Moray and Aberdeenshire Forest District

Dunnottar

Forest Design Plan

Plan Reference No: FDP 36

Plan Approval Date:

Plan Expiry Date:

FOREST ENTERPRISE - Application for Forest Design Plan Approvals in Scotland

Forest Enterprise - Property

Forest District:	Moray & Aberdeenshire FD
Woodland or property name:	Dunnottar
Nearest town, village or locality:	Stonehaven
OS Grid reference:	NO864849

Areas for approval

	Conifer	Broadleaf
Clear felling	1.4ha	
Selective felling		
Restocking		1.4ha
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 Nov 2012

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

Conservancy Grampian

Date ……

Date of Approval ……

Date approval ends: ……

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Forest Design Plan Summary

This plan is a review of Forestry Commission Scotland's management of Dunnottar wood in Stonehaven.

The purpose of the plan is to set out 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 main priority for this plan is the maintenance of broadleaf woodland that acts as a backdrop to recreation and community activities for the town of Stonehaven.

The site conditions across much of the plan area are better than many areas in the district. Therefore Low impact silvicultural systems (LISS) are suited too much of the plan area. This is mostly stands of both native and non-native broadleaves. These will continue to be thinned until they reach an age suitable for conversion (100-150 years).

1.0 Introduction

Refer to Map 1: Location.

1.1 Setting and context

Dunnottar wood lies on the southern edge of Stonehaven with housing estates overlooking it. The block is hemmed in with theA90 trunk road to the west, the A957 to the east, the A92 to the south and a number of minor roads pass through the woodland.

The wood is very popular with local visitors and has two car parks, an associated picnic area and a number of waymarked routes which follow historic routes through the wood. Additionally there are number of historic features within the wood. These include Gallowhill and its associated cairn, an icehouse, a shell house, Lady Kennedy's bath, the ruins of kennels and a quarry pit. Most of these features were associated with Dunnottar House.

Features adjoining the wood and also associated with the original estate include the walled gardens, open farmland (within the wood but not in FCS management), existing churches and old religious sites.

To the west of the wood runs an un-named burn that flows into the Carron Water which bounds the north west of the block. The Burn of Glaslaw runs through the eastern section of the wood.

The wood covers 33ha in two distinct areas divided by a single track public road running roughly North West to south east. The woodland in the southern section was planted in the style of an estate policy mixed woodland with non-native conifers mixed with the broadleaves while the northern section is ash, beech and sycamore dominated broadleaved woodland.

In terms of the draft Moray & Aberdeenshire Forest District Strategic Plan Dunnottar is located in a key area identified with potential for:

- Maintaining and building on existing key community partnerships;
- Providing a contribution to an area of deprivation;
- Delivering excellence in WIAT management;
- Providing a woodland area well used by the community.

1.2 Land Management Objectives

The purpose and objectives for managing this block of woodland have been identified following a review of:

- The physical context and existing woodland;
- The land management objectives of other statutory bodies;
- The physical capability of the woodland;
- The locational objectives identified in the draft Moray & Aberdeenshire Forest District Strategic Plan.

Analysis of the available information has lead to the **primary objective** for this block being the management of the woodland to provide a resource used and valued by the local community of Stonehaven.

Additional **secondary objectives** for the future management of the woodland have been identified as:

- Managing the riparian areas to provide the optimum conditions for flood alleviation and management;
- Manage the existing broadleaved woodland to provide an appropriate balance of biodiversity benefit, diverse productive timber and a setting for recreational pursuits;
- Manage the historical and archaeological interests within the woodland.

1.3 History of the forest

According to the 1st edition of Ordnance Survey maps published in 1887 there was woodland already on the site.

Between 1946 and 1952 much of the wood was felled, with additional trees being blown by a gale in January 1953. Replanting was carried out between 1954 and 1958.

Additional information on the history of Dunnottar woods are available in the booklet Dunnottar Woods and House 1782 – 2008 written by George Swapp and published by the Stonehaven Heritage Society.

2.0 Analysis of previous plans

The following table highlights the main priorities set out in the previous plans. It describes how and if those aims were met and what the proposed management intent is to carry these objectives forward in this plan.

Theme	**Priority** (in current approved plan)	**Objective** (in current approved plan)	**Management indicator**	**Progress to date** **0 –** No progress **1** – Nominal progress **2** – Some progress **3** – Progress as per FDP	**Proposed action (in this plan)**
Climate Change	High	Leave standing and fallen deadwood habitat especially concentrated within damp or wet areas linked to the wildlife corridor systems. N.B. make safe deadwood near recreational routes.	Retention of deadwood at levels appropriate to site conditions observed and recorded at 75% visits.	**2** – Only thinning has taken place during plan period so no major increase in deadwood provision has occurred.	Continue with this action in the new plan as part of the wider objective of increasing the biodiversity of the plan area. However care is needed in placement of deadwood in floodplain do to the issue of woody debris being moved down stream by flood events and blocking culverts and leading to flooding.
	High	Use ATC to maintain the tree cover within the woodland to maintain the existing policy woodland landscape.	ATC designation applied at levels appropriate to site conditions and recorded at 75% visits.	**3** – Sites identified as LISS recorded in FDP and GIS layers. Thinning undertaken in appropriate crops in 2008.	Ensure the LISS designation is appropriate to the crop and site conditions. Any areas that are not appropriate will have the designation changed. Other areas found to be suitable will be designated if site objectives are met by LISS prescriptions.

Environmental quality	High	Create wetland habitat and ponds, leave areas around wetland unplanted and take opportunity to integrate into the wildlife corridor systems, and link to riparian zones.	An increase in the area of open water and open space recorded in the SCDB.	**0** – No progress on this objective. Thinning operation only undertaken in last plan period.	This will not be an objective in the new plan for environmental quality. However the work undertaken to help with the management of flooding issues could contribute to environmental improvement as a by product.
	High	Protect archaeology sites and increase buffer zones around them; this can be incorporated into other adjacent features and link to the path network within the wood.	An increase in the area of open space around archaeological sites recorded in the SCDB.	**0** – No progress on this objective. Thinning operation only undertaken in last plan period.	The management of the archaeological features within the woodland will continue to be an objective for the new plan, although felling around them may not be the most appropriate management.

