Moray and Aberdeenshire Forest District

Glenfiddich Forest

Land Management Plan

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.

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PEFC PEFC/16-40-1002 Promoting Sustainable Fores Management www.pefc.org

Plan Reference No: 15

Plan Approval Date:

Plan Expiry Date:

FOREST ENTERPRISE - Application for Forest Design Plan Approvals in Scotland

Forest Enterprise - Property

Forest District:	Moray & Aberdeenshire FD
Woodland or property name:	Glenfiddach forest
Nearest town, village or locality:	Dufftown
OS Grid reference:	NJ240300

Areas for approval

	Conifer	Broadleaf
Clear felling	123ha	
Selective felling	18.5ha	
Restocking	128.3ha	10.0ha
New planting (complete appendix 4)	None	None

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

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

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

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 …… Signed ……

Forest District Manager Conservator

District Moray & Aberdeenshire Conservancy Grampian

Date …… **Date of Approval** ……

Date approval ends ……..

FOREST ENTERPRISE - Request for Approval of Thinnings

To: Conservator

Grampian Conservancy
Portsoy Road
Huntly
Aberdeenshire
AB54 4SJ

I apply for Authority to carry out a programme of thinnings within Glenfiddich forest in Moray & Aberdeenshire Forest District during the 10 years commencing from the date of approval.

I undertake to identify any statutory designations which apply to any of the land to be subject to thinning, and to obtain the necessary permissions from the appropriate statutory body before commencing work under any approval which is granted.

Signed…… Signed ……
Forest District Manager Conservator

District Moray & Aberdeenshire Conservancy Grampian

Date …… **Date of Approval**……

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Land Management Plan Summary

This plan is a review of Forestry Commission Scotland's management of Glenfiddich Forest located south of Dufftown. This plan area is made up of Morinsh, Blackwater and Glenfiddach forest blocks.

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

The plan area has a high priority for the production of quality timber.

The productive potential of the three forest blocks covers a wide spectrum, and this is reflected in the silvicultural options available for each block. All three blocks rise to over 500m but the local terrain provides some shelter.

The forests have a fairly low landscape impact with views from Ben Rinnes and roadside views from the B9009 & A941 being the most significant.

There are a number of dwellings, farms and tourism businesses close to the forest boundary in the northern part of Morinsh. Restructuring of these areas has the potential to enhance the positive impacts of forestry in terms of shelter, diversity and recreation for local residents and visitors.

Most of Morinsh forest is covered by the site boundary for the Battle of Glenlivet, although the focus for the fighting has been narrowed down to a much smaller area which is now open ground.

The River Spey SAC has impacts on the management of both Morinsh & Glenfiddich, while the Blackwater is a tributary of the Deveron which is also a significant salmon fishery. Restructuring work in Morinsh has opened up watercourses and the planting design at Glenfiddich & Blackwater has featured generous riparian buffer strips which provide valuable habitat linkages. The forests support a typical range of highland flora and fauna.

The small outcrop of serpentine rock in Blackwater supports an area of calaminarian grassland, which is the only representative of this vegetation type within the National Forest Estate.

1.0 Introduction

Refer to Map 1: Location.

1.1 Setting and context

The forests are located 5km south of Dufftown within Moray.

Morinsh lies just north of the Cairngorms National Park boundary and straddles the B9009. Access to the forest is via the B9009 at Bridge of Lagavaich (NJ 223 303).

Glenfiddich & Blackwater lie to the west of the A94, with Glenfiddich having road frontage and Blackwater being set back from the public road. Access to both blocks is via the A941 at Glacks of Balloch (NJ 353 343).

The forests are similar in nature to the other forests that occur in a sweep across the northern boundary of the Cairngorms. However they display a wider species diversity than many other locations with Scots pine (SP) & Sitka spruce (SS) being generally of equal significance.

Deer populations at Morinsh are moderate to low, although even low level selective browsing tends to favour SS over more palatable species. Glenfiddich & Blackwater have higher deer populations that are a major constraint to restocking options and may cause timber damage to crops of SS and Norway Spruce (NS) as the crop matures. Deer populations display significant seasonal variations.

The neighbouring forests to the south of Morinsh are managed by the Crown Estates and are of a similar type to Morinsh, although proportions of Lodgepole pine (LP) are higher in places.

Glenfiddich also has linkages with adjacent woodland, both productive conifer and native broadleaved, to the north, but other boundaries and the dominant adjacent land use over most of the surrounding area is intensive driven grouse moor with low levels of agricultural activity.

The forests have a value to the local communities in terms of informal access provision for a range of activities and offer a welcome environment for dog walkers to avoid any potential conflicts with stock farmers or sporting interests. There are also a number of tourist developments in close proximity that benefit from the recreational opportunities provided by the forest.

The River Spey SAC (Morinsh & Glenfiddich) and the Site of the Battle of Glenlivet (Morinsh) (Historic Scotland, Battlefield Inventory) are the main designations impacting on land management. The small area of calaminarian grassland close to the riparian zone at Blackwater, while not designated, is the only example of this vegetation type within the National Forest Estate.

Clearfell site on upper slopes of Morinsh.

Open riparian zone with dense mature heather at Glenfiddich.

Sitka spruce with generous riparian open ground, including calaminarian grassland (just beyond the open ridge), at Blackwater.

1.2 Land Management Objectives

The objectives for managing this land have been identified following a review of the following factors:

- the physical context and current crop;
- neighbouring land uses;
- a review of 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 (see appendix1).

The primary objective for the forest is timber production.

In common with all management across the National Forest Estate, the forest will be managed to meet the requirements of the UK forest standards. This will ensure that the plan area meets multiple land use objectives while utilising the intrinsic specific strengths of each block.

2.0 Analysis of previous plans

2.1 Aims of previous plans and achievements

The previous plan for Morinsh was approved in 2004 while Glenfiddich & Blackwater were approved in 2008.

Since the last plans were approved policy themes have been updated, and as a consequence previous objectives can't be directly compared with the current aspirations for the National Forest Estate.

The previous plan for Morinsh had the following objectives and ranking:

High:

- Producing wood and marketable timber
- Managing or regenerating forests or woodlands
- Protecting water quality and riparian habitats

Medium:

- Enhancing the landscape
- Maintaining and creating new wildlife habitats
- Conserving archaeological features

Low:

- Providing public recreation
- Providing sporting use
- Providing employment
- Native woodland restoration

The implementation of the previous plan has achieved many of these general objectives, particularly those ranked as "High" priority including:

- Production of significant volumes of high quality timber from both thinning's and clearfells.
- Enhancement of riparian zones.
- Increased open ground.
- An improvement of the roadside landscape (also a key riparian zone).
- An active thinning programme and LISS management with significant areas of seed tree fellings now completing the uniform selection cycle.

- Removal of significant areas of LP.
- Road upgrades to facilitate active management.
- The creation of open ground around the focus of the Glenlivet Battlefield site.

The previous plan for Glenfiddich & Blackwater had the following unranked objectives:

- Restoration of a proportion of Blackwater forest block to moorland habitat, promoting the priority habitats of upland heathland and upland birchwood.
- Increase of the naturalness of the woodland to improve its ecological value, in particular enhancing riparian zones and moving away from a near monoculture of Sitka spruce.
- Provide a framework for the ongoing sustainable management of the productive areas of the woodland, planting species suited to the site without the need for fertiliser to become established.
- Enhance and further integrate the woodland into the local landscape, keeping the requirements of black grouse in mind.
- Diversify the age structure of the forest.

The implementation of the previous plan has not achieved any of these objectives primarily due to the young age of most of the crop and the fact that the plan has only been running for a short number of years. Activity in the forest has however laid the framework for achieving some of the above objectives, these activities include:

- Clearfelling of mature stands and windblown areas.
- Road creation & upgrade.
- Thinning across sheltered areas of Glenfiddich.

2.2 How previous plan relates to today's objectives

Consequences for current revision:

The multi-purpose objectives of the original plans remain very relevant ten & six years on. The main changes relate to the external environment, with climate change and associated issues being major drivers. Increasing forest resilience to both disease and economic issues are now important considerations, and the value of productive forestry in mitigating climate change is generally accepted. With woodland expansion targets proving challenging, maintaining or increasing production from established forests is an important strategic economic and environmental consideration.

Enhancing water quality generally and specifically for the River Spey SAC remains a key objective. Added to this is the desire to increase the resilience of the forest to cope with extreme weather events, and the previous work carried out on riparian zones and expanding the use of LISS will help with achieving these objectives.

LISS will continue to play a key role in the silvicultural management at Morinsh, and SS is ideally suited to the uniform shelterwood approach which can deliver both a diverse stand habitat and productive timber with minimal ground disturbance. The dominance of SS in LISS is likely to increase progressively with time and where alternative conifer species are preferred, then more active management including managing forest floor light levels, selection of seed trees, selective respacing or restocking with a wider species range may be required.

In terms of species diversity the desire to expand the species range is compromised by the number of key species with an uncertain role in future forest restructuring. Ash, larch and pine are all important species on this site, but are all potentially very vulnerable to disease.

Increasing productivity in following rotations and maintaining a critical mass of productive forest area are important strategic considerations for the District, and the downstream industries dependent on this flow of timber.

Increasing economic diversity in forest industries, by marketing a wider range of forest products to a wider range of end users, increases resilience.

In terms of woodland expansion targets, the tendency to reduce productive forest area at each plan review needs to be addressed and balanced against the increasing realisation that productive forestry has a key role to play in terms of both economic and climate change imperatives. At Morinsh open ground has a fairly limited landscape role and as a consequence generous open ground provision is inappropriate here. Open ground at Morinsh is also likely to be fairly productive and would colonise with SS over time.

At Glenfiddich the proposal to scale back the SS area is still appropriate over parts of the forest, and enhancing the forest margins will provide ecological and landscape benefits that expands the area of Upland Heath Habitat. However significant areas of the forest are well suited to SS and a whole scale conversion to SP in the second rotation would lead to a significant decline in timber production from the forest. The riparian zones at Glenfiddich are characterized by rank heather in places, and this can offer nesting habitat for a range of moorland raptors; these habitats can be restricted in extent on managed grouse moors.

At Blackwater the site is challenging and the construction of a bridge to extend the road across the river is essential to bring the half of the forest south of the river into active management. Much of the SS is of good quality and is growing consistently, and a following rotation of SS will benefit from the preceding crop. A conversion of Blackwater to an area of open moorland and SP with Birch (BI) (as proposed under the previous plan) would lead to a significant loss of productive area for uncertain environmental gains. A more targeted approach in line with today's objectives would be to retain areas of productive SS and use the shelter provided by this species to establish areas of SP/BI on the upper margins and native broadleaves along the riparian zone. The small area of calaminarian grassland is not suitable for tree planting, and should be left unplanted, together with areas targeted for expanding this vegetation type by further quarrying. A transition zone of open SP/BI around the calaminarian grassland is appropriate. The top of the wood in the far south has very low productive capacity and could be converted to open ground with no loss of production. Again in the long term there may be scope here for promoting montane scrub. Deer fencing and control is essential for restructuring in this forest.

3.0 Background information

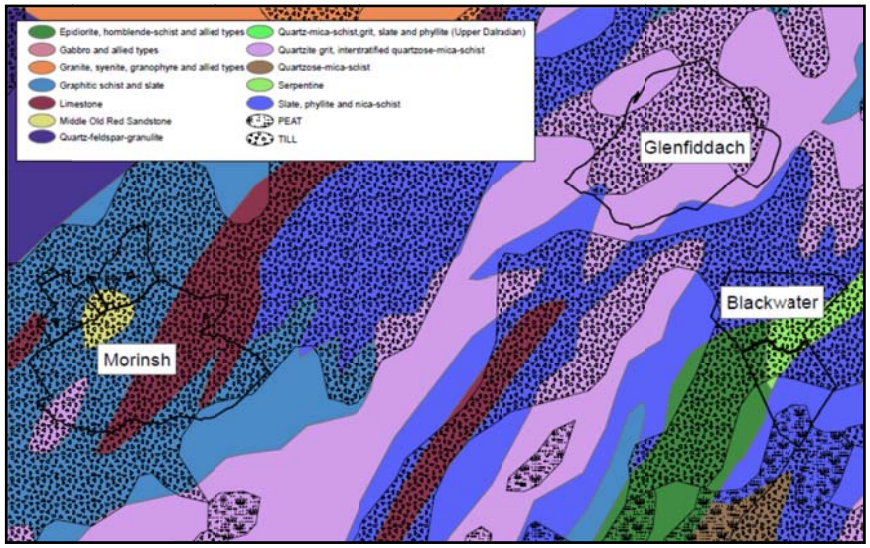
3.1 Physical site factors

Refer to Map 2: Key Features.

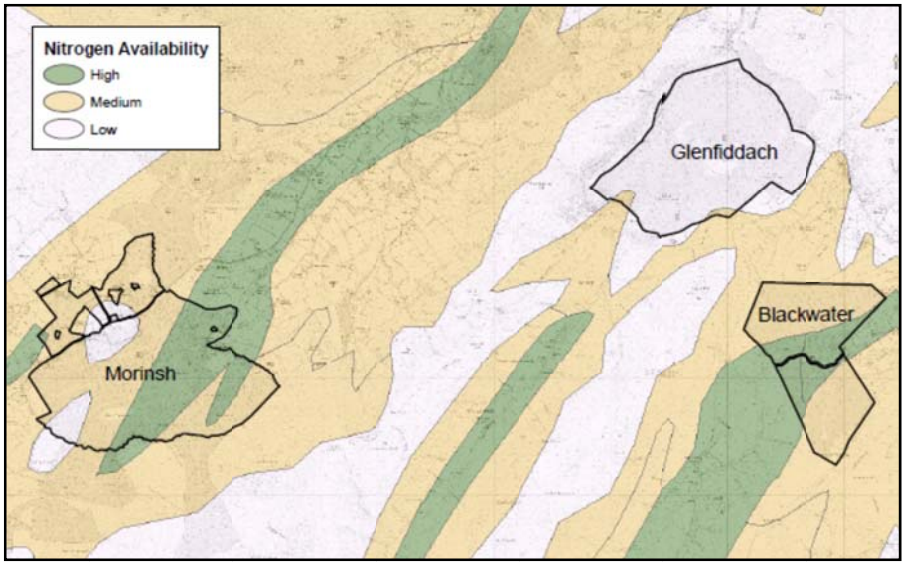
3.1.1 Geology, Soils and Landform

Morinsh: Geology & Soils – The solid geology underlying the site is composed mainly of schists, limestone and localized quartzite from the Mortlach Graphitic Schist Formation & the Corryhabbie Quartzite Formation (British Geological Survey, 1999b). These are overlain almost entirely with a drift deposit of Diamicton till (British Geological Survey, 1999). The geology gives rise to mainly Ironpan and Gleyed soils, with localized areas of Peats on poorer drained ground, and Podzols and Brown Earths on dryer knolls.

