

Moray and Aberdeenshire Forest District

Pitfichie & Corrennie

Land Management Plan



Plan Reference No: LMP 26

Plan Approval Date:

Plan Expiry Date:

We manage Scotland's National Forest Estate to the United Kingdom Woodland Assurance Standard – the standard endorsed in the UK by the international Forest Stewardship Council® and the Programme for the Endorsement of Forest Certification. We are independently audited.

Our land management plans bring together key information, enable us to evaluate options and plan responsibly for the future. We welcome comments on these plans at any time.



The mark of
responsible forestry



FOREST ENTERPRISE - Application for Forest Design Plan Approvals in Scotland

Forest Enterprise - Property

Forest District:	Moray & Aberdeenshire FD
Woodland or property name:	Pitfichie and Corrennie
Nearest town, village or locality:	Monymusk / Alford
OS Grid reference:	NJ 642 140

Areas for approval

	Conifer	Broadleaf
Clear felling	161.9 ha	0 ha
Selective felling	13 ha	0 ha
Restocking	271.7 ha	13.3 ha
New planting (complete appendix 4)	0 ha	0 ha

1. I apply for Land Management 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 2016

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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1. Introduction

Refer to location map.

1.1 Location

Pitfichie and Corrennie covers close to 2,500 ha made up of two forest areas separated by the A944 main road: Pitfichie to the North and Corrennie to the South. Pitfichie and Corrennie Forests are themselves made up of a number of larger and smaller forest blocks as can be seen in the location map.

The site is located East of Alford and West of Monymusk. The main A944 road crossing over the site leads directly to Aberdeen 20 miles to the east. The river Don flows to the North. Pitfichie is highly visible from the top of Bennachie, one of the most visited sites in Moray and Aberdeenshire Forest District.



Photo above: View of Pitfichie and Corrennie (North to South)

1.2 Setting and Context

The composition of the woodlands in Pitfichie and Corrennie is diverse, mainly composed of conifers with some areas of broadleaves. The open lands are mainly composed of upland heathland located at the top of the hills.

Pitfichie is composed of a series of summits ranging from Pitfichie Hill 381m, Cairn William 448m, Pile of Stones 399m, White Lady 361m. Corrennie is however mainly located on the slopes of Green Hill and Red Hill. Its lowest point is located close to the river Don (around 100 meters high).

In terms of the Moray & Aberdeenshire Forest District Strategic Plan, Pitfichie and Corrennie is located in an area identified with potential for:

- Some areas are suitable for growing productive broadleaves.
- Having a high number of visitors.
- Enhancing visitor experience at high public value sites for recreation.
- Improving facilities to enable access for all abilities.

□ **Moray & Aberdeenshire Forest District** Strategic Plan (Public consultation) - <http://www.forestry.gov.uk/fesplans>

1.3 Land Management Objectives

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

- the physical context and existing land use;
- the land management objectives already established by statutory bodies;
- the physical capability of the land;
- the locational objectives identified in the Moray & Aberdeenshire Forest District Strategic Plan;
- the views expressed by the public and statutory stakeholders

The primary objective of the plan will be **to produce a high quality timber**. The timber could come from either broadleaves or conifers. This will be done taking into account: areas of high recreation, the trails and the forest landscape management which are key issues at this location.

The secondary objectives will be to:

To maintain the high environmental value of the site maintaining tree species and habitat diversity.

2. Analysis of previous plan

The previous Forest Design Plan was approved in 2006.

The main objectives stated in this plan are included in the table below, along with the progress made to date on the achievement of the objective and how this will be carried forward into the new plan.

Since the last plan was approved in 2006 policy themes have been updated and as a consequence previous objectives have had to be categorised to fit with current policy theme descriptions.

Theme	Priority (in current approved plan)	Objective (in current approved plan)	Management action	Progress to date 1 – Nominal progress 2 – Some progress 3 – Progress as per FDP	Proposed action (in this plan)
Economic	None	New roads required	Build new roads when needed	3 – All upgrades and road needed have been discussed and done if required.	Some upgrades will be needed particularly in west Corrennie. However, the road network is good all over the site and at the moment, no new roads seem to be required.
	None	Deer Control: planned and managed deer lawns to aid control.	Create Lawns appropriate for deer culling.	3 – Deer culling is still ongoing in the area	Deer control will still be considered as a priority in the area. The new restock sites will be either protected by fences or shooting.

	None	Maintain current species diversity.	Scots pine and Larch crops as long as possible and, where practical replace like with like.	3 – Most of the Scots pine and Larch stands have been put within Low Impact Silvicultural System (LISS – See definition in 5.) and Long term retention designations when the previous plan was approved	Scots pine and Larch will be harvested when their economic value will be ideal. However, we will try to retain these stands as long as possible in order to reduce the impact of a timber drop forecasted within the next 20 years. Pines and larches are more stable than others conifers species and can be therefore retained longer than sitka spruce for example. LISS and Long term retention coupes will be reviewed regarding the current policies, national and local strategic plans.
	Medium	Produce wood & marketable timber.	Actively manage stands to produce quality timber. Remove LP infected by DNB.	3 – The felling programme has been respected and is still ongoing. LISS stands have been actively thinned to produce timber, and improve crop quality.	Continue to produce a good quality timber in the site. Diversify the range of products in the future in order to increase the species diversity of the site for its benefit regarding resilience to diseases and climate change.
Social	None	Plan new mountain bike trails in order to take cycling pressure away from Benachie. New car park for cyclists was proposed at	Work in partnership with Aberdeenshire Council and Monymusk estate to plan new mountain bike trails. Investigating the possibility of funding from a variety of	2 – No new mountain bike trails have been built. However, events have been organised and FES is working with Monymusk estate and Aberdeen Council on a regu-	The possibility of expanding mountain bike trails is still considered. This could be done in partnership with the North East Trail Centre Organisation on the top of other groups or communities...

		Pitmunie.	external sources.	lar basis.	
Environment and biodiversity		Fight against grey squirrels.	Stop planting species encouraging grey squirrels such as beech.	1 – The site does not belong anymore to the red squirrel stronghold	The stronghold areas have been reviewed for Moray and Aberdeenshire forest district. Pitfichie and Corrennie forest does not belong anymore to the stronghold. Therefore, species such as beech could be considered for restocking
		Improve / maintain the quality of the open moorlands at the top of the hills.	Lower the tree line on restock.	3 – Open areas have been left at the top of the slopes after clear-felling in order to lower the tree line.	There are no issue with the current tree line of the forest. Indeed, the tree line fits well in the landscape and no action is needed to improve it at the moment.
		Restore 3 Plantations on ancient woodland site (PAWS).	Restore the site by felling non-native conifers and planting native species.	2 – Native species have been planted. However, some plantations have been unsuccessful and need to be re-established.	Restore PAWS in the long term as detailed in part 5 of this plan.

		Expand Broad-leaf resource along water-course	Plant broadleaves along water-courses	3 – Plantations have been done as per UK woodland forestry standards guideline.	Buffer zones with broadleaf plantations will be established when restocking along watercourses.
	High	Conserve scheduled monument.	One Scheduled Monument (SM) monitored yearly/5 yearly and work undertaken where necessary. Regularly recording archaeology/historical interest features.	3 - All SM are on Monument Management Plans (MMPS) since 2015 Recorded info shared with Historic Environment Scotland and FCS staff	Continue to conserve the Whitehill Stone Circle (NJ 643 135) Scheduled Monument by following MMPs.

3. Background information

3.1 History of the site

The older crops in Pitfichie and Corrennie were planted in 1900.

4 % of the trees were planted between 1900 and 1940, 50 % between 1940 and 1960 and 46 % after 1980 (see graph below). Pitfichie and Corrennie forest has therefore a relatively good age diversity of stands. Half of the stands could be characterised as mature or close to maturity and ready to harvest.

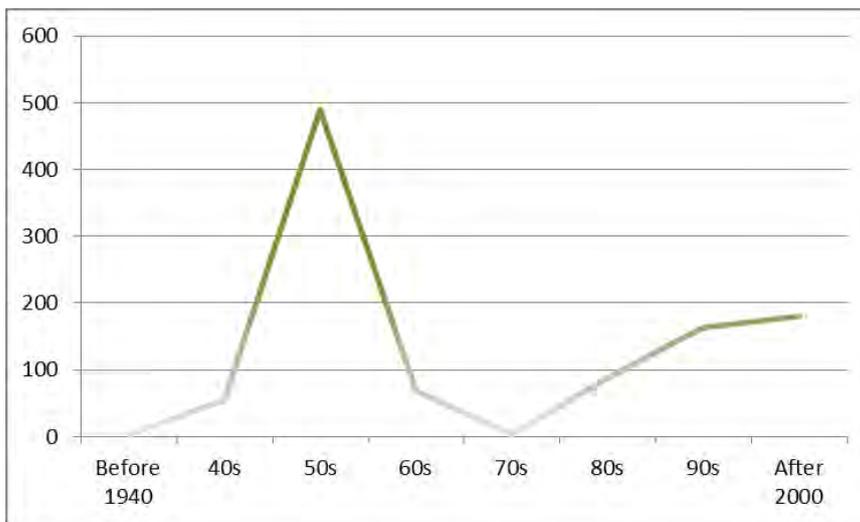
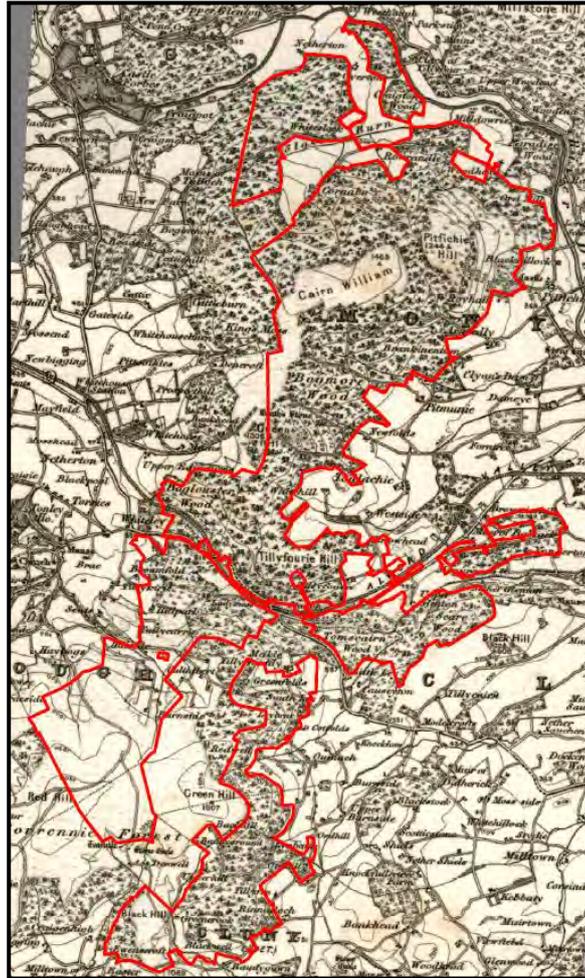


Figure above: Hectarage planted from 1900 until today

In the more distant past it is clear from the extracts of the Ordnance Survey (OS) maps published in 1874 the area was associated with forestry other than the west side of Corrennie (see map 1 below).



Map 1: Pitfichie and Corrennie, OS One-inch to the mile maps of Scotland, 1st Edition, 1856-1891, publication date: 1874.

3.2 Physical site factors

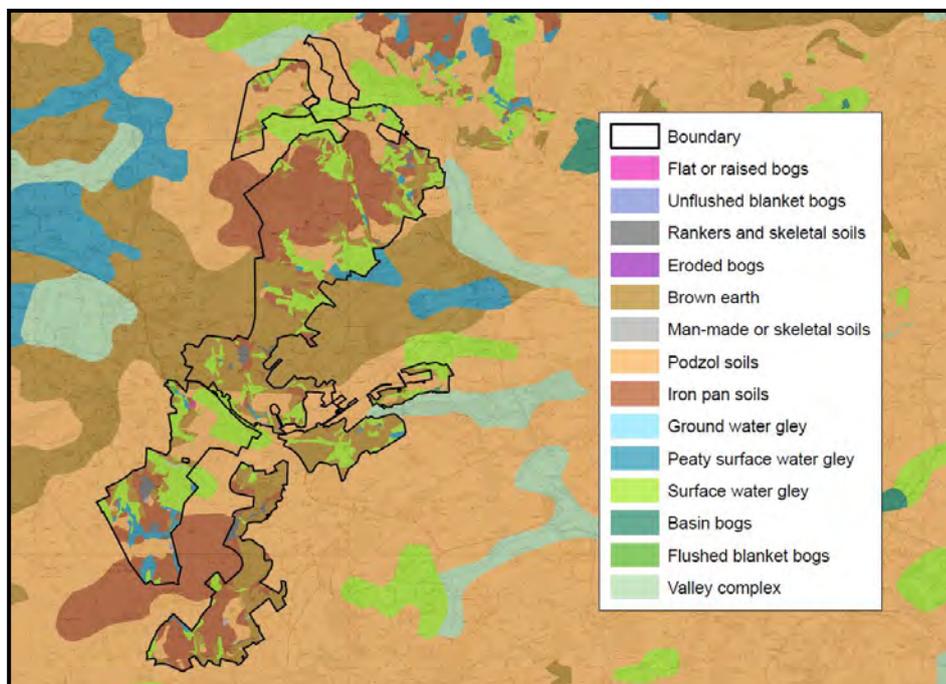
3.2.1 Geology, Soils and topography

Geology - According to the British Geological Survey Geological Map of the UK the plan area is underlain by granite, syenite, granophyre and allied rocks which generate medium nutrient overlying soils and by quartzose, mica and schist rocks.



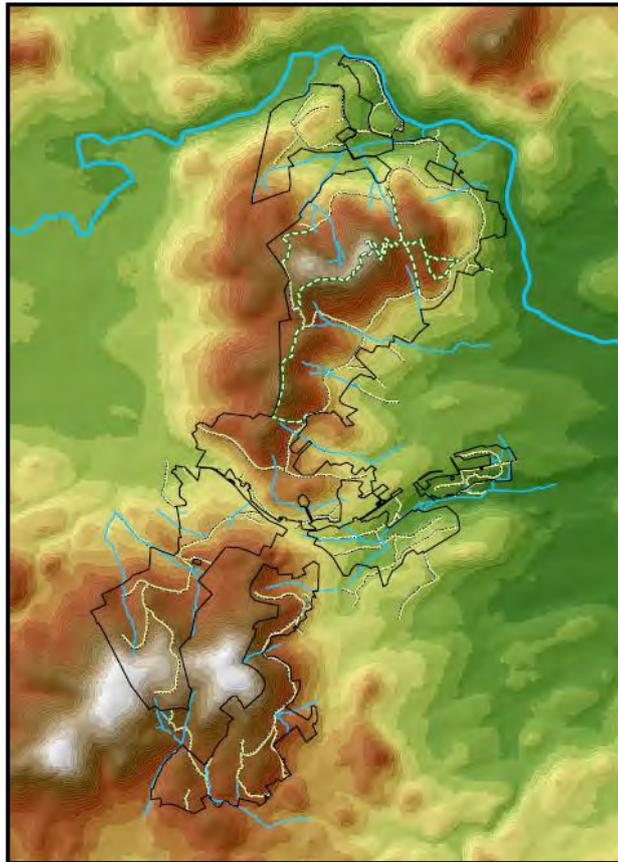
Map 2: Pitfichie and Corrennie's geology. Extract from British Geological Survey, 50k Geology map of the UK.

Soils – The soils in Pitfichie and Corrennie are medium nutrient soils. 28 % of the area is covered with a brown earth soil which is the most represented type of soil in the forest block. This type of soil allows a wide range of species to grow including broadleaves. 27 % are Iron pan soils and 22% surface water gley soils. Podzol soils are also well represented over the area (18 %).



Map 3: Soils in Pitfichie and Corrennie; map based on an interpretation of the James Hutton Institute soil maps.

Topography – Pitfichie and Corrennie has an altitudinal range of 100 - 491 m (see map below).



Map 4: Pitfichie and Corrennie topography

3.2.2 Water

Pitfichie and Corrennie forest is located in the catchment of the river Don with several Burns starting from the site flowing directly into the river. SEPA has classified the River Don as moderate ecological status (High, Good, Moderate, Poor and Bad scale range). The quality of the water in the River tends to be worse whilst approaching Inverurie and Aberdeen. Point source pollution from sewage discharges currently impacts on the River Don (between Inverurie and the tidal limit). Diffuse pollution from agricultural activities is also deteriorating the water quality of the lower River Don and tributaries. Several programs lead by SEPA have been started in order to help reducing pollution sources. A very small part of the south of the site is located in the river Dee catchment.