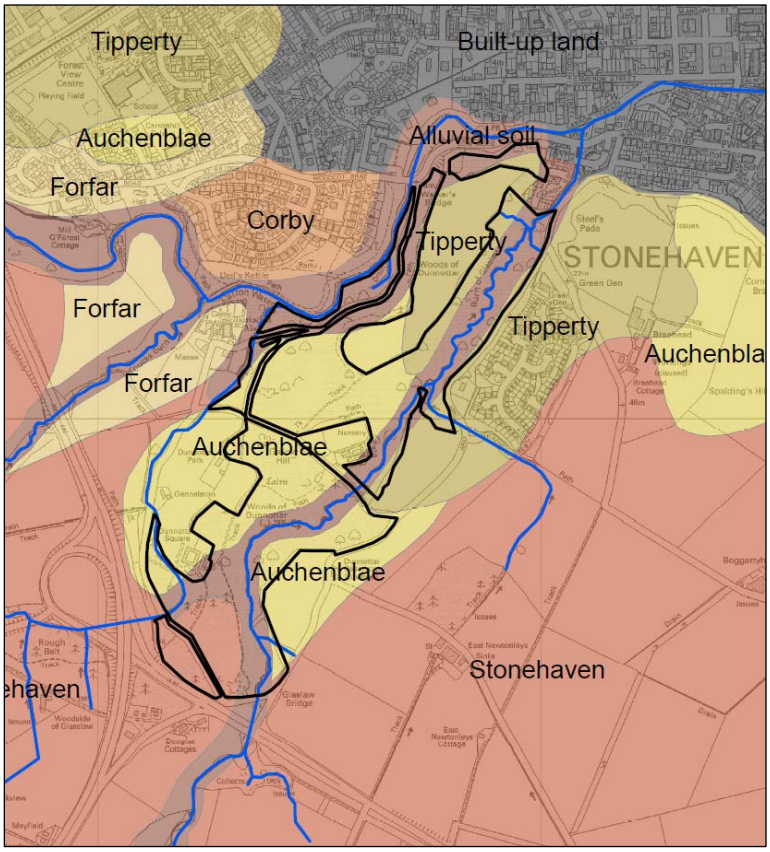
3.0 Background information

3.1 Physical site factors

Refer to Map 2: Key Features.

3.1.1 Geology, Soils and topography

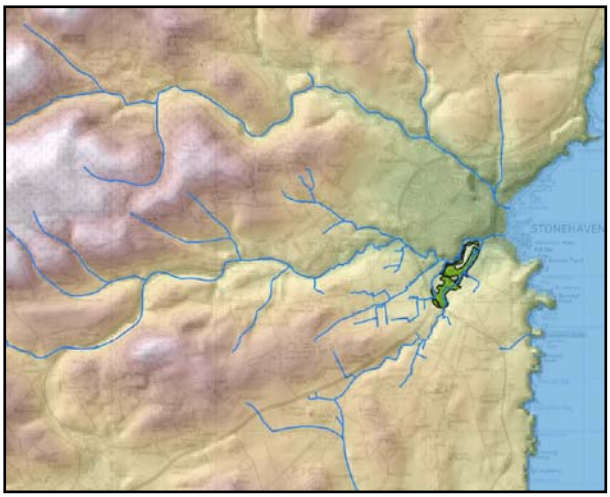
Geology - According to the British Geological Survey Geological Map of the UK all this forest design plan area is underlain by Lower Old Red Sandstone of the late Silurian period. This gives rise to overlying soils with high nitrogen availability.

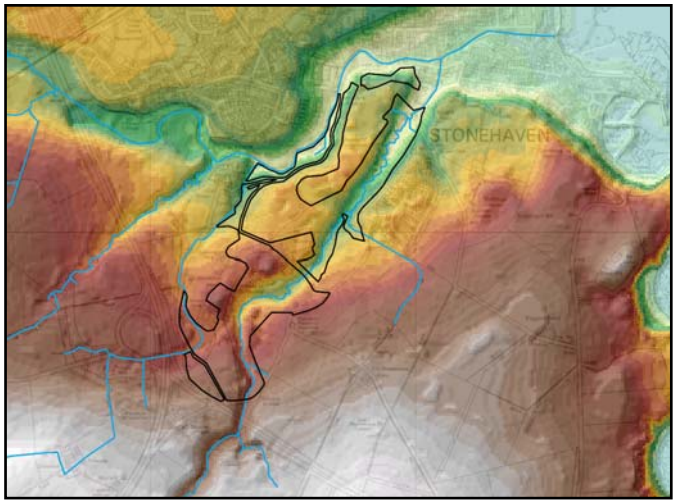


Soils – According to the Soil Survey of Scotland part of this design plan area is underlain with soils of the Stonehaven, Tipperty and Auchenblae associations, with alluvial soils along the watercourses. The Stonehaven association comprises both imperfectly drained and freely drained brown forest soils with some humus-iron podzols and noncalcareous gleys. The Auchenblae association consists largely of humus-iron podzols with some brown forest

soils, peaty podzols and gleys. The Tipperty association contains areas of brown forest soils with gleying with some poorly drained noncalcareous gleys and minor areas of peaty gleys.

Topography – This FDP area is located at the confluence of two watersheds just above the flat ground occupied by Stonehaven. The majority of the woodland is on the small spur of land between the Carron and Glaslaw burns. The area within the floodplain of the Glaslaw is the most sensitive for potential management of flood events.





3.1.2 Water

The FDP area falls within the Kincardine and Angus coastal catchment area which runs from Aberdeen south to Inverbervie.

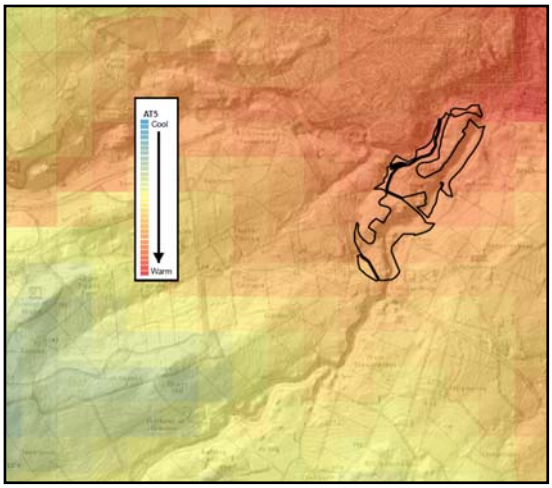
Due to its location on the coast at the outfall of two significant rivers: the Carron and the Cowie, Stonehaven is subject to flooding from fluvial, surface water and coastal sources. Serious flooding has taken place in recent years: November 2009 and December 2012 from the river Carron.

FCS have recently been working closely with Aberdeenshire council and SEPA to improve the potential of the limited flood plain within the woodland area to help with flood alleviation. This plan will continue to take forward these improvements and no works will be undertaken without consultation with the relevant authorities.

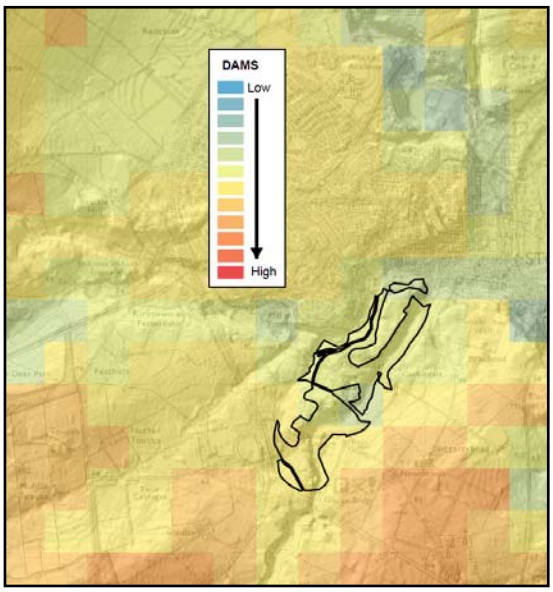
3.1.3 Climate

The climate for the whole of this plan area falls within the relatively benign climate zone of "warm, moist, sheltered".
The climate data from interrogating the Ecological Site Classification system (ESC) is:

