.	Detailed email response sent on 01.07.13. Copies of both available.
Wendy Haston- Member of public	From public consultation	03.06.13 By email	<p>Emphasis of plan on amenity and conservation "very welcome".</p> <p>Pointed out other UK BAP species present in block i.e. Pine Marten</p> <p>Highlighted community on south side of block.</p> <p>Disappointed by decommissioning of cycle trails.</p>	<p>Additional info on UK BAP species passed to conservation team for inclusion in GIS.</p> <p>Community on southern boundary important, plan just tries to put them in an overall context.</p> <p>Resource issues and strategic planning makes decommissioning of cycle trails necessary.</p>

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## Appendix 2 – Tolerance table

	Adjustment to felling coupe boundaries	Timing of restocking	Change to species	Windthrow response	Changes to roadlines	Designed open space
FC Approval not normally required	1.0ha or 5% of coupe – whichever is less.	Up to four planting seasons after felling.		Up to 1.0ha.		Location of temporary open space e.g. deer glades if still within overall open space of design.
Approval by exchange of letters and map	1.0 to 4.0ha or 10% of coupe whichever less.		Change within species group e.g. conifers, broadleaves.	1.0 to 4.0ha if mainly windblown trees.  >4.0 to 6.0ha in areas of low sensitivity.	Additional felling of trees not agreed in plan  Departures of >60m in either direction from centre line of road.	Increased of 0.5 to 2ha or 10% whichever is less
Approval by formal plan amendment	4ha or 10% of coupe.	Over four planting seasons after felling.	Change from specified native species. Change between species groups.	>6.0 ha.	As above depending on sensitivity.	More than 2ha or 10%. Any reduction in open space in sensitive areas. Colonisation of agreed open space

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## Appendix 3 – FDP Brief

As part of the national forest estate this plan will contribute to the seven key national themes in the Scottish Forest Strategy. The objectives for this plan area are:		
National theme	District strategic plan	Forest Design Plan Objective
Climate change	Renewable energy	<b>Woodfuel</b> – Increase the potential for the production of woodfuel by managing the existing broadleave component where appropriate and felling DNB infected LP.
	Adapting to climate Change	<p><b>Restore moorland areas</b> – Potential to undertake moorland restoration work on areas where current crops are in check and given limitations on restock species with DNB present.</p> <p><b>Forest habitat networks</b> – Riparian woodland, natural reserves and moorland are integral to FDP area. Opportunities to link these areas to form substantial habitat networks.</p> <p><b>Species choice</b> – Match species to site conditions to allow them to be most resilient to future climate change and pest &amp; disease resistant.</p>
	Flood & catchment management	<p><b>River catchments</b> – This FDP is within and an integral part of the river Spey catchment area. Some areas very close to the river. Manage blocks to improve river catchment value where possible.</p> <p><b>Riparian woodland</b> – Enhance riparian woodland along watercourses that run through or leave the block. This work to be planned giving consideration to the difficult ground conditions in most of these areas.</p>

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	Carbon sequestration	<p><b>CCF</b> – Increased usage of Continuous cover and low impact silvicultural approaches to minimise inputs and lengthen rotation periods where the sites and crops are appropriate.</p> <p>Use the application of fell years and thinning cycles to lengthen the rotations and thus reduce the number of interventions.</p>
Timber	Timber supply	<p><b>Thinning</b> – Aim to thin as much of the block as possible, with the possible exception of the very steepest ground.</p> <p>Ensure a timely first thinning and thereafter transformation to LISS where appropriate.</p>
	Timber quality	<p><b>Species choice</b> – Select and plant appropriate species for site type according to results of ESC assessments and DNB issues.</p> <p>Select good phenotypical specimens to produce seed for natural regeneration.</p> <p>Increased rotation ages to produce larger diameter high value timber where appropriate.</p> <p>Where planting is require the use of improved planting stock to be considered. This applies equally to the quality of broadleaved and conifer crops.</p> <p>Appropriate stocking densities to achieve good quality timber must be maintained.</p> <p><b>Thinning</b> – Undertake thinning where possible to produce a high quality timber supply.</p>
	Timber transport	<p><b>Transport</b> – Use preferred timber haulage route to minimise potential damage to public roads.</p>
	Hardwood timber	<p><b>Niche marketing</b> – Potential to plant areas of birch, encouraging niche markets and local woodfuel supplies.</p> <p><b>Commercial hardwoods</b> – Little potential for hardwood timber due to very poor soil conditions across most of block.</p>
Business development	Skills	<p><b>Local contractors</b> – Work with the locally based contractor base, where available, by providing secondary opportunities for energy production, niche market sawmills and additional added value markets (turnery, firewood etc) within limits of FCS contract &amp; tender rules.</p>

