ROTHIEMURCHUS

Forest Plan
2016-2035

February 2016

FCS ref: 5027553

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INTRODUCTION

This Long-term Forest Plan (LTFP) covers all of the woodlands on Rothiemurchus Estate (1879ha). It is based on the 2006 LTFP prepared by Stuart Blackhall (estate forester 2002-2009), revised by Piers Voysey (estate forester since 2010) in 2011. This is the third revision to accommodate the sale of some 2,300ha of forest and open hill land to Forestry Commission Scotland in 2014.

This plan retains the "Framework for the Management of Rothiemurchus Pinewoods" and the "Rothiemurchus Biodiversity Action Plan" prepared by Dr. Phil Ratcliffe as key, under-pinning documents.

The purpose of the plan is to describe the forest, identify opportunities and constraints, present the vision, aims and objectives for the management of the woodlands over the next 20 years and to set out the timing, location and scale of woodland operations in detail for the first 10-year period (2016-2025) and in outline to 2035.

The plan was prepared under a Scotland Rural Development Programme (SRDP) grant and approved by Forestry Commission Scotland (FCS). Public consultation has been carried out according to FCS guidelines and it has been strongly supported by the statutory public agencies making up the Rothiemurchus Concordat (Scottish Natural Heritage, FCS, The Highland Council and the Cairngorms National Park Authority). There will be formal reviews of the plan with FCS every 5 years.

The plan takes account of the woodlands' varied history and applies it in the context of changing user demands and expectations. It develops proposals in line with the themes of biodiversity enhancement (forest habitat networks, Natura 2000 designations), visual landscape enhancement, public access management and economic sustainability. The plan is part of sustainable estate management that includes farm and mountain land; managed together to enhance biodiversity and sustain the economic viability of the estate as a whole.

HISTORICAL BACKGROUND

Outwith the mountain realm of the estate, Rothiemurchus retains a woodland landscape surrounding farmland and habitation. Some of this woodland has grown, developed and been influenced by human activity without significant interruption since the last ice-age. As such it is part of the remnant of Caledonian forest that is now rare in Scotland and remains contiguous with a wider landscape of Caledonian forest stretching from Glen Feshie through to Abernethy.

The woodlands of Rothiemurchus have been managed over the centuries for timber production, woodland grazing, deer stalking, nature conservation and amenity; although the focus of management will have varied with the fashions and economics of the time. Commercial planting in the low-lying areas only commenced in the 1800's. More recently, after further periods of timber extraction during the World Wars followed by livestock grazing, the native woodland areas are once again in a period of regeneration. The national and international significance of the Caledonian Forest and montane habitat has been recognised by SSSI, National Park and Natura 2000 designations. Tourism and public access has also become a significant factor in the management of the estate.

FOREST DESCRIPTION

Much of the forest is growing on soils developed over free-draining glacial drift of sands and gravels. Deeper forest soils have developed in some areas, such as Callart Hill. Deep peats have formed in basins between moraines. The soils largely reflect the silica rich nature of the surrounding geology, but in places, such as Ord Ban, there are outcrops of lime-rich material that influences the natural vegetation.

The estate forest area can best be described in 5 general types:

1. semi-natural mixed broadleaved woodland along the Spey and tributaries at 210m amsl;
2. Policy woodlands associated with the Doune designed landscape and other 'domestic' landscapes;
3. Plantation woodland;
4. Caledonian pine woodland including areas of birch dominant woodland, juniper scrub, bog woodland and open moorland that is regenerating to native tree species;
5. Other significant areas of open ground, largely in the montane zone between 400m and 700m amsl that has the potential to regenerate to montane scrub and to contribute to the area of Caledonian woodland in the future.

Woodland types classified in this plan:

Woodland type	**2015 Area (ha)**	**%**
Scots pine, birch, juniper	896.09	47.69
Unstocked heath / acid grassland (largely tending to regenerate with pine)	577.45	30.73
Coniferous plantation	208.99	11.12
Bog woodland	57.83	3.08
Riparian woodland (alder, pine, bird cherry)	42.35	2.25
Mesic broadleaves	35.66	1.90
Policy woods	27.57	1.47
Misc scrub	17.22	0.92
Acid oak and birch	9.79	0.52
Sub-montane scrub (pine, dwarf willow and juniper)	3.9	0.21
Other land: tracks, open water, buildings	2.13	0.11
Total	1878.98	100

Key to the significance of Caledonian pinewood are the rare species associated with it, such as twin flower, intermediate wintergreen, single flowered wintergreen, narrow headed ant, crested tit and capercaillie, along with several species of bryophytes, fungi and invertebrates, many of these species are represented in the Rothiemurchus woods.

FOREST MANAGEMENT; VISION, AIMS, OBJECTIVES

The national and international significance of the pinewoods, their significance in the landscape, the cultural heritage of the area and the aspirations of the Grant family to sustainably manage the estate all combine to set the vision, aims and objectives for the woodland.

The long-term vision for the forest is that at least 60% of the forest area will be managed as Caledonian and other native woodland; that this area is regenerating, with high structural and age-class diversity and delivering the ecological functions appropriate to meet biodiversity action plan objectives for species and habitat conservation. As well as delivering conservation services the forest will be enjoyed by many thousands of visitors and support sustainable livelihoods for the owners, employees and associated contractors.

In addition to forest management being compliant with the UK Forestry Standard (UKFS), all forest areas (except where Government approval has been given for conversion to non-forest use) will be independently certified under the UK Woodland Assurance Standard.

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The Key aims are to:

- Combine ecological sustainability with economic and social sustainability
- Engage visitors in sustainable land management - by welcoming them and promoting understanding, appreciation and enjoyment of the estate environment.
- Enhance Forest Habitat Networks
- Increase the sequestration of carbon through sustainable forest management
- Maintain and enhance the character and quality of the landscape

The objectives are set out in detail in Section 1 of the Forest Plan.

The rational and principles for forest management activity have been informed by the Woodland Biodiversity Action Plan, the Rothiemurchus Forest Framework and the management statements for the relevant SSSI's. Activities are based on the needs of key pinewood species and identification of habitats that will be managed to reverse previous fragmentation of the forest. It is accepted that, in many areas, felling and timber production is a necessary part of conservation and recreation management. Thinning and coup felling can introduce structural diversity into a woodland, improve light levels for objectives relating to the field/shrub layer and stimulate natural regeneration of tree species. The habitat management areas identified at the sub-compartment level are listed below with a brief description of the level of management expected in these areas:

- Core Old Growth – minimal intervention, monitoring only, removal of exotics.
- Extension Old Growth – low intervention, deadwood creation to 40m^3/ha, removal of exotics, enhancement of minor species. Will include elements of riparian woodland where management will improve broadleaf component.
- Extended Rotation Woodland – deadwood creation to 20m^3/ha, timber harvesting and thinning to create structural diversity with felling coupe rotation lengths greater than 120 years, management of exotics.
- Timber Production – rotational timber harvesting largely based on systems that will maintain the forest environment (continuous cover or alternatives to clearfell) where practical; deadwood creation to 5m^3/ha, may include non-native species outwith designated areas.
- Policy woodland – managed for landscape/amenity objectives with a wide variety of tree species, both native and introduced, rotation lengths according to location in landscape and proximity to buildings, deadwood component as appropriate.
- Woodland Expansion – monitoring of regeneration.
- Bog Woodland – no intervention, monitoring only.
- Sub-montane woodland – no intervention, monitoring only.
- Open Ground – management for landscape/amenity objectives, to maintain important conservation features and to aid control of deer numbers.

Within all of these areas, as appropriate, the enhancement of minor species, such as aspen and holly will be prioritised.

Coniferous plantation areas on Creag Phitiulais and Ord Ban have separate management prescriptions due to their significance in the landscape and options to convert parts of them to native woodland.

Similarly policy woodlands, especially within the Doune designed landscape also have specific management requirements to reflect their role within the landscape of Strathspey.

ARCHAEOLOGY

There are three, Scheduled Ancient Monuments (SAMs) relevant to the forest plan area:

- Loch an Eilein Castle (ruin on island, possibly originating in the 15th C, with several periods of development);
- Doune Motte (possibly an ancient defensive site);

- Balvattan (field system with hut circles, possibly Bronze-age).

Operational work plans will show known archaeological sites, and these will be marked on the ground with an appropriate buffer zone for the duration of operations. If known sites could be affected by operations, the Archaeology Unit of The Highland Council will be notified. In the case of scheduled monuments, Historic Environment Scotland will be notified and if relevant the appropriate consents applied for. The Forestry Commission's Forestry and Archaeology Guidelines will be followed and relevant legislation complied with. If previously unknown archaeological sites are discovered during woodland operations these areas too will be taped off and The Highland Council notified.

ACCESS & RECREATION

The general public places considerable value on the cultural and natural heritage, landscapes, facilities and attractions of Rothiemurchus. With an estimate of over 380,000 visits per year, of which more than 50% are staying away from home and 95% are from outwith the local community[1], the promotion of responsible access to visitors on arrival is critical for Forest Management and public enjoyment.

The public uses Rothiemurchus Forest formally by way of managed tours, walks, activities and educational trips, and informally; principally for walking and cycling. This level of use contributes to the local and wider economy and healthy living, but places substantial demands on the forest environment and its ability to deliver all these benefits, which people have come to expect. Forest Management at Rothiemurchus recognises this, and the management treatments proposed in this plan aim to ensure that the forest will be able to deliver.

The Recreation Management Plan accounts for the changing patterns of use of the forest by the public. This strategic document will detail how the changes resulting from recreation will affect the woodlands, and how the impacts will be addressed. There will be opportunities to monitor visitor numbers, to add value to the visitor experience by promoting the Forest Plan through interpretation, to schedule track repairs, to collect litter, to assess dangerous trees etc.

FOREST ROADS

There is no requirement for new roads to meet the Forest Plan objectives. However, very few of Rothiemurchus' internal forest roads were designed with modern harvesting vehicles in mind. Minor modification will be phased according to need and detailed plans will include both tree works and improvements to the roads themselves. This seeks to minimise the ecological impacts and to avoid unnecessary expenditure. The existing character of the roads and tracks, which meander between trees or adjacent to a river, will maintain the attractiveness and appeal of these routes for recreational access. Prior to any road up-grading works being carried out detailed plans will be submitted to FCS using their Environmental Impact Assessment (EIA) "determination enquiry form".

Management of forest Natura 2000 sites should not lead to a decline in the forest conservation status of habitats or species (European Commission[2], 2003). To this end, some tracks and old sections of road were re-instated during 2006-2010, to mitigate against the impacts of future upgrades to sections of the forest road network. This is additional to the considerable habitat gains that will be achieved through implementation of the Forest Plan.

DEVELOPMENT

The creation of the new community of An Camas Mòr consisting of up to 1500 homes and associated work and community space at Cambusmore within an area of some 100ha of

[1] Rothiemurchus 2013 Recreation Plan survey data. CNPA/Progressive Cairngorms Visitor Survey 2015, interim report

woodland is a major consideration. Having received outline planning permission in 2014, detailed plans are being prepared, which include recreation, landscape and compensatory habitat management designed to enhance surrounding woodlands. These have been considered in the preparation of this plan.

Two smaller developments are proposed for other woodland sites; one on the former sawmill site at Inverdruie and the other to improve the campsite at Coylumbridge.

FORESTRY EMPLOYMENT

Rothiemurchus Estate has employed a Forester since May 2003, as part of its commitment to ensuring a consistent and long-term approach to identifying opportunities and meeting objectives at both strategic and site level. This is the Estate's preferred approach to management of this remnant of the Ancient Caledonian Pinewood.

The forester is supported by the maintenance team and recreation rangers where appropriate, but significant operations are largely undertaken by forest contractors.

DEER MANAGEMENT

Deer management on Rothiemurchus covers the whole estate, not just the woodland area, but it is included within the forest plan as a key component of forest management. Deer management on the estate is also strongly influenced by the deer management activities of neighbouring estates; more so now that the Upper Rothiemurchus Forest is managed by Forest Enterprise. Liaison on deer management between estates is largely done through the Cairngorms and Speyside Deer Management Group. Red and roe deer are resident species and, very rarely, Sika deer will be encountered on the estate.

Deer fencing has been largely removed from the estate except the key strategic fence-line to separate hill ground from farmland areas. This fence has now been marked to prevent woodland grouse collisions with the fence.

Long-Term Vision

Rothiemurchus aims for the full integration of objectives in relation to the management of wild deer, through the application of sound knowledge and Best Practice, leading to the enhancement of the Natura 2000 interests.

Management Statement

Deer are an important element of the biodiversity of the forest. They are also important for our cultural heritage, wildlife tourism and for venison. They contribute in many ways to the public benefit derived from these designated sites.

Rothiemurchus' deer management practise is designed to reflect this and to ensure that deer continue to populate these woodlands and hills in numbers, which enhance these values. Deer Management at Rothiemurchus aims to:

- Enable the ongoing expansion and enhancement of the Pinewood by natural regeneration, at levels commensurate with a wide range of management objectives and in line with European requirements
- Maintain balanced populations of healthy wild deer based on sound knowledge and Best Practice
- Achieve successful establishment and promote enhancement of planted woodlands, including restock sites
- Protect agricultural and farm land against damage from wild deer
- Provide employment and sustain the viability of stalking and its contribution to the rural economy
- Maintain the sporting heritage of Rothiemurchus

- Manage the cull so that deer may still be seen by the public
- Provide quality venison for processing and retailing
- Exclude non-indigenous species such as Sika deer

Objectives

Control of deer numbers by shooting, in season to ensure sustainable forest habitats including:

- a vegetation under-storey (shrub layer) over more than 20% of the Pinewood area (Scottish Natural Heritage, 2003[1]);
- on-going expansion of the forest area through natural regeneration, including the establishment of woodland habitats towards a climatic tree line above 500m amsl and re-stocking of felled areas within 15 years of felling;
- more than 75% of established Scots pine seedlings achieving positive leader growth each year;
- Establishment of Native Broadleaves (including natural regeneration) with > 75% showing positive growth each year;
- Establishment of other conifer species within timber production areas (see habitat networks) with > 90% showing positive leader growth each year;

In addition:

- Sika deer to be culled immediately using safe and legal means
- Utilise deer fences to protect plantations or regeneration if necessary as a contingency measure. These need to be well marked in areas utilised by woodland grouse and removed when they have served their purpose.

DELIVERY

Delivery of the Forest Plan is dependent on the availability and cost of suitable contractors, timber values, public contribution towards non-market benefits, voluntary contribution and the weather.

1 ROTHIEMURCHUS PROPERTY INFORMATION

1.1 Applicant, Ownership, Payee, Contact Details

1.1.1 Name of Applicant

JP Grant, Rothiemurchus, Estate Office, by AVIEMORE, PH22 1QH

1.1.2 Ownership

Rothiemurchus has been managed and occupied by the Grant family since 1574 and current ownership of the main woodlands is shared between family members, either individually or through trusts. All parties have agreed to work together in the preparation and implementation of this plan and to manage the woods as a single entity.

Map 1: Rothiemurchus Ownership & Tenancies shows the Rothiemurchus boundary, the Grant woodland ownerships, farm and forest leases and significant land holding neighbours.

1.1.3 Payee

J.P. Grant, Rothiemurchus, Estate Office, AVIEMORE, PH22 1QH

1.1.4 Contact

Piers Voysey, Forester, Rothiemurchus, Estate Office, AVIEMORE, PH22 1QH

1.2 Property Details

1.2.1 Location and Extent

Rothiemurchus is situated in Badenoch and Strathspey in Inverness-shire. The forest plan area covers some 1900ha to the East of the River Spey by Aviemore and forming two main blocks. The main block of woodland extends from the River Spey (West), Loch Pityoulish (North) to Moormore (East) and Loch Gamhna (South). The other main block is around Rothiemurchus Lodge, extending around the lower part of Castle Hill. An Additional small section of woodland is within the upper part of Am Beannaidh as it leaves Gleann Einich. The forest area is continuous with woodland at Pityoulish, Inshriach, Glenmore and the Rothiemurchus woodlands owned by Forestry Commission Scotland (Upper Rothiemurchus Forest).