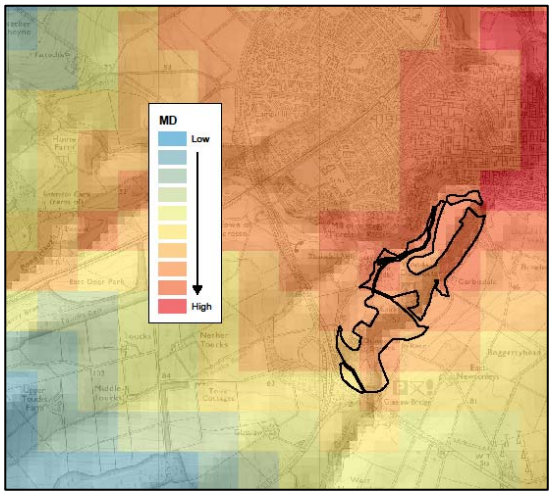
AT5	DAMS	MD
1257 – 1317	8 - 10	141 – 153



AT5 is the accumulated total of the day-degrees above the growth threshold temperature of 5º, which provides a convenient measure of summer warmth. The results for AT5 place this block in the "warm" 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. The results for DAMS place this block in the "sheltered" zone.



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 this block in the "moist" zone.

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

The small size of the woodland, the system of roads around it and the high level of community usage reduce the potential biodiversity value of the area. However it still has some significance due to its location on the interface between urban land and intensive farmland. There are no biodiversity designations.

The most important habitats within the woodland are the two riparian areas along Toucks Burn and the Burn of Glaslaw. Maintenance of water quality and flood management are priorities. These will be achieved by following the latest Forest & Water Guidelines and by introducing improvements to the riparian habitat to work towards creating more natural riparian woodland.

The fenced meadow and picnic area adjacent to the Glasslaw car park has a wide range of wildflowers. This will require regular maintenance to retain its biodiversity value.

There are limited species of significance to the forest planning process with the exception of otter that use the Glasslaw burn and bats that feed and potentially roost in and around the woodland.

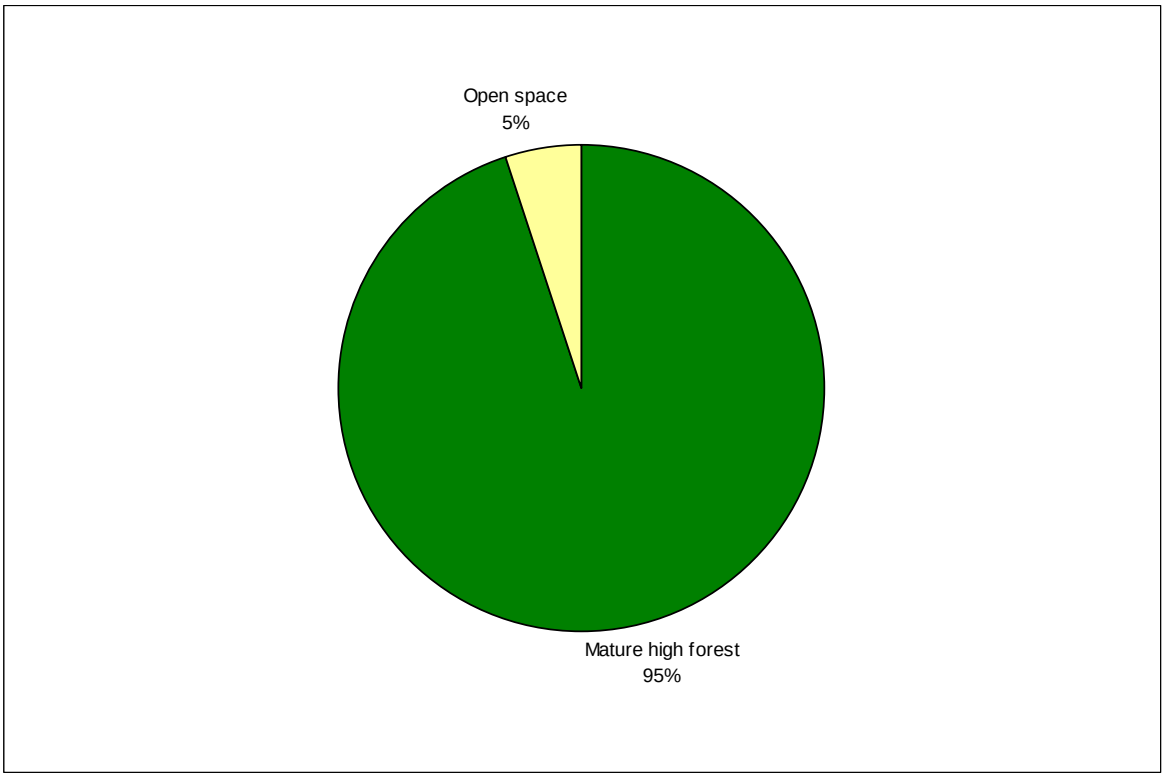
3.3 The existing forest

3.3.1 Age structure, species and yield class

Age Structure

As can be seen from the following table and pie chart the spread of age classes across the plan area is very uneven with only two structures represented. The main reason for this is the almost complete loss of woodland by 1953 due to felling and windblow and the subsequent restocking over a very short time scale. This plan will try to redress some of this in balance but the potential for this is limited due to the size and nature of the woodland.

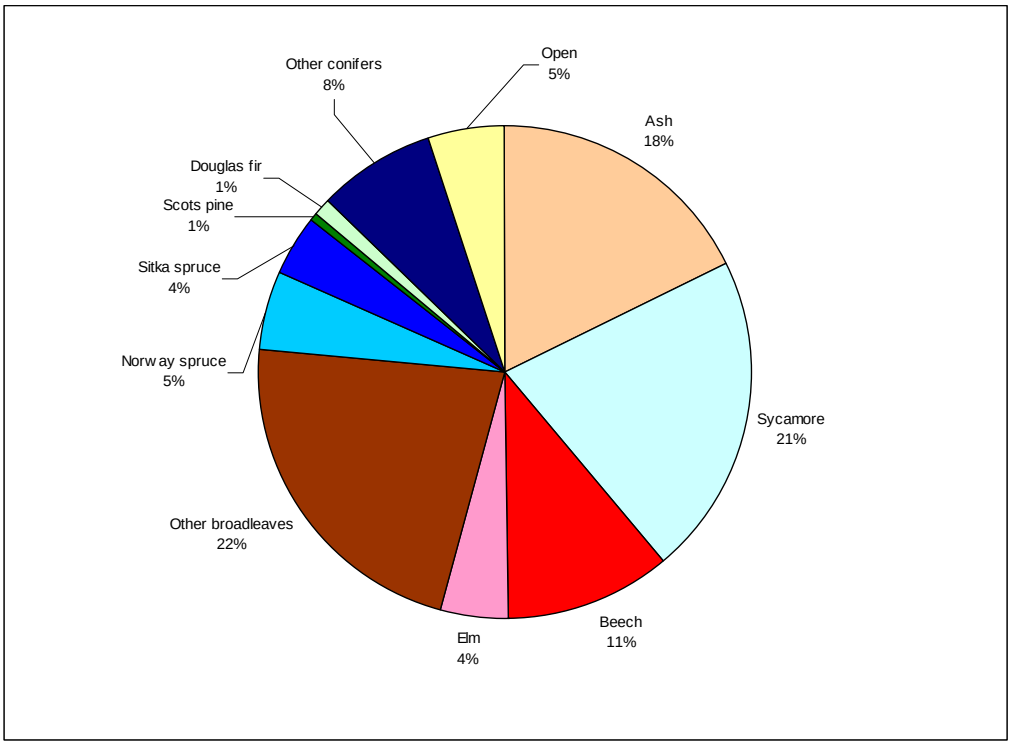
Ages of Trees (years)	Successional Stage	Area (ha)	%
0 -10	Establishment	0	
11 – 20	Early thicket	0	
21 – 40	Thicket & pole stage	0	
41 – 60	Mature high forest	32.0	95%
61+	Old forest	0	
	Open space	1.7	5%