To help improve water quality the UK Forestry standard (UKFS) guidelines for Forest and Water is used as a reference to manage the woodland along water-courses. This series of guidelines sets out the approach of the UK government to sustainable forest management, defining standards and requirements, and providing a basis for regulation and monitoring. To improve water quality and ecology by intercepting possible diffuse pollution and creating dappled shade, na-

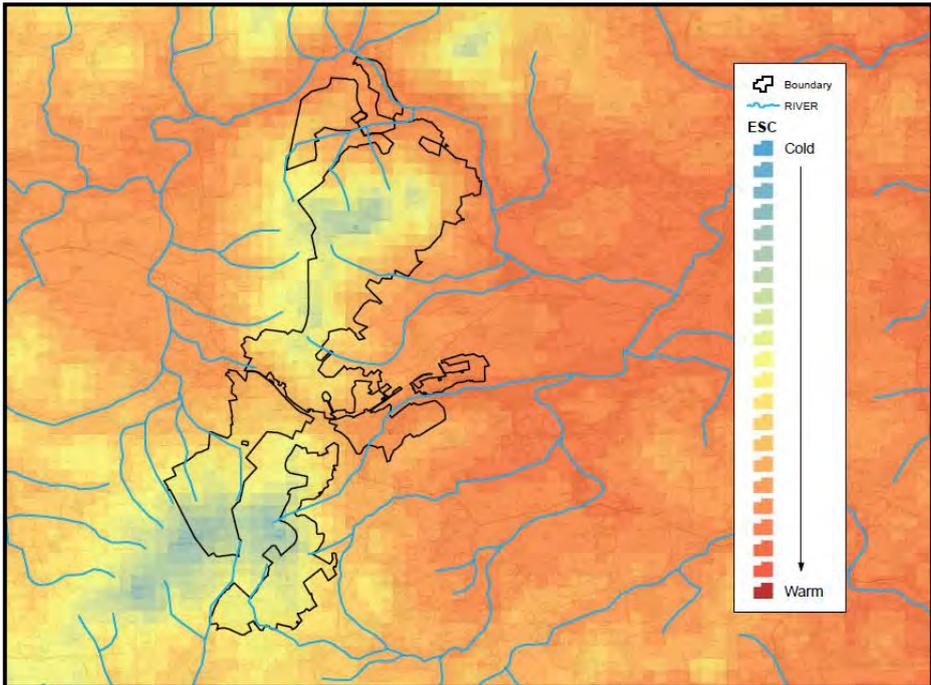
tive broadleaves will be planted where applicable along watercourses and approximately 50 % of open ground will be left. This will aim to restore those areas as native riparian woodlands. Concerning the plan period, approximately 50% of the restock coupes are crossed over by watercourses (please see restock map). The scale of those riparian areas being very small, they might not appear on the restock map but the restoration is systematically done on all sites by FES when restocking along watercourses.

3.2.3 Climate

According to the Ecological Site Classification (ESC) protocol, the climate at Pitfichie and Corrennie is classed as cool, between wet and moist and between Sheltered and severely exposed. Four climatic factors are used to define the climate for any given location. These are warmth, wetness, continentality and windiness. Continentality has the least impact so is dropped from the overall climate zone designation.

The climate data for Pitfichie and Corrennie from interrogating the ESC is:

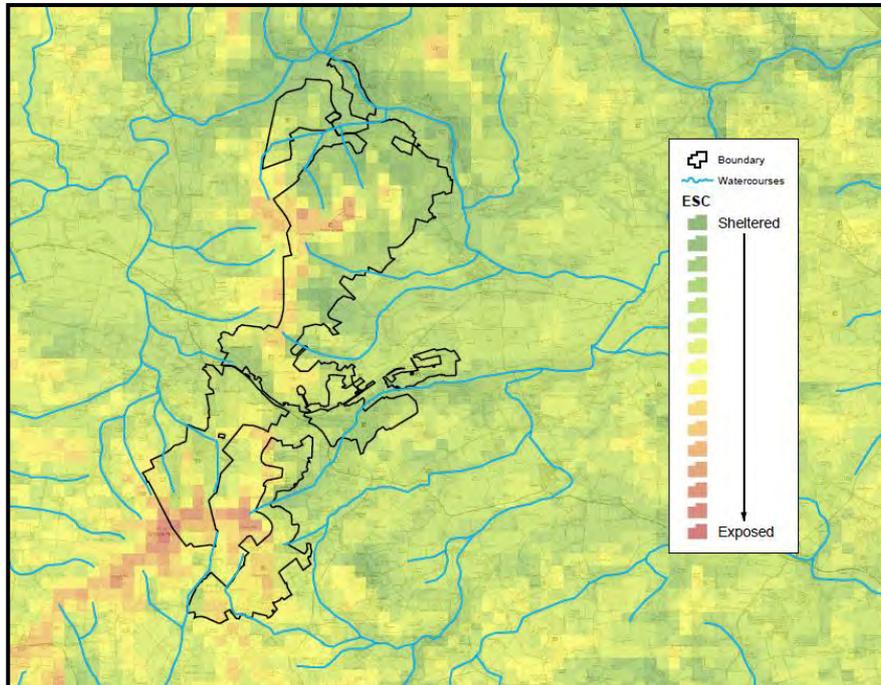
	AT5	DAMS	MD
Range	733 - 1200	7 - 19	29 - 129



Map 5: Accumulated total of the day-degrees above the growth threshold temperature of 5° at Pitfichie and Corrennie

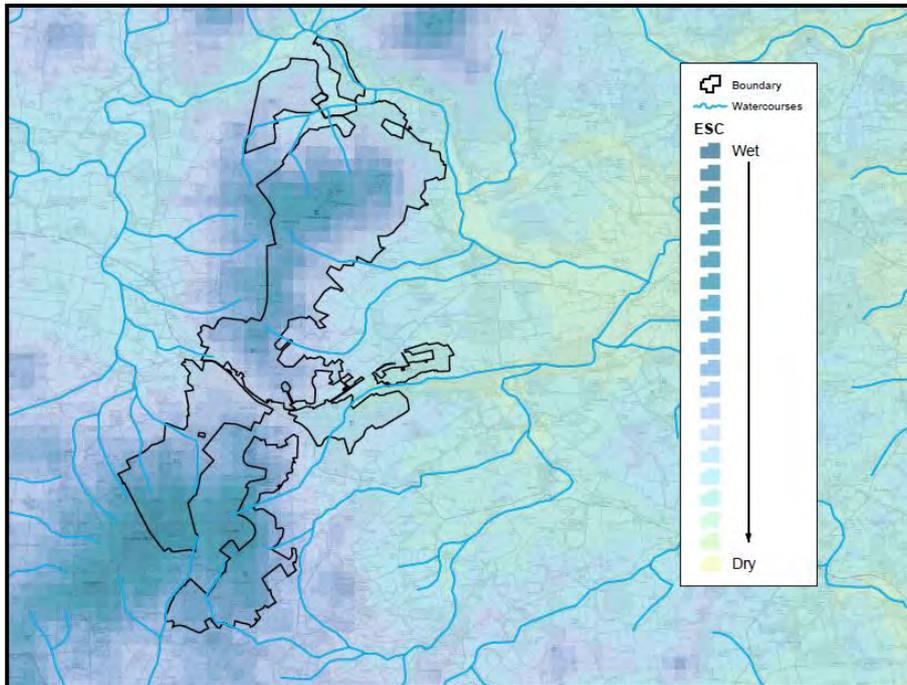
AT5 is the accumulated total of the day-degrees above the growth threshold temperature of 5°, which provides a convenient measure of summer warmth. The results for AT5 place Pitfichie and Corrennie between the sub alpine and warm zones but are mostly placed in the cool zone. Therefore, a number of spe-

cies will not be suitable for this site, particularly at the top of the slope where the AT5 is very low.



Map 6: Detailed Aspect Method of Scoring at Pitfichie and Corrennie

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 7 to 19 and windiness is the most likely limiting factor to tree growth at higher elevations in Britain. The results place Pitfichie and Corrennie between Sheltered and severely exposed at the top of the slopes.



Map 7: Moisture Deficit at Pitfichie and Corrennie

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 Pitfichie and Corrennie **between the “wet” and “moist” zones**.

These results will be used to help assist in the choice of tree species in the land management proposals for the site (see section 5). 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.

3.3 Biodiversity and environmental designations

(See 5. For management prescriptions)

3.3.1 Designated sites

There are 3 Plantations on Ancient Woodland Site (PAWS) in the area (see below).

3.3.2 Plantation on Ancient Woodland Sites (PAWS)

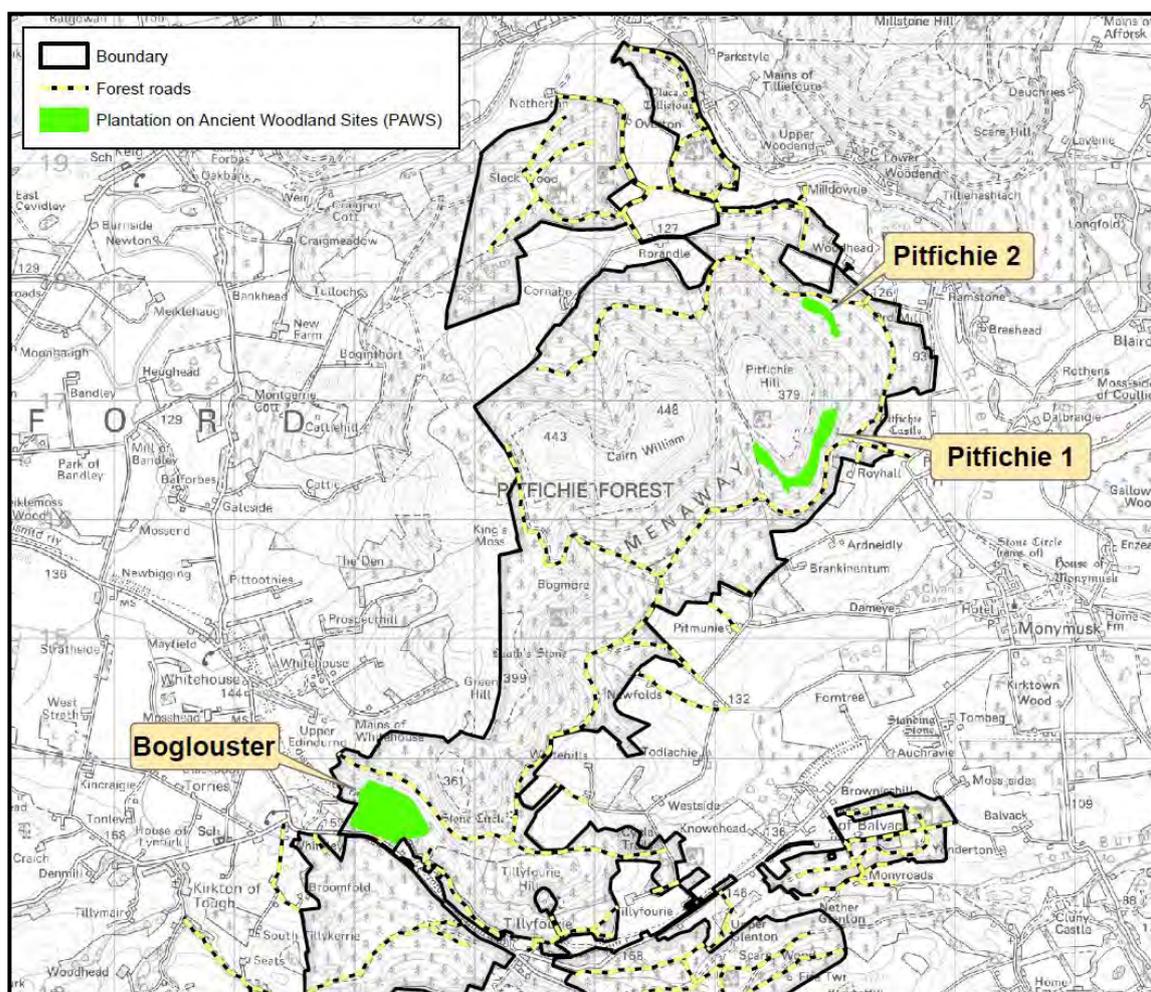
In Pitfichie (including Pitfichie main block, Scare, Overton, Slack and Balvack plantations):

There are three PAWS that are located within this main block :

1) Boglouster (our ref 21338) is 25 ha mainly composed of mature Scots pine and Larch. There are also species such as Sitka spruce, Norway spruce and Lodgepole pine in the area.

2) Pitfichie 1 (our ref 51337) is 11.4 ha is composed of Scots pine, Mixed broadleaves but also mature non-native species such as Japanese Larch, Sitka spruce and Norway Spruce.

3) Pitfichie 2 (our ref 51336) is 3.5 ha mainly composed of Birch spp., mixed broadleaves and some pine ssp., larch spp. and Sitka spruce.

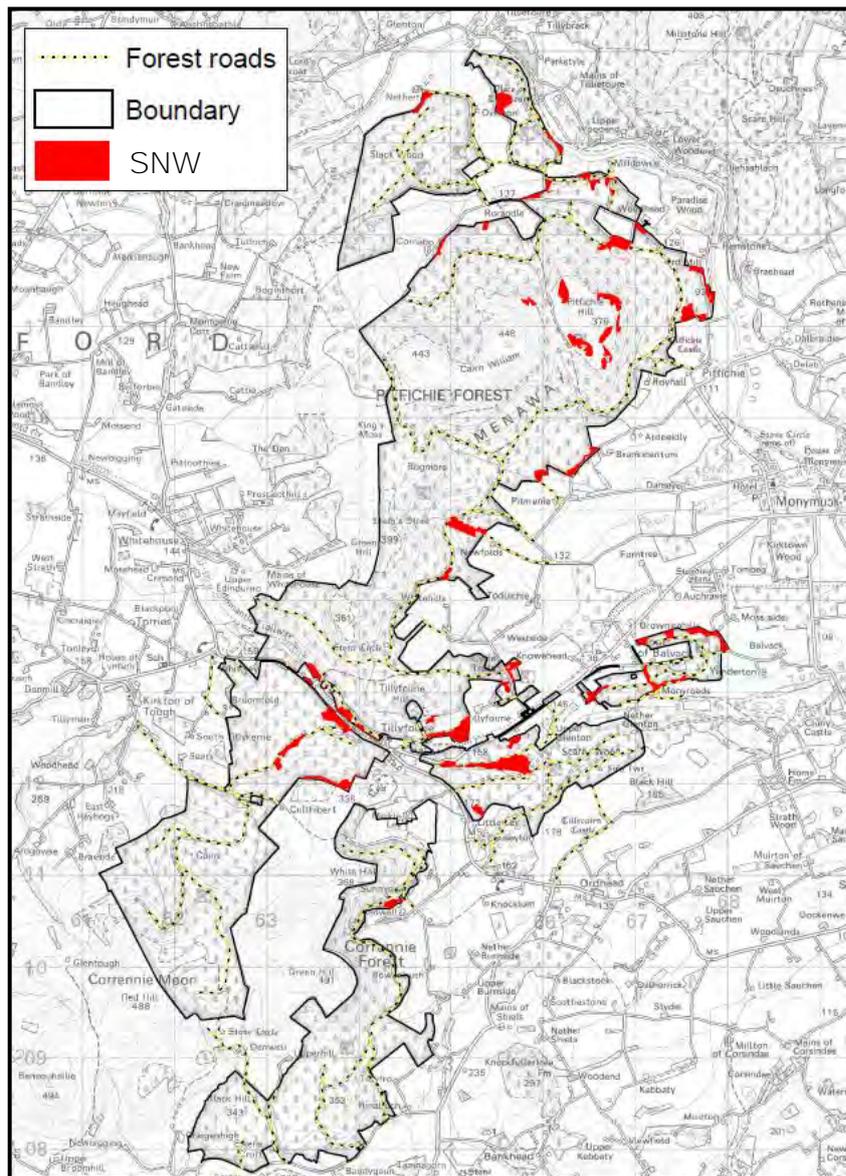


Map 8: Location of PAWS in Pitfichie

3.3.3 Native woodland

The plantations in this LMP are long established plantations since 1860.

The Semi Natural woodlands areas in this plan total 74 ha (see map 9 below) and will be maintained as per Native Scotland Woodland (NSW) Survey Criteria.



Map 9: Location of Semi Natural Woodlands in Pitfichie

3.3.4 Protected species

A number of sensitive plants, birds and mammals are located within the LMP and surrounding area. **The term 'sensitive' refers to species that are vulnerable to persecution or over-exploitation.**

Notable bird species include Red Kite, Goshawk, Sparrow-hawk, Buzzard and Peregrine Falcon. Ospreys are also seasonal species in the area.

Historically, Black Grouse have been recorded in the area but there are no recent records and a nearby lek site (not on FCS ground) appears to be no longer used.

The area is important for red squirrel with the current species and age composition providing suitable habitat. Pine marten have also been recorded. Otter are present on the River Don and its tributaries.

There are a fairly wide range of both open and wooded habitats that provide niches for many other species of birds and mammals.

The district maintains a database of all known species (flora and fauna) in the forests, in addition to using both confidential and public biological records. These records and site checks are used along with pre-operational site checks to ensure mitigation or habitat improvement is written into the districts work plans and budgets.

3.3.5 Main Priority habitats:

See map: Appendix 7

Upland Heathland is the largest priority habitat in the LMP area. There are also areas of Upland Flush and Upland Birchwood within the site.

Peatland habitats have been identified using soil survey information (when present), historical information, Strategy for Lowland Raised Bog and Intermediate Bog on the National Forest Estate in Scotland 2012-2022 along with ground surveys. There are no areas that are suitable for peatland restoration (areas are too small to be restored). Many of the peat areas are a mosaic of upland heath and wet woodland.

