Forestry and Land Scotland
Coilltearachd agus Fearann Alba

Keillour

Land Management Plan

2024-2043

This plan sets out the strategic direction for management over the next 20 years and provides details of the operations proposed in the first 10 years.

Keillour
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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Keillour
Land Management Plan

Contents

1. Introduction and summary

1.1 Location

Keillour Forest lies on rolling hills between Glen Almond and Strathearn in Perthshire, off the A85 between Perth and Crieff. The forest is split in to two discrete blocks, Gorthy Wood to the south west and Bellour to the north east. See map in section 4.1.

1.2 The site

The forest varies in altitude from 120m to 220m above sea level on rolling hills with rounded summits. The forest is predominantly Sitka spruce plantation (76%). The earliest planting is from 1870 when the land was part of the Keillour Castle estate. The age structure shows the majority of planting was undertaken in the 1980s and 90s. The geology is siliciclastic argillaceous sediment and rock- sedimentary rocks with a high content of silica (quartz) from the Devonian period. This has resulted in the majority of the forest soil being surface water gley, these are wet soils that are of low to medium fertility. There are, however areas of brown earth soils where oak, beech and sycamore are growing well and podzolic soils at the higher elevations that are dominated by heather.

The soil and climate are well suited to Sitka spruce with the majority of Sitka spruce yield class 20 and above. The forest has generally been thinned although some stands have missed the thinning window and as such will need to be managed as unthinned. The 80's and 90s plantings are coming to maturity and some are starting to suffer from windblow.

1.3 Certification

The management of the woodland is certified and at all times we seek to adhere to the UK Woodland Assurance Scheme (UKWAS)

1.4 Key Issues

- Windblow damage
- Low species diversity in the plan area
- Some thinning interventions have been delayed
- Water supplies and fish habitats
- Poor quality roadstone

1.5 Proposals in Brief

- Fell 68.37ha
- Thin 252ha
- Restock 89.8ha
- New Road Construction 50m
- Quarry Expansion 0.44ha

1.6 Timing

The plan presents in detail the management, felling, thinning and restocking proposals for the next 10 years (2024-2033). These are the approved coupes for the plan. Longer term management of the forest is given for context and to indicate direction of travel and long term objectives.

1.7 Consultation and Further Information

The draft plan has been consulted with statutory stakeholders as detailed in Appendix 1 – Consultation Record. Neighbouring landowners, local stakeholder groups and the community council were also consulted. For further information on the plan please contact:

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2. Scottish Forestry Regulatory Requirements

2.1 Summary of Planned Operations

Proposed Operations	2023 - 2032
Felling	68.4ha
Thinning	252ha
Restocking	89.8ha
New Road Construction	50m
Road Upgrade	570m
Quarry Expansion	0.44ha

2.1.1 Proposed Felling in Years 2024-2033

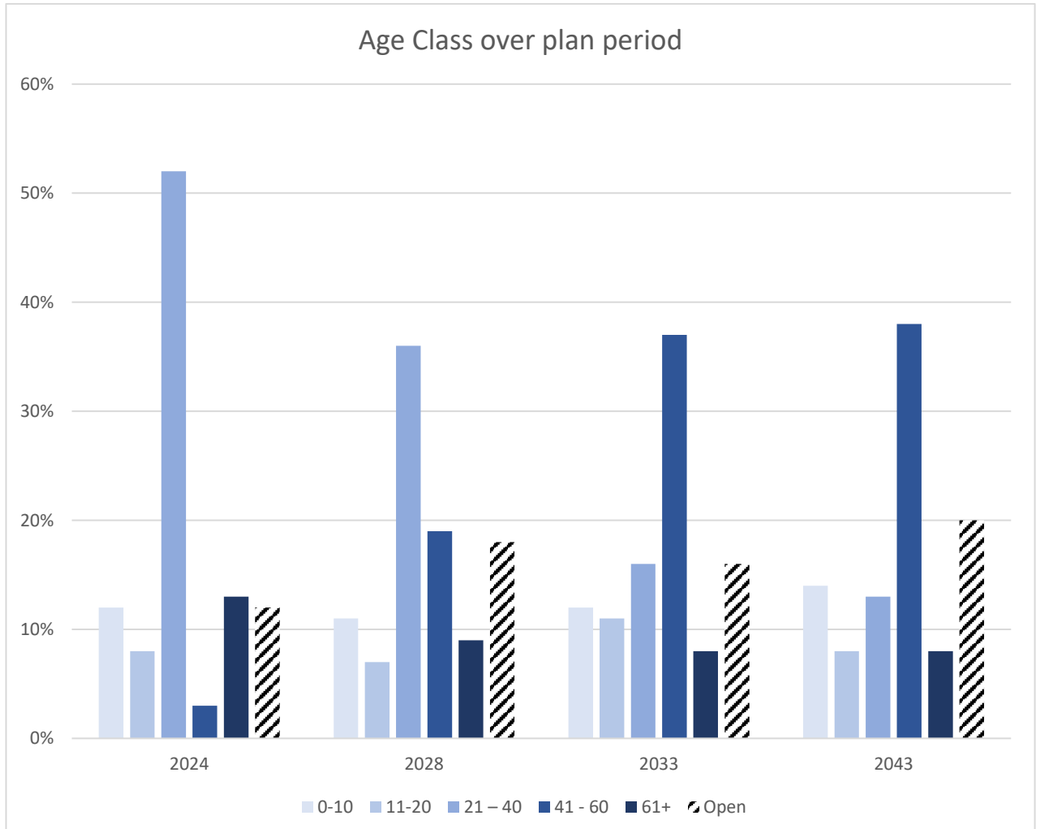
Proposed Phase	Area to be Felled (ha)	Proportion of Woodland Area (%)
2024- 2028	39.55	10%
2029 - 2033	28.82	7%

Details of Clearfell by Coupe for phase 1 and phase 2

Coupe Reference	Programme Year	Species 1	(ha)	Species 2	Area (ha)	Open Area (ha)	Total Area (ha)
26204	2025	SS	1.7			0.17	1.87
26421	2025	SS	13.2	SP	0.6	1.73	15.53
26659	2025	SS	1			0.08	1.08
26068	2025	SS	0.4			0.04	0.44
26053	2026	SS	5.8			0.73	6.53
26939	2027	SS	4.6	NS	0.2	1.87	6.67
26011	2028	SS	4.6	NS	2.2	0.63	7.43
26417	2029	SS	4.4			0.77	5.17
26908	2030	SS	9.1			1.2	10.3
26062	2031	SP	1.8	SS	1.5	5.36	8.66
26114	2033	SS	2.8			1.89	4.69