Species

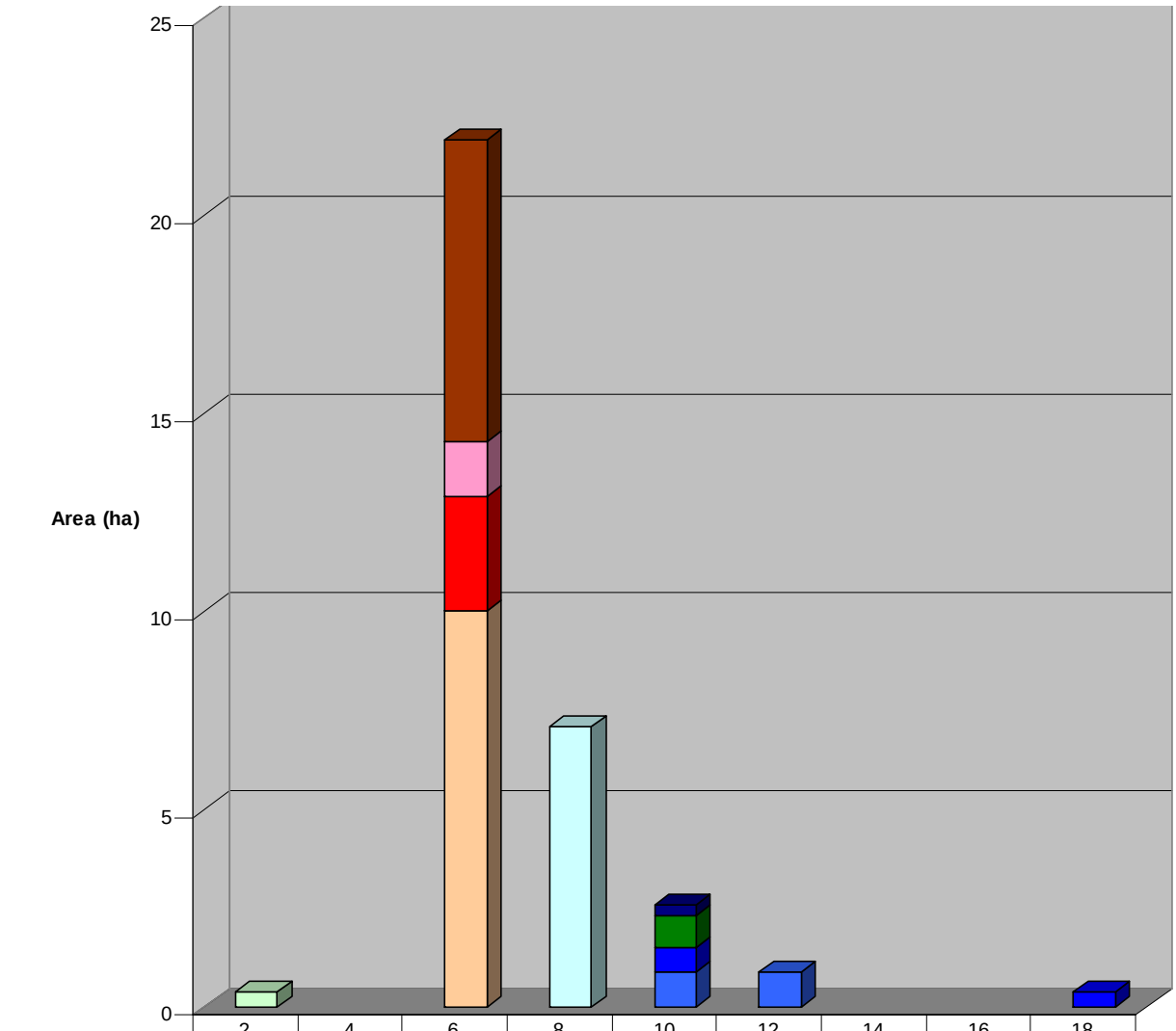
About 85% of the block is stocked with broadleaves. The remainder of the area is stocked with a limited range of conifers. Due to the location and nature of the woodland there will be no attempt to greatly change these percentages but to sensitively manage what is currently on site.

Species	Area (ha)	Percentage
Ash	6.0	17.8%
Sycamore	7.1	21.1%
Beech	3.7	11.0%
Elm	1.5	4.5%
Other broadleaves	7.4	22.0%
Norway spruce	1.6	5.3%
Sitka spruce	1.3	3.9%
Scots pine	0.2	0.6%
Douglas fir	0.4	1.2%
Other conifers	2.6	7.7%
Open	1.7	5.0%



Yield Class

The yield classes for the majority of the broadleaves is recorded as 6 but this is a just a notional figure to bring them into the production forecasting system.



	2	4	6	8	10	12	14	16	18
Other conifers					0.3				
Douglas fir	0.4								
Scots pine					0.8				
Sitka spruce					0.6				0.4
Norway spruce					0.9	0.9			
Other broadleaves			7.6						
Elm			1.4						
Beech			2.9						
Sycamore				7.1					
Ash			10						

Yield class

3.3.2 Access

Despite the block being located next to the A90 trunk road access is still quite difficult.

Access for timber lorries is limited, with two short sections of road, one off either side of the minor passing through the middle of the block. These can be used as turning point by reversing off the minor road. They provide limited space for stacking so uplift of cut timber will need to be fairly swift.

It appears the bridge damaged in the floods two years ago is unlikely to be reinstated to a standard fit for timber lorries, although it may be secured enough for pedestrian access. This would make an access point to the southern end of the block desirable for future operations Operation staff and civil engineers will examine the potential to establish a turning point between the bridge and the main road to allow timber extraction.

Access within the block is difficult in the northern section with steep slopes and a multitude of paths. Currently operations are planned to make use of hand felling with extraction by a small tractor and forwarding trailer unit.

The southern section has more potential, although this is still made more difficult by the number of paths and car parks.

A small spur of road enters the block from the south west however this is currently totally overgrown and will require some upgrading before it is used. This would allow future operations to avoid extracting towards the car park.