3.4 The existing forest

3.4.1 Age structure and species

- Age structure

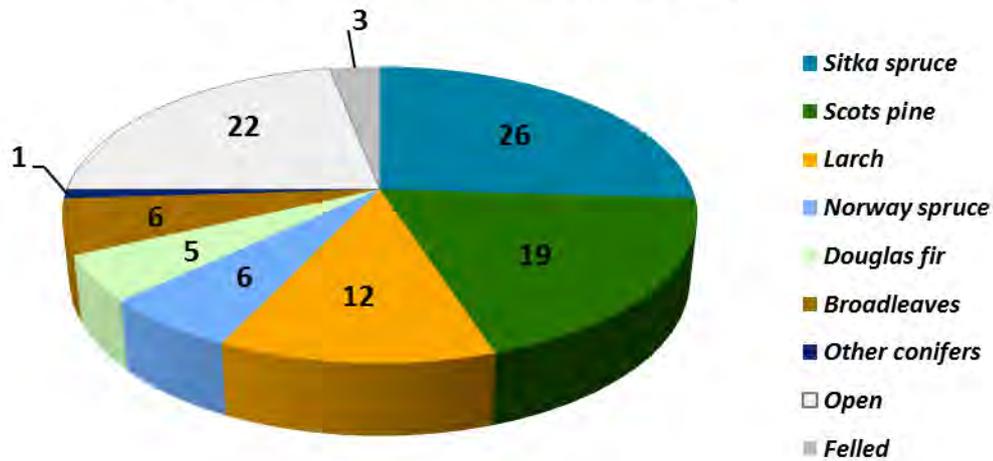
Age of Trees (years)	Successional Stage	Current distribution 2017 (%)
0 -10	Establishment	6
11 - 20	Early Thicket	24
21 - 40	Thicket & Pole Stage	7
41 - 60	Mature High Forest	9
61+	Old Forest	29
	Open space	22
	Felled area	3

The most represented age class in Pitfichie and Corrennie is above 61 years old followed by the 11 - 20 years old one.

- Species

Species	Proportion in 2017 (%)
Sitka spruce	26
Scots pine	19
Larch	12
Norway spruce	6
Douglas fir	5
Other broadleaves	6
Other conifers	1
Open	22
Felled area	3

Proportion of Pitfichie and Corrennie Covered with the current species (%)



The site is dominated by Sitka spruce, Scots pine and Larch. These species are well adapted to the site.

Areas of Sitka spruce have shown good growth and the climatic and soil condition of the site is often suitable for this species. At the top of the slope and over the north shaded slope of the site, Sitka spruce often is one of the best species choice in order to produce a good quality timber within a reasonable timeline.

Pine and Larch are two species appreciated for recreation as they create a nice atmosphere for outdoor activities. Larch is showing very good potential for natural regeneration in some areas. However, the pine planted over the north shaded slope of Pitfichie does not show a good growing rate. The climatic conditions of the area do not allow this species to be very productive and will be replaced by more suitable species in the future such as Sitka spruce, Norway spruce or Douglas fir.

Indeed, conifers such as Norway spruce and Douglas fir produce very good quality timber. Furthermore, Douglas fir is growing very well on the richer soils usually located at the bottom of the slopes and in the central area of the forest widely covered by brown earth soils, particularly in the Scare and Balvack wood areas. These species are very well adapted to the site and have strong potential to help diversifying the woodland.

A range of hardwoods including birch and rowan have grown well in the forest. The lower part of the slopes shows very good potential for natural regeneration of birch and for growing hardwood as the soils are richer than the higher part of Pitfichie.

Other conifers also present on the site include Western hemlock, Noble Fir or Grand Fir. These species are also growing well in some areas of the site, sometimes in mixture with Sitka spruce. Western hemlock is strongly regenerating in some areas of the forest.

3.4.2 Access

Access throughout the forest for management and harvesting is generally good with a fit for purpose road network and public road links. There is not expected to be any road building needed for the next plan period.

3.4.3 LISS potential

Low Impact Silviculture Systems (LISS) are defined as: 'Use of silvicultural systems whereby the forest canopy is maintained at one or more levels without clear felling.'

LISS normally implies that no clearfell areas larger than 2 ha will be undertaken. Larch, Sitka spruce, Norway spruce, Western hemlock, Douglas fir and Birch are the main species which regenerate naturally on the site. Therefore, they present good potential for LISS.

Some additional actions such as scarification of the soils might need to be undertaken in order to encourage implementation of future natural regeneration. If done successfully this is also financially attractive as this would cost less than clearfelling and restocking entire coupes. It is also a very good opportunity to use the local seed source which has already proven its ability to grow on the site.

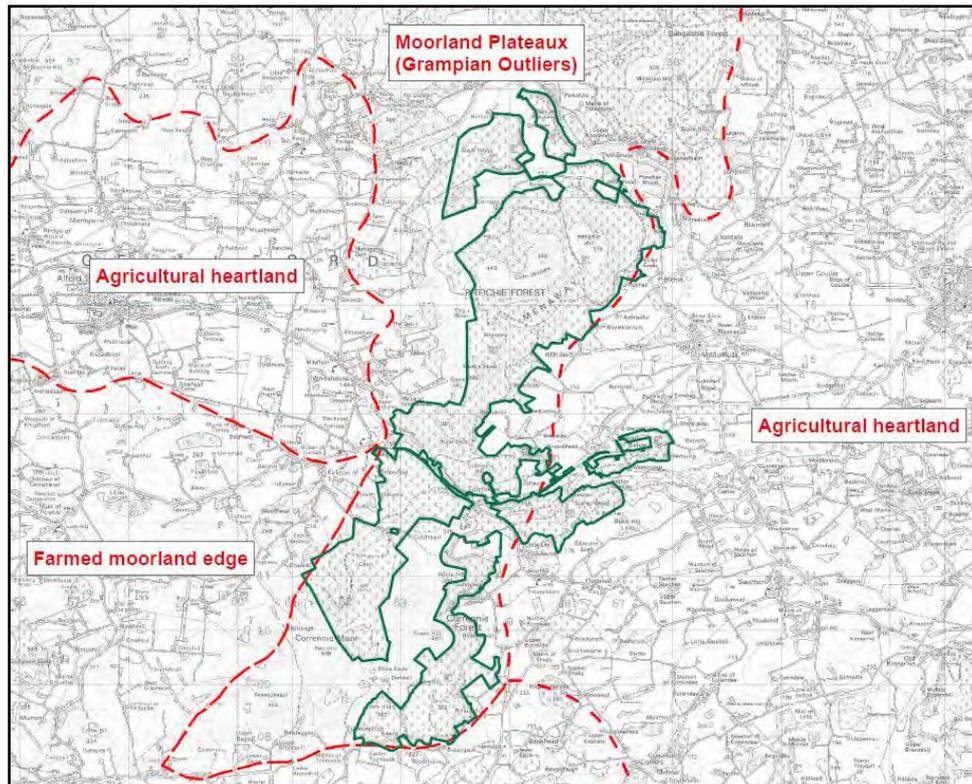
3.5 Landscape and use

3.5.1 Landscape character, value and visibility value

The forests covered by this plan are largely located around the prominent upland ridge of Pitfichie of which Cairn William is the most notable summit on the ridge.

Pitfichie ridge and Corrennie are located in the continuity of the Bennachie iconic landform feature which dominates the wider area of Aberdeenshire. Surrounded largely by flat agricultural plains, it has an immediately recognisable and distinctive skyline shape which defines the region and is highly visible.

The map below identifies landscape character areas which are based on the classification carried out by SNH (1998).



Map 10: Landscape character areas in Pitfichie and Corrennie SNH (1998).

The forests of Pitfichie and Corrennie are located on the side slopes of the upland ridge. Linking with Bennachie to the North, it forms upland moorland plateaux, one of a number of Grampian outliers. This upland is typically covered with heather moorland or conifer forest. The relief of this upland ridge is mostly rolling with both gentle and steeper slopes. Rocky outcrops, most noticeable on the skyline, highlight its mountain character.

Woodland is continuous around the upland though it is not all within the National Forest Estate. Given the iconic nature of the hill and its dominance over the surrounding area, the forest needs to fully integrate with the landform and be in harmony with the landscape character.



Photo above: View of Pitfichie and Corrennie from North to South

Special attention should be given to reflecting the changes in scale between the wide, open, upland moorland to the more intimate spaces on the lower slopes. The upper margin of the wooded areas should appear natural, not encroach unduly onto the open moorland of the higher altitude, and be shaped using forest

Pitfichie and Corrennie LMP, 2017 – 2026 / Antoine Le Prêtre - 2017

landscape design principles to respond to the underlying landform. The lower edges should integrate with the dominant field pattern of the agricultural plain that surrounds it. A small area of Corrennie east belongs to the agricultural heartland (Scare wood and Moor of Balvack wood). Forest design principles should be applied to both the coupe shapes and alignment of future species planting to ensure this highly distinctive landscape defines the character of the forest rather than the opposite way round.

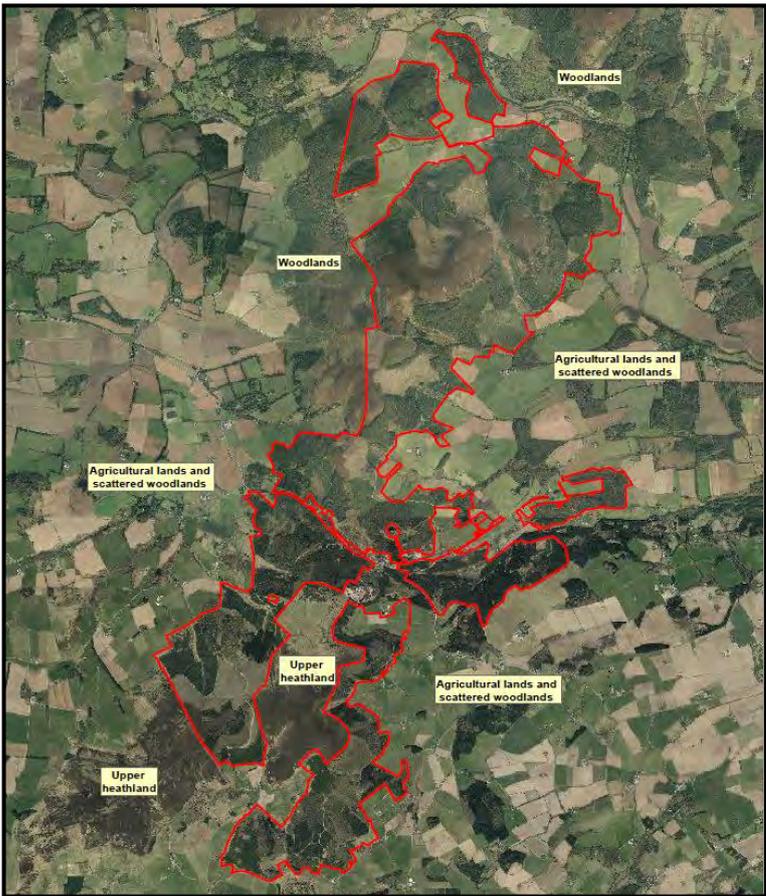
The plan area is covered by Scottish Natural Heritage Landscape Character Assessment No102, South and Central Aberdeen, produced in 1998.

3.5.2 Neighbouring land use

Pitfichie and Corrennie is surrounded either by woodlands or fields. These lands belong to either private individuals or private Estates.

A great majority of the woodlands along Pitfichie and Corrennie are located along the north west edge of the forest. There is also an adjacent woodland to the east of Scare woods.

The agricultural lands are located all around the rest of the site.



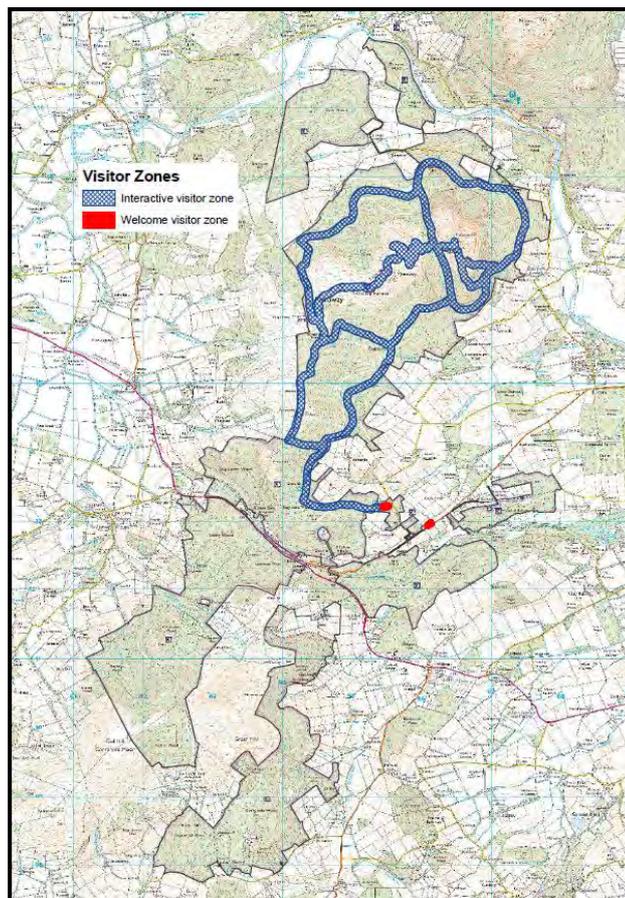
Aerial photo of Pitfichie and Corrennie (Boundaries in red)

3.6 Social factors

3.6.1 Recreation (see map 11 below)

Pitfichie is not the most visited forest of the area compared for example with Bennachie to the north where there are approximately 150.000 visitors a year. However, the site is well known for its mountain bike trails and mountain biking is an outdoor activity frequently practiced in the site. These trails are located in Pitfichie forests and runs mainly around and over Pitfichie Hill and Cairn William. The tracks and rides are classified as **“interactive visitor zones”**: a 50m buffer either side of a designated facility or well-used informal route. There are no particular facilities over the site.

There are two main car parks giving a direct access to the site nearby Tillyfourie to the east. There are also informal car parks all around the site used by the public to access the forest. The car parks are located within the **“welcome visitor zones”**, FES term: “arrival” point and associated access, parking and immediate backdrop.



Map 11: Pitfichie and Corrennie - visitor zones

3.6.2 Community

The major and closest to Pitfichie and Corrennie is Inverurie to the North, Monymusk to the east or Alford to the west.

3.6.3 Heritage

There is 1 Scheduled monument in Pitfichie & Corrennie located on White Lady Hill. The monument comprises the Whitehill recumbent stone circle, some 4500 years old. It is about 20m in diameter. The management prescriptions are recorded in the FCS Monument Management Plan which was drawn up by FCS in collaboration with Historic Scotland.

All forestry works around their location will be done in appliance with the UK Forestry Standards Guidelines and the Monument Management Plan agreed between FCS and Historic Environment Scotland.

3.7 Pathogens and disease

3.7.1 Hylobius

Due to the expected high level of Hylobius and the adopted policy for **environmental management to “reduce the use of Insecticides where feasible”** restocking is planned to take place at the end of year four. Restocking may take place before then if monitoring, using the Forest Research Hylobius Management Support System, shows that it is safe to do so.

3.7.2 Dothistroma needle blight

Dothistroma Needle Blight will be addressed differently depending on the level of current infection in the crop. The severity of infection and crop symptoms produced range from reduced growth rate to high levels of mortality within the stand. The level of mortality is the key concern as once dead the integrity of the tree quickly deteriorates to a state where it cannot successfully be harvested. Categorisation of the infected crop will allow us to prioritise the harvesting of such areas.

3.7.3 Phytophthora ramorum

Phytophthora ramorum is the Oomycete plant pathogen also known to cause the disease sudden oak death. The disease kills oak and other species of tree and had a devastating effect on the oak populations in California and Oregon as well as also being present in Europe. In the UK, the disease does not seem to affect oaks. However, it is largely infecting Larches particularly in the south Scotland. **Symptoms include bleeding cankers on the tree’s trunk and dieback of the foli-**

age, in many cases eventually leading to the death of the tree. *P. Ramorum* also infects a great number of other plant species, significantly woody ornamentals such as *Rhododendron*, *Viburnum* and *Pieris*, causing foliar symptoms known as ramorum dieback or ramorum blight. Such plants can act as a source of inoculum for new infections, with the pathogen producing spores that can be transmitted by rain splash and rainwater. *P. ramorum* was first reported in 1995, and the origins of the pathogen are still unclear but most evidence suggests it was repeatedly introduced as an exotic species. Very few control mechanisms exist for the disease, and they rely upon early detection and proper disposal of infected plant material.

Any infection of *Phytophthora ramorum* is of relevance to the continued management of the forest, but Larch infection is of particular concern due to the wide scale outbreak in Scotland. Protocols are in place if there was an outbreak for the removal of infected species and for alternatives for restocking. Any suspicions of outbreak need to be reported immediately: treehealthscotland@forestry.gsi.gov.uk.