Changes in Age Class over plan period

Age of Trees	Growth Stage	Percentage of Class at Given Year			
		2024	2028	2033	2043
0-10	Establishment	12%	11%	12%	14%
11 - 20	Thicket	8%	7%	11%	8%
21 – 40	Pole	52%	36%	16%	13%
41 - 60	Maturing High Forest	3%	19%	37%	38%
61+	Old High Forest	13%	9%	8%	8%
Integral Open Ground	N/A	12%	18%	16%	20%



2.1.2 Proposed Thinning in Years 2024-2033

Proposed Phase	Area to be Thinned (ha)	Proportion of Woodland Area (%)
2024-2028	130	34%
2029- 2033	121.9	32%

Coupe Reference	Programme Year	Species 1	Area (ha)	Species 2	Area (ha)	Species 3	Area (ha)	Open Area (ha)*	Total Area (ha)
26001	2027	SS	117.3	SP	4.5	MC/MB	8.2	123	253
26002	2030	SS	95	BI	11	MC/MB	16.5	70	192

*Open area includes all areas that are unthinnable

2.1.3 Proposed Restocking in Years 2024-2033

Proposed Phase	Area to be Restocked (ha)	Proportion of Woodland Area (%)
2024- 2028	18.1	5%
2029 - 2033	71.7	19%

Proposed Restocking by Coupe

Coupe Reference	Programme Year	Species 1	(ha)	Species 2	Area (ha)	Open Area (ha)	Total Area (ha)
26063A	2024	Mixed broadleaves	0.70		0.00	1.62	2.32
26063C	2024	Mixed broadleaves	0.23		0.00	0.35	0.58
26063D	2024	Sitka spruce	0.22	Mixed conifers	0.05	0.00	0.27
26050A	2024	other broadleaves	0.31	Mixed conifers	0.21	0.52	1.04
26050B	2024	Sitka spruce	0.66	Mixed conifers	0.28	0.00	0.94
26057C	2024	other broadleaves	0.28		0.00	0.42	0.7
26057D	2024	Sitka spruce	0.14	Mixed conifers	0.06	0.00	0.2
26046A	2024	Mixed broadleaves	0.54		0.00	0.00	0.54
26046B	2024	Mixed broadleaves	0.46		0.00	0.00	0.46
26418A	2024	Mixed broadleaves	0.92		0.00	0.23	1.15
26080A	2024	Beech	1.79	Oak	1.79	0.00	3.58
26080B	2024	Mixed broadleaves	1.94	Mixed conifers	0.32	0.97	3.23
26080C	2024	Birch	0.39	Mixed broadleaves	0.10	0.00	0.49
26982B	2026	Sitka spruce	0.28	Mixed conifers	0.07	0.00	0.35
26809B	2026	Sitka spruce	0.31	Mixed conifers	0.08	0.00	0.39
26204A	2027	Mixed broadleaves	0.75		0.00	1.12	1.87
26066A	2029	Mixed broadleaves	2.08	Mixed conifers	0.83	1.25	4.15
26066B	2029	Mixed broadleaves	0.28	Mixed conifers	0.09	0.55	0.92
26066C	2029	Mixed broadleaves	0.12		0.00	0.27	0.39
26063B	2029	Mixed broadleaves	0.71	Mixed conifers	0.28	0.43	1.42
26421A	2029	Sitka spruce	5.86	Mixed conifers	1.47	0.00	7.33
26421B	2029	Sitka spruce	3.61	Mixed conifers	0.90	0.00	4.51
26421C	2029	Mixed broadleaves	1.50		0.00	0.38	1.88
26421D	2029	Mixed broadleaves	0.60		0.00	0.90	1.5
26421E	2029	Mixed broadleaves	0.16		0.00	0.10	0.26
26982A	2029	Mixed broadleaves	0.08		0.00	0.73	0.81
26633A	2029	Mixed broadleaves	0.09		0.00	0.35	0.44
26040A	2029	Sycamore	0.81	Beech	1.22	0.00	2.03
26040B	2029	Beech	1.56		0.00	0.00	1.56
26040C	2029	Mixed broadleaves	0.02		0.00	0.20	0.22
26809A	2029	Mixed broadleaves	0.27		0.00	2.45	2.72
26057A	2029	Mixed broadleaves	0.65		0.00	0.97	1.62
26057B	2029	Mixed broadleaves	0.65		0.00	0.16	0.81
26964A	2029	Mixed broadleaves	3.13		0.00	0.00	3.13
26287A	2029	Mixed broadleaves	0.24		0.00	0.00	0.24
26288A	2029	Mixed broadleaves	0.28		0.00	0.00	0.28
26071B	2029	Mixed broadleaves	0.27		0.00	0.40	0.67
26011A	2030	Sitka spruce	3.82	Mixed conifers	0.95	0.00	4.77
26011B	2030	Norway spruce	1.19		0.00	0.00	1.19
26011C	2030	other broadleaves	0.30		0.00	0.44	0.74
26011D	2030	Scots pine	0.40	other conifers	0.05	0.05	0.5
26011E	2030	Mixed broadleaves	0.24		0.00	0.00	0.24
26068A	2030	Sitka spruce	0.21	Mixed conifers	0.05	0.00	0.26
26053A	2031	Sitka spruce	5.08	Mixed conifers	1.27	0.00	6.35
26053B	2031	Birch	0.09	Rowan	0.09	0.00	0.18
26939A	2032	Sitka spruce	4.62	Mixed conifers	1.15	0.00	5.77
26939B	2032	Sitka spruce	0.72	Mixed conifers	0.18	0.00	0.9
26417A	2033	Sitka spruce	2.31	Mixed conifers	0.58	0.00	2.89
26417B	2033	Mixed broadleaves	1.90		0.00	0.47	2.37
26062A	2033	Norway spruce	2.85	Sitka spruce	0.71	0.00	3.56
26062B	2033	Mixed broadleaves	0.96		0.00	2.23	3.19

Coupe Reference	Programme Year	Species 1	(ha)	Species 2	Area (ha)	Open Area (ha)	Total Area (ha)
26062C	2033	Scots pine	1.25		0.00	0.00	1.25
26062D	2033	Sitka spruce	0.53	Mixed conifers	0.13	0.00	0.66

Species Change of forested area Over Plan Period

Species	2024		2028		2033		2043	
	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%
Sitka spruce	303.3	77%	274.5	75%	276.5	74%	257.6	72%
Birch	25	6%	23.5	6%	21.4	6%	20.9	6%
Mixed broadleaves	20.1	5%	24.3	7%	25.4	7%	25.9	7%
Norway spruce	16.9	4%	14.9	4%	17.7	5%	17.7	5%
Scots pine	15.5	4%	13.8	4%	13.6	4%	12.9	4%
Beech	4.6	1%	4.4	1%	4.4	1%	4.3	1%
Oak	2.5	1%	2.5	1%	2.6	1%	2.6	1%
Larch	2.8	1%	2.6	1%	2.6	1%	2.4	1%
Goat willow	2.1	1%	2.1	1%	1.9	1%	1.9	1%
Mixed conifers	2.5	1%	5.1	1%	9.1	2%	11.7	3%
Total	395.3	100%	367.7	100%	375.2	100%	357.9	100%

2.1.4 Access and Roading in Years 2024-2033

Period of Works	Proposed Length for Construction (m)	Proposed Length for Upgrade (m)
2024-2028	50m (2 x turning points)	570m
2029- 2033	None required	None Required

- Phase 1 maintenance 4930m
- Phase 2 maintenance 1350m

2.2 Departure from UKFS Guidelines

The LMP seeks to follow the UKFS in all requirements. Adjacency guidance will be followed where possible however windblow damage may prevent this in some instances. These cases will be agreed with Scottish Forestry as part of this LMP.