Glenfiddich & Blackwater: Geology & Soils – The solid geology underlying Glenfiddich and Blackwater is broadly metamorphic. Where it exists, the overlaying drift geology is glacial till (diamicton) with sand, gravel and silt along the river valley floors. Much of the higher ground is devoid of any drift geology. The soil type on the mid to upper slopes of both forest blocks is *Calluna* blanket bog. A mix of podzolic ironpan soils, peaty gleys, and surface- water gleys dominate the surrounding areas with some basic brown earths within the river valley floors.

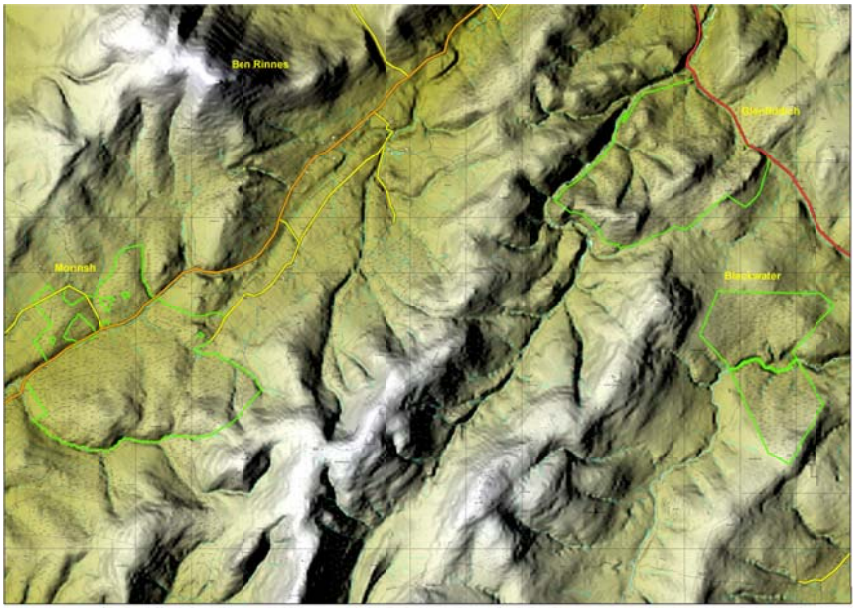


The combinations of solid and drift geology lead to soils with a varying amount of nitrogen availability which is one of the main constraints on tree growth. The map below shows the nitrogen availability across the plan area.



Morinsh Landform – The forest lies between an altitude of 250m & 510m. The landform is a gentle slope rising to open hills in the east, and incised with fairly gentle river valleys.

Glenfiddich & Blackwater Landform – Glenfiddich forest lies between an altitude of 260m & 520m, while Blackwater lies between 320m & 540m. Glenfiddich comprises a series of rounded hills with gently incised valleys rising from the valley of the River Fiddich. Blackwater comprises uniform gentle slopes rising from the River Blackwater.



Terrain map of the site with FES forests outline in green.

3.1.2 Water

The water environment within and adjacent to these forest blocks is of added significance due to the proximity of the River Spey SAC to Morinsh & Glenfiddich. Also the importance of a good water supply for the local whisky industry needs to be borne in mind.

The key designated species dependent on good water quality within the Spey SAC are Atlantic salmon, sea lamprey, freshwater pearl mussel & otter. Sea lamprey & freshwater pearl mussel are only present within the main body of the Spey, so these are not directly affected by the plan area. However all these species are reliant on the water quality within the entire catchment. Atlantic salmon in the form of spawning adults, fry & parr are all likely to be present in the main watercourses flowing in the proximity of all the forest blocks, and could be affected by forestry operations. Otters are also likely to be present across the catchment, although in the forest area the presence is likely to be of a transient nature.
Due to the high conservation value of the Spey SAC there will be specific operations in certain locations that could pose a higher risk to the condition of the SAC. Therefore during the planning of such operations any additional measures needed to afford appropriate protection to the SAC will be identified and their implementation will be assured.

While the Deveron (into which the Blackwater flows) is not designated, it shares many of the species that occur in the Spey and is a highly valued salmon fishery.

The forest, particularly where there are significant areas of LISS, can contribute significantly to reducing the sediment load of waterbodies compared with open agricultural land.

The initial forest establishment at Glenfiddich & Blackwater created generous areas of open ground, and this benefited the freshwater ecology of the area.

The upper catchments for both systems create spate rivers with the capacity to rise very quickly. Climate change and associated extreme weather events may increase the potential for erosion and silt movement and deposition. Riparian woodland may help to mitigate these impacts.

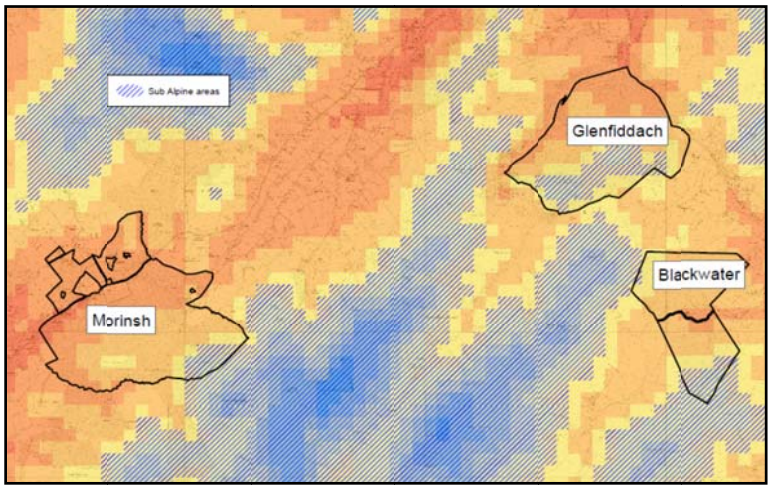
The Blackwater river with scattered native broadleaves and generous open ground.

It is becoming clear that work within forest blocks can have a positive impact on natural flood management if the right measures are taken in the right places. The SEPA website identifies a Potentially Vulnerable Area around Rothes and Aberlour which is down stream of the LMP area. However the report for this area does not highlight natural flood management as a priority action that will have a major impact on the flooding in this area. The Flood Risk Management Strategy for the River Spey catchment states that "It is … unlikely that actions taken to reduce rainfall runoff will have a significant impact on flood risk within these Potentially Vulnerable Areas." Also "All of the Potentially Vulnerable Areas show significant potential for floodplain storage, particularly those directly along the River Spey. It is likely that floodplain storage could improve flood risk in the Potentially Vulnerable Areas and should be considered further." However all the areas highlighted on the SEPA interactive map that are suitable for this measure are out with the LMP area.

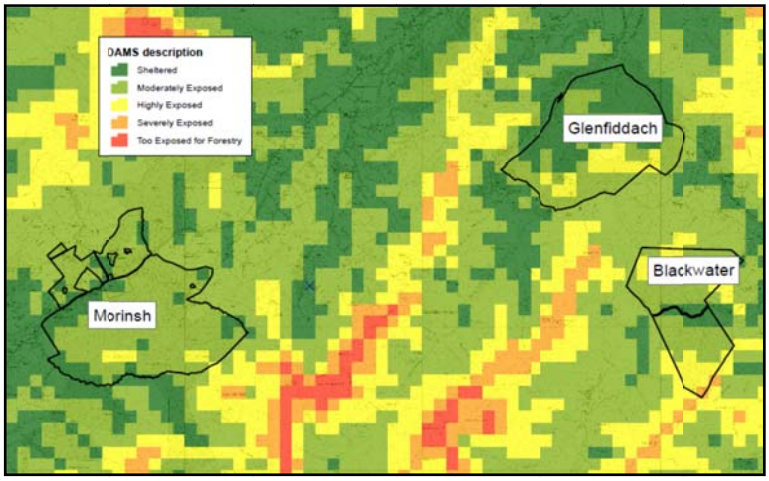
3.1.3 Climate

The climate data for the plan area is obtained from the Ecological Site Classification system (ESC).
The results of interrogating this system give the following data:

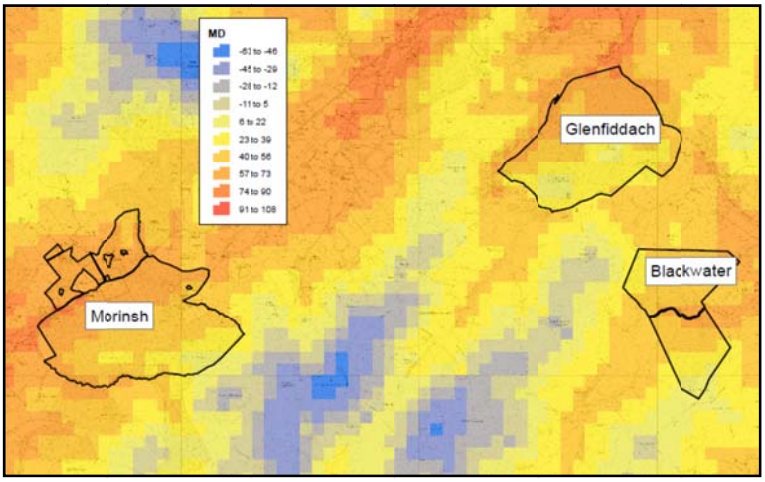
Forest	AT5	DAMS	MD
Morinsh	678 - 992	10 - 17	10 - 76
Glenfiddach	692 - 986	9 - 18	15 - 79
Blackwater	658 - 916	11 - 20	8 - 63



AT5 is the accumulated total of the day-degrees above the growth threshold temperature of 5º, which provides a convenient measure of summer warmth. The results for AT5 place these blocks in the "cool" to "sub alpine" zones.



DAMS is the Detailed Aspect Method of Scoring. This represents the amount of physically damaging wind that forest stands experience in the year.
The range of DAMS is from 3 to 36 and windiness is the most likely limiting factor to tree growth at higher elevations in Britain. The site description based on the DAMS score ranged from "sheltered" to "highly exposed".



MD is the Moisture Deficit for the area. Moisture deficit reflects the balance between potential evaporation and rainfall and therefore emphasizes the dryness of the growing season (rather than the wetness of the winter or whole year). These results place the blocks in the "wet" zone.

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

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

3.2 Biodiversity and environmental designations

The River Spey SAC is the most significant conservation designation on site.

The Burn of Tervie (Morinsh) and River Fiddich (Glenfiddich) are classified under the Water Framework Directive (WFD) as being of moderate status. In both these cases the cause is related to fish passage issues that are not relevant to forestry. Following the UK forest standards in relation to Forests & Water will ensure that any infrastructure affecting watercourses doesn't impede fish passage.

The calaminarian grassland on site is the only example of this vegetation type within the National Forest Estate. Normal quarrying operations on the fringes of the existing exposure can help to expand the area of this ecosystem.

Species Action Framework (SAF) species likely to be resident in these blocks include red squirrel, wildcat, black grouse & capercaillie. Three of these species (red squirrel, black grouse & capercaillie) are also key forest species identified in the Scottish Forestry Strategy. Juniper is also identified as a key forest species, and the significance of this has increased as the scale and impact of *Phytophthora austrocedrae* has become clearer.

Morinsh has a diverse forest structure, although excessive fragmentation of forest types and habitat in the core forest area may be counterproductive for woodland specialists. Areas of SP and NS managed under LISS have the potential to contribute to biodiversity and "naturalness". SS managed under uniform selection has the potential to create valuable ecological niches. This process is at an early stage in Morinsh, however, seed trees retained on adjacent Crown Estates forests are effectively specimen trees that make a large contribution to both

landscape and ecology. The seed trees offer a range of habitats for birds including raptors and provide an ecological continuum lacking in clearfell sites. The regeneration is also structurally diverse, although as the canopy closes in the pole stage, the ground flora will decline.

Clearfells on the upper slopes of Morinsh create transient open ground which is used by a number of moorland raptors.

Glenfiddich & Blackwater have less potential for LISS in this rotation, although with an active thinning programme, areas holding up as a stable crop could be converted. The traditional dense stands of SS & LP have a fairly low biodiversity value, however the wide areas of riparian and hilltop open ground set within the forest create habitats suitable for a range of species including nesting moorland raptors in old heather. Upland heathland (dry heath, heather dominated with lichens) is common across Glenfiddich, and remains vigorous even amongst the failed crop adjacent to the open ground. There are also limited areas of wet heath, mainly on checked crops within Blackwater.

Areas of mixed SS & SP have generally evolved into pure SS crops with the occasional remnant SP. Thinning or clearfell operations could retain viable SP with the long term aim of increasing the SP component across the site, and utilizing the shelter provided by the SS element to achieve this. Even a sporadic cover of scattered SP would provide both an environmental benefit and a potential seed source for a future gradual expansion of SP.

Pockets of acid grassland, and wet flushes occur sporadically across all sites. With the exception of the calaminarian grassland the other priority habitats are widely represented across the surrounding landscape.