4. Analysis and Concept

4.1 Analysis and concept table

The information gathered in the previous section (3.0 - Background information) has been analysed for its relevance to the plan. This has informed the design concept plan which is based on the land management objectives (section 1.3).

The results of this process are presented in the table below. This has been set out against the national themes of the FES strategic directions document and the issues highlighted in the Moray & Aberdeenshire strategic plan.

Theme	Key Commitments	District specific Action	Analysis	Proposed Action
Healthy	We are committed to high quality silviculture and increasingly, to using alternatives to clearfelling.	We want to maintain a minimum of 30 % of Low Impact Silvicultural System (LISS) in the district. Thinning will be the preferred option.	The site presents a medium potential for LISS. Clearfells should be avoided when possible.	Find the most appropriate areas for LISS. Limit the use of clearfelling and use it only when necessary.
	We will help the Estate adapt to climate change and become more resilient to pressure.	The District will continually make good use of Ecological Site Classification to closely fit species to sites, and take into account the anticipated effects of climate change.	The climate of the site is predicted to change in the future.	Use the ESC and its' built in predicted future climate models to help guide the selection of species suitable for planting.
Productive	We aim to provide at least three million cubic metres of sustainable softwood timber every year.	We will maintain a sustainable annual softwood timber production of 350,000 cubic metres over bark standing.	The site has good potential to grow or maintain softwood trees.	Identify the most appropriate areas for planting or maintaining soft wood trees.

	We intend to manage at least a quarter of our expanding broadleaf woodlands to produce quality hardwoods and wood-fuel.	We will increase our productive broadleaf resource by planting a further 700 ha by 2019. Where economically viable, we will actively manage our broadleaf resource to secure silvicultural improvement and commercial return.	This plan area has been identified as having potential to establishing productive broad-leaves.	Plant broad-leaves where appropriate and manage them to secure silvicultural improvement and commercial return.
	We will work with partners to find new ways to harness our natural and cultural heritage and develop the Estate's potential for tourism.	The District works with Aberdeen and Aberdeenshire council, Monymusk estate, local tourism organisations benefiting the local economy.	This plan area has been identify has a moderate recreational area.	Continue to manage the site in order to maintain its recreational value. Work in partnership with the different stakeholders and organise consultations and meetings with them to exchange ideas about this thematic.
	We are committed to maintaining the best open habitats in good ecological condition.	The District will continue to review all open ground management on a regular basis to ensure it is appropriate.	The upper heathland at the top of the hills is a wide protected habitat.	Monitor and maintain the ecological condition of priority open habitats.
Treasured	We want to encourage local people to get involved in using and managing local Estate woodlands, so we will actively engage with local communities and be open to work in partnership.	Land Management Plans will be developed in consultation with local communities.	The site is in the centre of interest of visitors coming for recreation reasons.	Organise a consultation programme in order to share ideas about the management of the site and exchange about the LMP process and interest.

	<p>We are committed to creating more uniquely special places across the Estate and to delivering benefits to an increasingly diverse range of Scotland's people.</p>	<p>We want to maintain the highest standards of recreational management to maximise the opportunities for their responsible use.</p> <p>To enhance the visitor experience, we will continue to make visual and environmental improvements around priority visitor recreation sites and along major tourist routes.</p>	<p>The site is a well visited by the public and also well known for its mountain bike trails.</p>	<p>Identify the main touristic areas and trails and maintain/create the most appropriate habitat in order to maintain / increase their value. Consider carefully the impact of the forest management on the landscape.</p>
Cared For	<p>We are restoring around 85% of areas on ancient woodland sites to largely native species – the remaining areas will be enhanced through our management.</p>	<p>Moray & Aberdeenshire Forest District will have 38% of plantations on ancient woodland sites (PAWS) in active restoration within the plan period, with an overall aim of achieving 53% of sites fully restored to native woodland.</p>	<p>PAWS are located in the site.</p>	<p>Localise PAWS and encourage or maintain the growing of native species.</p>

	<p>We will identify particularly vulnerable species for which the National Forest Estate is important and take specific conservation action.</p>	<p>We will employ a best practice approach to ensure that raptors are safeguarded and enhanced by beneficial silvicultural management. We will safeguard existing populations through beneficial management and by supporting a cull programme to constrain the populations of grey squirrels in the Aberdeen area and along the watercourses of the Don and the Dee.</p>	<p>Pitfichie and Corrennie is a site which offers good habitats for raptors and squirrels.</p>	<p>Identify the breeding areas of raptors and red squirrels and ensure their protection.</p>
	<p>We will safeguard archaeological sites through our planning and management, and recognise special places and features with local cultural meaning.</p>	<p>We will ensure our significant designated heritage assets are managed according to Monument Management Plans (MMPs) agreed with Historic Environment Scotland.</p>	<p>There are significant archaeological sites in Pitfichie and Bennachie with a high heritage value.</p>	<p>We will follow the UK forest guidelines and the MMPs for the management of the lands around the archaeological sites.</p>

5. Land Management Proposals

See future habitats and species map

5.1 Management

Specific features of the site

The objectives of the plan are used as the main general guidance along with the UK Forestry standard guidelines. However, other local issues have to be taken into account in order to reach these objectives. Some issues will be identified in each forest block in Moray and Aberdeenshire forest district such as windblow, wetness / poorness of soils or natural regeneration.



Photo above: Sitka spruce - windblow

In Pitfichie and Corrennie windblow is a key constraint. The choice of the sequence and location of felling phases is strongly related to wind orientation. Therefore, if the orientation of the strongest wind is west to east clearfells will be started to the east in order to keep the West edge of the woodland stable (as a shelterbelt).

Clearfells will be preferably accomplished before wind damage. Clearfells will be targeted to when trees have reached their critical height. The critical height of a tree is when the probability for the tree to blow down is high and can be harvested before it falls under wind pressure.

The landscape has been a key factor when considering the management of the site. Indeed, clearfells and restock areas have been shaped to improve or maintain the landscape quality where possible.

Clearfells

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 the poor soil conditions clearfell will remain the most appropriate silvicultural system where LISS is not appropriate (see below for definition).

Although clear-felling can appear to have a negative impact on landscape and habitat it's 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.

Low impact silvicultural system (LISS) – See appendix 3 and 4

'Low impact' 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 low impact forestry 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, low impact forestry is seen as a means of reducing the impact of clearfelling and the associated changes that this produces in forest landscapes and habitats.

Prescriptions will be written up for each area managed under LISS. Each prescription will be included in the site management plan before any operation commences.

Restocking by natural regeneration will be the aim in some areas. All areas identified for restocking by natural regeneration have been recorded and programmed for inspect on a five yearly basis. If after 10 years, or at any preceding inspection, it is apparent that natural regeneration is not going to be successful then replanting with appropriate species will be undertaken.

Enrichment planting may also be used to increase species diversity, target key recreational/visual areas, or to ensure the rapid establishment of ground cover.

Thinning

Wherever possible the district will continue to maximise the area managed through thinning. 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.

An active thinning programme is essential for LISS.

Where Lodgepole Pine occurs in mixtures with other crops it will be targeted for removal during thinning operations.

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

Long Term Retention

There are a number of coupes within Pitfichie and Corrennie have been designated as Long Term Retention (LTR). See Map 5 – Management. Most of these coupes are broadleaves and it is desirable to retain these stands beyond their normal economic maturity for environmental benefits.

A range of management options are appropriate in LTRs depending on stand characteristics and objectives. It is generally desirable to thin cautiously, promoting crown development and stand stability. However, thinning will be inappropriate in less stable LTRs and impractical in very small stands, particularly where they are isolated from adjacent thinnable stands. Other operations such as felling of dangerous trees around recreation facilities and removal of invasive plants may be required.

Minimum intervention

Minimum intervention (MI) areas are predominantly wooded managed in perpetuity by minimum intervention. Conservation of biodiversity is the prime objective. The function of MIs is to provide a continuity of habitat to allow sedentary species to establish and thrive. MIs provide reservoirs of permanent habitat from which more mobile species can expand into adjacent managed forests. MIs can be derived from semi-natural native woodland, planted native woodland and non-native plantations. Intervention will only take place to protect the MI, adjoining areas of forest or infrastructure, either FES or third parties.

5.2 Future Habitats and Species

The choice of species for restocking by planting in this plan has been guided by the Environmental Site Classification (ESC) results for this climatic zone and soil types, the primary areas for large scale restocking activity are the clearfells associated with the removal of Lodgepole pine stands. Approximately 70 ha of Lodgepole pine have been felled within the last few years for DNB infection (the main site being on Red hill, Corrennie Moor). To achieve the best results ESC needs to be used as a guide in conjunction with local site specific knowledge and experience. The base data used in the ESC process can be fairly broad brush and can overlook the opportunities and pitfalls presented by small scale site charac-

teristics and microclimate. Site specific planting plans following a restock site survey will guide the final species choice and if necessary, an amendment to the plan will be required.

There are big areas of commercial woodland in Pitfichie and Corrennie. The site presents very good potential to grow good quality timber. Therefore, species such as Sitka Spruce, Scots Pines and other conifers will continue to be planted. However, other species sometimes already present in the site, will be planted to maintain the diversity of the site. Some of these species include Norway spruce, Douglas fir or European silver fir which are adapted to grow in the area and produce a good quality timber. It is also possible to plant Sitka spruce in mixture with other species in order to increase the forest resilience to possible diseases and climate change. Furthermore, this will not affect the timber quality produced.

In order to fight against *Phytophthora ramorum*, no Larch will be planted in the near future until the disease threat is better understood. The proportion of larch present in the site might be therefore diminished. However, it is possible to manage it with LISS and to encourage natural regeneration of this species. There are big areas of Larch producing very good timber and already regenerating over the site. Natural regeneration of Larch will be encouraged where applicable. It is also applicable for Scots pine stands and Sitka spruce, widely represented in the site. Silvicultural systems such as uniform shelterwood, group selection, group shelterwood or single tree selection will be used in LISS areas. In some cases preparation of the ground such as scarification will be utilise in order to encourage natural regeneration. Indeed, for species such as Scots pines, it is necessary to have the mineral layer of the soil directly exposed or very close to the surface of the soil to obtain natural regeneration.

Further diversification could also be achieved through increasing the area of broadleaves, where this will contribute to both national and forest district policy objectives, which are seeking to increase broadleaf tree cover from the current 8% of woodland cover to around 20% on the National Forest Estate. 2 ha of broadleaves will be planted during the plan period. Commercial management will range from the production of birch, alder, willow, and/or aspen on wet sites for fuel wood (and quality timber, if possible), to the production of quality timber of oak and beech and other broadleaf species on drier and nutrient-richer sites. Establishment of broadleaves will have multiple benefits which include production of timber and naturalisation of watercourses.

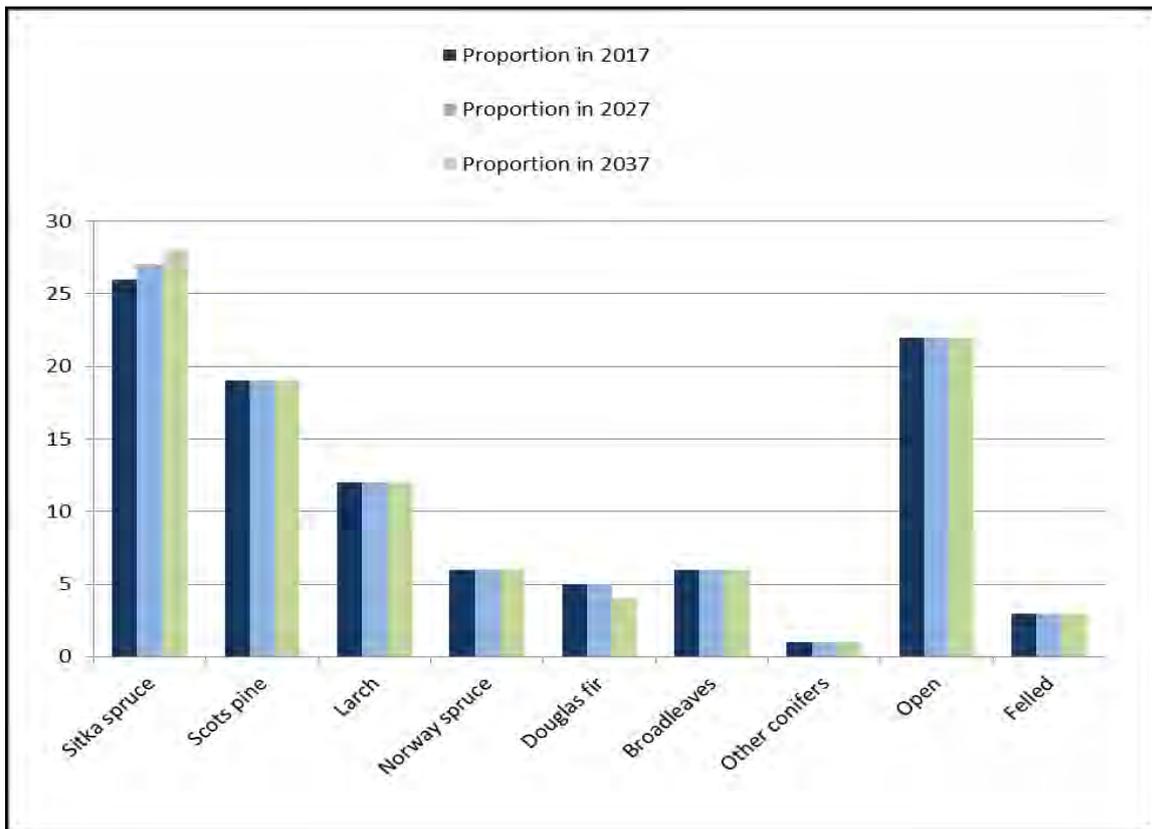
Restocking will be undertaken, or regeneration will be managed to achieve a spacing that will allow a commercial approach. This will usually be 2500 trees/Ha and in some cases higher depending on the objective of the stand and the condition of the local area.

The restock sites shown on the future species map of the LMP are the ones covering area where clearfells will happen during the next 10 years. This means that

if a clearfell happens at year 9, the restock for this area will not take place during the period of this plan (as a minimum of 2 years fallow period will be applied before restocking the site). This also means that some of the 285 ha planned to be restock in this plan will be done during the next plan period.

5.3 Species table

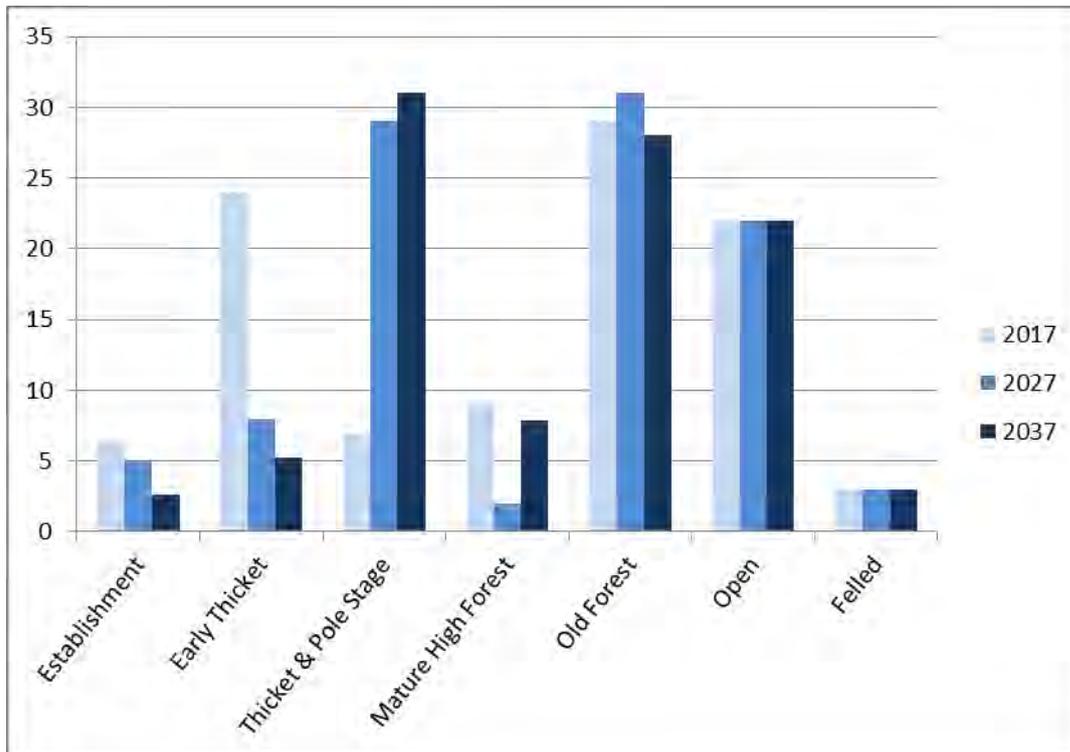
Species	Proportion 2017 (%)	Projected proportion 2027 (%)	Projected proportion 2037 (%)
Sitka spruce	26	27	28
Scots pine	19	19	19
Larch	12	12	12
Norway spruce	6	6	6
Douglas fir	5	5	4
Other broadleaves	6	6	6
Other conifers	1	1	1
Open	22	22	22
Felled	3	3	3



Regarding the figures above, we can see that the future management of the forest will generally maintain the proportion of species within the site. No major changes are remarkable.