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	Tourism	<b>Landscape value</b> – High landscape value on western slope of block. Deliver a positive contribution to the landscape of the area by increasing the diversity of species and age class in accordance with SNH landscape character assessments.
	Income diversification	<b>Woodfuel</b> - Seek opportunities for woodfuel, see Renewable Energy section above. <b>Non-forest enterprises</b> – Little potential at present.
	Contribution to rural development	<b>Partnership with local communities &amp; business</b> – There are currently no formal partnerships in this plan area but all approaches will be positively considered.
Community development	Community engagement	<b>FDP process</b> – Consult with both statutory and non-statutory consultees during FDP process especially in light of high landscape value of block. <b>Local communities</b> - Increased community council engagement as appropriate.
	Learning	<b>Forest visits</b> - Consider use of block for “What’s on” events and school visits if appropriate.
Access & Health	Recreation	<b>Planned maintenance</b> – Maintain existing mountain biking routes. Plan forest operations to limit their impact on the recreation experience of Ben Aigan.
	Making access easier	<b>Core paths</b> – Work with Moray Council to maintain core/Speyside Way. <b>Appropriate access provision</b> – Maintain forest roads to allow continued informal access.
Environmental quality	Soil water & air quality	<b>ATC &amp; LISS</b> – Adopt alternative to clearfell (ATC) or low impact silvicultural systems (LISS) where practicable to reduce impacts on soil and water quality. Engage with consultees to ensure plan contributes positively to Spey SAC and SSSI plans. Undertake all operations in accordance with FCS Forest and Water Guidelines to meet EU water framework directive objectives.

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	Landscape	<p><b>ATC &amp; LISS</b> – Adopt ATC and LISS where feasible to reduce the landscape impacts associated with clearfell and restock.</p> <p><b>Naturalisation of woodlands</b> – Progress the naturalisation of woodlands where appropriate, taking into account site, species and silvicultural context.</p>
Biodiversity	Species & habitats	<p><b>Forest habitat networks</b> – Manage riparian zones, natural reserves and moorland to maintain and improve existing habitat networks and take opportunities to extend the area where appropriate. Encourage broadleaved regeneration, augmented by planting where necessary.</p> <p><b>Priority species</b> –Red squirrel, black grouse and capercaillie are all priority species within the FDP area. The plan will aim be to improve the ecological condition and habitat quality for these species.</p>
	Ecosystems	<p><b>Species &amp; HAP</b> – Upland moorland is a HAP area. Juniper, twin flower, water vole, otter, red squirrel and scottish crossbills are all SAP species found within the plan area. Plan and undertake management to enhance forest for these habitats and species.</p> <p><b>Deer management</b> – Maintain, and review annually, a deer management unit plan to achieve timber production and ecological objectives.</p>