Map 2: Rothiemurchus Location shows the Estate in the context of the northern Cairngorms and Badenoch and Strathspey and illustrates the connectivity of woodland within this area.

1.2.2 National & International Significance, Designations and Management Agreements

The Cairngorms form the largest mountain range in the British Isles, and the diversity of features, habitats and the extremes of climate make them unique. This has been recognised at the highest levels across the European Union and the United Kingdom.

At EU level, Directive 92/43/EEC (the “Habitats Directive”) set the goal of establishing a European network for nature conservation, called Natura 2000, consisting of Special Protection Areas (SPAs) under the Birds Directive 79/409/EEC and the Special Areas of Conservation (SACs) under the Habitats Directive (European Commission[1], 2003). The Cairngorms SPA, Cairngorms SAC and River Spey SAC give the highest levels of protection to much of the woodland area (see Map 4: Rothiemurchus Natura 2000).

At UK level Sites of Special Scientific Interest are: Cairngorms SSSI, Northern Corries SSSI, North Rothiemurchus Pinewood and River Spey SSSI (Map 3: Rothiemurchus SSSI). Appendix 1 shows the Site Management Statements for the SSSI natural heritage designations

Approximately 1170ha (61%) of the forest plan area is within SSSI, or SAC boundaries.

The whole of Rothiemurchus lies within the Cairngorms National Park and Cairngorm Mountains National Scenic Area.

The Doune of Rothiemurchus Designed Landscape (Map 7) recognises the important ornamental landscape character associated with the 18C Doune.

Scheduled archaeological monuments and other archaeological sites are shown on Map 8:

Designated Core Paths and rights of Way are shown on Map 10.

Extant Management Agreements are reproduced in Appendix 2. These include:

The Rothiemurchus Concordat, which outlines a framework for partnership working between Rothiemurchus Estate and the Government's public agencies to sustain and enhance the important landscape, culture and habitats of Rothiemurchus.

The Capital Transfer Tax Exemption Agreement (December 1982) sets out management objectives and constraints required to secure the scenic and scientific interests of property within the agreement, although half of the forest land referred to is now outwith the Estate's ownership.

The Highland Regional Council Tree Preservation Order No 12, Coylumbridge (Map 9, App 2-3) prohibits felling, lopping, topping, uprooting, damage or destruction of any tree contained within the subjects without the consent of the Planning Authority.

1.2.3 Woodland Context

The lower ground in the parish of Rothiemurchus has historically been heavily wooded, a trait which continues to the present day. Woodlands are prevalent to the north of the Estate, on the better soil types and at lower elevations.

Map 13 shows the different woodland types present on the estate

The forest plan area includes an element of the Caledonian Scots pine remnant within Rothiemurchus Parish, which has long been considered one of the finest, and which was recorded as 1759ha in the Caledonian Pinewood Inventory (Anon, 1994). (See Map 6.) The term "Caledonian pinewood remnant" refers to those descendants of Scots pine (*Pinus sylvestris* L. var *scotica* Schott) which emanated from the post glacial pine forests (Dunlop, 1994) and which "descended from one generation to another by natural means" (Steven & Carlisle, 1959). There are populations of species associated with these woodlands, which are found nowhere else in Britain.

Plantation woodland is important at Rothiemurchus, with the potential to generate multiple benefits and provide habitat linkages for wildlife. Similarly, the Policy woodlands of the Doune form a significant part of the Rothiemurchus woodland estate.

1.2.4 Woodland Extent

The area of woodland under this plan extends to 1878.98ha. Much of this falls under the Ancient Semi-Natural Woodland classification, with the Pinewoods forming the greatest, single component. The Caledonian pinewoods of the Cairngorms are greater in total area and individual size than anywhere else in Scotland (Cosgrove *et al*, 2002), representing part of the most extensive area of boreal forest in the UK. The area of woodland is increasing at Rothiemurchus, as natural regeneration becomes successfully re-established at the woodland edge.

There are some 209ha of mixed species plantation at the thicket, pole maturing and felled stages on land formerly occupied by woodland heath and scrub. The woodlands of the Doune comprise a range of native and introduced tree species.

In addition, there is one plantation of 26ha, planted in the 1970s, that is leased to another forest management business, with Rothiemurchus retaining the deer management rights and responsibilities within this area.

1.3 Long-term Vision, Forest Management Aims and Objectives

The long-term vision for the forest is that at least 60% of the area will be managed as native, or Caledonian woodland; that this area is regenerating, with high structural and age-class diversity and delivering the ecological functions appropriate to meet biodiversity action plan objectives for species and habitat conservation. All forest areas will be managed to standards consistent with the UK Woodland Assurance Standard and as well as delivering conservation services they will be enjoyed by many thousands of visitors and support sustainable livelihoods for the owners, employees and associated contractors.

The strap-line for visitor interpretation is “Rothiemurchus - Loved by many, cared for by you”. This emphasises the visitor management philosophy of identifying the role of every visitor in helping to care for Rothiemurchus.

Key aims:

- Combine ecological sustainability with economic and social sustainability
- Engage visitors in sustainable land management - by welcoming them and promoting understanding, appreciation and enjoyment of the estate environment.
- Enhance Forest Habitat Networks
- Increase the sequestration of carbon through sustainable forest management
- Maintain and enhance the character and quality of the landscape

Forest Management at Rothiemurchus aims for the full integration of woodland and habitat management through delivery of the Local Biodiversity Action Plan, applying the principles of the Rothiemurchus Forest Framework in line with the Cairngorms National Park Forestry and Woodlands Strategy and recognising its role within the Forest of Spey landscape and sympathetic to neighbours’ objectives.

The highest levels of national and international site protection, including Natura 2000 designations under the Habitats Directive, will be upheld through the appropriate planning, timing, and control of all forest operations. Stringent safeguards will be applied to ensure there is no degradation of site interests. The principles and standards identified for the management of the Natura 2000 sites may also be adopted for other areas of the Pinewood, which are not similarly designated.

The Rothiemurchus Forest Plan serves to collate the data, information, facts, findings and issues arising from other documents, studies, reports and plans for the whole Rothiemurchus woodland estate. Its purpose is to inform management and relevant parties of the timing, location and scale of woodland operations so that the forest and woodlands will be able to meet management objectives indefinitely, including being able to adapt to unknown future demands, including climate change. This policy will be implemented through a process of temporal, spatial and structural silvicultural interventions. This Forest Plan applies management objectives and time scales appropriate to stand type and function.

Rothiemurchus Forest will continue to employ a professional forestry service in order to maintain the high quality of management appropriate to this significant woodland resource.

Aim	**OBJECTIVES**	**PERFORMANCE INDICATORS**
Combine ecological, environmental, economic and social aims in a way that all management contributes positively to all aims.	Strong local support for forest management plan	Representation at community meetings re operational plans, local employment and appropriate development
		Local employment levels and support for local enterprise
	Enhance recreation, and wildlife values.	Viable Rothiemurchus business model. Grant funding secured to support delivery of public benefits.
	Enhance value of timber products and develop non-timber benefits of woodlands	Harvesting operations carried out at no net economic loss. Compliance with UKWAS
	Identify & maintain important woodlands for stock and crop shelter, increase effectiveness and continuity of shelter.	Agricultural viability & diversity
Engage visitors in sustainable land management through giving confidence by welcoming them and promoting understanding, appreciation and enjoyment of the estate environment.	Through the whole estate team communicate with visitors through a wide range of media (signs, information boards, leaflets, maps, other publications, website & social media):	
	Promote Rothiemurchus' sustainable access policy in line with the Scottish Outdoor Access Code according to the Land Reform (Scotland) Act 2003:	Enable feedback and monitoring of visitor numbers and satisfaction levels. Production and distribution of Rothiemurchus leaflets and sales of guide maps. SOAC promoted in all Estate interpretation media.
	Promote sustainable access in line with local social and economic needs: - Maintain the Friends of Rothiemurchus scheme - Maintain a network of formally promoted carparks, picnic areas and waymarked access routes along estate management tracks.	Representation at community meetings. Liaison with business & special interest groups. Grants and other income in place to support provision & maintenance of high quality recreation infrastructure. Delivery of events aimed at local residents. Liaison with Forest Enterprise as principle neighbours.
	Promote the understanding and enjoyment of visitors in relation to the estate's	Accordance with Rothiemurchus marketing and interpretation strategies.

Aim	OBJECTIVES	PERFORMANCE INDICATORS
	natural and cultural heritage and management operations:	Sustained draw of school and other group visits, Blog posts, website, twitter and Facebook presence maintained. Consistent, key messages agreed. Numbers of guests on guided activities.
	Protect/restore condition of promoted paths affected by forestry operations	Comprehensive planning well in advance. Planning and consultation with key estate staff. Sufficient and comprehensive warning and advisory signs, including use of other media.
	Manage public access according to best practice; with a special focus on events management & fire protection	Visitor numbers in excess of 300,000. Staff numbers. Record of access “incidents”. Sustainability & functioning of campsite & youth campsite.
Enhance Forest Habitat Networks	Manage deer, brown hare & rabbit populations at levels commensurate with achieving woodland regeneration & expansion.	Area of open ground in compartment records being replaced by woodland types. Target browse levels achieved. Zero rabbits.
	Ensure regeneration of riparian woodland and broadleaf species, especially within the River Spey SAC. (Flood control & river bank stabilisation)	Increased area of alder, aspen and other broadleaved species in forest records
		Aspen stands with established regeneration
		Gaps between birch stands less than 2km
	Viable populations of BAP species	Work towards delivery of the Cairngorms Nature Action Plan (LBAP) & UK BAP, support delivery of the Cairngorm Capercaillie Framework – signs of capercaillie on Rothiemurchus increasing in frequency, large, contiguous areas of suitable habitat, no additional, unplanned access routes
		Gaps between established old growth areas all less than 0.5km, Old growth areas make up

Aim	OBJECTIVES	PERFORMANCE INDICATORS
		22% of forest. Each old growth area at least 10ha in extent. Forest certified under UKWAS.
		Deadwood component targets achieved
		Species and age class distribution 'normal'
		Development of sub-montane scrub at natural upper treeline.
		Working within designated site management plans & compliance with Natura 2000 principles – sites in favourable condition.
		Liaison with FE and SNH re operational plans.
	Increase level of understanding of woodland processes.	Facilitate research and site condition monitoring requests. Maintain detailed forest records.
Increase the sequestration of carbon through sustainable forest management.	Increase the sequestration of carbon through sustainable forest management	Old growth makes up 22% of forest area. Extended rotation woodland area Use of low impact silviculture Use of high yielding species where appropriate. Increased stocking densities in open woodland.
		No disturbance to forest bogs and wetland
		Deadwood targets achieved
		Prevent forest fires
Maintain and enhance the character and quality of the landscape	Identify and retain important view points	A range of views of the Forest, Hills, traditional and attractive buildings, rivers and lochs.
		Effective visual screening of less attractive buildings and roads from popular locations in Rothiemurchus
	Maintain geographical and physiographical features	Gravel pits and borrow pits identified and agreed with SNH / CNPA
	Improve woodland internal views and road / trackside corridors.	Structural diversity and old growth, management of damaged trees, care with placing extraction racks.

Aim	**OBJECTIVES**	**PERFORMANCE INDICATORS**
	Improve external woodland shape where straight line boundaries have been followed in the past	Distinct identity of integrated land use
	Identify and manage estate's cultural heritage	Protection of scheduled ancient monuments. Identify and protect all archaeological structures, features and other remains of local importance during operations
		Maintain the Doune Designed Landscape
	Improve the role of woodland in reducing noise pollution	Enhanced woodland along the Spey and old river terraces.

2. ROTHIEMURCHUS FOREST ENVIRONMENT

2.1. Historical Background

The first trees to colonise the lower slopes of the Cairngorms after the retreat of the last Ice Age 10,000 years ago were Birch. Scots pine in Scotland is believed to have originated from the Loch Maree area of the north-west, reaching Strathspey by around 5500BC, though it soon became the dominant species in the Boreal period. Its tolerance of poor site conditions, in terms of soil type, drainage and climate, and its ability to adapt and regenerate, contributed greatly to its success.

The Neolithic Period saw human settlements, which resulted in some localised forest clearance around 1500BC, and there were further disturbances from 500 to 1000AD. Apart from the establishment of clearings for agriculture, Rothiemurchus Forest appears to have satisfied mainly local needs for timber, including for buildings, implements and fuel during that time.

Rothiemurchus Estate has been held by the Grants of Rothiemurchus since the 16th Century, and during the intervening period the woodlands have had a varied history of husbandry. The area has historically been heavily wooded and the oldest continuous records, dating back to the mid 17th Century, confirm that felling for timber production took two main forms from 1650-1800:

- efforts by the Estate to supply southern markets
- more continuous movement of timber for local use

The former probably had little impact on the woods, while the latter is likely to have had a profound effect, altering both their structure and character (Smout & Lambert, 1999).

A second identifiable period of felling commenced early in the 19th Century at Rothiemurchus. Felled timber continued to be floated out using a series of dams and sluices down to the River Spey and then onwards to markets in Garmouth and the north east. This felling was characterised by pulses of heavy production by the estate, nearly reaching clearfell proportions at least once (Smout & Lambert, 1999). From 1840 came the first attempts to practise woodland management. Dykes were built as a boundary between grazing land and forest. The woodlands were divided into systematic blocks, and felling concentrated therein. In the late 1800s, commercial planting commenced in the low-lying areas and use of the Spey for timber transport declined. This period also saw control of livestock in the woods, and the forest regenerated from the large coarse seed trees, which were left.

In the 20th Century, following felling and food shortages during the two world wars, the emphasis was on sheep grazing before shifting towards natural regeneration of open ground and conservation (Smout & Lambert, 1999).

Visitors may be left with the impression that the pinewood of Rothiemurchus is an untouched wild wood, but this is a myth. In fact the Rothiemurchus woodlands exist today because of their ability to regenerate, having probably been clearfelled twice, and not because they were spared by the axe (Smout & Lambert, 1999).

2.2. Physical Environment

2.2.1. Climate & Weather

Scotland's climate is cool, humid and heavily influenced by its proximity to oceans. The Ecological Site Classification identifies the majority of pinewoods, including Rothiemurchus, as being in the cool-wet climatic zone (Pyatt *et al*, 2001). However there is a marked climatic transition from east to west, with the Eastern Highlands featuring a more continental influence than the west. Accordingly, the weather of the Cairngorms is characterised by

moderately wide seasonal temperature extremes, with a mean July temperature of 18.7°C and a mean December temperature of 1.3°C.

The Met Office averages (1981-2010) for Aviemore are as follows:

	Max temp (^{o}C)	Min temp (^{o}C)	Days of air frost	Sunshine (hours)	Rainfall (mm)	Days of rainfall >= 1mm	Mean wind speed (10m above ground level) (knots & km/h
Annual	11.4 (Jul=18.7)	3.5 (Dec=1.3)	88.7	1205	977.1	162.8	7.1 13.15

Source: http://www.metoffice.gov.uk/public/weather/climate/gfjm2yj30

Heavy snow falls are now rare, but when they do occur, as with high wind events, they can lead to significant structural failure in trees.

The long-term forecast is that climate change (global warming) will have the following impacts on the UK climate:

- Modulating seasonal variation with milder winters and increasing average annual temperature;
- Drier summers, wetter winters
- Increase high wind events and
- Increase high rainfall events

As to what sort of weather Rothiemurchus receives each year, much depends on how global warming affects North Atlantic Drift and jet streams crossing the Atlantic, but the impact of steadily rising temperatures so far has been noted by ecologists with Spring starting earlier and Autumn starting later. (http://www.metoffice.gov.uk/climate-guide/climate-change)

2.2.2. Geology

Sediments believed to have been deposited 750-500 million years ago during the mountain building phase of the Caledonian Orogeny, metamorphosed into Caledonian schists and gneiss. 500 million years ago, these sediments were heaved up into mountain ranges similar in size to the European Alps of today. As magma rose beneath the schists, granite bosses were formed at the roots of these mountains. The granite cooled and solidified slowly deep below the earth, resulting in its crystallised coarse state. The granite was then exposed as the schists became eroded, forming the Cairngorms. These mountains, with their granite core and corrie scars, are in deep contrast to the Monadhliath range, to the west of the River Spey, which was carved from uniform layers of mica schists and is almost devoid of corries and features, and is clothed in peat and moorland.