A good portion of the southern section is accessible by standard harvester and forwarder (dependant on lorry access for delivery) but a section to the east of the Glasslaw burn is only suitable for motor manual felling and winch extraction.

3.3.3 LISS potential

Much of the area of this design plan has potential for management under LISS (Low Impact Silvicultural Systems).

These are defined as '… silvicultural systems whereby the forest canopy is maintained at one or more levels without clear felling.' This means there will be no felling areas larger than 2 ha.

The potential for LISS is based on the wind hazard class of the crop, the soil nutrient regime and the suitability of the species to the site. The issue that will need to be addressed in future plans is how to achieve successful natural regeneration in a block with very heavy recreation pressure including the control of browsing mammals (deer and rabbits).

3.3.4 Current and potential markets

Currently the thinning from this design plan area is likely to only produce about 570 cubic meters of timber due to its size and age structure.

Material	End product	Percentage
Short roundwood	Fire wood	>95%
Log	Construction	<5%

The log production will be sold on the open market to establish demand and prices as we have very limited experience of marketing such material.

The remaining material will go for firewood, both domestic and commercial suppliers.

The future changes are hoped to be an increase in the proportion of the material that can be sold as log as the wood matures and individual trees increase in size. The long term aim is to create woodland capable of producing quality hardwood timber but the constraints of access difficulties and cost, recreation issues, the woodlands small size and resource availability will all have a limiting impact on this objective.

3.4 Landscape and land use

3.4.1 Landscape character and value

Due to the topology of the area and the surrounding land use any external views of the woodland are very limited. However due to the population of the area and the high level of recreation internal views are very important.

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 Forest Design plan reviews and where appropriate all efforts are made to follow the guidance given, where it matches with current FCS policy.

The design plan area is covered by Scottish Natural Heritage Landscape Character Assessments No102 South and Central Aberdeenshire, produced in 1998 by Environmental Resources Management.

Dunnottar falls on the boundary of the Agricultural heartlands, Garvock and Glenbervie and Coastal strip, Kincardine cliffs.

Garvock and Glenbervie landscape character area is one of extensive rolling farmland. While Kincardine cliffs is essentially a rocky coastline zone. Therefore neither zone fits well with the semi-urban setting of Dunnottar so any specific guidance in the character assessment is less relevant for this woodland.

3.4.2 Visibility

The block is visible from most of the surrounding area. But due to the topology of the area and the surrounding land use these external views are very short and limited.

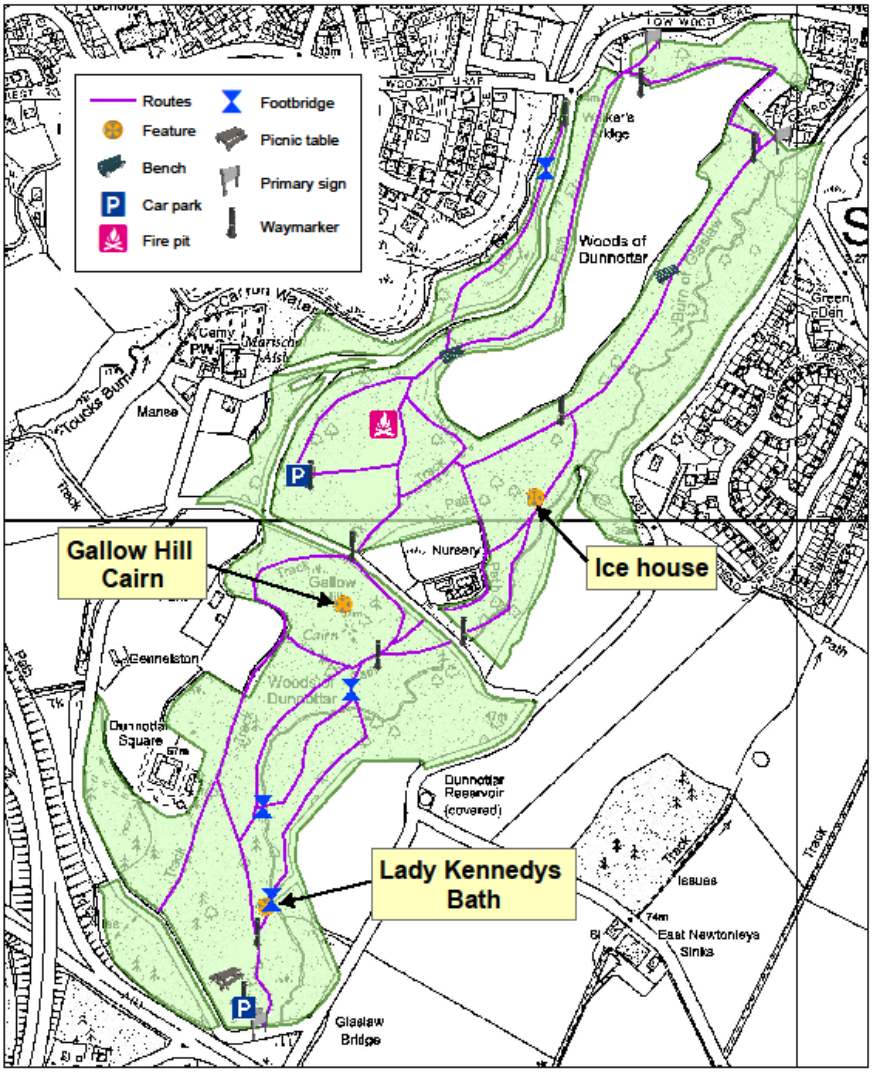
3.4.3 Neighbouring land use

Dunnottar wood lies on the southern edge of Stonehaven with housing estates overlooking it. The block is hemmed in with the A90 trunk road to the west, the A957 to the east, the A92 to the south and a number of minor roads pass through the woodland. Else where intensive agricultural land neighbours or even lies within the block.

3.5 Social factors

3.5.1 Recreation

Dunnottar is a very important block for recreation given its location on the outskirts of Stonehaven. There are two main car parks with other pedestrian access points with entrance signage (see photo below), a total of approx 5.4km of waymarked routes. See map below. In addition there are several picnic tables and benches and a fire pit in an open play area (see photo below).



3.5.2 Community

Dunnottar is important community woodland which is enjoyed by the population of Stonehaven for a variety of activities and by a range of individuals and groups.

Dunnottar Woodland Park Association is actively involved in the management of the woodland with support from FCS. They undertake work parties and litter picks and also encourage wider community involvement in the woodland.

The Dunnottar bodgers are a group of locals from Stonehaven who meet regularly in the woods to learn and teach 'bodging' and green woodworking

skills. They regularly engage with local schools to pass on their skills to local children. The bodging group have a metal shipping container on site where they store their equipment and that acts as a base for their activities.

The block is also used by local outdoor education businesses such as Mudpies and Dawn Ewans forest schools, and FCS will continue to encourage and support such activities.

The woodland plays host to a number of public events each year delivered either by FCS or by others with permission from FCS. FCS also runs a number of events to engage with local schools to deliver outdoor education activities.

3.5.3 Heritage

There is a Scheduled Monuments within the design plan area, Gallow Hill. The following description comes from the Historic Scotland website.