5.4 Age class

Age of Trees (years)	Successional Stage	Current distribution 2017 (%)	Projected distribution 2027 (%)	Projected distribution 2037 (%)
0 -10	Establishment	6	5	3
11 - 20	Early Thicket	24	8	5
21 - 40	Thicket & Pole Stage	7	29	31
41 - 60	Mature High Forest	9	2	8
61+	Old Forest	29	31	28
Open		22	22	22
Felled		3	3	3



Regarding the figures and table above, we can see that the forest is currently and mainly composed of woodlands at a mature and early thicket stage. The proportion of **“very young crops”** (establishment and early thicket stages) will tend to diminish within the next 20 years. Consequently, the proportion of thicket and pole stage will increase during this period. The proportion of more mature crops (Mature high forest and old forest) will remain fairly stable.

5.5 Native woodland

Prioritised Semi Natural woodlands

Deer control will be undertaken in these woodlands.

Over the course of this LMP all these woodlands will be surveyed according to FES Ancient Semi-natural Woodland Condition Assessment. These areas will be expanded into habitats close by that are priority woodland habitats and/or connected to PAWS sites. Opportunities will be made to link these semi native woodlands to other similar woodlands in the surrounding landscape. Some of these woodlands will be preserved as Natural Reserve particularly the woodland on Pitfichie hill that connects with the PAWS sites, so as to improve habitat connectivity.

Long established plantations

Over 80% of the woodlands in this LMP are long established plantations (LEPO) from 1860s. In the work plan process we will look for opportunities to identify and enhance areas with semi-natural characteristics, favour native species, protect veterans/hotspots. Where possible, we will aim to undertake LISS due to the historical age of these plantations.

5.6 PAWS restoration

All PAWS sites are surveyed according to FES PAWS Guidance 2016. Deer control will be prioritised in these areas.

Boglouster

This PAWS has a dismantled railway line running through the site. This line runs from west to south through the site and has many mature native broadleaves growing on the line such as birch spp., grey and sallow willow, alder and rowan. South of this disused railway line is a plantation and south of this plantation a wet area. This wet area is regenerating with mainly Sitka spruce, birch spp. and alder. Over the course of this plan the regenerating spruce will be cut down and we will also assist the natural regeneration process by planting common alder in clumps. Once there is woodland established, the adjacent plantation will be felled; retaining where possible patches of Scots pine and birch spp. present in the existing plantation. Natural regeneration will be allowed to occur and patches of willow spp., aspen and alder will be planted to augment the natural regeneration process. Above the disused railway line, in the south east corner, the area of Scots pine regeneration (P2005) has been unsuccessful due to both bracken swamping trees and deer pressures. In the next five years, we will plant an oak wood (NVC type: W17) on the brown earth sites and alder on the gley and fence

Pitfichie and Corrennie LMP, 2017 – 2026 / Antoine Le Prêtre - 2017

where appropriate. The Sitka spruce area planted in 1993 will be clear felled once its ideal economical value will be met. The Norway spruce and Larch areas over the LMP plan period will be retained and thinned as per the normal forestry cycle and then felled. Supplementary broadleaf planting will occur in the mixed native broadleaf areas.

Pitfichie 1

The last thinning of this area took place in 2016, which saw the gradual removal of patches of exotic conifers (such as Sitka spruce and Lodgepole pine) creating gaps within the forest to allow natural regeneration. Part of the woodland will be maintained as LISS (Scots pine and Larch areas). However, we will aim to clear-fell the other non-native species through thinning. This PAWS links with patches of semi natural woodlands that are found on the upper flanks of Pitfichie hill and will be they will be left as they are (see semi natural woodland section).

Pitfichie 2

Removal of Sitka spruce regenerating in this woodland will continue during the lifecycle of this LMP so as to create an Upland Birchwood that links with the semi natural woodland next to this site.

5.7 Non-woodland habitats

Heathland

The upland heath will be maintained during this plan. We will set up several fixed points in the heathland and every 5 years at these points set up a 2m² quadrat assessing: condition of the heather, and species present and spread of non-native trees on the heathland. Natural colonisation of conifers within open ground will be managed if they are a threat to the integrity of priority habitat. Over the next ten years we will develop a management plan for the area so that this priority habitat can be improved for its associated wildlife and maintained in future years.

Open water, wetland and water courses

The district will follow "Forest and Water Standard guidelines" during all operations such as in path/road construction, planting etc. The River Don runs close to this plan.

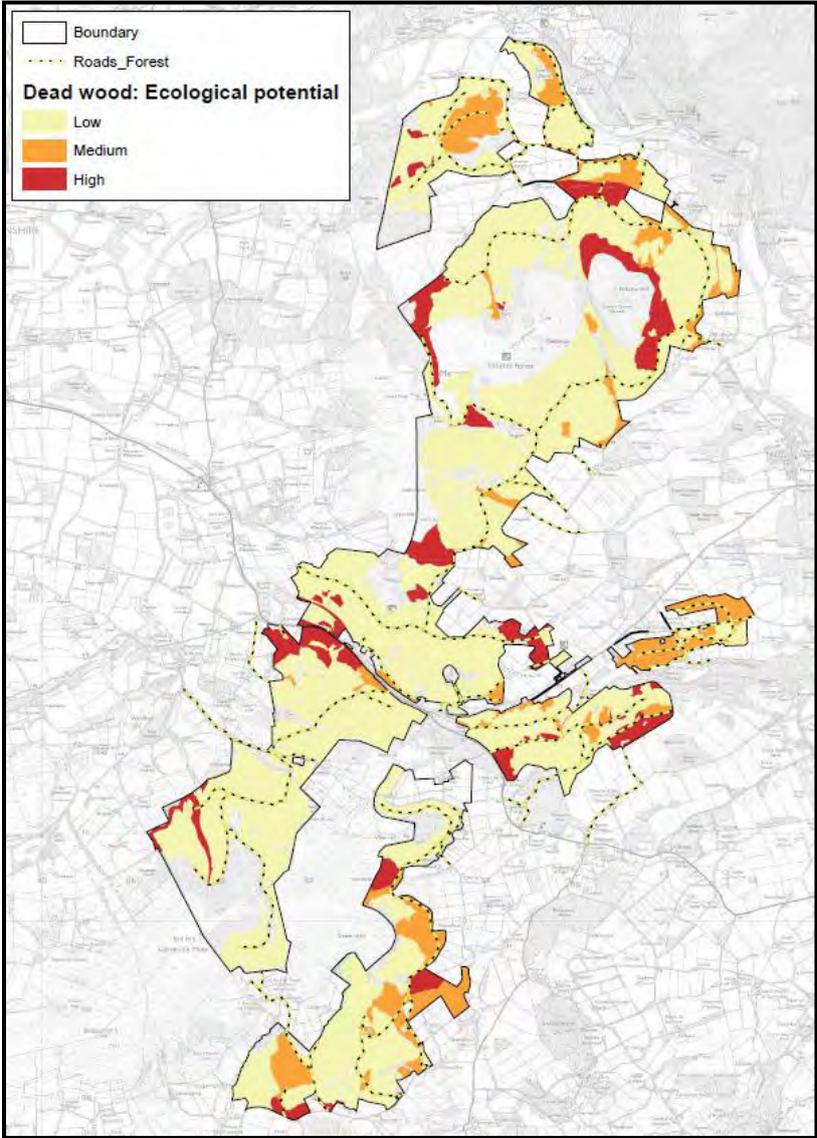
5.8 Management of open land (non priority)

The open ground element required as part of the recreational infrastructure (paths and access tracks) will be monitored and maintained. In other areas successional vegetation will generally be accepted.

Open ground will also be left around archaeology features following our Monument Management Plans.

5.9 Dead wood

Current analysis of the deadwood provision for Pitfichie and Corrennie forest identifies that it is currently below the target of 20m³/ha across the woodland management unit. As per the local deadwood policy all deadwood and un-economic windblow on high and medium sites (see map 12 below) will be retained where practical and safe to do so. On clearfell sites, the low 1 prescription will be applied to include the retention of one small stand of trees per 20ha. More detailed information on the provision of deadwood will be assessed and included in the work plan for each site regarding the map below.



High – Areas with high potential to retain dead wood such as natural reserve;

Medium – Areas with an intermediate potential to retain dead wood such as LISS areas;

Low – Areas with low potential to retain dead wood such as clearfells.

Map 12: Dead wood, ecological potential in Pitfichie and Corrennie

5.10 Species of interest

Selected Priority Species

There is a wide range of guidance available when working with species and habitats, see Appendix 5, these will be followed within this plan and whilst undertaking forest operations. Forest Operations will be planned to ensure that these species are not put at risk, and where practical, work will be undertaken to encourage them.

Juniper

The district intend to monitor and expand the juniper population on the hill (guidance will be sought on planting of juniper when heath survey commissioned).

Red squirrel

The district will continue to support Saving Scotland's red squirrels. The district will improve the habitat to sustain viable populations of red squirrel such as creating uneven age stands of conifers and adopting continuous cover forestry where possible.

Raptors

The district will continue to work with Royal Society for the Protection of Birds (RSPB) and North East Raptor Group (NERG) to secure breeding populations and where possible safeguard/retain habitat.

5.11 Heritage

Scheduled Monuments (SM)

There are no separate Monument Management Plans for each sites but one global Monument Management Plan agreed between FCS and Historic Environment Scotland for all the forest blocks. Over this plan there are no specific management requirements. Scheduled Monument approval will be obtained from Historic Environment Scotland prior to any potential disturbing/damaging works. SM are monitored yearly/5 yearly and work undertaken where necessary.

Unscheduled Monuments

Staff will consult relevant information sources (following "Identifying the historic environment in Scotland's forests and woodlands") and carry out archaeological surveys as part of the coupe check process to identify heritage features, recording and preserving as required.

5.12 Deer management

All deer management will be carried out in accordance with OGB 5 - Deer management. Our 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 deer density level of 5 to 7 deer per 100 hectares.

Deer cull plans are prepared for each Deer Management Unit and are monitored by the Wildlife Ranger Manager.

Deer fencing is likely to be required when planting palatable species such as in the PAWS areas. High levels of public use can modify and limit deer grazing/browsing behaviour so fencing is not required in all cases.

Fences might have a short term impact on the landscape and access to restock areas as they will be kept until the woodland is established (usually a period of 10 years). However, by planting trees the landscape will be improved in the long term as well as the benefits that woodlands provide to the public.

5.13 Access

There are no additional access issues that need to be addressed in the period of this plan.

5.14 Pathogens

Hylobius

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 clear-fells 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 clearfells sites for successful, cost effective and environmentally friendly restocking. This Support System will be used on sites identified for monitoring in May and August or both depending on the felling year.

Dothistroma Needle Blight (DNB)

Dothistroma Needle Blight will be addressed differently according to the level of 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 level of mortality is the key concern as once dead the integrity of the tree quickly deteriorates to a state where it cannot 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:		Mortality (%)		
Needle retention (years)	Defoliation (%)	<20	20-40	>40
>2.25	0-25	1	2	4
1.51-2.25	26-50	2	3	4
0.76-1.50	51-75	3	4	4
<0.75	>75	3	4	4

From this the priorities for felling are as follows:

Highest: Category 4 - Once crops reach category 4 there is a marked reduction of marketable products.

Medium: Category 3 - Category 3 still produce high proportion of timber before its value drops significantly.

Low: Categories 2 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 led 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 forest design plan

will be required as specified in the tolerance table for felling such areas.

- Reassess badly affected blocks and consider if a full review is required.
- Due to the moratorium on planting CP and LP on all sites and SP on previously infected areas, plus a 500m buffer zone, planting programs will need to be amended to include replacement species suitable for the site.

There is no infected area to clearfell for DNB reasons at the moment in Pitfichie and Corrennie forest. However, this could be reassessed following the DNB survey results within the next few years. Furthermore, the area of Lodgepole pine left growing within the site is very small. Therefore, DNB is not a big threat for this site anymore.

Phytophthora ramorum

Any infection of *Phytophthora ramorum* is of relevance to the continued management of the forest, but Larch infection is of particular concern due to the wide scale outbreak in south Scotland. Protocols are in place if there was an outbreak for the removal of infected species and for alternatives for restocking. Any suspicions of outbreak need to be reported immediately: treehealthscotland@forestry.gsi.gov.uk. No infection has been detected in this block so far.

5.15 Critical Success Factors

Careful consideration has and will be given to the impact of forest operations on the landscape;

Careful consideration has and will be given to the impact of forest operations along the recreation areas;

Continue with an active thinning programme to ensure the ongoing success of the LISS areas as described in this plan;

Management of the LISS regeneration will be used to encourage natural regeneration processes;

Species and structural diversity will be maintained to encourage forest resilience;

The guidelines in relation to DNB with heavy thinning and LP removal being priority actions will be followed if necessary;

React positively to any disease impacts; seek to use any dramatic change in forest structure to deliver un-anticipated benefits. For example open transient views and greater species/structural diversity.

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Appendix 1 – Consultation record

Statutory Consultee	
SNH – Contacted on 10/2016	
<p>Issue raised:</p> <p>Many thanks for consulting us on this case. One of our area officers has looked at this and has confirmed that as there are no natural heritage interests of national importance, we have no comment to make on this case.</p>	<p>Forest district response:</p> <p>No response required</p>
RSPB – Contacted on 10/2016	
<p>Issue raised:</p> <p>Thank you for consulting RSPB Scotland. We are aware that goshawk are present in this forest. Red kite have also nested in the area in recent years and therefore may breed within the forest in future years. As we do not have specific nesting locations, however, we would recommend that if forestry operations such as felling, that may cause disturbance, takes place within the main bird breeding season (April to August) the FCS Guidance Note 32: Forest operations and birds in Scottish forests (Nov 2006) is consulted and the area checked for active nests as a precautionary measure. This will avoid unnecessary disturbance of breeding birds and ensure that the requirements of the Wild-</p>	<p>Forest district response:</p> <p>We will follow the FCS Guidance Note 32: Forest operations and birds in Scottish forests (Nov 2006) in case of a nest of protected listed bird is found on a coupe site.</p> <p>We aim to maintain at least 10 % of a forest block as open. When restocking a site, open space is often left for diverse reasons which creates a diversity of habitats in the woodlands.</p>

<p>life and Countryside Act, as updated by the Nature Conservation (Scotland) Act 2004 are met.</p> <p>Maintaining the areas of open ground that are currently found within the forest would be welcomed as this could benefit a wider range of biodiversity.</p>	
<p>Aberdeenshire Council – Contacted on 10/2016 – No reply to date</p>	
<p>SEPA – Contacted on 11/2015 – See Appendix 2</p>	
<p>Issue raised:</p> <p>See Appendix 2</p>	<p>Forest district response:</p> <p>We follow the UK Forestry standards guideline for water in order to protect and conserve the water resource in and around the site.</p>
<p>Historic Environment Scotland and Aberdeen Council (Infrastructure service) - Contacted on 11/2015</p>	
<p>Issue raised:</p> <p>We note that there are no scheduled monuments, category A listed buildings or Inventory gardens and designed landscapes within the boundary of the proposed plantations that are part of the Land Management Plan Review and therefore have no comments to make regarding this consultation.</p> <p>You may also wish to seek information and advice on matters including impacts on unscheduled archaeology and category B and C listed buildings from your local authority's archaeology and conservation services if you have not already done so.</p>	<p>Forest district response:</p> <p>We will follow the UK Forestry Standards Guidelines and the Scheduled Monument Management Plan in order to conserve the monument present in the site.</p>

CONFOR – Contacted on 10/2016 – No Reply to date	
Torphins Community Council – Contacted on 10/2016	
Issue raised: Torphins Community Council appreciates being included in this process. We did review the proposals and have decided we have no specific comments or concerns to submit regarding this LMP.	Forest district response: No response required
Donside Community Council – Contacted on 10/2016 – No reply to date	
Cluny, Midmar and Monymusk Community Centre – Contacted on 10/2016 – No reply to date	
BAMMC – Contacted on 10/2016	
Issue raised: Thank you for the opportunity to input to the land management plan. BAMMC is committed to work with the forestry commission to gain access to FC land in order to promote safe and enjoyable off road motorcycle sport in the North East of Scotland. To the benefit of other FC land users through designated off-road areas that do not adversely affect other forms of forest recreation and use. The club are keen to continue our partnership with the FC to encourage and educate unauthorised offroaders on the benefits of joining a recognised club and participating in organised off road events. Membership of the club also brings with it the opportunity to learn new skills in a safe and controlled environment with trained coaches available for one to one or group coaching sessions. The goal of the	Forest district response: No response required

<p>BAMCC is to locate land that can be earmarked as suitable for off-road motorcycle use on a more permanent basis to eradicate unauthorised offroading in the North East of Scotland.</p>	
<p>SSE – Contacted on 10/2016</p>	
<p>Issue raised:</p> <p>With respect to your subsequent restocking proposals, we would welcome the opportunity to reduce any future potential 'red zone' trees as much as practically possible. We would welcome any of the following, if practical to your other objectives, with the aim of reducing the risk to our network infrastructure and the associated safety risks of harvesting/forestry operations working in close proximity to overhead powerlines. Potential scenarios we would encourage are the inclusion/increase of designed open ground on both sides of our infrastructure; Designed open ground and broadleaves (including shrub species); Where commercial conifers are the preferred species, the inclusion of designed open ground and/or broadleaves between the overhead powerline and conifers to act as a buffer for future harvesting operations. I hope you appreciate these are simply suggestions which may reduce the future risks to our network from adjacent trees whilst increasing the safety protection to operatives required to work in proximity to overhead powerlines. We do understand that these suggestions may not fit in with your other objectives but we appreciate your consideration of them and for the opportunity to be included in this consultation process.</p>	<p>Forest district response:</p> <p>We will be following the national wayleave agreement giving directions concerning open space along powerlines and tree felling.</p>
<p>BHS – Contacted on 10/2016 – No reply to date</p>	

Scottish Wildlife Trust – Contacted on 10/2016 – No reply to date	
Grampian orienteers – Contacted on 10/2016 – No reply to date	
Forbes Estate – Contacted on 10/2016 – No reply to date	
Issue raised: I am currently reviewing the Forest Plan for Forbes Estate and Forest Enterprise would be our main neighbour. I am just in the early stages of planning but can let you see my felling plan for the next twenty years. This plan may change slightly as my Forest Plan progresses, but I certainly will keep you up to date. It would be useful to see your felling plans in the Pitfichie, Slack Wood area before I finalise mine to ensure there are no conflicts.	Forest district response: I will keep you up to date as the planning process for Pitfichie and Corrennie progresses in order to avoid any issues such as adjacency.
Monymusk Estate – Contacted on 10/2016	
Issue raised: Thank you for your email yesterday with the copies of the FES plans for Pitfichie and Corrennie Forests for the next 5 years. I agree that access, health and well-being are important public issues but they should be secondary to FES' primary purpose which is to help provide a continuous supply of timber and forest products for Scotland's and the UK's downstream wood products industries, i.e. everything from construction timber to wood chip fuel. As you know, Monymusk Estate and FES share a long common boundary along the edge of Pitfichie Forest and so, inevitably, I am interested in what my neighbour is doing and, where possible, work together to our mutual advantage. In	Forest district response: The primary objective of the plan is to produce a high quality timber as described in the core of the text. I will keep you up to date as the planning process for Pitfichie and Corrennie progresses in order to avoid any issues such as adjacency.