Mica schist and siliceous granulites of the Central Highland Granulites form the underlying rocks for most of the pine forest. To the north and north-west of Loch an Eilein, where birch has been dominant there are gneisses and schists, plus some crystalline white marble and calc-silicate rock (Steven & Carlisle, 1959).

2.2.3. Soil Types

The underlying rocks are highly porous, and weathering caused by the freeze-thaw cycles of the present climate has readily broken these rocks down into coarse soils. The high silica content, allied with low soil temperatures and low nutrient status limits microbial activity, resulting in very slow decomposition of organic matter.

The soils on the main plain are largely of glacial derivation, and nearer the River Spey fluvio-glacial sands and gravels predominate. They are mainly freely draining, except where affected by underground springs, iron pans or induration. When they occur in depressions, gleys predominate.

Map 12: Rothiemurchus Soils, may be used in conjunction with the table overleaf, which is an excerpt from the National 1:250,000 Soil Map Legend (MLURI, 1982) with suggested soil codes (John Bell, pers com) to enable direct conversion with the classification used by the Forestry Commission (Pyatt, 1982).

Soils Key (Source: MLURI, c1982; John Bell, pers com)

PARENT MATERIALS	MAP UNIT	FC CLASSIFICATION	COMPONENT SOILS	LANDFORMS	VEGETATION
Recent riverine & lacustrine alluvial deposits	1	1v; 1vc 7bv; 7bvc 6v where peaty alluvium	Alluvial soils	Flood plains, river terraces & former lake beds	Arable & permanent pastures Rush pastures & sedge mires Broadleaved woodland
Organic deposits	3	10a 10b if sphagnum present	Basin & valley peats	Basin & valleys	Blanket & flying bent bog Swamp, sedge mires & rush pastures
Drifts derived from schists, gneisses, granulites & quartzites, principally of the Moine Series	20	3; 3x; 3c 1; 1u; 1c 7 6; 6p	Humus-iron podzols; some brown forest soils, noncalcareous gleys and peaty gleys	Undulating lowlands & valley sides with gentle & strong slopes; non-rocky	Arable & permanent pastures Dry boreal heather moor Acid bent- fescue grassland
	28	11b,c; 4z; 4zp 3; 3x 6; 6p 13p	Peaty podzols, humus-iron podzols; some peaty gleys & rankers	Hills & undulating lowlands with gentle & strong slopes; moderately rocky	Boreal & Atlantic heather moor Heath rush – fescue grassland Rich bent-fescue grassland
	30	13; 13z; 13p; 3p; 3; 3x; 4zp; 8c/d; 11b,c if peat occurs 6; 6p	Rankers, peaty podzols; some humus-iron podzols & peaty gleys	Rugged hills with strong & steep slopes; very rocky	Dry & moist boreal heather moor Bog heather moor Blaeberry heath
Fluvioglacial and raised beach sands and gravels derived from acid rocks	100	3; 8c/d 5p for peaty gleys 5h for humic gleys	Humus-iron podzols: some peaty gleys & humic gleys	Mounds & ridges with gentle to steep slopes	Acid bent-fescue grassland Atlantic & boreal heather moor Rush pastures & sedge mires
	101	3p or 4zp for peaty podzols 3 8b/c	Peaty podzols: some humus-iron podzols: and peat	Mounds, ridges and terraces with gentle to steep slopes	Atlantic & boreal heather moor Blanket bog Oak & birchwood
	123	3p or 4zp 8b/c 6, 6p	Peaty podsols, peat, peaty gleys	Hummocky valley and slope moraines: often bouldery	Moist boreal & Atlantic heather moor. Flying bent grassland Bog heather moor and blanket bog
	134	11a;11c 14; 14h 13; 13p	Subalpine soils: some peat & rankers	Mountains with gentle to very steep slopes: non- to very rocky	Mountain heath communities Upland bent-fescue grassland Stiff sedge -fescue grassland
	137	13; 13p	Rankers, lithosols: some alpine soils	Mountain summits with strong to very steep slopes: very rocky	Blaeberry & bog whortleberry heath. Alpine lichen heath Alpine clubmoss snow-bed
Partially sorted gravelly fine sands derived from acid schists and granites	172	3; 3c 5; 5p 4zp; 3p	Humus-iron podzols: some gleys & peaty podzols	Undulating lowlands and hills with gentle and strong slopes	Arable & permanent pastures Dry boreal heather moor

2.2.4. Topography

The River Spey has cut deeply into the schists and granite of the massif, and ice sheets have deepened and broadened the Spey valley to form the 'strath'. The fluvioglacial kame-like hummocks interspersed with kettle holes and poorly drained flats are characteristic of this area.

2.2.5. Elevation

Rothiemurchus spans an elevation range of nearly 1100m (3600 feet), and the extensive forest zone may be found over a considerable proportion of this. From the Riparian woodlands at 210m (690 feet) above sea level by the River Spey at the northern boundary to the sub-montane scrub found in excess of 600m (1980 feet) on the edge of the Cairngorms plateau.

2.2.6. Aspect

Rothiemurchus is situated at the northern edge of the Cairngorm mountains, so the prevailing aspect is northerly, but given the varied topography, especially closer to the Spey, some Southerly aspects are encountered.

Ord Ban, which rises sharply between the River Spey and Loch an Eilein, has woodlands facing every aspect, and at the northern end of Rothiemurchus in the Guislich and Pityoulish areas southerly and south-westerly aspects are prevalent.

2.2.7. Stability

Damage to woodlands from wind takes two main forms: windthrow and wind snap. Although both are forms of natural disturbance, their effects can be devastating, particularly in terms of economics. In addition, the risk of wind damage can markedly restrict the range of available silvicultural options and rotations.

The Windthrow Hazard Classification (WHC) attributed critical and terminal heights to different management regimes as set out in the following table.

WHC	**Critical Height (m)**			**Terminal Height (m)**		
class	**Non-thin**	**Selective**	**Line thin**	**Non-thin**	**Selective**	**Line thin**
1	Unconstrained by windthrow			Unconstrained by windthrow		
2	25.0	22.0	21.0	31.0	28.0	28.0
3	22.0	19.0	17.0	27.0	25.0	23.5
4	19.0	16.0	14.0	24.0	21.5	18.5
5	16.0	13.0	12.0	19.5	17.5	15.5
6	13.0	10.0	9.0	15.5	13.5	11.5

(Source: Miller, 1985)

This should be put into context at Rothiemurchus, which features many mature stands of Scots pine on relatively infertile sites. In many instances, these stands have already attained their maximum height (between 16-21 metres) by Yield Class, so some of them, although having passed their critical height may never reach their terminal height, for the management regime and WHC applied. Similarly, for those trees on higher elevation or waterlogged sites (and thus at higher WHC), growth rates are even lower and similar patterns apply.

Many stands in the Pinewood currently remain wind-firm despite their age, so management will continue to monitor wind damage in relation to planned activities, and will accept that some damage is unavoidable and may even be beneficial, with respect to introducing new deadwood to a stand. Damage approaching 40% by stem numbers or area would necessitate a re-appraisal of coups, timing and treatments.

The successor to the WHC, ForestGALES, estimates the probability of windthrow or wind snap, rather than stating a height at which damage is likely to occur (Gardiner *et al*, 2004). This latter method has been used in the analysis for plantation restructuring.

2.3. Woodland Classification

2.3.1. Woodland Types

The woodlands in the Cairngorms are aggregated into seven main functional categories. The basis for this classification uses associated specialised flora and fauna, which reflect the habitat requirements of important species (Ratcliffe, Peterken & Hampson, 1998).

Woodland type	2015 Area (ha)	%
Scots pine, birch, juniper	896.09	47.69
Unstocked heath / acid grassland (largely tending to regenerate with pine)	577.45	30.73
Coniferous plantation	208.99	11.12
Bog woodland	57.83	3.08
Riparian woodland (alder, pine, bird cherry)	42.35	2.25
Mesic broadleaves	35.66	1.90
Policy woods	27.57	1.47
Misc scrub	17.22	0.92
Acid oak and birch	9.79	0.52
Sub-montane scrub (pine, dwarf willow and juniper)	3.9	0.21
Other land: tracks, open water, buildings	2.13	0.11
Total	1878.98	100

See Map 13: Rothiemurchus Woodland Types

There are frequent intergrades, at a full range of stocking densities, between these seven types, all of which are represented at Rothiemurchus. The largest part of this plan relates to management of the Caledonian Pinewood remnant. Since there are significant differences between the treatments for the Pinewood, particularly compared to the Plantation and Policy Woodlands, there are dedicated sections for these latter woodland types.

2.3.2. Woodland Structure

It is insufficient to describe the woodlands of the Cairngorms simply by type, since many of the species associated with them may depend on a stage, or several stages of woodland development (Ratcliffe *et al,* 1998). A classification of five woodland growth stages was developed as part of the Forest Habitat Network for the Cairngorms. In their work, Managing the Pinewoods of Scotland (2004), Mason *et al* use the four point classification based on height and age proposed by Oliver and Larson (1996).

The table below broadly ratifies these alternative classifications, allowing comparison:

Ratcliffe, 1998	**Mason *et al*, 2004**
Establishment	Stand initiation
Thicket	Stem exclusion
Pole	
	Understorey re-initiation
Maturing	
Old growth	Old-growth

See Map 14: Rothiemurchus Woodland Structure (Growth Stage), which includes categories for Unstocked and Uneven-Aged.

An equally important gauge of woodland structure is the stocking density. In naturally regenerated Scots pine as at Rothiemurchus, this is immensely variable. After several attempts to portray this using a measure of the density of stems per unit of ground area, it was decided to use the measure of canopy cover as a percentage of the ground area.

The following table may be studied concurrently with Map 15: Rothiemurchus Woodland Structure (Canopy Cover). The first column lists the mapped classes and the second column interprets what they actually represent. For example, mapped class 40 depicts a canopy cover of 21-40%.

Mapped Class %	**Actual Range %**
Unstocked	Unstocked
5	0-5
20	6-20
40	21-40
60	41-60
80	61-80
100	81-100

2.3.3. Woodland Condition

The Cairngorms Working Party Report (1992), referring to the Forests of Spey and Dee, considered that "much of the present forest is severely degraded in ecological terms. The past forest cover of the area was not extensively dense and uniform. It contained a variety of habitats including open mire systems and forest mires with stunted pine; areas of open heath, rock, scree and open water; and a mosaic of forest structures with a range of tree densities and age".

The woodlands of Rothiemurchus have been described by CRAGG (2004), "these habitats are in the main in good condition" and more broadly by Cosgrove *et al* (2002) "…the Cairngorms broad woodland habitats (are) generally in a better state of management than at any time in recent history".

After extended periods of heavy felling in the 19th Century and the early 20th Century, Rothiemurchus has embarked on an extended period of woodland restoration. This led to regeneration on areas where livestock was excluded, and many of the pole stage and maturing woodlands evident today stem from that era. However, until 1960 sheep and cattle were grazed throughout much of the forest (Collie, pers com), which hampered woodland regeneration in many areas. In addition, with the large increase in use for public recreation, the 20th Century saw several large fires and these have left their mark on large areas of the woodland at Rothiemurchus. Many mature Scots pine trees bear the scars of these historic fires, and the combination of fires and sheep grazing has shaped much of the forest as it exists today.

Direct habitat loss and fragmentation was an important issue affecting the 45 woodland Priority species in the Cairngorms (Cosgrove *et al*, 2002). Work by Ratcliffe (2001) found that, generally "fragmentation is one of the principal causes of losses in biodiversity" and …most importantly, the continuity between different forest types, and between different structural types within forests, has to some extent been lost".

Ratcliffe (2001) also commented on the lack of standing and lying coarse woody debris (CWD or dead wood). Since then, active management by retaining naturally killed trees, deadwood creation during timber harvesting operations, retention of over mature trees with components of deadwood in the crowns and protection from fire has improved the deadwood component in many stands.

The management statement for North Rothiemurchus Pinewoods SSSI refers to the condition of the native pinewood to be unfavourable (recovering), due to the presence of non-native tree species within the sample plots. Again, this is being addressed by recent management whilst also recognising the role that species such as Norway spruce and European larch can play in providing suitable habitat for notified species.

2.4. Caledonian Pinewood Ecology

Forest represents the highest development of natural ecosystem potential below the treeline and contains a great diversity of plants and animals (Cairngorms Working Party Report, 1992), especially if they are large in extent and have existed on a particular site for many years. However, the native pinewoods of today are mere fragments of the original Caledonian forest. Caledonian pinewood is listed as a priority habitat in the EC Habitat and Species Directives, recognising that it "is in danger of disappearing in the European Community and requires special and urgent protection measures to ensure its survival and subsequent enhancement".

The significance of this unique ecosystem merits the inclusion of a brief description of its ecology. This will serve to inform future management of the pinewood in terms of delivering to national and international obligations.

2.4.1. Tree Species

Scots pine (*Pinus sylvestris*) is the dominant tree, providing a matrix of long-lived and regenerating trees, widely spaced or close together, through which silver and downy birch are sometimes co-dominant or form patches of woodland where they dominate. Rowan is often more of an understorey species. Juniper scrub is widely spaced and dominates in areas exposed to high grazing pressure. Other tree species such as aspen and holly are represented in a few local situations, but might have been more widely distributed in a totally natural ecosystem. Native pinewood gives way to oak and hazel woodland on more fertile, valley soils.

2.4.2. Site Requirements

Scots pine (*Pinus sylvestris*) is the world's most widely distributed productive conifer (Steven & Carlisle, 1959), its range extending across Eurasia and North America, and from the Arctic Circle to the Mediterranean. It is a continental species at the edge of its range in Scotland, which has a predominately oceanic climate and it is more prolific in the Eastern Highlands of Strathspey where a more continental climate predominates (see 2.2.1 above). Scots pine is an adaptable species, is extremely frost hardy, and can often be found at elevations exceeding 460 metres above sea level. Within Rothiemurchus, Scots pine is common up to an elevation of 610m and forms a component of montane scrub up to 800m.

Freely draining slopes, such as the raised knolls of glacial moraines, riverbanks or hillsides at Rothiemurchus, are most favoured by Scots pine. The species does occur naturally on deep peat, but it is less well suited to water-logged soils. Preferred soils are podzols and peaty podzols, typically sandy in texture, infertile and strongly acid in reaction, with heath vegetation dominant.

Scots pine has a low tolerance to shade and does not regenerate readily in small forest gaps.

In nature, Scots pine occurs in predominantly uniform stands regenerating after catastrophic damage from fire, wind or flood and exposed gravel and thin surface vegetation with ample sunlight provides the ideal environments for abundant seedling establishment. Though uniform in structure, these stands are not necessarily even aged but may contain patches or individuals surviving from previous stands and from which the area was regenerated (Malcolm, 1995).

Scots pine trees can live for over 400 years but they cannot compete with successional species with greater shade tolerance on better sites. Where successional species are absent, on poorer sites, or in extreme climates, it remains dominant (Malcolm, 1995).

2.4.3. Natural Regeneration

Scots pine will regenerate successfully in canopy gaps of sufficient dimensions, in the presence of an adequate supply of viable seed falling on a suitable seedbed.

The male flowers of Scots pine blossom annually in May-June when they shed large quantities of pollen. The female cones differ in this respect by maturing over 3 seasons, and finally opening in January-February. Thus many trees bear female cones at all stages of maturity. The female cones contain the small winged seed, which is largely dispersed by the wind. Most seed lands 30-50m from source trees, or at a distance of up to twice the height of the seed tree (Douglas Malcolm, pers com).