"The monument comprises the remains of a burial cairn of the Bronze Age, situated on the summit of a natural hillock. It measures 15.5m in diameter and 1.8m high. Antiquarian disturbance in the last century revealed human bones. In 1989 a cup marked stone was found a short distance away. The mound will almost certainly cover further burials and a contemporary ground surface. The area …scheduled measures 30m in diameter, centered on the cairn…

National Importance

The monument is of national importance as a burial monument which has the potential, despite some antiquarian disturbance, to enhance considerably our understanding of prehistoric burial practices. The contemporary ground surface under the mound has the potential to increase our understanding of Bronze Age land use. The discovery of the cup marked stone may indicate that traces of further burial or ceremonial activity may survive in the area."

The monument management plan includes the following actions which will be undertaken in the period of this plan:

- Monitor the condition of the monument and ensure the removal of all intrusive scrub vegetation and regeneration. Retain as open space.
- The current informal path accessing the summit of the site from the N is causing erosion and could become both a hazard to the public and a serious problem in regards to the monument and its buried archaeological deposits. The area of erosion will be 'formalised' with the insertion of irregular flat stone steps. Between three and five large flat

stones will be sourced locally and inserted into the eroded section, with minimal ground disturbance (no more than 0.1m in depth).

- FCS staff will formally inspect the condition of the monument once every year. A brief file note will be prepared describing the condition of the site as found. A copy of this file note will be sent to the local Historic Scotland Inspector of Ancient Monuments.

3.6 Pathogens and diseases

Chalara dieback of ash is an aggressive fungal disease and is caused by *Chalara fraxinea*, including its sexual stage, *Hymenoscyphus pseudoalbidus.* The disease causes leaf loss and crown dieback in affected trees, and usually leads to tree death. Ash trees suffering with the infection have been found widely across Europe since trees believed to have been infected with this newly identified pathogen were reported dying in large numbers in Poland in 1992. These have included forest trees, trees in urban areas such as parks and gardens, and also young trees in nurseries. Currently the closest recorded outbreaks are approximately 7.5km south west around Brechin.

3.7 Statutory requirements and key external policies

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

<u>Biodiversity</u>

- Conservation (Natural Habitats) Ammendment (Scotland) Regulations 2007
- Nature Conservation (Scotland) Act 2004
- Wildife 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 2004

Climate Change

- The United Nations Framework Convention on Climate Change
- The Kyoto Protocol
- EC Directive 2003/87/EC
- Climate Change (Scotland) Act 2009

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

Forests & People

- Control of Substances Hazardous to Health Regulations 2002
- Employers Liability (Compulsory Insurance) Act 1969
- 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 Occurences Regulations 1995
- The Highways Act 1980

Soils

- Control of Pesticides Regulations 1986
- The Waste Management Licensing Regulations 1994
- European Soil Charter

4.0 Analysis and Concept

Refer to Map 4: Analysis and concept.

Issue	Analysis	Concept
Flood & catchment management	Glaslaw burn is situated in a very restricted floodplain with little room for expansion in severe flood events.	Follow advice of statutory bodies to Undertake operations that may have a positive impact on the limited potential for flood alleviation at this location. Work with the local community where this is appropriate.
Adapting to climate Change	Crop and site characteristics make LISS an appropriate management system for much of the woodland.	Continue the current regime of regular thinning operations to create a final crop of broadleaves suited to the production of good seed crops for natural regeneration.
Timber supply	Some areas have conifer crops on wet soils that are becoming unstable and prone to windblow.	Programme these areas for early clearfelling and restock with species appropriate to the site conditions.
Recreation	Good provision of recreation facilities with a high level of community involvement.	Maintain current provision of recreation facilities with the involvement of the local community.
Species & habitats	The wood has a high biodiversity potential given the range of native and non-native conifers and broadleaves.	Maintain current diversity potential by retaining existing veteran trees during thinning operations and varying the thinning intensity in areas to create varied woodland densities.

5.0 Forest Design Plan Proposals

5.1 Management

Thinning

Refer to 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 Dunnottar this means that most of the area will continue to be thinned in order to improve timber quality. The woodland is one thinning coupes, which will be worked on 10 year cycle due to the predominance of broadleaves. However the coupe will be thinned over two years to reduce the impact on the recreation in the block.

All thinning decisions will be guided by Operational guidance Booklet No 9 'Managing thinning.'

Low Impact Silvicultural Systems (LISS)

Refer to Map 5: Management.

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 and most of this design plan area will be managed under this system.

LISS is defined as the use of silvicultural systems whereby the forest canopy is maintained at one or more levels without clearfelling. Clearfelling is defined as the cutting-down of all trees on an area of more than 2.0ha.

The attraction of LISS lies in the fact that this approach is suited to an era of multi-purpose forestry where environmental, recreational, aesthetic and other objectives are as important as timber production. In particular LISS is seen as a means of reducing the impact of clearfelling and the associated changes that this produces in forest landscapes and habitats.

In the plan area those stands selected for LISS are those with the most suitable crops on sites with the appropriate ground conditions and that have received the necessary management (thinning) in the past. Areas selected for LISS management are highlighted on the Management map.

At this stage of the process thinning will be the only operation required until the conversion phase is reached in future plan periods.

A prescription has been written up and is held in the coupe records folder for the plan. Each prescription will be included in the site management plan before any operation commences. The prescription is included in appendix 3.

Clearfell

As stated above the main silvicultural system employed in British forestry is 'patch' clear-felling followed by planting or occasionally natural regeneration. There is one clearfell coupe planned for the first phase of this plan in order that the timber in these areas is harvested before the onset of more severe windblow. This is mainly Norway spruce, Japanese larch and Scots pine on wet soils that are not stable enough for continuous cover systems.

Although clear-felling can appear to have a negative impact on landscape and habitat it is 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, (replanting), also creates transient open habitat that is exploited by several species such as voles, deer, raptors such as Kestrel, Buzzard and owls.

5.2 Future Habitats and Species

Refer to Map 7: Future habitats and species.

Restocking

There is only one coupe that will be restocked during the period of this plan. Species choice is guided by soil and current climatic conditions plus potential climate change and the objectives for the plan.

In common with the majority of Forest Enterprise Scotland estate, most restocking in the design plan 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 abiatis.* 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.

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 before then if monitoring, using the Forest Research *Hylobius* Management Support System shows that it is safe to do so. Please refer to the district fallow policy for details.

The area for restocking will be planted with mainly alder and aspen. Any existing or future natural regeneration of broadleaves will be accepted. Up to 10% of the mix as naturally regenerated conifers will be accepted but if it exceeds this figure cleaning operations will be required.

The areas of the coupe that are dry enough will be managed as commercial productive woodland with the aim of producing a fuelwood crop. This means the planting density will be around 5,000 stems per hectare.

Thinning will be carried out as appropriate for the crop and the final objective.

Open ground

Currently open ground makes up only 3% of the block area. The UK forest standard requires 10% of each management unit to be open ground. However this is a woodland which has very good 'interlock' with the open space created by surrounding agricultural land, it has long convoluted edges creating a good length of edge habitat, providing shelter for adjacent farmland, and 'borrows' open space from the surrounding fields.