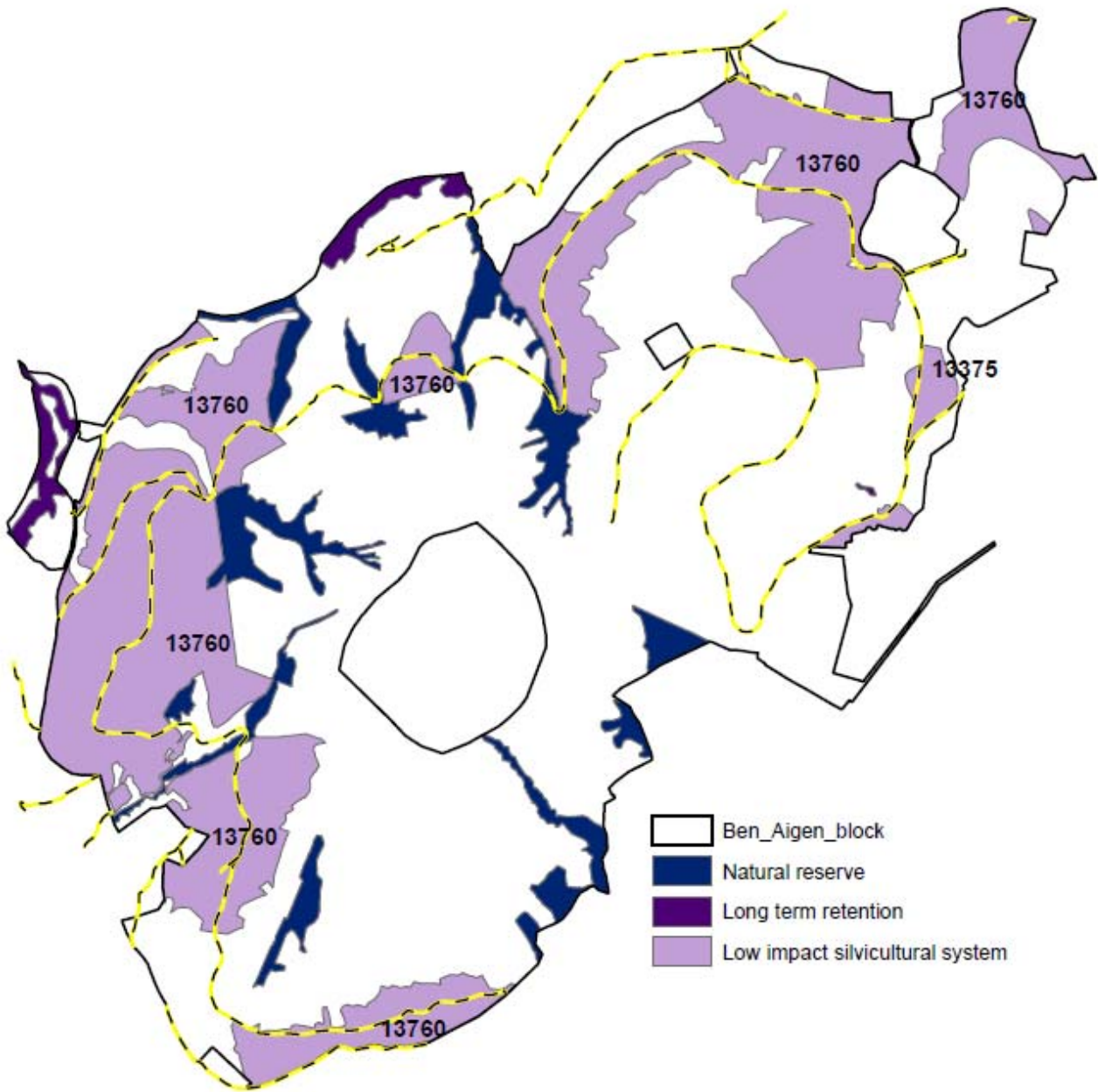
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## Appendix 4 – LISS prescriptions

Coupe no. (See map 1 below)	Management objective/Reason for selection	Long-term structure* and desirable species	Age Trans. period and return time (years)	Regeneration and ground flora	Observations (e.g. likely barriers to achieving objective)	Next treatment required**	Proposed monitoring	Other useful information
13760	Biodiversity, landscape & backdrop for recreation. Stands of predominantly SP, Larch, SB with components of NS, SS, and MB.	Simple 80% SP/L/SBI & 20% MC/MB	Mixed age (10 – 60 years) 100 10	Sparse due to current light levels. Grassy tending towards heather in places.	Deer browsing & weed competition.	Crown thin to MT.	Thinning control.	See appendix 5 - LISS management for further details
Various NR coupes	Biodiversity and landscape. Not undertake operations on steep ground liable to soil damage.	Complex No specific desirable species as NR.	Mostly around 60 years. None None	Sparse due to current light levels. Grassy tending towards heather in places.	Deer browsing & weed competition.	No intervention as NR.	Site visit	
Various LTR coupes on Spey riparian zone.	Biodiversity and landscape. Not undertake operations on steep ground liable to soil damage.	Complex 60% MB 40% CAR	58 years. None None	Sparse due to current light levels. Grassy ground flora.	Deer browsing & weed competition.	Thin along with adjacent coupe if appropriate to promote stability.	Thinning control.	If windblow occurs most will be harvested and sites restocked with appropriate species to achieve forest habitat network objectives.