The production and viability of Caledonian Scots pine seed varies substantially between different ancient native pinewoods and is correlated with latitude and longitude (Summers & Waddell, 2004). Seed yields from cones collected from 27 pinewoods during 1995 and 1996 were higher in eastern and northern woods than western and southern woods respectively. These results do not account for losses sustained through predation by Red Squirrels, Crossbills and invertebrates, but they have important implications for natural regeneration.

On suitable sites, Scots pine produces high numbers of cones and seed at 3-5 year intervals, with trees of 80-120 years of age tending to be the best producers (Cairngorms Partnership, 2001). On marginal sites, this frequency is likely to be lower.

Pine sites commonly feature high accumulations of organic matter, which may act as a barrier to natural regeneration becoming established. This can include dense heather, grasses, moss or a layer of un-decayed acid mor humus (Douglas Malcolm, pers com). The seedling roots consequently have difficulty penetrating through to mineral soil. The best natural regeneration of Scots pine occurs at the interface between the mineral and organic horizons, once exposed.

2.4.4. Seedling Establishment

On undisturbed sites with an accumulation of organic matter, growth of germinants is very slow initially, possibly due to the time taken for roots to penetrate to the soil mineral layer. Once this is attained, growth speeds up rapidly. For successful establishment and ongoing development of these germinants, protection must be afforded against the effects of browsers, and any remaining overhead tree canopy should be removed when seedlings attain approximately 0.5m in height (Matthews, 1989).

2.4.5. Natural Disturbance

The natural dynamics of Scots pine and birch forests are based on the “moving forest” principal (Dunlop, 1994), whereby the most prolific natural regeneration tends to occur on adjacent moorland, and unstocked areas within the forest. In short, Scots pine and birch act as pioneer species, opportunistic, shade intolerant, light-seeded and thriving on periodic disturbance (Malcolm, 1995).

There has been extensive regeneration of Scots pine onto unstocked areas at Rothiemurchus over the last 60-70 years, with the glacial moraines of the lower plains, and the riparian areas the first to regenerate, resulting in dense, relatively even-aged stands. These bursts of regeneration often followed large fires, such as occurred in the 1920s between Loch an Eilein and the Mineral Well. Regeneration has continued where deer and domestic stock levels have permitted, including on the poorly drained bogs and mires, but at lower stocking densities and much slower growth rates. This natural process still continues today but over longer time scales, primarily due to the cessation of forest clearance and the prevention of fires. All natural regeneration by native species adds to diversity, but where the resultant stocking levels are low and the time-scales are very long, the range of future management opportunities for these stands is limited.

Disturbance is important ecologically because of the implications for woodlands and their vegetation, particularly in terms of diversity, composition, structure and dynamics (Peterken, 1993) and this has led to the thinking that climax vegetation may not be the stable end-point of succession as was previously believed. Whilst the natural processes of competition, disease, old age and death do occur without large scale disturbance, they largely fail to

create the conditions required for natural regeneration within the woodland. Many stands of woodland at Rothiemurchus are characterised by the almost complete lack of recruitment of seedlings of any species in the under-storey. This has led to the situation currently encountered whereby there is a prevalence of relatively even-aged mature pine-dominated woodlands.

2.5. Habitat for Wildlife

Plant and animal species closely associated with pinewoods have hung on in Scotland in very isolated situations, due to the fragmentation of the Caledonian forest. These include twinflower, single flowered wintergreen, pine hoverfly, narrow headed ant, Scottish crossbill, crested tit and capercaillie.

The habitat requirements of many species and the ways that species interact are poorly understood. For example the role of insects in pollen and seed dispersal could be significant. Generally species fall into two main types: large wide-ranging animals with narrow niche requirements, such as capercaillie and red squirrel, and the more sedentary species with limited ability to disperse and narrow niche requirements, such as the saproxylic invertebrates and soil microfauna (Ratcliffe *et al*, 1998). For the former group, the spatial distribution of habitat patches and the structure of woodlands are usually more important than tree species. For the latter group, there may be requirements for particular woodland types or growth stages, or even dependence on particular tree species. If the forest can provide patches equivalent to the needs of the species with the largest minimum patch size, this should satisfy the requirements of a full range of species (Ratcliffe, 2001).

Wild deer are important in terms of the overall biodiversity of the woodlands at Rothiemurchus as well as for the valuable contribution they make to the rural economy. Chapter 12 Deer Management considers aspects of the population's distribution and dynamics, monitoring and control.

2.5.1. European Protected Species

Whilst a number of plant and animal species found within Rothiemurchus Forest are protected under Scottish and UK legislation and are the focus of UK and local biodiversity action plans (those receiving protection under European law are:

- All species of bat, but typically in Strathspey include: brown long-eared (*Plecotus auritus*), common pipistrelle (*Pipistrellus pipistrellus*), Daubenton's (*Myotis daubentonii*) and soprano pipistrelle (*Pipistrellus pygmaeus*)
- Otter (*Lutra lutra*)
- Wild cat (*Felis silvestris*) although no confirmed sightings on Rothiemurchus for over ten years.

2.5.2. Invasive non-native species, pests & diseases (Biosecurity)

Phytophthora austrocedrae is present and is affecting juniper. The impact of this fungus is being monitored by Forest Research

Dothistroma (red band) needle blight is also present and until its impact on Scots pine can be determined, current national policy means that Scots pine seedlings sourced from nurseries outwith Rothiemurchus should not be planted within or close to core areas of Caledonian Scots pine.

Chalara ash dieback is not yet present on the estate.

The presence of non-native garden escapes, e.g. rosebay willow herb, snow-berry and Spyria are currently limited and not regarded as a significant problem, but require management to contain or remove their potential impact.

Given the surrounding seed source of beech, Sitka spruce and other non-native tree species, seedlings of these species do occur within native woodland areas. Sycamore is well

established in some areas of native woodland, such as the Inverdruie woods close to the Spey.

Sika deer are established west of the Spey, but not yet in the western Cairngorms area.

2.6. Cultural Heritage & Archaeology

People have lived and worked in the Rothiemurchus Forest for centuries, consequently much of the area's cultural heritage is represented by the forest and its features. Many archaeological relics remain as evidence of ancient human settlements and workings, dating from prehistoric to post-medieval periods, and many sites were recorded during a survey undertaken in 1999, though never verified in the field by the Highland Council Archaeology Unit.

The most common cultural heritage sites across this area are medieval (or later) settlements such as cleared townships, abandoned farmsteads and their associated shielings, enclosures, cultivation remains, dykes, tracks and field systems. Many are minor agricultural or landscape features when considered in isolation, but combine to form historic landscapes of local importance (Kirsty Cameron, pers com). There will inevitably be others awaiting discovery.

The four Scheduled Ancient Monuments (SAM) and the archaeological sites listed in The Highland Council's Sites and Monuments Database (smr) for Rothiemurchus are shown on Map 8: Archaeology. Note that the map shows woodland and non-woodland sites.

2.7. Landscape

The outstanding landscapes of the Cairngorm mountains, and the lochs, rivers and forests, integrated with moorland and agriculture, are part of the attraction that brings the many tens of thousands of visitors to this area each year. Although much of this landscape has been created by nature, there are aspects of it, which have been very much influenced and shaped by human activity. Not least among these, are the various components of the Rothiemurchus Forest, which make a substantial contribution to the aesthetic and historic value of this part of Strathspey. They require particular attention when one considers the visual impacts of woodland management. Rothiemurchus is within the Cairngorms National Scenic Area, and the woodland compliment of the Doune is recognised by its Designed Landscape.

Woodland operations will be very much in the public eye and will impact on landscape values and visitor expectations. Careful planning will address their potential impacts. That said, there is a need to be innovative in the future restructuring of some of the plantations at Rothiemurchus, particularly the most visible amongst them, on Ord Ban and Pityoulish Hill (Section 8).

2.8. Access

There has been a long tradition of recreation in the Cairngorms and Rothiemurchus, though visitor management was not given a high priority when the Cairngorms National Nature Reserve was designated in 1954. In subsequent years, it was recognised that there should be a formal provision to manage access, so efforts were concentrated on directing visitors towards Loch an Eilein. The Visitor Centre opened there in 1972 following publication of the Countryside Commission Speyside Report 1970-71, and 1975 saw the establishment of the Ranger Service. Guided walks were introduced and a more proactive stance was adopted, in response to public expectation and demand (Smout & Lambert, 1999).

Currently, the number of visitors to the Forest is calculated to be upwards of 300,000 per annum, with year-round visits very much the reality (activity peaks in July/August with smaller highs at New Year, Easter and October holidays). This provides massive public benefit in terms of employment and income for local service and tourism-based businesses; a source of information, interpretation and education about the area's natural and cultural heritage; a chance for visitors to see nature and enjoy healthy recreation. The contribution, which

Rothiemurchus makes to the local economy was often over-looked and seldom properly quantified. The Cairngorm, Rothiemurchus and Glenmore Group Visitor, Visitor Infrastructure & Tourism Audit (2013) and the Cairngorms National Park Authority surveys 2010 and 2015 have started to try to measure this.

Visitors generate income for the estate too, both directly by participating in some of the estate's paid attractions, as well as indirectly through subsidies and grant contributions to help the estate look after the resource. Compliance with the Land Reform (Scotland) Act 2003 and the Scottish Outdoor Access Code requires maintenance of the Rothiemurchus Estate Recreation strategy and plan to ensure continued management and adequate service provision for recreation at Rothiemurchus. Plans account for the high levels of public access in relation to the effective management of biodiversity and the delivery of other woodland management objectives.

The claimed Public Rights of Way at Rothiemurchus and the designated core paths form part of a network of approximately 50km of tracks which are available and maintained for year round recreation.

2.9. Wayleaves

Map 11 shows the electricity transmission lines and wayleaves in the forest area, phone lines and water supplies, including private water supplies (managed by Rothiemurchus) and public water supplies managed by Scottish Water. Recent undergrounding of power lines by SSE has improved landscape values and reduced risk management conditions during timber harvesting works and has not significantly increased the area of forest land occupied by wayleaves.

2.10. Development Plans

2.10.1. An Camas Mòr

Map 16: A key feature of the Cairngorms National Park Local Plan (2010) is the development of a new community, An Camas Mòr (www.ancamasmor.com) on the East side of the Spey on Rothiemurchus Estate. Planning permission in principle was granted for the construction of a new community with up to 1500 homes and associated businesses and community facilities in March 2014 (Planning reference: 09/155/CP). Construction is expected to start in 2017 for a twenty five year period. The implications for the forest plan include:

- A significant area of woodland will be retained within the development as connecting habitat, landscape enhancement and for recreation, with some loss of productive plantation woodland and heathland tending to regenerate to pine/birch woodland;
- Adaptation of retained woodland and establishment of new woodland in the peripheries of the community to maintain visual screening, for habitat connectivity and recreation;
- Inclusion of compensatory habitat management (ref. S75 agreement) within the forest plan: 6.77ha lowland heath, 1 ha wet woodland, 23ha upland heath and 78.4ha of montane woodland.) Specific management plans for these sites are included in Appendix 6.

2.10.2. Loist Moor Sawmill

A proposal is being developed in partnership with the Highland Small Communities housing Trust to create 6 self-build housing plots within 1.14ha of woodland

2.10.3. Rothiemurchus Camp & Caravan Park

Rothiemurchus Camp and Caravan Park is a key part of the Estate's strategy to reduce wild camping and the associated risk of disturbance to wildlife and forest fire. It also increases the opportunity to interact with and inform forest visitors and to sustain employment in the tourist sector. The sustainability of the camp and caravan park depends on being able to respond to changes in market demand and contemporary standards. To this end the Estate plans to expand the site (over 0.9ha) to the South. The woodland character of the site will be maintained and the former domestic area of Lairig Ghru Cottage enhanced.

2.11. Approved Grant Schemes & Felling Licences

Ref Map 17, Woodland Grant Scheme areas)

WGS Number	Name	Date Approved	Type
517/92/PW9	Guislich	1 Apr 1989	WGS 1
030/000460	Glenmore	25 Mar 1994	WGS 2
030/000743	Pityoulish	13 Jul 1994	WGS 2
030/000801	Lochans	20 Jun 1995	WGS 2
030/000812	Drumintoul	17 Nov 1995	WGS 2
030/000813	Upper Tullochgrue	14 Sep 1995	WGS 2
030/000814	Inverdruie	26 Jun 1995	WGS 2
030/000816	Ord Ban	29 Aug 1995	WGS 2
030/000817	NNR (North)	26 Mar 1996	WGS 2
030/001149	Castle Hill	11 Mar 1996	WGS 3
030/001154	Cambusmore South	20 Mar 1998	WGS 3
030/001213	Cambusmore II	16 Feb 1996	WGS 3
030/001511	Guislich Farm	11 Dec 1997	WGS 3
030/001572	Guislich Farm (Drumintoul)	11 Dec 1997	WGS 3
030/31/98-99	Drumintoul	7 May 1999	FL
030/52/08-09	Doune Farm	18 Dec 2008	FL
5027553	Forest Plan preparation	2015	SRDP
Where WGS = Woodland Grant Scheme; FL= Felling Licence; SRDP=Scottish Rural Development Programme			

2.12. Public Consultation

Scoping for this revision of the forest plan was carried out between 5-21 May 2015 and responses are summarised as follows:

The scoping process has proved to be very useful; it has clarified the level and detail of public interest and enabled helpful discussion.

There has been a lot of work carried out since the last plan approval and updating, as listed in the report table is required. Feedback from stakeholders has indicated where the plan could be improved in terms of terminology and by cross-referencing to designated site plans and site condition monitoring; and to action plans or policy frameworks for particular species, e.g. capercaillie. New references will include, e.g.: Natura 2000 designated site management plans, as they become available; Cairngorms Nature Action Plan 2013-18; Cairngorms Capercaillie Framework; Cairngorms National Park Outdoor Access Strategy; UK Woodland Assurance Standard (3rd edition & 4th edition draft) and the Rothiemurchus Recreation Management Plan.

There was strong support for the current direction laid out in the forest plan's vision and aims, so the plan will continue to emphasise habitat enhancement (forest extent and diversity, including deadwood, with a particular focus on capercaillie) and management for recreation. Bog areas will continue to be protected from damage and important open ground elements identified within operational plans. Bio-security is the new subject to be addressed.

Implementation of the forest plan is a partnership effort that embraces the whole community. It is dependent on the markets for goods and services, be they timber or recreation activities, on voluntary support and public funding for the delivery of public benefits.

A full scoping report is included in Appendix 9. The draft Forest Plan was put on the Public Register for consultation from 8th January 2016 and formal responses will also be included in Appendix 9.

3. ROTHIEMURCHUS FOREST SURVEY

3.1 Mapping, Mensuration & Inventory

Detailed surveys and re-mapping of Rothiemurchus Forest using aerial photographs was carried out by the forest management team in 2003/4, with the 1994 inventory (Basil Dunlop) forming the basis for stand stratification.

The main criteria used in 1994 were stocking density and canopy height, and in 2004 this also included species. 2007 aerial photos for the Forest of Spey were obtained in 2011, courtesy of Scottish Native Woods/CNPA. These photos cover most, but not all forest areas.

Extensive ground checking was undertaken in 2003/4, to verify the presence of different characteristics and components, focusing on:

- tree species
- tree stocking density
- age class
- tree form
- growth rate
- site type
- habitat type

As expected, there is a close relationship between some of these factors with soil type and topography, notably stocking density and growth rate.

Monitoring and forest management surveys have continued to update compartment information since the 2003/4 surveys. For 2016 there has been some simplification of sub compartment boundaries to reflect management activity (woodland grazing, core old growth classification and habitat type) and information on species, stocking densities and age-class has been retained within the stand data of the compartment records.

Refer to Map 18: Rothiemurchus Forest Compartments to view boundaries at Compartment and sub-compartment level.