Seed trees retained under Uniform Shelterwood System at Morinsh

3.3 The existing forest

3.3.1 Age structure, species and yield class

i. Age Structure

Morinsh displays a very wide age class range across the forest area. Glenfiddich & Blackwater were planted between 1987 & 1990. An older area of woodland on the north side of Glenfiddich has been felled. Prior to the woodland creation initiated by the Forestry Commission, the ground was open grouse moor/sheep grazing, although historically the area carried a diverse forest cover and was a noted deer forest.

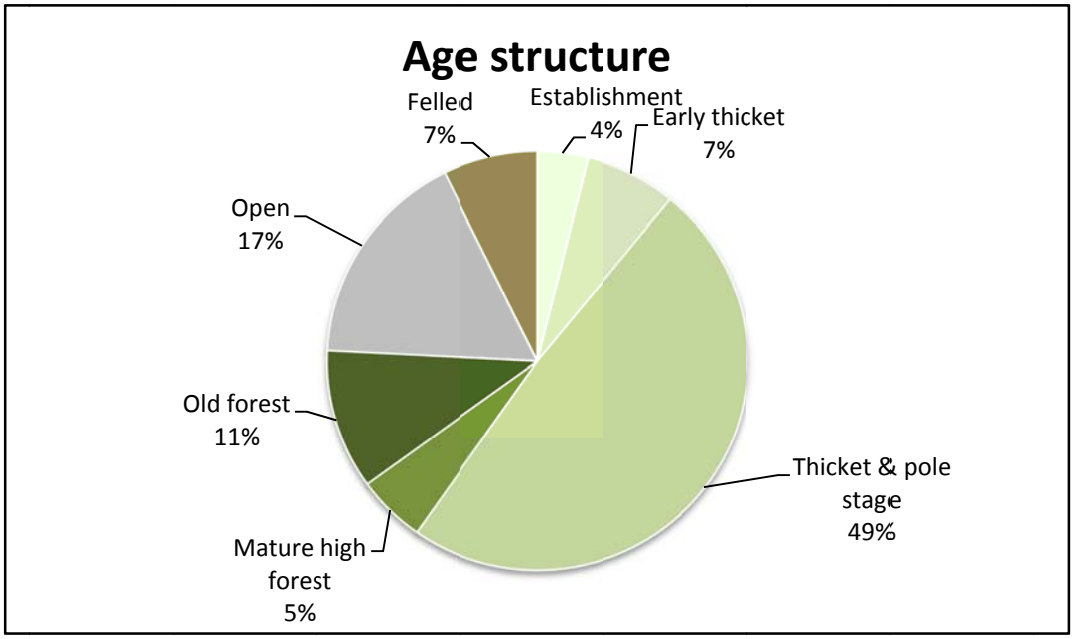
Past management at Morinsh focused on traditional thinning and clearfelling, which in practice was not dissimilar to a LISS uniform shelterwood approach.

Fellings in Glenfiddich & Blackwater have been very limited in extent due to the young age of most of the crop. Increasing age class diversity within these blocks will be achieved by clearfells, restocking and the retention of targeted areas of SP. The retention of individual viable SP across the site where these occur will increase age class diversity.

Increasing age class diversity increases the forest resilience to disease, storms and climatic changes.

Table showing successional stage of current forest

Ages of Trees (years)	Successional Stage	Area (ha)	Percentage
0 -10	Establishment	79	4%
11 – 20	Early Thicket	142	7%
21 – 40	Thicket & Pole Stage	991	49%
41 – 60	Mature High Forest	107	5%
61+	Old Forest	219	11%
	Open space	343	17%
	Felled	148	7%



ii. Species

Refer to Map 3: Existing species.

Morinsh is dominated by SS with SP and LP as secondary species. The smaller elements of L & NS make a high landscape contribution along the roadside margin and add vital diversity to the forest. There are significant areas of open ground throughout the forest.

All of the above species have shown good growth generally, with the SS & SP having good form and timber quality. On the sheltered slopes both NS & SS have shown themselves able to reach good heights and the option of retaining areas of these trees as seed trees in a uniform shelterwood system is a viable option.

Regeneration of SS across the site is particularly vigorous, even under pure stands of thinned SP. This offers the potential for a very effective SS uniform shelterwood system. However the need to maintain species diversity means that active management will be required in areas to avoid the rapid progression to a SS monoculture that could occur if a laissez-faire LISS is used.

Mixed broadleaves including oak have grown well along the lower riparian corridor, and there are good stands of ash and aspen on pockets of better ground. Productive broadleaves may well have some role in Morinsh although growth rates of most species will be fairly low.

Glenfiddich & Blackwater are dominated by SS, with LP and SP as secondary species. Small areas of larch and other conifers occur on the sheltered slopes. Around a quarter of the area is currently open ground. There are small areas of mixed broadleaves along the lower margins and riparian areas, over most of the site scattered birch and rowan are the dominant broadleaved species.

Areas of all species around the upper margins of the forest have shown very poor growth due to exposure and soil nutrition. Most of the SS areas away from the tops are showing reasonable growth and stem quality is good. Fertiliser applications facilitated establishment and helped the crop to overcome heather check.

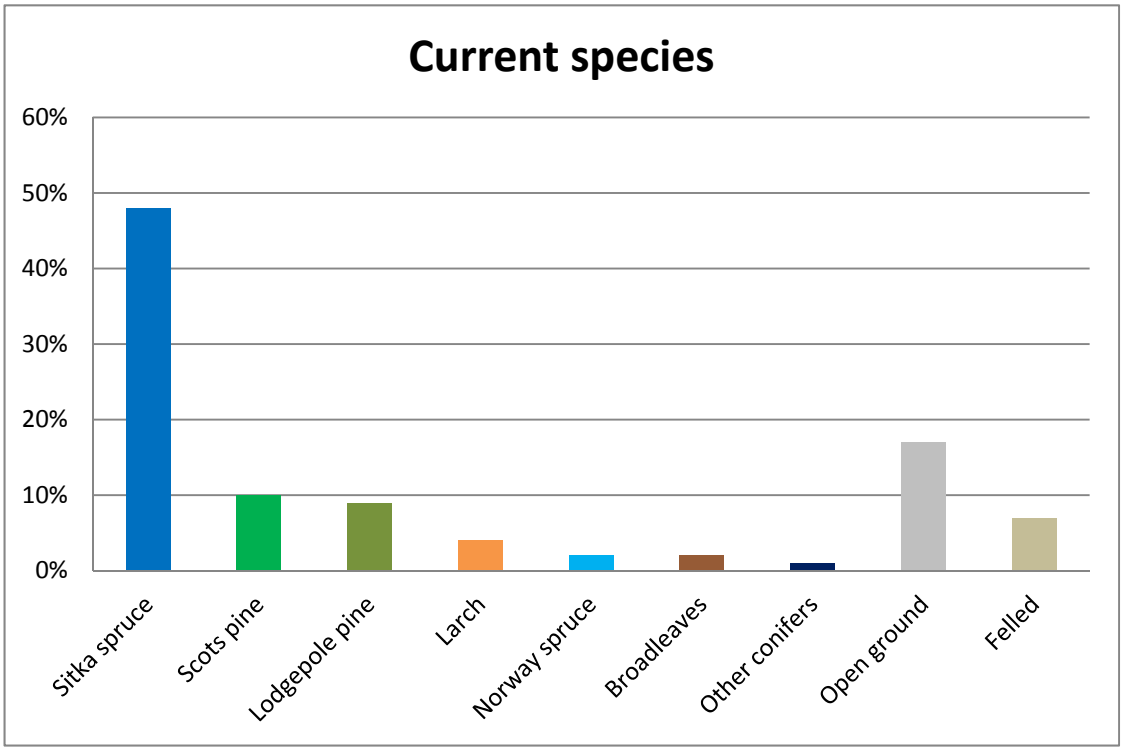
The previous plan stressed the desirability of restocking with species that could be established without artificial fertiliser. In the second rotation site amelioration from the previous crop and site preparation may contribute to a more vigorous crop that produces valuable timber with very light or no fertiliser applications. Traditional mixtures could also provide a proven route to sustainable establishment on these difficult areas.

A LISS approach would further facilitate the conservation of accumulated site nutrition, but exposure is a major limiting factor across much of Glenfiddich & Blackwater, particularly where tree growth is marginal. As a consequence clearfells are likely to remain the main silvicultural method. Both LP and SP have shown much slower growth across many areas.

Mixtures of SS/SP have generally developed into SS monocultures, and this has resulted in good growth within the SS element. There are areas (NW corner of Blackwater) where slow growth of both species has resulted in an element of SP surviving, and occasional viable SP survive scattered through most of these mixed areas.

Table showing stocking of current forest

Species	Current area (ha)	%
Sitka spruce	965	48
Scots pine	205	10
Lodgepole pine	181	9
Larch	81	4
Norway spruce	31	2
Broadleaves	30	2
Other conifers	15	1
Open ground	343	17
Felled	148	7

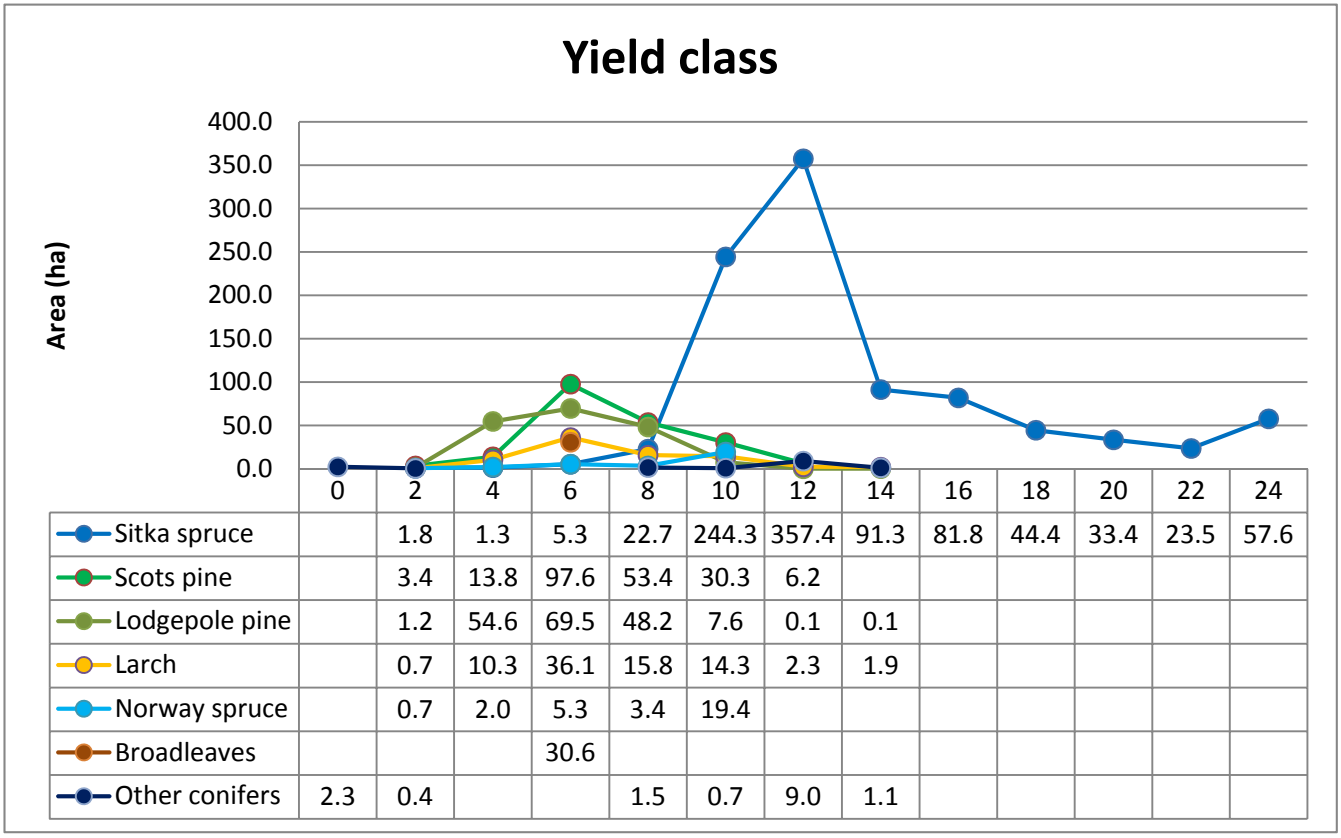


iii. Yield Class

At Morinsh, SS yield classes range from 2 to 24, although there are very limited areas of severely checked SS. SP has shown good growth with yield classes of around 4 and up to 12 in places.

At Glenfiddich & Blackwater, SS yield classes range from 2 to 20. However areas on the upper margins contain significant areas of severely checked SS (as well as other checked conifers). SP has shown moderate growth with yield classes of around 4 and up to 6 in places.

Second rotation and subsequent crops on the whole forest area may show better growth as the sites organic matter, nutrient status and rooting depth builds progressively. Crop residue management would affect this buildup of soil fertility and LISS offers advantages in terms of retaining nutrients on site.



	0	2	4	6	8	10	12	14	16	18	20	22	24
Sitka spruce		1.8	1.3	5.3	22.7	244.3	357.4	91.3	81.8	44.4	33.4	23.5	57.6
Scots pine		3.4	13.8	97.6	53.4	30.3	6.2						
Lodgepole pine		1.2	54.6	69.5	48.2	7.6	0.1	0.1					
Larch		0.7	10.3	36.1	15.8	14.3	2.3	1.9					
Norway spruce		0.7	2.0	5.3	3.4	19.4							
Broadleaves				30.6									
Other conifers	2.3	0.4			1.5	0.7	9.0	1.1					

3.3.2 Access

Access throughout the forest for management and harvesting is good, with a well-constructed road network and good public road links.