\* Continuous cover stands: simple = 1 or 2 layers in canopy structure; complex = 3 or more layers in canopy structure

\*\* Presumption will be that regeneration will be natural, unless otherwise stated.



Map 1 - LISS coupe numbers



## Appendix 5 – LISS management

LISS is an approach to forest management in which the forest canopy is maintained at one or more levels without clearfelling.

The word 'approach' is important because:

- we are not following a system;
- there are no standard prescriptions; and
- flexibility is important – to take advantage of opportunities as they arise.

Any preconceived ideas about systems of managing forests can act as a 'straight jacket' to thinking about CCF.

Stands that have been regularly thinned are more likely to be successful with CCF. Crown thinning will be undertaken when transforming stands to CCF rather than low or intermediate types, as used in plantations. The basis of crown thinning is to remove competition from around selected trees (Frame trees), even if the trees to be removed are as big. Using crown thinning usually increases the average tree size, so there is potential for more income.

There are two main types of structure:

- Simple – in which there will be one or two canopy layers of trees
- Complex – where there are three or more canopy layers of trees

### 1. Transformation of a young (<40 yrs) stand to a simple structure

The objective is to achieve reasonably even regeneration of the desired species and then remove the canopy in a number of thinnings.

Early crown thinning will be heavier (10-20%) than management table intensity and aim to develop 100 equally distributed 'frame' trees per hectare.

'Frame' trees are well-formed dominant trees with good crowns at reasonably even spacing.

When the trees begin to cone (see table 1 below) stands will be thinned to the basal areas shown in table 2 to develop good conditions for regeneration to establish.

If/when natural regeneration occurs it will be more variable than on a planted site, giving more variability in age, density and species.

Canopy removal will aim to maintain a leader-to-lateral ratio of >1 in the regeneration (see figure 1), generally this will be achieved using the basal areas in table 2.

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The final removal of the overstorey may not involve all the trees depending on management objectives and windthrow considerations (green tree retention). If natural regeneration is only partially successful in terms of number and species mix planting will be undertaken. Planting will be concentrated so the location of trees is known and they can be maintained. This will be by using a minimum of 16 trees in distinct group with the trees planted at 1.5 m x 1.5 m to form robust groups. If natural regeneration has been completely unsuccessful and CCF is still seen as appropriate planting will be undertaken to form the new canopy layer. Before planting the stand will be thinned to the basal areas for 'seedling growth' in the table 2.

The felling and extraction of the canopy trees will be considered when deciding where to plant.

Planting will be at 2500 trees per hectare in a well-defined pattern so they can be found for subsequent maintenance. 'Blanks' will be left when the planting position is close (<1 m) to canopy trees. This should ensure restocking compliance with OGB 4, as the area under the canopy is not part of the net area.

Attention will be paid to site preparation, vegetation management, plant quality and reducing the impact of mammals to make sure of successful establishment. In general opportunities for site cultivation will be constrained by the overstorey.

If the established crop is between the ages of 20 and 40 years, a transformation period of up to 50 years is expected.

Table 1. Species seed production details.

Species	Age of first good seed crop	Age of max seed production	Interval between good seed crops (yrs)
Sitka spruce	25-35	40+	3-5
Scots pine	15-20	60+	2-3
Douglas fir	30-35	50+	4-6
European larch*	25-30	40+	3-5
Japanese larch*	15-20	40+	3-5
Hybrid larch*	15-20	40+	3-5
Western hemlock	25-30	40+	2-3
Corsican pine	25-30	60+	3-5
Lodgepole pine	15-20	30+	2-3
Norway spruce	30-40	50+	**
Noble fir	30-40	40+	2-4
Grand fir	35-45	40+	3-5

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Table 2. Basal area guidance for natural regeneration