3.2 Forest Records

Compartment and sub-compartment data is stored using Woodplan software linked to the forest sub-compartment map. Within a sub-compartment there can be any number of stand components, and those differentiated for the purposes of this plan include:

- Species – all the tree species found in any sub-compartment.
- Planting year – the average planting year for any stand component. Regenerated stands frequently contain a wide range of ages around the mean age.
- Storey – the software used necessitates that species components be recorded as main/over/under storey which allows the total area of components to be greater than the mapped area of that sub-compartment.
- Woodland type – the seven woodland types identified by the Forest Habitat Network for the Cairngorms.
- Stocking Density – the average number of trees per hectare for any component, where this was available

Rothiemurchus Forest Plan Records are reproduced in Appendix 3.

All forest monitoring records (regeneration surveys, deadwood surveys, stand volume assessments, species surveys and third party research results) are added to the sub-compartment records and forest maps as appropriate.

4. ROTHIEMURCHUS FOREST ANALYSIS

4.1. Tabled Analysis of Constraints & Opportunities

FACTOR	CONSTRAINT	OPPORTUNITY
Biodiversity	Primacy of nature. Conservation designations	Enhancement, partnership working with public agencies. Govt grants through e.g. SRDP, etc
Protected sites and sensitive species	Timber harvesting restricted to autumn/winter months	Minimise habitat disturbance.
Minor broadleaved species	Limited seed sources and means of propagation	To set clear targets for increasing the distribution of Aspen, Holly
	Susceptibility to damage by livestock & deer	To define practices for protecting against grazing and browsing
Woodland condition & deadwood component	Fragmentation of niche habitats due to previous woodland habitat loss	To progress through the developmental stages of achieving a Forest Habitat Network. Natural regeneration increases forest cover
	Changing functions of forest stands as they evolve and develop	To prioritise woodland objectives, specifically related to 'natural woodland' characteristics. Increase structural diversity, including deadwood. Create a balance between "gap phase" and "stand replacement" regimes.
Pinewood extent	Total extent of pinewood much less than historically	To allow natural regeneration to fill gaps and extend up glens and up the hill.
Pinewood age structure	Prevalence of very young and very old age classes	To achieve a more even spread of age classes, as a long-term objective, through re-structuring felling and regeneration over a long time period.
Plantation age structure	Even-aged plantations limit choice of felling years	Range of species, growth rates and site types afford some flexibility to felling
Prolific natural regeneration of Scots pine	Loss of landscape diversity & views	Identify key view points and to create alternative views by regeneration coup felling, thinning and targeting operations to maintain landscape (tree removal from roadsides)
	More competitive than broadleaved tree species in Riparian zones	To increase species diversity by planting native broadleaves of local provenance & removing competing pine regeneration.
Variation in stocking levels, age classes and growth rates in the Pinewood	Low stocking density stands tend to produce poor quality timber	To balance the sustainable production of timber with biodiversity enhancement
Cultural Heritage & Archaeology – Scheduled and unscheduled monuments	Potential conflicts with management for woodland regeneration	To agree measures to safeguard against damage from natural regeneration, e.g. ring-barking or felling to create deadwood
	Potential damage from timber management activities	To discover & notify The Highland Council of "new" sites and identify options for interpretation
	Man-made woodland boundaries (dry stane dykes) conflict with landscape guidelines	Use felling and natural regeneration to improve woodland margins and reduce risk of windblow or snow damage impacting on dykes

FACTOR	CONSTRAINT	OPPORTUNITY
Fire	Loss of natural disturbance, limiting the occurrence of natural regeneration within the forest	To mimic the natural process of fire disturbance by use of appropriate silvicultural techniques
Internal road network	Potential loss of habitat resulting from road upgrading	To identify tracks and areas for reinstatement in mitigation. Roads and tracks managed and promoted to reduce visitor disturbance to wildlife, reduce conflict with stalking.
	Limited access to stands of utilisable timber due to inadequacy of roads	To re-classify the existing infrastructure, by identifying future strategic timber haulage routes
Ownership boundary	Limited scope to improve landscape shortcomings due to different woodland types and management objectives	To improve shape problems by use of natural regeneration and open ground at restocking
Stream and river network	Difficult access to woodlands isolated by rivers	To manage these areas for biodiversity as the main priority
	Difficult access to stands of quality timber	To provide habitat linkage by increasing the distribution of native broadleaved tree species
Timber operations	Short-term disturbance to sites & wildlife, although potentially longer-term impact on soils and rare wildlife	To create a functioning Forest Habitat Network catering for the requirements of a wide range of species
	Landscape impacts	To use natural features to determine coup boundaries
	Recreation & high public use	To achieve long-term enhancement of the visitor experience
Wild deer management	Different management objectives across ownership boundaries	To adopt a co-ordinated approach to deer management through the Cairngorms Speyside Deer Management Group
	Conflicts between woodland regeneration and sporting deer management objectives	To identify and improve strategic deer control areas and measures as part of forest plan
Non-native species	Conflict with nature conservation objectives and, in the case of Sika deer, potential conflict with timber production objectives as well. Additional costs of management.	Certain species, such as European larch and Douglas fir have potential to increase value of timber harvested from the estate. Sitka spruce is high yielding and can help sustain a timber production/economic objective. Sycamore could replace ash if ash succumbs to disease. Beech is resilient and contributes positively to landscape values.
Pests & Diseases	Potential to impact on a wide range of objectives and may impact on access management.	Few opportunities but an incentive to build resilience with species and age-class diversity. At a small scale pests and diseases can contribute to deadwood component.

4.2. Biodiversity Enhancement

With numerous conservation designations covering the forest area and the significant location of the Rothiemurchus Estate woodlands within the landscape, there are opportunities to work with public agencies and neighbouring land managers to improve and secure the conservation values of the forest. A key concept in landscape scale planning is the one of habitat networks.

Within the duration of this forest plan, it would be appropriate to consolidate the work initiated in the 2006 forest plan and supported by the SRDP funding for sustainable management of forests 2009-2015 (Case no. 3680340)

4.3. Forest Habitat Network

The Forest Habitat Network concept was developed to provide an ecological basis for planning future woodland expansion in Scotland (Scottish Executive, 2000), so that existing woods could be enlarged and reconnected. This recognises that woodlands function better for wildlife if they are linked together, compared with stands of isolated trees. The same analogy can be made for the different stages in forest growth, or different woodland types so that, for example, species dependent on old growth and deadwood features are not isolated from other deadwood or over-mature trees.

The current extent, distribution, size and composition of Cairngorms woodlands has largely been determined by historical human activities (Cosgrove *et al*, 2002) and past attention has often concentrated on the ecological importance of the larger stands of trees. This is appropriate for species such as capercaillie. However, recent findings confirm the importance, in biodiversity terms, of small woodland stands and lone wayside trees, especially for bryophytes and lichens. Forest Management at Rothiemurchus endorses this and has adopted a holistic, yet site-specific, approach based on a biodiversity framework.

4.4. Rothiemurchus Forest Biodiversity Action Plan & Framework

Eminent scientist Dr P.R. Ratcliffe formulated both the Rothiemurchus Estate Forest Biodiversity Action Plan (1996) and the Forest Framework (2001), which describe the Forest in specific ecological terms. The 2011 revision of these documents also consider the various policy drivers on conservation and forest management, such as the CNPA Forest and Woodland Framework. They move some considerable way towards translating the recommendations of the Forest Habitat Network for the Cairngorms (Ratcliffe *et al*, 1998) into practical management prescriptions. They recommend maintaining a well-distributed Normal Age Class Distribution, that is, a balanced age distribution in all main woodland blocks. With light-demanding/pioneer species such as pine and birch, this might be in a mosaic of even-aged stands of varying sizes, so over the whole forest there will be an irregular age structure. With shade tolerant species and in the near absence of browsing animals, multi-aged stands with under-storey regeneration can be achieved. Ideally, areas of old growth are scattered through the forest, connected by areas managed on longer rotations than conventional timber rotation lengths.

This habitat-based approach seeks to provide the full range of habitat components throughout the woodlands and to mimic natural ecological processes, which Ratcliffe (2001) asserts should be the basis for any strategy aimed at biodiversity conservation, coupled with addressing the requirements of important local species. Implementation of this approach is outlined in section 5.1.

As previously stated information collected during the extensive study of the Rothiemurchus Forest, coupled with an understanding of Pinewood dynamics, has been invaluable in terms of informing management options.

Forest Management at Rothiemurchus has gone to great lengths to understand how its different stands of trees function as habitat, how they connect to one another and also how management practices may link them to stands owned and managed by neighbours.

It has been proposed, in terms of developing a forest habitat network in the Cairngorms from a scattering of habitat types (Ratcliffe, Peterken & Hampson, 1998), that the development must progress through several stages:

- Complete the core forest areas and landscape links
- Extend network to reduce isolation of outlying woods
- Reinforce the network of native woodland within the overall network
- Ensure that rare native woodland types are minimally isolated
- Develop management policies, which link critical stages of growth
- Retain and develop semi-woodland habitats in non-forest land

In working through these 6 stages, Forest Management at Rothiemurchus has noted several important additional factors:

- The need to classify the woodlands in the ecological terms of the Forest Framework
- A requirement to identify management priorities for each compartment
- Progression through the stages of this process necessarily takes time, since one is dealing with woodlands and their integral developmental processes
- Embarking on this ecological process needs a long-term commitment from the Rothiemurchus ownership and management, plus the consistent backing of Government legislation, policy and finance

Commitment from Rothiemurchus and multiple agencies has already secured substantial progress towards the development of a functioning Forest Habitat Network. More than 1000ha of woodlands were established or re-established in the last 100 years. Woodland Grant Schemes for natural regeneration, which seek to increase the distribution of native woodlands and the viability of the forest habitat, cover 1145ha of the 2015 forest area.

Rothiemurchus Estate woodlands include a significant part of the core Caledonian pine forest in the area with the following principle opportunities in its function: secure additional regeneration to enhance forest structure and increase the forest area up-hill; liaise with neighbours to ensure connectivity of habitat across ownership boundaries; manage intervention to maintain age-class distribution at a landscape scale; maintain a high quality visitor infrastructure to enable the public to experience this unique pinewood landscape.

The prevalence of mature and over-mature stands has long been reported (Hackett, 1998), though the 1980s and 1990s saw the implementation of measures to encourage natural regeneration of open ground. These efforts were targeted at particular areas where maximum benefit could be gained from woodland expansion, linking areas of isolated woodland. This is an important first step in ensuring that these woodlands are perpetuated.

Biodiversity enhancement is not the only function of the forest and a well cited phrase is: “the woodland that pays is a woodland that stays.” There are still opportunities at Rothiemurchus for the full integration of the Forest’s protective and productive functions to result in unprecedented achievements in terms of biodiversity conservation and sustainable rural development.

4.5. Disturbance Regimes

In order to ensure the existence and function of the Pinewoods in perpetuity, it is necessary to promote their regeneration by practising silviculture, which emulates the natural processes of disturbance and succession, as advocated by Mason *et al* (2004). Woodland manipulation and expansion by gradual means, based on the ecology of natural indigenous forests, rather than radical change, are fundamental at Rothiemurchus. The Pinewood is considerably smaller in overall extent than it was historically, so it has been necessary to consider the various natural disturbance mechanisms and their particular properties. That is, to study scale, frequency and impact. This has enabled the differentiation between “gap phase” and “stand replacement” regimes, whereby gap phase disturbance is generally insufficient to create the required conditions for natural regeneration in Scots pine. Therefore since the

desired result is to create these conditions, then disturbance at stand replacement scale is necessary. Principally, this means looking to wild fire as a model.

Fire is almost unique as a form of disturbance, in that it can use the energy stored in a forest to effect change to that vegetation (Peterken, 1996), indeed wild fires are the main disturbance factor in natural boreal forests (Angelstam, 1998). It is noted that most broadleaved woodlands are relatively fire resistant, so we are considering the effects of fire on Scots pine in this instance.

Site and soil type, soil moisture and vegetation tend to be closely related in boreal forests, determining the fuel characteristics of a site. Several patterns are commonly observed in these woodlands:

- Dry Lichen-*Calluna* sites burn often ("O" every 40-60 years)
- Frequent fires on these sites are characterised by different cohorts of Pine, established after previous disturbances, resulting in a multi-layered vertical structure
- Mesic *Vaccinium* spp sites burn with intermediate frequency ("I" – approximately every 100 years)
- Intermediate frequency fires tend to result in even-aged stands

Source: Zackrisson (1977); Angelstam (1998).

These give recommendations for management thus:

- Dry "O" sites should be managed to maintain different tree age cohorts, as well as different successional stages
- Mesic "I" sites should be managed in larger units with a high variance in stand size to maintain the full range of successional stages

Source: Angelstam (1998)

These principles have been derived from larger natural forests than Rothiemurchus alone, however, should neighbouring landowners across the Forests of Spey and Dee adopt similar practices, the benefits will potentially be far reaching. The current fragmentation of these forests requires an effective spatial planning of felling and non-intervention areas (Ratcliffe, 2001).

(The inherent risks associated with forest fires spreading out of control are very real, and too great to allow consideration of their use at Rothiemurchus, except to promote manipulation of the field layer vegetation.)

4.6. Silviculture – Continuous Cover

Silviculture involves the application of ecological principles to forest stands in order to attain defined management objectives (Malcolm, 1995). Silvicultural practice throughout the UK has largely concentrated on clearfelling and replanting regimes because of the main commercial species, site types, and the windy climate. That said, however, there are many instances where continuous tree cover has been maintained by variations of the management treatments commonly practised in Continental Europe. Scots pine, for example has been traditionally managed using a uniform shelterwood system where seed trees are left in an otherwise cleafelled site. Small felling coupes, less than 0.25ha, also class as continuous cover, but true shelterwood systems really only work with shade tolerant species. Continuous cover forestry requires a holistic approach to maintaining the forest environment when harvesting timber.

Many of the objectives of Forest Management at Rothiemurchus relate directly to the maintenance of forest habitats and biodiversity, and it is felt that these interests will be best served by practising continuous cover systems. While Scots pine and birch are essentially light demanding, pioneer species and regenerate well into very disturbed sites, given time they will regenerate in small forest gaps. In forming the management proposals for the other woodland elements at Rothiemurchus, such as the Policy woodlands or Coniferous plantations, due consideration has also been given to continuous cover regimes.

Scots pine and birch thrive on disturbance for their dispersal and perpetuation, yet once established they provide relatively stable conditions. This stability is favoured by the likes of Twinflower (*Linnaea borealis),* One-flowered wintergreen (*Moneses uniflora)*, Intermediate wintergreen (*Pyrola media),* which all require heavy shade. Though sensitive to the changes in conditions resulting from disturbance, these plants are well adapted to re-colonise, albeit slowly, areas of felled woodland (Pitkin *et al*, 1994).

Young & Armstrong (1994) found that in "mixed (age & density) forests" the presence of Pole Stage and Maturing stands may increase the invertebrate interest of old woodland by harbouring extra insect species, even if only by providing more sheltered areas interspersed with more open Old Growth. Rare and "characteristic" species occurred in all forest developmental stages, indicating that they may find useful habitat features in all types. This would accord with the provision of a wide range of age and structural classes, as in a Normal age class distribution. Mason *et al* (2004) advocate an irregular mosaic of 4 phases, as well as open areas.

The value of a forest stand as wildlife habitat is greatest at the start and end of the rotation (Matthews, 1989). These stages are populated by specialists, as well as most generalists: in the former case, "specialist open space, edge and young-growth species, and in the latter, specialists of deadwood, mature timber, large trees and complex stand structures. Therefore by maximising the extent of young-growth and old-growth and connecting the patches in these states, biodiversity, itself, is likely to be maximised" (Ratcliffe, Peterken & Hampson, 1998). In today's forests, characteristics promoting high biodiversity are mainly found in mesic old-growth succession forests which are at least 50-100 years older than the age at which trees are usually harvested (Angelstam, 1998).