2.3 Tolerance Tables

Appendix III gives details of the allowable tolerances for plan amendments.

3. Determination

3.1 Deforestation

There is no deforestation planned within the LMP.

3.2 Forest Roading

There are two new turning points planned to be constructed in the first felling phase. These are 25m long each and are required to facilitate harvesting. There will need to be 570m of road upgrade in phase 1 to allow timber wagons access for haulage. These works are below the threshold that would require an EIA screening opinion request. Prior notification will be requested from the local authority as part of the work planning process.

3.3 Quarries

The quarry in the north east of Bellour forest will be expanded to the north and west. This will allow roadstone for road maintenance and upgrade. The additional area will be 0.44ha which is below the threshold for an EIA screening opinion request. Prior notification will be applied for through the local authority.

3.4 Afforestation

There is 3.82ha of open land in the south west of Keillour forest. This is currently open grassland. It is proposed that this is mounded and planted with beech and sycamore at 2500 stems per ha for productive broadleaf forest. This area of afforestation is below the 20ha threshold for EIA screening requests.

3.5 Additional Regulatory Requirements

3.5.1 Water Framework

Buffering of commercial crops from water courses and private water supplies will follow current Forestry and Water guidelines. There are no operations within the LMP that would require permission under the water framework directive.

3.5.2 Prior Notification

Prior notification will be sought for the 2 new turning points to be constructed during the first phase of the LMP and for the extension of the quarry.

3.5.3 Planning Consent

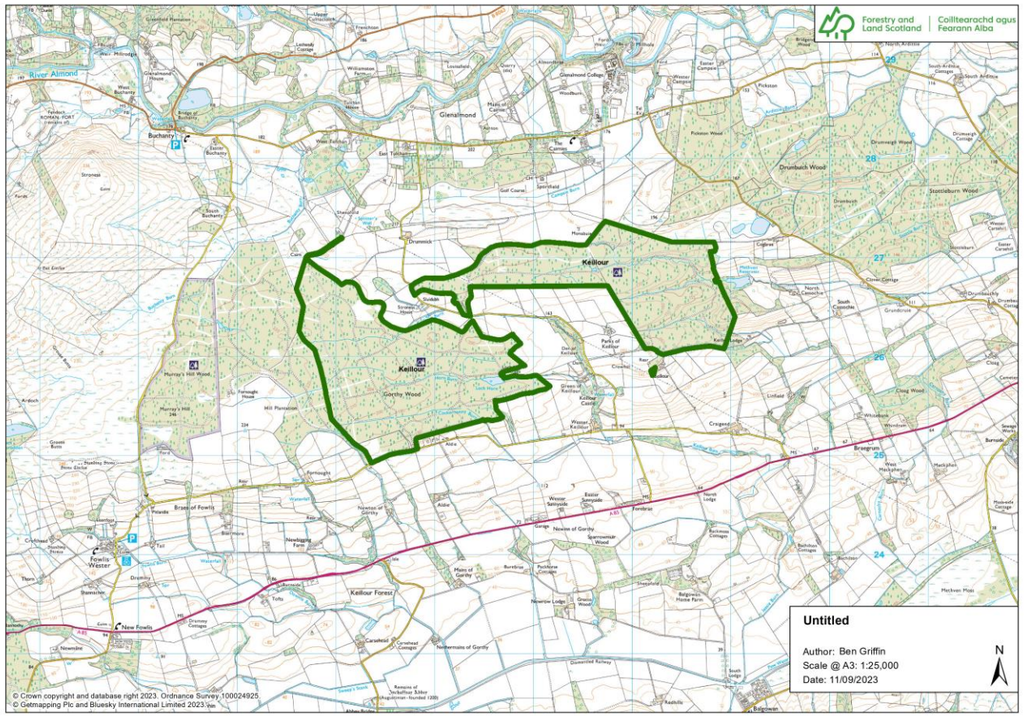
There are no operations within the LMP that require planning consent.

4. Introduction

4.1 Existing Land Holding

The forest is broken in to two blocks- Gorthy Wood in the West and Bellour to the East. The forest sits on a low ridge. The land was acquired from the Keillour Estate in two lots between 1937-38, it is mostly gley soils especially at the higher altitude with brown earths lower down, which is reflected by the neighbouring arable land used for grain production.

Location Map



4.2 Setting and Context

The forest is located on a ridge between Perth and Creiff. It is between the main road A85 and B8063. The river Earn is to the south of the forest and the River Almond is to the north. The forest occupies the higher ground and has a march with Fornought Forest to the west. The ridge is blunt and smooth and the forest is of very low visibility from local viewpoints. Neighbouring land is mostly arable land used for grain production and also horse paddocks.

Murrays hill to the west of Keillour was under FLS ownership but has since been sold and is therefore not part of the new plan.

5. Plan Objectives

5.1 Issues

- The forest is mostly Sitka spruce (76% of forested area) and the majority of the forest is 21-40 years old (61%).
- The majority of the forest is reaching the optimal size to be clear felled.
- Mature and exposed stands are suffering from windblow.
- The soil is mostly gleyed.
- Wetland habitats currently under conifer plantations
- Poor road stone results in dense tree and weed growth on roads

5.2 Key Challenges

- Restructuring the forest opens up the forest and increases the risk of windblow damage
- Increasing species diversity is difficult where gleyed soils limit species suitability
- Reducing reliance on spruce, increasing open areas and increasing broadleaf planting will reduce overall productivity of the forest.

5.3 Management Objectives

5.3.1 Restructure forest

The majority of the forest is 21-40 years old which means that most of the forest is within 1st thinning to clearfell age. It is therefore important to vary the clearfell age to retain stands that are stable and of suitable mean tree size and prioritise felling of stands that are beyond terminal height and starting to suffer from windblow.

The management coupes have been designed to prioritise felling coupes that are mature and starting to show signs of windblow. Where stands are unthinned and not suffering wind damage the rotation will be extended, this will diversify the age structure and also allow unthinned/ self-thinning stands to develop to a mean tree size that is more desirable for timber markets.