The exception to this is the south section of Blackwater which requires the construction of a bridge and a section of new road to bring this significant area under management. While the upper part of this isolated section is unproductive and could be converted to open ground with little loss of productive capacity, the lower portion of the section holds significant areas of good quality SS, and could do so in subsequent rotations. The cost of bridging and roading would therefore be spread over the current and future rotations. All future roading is planned for after 2024 so is out with this plan period and therefore not included in this plan.

Good stone is available on site at Morinsh, Glenfiddich & Blackwater and this reduces the carbon footprint of roading operations by greatly reducing haulage distances. The quarry at Blackwater is adjacent to the serpentine rock outcrop which supports the rare calaminarian grassland. Further exposing outcrops of this material adjacent to the established grassland should lead to an expansion of this small and vulnerable ecosystem; a rare example of economic activity expanding a scarce ecosystem.

The well drained soils that dominate most areas, and the proactive thinning management also facilitate access within the stands.

Slope is generally not a constraint except for limited areas associated with river valleys.

3.3.3 LISS potential

LISS management systems 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.

At Morinsh there is scope for LISS across some of the lower part of the forest utilizing the current crop. On the higher slopes exposure and the desire to replace LP areas limits the application of LISS. Uniform shelterwood is the most suitable silviculture for most of the LISS area given the current stand structure and key species. However LISS needs to adapt to some extent to the way the stand develops naturally (for example windblow) and may need to be opportunistic.

The uniform shelterwood approach can meet environmental and landscape objectives while providing economically viable quantities of uniform timber that can be effectively marketed. Areas of the core part of the forest currently display a fragmentary appearance out of scale with landscape. Larger cohesive areas of LISS can help to improve the internal and external landscape, particularly where final seed trees can be retained to create specimens.

The possible impact of LISS in narrowing species diversity needs to be monitored, and action taken to address any drift towards a SS monoculture in targeted areas. This action may involve managing light levels, selection of seed trees, selective respacing and thinning and restocking with desired species.

At Glenfiddich & Blackwater there is limited scope for LISS in the current rotation, and exposure is likely to limit its application in subsequent rotations. Areas near the public road in Glenfiddich have some potential in subsequent rotations, and this could have a positive impact on important landscape views from the road.

Mixed aged SS regeneration under a SP stand at Morinsh.

One of the critical factors for the success of LISS is protection for browsing and grazing pressure. Roe deer, hares and rabbits are all present on site, but the level of public use and active control keep damage to acceptable low levels.

3.3.4 Current and potential markets

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

Material	End product	Percentage
Small round wood	Chip board, Orientated strand board (OSB), Paper, fencing	40
Firewood/wood fuel	Posts & rails	5
Short log	Pallets & slats	25
Log	Construction	30

The proposed early felling of LP areas for DNB control will reduce these figures for the forest as a whole as this programme is implemented.

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

3.4 Landscape and land use

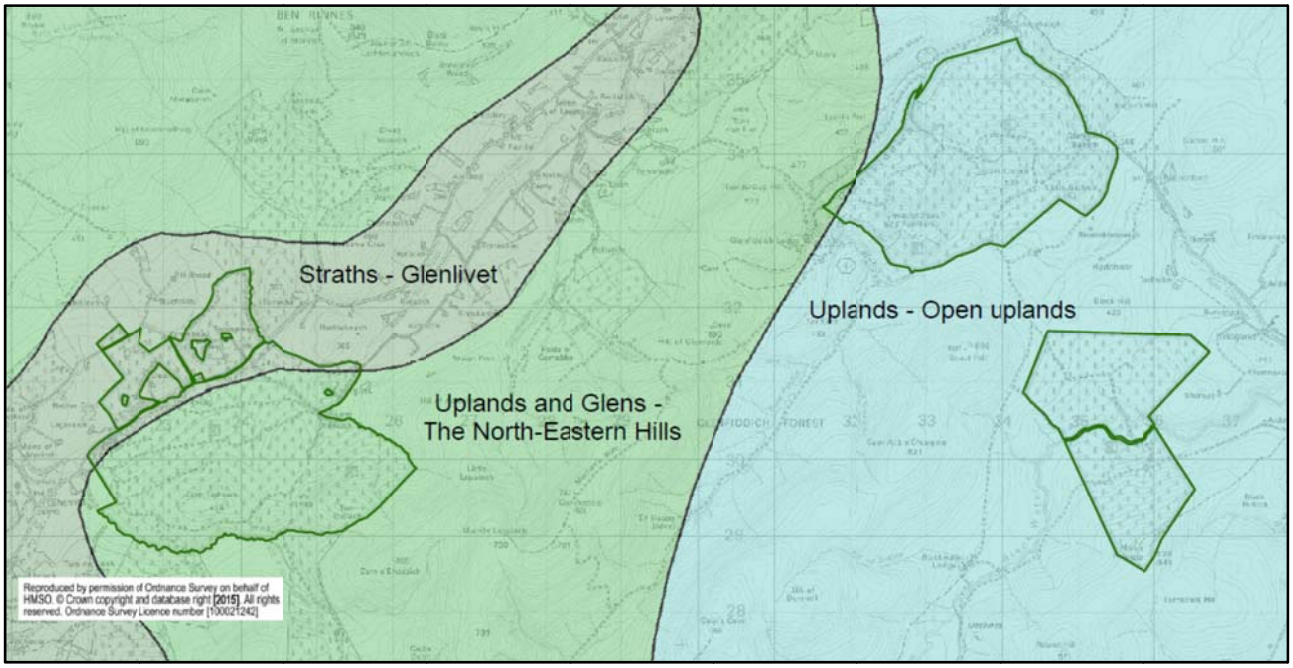
3.4.1 Landscape character and value

Morinsh lies within an Area of Great Landscape Value (Moray District Council 2003).

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

These assessments are considered during all plan reviews and where appropriate efforts are made to follow the guidance given.

The plan area is covered by Scottish Natural Heritage Landscape Character Assessments No101, Moray & Nairn, and No75, Cairngorms, produced in by the Turnbull Jeffrey Partnership in 1998 and 1996 respectively.



The Landscape Character Assessment (LCA) designates Morinsh forest as lying on the boundary of the Glenlivet strath and The North-Eastern Hills. The LCA describes the Glenlivet as dominated by 'larger-scale regular sized fields…. interspersed with small-scale geometric coniferous plantations to create a strong and simple pattern'. In contrast the mixed deciduous woodlands along the many burns create 'a more irregular and naturalistic pattern'. The landscape character of the straths again contrasts strongly with the 'simple shapes and vegetation cover' of the surrounding hills.

The north-eastern hill range is an extensive area with hills characterized by their relatively low and rounded summits, gentle slopes and long smooth interlocking spurs. The upper slopes are predominately covered by heather moorland. The lower slopes along the valley floors are covered with rough grass and moss. Coniferous plantations are generally small-scale and many form geometric blocks.

The Scottish Natural Heritage Landscape Character Assessment places Glenfiddich & Blackwater within the 'Open Upland' landscape character area. The LCA categorizes this area as being 'comprised of a series of rounded hills with summits of a generally similar height, broad smooth ridges and expansive gently undulating plateau…. Heather moor and blanket bog accentuate the smooth roundness of the landform, whilst patchy and stunted pockets of native pine and tracts of muir burning, create a distinctive pattern of colour and texture on some of the open slopes'.

Glenfiddich has an interesting landform that increases the attraction of internal views. The generous open ground along the riparian areas emphasizes the landform and gives longer distance views of the forest and beyond.

Blackwater has a simpler terrain with even slopes dropping gently to the Blackwater river. The area around the river is more interesting and here the wide open ground enclosed by the woodland provides shelter, with no views out of the forest, with the river running through it.

Glenfiddich has some visual impact from Ben Rinnes, but the distance reduces impacts. Most of the forest area has a very low visual impact with limited views from the A941. Heading south along the road from Dufftown the forest fits well with the landscape with good linkages to surrounding woodland and a pleasant mixed roadside environment.

Morinsh from close to the Speyside Way

Glenfiddich from the A941 to the north.

3.4.2 Visibility

The landscape impacts are most striking from Ben Rinnes (Morinsh & Glen Fiddich), Coryhabbie Hill (Morinsh), the Speyside Way (Morinsh) and the B9009 travelling south towards Morinsh.

Glenfiddich and Blackwater are visible from the A941, but with most of the forest having a very low visibility.

The immediate roadside landscape is important in Morinsh & Glenfiddich, and these roadside landscapes are generally of good quality. The young crop on the north side of the road in Morinsh offers a less inspiring landscape, but the eye tends to be drawn to the lower ground to the north which is more visually interesting.

Blackwater from the A941 to the east.

3.4.3 Neighbouring land use

The surrounding land use is dominated by driven grouse moors with little agricultural activity. Glenlivet to the NW of Morinsh in contrast remains a vibrant agricultural area with farming being a key part of the local culture and economy. However the interaction between forestry and farming even at Morinsh is limited to the traditional issues of fencing and stock control. It should be noted that the shelter provided by forestry generally plays an important role in stock farming across the Glenlivet area. While some driven grouse moors also have deer stalking enterprises, many regard all mammal species as either grouse predators or tick hosts that are not welcome on grouse moors. As forestry supports a wide range of mammals including foxes and deer, then the potential for forestry objectives to conflict with sporting objectives are high. However grouse moors that control deer with a target population of zero deer can complement deer control within

forest areas. Intensive blue hare control can also benefit forestry restocking and establishment, although the ecological impacts of this on balance outweigh the transitory benefits.

Tourism businesses are linked to neighbouring land use businesses and the free recreational resource delivered by the forest area complements these businesses.

There are no renewable projects currently planned for the forest areas although proposals are being advanced for neighbouring areas.

Surrounding land use viewed from Glenfiddich showing grouse moor, forestry & rough grazing.

3.4.4 Environmental Protection

Water quality and the River Spey SAC will be protected by following the UKFS. As well as operational management, riparian buffer zones of open ground and scattered broadleaves offer an environment that maximizes the benefits of forestry and minimizes adverse impacts. An Appropriate Assessment has been carried out for the proposals within this plan (see appendix 4).

The use of LISS and minimal ground preparation further reduces adverse impacts on watercourses and the designated species of conservation interest in the SAC.

The area of calaminarian grassland can be protected by leaving this area unplanted and reducing deer pressure. Expansion of this limited area can be achieved by targeted quarrying operations to expose similar rock outcrops adjacent to the established grassland.

Calaminarian grassland on outcrop of Serpentine rock in Blackwater.

3.5 Social factors

3.5.1 Recreation

The area is lightly used, however the forest provides a valuable resource for local tourism businesses in a very cost effective manner.

The landscape of the forests contributes to the overall landscape diversity that visitors across the area experience, and Ben Rinnes in particular is a very busy destination, with Morinsh having a significant impact on views out to the distant snow-capped Cairngorms from the summit.

At Glenfiddich the lack of formal through links to the core path network and the absence of circular routes limits the attraction of the forest.

All the woods offer a low key recreational experience of value to local residents. Dog walkers in particular benefit from the welcoming forest environment that avoids any conflicts with game or farming interests.

The roadside margin at Morinsh creates an interesting and welcoming landscape for recreational users.

3.5.2 Community

Community involvement is low because of the low recreational impact of the woodland and the sparsely populated nature of the surrounding land.

3.5.3 Heritage

There are a number of unscheduled ancient monuments across the forests, most of which relate to previous agricultural activity.

The most significant feature within the area is the site of the Battle of Glenlivet in Morinsh which is on the HS Battlefields Inventory.

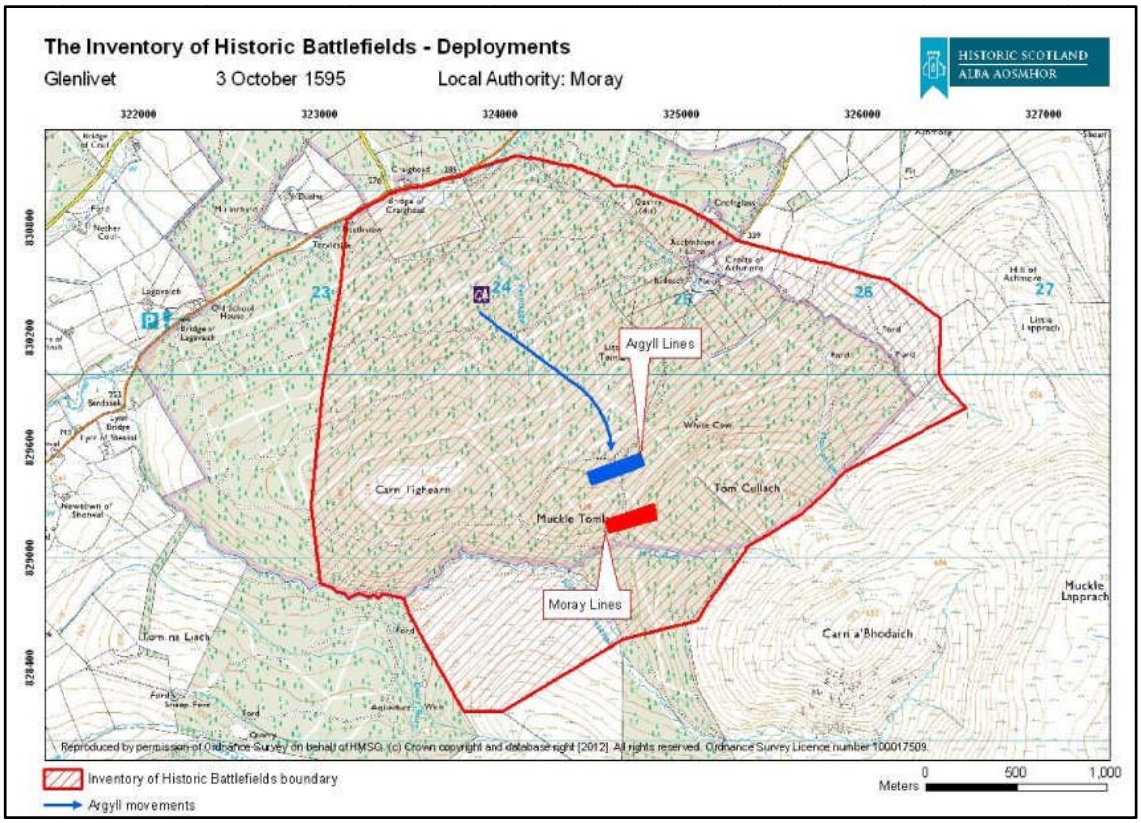
The main site of the battle has been identified as taking place in a fairly confined area between the hills of Tom Culloch and Muckle Tomlair, and open ground was created around this site to enhance the visitor experience. In the longer term retaining this area as open ground may prove difficult as SS regeneration is vigorous across the site.