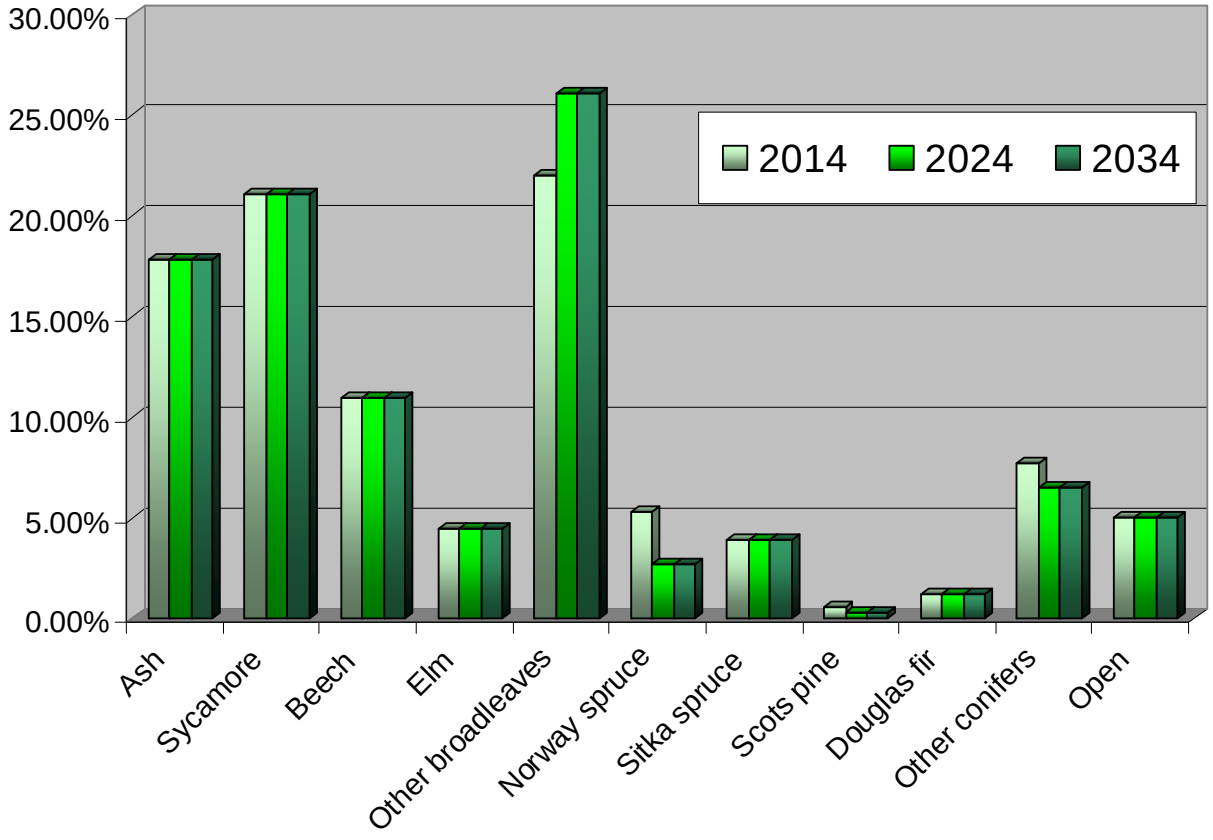
The woodland contributes significantly to the setting of Stonehaven, by reinforcing the enclosure provided by the higher ground that contains the settlement to the north of the block.

The only reason for more open space is to create a new woodland habitat or enhance the experience of walking through the woodland. There are no external landscapes or biodiversity reasons for establishing more open space. Neither the Environment nor Community, Recreation and Tourism teams see the creation of more open ground within the block as a priority.

Therefore we are reluctant to create open space simply to meet the 10% target without a robust need, as this woodland is an independent, standalone wood that provides a forest habitat link within a more open agricultural area, and also a sheltered recreation resource within a more open and at times exposed coastal landscape.

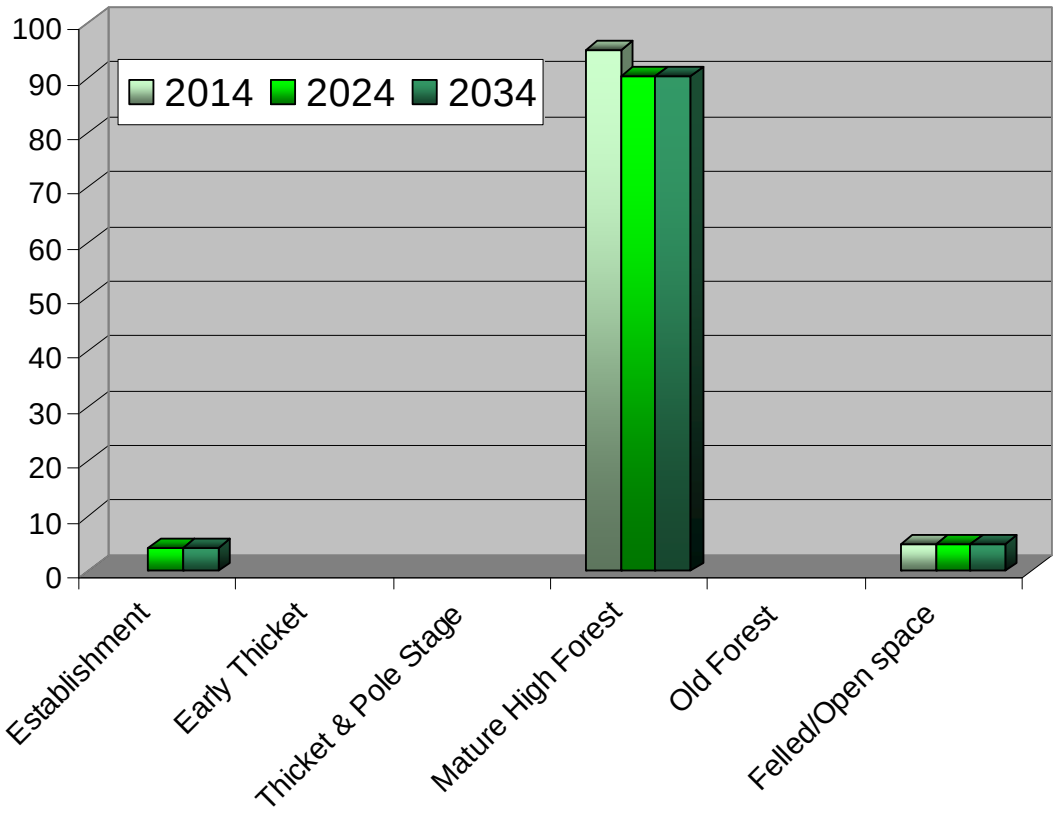
5.3 Species tables

Species	Current distribution 2014	Projected distribution 2024	Projected distribution 2034
Ash	17.8%	17.8%	17.8%
Sycamore	21.1%	21.1%	21.1%
Beech	11.0%	11.0%	11.0%
Elm	4.5%	4.5%	4.5%
Other broadleaves	22.0%	26.1%	26.1%
Norway spruce	5.3%	2.7%	2.7%
Sitka spruce	3.9%	3.9%	3.9%
Scots pine	0.6%	0.3%	0.3%
Douglas fir	1.2%	1.2%	1.2%
Other conifers	7.7%	6.5%	6.5%
Open	5.0%	5.0%	5.0%



5.4 Age structure

Age of Trees (years)	Successional Stage	Current distribution 2014	Projected distribution 2024	Projected distribution 2034
0 -10	Establishment		4.2%	4.2%
11 – 20	Early Thicket			
21 – 40	Thicket & Pole Stage			
41 – 60	Mature High Forest	95.0%	90.9%	90.9%
61+	Old Forest			
	Felled/Open space	5.0%	5.0%	5.0%



5.5 PAWS restoration

There are no areas with a PAWS designation in the plan.