Capercaillie is one of many animal species whose populations can benefit from appropriate and carefully planned forest management since it requires a mosaic of different structures in its forest habitats (European Commission[1], 2003). Hart (1995) advocates the use of alternative management systems to clearfelling in appropriate stands of Scots pine (for Capercaillie). Multi-structured stands, with a proportion of older trees with large crowns, and younger trees, can combine the winter requirements of adults and those of broods, while at the same time providing more cover and shelter than found in even-aged stands. Any clearfelling should be restricted to sites where ericaceous vegetation is likely to develop, and should avoid leks (Petty, 2000). Old-growth Scots pine should generally be retained, since the area of such stands within a forest has a direct bearing on the carrying capacity of the forest for Capercaillie (Petty, 2000). These old trees will be retained near to lek centres.

Further information in relation to management for Capercaillie is given in "Capercaillie BAP Steering Group (2013). Advice for Land Managers on Avoiding Disturbance of Breeding Capercaillie," and "Kortland, K. (2006). Forest Management for Capercaillie. Capercaillie BAP Steering Group."

4.6.1. Thinning

Scots pine regenerates very prolifically on freely draining glacial moraines, which are common at Rothiemurchus, with seedling densities frequently exceeding 5,000-10,000 stems/ha. Once they become established, progressing to thicket phase, the young trees gradually shade out the ground vegetation, as they compete with each other for nutrients and light. The trees start to self-thin at the pole stage but generally remain too closely spaced to allow much development of ground flora beneath.

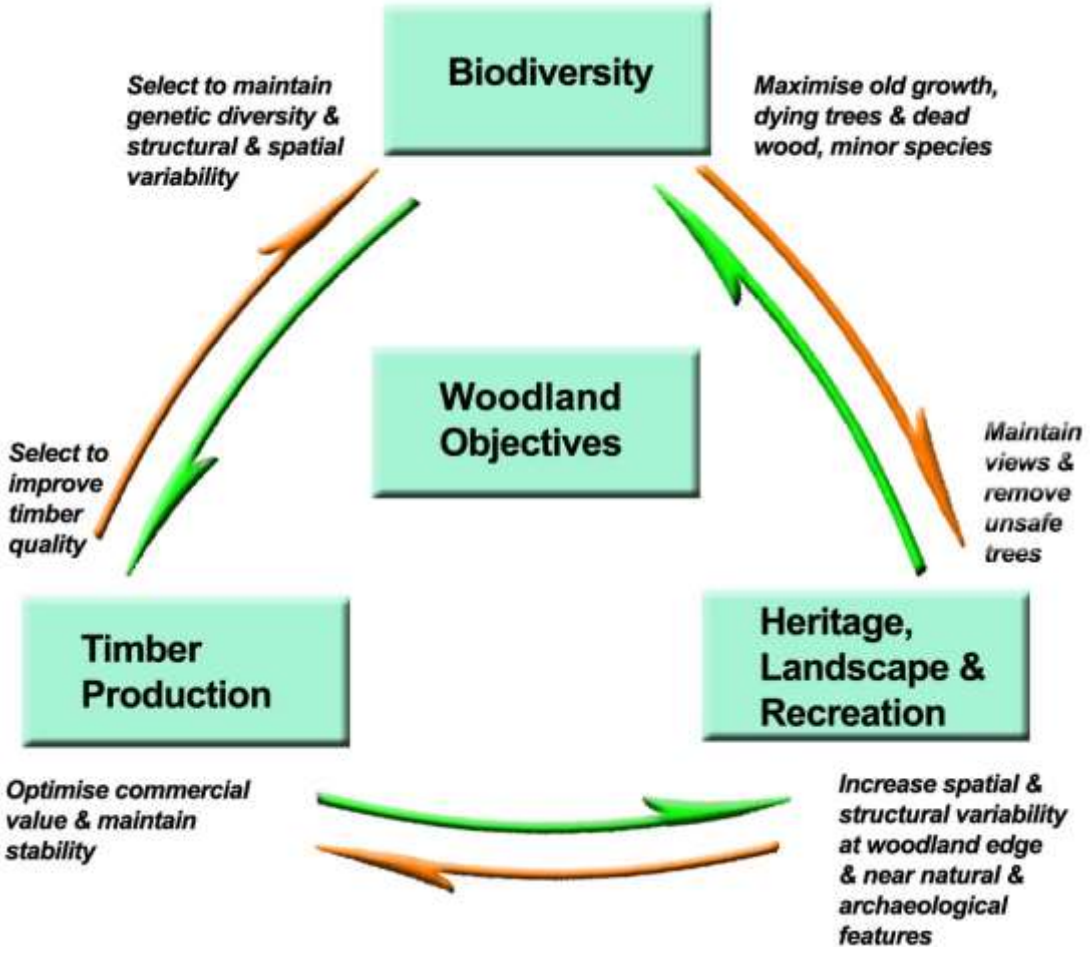
The thinning process removes a proportion of the growing trees from a stand. Thinning improves biodiversity by allowing more light to penetrate, thus creating more suitable conditions for growth and dispersal of other living organisms. The reappearance of ground vegetation is accelerated, compared to un-thinned stands, as can be observed in many previously thinned stands at Rothiemurchus, leading to increases in insect species and numbers, which provide food for insectivorous birds (Matthews, 1989). Capercaillie also

seem to respond positively to thinning activity, if operations are outwith the breeding season. Blaeberry (*Vaccinium myrtillus*) in particular is an important species for capercaillie broods because of its associated invertebrates, and the foliage, stems and berries provide important food for older chicks and adults (Storch, 1993). Blaeberry is a long-lived rhizomatous shrub that prefers well-drained acid soils. It persists through the early thicket stage in Scots pine (plantations), but flourishes once tree density starts to decrease due to thinning or mortality (Petty, 2000).

Thinning maintains continuous canopy cover while allowing the selection and removal of marketable timber.

Thinning requires a compromise between maintaining good stem quality, which requires close spacing, and attaining high growth rates, which requires wider spacing (Worrell & Ross, 2001). There are opportunities at Rothiemurchus to thin accessible, naturally regenerated stands at the pole stage of development or later, on sites where the trees are able to respond to thinning, in terms of ongoing growth and stability.

The following diagram depicts the principles of thinning practice in relation to the 3 main woodland objective groups at Rothiemurchus.



This is designed to represent the dynamic nature of thinning in response to different site or stand objectives and constraints. Inevitably it involves some trade-off between the different priorities. For example on a given site, landscape and biodiversity may be more important than, say, timber production, heritage and recreation so the thinning treatment would seek to create deadwood and an irregular canopy structure. This would favour the clumps and gaps created by adopting a continuous cover regime. In other stands, the weighting may be more in favour of any of the other objectives. Thus it is necessary to prioritise the objectives at

sub-compartment level and to design different thinning treatments to reflect these different priorities. Section 5.2 describes these thinning treatments in more detail.

In some stands, thinning will be applied as part of the process of preparing for felling. Thinning will enable the selection of seed trees, will stimulate diameter and crown growth and will serve to gradually open the stand to the wind.

4.6.2. Selective Felling

As per section 4.5, selective felling (SF) can be used to simulate disturbance regimes that will initiate "stand replacement phase" regeneration coups at a small to medium scale whilst yielding marketable timber. In the Pinewoods, these coups will be in well-stocked stands, which at Rothiemurchus:

- occur on freely draining sites
- are of variable (often small) size
- are of irregular shape, dictated by topography and drainage
- are frequently adjacent to other stands with different characteristics

Coup shapes can be designed in an attempt to reduce wind damage to surrounding stands, through the use of green edges and natural open space. These gaps frequently occur close to riparian zones and where there has been windthrow historically, or where natural processes have led to the formation of distinct stand types and natural boundaries. Using a modified version of the uniform shelterwood system designed to maximise the rate of regeneration would work best to ensure forest structural diversity is achieved.

4.6.3. Restocking Scots pine

The restocking of gap sites in the ancient Pinewood should be by natural regeneration of native species only, as defined in the Caledonian Pinewood Inventory (Anon, 1994), though it is widely known that natural regeneration can be unpredictable and may take several years to appear. This may be caused by a delay before the remaining and surrounding trees bear sufficient numbers of cones to produce seed. In addition, variations in soil type, drainage or the nature of the field layer vegetation and deer browsing will undoubtedly influence the levels, rates and distributions of naturally regenerating pine and other species. This variation will afford substantial benefits in terms of spatial, structural and temporal diversity.

The use of fencing to protect regeneration is not an option given the concerns about its impact on capercaillie populations.

Within timber production areas there is more flexibility to plant Scots pine, preferably from locally collected seed, or to plant higher yielding non-native species outwith designated sites and where the timber yields would justify the investment.

4.6.4. Restocking Broadleaves

Restocking affords a valuable opportunity to increase the area of broadleaved woodland, particularly where woodlands border streams and rivers. Woodlands, and especially semi-natural woodlands, markedly influence stream and river characteristics and behaviour. They link important habitats and help reduce the impacts of fragmentation. Additionally, woodlands are able to fundamentally increase the health and productivity of freshwater systems, and they are valuable for their intrinsic conservation and amenity value (Parrot & MacKenzie, 2000). Their influence is heightened because it is wielded at the interface of the terrestrial and freshwater ecosystems.

Rothiemurchus Forest features a wealth of riparian and wet woodlands, on important tributaries of the River Spey, and given the highest levels of national and international protection. The Am Beanaidh and the Allt Druidh are spate rivers, both of which take their source in large catchments high in the Cairngorms. They are prone to rapid and significant fluctuations in flow and are very susceptible to erosion. The influence of the woodlands, through which these rivers pass for much of their length, is therefore considerable. The protection afforded against erosion, the increased biological productivity through providing

food and nutrients, the shelter and habitat provided for salmonid fish, plus the benefits to terrestrial and avian creatures all arise due to the intricate relationship with woodland and trees.

Many riparian areas at Rothiemurchus feature relatively dense stands of Scots pine, at various growth stages. Whilst these woodlands have been established by self-seeding, biodiversity and stream productivity would be improved by the presence of a higher proportion of native broadleaved trees. The River Spey Catchment Management Plan (2003) cites that Riparian and floodplain woodland is under-represented in the Spey catchment, and the benefits afforded to Riparian and Aquatic zones by the presence of broadleaved tree species is well known. Parrot and MacKenzie (2000) advocate that broadleaved species, such as alder, willow and cherry in the Riparian zone, increase stream productivity and control flooding by several means:

- the increased numbers of invertebrates they support provide food for fish
- the leaf litter breaks down at different rates, providing nutrients
- the improved light levels reaching the water surface through their canopies increase water quality
- broadleaved species increase bank stability because of their deep rooting habit, which minimises erosion
- branches and roots provide shelter and hiding places for fish

The current restricted distribution of broadleaved trees in Riparian areas at Rothiemurchus limits the viability of the populations associated with them. More alder, willow, birch and bird cherry will provide more desirable leaf litter as an invertebrate food source and greater diversity in the levels of light and shade. This will support a wider range of invertebrates than Scots pine. Implementing measures to establish more broadleaves along the banks of the rivers and streams will help connect both riparian and non-riparian broadleaved woodland types.

Restocking programmes will endeavour to avoid using large-seeded species (which are preferred by Grey squirrels), in recognition of the importance of this area for Red Squirrels and in support of the Red Squirrel Strategy.

4.7 Habitat Enhancement

Felling, thinning and restocking proposals typify the extent of silvicultural operations in many Forest Plans, and for the most part this is sufficient, provided that the requisite analysis has been adequately undertaken. The unique characteristics and special value of the Rothiemurchus Forest warrant further attention in relation to biodiversity, however, so to limit the scope of this plan to felling, thinning and restocking would be to commit an injustice. The following complement of treatments aims to address the needs of a wide range of species and to significantly enhance the provision of various habitat types.

4.7.1 Minor Species

The Cairngorms Local Biodiversity Action Plan (Cosgrove *et al*, 2002) illustrates the importance of Aspen stands as a remnant of the ancient boreal woodlands, pre-dating Scots pine as a post-glacial colonist. It states that the most important aspect, in biodiversity terms, is the species' transition from groups of scattered individual trees to more homogeneous stands, while affirming the importance of these lone trees. Quelch (2002) suggests that Aspen in Scotland is an ancient woodland indicator species, since there appears to be a strong linkage between Aspen and ancient woodland sites.

Aspen supports a number of rare species of flies, moths, beetles, fungi, lichens and mosses and some of these urgently require targeted and monitored management (Cosgrove & Amphlett, 2002). Forest Management at Rothiemurchus will implement measures in line with the Cairngorms LBAP to try to double the area of Aspen, and to apply treatments appropriate to its ecological requirements.

Bird cherry, Rowan, Hazel, Willow and Holly are important broadleaved components of the woodland environment at Rothiemurchus. Efforts will be made to double the distribution of these species. The Juniper component of these woodlands continues to thrive, although *Phytophthera austrocedrae* is now present on the estate. Juniper is a UKBAP priority species and juniper scrub is a habitat of European interest and this further justifies the protection of juniper stands during forest operations.

These practices are in line with objectives of the River Spey Catchment Management Plan (2003) to increase the abundance and distribution of broadleaved trees in Riparian zones.

4.7.2 Non-native Species

A number of non-native (exotic) tree species, both coniferous and broadleaved, have been introduced to the area and have regenerated by natural seed dispersal into pinewood areas. Their ecological impact is principally in the form of direct competition for space with native tree species and shading out of native ground flora. European larch and Norway spruce may be of some benefit to native fauna as they provide food supplies at times when native species are of more limited productivity. Non-native species present a threat to the integrity of the Natura sites where leaving them could result in further colonisation through natural regeneration. In most instances, non-natives are present within native pinewood areas only as scattered individual trees, though they are present in significant numbers in some localised stands. The principal introduced species are European larch (*Larix decidua*), Norway spruce (*Picea abies*), Corsican pine (*Pinus nigra*) and Beech (*Fagus sylvatica*). These tend to be on more lowland sites. Sitka spruce (*Picea sitchensis*) spread into some areas, such as Kennapole hill from plantation seed sources. These have now been largely removed. To bring North Rothiemurchus Pinewoods SSSI back into favourable condition it would be beneficial to gradually remove non-native species from designated areas, in an effort to curb their spread there.

Non-native species contribute positively to the landscape character of the policy woodlands and within plantations are important because they can produce higher yields of timber and more marketable timber than native species. The trade-off with meeting sustainability objectives for the forest as a whole is that there will be an on-going cost of removing non-native tree seedlings from native woodland areas. Larch and Spruce can also contribute to the diversity of native species; most significantly larch buds and needles can be an important food source for Capercaillie.

Other, localised non-natives that justify monitoring or management include red elder (*Sambucus racemosa*) and snow berry (*Symphoricarpos albus*). Sycamore (*Acer pseudoplatanus*) is present in some of the policy woodlands and has spread into riparian woodlands close to the Spey.

4.7.3 Deadwood

The Rothiemurchus Forest Deadwood Survey (Jones, 1997) identified very low volumes of deadwood (or Coarse Woody Debris – CWD), compared to figures for other semi-natural temperate woodland. This lack of deadwood may be limiting the Rothiemurchus Forest's value for a range of species, which require this habitat type, such that the viability of some of these species could be threatened (Ratcliffe, 2001). Indeed, species associated with deadwood make up the single largest group of threatened species in Europe (WWF, 2004).

There are several reasons for this perceived lack of deadwood. Many of the mature stands in the Rothiemurchus Pinewood are relatively wind-firm, so there are only sporadic instances of windthrow. Every effort is made to minimise the effects of fire, because of the potential impacts on the economy, and on the size and future viability of this Pinewood remnant. Neither disease, insect or fungal attack seem to account for significant losses in the Pinewood, though if pitch canker (caused by *Fusarium circinatum*) became established in Scots pine, or if *Fomes* butt or root rot (caused by *Heterobasidion annosum*) took hold, this situation could change markedly.