<p>particular I would be interested:</p> <ul style="list-style-type: none"> · to know what felling plans there might be for the forestry blocks near the Tillyfourie Quarries. 	
<p>Pittodrie Estate – Contacted on 12/2016 - No reply to date</p>	
<p>North East Mountain Trust – Contacted on 10/2016</p>	
<p>Issue raised:</p> <p>Thank you for giving us a chance to comment at this early stage. We believe that the following points need to be taken into consideration.</p> <ol style="list-style-type: none"> 1. NEMT strongly supports the current provisions in the area for recreation. It is essential to bear this in mind whenever commercial decisions regarding forestry are taken. 2. NEMT would like to see emphasis on 1) extending the diversity of tree species to include more broad leaf and native trees and 2) reduction in the use of clear felling in favour of the increased use of Low Impact Silviculture Systems. 3. Within the context of maintaining commercial forestry on the hill, NEMT supports 1) the restoration of native species on the Plantation of Ancient Woodland Sites (PAWS) and 2) the use of supplementary planting where natural regeneration is proving problematic. In respect of this, while it is recognised that fencing is sometimes necessary, it should be used only where it is unavoidable because of its intrusive visual detriment. 4. We note that clear felling leaves 'industrial wastelands' which lessen people's experience of time 'away from civilisa- 	<p>Forest district response:</p> <ol style="list-style-type: none"> 1. No response required. 2. Diversity will be encouraged where applicable. LISS will systematically be used if applicable and where appropriate. 3. PAWS restoration is one of the National Objectives that Moray and Aberdeenshire forest district aims to achieve. Regeneration will be removed if it presents a threat to priority habitat. Regarding the PAWS guidance, 10 % of exotic conifers will be tolerated in PAWS areas. Deer fences are used where necessary. When fencing is not considered as required it will be avoided. Fencing is a permanent system used to establish woodlands. Therefore, the fences are usually removed after a 10 year period. 4. LISS will be encouraged along tracks/high recreation areas/wherever possible when applicable. Depending on the site conditions, LISS is not always applicable. Replanting after

<p>tion'. Areas adjacent to existing paths should not be clear felled. Where clear felling takes place then replanting should take place as soon as it is feasible to do so. We suggest that moves to reduce the extent and visual impact of clear felling in favour of LISS should be actively publicised and would engender widespread public support.</p> <p>5. There is an extensive network of tracks already existing in the forest. While NEMT notes the cost issue of extraction without building tracks, we are opposed to road construction as it further 'industrialises the hill'.</p> <p>6. NEMT opposes the construction/upgrading of more paths on the basis that this has an urbanising effect.</p> <p>7. NEMT suggests that any expansion of provision for mountain biking needs to be thought about carefully because the hill is used by large numbers of walkers, including families with small children, and there is a significant risk of collision. Mountain biking should be encouraged on the broader tracks within the forested areas.</p>	<p>clearfelling is done after a period of 4 years to avoid pests damage (Hylobius, a beetle highly active in the remaining stumps for a period of approximately 4 years and which can highly infect new plantations). Clearfells are designed using landscape principles in order to fit their design with the landform and to minimise their impact in the landscape</p> <p>5. There will be no road construction within the plan period.</p> <p>6. At the moment there is no new paths / tracks to be built. However, this is usually not a decision taken during a LMP review and cannot ensure that no tracks will be built within the next few years.</p> <p>7. This type of issue is not part of the planning process. However, the information has been passed to the FES recreation team.</p>
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Whitehouse Estate – Contacted on 12/2016 - No reply to date

Permit holders – Contacted on 10/2016 – No reply to date

Alison Espie

<p>Issue raised:</p> <p>There seems to be no scientific background to your choice of species for which management should take account; and no positive management plan. Reference to FC best practice notes in an Appendix does not in my view constitute a fully-developed management policy.</p>	<p>Forest district response:</p> <p>The species listed in the plan and taken into account during forest operations are those having a particular designation and present in the site area. Our environmental team, RSPB and SNH are consulted during the review of the Land Management Plan to eventually complete the information that we</p>
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May I suggest you conduct a proper review into which species of National or Local Biodiversity Action Plan interest are present within this forest estate, and incorporate systematic, science-based management plans for their conservation into your overall proposals.

have concerning species and habitats in the plan area.

We do not aim to have particular management prescriptions for each species in the text of the Land Management Plan as there are national prescriptions and policies that we do apply for all our managed areas (mentioned in the appendix). The Land Management Plan aims to explain how we will manage the woodland and the policies that we are using and in this case, policies in connection with designated species and habitats. If some of the species present within the site need a particular type of management, not mentioned in existing policies, this would be mentioned into the plan. However, we do have a wide diversity of local projects and surveys led by our environmental team and in connection with designated species and habitats (I can provide you with their contact if you wish to obtain more information).

Appendix 2 – Response from SEPA

Land Management Plan (LMP) of Pitfichie and Corrennie forest

Thank you for consulting SEPA for scoping advice on the above document by way of your e-mail which we received on 17 October 2016. Good plans can help deliver multiple benefits for people, the environment and the Scottish economy. We welcome this opportunity to assist in your preparation of this plan.

We advise that you address the following issues. We would welcome the opportunity to provide advice on the draft plan to ensure that all issues within our remit have been addressed prior to the formal submission of the plan for consultation.

General issues

Your plan should include a clear analysis of the environmental risks of the proposals accompanied by information on how they will be addressed and, where necessary, mitigated. For example, it should show on maps of 1:2,500 scale or more detailed, areas of peat greater than 50cm, watercourses, lochs and wetlands, and the setback of planting and infrastructure from these.

The advice on our website should be referred to. General advice on forestry in relation to our interests can be found on the [Forestry](#) page of our website. RBMP information may be found on the [RBMP information sources](#) page. Other information is identified in the sections below.

Flood risk

The Pitfichie and Corrennie Forests covers a large area and there are a number of rivers and watercourses which flow either through the forests or lie along its borders. In particular, in the very north of the defined forest area, the "Overton Wood" and "Craigton Wood" are immediately adjacent to the River Don. Several tributaries of the River Don including the Slack Burn flow through or are adjacent to Slack Wood and Pitfichie Forest and Corrennie Forest.

Some small areas of the woodland which border some of the watercourses lie within the medium likelihood (0.5% annual probability or 1 in 200 year) flood extent of the SEPA Flood Map, and may therefore be at medium to high risk of flooding*.

In addition, many of the watercourses within the forest area have catchment areas of less than 3km² and therefore, as indicated below, they have not been modelled on the SEPA flood map. They may however be a source of flood risk and these catchment areas may also be at medium to high risk of flooding. Small watercourses are often poorly understood with respect to the severity of the flood hazard that can be generated on a

catchment of this scale. SEPA holds a wealth of information on past small catchment flooding in Scotland which has led to significant impacts upon people and property.

From a flood risk perspective, we are interested in any proposed activity which may possibly be at risk of flooding and/or increase the risk of flooding elsewhere. It should be ensured that there is no increase in flood risk as a result of the works proposed within the Plan.

The plan should consider the impact of the works on the flood risk to downstream receptors.

The Plan should consider the impact on flows, sediment transport, capacity of culverts and potential blockage of culverts and bridges downstream. Mitigation may also need to be put in place to prevent an increase in runoff or woody debris from entering watercourses. Monitoring before, during and after works may need to be implemented. We would also advise that within the SEPA Flood Map and areas adjacent to small watercourses there is no increase in present ground levels of the floodplain as a result of any woodland operational works undertaken.

Should any new watercourse crossings be required, consideration should be given to the following documents: our [Good Practice Guidance on river crossings](#), [SEPA's position statement on culverting of watercourses](#), [Controlled Activities Regulations \(Flood Risk Standing Advice for Engineering, discharge and Impoundment Activities\)](#). Any bridges and culverts should be designed to convey the 1 in 200 year flow plus an appropriate allowance for freeboard. Where any watercourse crossings are planned we would advise that there is no increase in ground levels adjacent to the watercourse on the approach tracks.

We welcome the opportunity to provide more detailed advice when any additional relevant information is submitted. We would welcome early consultation with SEPA on any proposed new woodland or expansion and we can provide detailed comments on flood risk on a site by site basis.

* For background information please note that the [SEPA Flood Maps](#) have been produced following a consistent, nationally-applied methodology for catchment areas equal to or greater than 3km² using a Digital Terrain Model (DTM) to define river corridors and low-lying coastal land. The maps are indicative and designed to be used as a strategic tool to assess flood risk at the community level and to support planning policy and flood risk management in Scotland.

River Basin Management Planning

[The UK Forestry Standard](#) identifies that forest management should protect and improve the water environment by ensuring that forestry pressures on the aquatic environment are addressed and thus contributing towards the objectives of the River Basin Management Plan (RBMP). It should be ensured that the activities within the Plan do not impact upon any aspects of the water environment.

We have checked our RBMP records and would highlight that there are a number of water bodies in/adjacent to the Plan area which are at less than overall good sta-

tus/potential; the River Don – Alford to Inverurie (WBID 23293) is at moderate status, the Beltie Burn (WBID 23333) is at poor status and the Ton Burn/Cluny Burn lower (WBID 23310) is at moderate status.

It doesn't appear that any of the above referenced downgrades can be attributed to forestry pressures. However, it should be ensured that the Plan adheres to current best practice and guidance, including the Forest and Water guidelines particularly in relation to prevention of diffuse pollution.

We would welcome consideration of any opportunities to improve the water environment, for example, the plan could identify the location of any inappropriately designed or redundant structures which could be removed or improved. Examples include the upgrading of a culvert to allow fish passage or removal of a redundant weir. Opportunities for morphological and ecological improvements should also be considered. Measures could include re-introduction of meanders in artificially straightened watercourses or the planting of appropriate broadleaved species at a suitable density.

We would take this opportunity to highlight that there is an impassable structure on the Pitmunie Burn at NJ 66051 15399. This is sited on the border of the plan area, and consideration could be given to removal or enabling fish passage.

The plan should confirm whether or not there are any invasive non native species (such as the North American signal crayfish, Japanese knotweed, giant hogweed, rhododendron and Himalayan balsam) present in the plan area. If there are invasive non native species present the plan should briefly outline proposals for control and removal.

Felling and replanting proposals

As the plan will give permission for the felling and replanting proposals outlined within it, it should provide clear information on how protecting the environment has been considered when deciding on the proposals (for example in relation to the timing of works or size of areas felled at the same time).

Diffuse pollution from planting and felling proposals is a significant threat to achieving and maintaining good water quality. The plan should confirm adherence to [The UK Forestry Standard](#) and related Forestry Standard Guidelines and comply with the requirements of the [Water Environment \(Controlled Activities\) \(Scotland\) Regulations \(CAR\)](#).

In acidified catchments (<http://www.forestry.gov.uk/forestry/INFD-9FSM8R>) plans should identify the percentage of felling proposed in each water body catchment within a three year period. In line with [The UK Forestry Standard](#) we prefer that less than 20% of acidified water body catchments and catchments which are sensitive to nutrient enrichment are felled in any three-year period. If greater than 20% is proposed to be felling in any three year period then the plan should include an assessment of the likely effects this may have on local water bodies and the design mitigation measures proposed to address possible effects.

New supporting infrastructure

In line with Appendix 1 of [Forestry Practice Guidance: Forest Design Planning](#) the plan should include information on any new infrastructure which may be required to facilitate plan proposals. For example, details should be provided of any new or upgraded tracks and new lay-down areas, borrow pits or temporary welfare facilities or new infrastructure

to facilitate public access to the area. This supporting infrastructure should be designed to avoid engineering activities in the water environment wherever possible.

Carbon balance and impacts on peat

Our GIS mapping system indicates that there may be peaty soils in the area.

Proposals for any new planting or replanting should demonstrate how they comply with the guidance outlined on the Forestry Commission Scotland [peatland habitats](#) webpage.

If there is peat on the site then the plan should include a map showing peat depths across the site and identify any adjacent bog habitats. The map and supporting text should demonstrate that (1) all new planting has avoided peat exceeding 50 cm depth (2) any replanting on peat complies with the relevant guidance and (3) outline the measures to be taken to ensure that the hydrology of any adjacent bog habitats is not compromised.

We support peatland restoration proposals in areas which are to be clear felled, but, due to site conditions, not replanted. The plan should identify any such areas, outline the aims of restoration and the methods to be employed to achieve the outlined aims.

Impacts on wetlands

Our GIS mapping system indicates there may be some small areas of wetland in the area.

[The UK Forestry Standard](#) states that managers should "Ensure that wetland features such as springs, flushes and bogs are protected, and take opportunities to restore degraded features." You should consider whether any areas within the plan provide opportunities for peatland and wetland restoration, for example, areas which are not going to be replanted. We wish the plan to include details of any such proposals.

It doesn't appear that any new woodland is proposed. However, the following comments would apply to any new woodland areas:

The [Forests and Soil UK Forestry Standard Guidelines](#) specifically identify the need to consider the effects new woodlands can have on wetlands. It states "Where new woodlands are proposed, the sensitivity of downstream water bodies and wetlands to a reduction in water quantity should be considered; where this is an issue, advice should be sought from the water regulatory authority and conservation agency" and that managers should avoid establishing new forests "on sites that would compromise the hydrology of adjacent bog habitats." We also have a specific interest in groundwater dependant terrestrial ecosystems, which are specific types of wetlands protected by the Water Framework Directive. Some of these types of wetland habitats are very common in peatland areas where both native woodland and commercial forest projects are often located.

The planting of trees in any density on these types of wetland habitats will destroy their integrity. However, many of these wetland habitats have formed as a direct result of specific management practices relating to felling, drainage and grazing and if managed differently would have evolved into native woodlands. Proposals for native tree regeneration, either passively by way of controlling grazing or more actively by way of planting, are supported by current national policy including the [Scottish Forest Strategy](#). As a result we will take a different approach to protecting wetlands on sites proposed for na-

tive woodland planting/natural regeneration than we will take on new sites for productive commercial forestry.

If new native woodland proposals are being considered within the plan then it should include general information on how wetland features such as springs, flushes and bogs have been protected. This could include, for example, the commitment for planting to avoid wet areas.

However if new commercial planting (*i.e.* not native species regeneration and not re-planting of previously felled areas) on peatland areas is considered within the plan then a Phase 1 habitat survey should be carried out on these areas and the guidance [A Functional Wetland Typology for Scotland](#) should be used to help identify all wetland areas. National Vegetation Classification should be completed for any wetlands identified. Results of these findings should be submitted, including a map with all the proposed new planting and any related drainage overlain on the vegetation maps to show clearly which areas will be impacted and which areas will be avoided. The results of the National Vegetation Classification survey and Appendix 2 (which is also applicable to other types of developments) of our [Planning guidance on windfarm developments](#) should be used to identify if wetlands are groundwater dependent terrestrial ecosystems. We consider that the presence of groundwater dependant terrestrial ecosystems should be considered as a constraint and therefore should be highlighted in the plan.