5.6 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 prepare for each Deer Management Unit and are the responsibility of the Wildlife Ranger Manager.

5.7 Access

There are no access issues that need to de addressed in the period of this plan except the ongoing maintenance of the existing forest road and recreation route networks.

5.9 Pathogens

Large Pine Weevil, *Hylobius abiatis*
In common with the majority of Forest Enterprise Scotland estate, most restocking in the design plan area has traditionally taken place within two years of sites being clearfelled. However, many seedlings were badly damaged or killed by the Large Pine Weevil, *Hylobius abiatis.* 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.

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 before then if monitoring, using the Forest Research *Hylobius* Management Support System shows that it is safe to do so. Please refer to the district fallow policy for details.

Ash dieback, *Chalara fraxinea*
Ash dieback is a disease of ash trees caused by a fungus called Chalara fraxinea. The disease causes leaf loss and crown dieback in affected trees and it may lead to tree death. Ash trees suffering from symptoms likely to be caused by Chalara fraxinea are increasingly being found across Europe. These have included forest trees, trees in urban areas (such as parks and gardens) and also young trees in nurseries.

FCS published a Chalara Action Plan for Scotland in March 2013. Although no evidence of the disease has not been seen in Dunnottar to date the situation will be kept under review and the above action plan will be followed.

Phytophthora ramorum
P. ramorum is a fungus-like plant pathogen which was first detected in GB in the nursery trade in 2002 and which attacks a wide range of trees and shrubs. It was first found in nursery stock in Scotland in 2002 and in an established garden in September 2007. It was first detected on Japanese larch in south west England in 2009 and in Scotland late in 2010.

Although European and hybrid larch are also susceptible to P. ramorum, current evidence indicates that the impact of the disease is greatest on Japanese larch which can die within one to two seasons, with consequential economic, environmental and amenity impacts. The disease on larch showed a significant expansion in 2013 with a core area of some 5-6000 ha of larch within South West Scotland showing extensive signs of infection. Further, smaller and more sporadic infections have also been identified along the western seaboard of Scotland principally in the Argyll and Cowal areas. There have also been four isolated outbreaks in the north east of Scotland. The total infected area within Scotland is estimated to be now in excess of 6,500 ha.

FCS published a Chalara Action Plan for Scotland in August 2013. Although no evidence of the disease has not been seen in Dunnottar to date the situation will be kept under review and the above action plan will be followed.

5.10 Critical Success Factors

- Monitor for diseases and act appropriately if any discovered.
- Undertake the planned thinning programme in order to continue the LISS management of creating stands with good potential for seed production a conversion stage.
- Continue with the maintenance of the forest road network to allow forest operations to be successfully completed.
- Maintain the current recreation resource to a high standard.

Appendix 1 – Consultation record

Consultee	Date of contact	Response Received	Issues Raised	Forest District Response to Issues
Aberdeenshire Council	02/07/2013 By email	04/07/2013 By email	Request to discuss proposals with Principal Engineer with responsibility for flood protection.	Met with Principal Engineer on 27/11/2013, Discussed issues and current proposals based the information gained.
Scottish Environmental Protection Agency (SEPA)	08/01/2013 By email	28/01/2013 By email	Request to discuss proposals with SEPA Ecologist based in Dingwall.	Discussed issues during telephone conversation and current proposals based the information gained.
Scottish Natural Heritage (SNH)	02/07/2013 By email	03/07/2013 By email	No comments	
Aberdeenshire Council Archaeology Service	02/07/2013 By email	03/07/2013 By email	Forwarded all known archaeological records.	FCS archaeology info checked against this.
Royal Society for Protection of Birds	02/07/2013 By email	02/07/2013 By email	No comments	

(RSPB) Ian Francis				
Dunnottar Bodgers Group (Alan Craig)	02/07/2013 By email	18/07/2013 By email	"DBG would like to see the area called the Walled Garden be taken in to community ownership/leasing so that a community craft centre can be built in the heart of the woodland."	This area is not in FCS ownership so this issue will not be addressed in this plan.
Stonehaven & District Community Council (David Fleming)	02/07/2013 By email	No response to date.		

Appendix 2 – Tolerance table

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

Appendix 3 – 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
36102	Single tree selection	Landscape & backdrop for recreation. Mixed stand of broadleaves	Complex. 100% MB	Limited age range (54 – 60 years) 100 10	No regeneration due to low light levels.	Deer and rabbit browsing & difficulty of protection in high rec area.	Intermediate thin to MTI looking to improve overall crop quality.	Thinning control.	See appendix 5 LISS management, section 3 (transformation in older (>40yrs) stands).

Appendix 4 – 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.
- The final removal of the over storey 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 over storey.
- 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

Table 2. Basal area guidance for natural regeneration

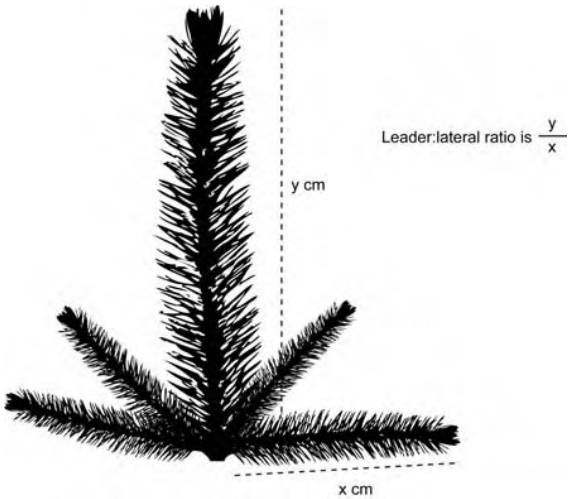
Species/ group	Shade tolerance of seedlings	BA (m2 ha-1) Establishment*	BA (m2 ha-1) Seedling growth**
Larches	Intolerant	20-25***	15-20
Pines	Intolerant	25-30***	20-25
Sitka spruce	Intermediate	30-35	25-30
Douglas fir	Intermediate	35-40	30-35
Norway spruce	Tolerant	40-45	35-40
Western hemlock	Tolerant	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 ≥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 m2 per ha for larches and pines, and 25-35 m2 per ha for spruces and Douglas fir. The choice within this range will depend upon the site and the balance between the over storey 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:

- 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 over storey while older trees are progressively felled.