Guidance relating to deadwood in the United Kingdom Woodland Assurance Scheme (UKWAS, 2000) recommends maintaining at least 3 standing and 3 fallen pieces per ha, or a volume of at least 5m^3/ha of pieces with diameter greater that 15-20cm, across the forest as a whole. The Worldwide Fund for Nature has called for action to increase the amount of deadwood in temperate and boreal forests to 20-30m^3/ha by 2030 (WWF, 2004). In Ancient Semi-Natural Woodlands, the suggested benchmark values for deadwood are 40-100m^3/ha of CWD $\geq$ 20cm diameter (Forest Enterprise, 2003). It should be borne in mind that the potential for deadwood varies between woodland types, so targets must be flexible, reflecting the species composition and structure (Scottish Natural Heritage[1], 2003).

There are opportunities to further enhance the deadwood resource where it will provide added value to existing habitat, expand habitat area and provide linkage between habitats. Over the last 10 years, significant volumes of deadwood have been added to many stands, both by natural and artificial means, but regular injections of deadwood are required to maintain the different phases of decomposition. (E.g.: The aspen hoverfly, *Hammerschmidtia ferruginea,* only utilises the decaying cambial layer of aspen trees greater than 12cm in diameter for the first 2 years of the decay process before this habitat becomes unsuitable for the larvae)

4.7.4 Coppicing

There are several stands of broadleaves on the fringes of Rothiemurchus Forest, interspersed with farmland and along Riparian zones, which show little sign or re-junvination due to browsing and suppression of regeneration by the overstorey. These stands may benefit from coppice management to rejuvenate old stools and add age and structural diversity to the stand. Coppicing river bank black alder (*Alnus glutinosa*), bird cherry (*Prunus padus*) and willow (*Salix* spp) could reduce river bank erosion by strengthening root systems and before tall stems collapse into the river, taking their roots with them. Coppicing hazel (*Corylus avellana*) is not to be encouraged, given the value of old growth stems for lichens and that the creation of coppice glades in the small patches of woodland where hazel is found is not necessary to improve the conservation value of the woodlands.

The key products from coppicing will be firewood, although there may be niche, craft markets from time to time for small dimension stems.

4.7.5 Re-spacing and formative pruning

Some stands of naturally regenerated Scots pine have established at stocking densities exceeding 5,000 stems/ha. Re-spacing to approximately 3000 stems/ha by prior to canopy closure will enhance the ground flora and maintain stability and yield more utilisable stems at first thinning. At the other end of the spectrum, where regeneration has been achieved at wider spacing, formative pruning to remove side branches and multiple leaders will also benefit future timber values, but these are both expensive operations which may not, ultimately yield the benefits anticipated in terms of timber value. With strong timber markets expected in the future, investment in timber quality may not be that necessary to produce marketable timber.

4.8 Landscape

Trees and woodlands on Rothiemurchus strongly influence the landscape character of the place; of which there might be three elements:

- Low ground & the interconnections between forest, farm and cultural heritage
- Caledonian pine forest; relatively large scale extent of ‘wild wood’ with high levels of diversity in terms of tree size, shape, spacing and relatively uniform in species composition.
- High ground and the blending of forest with the larger expanse of montane environments.

4.8.1 Viewpoints

There are several viewpoints that need to be considered in relation to:

- managing the impact of forest operations on views of the forest and
- monitoring the appearance of the forest within the landscape.

Other key viewpoints from within the forest are more relevant to the recreation management plan in terms of meeting objectives for enhancing recreational amenity quality.

Map 27: Identifies the principle landscape viewpoints.

4.8.2 Maintaining Views

Judicious felling of selected trees at key locations will enable the maintenance and creation of important views within, and of, the Rothiemurchus Forest, lochs, rivers and traditional buildings. The Rothiemurchus visitor experience is important for the Estate and for the wider economy of Strathspey, so glimpses through the forest from moving vehicles on public roads, and sustained views and panoramas from strategic viewpoints are valuable. A combination of these and other factors shapes the visitor's overall impression of the landscape and their perception of how it is managed.

Similarly, internal views are important and if Rothiemurchus is also to serve as a key visitor destination and recreational area then structural and species diversity, especially over-mature pine trees, and views over water are very important in delivering visitor satisfaction.

5. ROTHIEMURCHUS - FOREST MANAGEMENT

Forest Management at Rothiemurchus aims to comply with the requirements of the UK Forestry Standard and the UK Woodland Assurance Standard. The following proposals have been formulated to protect the public interest and to enhance biodiversity. Sections 6-10 cover particular woodland types in more detail. The framework for management is provided by the concept of forest habitat networks (introduced in section 4.3).

5.1. Forest Habitat Management Categories

Adapted from Ratcliffe (2001), the forest area is divided into habitat management categories as follows to differentiate between the function of the forest area, objectives and anticipated levels of intervention. (Terminology has changed slightly since the previous forest plan in order to add clarity to the definitions and remain consistent with Ratcliffe):

- Core Old Growth (COG) - Represents the most functional and most continuous stands of Old Growth, including riparian woodland. Developmental processes will be monitored. No planned intervention.
- Extension Old Growth (EOG) – Less continuous or less functional than COG currently and might include some areas of riparian woodland where management will focus on enhancing the broadleaf component. The primary aim of intervention will be enhancement of the Old Growth function (multi-layered canopy, minor tree species, deadwood) with low levels of intervention and timber extraction only if other objectives have been met. The locations of COG and EOG areas will be determined by spatial distribution (500m between old growth areas), by the presence of rare species requiring a stable environment and to represent a range of micro-habitats (dry ground, deep peat, humid, etc)
- Extended Rotation Woodland (ERW) - Includes many old stands, which already exceed 90 years of age, plus some younger stands, all of which will be managed to maintain continuous woodland habitat. Proximity to COG/EOG, plus factors of site, growth and structure are important. Management will include thinning, and selective felling at extended rotations, allowing manipulation of the woodland age structure.
- Timber Production (TP) – The sustainable production of timber through thinning and felling is an important objective. Biodiversity, site type, timber quality and accessibility are important criteria in determining these stands.
- Policy Woodlands (POL) – Woodlands (as per the woodland type) that form part of the Doune designed landscape and other areas of woodland close to houses, carparks, etc, where their landscape function is primary. Exotic species have been planted in the past and may be promoted. The accumulation of deadwood may be minimal for safety or aesthetic reasons, but trees will generally be managed on extended rotations to provide landscape ‘structure’ and gaps created by natural or planned tree removal will be regenerated.
- Woodland Expansion (WE) – Areas where natural regeneration is already present at the establishment phase, or could be expected to achieve at least 20% canopy cover within 20 years. Including montane areas where woodland regeneration could be initiated within the next 20 years.
- Bog Woodland (BOG) – Due to the absence of draining in the past, no intervention is anticipated in these areas, which will be monitored for a greater understanding of their function as habitat.
- Sub-montane (MON) – Established sub-montane scrub at the upper woodland margin.
- Woodland Grazing (WG) – Generally small areas of woodland within fields grazed by livestock and where any regeneration will require livestock exclusion. Other, larger areas of woodland are grazed by low numbers of cattle and these are categorised as COG/EOG or ERW habitat types, as grazing is part of their long-term management (see section 7.1.1) and does not compromise their habitat function.
- Unstocked (OG) – There are three elements to this category. Some are important ecological features of Native Pinewoods (acid to neutral grassland), increasingly important as deer glades and may also be significant for the narrow headed ant (*Formica exsecta*). Others will be maintained as view-points as part of the recreation management

plan, for deer management or as electricity wayleaves. The third element includes upland areas unlikely to regenerate to montane woodland within the period of this plan or valuable in terms of landscape enhancement.

Table showing the forest management categories by area (see also Map 19) and how this might have changed by 2025:

Forest Habitat Management category	**2015**			**2025**		
	Area (ha)		**%**	**Area (ha)**		**%**
Core Old Growth (COG)	112.74		6.0	263.06		14.0
Extension Old Growth (EOG)	316.43		16.8	165.35		8.8
Extended Rotation Woodland (ERW) - plantation		42.51			42.5	
ERW other areas		434.81			483.6	
ERW total	477.32		25.4	526.11		28.0
Timber Production (TP) plantation		156.91			136.4	
TP other areas		197.16			177.7	
TP total	354.07		18.8	314.07		16.7
Felled plantations		9.57			30.1	
Felled other		11.19			30.7	
Felled total	20.76		1.1	60.76		3.2
Policy Woodland (POL)	27.57		1.5	27.57		1.5
Bog Woodland (BOG)	131.53		7.0	131.53		7.0
Sub Montane Scrub (MON)	3.9		0.2	5.30		0.3
Woodland Expansion (WE)	319.92		17.0	270.49		14.4
Woodland grazing (WG)	10.98		0.6	10.98		0.6
Unstocked (OG)	103.76		5.5	103.76		5.5
TOTAL	**1878.98**		**100**	**1878.98**		**100.0**

Forest Management at Rothiemurchus aims to provide in perpetuity a spatial distribution of Old Growth habitat across the whole forest. These units of minimum size 10ha, separated from one another by no more than around 500m, and extending to at least 22% of the forest will exist within a dynamic mosaic of different structures. This is in line with recommendations by Mason *et al* (2004) and Scottish Natural Heritage (Duncan Stone, pers com).

Note:
Under terms of the UK Woodland Assurance Scheme (UKWAS), by which Rothiemurchus Estate is certified, the above categories are grouped in the following way:

UKWAS definition	**Forest Framework Category**	**2015 Area (ha)**	**%**
Natural Reserves	COG, EOG, BOG, MON	564.6	30
Long-term retentions	ERW, POL	504.89	27
Restoration, e.g. to natural woodland	WE	319.92	17
Other	TP, OG WG	489.57	26
Total		**1878.98**	**100**

Where Natural Reserves are: Areas where biodiversity is the prime objective; they are permanently identified and in locations which are of particularly high wildlife interest or potential. They should be managed by minimum intervention unless alternative management has a higher conservation or biodiversity value.

Long-term Retentions: Stable stands and clumps.

Restoration: Areas being restored to semi-natural woodland or to non-woodland habitats

This is not to say that areas of policy woodlands cannot be classed as long-term retentions, but the management objectives for them are more complex or variable. Also, some open ground is maintained for grassland species, e.g. the narrow headed ant (*Formica exsecta*) and therefore might also qualify as Natural Reserves, but they are small in relation to the total forest area.

Refer to the Rothiemurchus Forest Habitat Network (Map 19), which shows the current and proposed distribution of the ten Forest Habitat Management categories described above. This distribution has been designed based on knowledge of the woodland areas, the habitat requirements of a wide range of species, and the latest research on stand dynamics. All woodlands at Rothiemurchus are incorporated in the Forest Habitat Network, in recognition that all woodland types have a defined purpose.

5.2. Thinning

The following management strategies relate to native woodland areas. Management of conifer plantations is dealt with in Section 8. All thinning at Rothiemurchus seeks to enhance biodiversity, but it has been highly beneficial to develop a series of thinning treatments, which reflect the management categories at sub-compartment level (Map 19, Section 5.2).

5.2.1. Thinning – Biodiversity

The most biodiverse functional woodland units at Rothiemurchus have been designated as Core Old Growth stands (COG), characterised by their spatial, temporal and structural variability, the presence of minor tree species and an abundance of deadwood. Thinning 'to waste' will seek to create these conditions in other stands (Extension Old Growth – EOG) within the Forest Habitat Network to ensure that this dynamic state is perpetuated.

Management of these EOG stands has been planned, to enhance biodiversity, by stimulating the creation of COG conditions. Selection will focus on increasing the inherent stand variability, in terms of species, phenotype, age class, stocking density, tree form and growth rate. Trees will be selected to accentuate canopy gaps and areas of variable stocking and dense clumps. Enhancing the standing deadwood element, through the creation of snags, will be a factor in this treatment.

5.2.2. Thinning – Timber Production

Along with areas of conifer plantation, some stands within native woodland areas have been identified as suitable for the sustainable production of timber (ERW and TP). Consequently, thinning will favour trees with good crown development and stem form. Thinning intensities will reflect the need to maintain a live crown of 30-40%, which will give adequate diameter growth and which is also conducive to achieving good amounts of natural regeneration after seeding and secondary felling (Worrell & Ross, 2001). The inherent stand variability will be utilised during thinning to enhance structural diversity. Thinning seeks to maintain a healthy over-storey, so that the field layer vegetation currently present will continue to be supported. This ought to prevent the development of a dense, more competitive field layer, though it is accepted that the vegetation will change throughout the life of the stand in any case. This methodology aims to maintain an abundant field layer of shade bearing species such as Blaeberry (*Vaccinium myrtillus*).

The first thinning of dense stands will entail the installation of racks for timber extraction, with further selection of trees between the racks. The racks will be as widely spaced as possible in order to maximise the amount of selection. Thinning will be undertaken on a cyclical basis so that subsequent thinning operations will generally follow 5-10 years later. This frequency aims to optimise diameter growth. Some 200-300 trees/ha will be identified at an early stage as intended final rotation trees and subsequent treatments will favour their development.

Thinning is an important pre-requisite for regeneration coup felling, particularly in stands with a high stocking density and/or where growth rates are low. Several successive light thinnings will re-initiate the ground flora, promote some crown development and open-up the stand gradually, without significantly jeopardising stand stability.

Where thinning and selective felling are to take place in adjacent stands in the same 5-year phase of the plan, the treatments will be almost intimate in nature. The thinning intensity and number of retained seed trees will vary near the transition zone to serve as a means of blending the boundaries between the coups.

Birch and pine are both shade intolerant species, so they require high levels of light for unchecked growth. They will be thinned using similar treatments.

Thinning will not be practised on particularly wet or unstable sites where tree stability, erosion or ground damage problems could arise.

5.2.3. Thinning – Heritage, Landscape & Recreation

The Forest is one of the most important elements of Rothiemurchus' heritage, containing many other features and sites of former settlements and workings. Thinning round some of these features will remove trees, which could otherwise cause damage. Access will be improved where appropriate and the provision of interpretation will increase awareness and interest.

Thinning will be applicable in the proximity of tracks and paths with a high level of public access, to provide visual diversity to visitors. By applying the principles of the thinning diagram (4.6.1) in relation to site features, the resultant variation in stand structure will enhance the public interest.

It is intended that Rothiemurchus Forest continues to give the impression of unspoilt wildness and naturalness, yet it is also important that visitors gain an understanding about the forest's productive functions. Visual interpretation about silviculture will inform visitors about the many objectives of management.

The proposed timing of thinning operations is illustrated with Maps 21 & 21b.

5.3. Regeneration Felling

5.3.1. Low Impact Silvicultural Systems (LISS)

The management of native woodland areas on Rothiemurchus follows systems that are regarded as 'low impact', e.g. shelter-wood or small coupe felling, but given the limited scale of proposed regeneration felling over the next 10 years, there are no plans to apply for LISS funding under the current Forestry Grant Scheme options.

Regeneration coups will be created in 2-3 stages within timber production and extended rotation areas as required to initiate a regeneration phase:

1. Stands with a stocking density exceeding 600 trees/ha will be thinned, in preparation for the seeding felling. This should elicit a growth response, without significantly affecting stability.
2. The seeding felling, that is the reduction of the stocking density to 80-140 trees/ha for Scots pine and 40-60 trees/ha for birch, will follow up to 10 years later. (Allowances have

been made in the numbers of retained seed trees, in anticipation of losses from windthrow and windsnap.) These retained trees will provide a source of seed and shelter for the site. Natural regeneration should occur and for a time a two-aged structure will be created (Peterken, 1993).

3. Once the naturally regenerated young trees reach a height of approximately 0.5m, and provided there is a sufficient stocking density, there will be a requirement to fell a proportion of the seed trees to prevent suppression of the young trees. This is the third stage and is likely to be a minimum of 5-10 years after the second stage.