Our preference is that new commercial planting areas and related new infrastructure (which includes any new significant drainage channels) avoid direct impacts on groundwater dependant terrestrial ecosystems wherever possible. If any groundwater dependent terrestrial ecosystems are located where new planting is proposed or within a radius of (i) 100 m from new roads, tracks and trenches or (ii) 250 m from any new borrow pits, the likely impact of these features will require further assessment. This assessment should be carried out whether or not the features in (i) and (ii) occur within or outwith the site boundary in order that the full impacts on the proposals are assessed. The results of this assessment and proposed mitigation measures should be included in the plan.

Use of waste on site, including felling waste

Proposals to make use of any waste wood on the site should be outlined in the plan. The proposals should comply with our [SEPA: Guidance: Management of Forestry Waste](#).

Pollution prevention and environmental management

We expect forest activities to be carried out following the best practice guidance outlined in the UK Forest Standard Guidelines and other relevant best practice guidance outlined on the [Forestry](#) page of our website. Please also refer to the [Pollution prevention guidelines](#). Engineering activities in or adjacent to the water environment are likely to need authorisation under the [Water Environment \(Controlled Activities\) \(Scotland\) Regulations \(CAR\)](#) and should follow the related elements of the [Forests and Water UK Forestry Standard Guidelines](#).

The Opportunities and Constraints Map should identify whether the forest contains any drainage ditches which directly connected to the water environment. If this is the case there should be a commitment for these to be addressed.

The plan should provide clear information on the minimum buffers to be included between the forest edge and each water body or abstraction. This should comply with [Table 5.1 of the UK Forestry Standard](#).

Regulatory requirements

Details of regulatory requirements and good practice advice for the applicant can be found on the [Regulations section](#) of our website. If you are unable to find the advice you need for a specific regulatory matter, please contact a member of the operations team in your local SEPA office at: Inverdee House, Baxter Street, Torry, Aberdeen, AB11 9QA, Tel: 01224 266600.

If you have any queries relating to this letter, please contact me by telephone on 01224 266698 or e-mail at planning.aberdeen@sepa.org.uk.

Yours sincerely

Jessica Fraser
Planning Officer
Planning Service

Disclaimer

This advice is given without prejudice to any decision made on elements of the proposal regulated by us, as such a decision may take into account factors not considered at this time. We prefer all the technical information required for any SEPA consents to be submitted at the same time as the planning or similar application. However, we consider it to be at the applicant's commercial risk if any significant changes required during the regulatory stage necessitate a further planning application or similar application and/or neighbour notification or advertising. We have relied on the accuracy and completeness of the information supplied to us in providing the above advice and can take no responsibility for incorrect data or interpretation, or omissions, in such information. If we have not referred to a particular issue in our response, it should not be assumed that there is no impact associated with that issue. For planning applications, if you did not specifically request advice on flood risk, then advice will not have been provided on this issue. Further information on our consultation arrangements generally can be found on our [website planning pages](#).

Appendix 3 – LISS Coupe prescriptions

Coupe ref. (See map – LISS coupes)	Management Type and area	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	Other useful information
1	Uniform shelterwood 11.3 ha	Production of timber. Good seed source present over the site. Evidences of successful natural regeneration within and around the site.	Uniform mix of even age species: SS 20 % NS 20 % JL 60 %	Age – 69 years old Trans period – 15 to 20 years (depending on natural regeneration) Return time – 5 years for light thinning	NS + SS Natural regeneration. Moss presents on the ground but not an issue for NR success.	Windblow could be an issue but NR already presents.	Light thinning	1 to 3 more light thinning required before final clearfell. Area sensitive to windblow. NR just needs more light to settle successfully. Respacing NR might be needed afterwards. Replanting required if NR not successful.
2	Group selection 30.9 ha	Production of timber. Good seed source present over the site.	Stand mainly composed of Larch with uneven aged	Age – 62 years old Trans period – Approx. 60 years Return time	Patchy ground flora mainly composed of moss and grass. Few evidences of	Ground flora could be an obstacle to NR: ground preparation such as scar-	Thinning and start to open groups - 5 ha of groups	The site might be sensitive to windblow. However, using a group shelterwood sys-

			trees: JL 80 % SS 20%	- 5 years for thinning and open first groups (no more than 2ha).	NR at the moment but need more light.	ification or soil scraping will help to acquire NR	spread over the area. Group size approx. 0.2ha each. Then open identically 5 ha every 10 years. Acquire NR without ground prep but if not successful, scarification / ploughing / scraping must be undertaken.	tem will limit the risk of windblow. The seed source is currently stable and produces a good quality timber. We will aim to acquire larch NR but SS and SP NR will also be very much accepted. When NR will appear in the first groups, start to open another set of groups (ideally every 7 years when returning for thinning).
3	Group shelter-wood 11.3 ha	Production of timber. Encourage value of woodland for neighbours living nearby and road running along the area.	Stand mainly composed of SP and NS with uneven aged trees: NS 40%	Age - 72 years old Trans period - Approx. 40 years Return time - 5 years thinning and open first	To check	Ground flora could be an obstacle to NR: ground preparation such as scarification or ground scraping will	Thinning and open first groups in priority by felling the NS areas. Then open groups where NR is already pre-	The NS has been under thinned in the past and will need to be clearfelled during the next thinning period (this will be the

			SP 40 % SS 10% BI 10 %	groups (no more than 2ha).		help to acquire NR.	sent.	first groups). However, the CF areas will not exceed 2ha. We will aim to obtain NR of NS/SP or SS within the felled areas. Replanting required if NR not successful.
4	Group shelter-wood 8.5 ha	Production of timber. Good seed source (SS + BI + SP) present over the site. Evidences of successful natural regeneration within and around the site.	Uneven age structure mainly composed of SS and BI with some SP: SS 40 % BI 40 % SP 20 %	Age - SP: 71, SS+BI: 24 Trans Period - approx. 30 years Return time - 7 years for thinning asap for opening big groups	Heather - Patchy. BI and SS NR already present.	Ground flora could be an obstacle to NR: However, as we are aiming to obtain SS and BI NR the ground flora should be a big obstacle to succeed.	Thinning and start to open big groups above current NR of BI / SS and / or SP.	Open big group where NR is already well settled. The SP stands will progressively be transformed in a stand mainly composed of SS. Encourage SP where NR is present (e.g. southern area). Keep opening canopy when NR appears.
5	Uniform shelterwood	Production of timber. Good	Complex: SS 70 %	Age - 24 years old	Diverse - Young crop:	Depending on the future	Keep thinning on a 5	Some areas of the site need

	12.5 ha	seed source present over the site. Evidences of successful natural regeneration within and around the site.	BI 30 %	Trans period – approx. 40 years Return time – asap for thinning – then 7 years thinning cycle.	Ground vegetation not invasive below SS.	development of the stand, obstacles such as windblow may appear.	to 7 years basis.	immediate thinning.
6	Uniform shelterwood 1.8 ha	Production of timber. Good seed source present over the site. Evidences of successful natural regeneration within and around the site.	Complex: GF 40 % NS 30 % SS 30 %	Age – 57 years old Trans period – approx. 30 years Return time – asap for thinning then 7 years thinning cycle.	Not much ground flora – Dense plantation.	Depending on the future development of the stand, obstacles such as windblow may appear.	Keep thinning on a 5 to 7 years basis.	Some areas of the site need immediate thinning.
7	Uniform shelterwood 11.2 ha	Production of timber. Good seed source present over the site. Evidences of successful natural regeneration within and around the site.	Complex: SS 70 % BI 30 %	Age – 16 years old Trans period – approx. 50 years Return time – asap for thinning then 7 years thinning cycle.	Diverse – Young crop: Ground vegetation not invasive below SS.	Depending on the future development of the stand, obstacles such as windblow may appear.	Keep thinning on a 5 to 7 years basis.	Some areas of the site need immediate thinning.

8	Uniform shelterwood 9.3 ha	Production of timber. Keep continuous cover for recreation.	Simple: NS 100 % (SS NR will be accepted)	Age - 58 years old Trans period - Approx. 20 to 30 years Return time - asap for thinning then 7 years thinning cycle.	Ground vegetation is quite thin and will normally be an issue to NS NR already well represented over the area.	Windblow could be an obstacle - Light thinning required before final clearfell.	Light thinning to avoid windblow and ground flora development.	If windblow become too important, fell the area: In this situation, wait for NS NR to grow before restocking the entire site as it is already present all over the site.
9	Uniform shelterwood 3.86 ha	Production of timber.	Complex: JL 100%	Age - 66 years old Trans period - Approx. 30 to 40 years Return time - 7 years for thinning	Vegetation mainly composed of wavy grass and some patches of bracken.	Ground vegetation could be an obstacle for regeneration. Some scarification will be necessary to acquire NR.	Thinning 3 or 4 more times and start scarifying.	Uniform shelterwood system will be used. Scarification will be needed to acquire enough NR to renew the crop.
10	Group selection 17.3 ha	Production of timber.	Complex: JL 100%	Age - 66 years old Trans period - Approx. 60 years Return time - 7 years for thinning	Vegetation mainly composed of wavy grass and some patches of bracken.	Ground vegetation could be an obstacle for SP regeneration. Soil scarification would be ideal within the felled group	Thinning and start opening the groups - 2 ha of groups spread over the area. Group size approx. 0.2ha each.	Group shelterwood system will be used in order to avoid windblow and damage to the landscape. If NR does not come up with the first group,

						area.	Then open identically 5 ha every 7 years (at each thinning cycle). Ground preparation might be needed to acquire NR.	plan to Clear-fell the area but soil preparation such as shallow ploughing / scarification might be a critical success factor.
11	Uniform shelterwood 15.5 ha	Production of timber. Good seed source present over the site. Evidences of successful natural regeneration within the site.	Complex: DF 70 % JL 20 % SP 10 %	Age - 55 years old Trans period - 10 to 20 years Return time - 5 years thinning cycle is preferable to 7.	DF already regenerating but inconsistently; scarification will help to have a higher quantity of plants.	Ground flora can be thick and would need to be scarified.	Thin every 5 years and start scarifying when space between trees is wide enough.	The DF suits the site very well and shows that it is mature and ready to regenerate naturally. The stands are clear enough to think about NR now and need therefore to be scarified when space between trees allows.
12	Group shelterwood 18.7 ha	Production of timber. Good seed source present over the site.	Complex: JL 80 % SS 10 % GF 10 %	Age - 65 years old Trans period - Approx. 40 years Return time	Some SS NR - Ground flora not too thick but would need some scarification.	Ground flora	Open groups and scarify the opened area. Keep thinning the rest of the	Group shelterwood system will be used in order to avoid windblow and damage to the

				- ready to open first groups now and scarification - 7 years for thinning			stand.	landscape. If NR does not come up with the first group, plan to Clear-fell the area but soil preparation such as shallow ploughing / scarification might be a critical success factor.
13	Single tree selection 79 ha	Encourage broadleaves growth / Remove SS regeneration. Hardwood production.	MB 90%, SS 10%	Age - Diverse Trans period - At least 50 years depending on stand age and growth Return time - Diverse in function of the stand	Diverse	To obtain NR in the future it will be sometimes necessary to fence the coupe areas.	Remove non-native conifer regeneration in order to encourage broadleaves growth - tending and thinning if necessary.	The management of these scattered areas of broadleaves will be done at the same moment as near-by operations (nearby thinning or clear-fells).
14	Uniform Shelterwood 18.5 ha	Encourage growth of Scots Pine and native broadleaves within Paws area	SP 70 % MB 30 %	Age - Diverse Trans period - At least 100 years	Diverse	To obtain NR in the future it will be sometimes necessary to	Remove non-native conifer regeneration in order to encourage	Keep thinning the crop over a long period of time in order to obtain big

				depending on stand age and growth Return time - 7 years		fence the coupe areas.	broadleaves and SP growth	trees, appro- priate for a PAWS area.
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Appendix 4 –What is LISS/Continuous Cover Forestry?

Please be aware that this article has been published in 1999 and that some of the policies/definitions have been amended.



What is Continuous Cover Forestry?

INFORMATION NOTE

BY BILL MASON, GARY KERR AND JAMES SIMPSON

OCTOBER 1999

SUMMARY

Continuous cover forestry involves the maintenance of a forest canopy during the regeneration phase with a consequent presumption against clearfelling in favour of alternative silvicultural systems. Although there are likely to be cost penalties from the use of continuous cover systems these can be more than offset by the provision of enhanced non-market benefits. The main constraints are the risks of windthrow and of regeneration failure through browsing or vegetation competition, plus the lack of experience of alternative silvicultural systems in British forestry. However, despite these limitations, there is potential for greater use of continuous cover forestry on selected sites throughout Britain as one means of providing more diverse forests for multi-purpose benefits.

INTRODUCTION

1. The phrase 'continuous cover forestry' has featured increasingly in discussions about the future management of British forests. For example, *The UK forestry standard* (Forestry Commission, 1998) requires managers to 'identify areas which are, or will be, managed under a continuous cover forestry system and to build them into the forest design'. 'Continuous cover' is defined as the use of 'silvicultural systems whereby the forest canopy is maintained at one or more levels without clear felling'. Clearfelling is defined in the text as the cutting-down of all trees on an area of more than 0.25 ha. The distinctive element of 'continuous cover forestry' is therefore the avoidance of clearfelling of areas much more than two tree heights wide without the retention of some mature trees. The *UKWAS certification standard* (UKWAS, 1999) requires favouring of lower impact silvicultural systems such as selection and shelterwood in windfirm conifer plantations (section 3.4.4).
2. The main silvicultural system employed in British forestry is patch clearfelling followed by planting or occasionally natural regeneration. We estimate that this system is employed in at least 90% of managed forests with an average size of clearfelled coupe of between 5 and 10 hectares, although there is appreciable regional variation.
3. The adoption of continuous cover forestry systems on any scale will require changes in silvicultural practices

and management thinking in Britain. There is little British experience of using alternative silvicultural systems to patch clearfelling. Our different species and site conditions mean that regimes developed in other parts of the world must be adapted through field trials of alternative systems on suitable sites and with supporting research. Our aim in this Note is to clarify the first principles involved for those considering continuous cover forest management.

HISTORY

4. The current discussions about the potential role of continuous cover forestry are the continuation of long-standing debate about the relative merits of regular and irregular silviculture which began in Europe in the middle of the 19th century. For example, the term 'continuous cover' has links with the German term 'dauerwald' or 'continuous forest' which was discussed in the 1920s and 1930s (Helliwell, 1997) and was last seriously examined in Britain during the 1950s and early 1960s.
5. The current attraction of continuous cover forestry lies in the belief 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, continuous cover forestry is seen as a means of reducing the impact of clearfelling and the associated changes that this produces in forest landscapes and

habitats. It does not mean abandoning stand management or timber production. Indeed the felling of trees and the harvesting of their timber is essential in continuous cover forestry to manipulate the stand structure to promote natural regeneration and to provide revenue to offset costs of meeting multiple objectives. Key aspects are discussed in the following sections.

PRINCIPLES OF CONTINUOUS COVER FORESTRY

6. A crucial point is that continuous cover forestry describes **one approach** to forest management, and therefore it is more than a silvicultural system. Silvicultural systems (e.g. shelterwood, selection, patch clearfelling) are means of implementing the chosen management objectives. Continuous cover forestry has variously been described as a 'close-to-nature', 'holistic' or 'ecological' approach to forest management, but these terms are too vague to be practical. It is more useful to think of certain guiding principles which underpin this approach and are considered below.

Managing the forest ecosystem rather than just the trees

7. Under continuous cover, the stands in the forest are seen as the framework for an ecosystem from which timber is harvested at intervals but where other aspects such as landscape or wildlife habitat are of equal importance. The manager considers the impact of the harvest upon this framework and adjusts the quantity removed to ensure that the changes brought about do not impair the wider system. It should be noted that this principle is common to all forests managed for multi-purpose objectives. Thus the restructuring of plantation forests through the forest design process is based on a similar principle. Deciding which is a more sustainable approach will depend upon a thorough evaluation of site factors, species requirements and management objectives.

Using natural processes as the basis for stand management

8. The approach assumes that the use of processes such as natural regeneration is more sustainable than one based upon artificial regeneration and the creation of uniform stand structures of single species. Evidence

for this assumption is generally lacking. Natural regeneration is favoured as a means of achieving greater species diversity and as an assurance that the species are suited to the site.

Working within site limitations

9. Natural processes will be favoured if the species composition of the forest is appropriate to the site conditions. One would avoid using species that would require high nutrient inputs on nutrient poor sites and adopt a more conservative approach based upon a less demanding species (e.g. favouring Scots pine over Sitka spruce on dry heathland soils). Site variation within the forest would be respected as a source of diversity rather than seeking to impose uniformity by drainage or insensitive cultivation. The advent of the Ecological Site Classification (Pyatt and Suárez, 1997) offers the opportunity to develop a framework of matching species to site in a logical manner.