There are two coupes that offer opportunities for Low Impact Silvicultural Systems (LISS). These are over mature, well thinned stands of larch, Norway spruce and Scots pine. Thinning these to encourage regeneration will create a more diverse species, structure and age class within these stands.

5.3.2 Increase climate change resilience

The restocking plan has allocated Sitka spruce with another conifer in the sites that are well suited to spruce- mostly the higher elevation gley soils. On these sites Sitka spruce will be planted in mixture with another conifer such as Norway spruce at higher elevation and Grand fir/ Douglas fir at lower elevations. On the brown earth sites broadleaves and Douglas fir have been specified. These measures will increase species diversity over time.

Diversifying species and age/size class will reduce the risk of negative impacts of climate change, including pests and diseases.

5.3.3 Improve wetland habitats

There are a number of water courses that run through the forest. There is Loch Horn that has substantial reed beds associated with it. To further enhance these areas riparian habitats will be created by planting wide spaced broadleaved trees with 50% open ground. Restocks will include riparian areas where water courses are present.

There is a small water course at the far east of Bellour that feeds Methven reservoir which is used for fishing. This already has a good riparian, wet land habitat of willow and birch mixed with open space.

5.3.4 Timber production

Stands will be prioritised for clearfell where the mean tree size is optimal for available timber markets. This will result in thinned stands being clearfelled near age 40 and unthinned, stable stands being delayed until they reach optimal tree size. Prioritising coupes with windblow will salvage as much volume as possible. Restructuring the forest will ensure more consistent timber production in to the future.

6. Analysis and Concept

6.1 Analysis

Objective	Opportunity	Constraint	Concept
Restructure the forest	• Produce a more "normal" forest structure to ensure consistent timber production in the future. • Increase the age structure diversity	• Increase risk of windblow by opening up the forest. • Sub-optimising mean tree size by extending rotation.	• Prioritise coupes that are suffering from windblow and are overmature. • Prioritise thinned stands of Sitka spruce of high yield class to fell at optimal mean tree size (dbh 36-40cm). • Restocking with slower growing species will extend future rotation lengths and further break up the age structure.
Increase climate change resilience	• Diversify species to reduce risk of climate change and pests and diseases. • Improve resilience in future crops by creating windfirm edges during establishment.	• Decreasing productivity due to lower yielding species • Increasing establishment costs through use of softer species.	• Select sites with podzolic soils to target Scots pine and alternative conifers and broadleaves on brown earth soils. • Gley soils will be planted with Sitka spruce in mixture with Norway spruce or other site suitable alternative conifers. • Edges vulnerable to windblow will be planted with a strip of wider spaced broad leaves and then a strip of slow growing conifer before the main stand of spruce. This will create a more windfirm edge in the future.
Improve wetland habitats	• Open up existing watercourses and water bodies to create riparian zones • Increase habitat connectivity	• Reduces productive area of high yielding conifer species	• At restocking stage water courses in the coupe will be buffered at variable distances from the water course. These riparian zones will be planted with mixed broadleaves at variable spacing with 50% open ground. • Loch Horn will have felling around it and be opened up to improve the wetland habitat
Timber production	• Optimise log production • Reduce risk of windblow now and in the future	• May result in some coupes being felled early in order to salvage windblow.	• Target windblown mature stands to be felled first. • Then clearfell younger thinned stands that have suffered windblow but the mean tree size is marketable • Extend rotation of unthinned spruce stands that are stable and will take longer to reach optimal tree size. • Restock with wide rides and slow growing species at the edge of coupes to create windfirm edges in future clearfell coupes.

7. Long Term Land management Plan Proposals

7.1 Management

This LMP has been designed in accordance with the guiding principles set out in UKFS and UKWAS to ensure the forest is managed sustainably and considers economic, social, cultural and ecological aspects of the forest. All operations will be undertaken in accordance with UKFS

7.2 Silvicultural Systems

The majority of the forest will be managed on clearfell and restock system. This is because the current species and age composition lends itself well to this and mature stands are starting to blow over. The maximum DAMS is 15, however within these areas there is often some volume of wind damage in thinned and unthinned stands.

There are two LISS coupes that will be suitable for Group selection systems. They are mature larch, Scots pine and Norway spruce. One coupe has wind blow which has infilled well with regeneration and the other has been thinned to a basal area of approximately 30 and there is no regeneration under canopy. Both stands will be thinned to open up gaps, reduce the basal area and encourage natural regeneration.

7.3 Operational Proposals

For details of harvesting, thinning and restocking see section 2.1

7.4 Open Land management

There are small areas of open land within the forest. These are generally wetter soils that will not support tree growth. There is an area of open land in the far south of the block. This is currently open grassland however it will be mounded to establish a productive broadleaf site of beech and sycamore, this will be new woodland creation within the plan.

8. Critical Success Factors

- Minimise further windblow
- Target clearfell coupes at optimal felling age
- Increase species diversity
- Enhance riparian habitats

9. Management Prescriptions

9.1 Forest Management Types

9.1.1 Stewardship

Ground Preparation

Clearfelled stands will have ground preparation undertaken. The majority of the sites are gleys that are relatively fertile and seasonally wet. These site will be trench mounded where brash and windblown stumps are abundant and hinge mounded and brash raked where there is less brash. This will create raised planting positions where the soil is warmer and drier. There are a few small areas where the soil is more podzolic and heathery in nature. These sites could be scarified which would be cheaper and less intensive than mounding.

Beatup

Conifer restock sites will be beaten up to achieve 2700 stems per ha with the aim to reach 2500 stems per ha at year 5. Broadleaf sites will be beaten up at 1800 stems per ha in order to achieve 1600 stems per ha. Where there are mixtures of conifer and broadleaf planted these will be planted 3:3 row mixtures at 2700 stems per ha.

Weed control

It seems that historically the restocking has been managed with a 5 year fallow in order to allow weevil populations to reduce to a point where insecticide is not required. It appears that these sites have dense weed growth. Mounding these sites will create weed free planting positions however until the new plants are established it is likely that some weed control will be required. This will be by hand cutting/ brush cutters in the summer and application of propyzamide in the winter if grasses are dominant.

Respacing

There are a number of coupes where spruce has been planted with birch regeneration. Some of these areas have been respaced to achieve 2m spacing. This may be required as restocks reach 10 years old. These sites will be surveyed to assess the requirements.

9.1.2 Silvicultural System

3% of the forest will be managed with various LISS and 88% will be managed as clearfell systems. This may change over time depending upon success of LISS and if early transformation of young stands may be undertaken.

9.1.3 Restock / Regeneration

FLS use the hylobius management support system (HMSS) to monitor clearfell sites for weevil populations. In this forest it is the default to restock a site the year after felling unless the HMSS suggests a longer fallow period. To date a 5 year fallow period has been recommended. This has resulted in fairly heavy weed growth of bracken, and bramble and has therefore required mounding and weed control to establish the trees.