While the core area of the battle site may or may not be accurate, the nature of battles is that they rapidly depart from the plan and spread across wide areas, particularly in this case during the rout of the larger Royalist forces. While no artefacts have been found, they are likely to occur across the forest if the initial start of the conflict has been correctly identified.

Given that the forest is in situ and that significant ground disturbance has already taken place during past establishment operations, then the options for the preservation of an untouched site are limited, however the artefacts in battles of this nature can be less vulnerable to damage than physical structures such as building foundations. Interpretation of battle sites often depends on the location of artefacts to piece together the flow of events, so operations that move soil significantly away from its point of origin should be avoided. Harvesting operations are unlikely to have significant impacts; however restocking featuring deep cultivation may have adverse impacts.

LISS can help to minimize site disturbance and can also play a role in increasing the aesthetics of the battlefield site.

The open ground created around the core area of the battlefield plays a role in people’s aesthetic enjoyment of the site, however wider deforestation to aid interpretation is of limited benefit given that little is known of subsequent actions past the initial encounter and rout in relation to physical locations.



Deployment of forces at the Battle of Glenlivet.

Open ground retained in the proximity of the core Battlefield area.

3.6 Pathogens and diseases

The upsurge in the disease threat over the last decade has a range of causes linked to globalization and associated climate change. Disease risk management has always been an integral part of forestry management; however the pace of recent events has created a great deal of uncertainty. While specific outcomes for species are hard to predict, the general principles for creating resilient forests are well known, and these include such actions as promoting diversity in all its forms.

Given the dynamic nature of the disease threat it is proposed to focus on creating a more diverse forest during the plan period. Control of SS dominance in LISS systems, monitoring and thinning to promote tree vigour and adjust microclimate are key considerations.

The major disease threat to pine in the plan area is currently Dothistroma needle blight (DNB) (*Dothistroma septosporum*) which can kill young trees very quickly and mature trees over time. Even where the disease fails to kill the trees, it can have very adverse impacts on timber production and vigour over a number of years. The importance of pine to the forest from a recreational, ecological and productive perspective is significant.

Since the late 1990s the incidence of the disease has increased dramatically in Britain, particularly on Corsican pine. More recently the disease has caused significant damage and death to Lodgepole Pine and Scots Pine.

Reasons for the increase in incidence of this disease are unclear but could be due to increased rainfall in spring and summer coupled with a trend towards warmer springs, optimizing conditions for spore dispersal and infection. Such conditions may become more prevalent in Britain over the next 20 years if current trends in climate change continue.

3.7 Statutory requirements and key external policies

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

Biodiversity

- Conservation (Natural Habitats) Amendment (Scotland) Regulations 2007
- Nature Conservation (Scotland) Act 2004
- Wildlife and Natural Environment (Scotland) Act 2011
- Land Reform (Scotland) Act 2003
- The Water Environment and Water Services (Scotland) Act 2003
- Water Environment (Controlled Activities)(Scotland) Regulations 2011
- UK Woodland Assurance Standard 2008
- UK Forestry Standard 2012
- Open habitats Strategy 2013
- Action for Juniper 2007
- Joint Agency Statement on Deer Fencing 2010

Climate Change

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

Historic Environment

- Ancient Monuments and Archaeological Areas Act 1979
- Planning (Listed Buildings and Conservation Areas)(Scotland) Act 1997
- Treasure Trove Scotland
- UNESCO World Heritage Convention
- European Convention on the Protection of the Archaeological Heritage Valetta 1992
- Managing Change in the Historic Environment: Battlefields 2011

Forests & People

- Control of Substances Hazardous to Health Regulations 2002
- Employers Liability (Compulsory Insurance) Act 1969
- Equality Act 2010
- Gangmasters (Licensing) Act 2004
- Health and Safety at Work Act 1974
- Management of Health and Safety at Work Regulations 1999
- Occupiers' Liability (Scotland) Act 1960
- Provision and Use of Work Equipment Regulations 1998
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995
- The Highways Act 1980

Soils

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

4.0 Analysis and Concept

Refer to Maps 4a & 4b: Analysis and concept.

Theme	Issue	Analysis	Concept
Climate change	Adapting to climate change	LISS and an increase in structural and species diversity are proposed to meet this challenge.	Continue LISS management. Advance heavy early thinning of younger pine areas.
	Adapting to climate change	The quality of the soils in the area means that a wide range of species are suitable in Morinsh with narrower options available in Glenfiddich & Blackwater.	Select a wide range of suitable species for planting to maximize the species diversity in the blocks, with the proviso of selecting species that perform well on the sites.
	Flood & catchment management	This is a key consideration given the nature of the catchment and the significance of the SAC.	Phased removal of heavy shading conifers and the expansion of open ground and broadleaves.
	Carbon sequestration	Crop and site characteristics make it possible to produce timber to help sequester carbon.	Manage suitable areas to increase the quality and quantity of timber products that can sequester carbon.
Timber	Timber supply	Current crop age and condition allows a planned programme of harvesting to be undertaken.	Manage suitable areas to increase the quality and quantity of timber products.

	Timber quality	The ground condition in this plan area allows thinning to be undertaken across most of the area.	Undertake thinning to improve timber quality wherever possible.
	Timber quality	Select timber species suited to the site and able to meet the multiple demands of this site, including timber production.	Use ESC together with the practical experience of what grows well on this site. Accept regeneration of species that prosper on the site and deliver economic benefits.

5.0 Forest Design Plan Proposals

5.1 Management

Refer to Map 5: Management.

Thinning

Wherever possible the district will continue to maximize 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;
- Thinning is unlikely to improve poorly stocked or poor quality crops.

An active thinning programme is essential for the LISS planned for areas of Morinsh to be successful.

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.'

Low impact silvicultural system (LISS)

'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 places. 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 have been written up for each area managed under

LISS and are included in appendix 3. Each prescription will be included in the site management plan before any operation commences.

Restocking by natural regeneration will be the aim in these areas.

Clearfell

The main silvicultural system employed in British forestry is 'patch' clear-felling followed by planting or occasionally natural regeneration.

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

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

The main areas proposed for clearfelling will be the LP areas as part of the DNB management programme, and the more exposed crops on the upper slopes of Morinsh. Glenfiddich and Blackwater will be managed almost entirely under a clearfell system.

The restocking of these clearfells will be with a wide range of site appropriate species, both conifer and broadleaved, with the aim of creating woodlands with diverse species and structures. This should ensure that they are more robust to face the future and the potential
issues caused by future climate change and pathogens.

5.2 Future Habitats and Species

Refer to Map 7: Future habitats and management.

Restocking & Regeneration

The choice of species for restocking by planting in this plan has been guided by the 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 LP stands. 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 characteristics and microclimate. Site specific planting plans following a restock site survey will guide the final species choice.

Typically LISS seeks to perpetuate tree cover by natural regeneration which is aided and manipulated by managing the seed sources available and light levels on the forest floor. However enrichment planting can also play a key role in LISS systems. In the case of Morinsh this specifically relates to increasing species diversity and reducing the dominance of SS.

All areas identified for restocking by natural regeneration have been recorded and programmed for inspect on a five yearly basis. At each inspection an assessment will be made to establish if the natural regeneration is or is likely to achieve the objectives for the site. If it is decided that the objectives are not being met then replanting with an appropriate species will be undertaken. If natural regeneration is occurring but not yet at the required density then the option to review the site in a further five years may be taken. If after two such inspections, that is ten years following felling, it is felt appropriate to wait a further period for natural regeneration then a discussion and agreement will be reached with the Conservancy woodland officer. Enrichment planting may be used to increase species diversity, target key recreational/visual areas, or to ensure the rapid establishment of ground cover.

Selective respacing will also be an essential tool to ensure wider species diversity, crop health and stem quality.

In LISS there is an element of having to make do with what the site delivers in terms of regeneration and using adaptive management to achieve the desired outcomes. In the short term a wide range of regenerating species should be accepted in all areas including NBL, NS, L & SP.

As mentioned above, enrichment planting will be considered to increase species diversity and to increase the density of the ground cover as required to create a more uniform crop that facilitates management and marketing.

In common with the majority of the Forest Enterprise Scotland estate, most restocking in the plan area has traditionally taken place within two years of sites being clearfelled. However this has left them vulnerable to *Hylobius* attack. See section 5.9 Pathogens for details of how this threat will be dealt with.

Non Commercial Areas

Areas not considered appropriate for commercial management will include areas designated as long term retentions and minimum intervention (see map 5 – Management). These areas total just over 30ha or 1.5% of the total plan area.

5.3 Species table

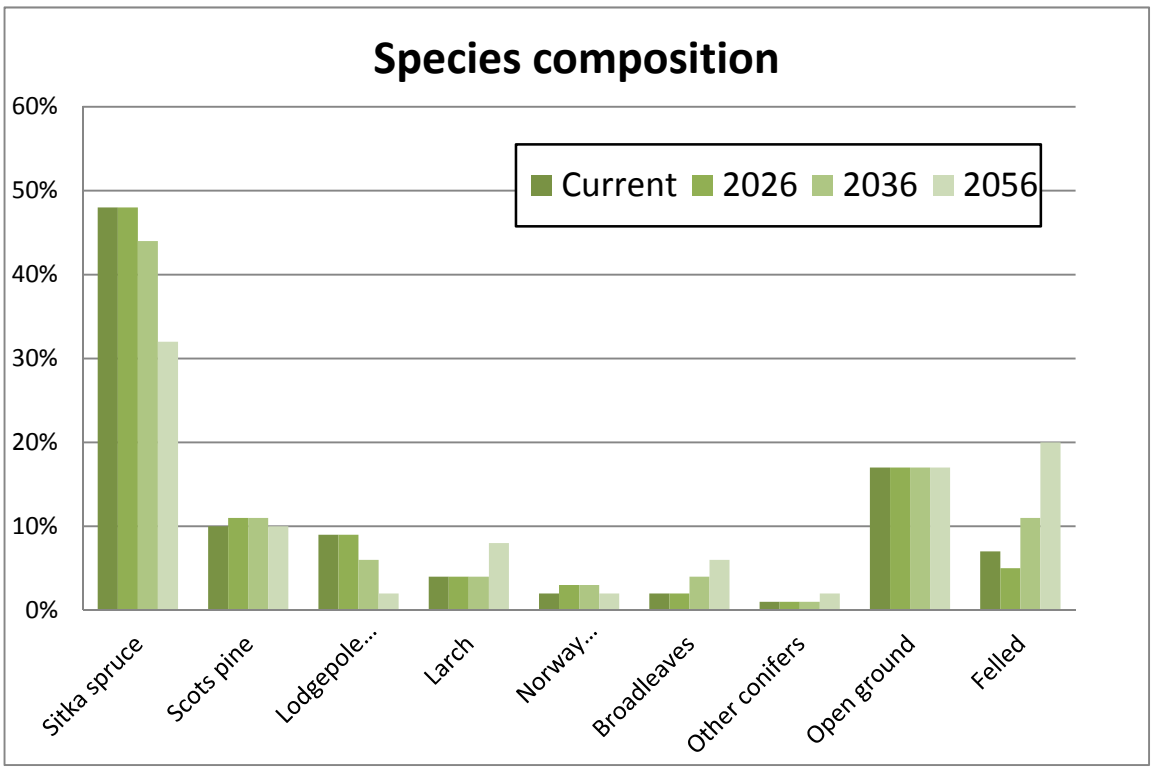
The management proposals in this plan are aimed at continuing to produce a crop of quality timber. However within this objective efforts have been made to diversify the species mix where the timing of felling coupes and the associated site conditions allow. The current proposals will see a reduction in the percentage of SS and LP. SP, NS and other conifers remain stable while there is an attempt to increase the area of larch and broadleaves (silver birch). The increase in larch will depend on the spread of Phytophthora ramorum as currently FES have a three year moratorium on the planting of larch species and unless this is removed then no further larch planting can be undertaken and other species will need to be identified for the restocking of areas currently planned for larch.

The planting of broadleaves is targeted at the better site conditions where they have a chance to fulfill their productive potential. The aim within Moray & Aberdeenshire FD is to plant all broadleaves so they have the potential to be productive in the future. For this to be realized the site conditions need to be favourable, access for future management needs to be good and the size of the coupes need to be such that fencing is a cost effective method of protection from browsing. Therefore we need to wait for sites that fit these criteria to be felled and then be available for restocking.

In this plan area the most suitable sites are not due to be felled within this plan period so the planned increase in broadleaves will not take place within the next ten years.