Creation of a diverse stand structure with a range of species

10. Many forests planted during this century are composed of trees largely in the stand initiation or stem exclusion phases (see Table 1). As a consequence the stands tend to have a regular structure with a single layer of trees in the canopy, little ground vegetation, little deadwood and few tree species. However, older stands generally have greater diversity of structure a wider range of microsites which are providing niches for more species, and a more favourable regeneration within the stand. Increasing the representation of these later stages in a forest enhances the possibility of providing recreational or wildlife benefits since many of these non-market benefits appear to be linked with the occurrence of older and larger trees.

STAND DEVELOPMENT

11. A useful conceptual model of stand development has been proposed by Oliver and Larson (1996). They postulate that the development of a regular stand of a single species can be separated as detailed in Table 1. Consideration of these stages indicates that, under a patch clearfelling system, many conifer stands managed for timber production rarely progress beyond the stem exclusion stage and are felled before advance regeneration is apparent in the understorey.

Table 1 The four stages of stand development after Oliver and Larson (1996)

Stage	Notes
Stand initiation	The period when young seedlings colonise a site after major disturbance e.g. felling, windthrow. Broadly equivalent to the 'establishment phase' defined in plantation forestry.
Stem exclusion	The existing trees dominate the site and there is no further colonisation by young trees. Some trees in lower canopy die as a result of inter-tree competition.
Understorey reinitiation	As the overstorey grows taller, herbs and advance regeneration start to colonise the forest floor. Often they make little growth because of the limited light conditions.
Old growth	Overstorey trees die in an irregular fashion and individuals of the advance regeneration grow towards the upper canopy.

The exceptions are stands of light demanding species such as pines and larches where the comparatively light shade allows other tree and shrub species to colonise the understorey before rotation age is reached. Such stands would be classed in the understorey reinitiation phase and the same is true of many regular broadleaved stands managed on longer rotations. In all these types, an approach based upon continuous cover forestry would try to maintain stand development well into the understorey reinitiation phase to foster the natural regeneration anticipated as a normal consequence of this phase.

A PRESUMPTION AGAINST CLEARFELLING IN FAVOUR OF THE USE OF ALTERNATIVE SILVICULTURAL SYSTEMS

12. Continuous cover forestry commits a forest manager to using an alternative silvicultural system to patch clearfelling. The choice of alternative system should be based upon an understanding of species requirements, site potential, climatic limitations and linked to management objectives.

13. It is convenient to distinguish between silvicultural systems according to the stand structures they produce (see Table 2). Regular stands are ones where all the trees are of similar height (but not necessarily of the same age) whereas irregular ones contain a mixture of sizes. Systems which promote regular structures require the removal of the overstorey once regeneration is established whereas in irregular systems there will always be some components of the overstorey retained in the stand. It is not our intention to discuss these systems in detail since relevant information can be found in Hart (1995) and Matthews (1989). Some 'regular' systems will involve felling the majority of trees on a site (e.g. seed tree system) and are therefore not as appropriate for continuous cover as the more intimate selection systems. Variants of these systems are described in the literature but these are generally adaptations of a basic model to particular site conditions and/or species requirements.

14. An important factor influencing the choice of silvicultural system is the light requirement of the species to be regenerated. A traditional distinction is drawn between light demanding, intermediate and shade tolerant species (see Table 3) on the basis of the amount of shade that seedlings can tolerate while still making effective growth. Those which are **shade tolerant** can be expected to grow in small gaps (0.05 ha or less) or under the canopy of a mature stand whereas **light-demanding** species will require very light canopies or open areas to achieve adequate growth. **Intermediate** species are those that can regenerate under a canopy, but require this to be opened up rapidly to ensure good seedling growth. Seedlings of all species can occur underneath an overstorey as 'advance regeneration', but only shade tolerant species can survive and grow for any length of time beneath a canopy. Therefore species in the shade tolerant category such as beech and Norway spruce are suitable for selection systems while those such as birch and Scots pine are favoured by seed tree systems.

Table 2 Classification of some silvicultural systems by stand structure

Regular stand structures	Irregular stand structures
Clearfelling	
Seed tree	Single stem selection
Uniform shelterwood	Group selection
Strip shelterwood	Irregular shelterwood
Coppice-with-standards	

Table 3 A classification of the main British tree species according to their seedling light requirements

Light demanding	Intermediate	Shade tolerant
European larch	Douglas fir	Western hemlock
Japanese larch	Sitka spruce	Norway spruce
Hybrid larch	Noble fir	Grand fir
Scots pine	Ash	Western red cedar
Corsican pine	Cherry	Yew
Lodgepole pine	Lime	Beech
Birch (<i>both silver and downy</i>)	Oak (<i>both pedunculate and sessile</i>)	Hornbeam
	Rowan	Field maple
	Sweet chestnut	Sycamore
	Whitebeam	
	Cherry	

This classification is inevitably relative and does not mean that all species in a given category have identical requirements. For example, there is good evidence to suggest that seedlings of Sitka spruce are less shade tolerant than those of Douglas fir and need increased light intensity for satisfactory growth much sooner than those of the latter.

ROTATION LENGTH AND YIELD CONTROL

15. Most of the silvicultural systems discussed above involve retaining a number of mature trees on site for an appreciable period after the remainder of the stand has been felled. These trees act as a seed source for regeneration, help modify the microclimate (e.g. reduction of frost damage) and provide benefits to biodiversity. Implementing a continuous cover forestry system requires rethinking the definitions of financial or technical rotation age that are integral to silviculture based upon patch clearfelling. For example, a general aim is to retain a stand into the understorey reinitiation phase with manipulation of the canopy to promote regeneration. Given that seed years are intermittent and that it can take 5–10 years for satisfactory establishment of regenerated seedlings of some species, designating a stand under continuous cover forestry management may require prolonging the rotation for some trees by at least 20 years beyond the age determined by maximum mean annual volume increment.
16. In addition, in the irregular systems, the focus is less on age than on the target diameter at which trees are considered to be marketable. In selection forests, it is quite common to find target diameters of 60–70 cm which are based on the belief that it is both possible to grow and successfully market large dimension sawlogs. In conifer stands, such target dimensions would again require an appreciable lengthening of current rotations. A number of parameters are used to guide the tending of stands managed under selection systems. Apart from the target diameter these include: the residual basal area to be left after thinning; the ideal stem size distribution on a particular site; and the actual stem size distribution recorded during a periodic inventory. Thinning of a selection stand involves the removal of stems in all size categories to bring the actual distribution closer to the ideal one (see Philip, 1994; pp. 146–149). The health and quality of the individual stems is a further guide as to which trees should be removed.
17. It is sometimes stated that stands under continuous cover management, particularly irregular stands, produce higher yields per unit area than regular, even-aged stands. There is no evidence in the literature to support this view and the safest assumption is that the yields are similar in both types of system. However, the product out-turn may vary since continental evidence suggests a higher proportion of large dimension (>50 cm) sawlogs are produced under selection systems (see Schutz, 1997).
18. There are no British yield models, and few in other countries, designed for the more complex stand structures which are one of the goals of continuous cover forestry. Existing even-aged yield models can be adapted by assuming that the average productivity of a continuous cover stand is equivalent to that expected of an even-aged stand on a given site and adjusting the model for the percentage of the stand in different size/age categories. However, this is a considerable simplification and stands being transformed to alternative systems should be monitored to check that the response is in line with expectations. This has to include an estimate of regeneration success and understorey development as well as measurement of the overstorey.

CONSTRAINTS TO CONTINUOUS COVER FORESTRY

19. There are a number of factors which limit the feasibility of adopting a continuous cover forestry approach. In much of northern and western Britain on exposed sites with shallow soils, the risk of windthrow is a major limitation to the possibility of adopting one of the alternative silvicultural systems. The opening up of the tree crowns as a consequence of thinning operations to promote regeneration increases the wind loading on the retained trees substantially and these trees will be very vulnerable to blowdown or stem breakage. Therefore, it would be risky to introduce an alternative silvicultural system on sites of windthrow hazard class 4–6. Even on sites of lower windthrow risk, trees on wet or shallow rooting soils are likely to be vulnerable to wind damage. Despite the magnitude of this constraint, there are appreciable areas of upland forests where better soils and reasonable shelter would make continuous cover systems a feasibility. Paterson (1990) thought that 25% of the upland forest area was a reasonable estimate. By contrast, in lowland Britain, where the return period for catastrophic wind damage exceeds 1 in 100 years, the risk of windthrow is not a general constraint to the use of continuous cover systems.
20. We have assumed that reliable natural regeneration will be necessary if continuous cover forestry systems are to be implemented. Natural regeneration of all major trees (i.e. native and non-native) can occur in British forests provided the parent trees are of sufficient age to produce regular seed crops. The presence of advance regeneration in or near the stand is a useful indicator of the chance of success. If the trees are of suitable age (see Nixon and Worrell (1999) for conifers and Hammer and Kerr (1995) for broadleaves), but advance regeneration is not present, the failure may be due to a host of reasons including lack of seed, vegetation competition and predation. Do not attempt to promote natural regeneration until the limiting factor has been identified and remedial action taken.
21. Trees need to be old enough before they start to seed regularly and for the potential for regeneration to occur. Depending upon species, the beginning of regular seeding is between 20 and 40 years of age, the younger age being characteristic of pioneer light-demanding species such as the pines, and the latter of

shade-tolerant species such as Norway spruce. There is also variation in the frequency of good seed years which, for example, may be every 3 years in birch and Scots pine and 5–8 years in beech.

22. Soil conditions are important for a number of reasons. Deep rooting soils are beneficial to tree stability which is a key consideration with any alternative silvicultural system. Fertile soils ('medium' to 'very rich' in Ecological Site Classification terms) have the potential for vigorous weed growth. On such sites it is important to encourage advance regeneration first and then develop it through progressive opening up of the canopy, so ensuring that small seedlings are not swamped by weeds. In contrast, on less fertile sites ('very poor' to 'poor'), vegetation competition is less intense and a regeneration 'window' for successful seedling establishment can persist for 2–3 years after a canopy is opened up. For this reason, many examples of the successful use of alternative silvicultural systems tend to be on less fertile sites.
23. Young seedlings are very vulnerable to browsing damage and, in areas with high deer densities, it is unrealistic to expect regeneration without reducing the populations below 5–10 animals per 100 ha and/or fencing the zones to be regenerated.

COSTS

24. There are few examples of continuous cover forestry systems in operation in Britain and it is not possible to provide definitive costings on the implications of changing to this type of management from conventional patch clearfelling systems. Some research is underway at the present time which may help to clarify this aspect. There is general agreement that some cost penalties are involved, either because trees are being maintained beyond financial rotation or because the costs of management per unit area are higher than with conventional systems. However, the increased costs may be offset by benefits in terms of ability to meet landscape, recreation or conservation objectives. In addition, the costs associated with replanting can be avoided provided that natural regeneration is sufficiently profuse and reliable. A further claim sometimes made for the irregular systems is that an all sized stand structure ensures some resilience against the effect of a catastrophic gale since there are always smaller trees to colonise the available growing space.

ADVANTAGES AND DISADVANTAGES OF CONTINUOUS COVER FORESTRY

25. The advantages and disadvantages of continuous cover forestry, given present knowledge, are summarised in Table 4.
26. There are clearly potential benefits and appreciable risks in embarking on the transformation of regular stands to continuous cover forestry. The benefits are greater the more that a stand or a forest is being managed for non-timber objectives. The long time before the success of transformation can be determined should borne in mind. For example, one of the best known areas of continuous cover management lies in Glentress Forest near Peebles in Scotland where Professor Mark Anderson of Edinburgh University initiated a trial of a group selection system in first rotation conifer stands in the late 1950s. It has taken some 30 to 40 years for the diversity of structure to become apparent and for it to be possible to start to judge the success of this trial. Not all organisations or owners will be prepared to take such a long-term view.

IMPLEMENTATION

27. We anticipate that an increasing number of owners will be interested in undertaking trials of alternative silvicultural systems in the years ahead and we would strongly advise anybody in this position to start on a trial basis to begin with. The following simple check list is a guide to anyone considering the continuous cover forestry approach.

- Are the stands in question of windthrow hazard class 3 or less and without sign of wind instability?
- Are the tree species present adapted to the site and of suitable genetic quality?
- Are the soils freely draining?
- Are the stands involved in the stem exclusion or very early understorey reinitiation phases?
- Is the forest floor under the stands bare or with very little vegetation?
- Is there evidence of advance regeneration of a desirable species? If not, do you know why not?
- Are deer, rabbits, sheep or other browsing animals under control?

Table 4 Advantages and disadvantages of continuous cover forestry

Advantages	Disadvantages
Less visual impact than clearfelling.	More complex stand management requiring skilled personnel.
Increased within-stand structural and species diversity.	Yield prediction/regulation is more difficult.
Greater structural diversity with potential benefits for wildlife.	Greater harvesting costs because of small dispersed felling sites.
Less disturbance of forest ecosystem and greater shelter for regenerating seedlings.	More site damage on heavy soils because of less brash to provide brash-mats.
Reduced restocking costs (assuming natural regeneration is successful).	Dependent upon natural regeneration to be cost-effective. Therefore less suited to more fertile sites (weed competition) and/or where there is heavy browsing pressure.
Production of large diameter, high quality sawlogs.	Risks of wind damage when transforming regular stands, particularly on unstable sites.
Structural diversity provides resilience against windthrow (at the stand level).	Time required to determine success.

- Is the site suitable for laying out a system of racks for machine access for harvesting?
- Are you prepared to wait at least 20 years to know whether you have succeeded?
- Have you access to a qualified professional forester who can handle the management and monitoring of these stands for you?
- Are you prepared to forgo the income from some mature trees in the stand?
- Are there other stands on the property to provide income in case of failure?

If the answer to any of these questions is in the negative, then we would advise reconsidering the proposal, possibly by looking for more suitable sites or by obtaining further advice. Further information can be obtained from the references, and from the organisation listed in paragraph 30.

28. Any trial area should have a short management plan outlining the objectives, the silvicultural system(s) proposed and the desired stand structure and species composition, and listing the intended operations. This plan should be reviewed at 5-year and revised at 10-year intervals in the light of the results obtained.

CONCLUSIONS

29. Continuous cover forestry is an approach to management that fits well with current requirements to manage forests for multiple objectives. The silvicultural systems required to implement such an approach demand species that are adapted to sites and stands that are not subject to regular disturbances such as gales. There are many sites in Britain which do not fulfil these requirements and, given present knowledge, it would be folly to try to introduce such systems in these areas. However, where suitable conditions exist, we believe that a continuous cover approach will have an increasing role to play in the future management of British forests. The transition from the present reliance upon a single silvicultural system to a situation where a mix of systems are used in forest management requires the evaluation of the more promising systems and the development of the knowledge and skills essential for this type of change

to occur. Achieving this type of change will demand time and patience, a readiness to learn from the experience of others and a willingness to manage trials and demonstrations for the long term. Success will not be achieved overnight, but the potential benefits from combining a mixture of systems at a landscape scale should produce more diverse forests to meet the demands of multi-purpose forestry.

FURTHER INFORMATION

30. There is an active research programme into alternative silvicultural systems and further details can be obtained from the authors on request.

The Continuous Cover Forestry Group hold regular meetings and workshops on these themes. For more details please contact the Membership Secretary:

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Appendix 5 – Wildlife Guidance references

1. Forest operations & wildlife in Scottish forests; Guidance Note 31 (2006)
2. Forest operations & birds in Scottish forests; Guidance Note 32 (2006)
3. Forest operations & Red Squirrels; Guidance Note 33 (2006)
4. Forest operations & European protected species; Guidance Note 34
5. Bat Habitat use in Forestry Commission Guidance Note 35a
6. Forest operations & otters in Scotland, Forestry Commission Guidance Note 35c
7. Forest operations & wildcats in Scotland; Guidance Note 35d
8. Forest & Water Guidelines; 5th edition (2011)
9. Creating new native woodlands; Bulletin 112 (1994)
10. Forest operations & badger setts; Practice guide 9

Appendix 6 – Tolerance table

	Adjustment to Felling period	Adjustment to felling coupe boundaries	Timing of re-stocking	Change to species	Changes to roadlines	Designed open space	Windblow Clearance
FC Approval not normally required	Fell date can be moved within 5 year period and between phase 1 and phase 2 felling periods where separation or other constraints are met	Up to 10 % of coupe area	Normally up to 2 planting seasons after felling. Where hylobius levels are high up to four planting seasons after felling subject to the wider forest and habitat structure not being significantly compromised.	Change within species group e.g. conifers, broadleaves.		Increase by up to 5% of coupe area	
Approval by exchange of letters and map		Up to 15 % of coupe area	Between 2 and 5 planting seasons after felling subject to the wider forest and habitat structure not being significantly compromised.		Additional felling of trees not agreed in plan Departures of more than 60m in either direction from centre line of road.	Increase by up to 10%. Any reduction in open ground within coupe area.	Up to 5 ha

Approval by formal plan amendment may be required	Advanced felling (phase 3 or beyond) into current or 2 nd 5 year period	More than 15% of coupe area	More than 5 planting seasons after felling subject to the wider forest and habitat structure not being significantly compromised.	Change from specified native species. Change between species group.	As above depending on sensitivity.	More than 10% of coupe area. Colonisation of open areas agreed as critical.	More than 5 ha
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Appendix 7 – Priority Habitats – Location map