Conifer restock sites will be restocked at 2700 stems per ha in order to achieve 2500 stems per ha at year 5. Where a mixture of conifer and broadleaf is specified then they will be planted in line mixtures 3:3 at a spacing of 2700 stems per ha. Pure birch planting will also be established at 2700 stems per ha as it has been shown it can produce good quality birch stands in sub-compartment 3075h and the photo below. Pure native broadleaves will be planted at 1800 stems per ha.

Birch in sub-compartment 3075h

Coupes with edges vulnerable to windblow will have broadleaves and Scots pine planted along the windward edge planted at 1600 stems per ha. These species will be slower growing and create a tapered edge to the forest that has been shown to reduce the risk of wind damage. Wide rides will also be left open at restock stage, this will provide future windfirm boundaries and also keep the roads more open and in a better condition.

Riparian areas will be planted with a mixture of native broadleaves such as aspen, willow, alder and rowan. They will be variably spaced with 50% open space included but with an average stocking of 1600 stems per ha.

In LISS coupes the light levels will be managed to achieve natural regeneration. For Scots pine and larch regeneration the basal area will need to be reduced to 15-20 and for spruce regeneration 20-25. The LISS coupes will require further thinning to achieve this. It is expected that the regeneration will occur after thinning, however if it doesn't happen then underplanting will be undertaken.

9.1.4 Woodland Creation

There is 3.82 ha of open ground in the south west of Gorthy Wood. This was originally a seed orchard but has been cleared over 30 years ago. It is proposed that this area will be mounded and planted with beech and sycamore mixture to create productive broadleaf woodland. This will be planted at 2500 stems per ha to produce firewood thinnings and clean hardwood stems at clearfell age. The area is deer fenced and has good access for thinning. With a high density initial planting the trees will be finely branched to allow thinnings to be processed by harvester and therefore reduce harvesting costs.

9.2 Future Habitats and Species

The restocking stated in the plan will increase species diversity over the period of the plan. Riparian corridors will be established at clearfell stage. Pure spruce stands will be restocked with resilient mixtures where suitable. There will be no planting of larch although regeneration will be accepted. Mixtures of conifer/broadleaf will also be planted to increase the broadleaf proportion of the forest. Section 2.1 gives a projection of species change over time.

9.3 Operational Access

The forest is generally well roaded however the roadstone available is noted to be of poor quality so roads will degrade quickly over time and are also prone to trees and woody weeds growing in the road. There is a single active quarry in the north east of Bellour block.

To access the programmed coupes there will need to be an upgrade of some existing roads/paths. The details of these are given in section 2.1. All larch coupes in the forest are easily accessible if they were to be infected with Phytophthora ramorum.

9.4 Herbivore Management

There is a small transient red deer population that on occasion come into the Keillour blocks , this very much depends on what is happening around the periphery and further afield if they appear at all. Access and shooting opportunities in Keillour change with each operation ,with no long-term open space for deer control available. On average approximately 61 deer are culled annually with the target to allow restocks to establish with less than 10% leader damage. Recently planted broadleaves have been planted in tubes to further protect the trees. Keillour forest has limited open space. It would aid deer control if deer glades could be created.

9.5 Management of Open Ground

See section 7.4 about managed open ground in the plan.

9.6 Public Access

Keillour is well used by public for mountain biking, dog walking and horse riding. There is a small informal car park at the entrance to Bellour forest which is popular with local visitors. Gorthy wood has a core path that runs through it (see recreation map XX). Where forest operations obstruct this path diversions will be put in place.

9.7 Heritage Features

There are no scheduled monuments in the forest. There are however 3 unscheduled monuments present. These are:

- Mill Dam- in Bellour block a mill pond at NN 98572674
- Stone axe head- found in Gorthy Wood at NN950260
- Brick mine shafts – in Gorthy wood to the north of Loch Horn NN965257

As per UKFS these structures will be protected during operations. There are no plans however to preserve or enhance these features.

9.8 Water Management

Water Quality.

Map 4 shows the river catchments, it shows that Gorthy Wood drains mostly in to the River Earn and Bellour block drains mostly to the north and east towards the river Almond and river Tay. The River Tay is in good ecological condition whereas the River Earn is in a bad ecological condition. Planting riparian zones in the forest will improve the water habitats and water quality. All forest operations will be undertaken in accordance with UKFS Forest and Water guidelines which will reduce the risk of diffuse pollution by following industry best practice.

Flooding

The rivers Almond and Tay are within the potential vulnerable area of Perth and Almond Bank which also includes Methven. These are areas that have been identified at risk of flooding where residential, business or public spaces are threatened by flooding. Current research shows that forestry practices will have measurable effects on flooding where at least 40% of the catchment is forest. Map 5 shows the drainage catchments and the percentage of forest within each catchment. It can be seen here that Bellour wood and part of Gorthy Wood are within the category of 0-20% forest cover. This indicates that forest operations such as felling, restocking, ground preparation and peatland restoration will have minimal effect on flooding within these drainage areas. The proposed clearfell and restock programme in the plan period represents a small proportion of the forest and as such these operations will have minimal effect on the potentially vulnerable areas downstream of the forest.

9.9 Landscape

The forest is of low landscape impact as it is not highly visible from many points. Map 12 and Appendix 6 illustrates three viewpoints showing that the forests feature in the landscape as distant views and therefore the operations in this plan will have minimal impact on the landscape. It is therefore more important to consider the internal views of the forest. The Landscape Character Type as assessed by nature Scot is Lowland Hills Tayside characterised by low rounded ridges and hills separating lowland straths and adjoining the nearby uplands. Increasing species and age diversity of the forest will break up

the continuous blocks of spruce plantation. Planting broadleaf edges to the forest will create less definite straight edges and improve the appearance in the landscape. Planting broadleaves in the wayleave for the pylon will break up the straight edge created here.