Species	Current distribution 2016	Projected distribution 2026	Projected distribution 2036	Projected distribution 2056
Sitka spruce	48%	48%	44%	32%
Scots pine	10%	11%	11%	10%
Lodgepole pine	9%	9%	6%	2%
Larch	4%	4%	4%	8%
Norway spruce	2%	3%	3%	2%
Broadleaves	2%	2%	4%	6%
Other conifers	1%	1%	1%	2%
Open ground	17%	17%	17%	17%*
Felled	7%	5%	11%	20%

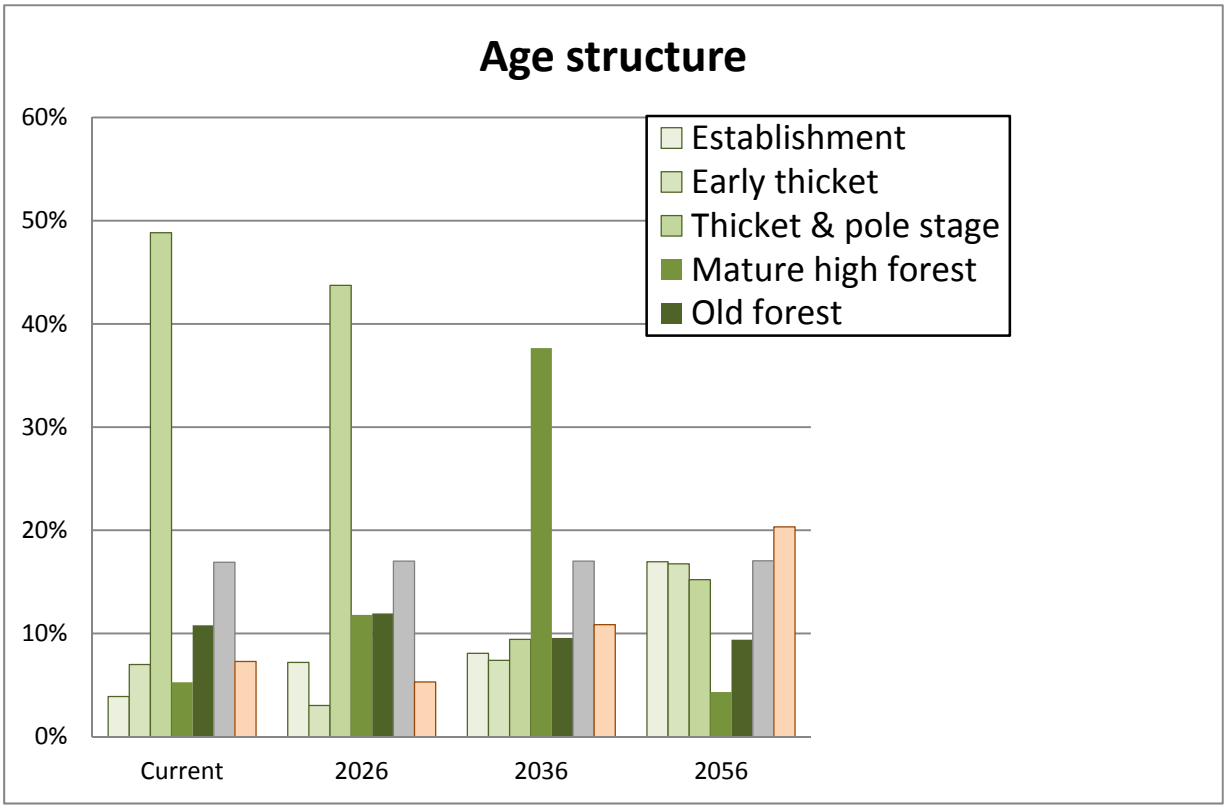
*The area of open ground is likely to reduce over time as SS naturally colonises further areas. However this will be closely monitored at plan reviews and revisions to ensure it does not fall below 10%.



5.4 Age structure

As most of the plan area, especially Glenfiddich and Blackwater, was planted over a short period and is still in its first rotation there is a significant spike in the current age structure. This gradually moves through the age classes but gradually reduces as we restructure the blocks.

Age of Trees (years)	Successional Stage	Current distribution	Projected distribution 2026	Projected distribution 2036	Projected distribution 2056
0 -10	Establishment	4%	7%	8%	17%
11 – 20	Early Thicket	7%	3%	7%	17%
21 – 40	Thicket & Pole Stage	49%	44%	9%	15%
41 – 60	Mature High Forest	5%	12%	38%	4%
61+	Old Forest	11%	12%	10%	9%
	Open space	17%	17%	17%	17%
	Felled	7%	5%	11%	20%



5.6 Management of open land

The open habitats which will require monitoring to ensure they deliver the required objectives. Non-desirable species, such as non-native conifer regeneration, may require removal.

Areas designated as permanent open space are limited within Morinsh to riparian zones and key parts of the SE margin. LISS with areas of high thinning intensity can deliver many of the benefits derived from open ground habitat. Removal of SS regeneration may be required to maintain open space on the core battlefield area, close to other archaeology and where it impacts adversely on riparian zones or the proposed juniper areas.

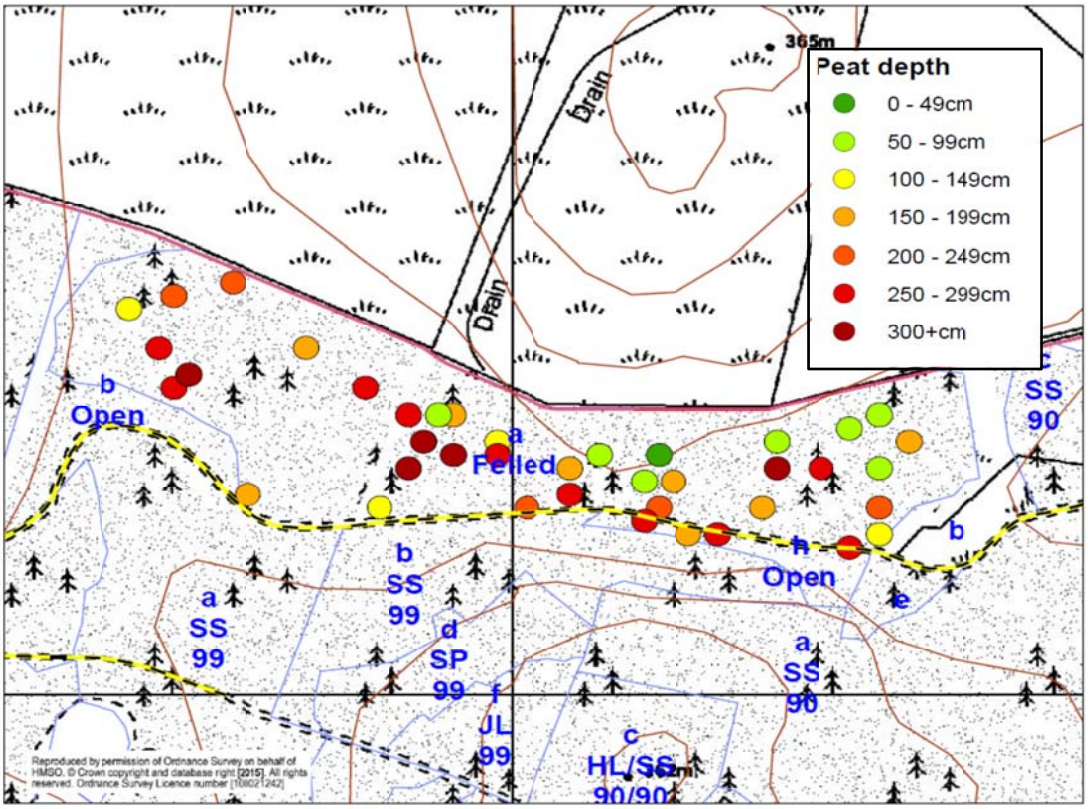
There is an area in the NW part of Morinsh known as Restocknach that has recently been felled and will be maintained as open ground due to its depth of peat and the poor growth rates of the crop that was felled. (See map 7 – Future habitats and species).

The area for bog restoration is approx. 6.9ha. The previous crop on the site was Norway spruce that was felled in early 2015. The timber crop was poor with areas of check and the harvesting operation encountered peaty and waterlogged ground conditions.

The area shows as deep peat on the British Geological Survey 50K peatland GIS layer. Additionally the FC soil maps show it as upland sphagnum bog (10b).

In the light of this the environment team carried out a peat probing survey to ascertain the actual peat depth on the site. Over the 40 points probed the peat depth varied from just under 50cm to in excess of 3m (see map below for peat depth distribution). Only one point was below 50cm. There are several drainage ditches on the site which contain plenty of water and sphagnum is much in evidence across the site.

Interrogation of ESC suggests that the growth potential for SS on the site is YC4, well below the YC8 required by the FCS Peat Restoration guidelines for commercial conifer restocking to be a suitable option. Below YC8 the ground preparation, fertilizing and poor growth rate would mean the site was a source of carbon rather than a carbon sink.



The guidelines also suggest that upland sphagnum bogs (10b) are edaphically unsuited for woodland and so are more suitable for restoring or converting to peat edge woodland.

In view of the sites unsuitability for commercial planting we intend to use it as the basis for a small scale peatland restoration project. This will include the blocking of drains with piling and/or peat dams and allowing native trees to naturally regenerate to create peat edge woodland. Further detailed consultations with the FES Open Habitat ecologist and SEPA will be under taken before restoration work is actually undertaken on site to ensure the best possible advice is utilized.

There are significant areas of open ground within the Glenfiddich and Blackwater blocks that will be maintained. These are mostly associated with riparian zones and hill tops.

5.7 Deer management

All deer management will be carried out in accordance with OGB 5 - Deer management and the Scottish Governments strategy "Scotland's Wild Deer - a National Approach" and under the auspices of the Code of Practice on Deer Management. The strategy and code takes recognition of the fact that wild deer are an asset, an integral part of Scotland's biodiversity and provide healthy food and recreation opportunities. The challenge of managing wild deer originates in a need to balance the environmental, economic and deer welfare objectives of the Scottish nation with the objectives of landowners for forestry, agriculture, sporting and other forms of land use.

The principal legislation governing the management of deer in Scotland is the Deer (Scotland) Act 1996

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.
At this level experience shows limited adverse impacts on commercial tree crops and wider habitats.

All deer culling will be carried out in an exemplary and humane way. We will collaborate with relevant organisations and neighbours to make sure that there are integrated deer management plans which seek to recognize the interests of all parties.

We will take opportunities to optimize income from venison and sporting where this does not conflict with our primary objective of maintaining deer impacts at an acceptable level in line with Quality Meat Scotland accreditation in the form of the Scottish Quality Wild Venison (SQWV) Assurance Scheme.

We will take all practical steps to slow down the expansion of deer species into areas where they are not currently present.

Currently deer management in Glenfiddich is contracted out. The deer cull targets for the plan area are set annually by the Deer Management Officer utilizing available data on damage assessments and deer densities provided by external contractor (StrathCauldh) and previous cull figures.

5.8 Access

As outlined in section 3.3.2 the south section of Blackwater which requires the construction of a bridge and a section of new road to bring this significant area under management. While the upper part of this isolated section is unproductive and could be converted to open ground with little loss of productive capacity, the lower portion of the section holds significant areas of good quality SS, and could do so in subsequent rotations. The cost of bridging and roading would therefore be spread over the current and future rotations. All future roading is planned for after 2024 so is out with this plan period and therefore not included in this plan.

5.9 Pathogens

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.

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 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 the infected crop will allow us to prioritise the harvesting of such areas.
The following scale and categorisation has been developed by Forest Research.

Needle retention (years)	Defoliation (%)	Mortality %		
		<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

This has led to the following action plan for dealing with Dothistroma Needle Blight 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 land management plan will be required as specified in the tolerance table for felling such areas;
- reassess badly affected blocks and consider if a full review of the land management plan is required;
- planting programs will need to be amended to include replacement species suitable for the site.

Specific measures within this plan area to reduce the impact of DNB include heavy thinning and the removal of Lodgepole Pine (which is particularly vulnerable). Even with these measures the volume production of pine stands may be uneconomic, although these actions may maintain a pine element for amenity purposes. The costs associated with these measures include lower volume production, lower timber quality and higher costs.

The process of species substitution as pine vigour declines may happen naturally in many of the pine stands managed as LISS, as the light levels increase on the forest floor (either from the disease impact or thinning management) alternative species will regenerate, in particular SS & BI. The pine regeneration may tend to be eliminated early on as the mature trees infect them, and the microclimate associated with dense regeneration could facilitate this process.

5.10 Critical Success Factors

- Continue with an active thinning programme to improve the timber quality of the final crop and encourage the conditions for successful natural regeneration in LISS areas.

- Use adaptive management of the LISS regeneration to achieve greater species diversity. Monitor the prevalence of SS in LISS recruitment and take necessary measures to ensure wider species diversity where this is a stand objective.

- Expand species and structural diversity to increase forest resilience, while retaining SS as a major crop element.

- Diversify SS stand structure and age class.

Appendix 1 – Consultation record

Statutory Consultee	Date contacted	Date response received	Issue raised	Forest District Response
Moray Council	12/05/14 by email 15/02/16 by email	None None to date		
Moray Council – Ian Douglas. Access Manager	12/05/14 by email 15/02/16 by email	None 29/02/16 by email	Public access low level and informal on forest roads so plan is acceptable. Connections to core paths and circular routes in Glenfiddich should be considered. New bridge in Blackwater supported for increased public access.	Recreation within the Glenfiddich forest is a very low priority with no formal infrastructure beyond the car park in Morinsh. There is no intention to increase this during the life of this plan as resources are to be concentrated at higher priority sites where they will have a positive impact for more people.
Moray Council – Speyside Way Ranger	12/05/14 by email 15/02/16 by email	None None to date		

Aberdeenshire council archaeology – Caroline Palmer	12/05/14 by email	20/05/14 by email	A number of archaeological sites recorded on the SMR within each of these forest areas, though not all will necessarily raise management issues.	
	15/02/16 by email	15/02/16 by email	There are a number of undesignated monuments within forest areas. Not shown on maps with the consultation. Sites to be managed in line with the UK Forests and Historic Environment guidelines.	Non-scheduled sites are not shown on maps due to number in some blocks and because they do not affect the way the block is managed. Only issues that will have a significant impact on the management of the block are mapped. Management according to UKFS guidelines not highlighted as these are standard practice and not above minimum standards that apply to all operations. Listed in section 3.7 of plan.