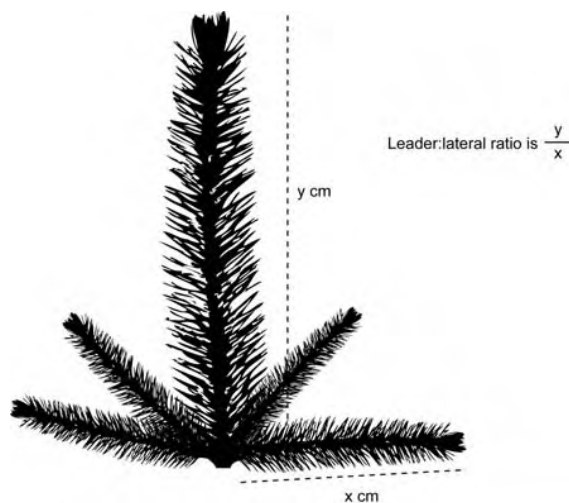
Species/ group	Shade tolerance of seedlings	BA (m <sup>2</sup> ha <sup>-1</sup> ) Establishment*	BA (m <sup>2</sup> ha <sup>-1</sup> ) Seedling growth**
Larches	Intolerant	20-25***	15-20
Pines	Intolerant	25-30***	20-25
Sitka spruce	Intermediate	30-35	25-30
Douglas fir	Intermediate	35-40	30-35
Norway spruce	Tolerant	40-45	35-40
Western hemlock	Tolerant	40-45	35-40

\* On moderate to fertile sites where vegetation regrowth will be faster and more severe the BA for establishment will be increased.

\*\* Seedlings and saplings are growing well under a canopy when the ratio of the length of the leader to the length of laterals in the upper whorl is  $\geq 1$ , as shown in figure 1.

\*\*\* Stands of larch and pine at these basal areas will usually have well-developed ground vegetation layer and control or cultivation will be needed to start regeneration.

Figure 1. Leader-to-lateral ratio.



## 2. Transformation of a young (<40yrs) stand to a complex structure

The objective is to create a wider dbh range than under a simple system by:

- retaining small trees; and
- encouraging fast growth of selected frame trees

The pattern of regeneration will be different to a simple structure, and will be arranged in groups that only cover up to 20% of the area at any one time.

Up to 50 'Frame' trees will be selected per hectare and these will be crown thinned so as to keep as many small trees as possible.

'Frame' trees are stable, well-formed dominant trees. They may need to be present on the site for a long time; spacing should be 'clumpy' and not regular. Stable trees will have a larger diameter for a given height.

The stand will be thinned to a residual basal area of about 18-25 m<sup>2</sup> per ha for larches and pines, and 25-35 m<sup>2</sup> per ha for spruces and Douglas fir. The choice within this range will depend upon the site and the balance between the overstorey and any regeneration. If there is little or no regeneration a higher value will be chosen to provide suitable conditions for seedlings to establish. If there is enough regeneration, which needs to be released, then a lower value will be favoured. The aim at each thinning is to remove enough trees to achieve the chosen residual basal area.

If there is too much regeneration thinning will be concentrated on releasing the best regeneration and attempting to hold it back in other areas.

Planting in complex structures will be considered to increase chances of success.

Trees will be planted in canopy gaps of 0.1 ha minimum size.

Trees will be planted in half the area of the gap in the centre.

Close spacing (1.5 m x 1.5 m) will be used to make the groups robust. For example, when planting a canopy gap of 0.1 ha 200 trees will be planted at 1.5 m spacing on half the area in the middle of the gap. Close spacing will ensure rapid canopy closure and planting only half the area ensures minimal competition from the canopy trees, allowing opportunities for natural regeneration and increasing operational access.

## 3. Transformation in older (>40yrs) stands

Transformation of stands older than 40 years may be possible, especially on wind-firm sites, but the opportunity to steer the development of the young stand in thinning has been lost. The main implications of this are:

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for simple systems there will be reduced opportunities for developing the crowns of 'Frame' trees and the window for natural regeneration is reduced. Therefore more 'frame' trees will be retained and a longer regeneration period used.

in complex systems the main risks are that 'Frame' trees will become too large to be marketable, and the stand will still be quite uniform when windthrow starts. The aim is to establish groups of regenerating seedlings under an irregular overstorey while older trees are progressively felled.