Appendix I – Land Management Plan Consultation record

I/1.0 Record of consultation responses

Stakeholder	Comments	FLS Response	Action
Scottish Forestry	• Please put grid references on maps as not everyone is aware where these forest are located. • I note that you have picked up one private water supply on your issues map but I believe there is also another in the NE of Gorthy Wood referenced as Glen Manor Borehole. • These woodlands are in a drinking water protected area for surface water and you should include Scottish Water in your scoping. • Timber will need to transported on a consultation route before it reaches the A85. You should provide haulage maps with expected tonnages and consult with P&K Council Timber Transport.	• Scottish Water included in consultation	• Grid References to be added to maps • Ensure PWS appear on all relevant maps • Timber haulage map needed to show predicted volumes to be hauled and sent to Perth and Kinross Council • Glen Manor resident contacted and site visited by FLS staff
Historic Environment Scotland	• No SAMs so no further comments	• No response necessary	• No action necessary
Nature Scot	• No impacts on designated sites	• No response necessary	• No action necessary
Scottish and Southern Electricity	• There is a 132kV line that runs through the forest and an 11kV line in Bellour which will both need to be consulted on when operations are undertaken in these areas. • When coupes are re-stocked it is beneficial to consider the use of wayleaves and surrounding areas as open ground or non-commercial areas to minimise the risk of contact with the network for future felling operations.	• OHPLs are on maps and SSE will be consulted on operations that may affect them. • Restocking along the 132kV wayleave will be with low growing broadleaves to reduce the need for future tree clearance.	• OHPLs are on maps and SSE will be consulted on operations that may affect them. • Restocking along the 132kV wayleave will be with low growing broadleaves to reduce the need for future tree clearance.
Scottish Water	• The impact of felling and restocking is considered low-risk with regards to water resources, as it will not have a detrimental impact on the yield of either catchment (River Tay and River Earn). We are happy to see that more native broadleaf trees are planned for planting. It is imperative that we are notified of any pollution incidents which occur as a result of forestry operations. • SW Assets (water pipeline) identified at the southern boundary of the forest. • The catchments of the Tay and Earn are designated as Drinking Water Protected Areas.	• Water pipeline is outside the forest boundary. It will not be affected by forest operations and it is mapped on the GIS. • All operations will adhere to UKFS Forest and Water Guidelines and also “Guidance on Forestry Activities near SW Assets”.	• Ensure proper adherence to UKFS Forest and Water Guidance when planning operations.
Perth and Kinross Access Forum	• Car park could be improved by vegetation management and moving the access gate up the track. • 2 suggestions of circular paths • Suggest interpretation about Mill Dam would enhance visitor experience	• FLS has limited funding for visitor services which we must allocate to sites where it will have the biggest impact. Although locally popular Keillour is considered of low recreational priority.	• FLS may consider improving the visitor experience in Keillour if additional funding or community support becomes available.

I/1.1 Record of online public consultation

Stakeholder	Comments	FLS Response	Action
Neighbouring Landowner	• Concern about trees blowing over access track and damaging oil tank and borehole.	• The windblown trees are targeted as a red coupe with the restock planned to be mixed broadleaves	• Phase 1 coupe will be felled and restocked with broadleaves to reduce the risk of future windblow damage. • Resident visited by FLS staff to confirm future plan
Local Resident	• Overgrown paths/forest roads • Circular walk in Bellour • Would like to see more native trees	• Forest roads will be cleared as operations are undertaken • Circular path query passed to Visitor Services Manager • New plan increases broadleaf planting	• FLS may consider improving the visitor experience in Keillour if additional funding or community support becomes available. • Plan aims to build resilience in future forest structure will include increasing native broadleaf components.

Public consultation was carried out online by publishing maps and putting up signs in the forest to inform local users. Letters were also sent to local residents to let them know about the LMP consultation.

Appendix II - Supporting Information

II/1.0 The Existing Forestry and Land Holding

Keillour Forest consists of two blocks (Gorthy to the southwest and Bellour to the northeast) are situated on a low ridge within Glen Almond and south of the river Almond. The majority of Keillour is composed of Sitka spruce which in general terms performs well with good growth rates being displayed. There are however other species including beech, oak and mature Scots pine which diversify the visual and structural values of the forest – as well as from a biodiversity perspective.

In terms of crop age distribution, this ranges between planting years 1870 and 2011 with a yield class distribution from 2 to 20. There is a history of thinning at Keillour, although this is perhaps not as widespread as it should have been as there are examples of unthinned stands of varying age.
The forest previously provided part of the range for the local capercaillie population with active lekking sites being recorded until 2000. However population, numbers have significantly dwindled to nil sightings by 2012. There is also a range of more common woodland bird species, with moorland species such as curlew being present on younger restock sites.

II/1.1 History of the Land Holding

Keillour Forest was purchased in 1937 and 1938 from a number of owners. The older stands in the forest were planted soon after this in the 1940's and some of these stands are still retained. Murrays Hill to the west of Keillour was part of the same forest block and acquired in 1948, it was, however, sold in 2013 and is now privately owned.

II/2.0 Analysis of the Previous Plan

II/2.0.1 Aims of Previous Plan and Objectives

Objective	Assessment of objective during plan period
Timber Production In poor access and wetter soils retain unthinned systems but maintain LISS coupes and thinning of better stands to optimise log production at clearfell.	Some coupes planted in the 80s have been left unthinned. In Gorthy wood these areas have become exposed due to felling in adjacent forest and suffered windblow. LISS management has been minimal so further thinning will be needed to reduce the basal area and encourage regeneration.
Conservation and Heritage Maintain habitat network within the forest. Manage historic features according to FC Practice Guide "Identifying the historic environment in Scotland's forests and woodlands" (2010)	Broadleaves have been included in the restocking with riparian corridors created. There is only one heritage site in the forest which is a stone axehead that was found in Gorthy Wood
Recreation Informal recreation will continue within the forest areas with walkers, riders and permitted husky dog teams using the existing forest road network and the continued lease of Loch Horn to the local angling club.	The forest continues to be well used for recreation, being very popular for dog walking and horse riding.
Landscape On account of the low visibility of the forest from major conurbations and road networks, the forests presence in the landscape will remain largely unchanged during the period of this plan.	The forest remains low impact in terms of landscape due to its low visibility from nearby locations.

II/2.0.2 How previous plan relates to today's objectives

Timber Production
This is still a high priority for the forest with the main challenge to prioritise stands that are suffering from windblow and make them more resilient to wind damage in the future. The forest is quite even aged so there is a further challenge to restructure the forest to allow a more constant timber supply in the future. LISS coupes have had no recent management but will require thinning and opening up gaps to allow regeneration.

Conservation and Heritage
There are no designated sites within the forest. There are no scheduled monuments and only one heritage find of a stone axehead. It still remains an objective to manage habitats within the forest, namely maintaining open areas around waterbodies such as Loch Horn and creating riparian habitats at restock.

Recreation
There is a small informal car park at the main entrance to Bellour and the forest is well used for recreation so this remains a relevant objective for the plan but with no plans to expand the recreational offering.

Landscape
The forest is of low visibility from most locations so landscape is a low priority objective however it will be considered in designing the clearfell and restock coupes.

Climate Change
This was not in the original plan but is a high objective in the new plan. The forest is heavily reliant on Sitka spruce which is very suitable for the majority of the forest. There are however areas where the soil would allow other species including oak and beech. It is therefore important in terms of climate change resilience to increase species and structural diversity through restocking, restructuring and use of LISS.

II/3.0 Background Information

II/3.0.1 Physical Site Factors

Geology, Soils and Landform

The soils are predominantly surface water gleys with some areas of peaty gleys. There are clearly areas of brown earth where beech, oak and sycamore are growing well and also areas of podzolic soils which are heather dominated and where spruce is suffering from check. The underlying geology is Old Red Sandstone.