Scottish Natural Heritage – Jennifer Heatley	12/05/14 by email	28/05/14 by email	Fully consider the impacts of forest management on the River Spey SAC, and apply a high level of protection during forest operations. Two burns within Morinsh are designated and other burns feed into the SAC. At Glenfiddich burns feed into the River Fiddich that is part of the SAC and runs just to the north of the forest. The designated species of interest for the SAC are salmon, sea lamprey, freshwater pearl mussel & otter. Only salmon and otter are directly affected by activities within the forest area, but general water quality issues could affect the other interests that occur within the main body of the Spey. Riparian areas with a mix of wetland, grassland & trees will benefit the freshwater ecology and invertebrate resource. Local deer numbers are likely to be high, and the deer management plan will need to consider this factor.	Follow guidance in relation to SACs. Follow UKFS Forests & Water Guidelines. Follow guidance in relation to EPS. Maintain and enhance riparian buffers by inclusion of NBL and phased removal of dense conifer coveralong watercourses. Use of LISS may improve water quality.

Cont. Scottish Natural Heritage – Jennifer Heatley	15/02/16 by email	09/03/16 by email	Operations in certain locations can pose a higher risk to SAC and it's important during planning of such operations that any additional measures needed to afford protection are identified and their implementation assured.	Additional text added to section 3.1.2 to highlight importance of appropriate pre operation planning.
			Morinsh Forest is within Strathavon Wildcat Priority Area. Glenfiddich and Blackwater are just out with Strathbogie WPA. Contact Emma Rawling, Scottish Wildcat Action project.	Email sent to Emma Rawling but no response received to date.
			Natural flood management techniques within these forests investigated?	SEPA website checked. Potentially vulnerable area around Rothes and Aberlour. Text added to section 3.1.2.

Scottish Environment Protection Agency – Planning service	12/05/14 by email	16/06/14 by email	Maintain or improve the status of water bodies within the Forest. The Burn of Tervie (Morinsh) has a moderate status, while the River Fiddich (Glenfiddich) has poor status. Both of these ratings are derived from problems with fish passage that are not related to forestry operations or management. Identify and manage INNS. Comply with the Water Environment Controlled Activities (Scotland) Regulations as amended.	All operations will be undertaken in accordance with the UKFS "Forests and Water" guidelines. Measures to diversify the riparian margins have been undertaken, and the process will continue. We remain open to discussions with neighbours or the Fisheries Board on measures to improve fish passage. No INNS are identified on site.

Cont. Scottish Environment Protection Agency – Planning service	15/02/16 by email	09/03/16 by email	The plan should include a commitment to consider the impact of the proposed works on flood risk to downstream receptors. The proposed bridge in Blackwater should be designed to convey the 1 in 200 year flow plus an appropriate allowance for freeboard and there should be no increase in ground levels adjacent to the watercourse on the approach tracks.	All operations are planned according to UKFS guidelines and the assessment of any flood risks downstream form part of the planning process. When the detailed planning of the bridge is started the engineers will contact SEPA for advice on the appropriate design of the bridge.

Royal Society for the Protection of Birds – Karen Cunningham	12/05/14 by email 15/02/16 by email	04/07/14 by email None to date	Blackwater & Glenfiddich are identified as being of high priority for management of Black Grouse in the 2010 report "Black Grouse & the National Forest Estate in NE Scotland". Any actions taken in the forest could complement mitigation planned in relation to the adjacent Dorenell windfarm. Operations to increase diversity and maintain open ground across the site are recommended. Forest Margins and OG/NBL areas are particularly beneficial. This will also benefit other species. A range of bird species have been recorded in Morinsh including goshawk, crossbill, black grouse and capercaillie. Open riparian areas and the encouragement of a natural berry rich flora under SP stands will encourage a range of bird species. Deadwood retentions will benefit woodpeckers and crested tits.	The proposals for Glenfiddich & Blackwater will enhance open ground habitats, and in particular the longer term aim of restoring the natural ecocline (NBL in riparian areas, SP/BI on the mid slope and montane scrub on the upper forest margin) will provide an ideal habitat for Black Grouse and a range of other upland species. Deer fencing is essential to achieving this aim, and a reduction in deer impacts will increase the feed availability from bilberries and other flora. Fence marking will be used as appropriate. The proposals for LISS and diversifying age class and forest structure will enhance the habitat of a wide range of species. Forest margins will be diversified. Deadwood will be retained.

Dufftown & District Community Council – Jim Nicol	12/05/14 by email 15/02/16 by email	None None to date		
Glenlivet & Inveravon Community Association	12/05/14 by email 15/02/16 by email	None None to date		
Spey Fishery Board Research Office. Sally Worsdall	12/05/14 by email 15/02/16 by email	None None to date		
The Crown Estate Glenlivet. Mike Libera. Forest Manager.	12/05/14 by email 15/02/16 by email	13/05/2014 None to date	Adjacent FDP proposal provided. No issues raised	Liaise with Glenlivet Estate on access and forestry issues as these arise.
Bluefolds Highland Holiday Cottages. Steve Oliver	12/05/14 by email 15/02/16 by email	21/05/2014 16/02/16	The forest at Morinsh offers an appreciated opportunity for local recreation, particularly for visitors to the holiday cottages. The opportunity to walk dogs free from any potential conflicts is appreciated. Request to be kept informed as proposals develop. Look through plan and maps and there are no issues of concern.	Maintain existing level of access provision. Improve the internal landscape and increase diversity. Keep Mr Oliver informed as plan develops.
Ballindalloch Estate. Tim Atkinson. Factor	12/05/14 by email 15/02/16 by email	None None to date		

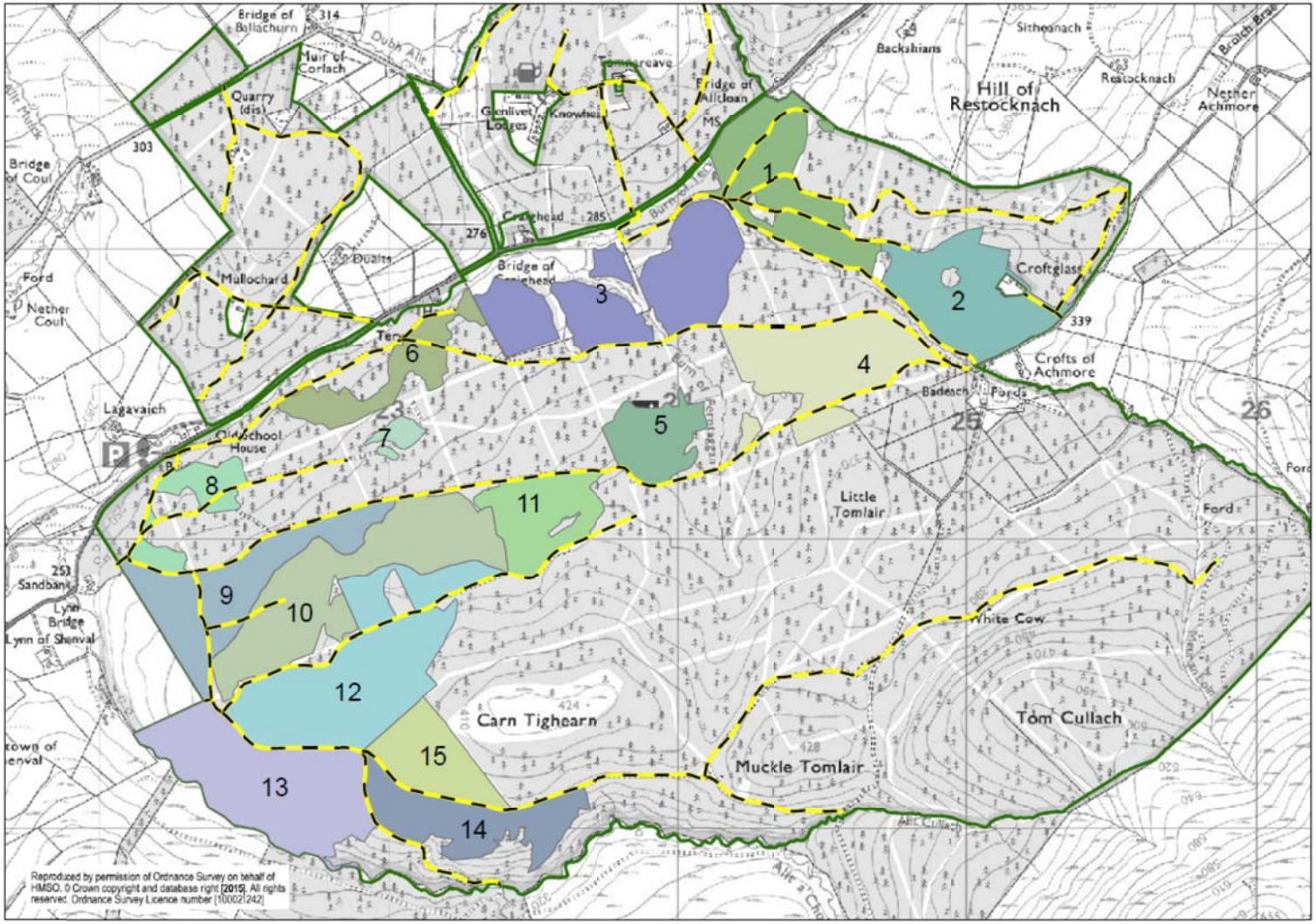
Cabrach & Glenfiddich Estate	12/05/14 by email 15/02/16 by email	None None to date		
Craighead. Gary Lock	12/05/14 by email 15/02/16 by email	None None to date		
Tomnareave Steading. Occupier	12/05/14 by email 15/02/16 by email	None None to date		
Knowhead & Glenlivet Lodges. Occupier	12/05/14 by email 15/02/16 by email	None None to date		
Dualts Farm. Occupier.	12/05/14 by email 15/02/16 by email	None None to date		
Heath View. Occupier	12/05/14 by email 15/02/16 by email	None None to date		

Appendix 2 – Tolerance table

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

Appendix 3 – LISS coupe prescriptions

- The size and number of groups in the group selection is indicative only. The actual size will depend on the conditions found in each coupe.
- The shape of the groups in the group selection coupes do not have to be circular. Oval shaped with the long axis orientated to receive the most light is preferred.
- The location of the felling areas in the group selection coupes will be located to reflect the conditions in each coupe. Felling areas will be located to:
    - expand existing groups,
    - start new groups taking advantage of existing natural regeneration,
    - start new groups in areas where there is currently no natural regeneration.


Bridge of Ballachurn
Muir of Corlach
Quarry (dis)
Dubh Allt
Glenlivet Lodges
Knowhead
Tomnacreave
Bridge of Allt-loan
Backshians
Sitheonach
Hill of Restocknach
Restocknach
Nether Achmore
Broich Brae
Bridge of Coul
Ford
Nether Coul
Mullochard
Duaths
Croftglass
Crofts of Achmore
Badesch
Fords
Lagavaich
Old School House
Little Tomlair
Ford
Sandbank
Lynn Bridge
Lynn of Shenval
White Cow
Carn Tighearn
Muckle Tomlair
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Coupe ref. (See map above)		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 16.6ha	Timber production. Use natural regeneration for restocking.	Simple structure. SS 50%, MC 30%, MB 20%	Age – 10 years. Trans period – 70 years. Return period – 7 years.	None – too young. (Dec 2015)	None at moment. (Dec 2015)	First thin at or before 12m top height.	
2	Uniform shelterwood 15.9ha	Timber production. Use natural regeneration for restocking.	Simple structure. SS 70%, MC 20%, MB 10%	Age – 16 to 25 years. Trans period – 40 years. Return time – 7 years.	None – too young. (Aug 2015)	None at moment. (Aug 2015)	First thin at or before 12m top height.	Some mature SP within coupe to be worked along with younger crops.
3	Uniform shelterwood 22.4ha	Timber production. Use natural regeneration for restocking.	Simple structure. SS 90%, MB 10%	Age – 26 years. Trans period – 50 years. Return time – 7 years.	None – too young. (Dec 2015)	None at moment. (Dec 2015)	First thin at or before 12m top height.	

4	Clearfell with seed trees 18.4ha	Timber production. Use natural regeneration for restocking.	Simple structure. SS 80%, SP 20%	Age – 69 to 74 years. Trans period – 2 years.	Good regen where adequate light.	Seed trees retained in areas with little regen at risk of windblow.	Fell & restock by nat regen.	Ready for seed tree felling currently. Retain seed trees where insufficient regen currently present.
5	Uniform shelterwood 7.4ha	Timber production. Use natural regeneration for restocking.	Simple structure. SS 80%, MC 20%	Age – 73 years. Trans period – 20 years.	Little regen under SP (Dec 2015)	Ground vegetation (Dec 2015)	Selective thin	
6	Uniform shelterwood 8.4ha	Timber production. Use natural regeneration for restocking.	Simple structure. SS 70%, MC 30%	Age – 18 years. Trans period – 37 years. Return time – 7 years.	None – too young. (Dec 2015)	None at moment. (Dec 2015)	First thin at or before 12m top height.	
7	Uniform shelterwood 1.5ha	Timber production. Use natural regeneration for restocking.	Simple structure. HL 50%, SP 50%	Age – 78 years. Trans period – 12 years. Return time – 7 years.			Fell & restock by nat regen.	

8	Uniform shelterwood 5.4ha	Timber production. Use natural regeneration for restocking.	Simple structure. SP 50%, NS 50%	Age – 20 years. Trans period – 35 years. Return time – 7 years.	None – too young. (Dec 2015)	None at moment. (Dec 2015)	First thin at or before 12m top height.	First thin required as soon as practical.
9	Irregular shelterwood 17.0ha	Timber production. Use natural regeneration for restocking.	Complex structure. SS 80%, MC 20%	Age – 78 years with understorey. Trans period – 12 years. Return time – 7 years.	SS regen present. (Dec 2015)	Light levels. (Dec 2015)	Fell & restock by nat regen.	
10	Uniform shelterwood 24.2ha	Timber production. Use natural regeneration for restocking.	Simple structure. SS 50%, SP 50%	Age – 14 years. Trans period – 58 years. Return time – 7 years.	None – too young. (Dec 2015)	None at moment. (Dec 2015)	First thin at or before 12m top height.	
11	Clearfell with seed trees 9.9ha	Timber production. Use natural regeneration for restocking.	Simple structure. SS 50%, MC 50%	Age – 77 years. Trans period – 10 years. Return time – 7 years.			Selective thinning	

12	Uniform shelterwood 28.2ha	Timber production. Use natural regeneration for restocking.	Simple structure. SS 90%, 10% SP	Age – 64 years. Trans period – 44 years. Return time – 7 years.	Moss with SS seedlings. (Dec 2015)	Light levels. (Dec 2015)	Selective thinning.	
13	Uniform shelterwood 23.2ha	Timber production. Use natural regeneration for restocking.	Simple structure. SS 90%, 10% SP	Age – 64 years. Trans period – 54 years. Return time – 7 years.	Moss with SS seedlings. (Dec 2015)	Light levels. (Dec 2015)	Selective thinning	
14	Uniform shelterwood 12.8ha	Timber production. Use natural regeneration for restocking.	Simple structure. SS 90%, 10% SP	Age – 64 years. Trans period – 64 years. Return time – 7 years.	Moss with SS seedlings. (Dec 2015)	Light levels. (Dec 2015)	Selective thinning	
15	Uniform shelterwood 9.0ha	Timber production. Use natural regeneration for restocking.	Simple structure. SS 90%, 10% SP	Age – 64 years. Trans period – 74 years. Return time – 7 years.	Moss with SS seedlings. (Dec 2015)	Light levels. (Dec 2015)	Selective thinning	

Appendix 3 – LISS management

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

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

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

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

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

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

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

- Early crown thinning will be heavier (10-20%) than management table intensity and aim to develop 100 equally distributed 'frame' trees per hectare.
- 'Frame' trees are well-formed dominant trees with good crowns at reasonably even spacing.
- When the trees begin to cone (see table 1 below) stands will be thinned to the basal areas shown in table 2 to develop good conditions for regeneration to establish.
- If/when natural regeneration occurs it will be more variable than on a planted site, giving more variability in age, density and species.
- Canopy removal will aim to maintain a leader-to-lateral ratio of >1 in the regeneration (see figure 1), generally this will be achieved using the basal areas in table 2.
- The final removal of the over storey may not involve all the trees depending on management objectives and windthrow considerations (green tree retention).

- If natural regeneration is only partially successful in terms of number and species mix planting will be undertaken. Planting will be concentrated so the location of trees is known and they can be maintained. This will be by using a minimum of 16 trees in distinct group with the trees planted at 1.5 m x 1.5 m to form robust groups.
- If natural regeneration has been completely unsuccessful and CCF is still seen as appropriate planting will be undertaken to form the new canopy layer.
- Before planting the stand will be thinned to the basal areas for 'seedling growth' in the table 2.
- The felling and extraction of the canopy trees will be considered when deciding where to plant.
- Planting will be at 2500 trees per hectare in a well-defined pattern so they can be found for subsequent maintenance. 'Blanks' will be left when the planting position is close (<1 m) to canopy trees. This should ensure restocking compliance with OGB 4, as the area under the canopy is not part of the net area.
- Attention will be paid to site preparation, vegetation management, plant quality and reducing the impact of mammals to make sure of successful establishment. In general opportunities for site cultivation will be constrained by the over storey.
- If the established crop is between the ages of 20 and 40 years, a transformation period of up to 50 years is expected.
-

Table 1 Species seed production details

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

Table 2 Basal area guidance for natural regeneration

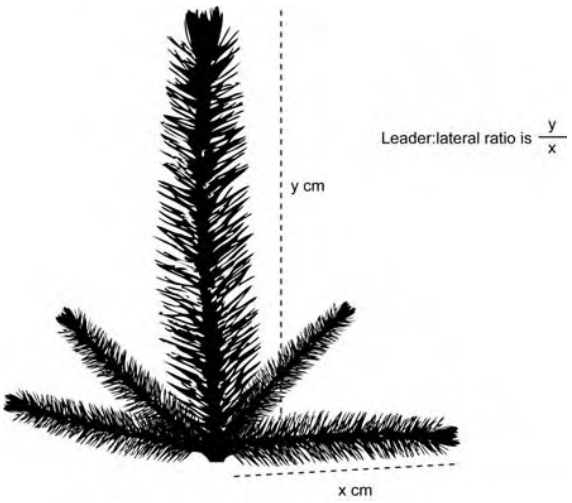
Species/ group	Shade tolerance of seedlings	BA (m2 ha-1) Establishment*	BA (m2 ha-1) Seedling growth**
Larches	Intolerant	20-25***	15-20
Pines	Intolerant	25-30***	20-25
Sitka spruce	Intermediate	30-35	25-30
Douglas fir	Intermediate	35-40	30-35
Norway spruce	Tolerant	40-45	35-40
Western hemlock	Tolerant	40-45	35-40

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

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

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

Figure 1Leader-to-lateral ratio.



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

The objective is to create a wider dbh range than under a simple system by:
- retaining small trees; and
- encouraging fast growth of selected frame trees

- The pattern of regeneration will be different to a simple structure, and will be arranged in groups that only cover up to 20% of the area at any one time.
- Up to 50 'Frame' trees will be selected per hectare and these will be crown thinned so as to keep as many small trees as possible.
- 'Frame' trees are stable, well-formed dominant trees. They may need to be present on the site for a long time; spacing should be 'clumpy' and not regular. Stable trees will have a larger diameter for a given height.
- The stand will be thinned to a residual basal area of about 18-25 m2 per ha for larches and pines, and 25-35 m2 per ha for spruces and Douglas fir. The choice within this range will depend upon the site and the balance between the over storey and any regeneration. If there is little or no regeneration a higher value will be chosen to provide suitable conditions for seedlings to establish. If there is enough regeneration, which needs to be released, then a lower value will be favoured. The aim at each thinning is to remove enough trees to achieve the chosen residual basal area.
- If there is too much regeneration thinning will be concentrated on releasing the best regeneration and attempting to hold it back in other areas.
- Planting in complex structures will be considered to increase chances of success.
- Trees will be planted in canopy gaps of 0.1 ha minimum size.
- Trees will be planted in half the area of the gap in the centre.
- Close spacing (1.5 m x 1.5 m) will be used to make the groups robust. For example, when planting a canopy gap of 0.1 ha 200 trees will be planted at 1.5 m spacing on half the area in the middle of the gap. Close spacing will ensure rapid canopy closure and planting only half the area ensures minimal competition from the canopy trees, allowing opportunities for natural regeneration and increasing operational access.

3. Transformation in older (>40yrs) stands

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

The main implications of this are:

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

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

Appendix 4 – Appropriate assessment

Appropriate assessment of forestry proposals which are likely to have a significant effect on a European site under the Conservation of Natural Habitats, &c.) Regulations 1994. Regulation 48.

1. Name of European site affected by the application and current designation status, including name of component SSSI (if relevant).

River Spey Special Area of Conservation (SAC) – includes the River Spey and several tributaries

2. Features of European qualifying interest, whether priority or non-priority; and conservation objectives for qualifying interests.

SAC – qualifying interests

Freshwater Riverine Habitat for the following **qualifying interests** (non-priority):

1. Atlantic salmon (*Salmo salar*)
2. Sea lamprey (*Petromyzon marinus*)
3. Otter (*Lutra lutra*)
4. Freshwater pearl mussel (*Margaritifera margaritifera*)

Morinsh and Glenfiddich Forests fall within the River Spey catchment and there are several smaller watercourses within the forest area that are tributaries of the River Spey. The tributaries included within the SAC boundary are the **River Fiddich and minor tributaries the Burn of Tervie and its' tributaries.** These watercourses provide habitats for Atlantic salmon and otters. Freshwater pearl mussels and sea lamprey have only been recorded within the main stem of the River Spey. Any activity affecting watercourses has the potential to impact on these 4 species and needs to be considered carefully.

Additional Proposed interests

None.

Conservation objectives for qualifying interests

To avoid deterioration of the habitats of the qualifying species (above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying features.

To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species (including range of genetic types for *Salmo salar* only) as a viable component of the site.
- Distribution of the species within the site.
- Distribution and extent of habitats supporting the species.
- Structure, function and supporting processes of habitats supporting the species.
- No significant disturbance of the species.
- Distribution and viability of the species' host species (for *Margaritifera margaritifera* and *Petromyzon marinus*).
- Structure, function and supporting processes of habitats supporting the species' host species (for *Margaritifera margaritifera* and *Petromyzon marinus*).

3. Details of proposal.

Name: Glenfiddich land management plan ***Location:*** Morayshire
Applicant: Forestry Commission Scotland Moray & Aberdeenshire ***Reference:*** LMP15

Description of proposal:
The management of approximately 2000ha of coniferous forest by a combination of clearfell & replanting and Low Impact Silviculture Systems (LISS) within the catchment of the River Spey.

Within the riparian areas of the watercourses in the forest, work will concentrate on the enhancement of the riparian habitat, through the clearance of heavy shading exotic conifers. The trees will be removed during felling or thinning operations. The open ground created will be allowed to naturally regenerate with native broadleaves (up to 50% of the area) where a seed source is available.

The proposal is in the form of the land management plan, as such reference to the plan maps and text should be made, as they form part of this assessment.

Operations:
- Clearfelling ('one-off' operations within riparian zones)
- Clearfell (out with riparian zones)
- Thinning (out with riparian zones)
- Mechanical mounding and drainage (out with riparian zones)
- Manual planting (out with riparian zones)
- Forest road construction (potentially crossing watercourses)

4. Appraisal of impact on European interest.

4.1 *Is the proposal directly connected with or necessary to the management of the site?*
Yes /No **(if Yes go to 5.)**

No

4.2 *Is the proposal likely to have a significant effect on the European interest on the designated site?*
Yes/No **(if yes assess impact on site)**

Yes

Atlantic salmon
Atlantic salmon are present in the River Spey and many of its tributaries, and are very vulnerable to barriers to migration and impacts on the river bed habitats. These could be caused by blockage of watercourses with felling material, pollution of watercourses from machinery or the release of sediment into the watercourses.

Otter
Otters may use the burns and surrounding vegetation for foraging or shelter. As otters are mainly nocturnal in Moray, they should not be disturbed by daytime operations. Holts and resting places could potentially be affected by machinery through the construction of temporary or permanent water crossings. Uncovered holes, equipment and excavations could cause otters to be trapped.

Sea lamprey
Sea lamprey is only present within the River Spey, and not its tributaries. Sea lamprey is most susceptible to barriers to migration and habitat disturbance. This could be caused by blockage of watercourses with felling material, pollution of watercourses from machinery or the release of sediment into the watercourses as a result of harvesting and road building/maintenance operations.

Freshwater pearl mussel
Freshwater pearl mussels have been recorded in the River Spey, but not its tributaries. Mussels could be affected by pollution of watercourses or silt/sediment into watercourses, which could be washed down into the River Spey.

4.3 *Summary of assessment in relation to possible impacts*
The conservation objectives for the qualifying interests will be met by avoiding deterioration of the habitats for the qualifying species by:

- minimising the possibility of sedimentation and pollution by adherence to operational guidance as described in section 6 ('Conditions Required');
- planning and implementation of all operations with due regard to all relevant forest management environmental guidelines and best practice;
- processing and positioning of felling residues to minimise the potential of these residues entering watercourses during normal flooding / spate events (see also section 6, 'Conditions Required');
- restocking riparian areas by natural regeneration of native wet woodland species such as alder, birch, willow etc.).

4.4 Any other comments
4.5 What *would be the outcome on the site if the proposal is not approved?*

- No immediate significant impact.
- Reduction in aquatic habitat quality over time due to:
- Significant shading of large sections of the watercourse from thickly foliated conifers.
- Acid needle fall into the watercourse from conifers.
- Gradual loss of riparian habitat over sections of the watercourse.

5. Conclusions.

Will the proposal adversely affect the integrity of the European site?

No.
With reference to the Assessment in section 4 and subject to the Conditions in section 6, the proposal should not have any adverse impact on the integrity of the site.

6. Conditions required (if any).

Operations:

- All operations will be timed to minimise the possibility of siltation, accumulation of felling material in the watercourse and to avoid the breeding seasons of key species.
- Work will be directly planned and supervised by FCS staff.
- All trees will be felled and extracted away from the watercourse. All mature trees in riparian zones will be extracted 'whole tree'. Smaller trees of no economic value will be felled, cut into short lengths and left in-situ to naturally recycle in the riparian zone. Brash material created from felling will where practical be removed out with the riparian zone. In all other situations the material will be removed at felling from the immediate environs of the watercourses (those generally un-vegetated areas adjacent to the watercourse where regular flooding / spate events would be expected) and spread over the wider vegetated flood plains. The material will remain there in-situ to naturally recycle, observing the condition below.
- Where any clearance work has been undertaken the watercourses will be visually monitored after any flooding / spate events to check for any wash-down of felling material. Where this has occurred the material will be removed from the watercourse and the immediate environs.

Qualifying interests:

- Otter surveys will be carried out as part of the environmental assessment of sites prior to operations to identify any holts and their status, so any forest operations can be planned to avoid disturbance.
- Plans will be, or have been discussed with the Spey Fisheries Board with regard to any impact on Atlantic Salmon.

Signed

Forest District

Name **John Thomson**

District Manager, Moray & Aberdeenshire Forest District

Signature ……

Date ……..

Name **Philippa Murphy**

Environment Manager, Moray & Aberdeenshire Forest District

Signature ……

Date ……..

Conservancy

Name ……

(for) Ops Manager / Conservator

Signature ……

Date ……..