The forest is in two blocks that are sitting on a blunt ridge that runs downhill west to east. It sits between the catchments of the river earn to the south and the river almond to the north. The land form is a rolling hills which vary in altitude from 130m to 220m above sea level.

Hydrology

There is one known, well-marked private water supply which arises near Loch Horn and one water supply in the north eats of Bellour forest. Part of Keillour falls within the catchment area for the Methven reservoir which is also used by a local angling club.

Climate

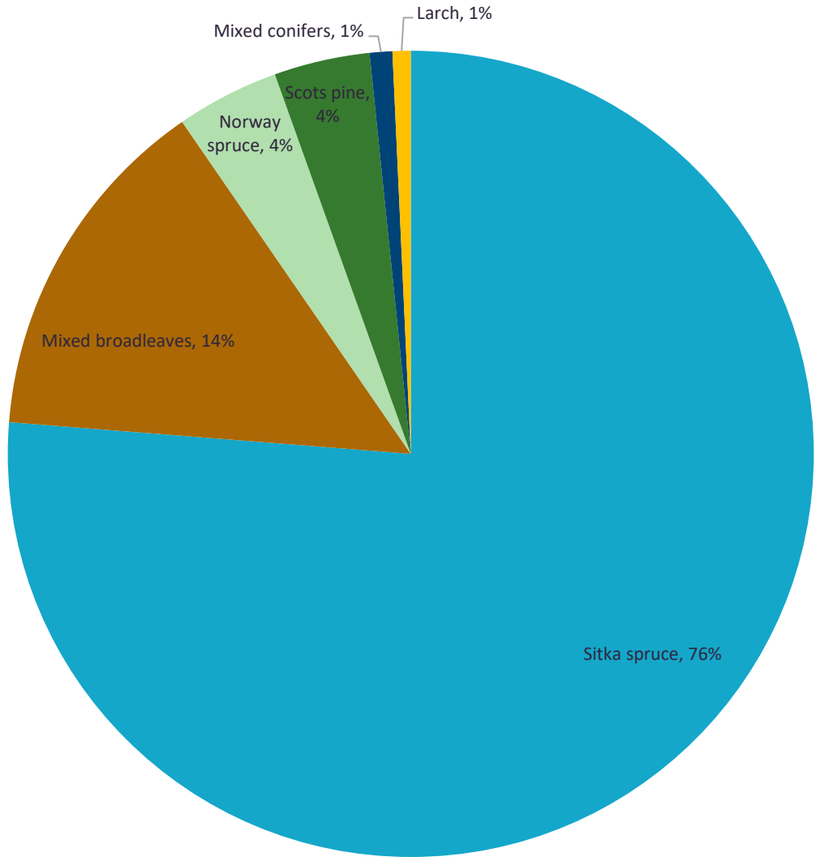
Rainfall in Keillour and Murray's Hill ranges from 423-557mm (summer to winter). The climate is cool and wet. Accumulated temperature ranges from 1460-1595. Moisture deficit ranges from 79-92 and DAMS ranges from 12 at low altitude to 15 at the highest altitude.

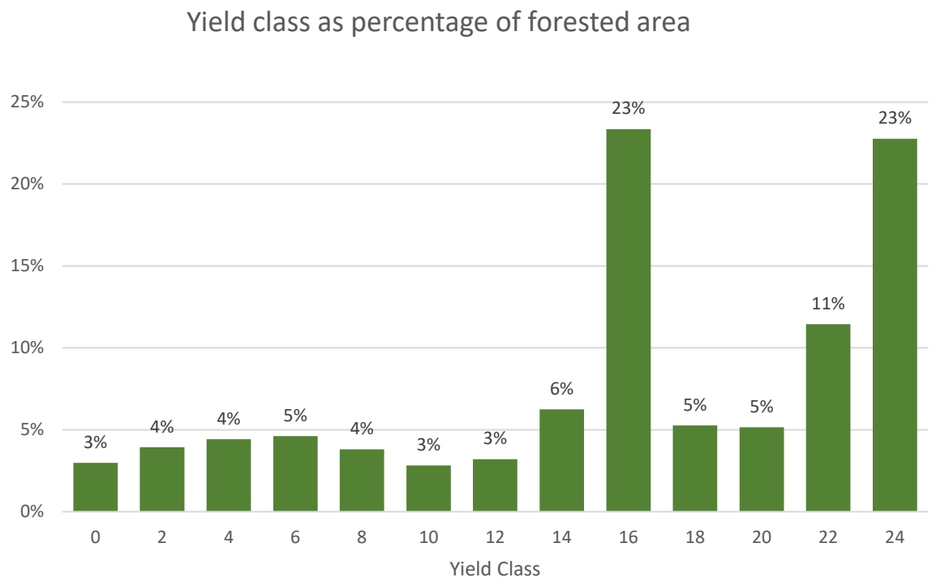
II/3.0.2 The Existing Forest

Age, Structure, Species and Potential Yield

Species	Area (ha)	%
Sitka spruce	293.8	76%
Mixed broadleaves	54.5	14%
Norway spruce	15.9	4%
Scots pine	14.8	4%
Mixed conifers	3.5	1%
Larch	2.8	1%
Total	**385.3**	**100%**

Proportion of forest by species (%)





Access
Keillour has a good network of forest roads that lead to a consultation timber transport route. Although the road network in the forest is good, a number of routes have over grown with woody weeds and therefore will need substantial upgrades to access the clearfell coupes for harvesting. Future restock coupes will be planted 10m back from forest roads to keep the roads dry and reduce the risk of them becoming over grown. There is an active quarry in the north east of Bellour block which will provide stone for the whole forest.

LISS Potential
The DAMS for the forest ranges from 12 to 15 and so should be thinnable. A number of stands have been thinned. Where DAMS is lower, especially in Bellour, there would be options for early transformation to CCF. This plan highlights two coupes that have been well thinned already and where LISS would be possible.

Thinning Potential
DAMS varies from 12 to 15 across the forest and as such most stands would be thinnable. However the wetter gley soils especially to the west of Gorthy Wood seem quite prone to windblow. These stands will therefore be managed on a no thin regime. The rest of the forest should be thinned however some stands have missed the first thinning window.

II/3.0.3 Land Use
The majority of keillour is productive high forest, with the surrounding land being improved grazing and arable land. The west boundary of the forest has a march with Fornaught forest that is privately owned. The open areas are generally open water, wayleaves and wetland habitat. There is also an open area to the South West which is a cleared seed stand. The whole trees were removed which has left a grass land. It is planned to cultivate this and plant with productive broadleaves.

II/3.0.4 Biodiversity and Environmental Designations
There are no nature designations in Keillour forest however the most important habitats are Loch Horn, the open peatland to the north of Gorthy Wood and the water courses that run through the forest. These riparian areas have been planted with dense conifer plantations and as such they will be opened up during clearfell operations to enhance the riparian habitats and create habitat networks.

II/3.0.5 Landscape
The forest is of low landscape impact as it is not highly visible from many points. Map 12 and Appendix 7 illustrates two viewpoints showing that the forests feature in the landscape as distant views and therefore the operations in this plan will have minimal impact on the landscape. It is therefore more important to consider the internal views of the forest. The Landscape Character Type as assessed by nature Scot is Lowland Hills Tayside characterised by low rounded ridges and hills separating lowland straths and adjoining the nearby uplands.

II/3.0.6 Statutory Requirements and Key External Policies

Appendix V provides all legal and external policies that are relevant to the LMP. This plan seeks permission to fell, thin and restock the areas of forest indicated in the plan. This will be approved by Scottish Forestry to ensure that FLS are adhering to UKFS guidance and principles. The LMP is also assessed by UKWAS auditors in order to ensure that FLS is managing the forest sustainably according to FSC and PEFC certification schemes.

The LMP acts as a vehicle to gain approval for FLS to undertake afforestation, deforestation, new roads and quarries through the Environmental Impact Assessment (EIA) process. Scottish Forestry will assess the LMP to determine if a full EIA is necessary.

Appendix III - Tolerance Tables

	Adjustment to Felling Coupe Boundaries	Timing of Restocking	Change to Species	Windthrow Response
FC Approval Not Normally Required	0.5ha or 5% of coupe – whichever is less	Planting up to 5 seasons after felling (allowing for fallow periods for Hylobius). For natural regeneration up to 10 planting seasons after felling.	Change within species group, e.g. conifers: native broadleaves	
Approval by Exchange of Email and Map	0.5ha to 2.0ha or 10% of coupe – which ever is first		Greater than 15% species change	Up to 5.0ha – if mainly windblown trees between 5.0ha to 10ha in areas of low sensitivity.
Approval by Formal Plan Amendment	Greater than 2.0ha or 10% of coupe	Delay in excess of that described above.	Increased native woodland component. Increase in native broadleaves and open/bog restoration.	Greater than 5.0ha
Tree Felling in Exceptional Circumstances	FLS will normally seek to map and identify all planned tree felling in advance through the LMP Process. However there are some circumstances requiring small scale tree felling where this may not be possible and where it may be impractical to apply for separate felling permission due to the risks or impacts of delaying felling. Felling permission is therefore sought for the LMP approval period to cover the following circumstances: Individual, rows or small groups of trees that are impacting on important infrastructure (ie Forest roads, footpaths, access routes (vehicular, cycle, equestrian or pedestrian), Buildings, Utilities and services and drains) either because they are now encroaching on or have been destabilised or made unsafe by wind, physical damage or impede drainage. The maximum volume of felling in exceptional circumstances covered by this approval is 75 cubic metres per Land Management Plan per calendar year. A record of the volume felled in this manner will be maintained and will be considered during the five year LMP review.			

Appendix IV - Land Management Plan Brief

IV/1.0 Previous plan objectives

Timber Production In poor access and wetter soils retain unthinned systems but maintain LISS coupes and thinning of better stands to optimise log production at clearfell.
Conservation and Heritage Maintain habitat network within the forest. Manage historic features according to FC Practice Guide “Identifying the historic environment in Scotland’s forests and woodlands” (2010)
Recreation Informal recreation will continue within the forest areas with walkers, riders and permitted husky dog teams using the existing forest road network and the continued lease of Loch Horn to the local angling club.
Landscape On account of the low visibility of the forest from major conurbations and road networks, the forests presence in the landscape will remain largely unchanged during the period of this plan.

IV/1.1 Strategic Influence

This plan has been written to conform with the following strategies and policies

- UKWAS Certification Standard
- UKFS
- Scotlands Forestry Strategy 2019-2029

FLS Corporate Strategies https://forestryandland.gov.scot/what-we-do/plans-and-strategies

IV/1.2 Key Issues and Constraints

See section 6.1 for Concept and Analysis Table.

IV/1.3 Aims of new plan

See section 6.1 for Concept and Analysis Table.

Appendix V – Links to Policy and Guidance Documents

UKWAS Certification Standard

- http://ukwas.org.uk/standard/background-and-purpose/
- http://ukwas.org.uk/wp-content/uploads/2018/05/UKWAS-4-Appendix-References-v1.0-FINAL.pdf

UKFS Standard

- https://forestry.gov.scot/sustainable-forestry/ukfs-scotland

Scotlands Forestry Strategy 2019-2029

- https://www.gov.scot/publications/scotlands-forestry-strategy-20192029/

FLS Corporate Strategies

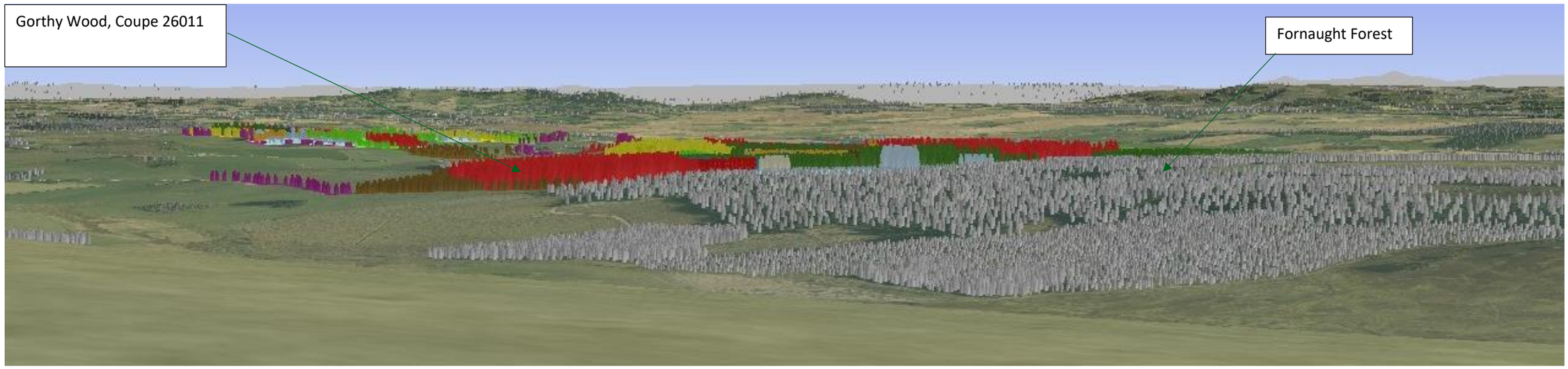
- https://forestryandland.gov.scot/what-we-do/plans-and-strategies

Appendix VI – Landscape Visualisations- see Map 12, landscape

Viewpoint 1. Bellour Wood from NO 00282682

Viewpoint 2- Gorthy Wood from NN93712716

Viewpoint 3- Management Coupes in 2024. NN92172715



Viewpoint 3- Species in 2044. NN92172715