A number of additional factors also come into force here:

- Seeding felling should be timed to coincide with good seed years, to increase the likelihood of attaining good levels of natural regeneration.
- In order to conserve the intrinsic genetic variation of these woodlands, individuals of all phenotypes, including veteran trees, will be retained as seed trees.
- Acknowledging that native pinewoods should comprise the full range of stocking densities and site types, Forest Management at Rothiemurchus accepts that natural regeneration is likely to be variable, and may be far from the levels which would be desirable were timber production the sole objective. Direct observation shows that there may be at least 20-40 years of age variation in a seemingly even-aged naturally regenerated pinewood. Therefore, there is a fair probability that on suitable sites with retention of a seed source, and in the reasonable absence of seed predators and browsing, gaps will fill in over time. This process may require the longer-term retention of seed trees, provided that the naturally regenerated seedlings are not unduly suppressed.
- Ground preparation may be necessary to provide soil/vegetation disturbance. This may precede or follow felling (see section 7).

Small-scale variations in topography, soil type and drainage have largely been accounted for in the determination of coup boundaries, but in the unlikely event of circumstances having been overlooked, the following control measures will be adopted. There will be no felling undertaken in the following:

- Wet, boggy, rocky or unstable ground
- Small, isolated woodland blocks
- Areas of low stocking density and scattered trees
- Areas of stunted, slow-growing trees (bog woodland)
- Sub-montane scrub

Timber operations are applicable in well-stocked stands where trees are of good form and growth, with reasonable accessibility. Some stands are already exhibiting advanced natural regeneration of pine, so further selective felling may be necessary to prevent suppression.

Coup size will reflect the objectives for the stand and will vary to suit topography and the landscape, with orientation to reflect natural features, and recreation where appropriate. There will be a tendency towards north-south orientation because of the effects of side shade (Worrell & Ross, 2001) and to enable enough light to penetrate.

Map 21: Rothiemurchus Forest Felling shows the proposed extent of felling & thinning to 2030.

There are no plans to burn lop and top produced by thinning or felling.

Refer to the Thinning, Felling and Restocking Schedule in Appendix 4.1.

With reference to ERW and TP habitat types, the key differences will be in the age of felling and the retention of deadwood, both of which will be greater in the ERW stands. See section 6.4

5.4 Environmental considerations

Detailed information about operational planning in order to minimise environmental impact is give in Section 11; Operational Planning and Appendix 4-2; Thinning Specification.

Rothiemurchus will seek certification through an approved scheme. Currently the forest is Forest Stewardship Council (FSC) certified as part of the UPM Tilhill group certification scheme. This helps management plan and monitor operations, demonstrates that we are operating sustainably and assists with timber marketing. Certification reference: Rothiemurchus SA-FM/COC-004552-G065

6. ROTHIEMURCHUS PINEWOOD – ENHANCEMENT

This section addresses several fundamentally important issues, which will lead to an enhancement of the value of the pine/birch/juniper woodland type in biodiversity terms. It identifies outcomes, which will be aimed primarily at Extension Old Growth, and also Extended Rotation Woodland, where management intervention is proposed. (Forest Habitat Network, Section 5.1).

6.1. Minor Tree and Shrub Species

Thinning will remove individuals and small groups of Scots pine and other conifers, as well as birch, to release minor broadleaved trees from shade and competition. This will apply specifically to where the dominant species are directly shading and impeding development of minor broadleaved species, particularly along riverbanks and stream-sides, and other locations where it is desirable to increase the distribution of locally-scarce species, such as aspen, holly, willow and alder. It is expected that natural regeneration and suckering of these and other broadleaved species will result from these operations, given adequate protection against browsing.

The current distribution of Aspen-dominated stands amounts to nearly 2.1ha. It is hoped to double this area during the period of the plan by selective removal of birch and Scot pine to create gaps. In addition the estate will facilitate the work of the Malloch Society and the Highland Aspen Group to implement aspen related research and stand intervention to improve the aspen habitat for rare species.

Apart from specific work on aspen, all of the above will be implemented during programmed thinning or selective felling operations and work targeted at deadwood creation.

6.2. Riparian Broadleaves

Opportunities will be taken to fell to waste or harvest all but old-growth pine trees in order to release riparian broadleaf regeneration or established trees that are being over-shaded by pine. Additional planting of native broadleaves might be required to stabilise banks where pine regeneration has been removed from river banks to protect downriver infrastructure in case of floods.

6.3. Non-native Species

Pole-stage and seed-bearing trees of non-native species will gradually be removed from the Natura 2000-designated parts of the Pinewood as part of the selective thinning and coup felling programme. Whether they may be present in scattered/dense clumps or as isolated individual trees throughout the Pinewood, they will be culled to prevent them seeding. Removal will entail up to 20% of the stem numbers of these species every 5 years on a selection basis. The Thinning and Felling maps show, but do not specifically detail, the location of these operations, which form part of thinning and felling.

Where exotics appear in stands outwith the thinning and felling areas they will be culled to create deadwood habitats.

Self-seeded seedlings or young saplings will be pulled or cut as appropriate.

These measures do not apply to non-Natura 2000 sites such as the Doune Designed Landscape.

6.4. Deadwood

Rothiemurchus aims to achieve the following targets for the amount of deadwood, by managed category:

Deadwood Target By Managed Category

Woodland Category	**Deadwood Target (m^3/ha)**	**Time-scale (years)**	**Approximate hectares/year**
Policy Woodland	3 standing & 3 fallen pieces/ha	10	11
Extended Rotation Area, Timber Production, Riparian Woodland	20+	20	50
Extended Old Growth, Core Old Growth	40+	40	10
Other areas	5	10	295

Pre-harvesting and monitoring surveys on a 10-year rolling cycle of Extended Old Growth areas will assess the quantities of deadwood in a stand, either by measuring volumes or by visual assessment using Forestry Commission guidelines. Deadwood will be assessed in the categories of standing and fallen and diameter ranges 10 to 19cm, 20 to 50cm and greater than 50cm. Low density deadwood is 5% or less of the total stems per hectare, medium density up to 10% and high density greater than 10%. The assessment will include trees with appreciable deadwood in the crowns.

Deadwood will be created during programmed timber harvesting operations. Where stands are being thinned or felled by harvester, a proportion of trees over 25cm dbh will be cut at 2 to 4m above ground level to leave a dead snag and a fallen top. Other trees of a range of sizes will be felled and left in whole length as deadwood. Deadwood trees will need to be selected and marked in advance to the volumes appropriate to the forest type. On felled sites, a proportion of the seed trees left will be culled as deadwood once a satisfactory density of Scots pine seedlings has become established.

Elsewhere and where felling is by chainsaw, deadwood will be created by felling to waste with stumps up to 1m high or created by ring-barking.

All deadwood will be created in groups of 3 to 7 trees in areas close to water courses or other biodiversity networks. Opportunities will also be made of creating deadwood around feature trees – e.g. suppressed juniper, broadleaves and “granny” pines that would benefit from and respond to being released by felling the over-storey.

Existing deadwood will be retained during timber harvesting operations.

Veteran trees will be left to die naturally and large senescing trees (hulks) will be left standing except where leaving dead and dying trees standing would create a hazard next to roads, tracks and buildings. In these instances it may be beneficial to create snags.

The Recreation Management Plan (see Section 6.9 & Appendix 7) will detail monitoring regimes with respect to deadwood and public access. Standing deadwood will be removed from the proximity of recreation facilities, roads and tracks with a high level of public access. Close to Inverdruie and within the Designed Landscape at the Doune, for aesthetic reasons, large amounts of fallen deadwood will be removed.

6.5. Respacing

If there is economic justification, respacing of natural regeneration to approximately 3000 stems/ha by motor manual means prior to canopy closure will seek to maintain stand variability and enhance stability in some young stands.

6.6. Landscape

Large areas of natural regeneration over the last 50-100 years have markedly changed the landscape and some important views of the Cairngorms have been lost. Felling and

regeneration management will ensure that the principle views, as identified in map 27, are re-opened, kept open or move as appropriate to the location and timber harvesting plans.

Internal forest views are also of significance to landscape/amenity values and within the pinewood they are enhanced by management for forest diversity: retention of over-mature or character trees, variety in tree ages, canopy cover and species, thickets and glimpses of rock and water features.

Within areas important for capercaillie it is recognised that dense pine and juniper regeneration close to paths helps to increase the area of suitable habitat used by the birds. Efforts will be taken to achieve this without creating 'tunnels' for people.

6.7. Archaeology

The Archaeology Unit of the Highland Council considers that the potential of the woodland is moderate to high, with regard to identification of previously unrecorded sites. The more favourable ground, on the flatter or more-gentle slopes, has attracted settlement from the earliest times so further sites may be awaiting discovery (Kirsty Cameron, pers com).

If previously unknown archaeological sites are discovered during woodland operations, or if operations could affect known sites, the Archaeology Unit of The Highland Council will be notified. Work plans will detail known archaeological sites, and these will be marked on the ground with an appropriate buffer zone for the duration of operations. The Forestry Commission's Forestry and Archaeology Guidelines will be followed. The Ancient Monuments and Archaeological Areas Act (1979) will be complied with and Scheduled Monument Consents (if required) applied for.

Natural regeneration of pine, birch and juniper is prolific in areas of Rothiemurchus and this may affect the integrity of some archaeological sites, e.g. the Balvattan scheduled monument site. Similarly, windthrow or poor routing of access could be detrimental to site remains. Sites will be monitored and management plans agreed with Historic Environment Scotland or The Highland Council as necessary.

When woodland operations take place in the vicinity of features of interest, especially dykes, or the line of the timber railway, opportunities will be taken to fell or ring-bark trees, which could otherwise jeopardise the long-term integrity of these features.

6.8. Capercaillie

Work to ensure the future of capercaillie in Rothiemurchus woodlands is informed by the Cairngorms Capercaillie Framework.

In addition to the fence marking and fence removal carried out in the previous 5-year plan, work for woodland grouse conservation includes:

- Capercaillie and black grouse population monitoring through lek and brood counts;
- Forest habitat management (see above) and expansion (section 7 below);
- Review current deer fences once every 5 years and determine actions;
- Public access and recreation management (see 6.9 below);
- Predator control (see 6.10 below).

6.9. Access & Recreation

The general public enjoys a high level of use of Rothiemurchus, and places considerable value on its cultural and natural heritage and landscapes, its facilities and its attractions. The public uses Rothiemurchus Forest both formally and informally. Formally through Rothiemurchus' own or partner businesses, which include:

- Camping for individuals and groups
- Bus tours
- Landrover Safaris

- Corporate training and motivation workshops
- Quad bike treks
- Pony Trekking
- Clay pigeon shooting
- Aerial adventure – Tree Zone
- Cross-country skiing and snow-shoeing (weather permitting)
- Wildlife watching and wildlife photography
- Tubing on the River Luineag
- Weddings
- Other tours, educational trips and volunteer activities.

This is not an exhaustive list and there are also a number of managed events run by businesses and charities, e.g. sponsored runs or adventure challenges.

Informally the woods and tracks are well used by the public for walking, cycling, horse riding, etc. A number of local guiding companies use Rothiemurchus from time to time for their activities, independently of Rothiemurchus Estate.

The level of use places substantial demands on the forest environment and its ability to deliver all these benefits, which people have come to expect. Forest Management at Rothiemurchus recognises this, and the management treatments proposed in this plan aim to ensure that the forest will be able to deliver. The key considerations are:

- landscape impact of timber harvesting and tree-felling;
- the up-grading of tracks to forest roads to accommodate timber lorries as well as multi-activity use and inclusive access and without diminishing the long-term aesthetic appeal of these routes and allowing the track verges to grow over in-between felling cycles;
- minimising the impact of recreational disturbance to wildlife (risk-assess current track & path network for wildlife disturbance, review annually and develop action plan accordingly);
- health and safety of visitors during forest operations;
- public health and safety in relation to trees and infrastructure.

The Recreation Services Plan (Appendix 7) accounts for the changing patterns of use of the forest by the public. This strategic document will detail, for a 5-year period, how Forest Management anticipates the changes resulting from recreation will affect the woodlands, and how the potential impacts will be addressed. There will be opportunities to monitor visitor numbers, to add value to the visitor experience by promoting the Forest Plan through interpretation, to schedule track repairs, to collect litter, to assess dangerous trees etc.

6.10. Predator Control

The management of predator numbers in the forest (mainly foxes, and crows) is aimed at reducing predation of Capercaillie eggs and broods.

Control plans will be shared with the Cairngorms Capercaillie Framework manager and the Capercaillie Project. Due to the significance of capercaillie and the mobility of predators, special account will be taken of neighbours' forest plans.

Control will be carried out according to Forestry Grants Guidance which requires all work to be carried out according to BASC best practice:
(https://www.ruralpayments.org/publicsite/futures/topics/all-schemes/forestry-grant-scheme/sustainable-management-of-forests/predator-control-capercaillie-black-grouse/)
This will be achieved by ensuring that no work will be carried out except by nominated estate staff who are appropriately qualified and have received relevant training regarding the law and best practice.

All work will be conducted in a way that aims to minimise disruption to people enjoying the outdoors.

Opportunities will be taken to interpret the role of predator control in capercaillie conservation to the public.

6.11. Biosecurity

In order to minimise the risk of disease spread in the forest environment, Rothiemurchus Forest Management will:

- Optimise conditions for natural regeneration and thus reduce the requirement to purchase tree seedlings from forest nurseries
- Only purchase transplant seedlings from disease free nurseries
- Ensure all contractors and visiting foresters/researchers follow best practice regarding biosecurity – clean boots, clean vehicles, etc.
- Promote Forestry Commission Scotland's Keep It Clean campaign through the Rothiemurchus visitor services media channels.

6.12. Research and Monitoring

The following lists current and recent research projects carried out within the forest by research organisations:

- Dendrochronology – Tree ring analysis of pine logs from Loch an Eilein and Loch Gamhna. http://www.st-andrews.ac.uk/~rjsw/ScottishPine/

- There is also a project led by St Andrews University to reconstruct 8000 years of Environmental and Landscape change in the Cairngorm region. This is a 2.5 year project to try to combine the continuous lake sediment records (which provide information on land use, catchment changes etc) with the currently non-continuous tree-ring record which will provide information on past climate and forest dynamics etc.

- Entomology – *Blera fallax* (Pinewood hoverfly). Released 176 individuals in total (81 larvae in October 2009 and 95 adults in May and June 2010). 1st and 2nd instar larvae located in six bored stumps July 2010– Drumintoul. Ellen Rotheray. <http://www.mallochsociety.org.uk/blera-2006-status/>

- The Malloch Society are also monitoring aspen hoverfly at various sites in Strathspey, including Rothiemurchus.

- Plants: Twinflower and intermediate wintergreen. Project to survey and identify management requirements for rare plants. Cairngorms National Park, Andrew Scobie. 2010.

- Fungi: PhD study on changing fungal associations in Scots pine roots with altitude. Susan Jarvis 2010-12

- Climate variation response in blue tit breeding, Edinburgh University 2015-16

- Estimating pine marten numbers, GWCT. 2014

- Crested tit alarm response behaviour, University of St Andrews 2015

- Scots pine tolerance to climatic conditions, James Hutton Institute 2014

- Aspen root stress trials, Coille Alba 2013-2015

- Phenology – Climate change and blue-tit breeding success, Edinburgh University Phillimore Group 2015 & 2016

- Fish: monitoring of salmonid species at various locations, Spey Fishery Board, since approximately 1995.

7. ROTHIEMURCHUS PINEWOOD – Regeneration

A number of treatments are proposed at Rothiemurchus as a means of influencing the rate and level of re-establishment of naturally regenerated trees, particularly on felled sites. These treatments, allied with the silvicultural practices described elsewhere in this plan, will facilitate the delivery of a wide range of management objectives, which is fundamental to the future of these woodlands.

7.1. Ground preparation

Ground preparation has proved successful elsewhere on natural regeneration areas and felled sites, particularly where there is a dense heather and moss field layer. Ground preparation will not be used on particularly wet or unstable sites or where stability or erosion problems could arise, and sites on glacial moraines may not require any ground preparation.

7.1.1. Managed Grazing

Rothiemurchus has a history of cattle grazing in woodlands, and reintroduction of this practice is proposed because of the proven enhancements to woodland biodiversity. The benefits of managed livestock grazing include the reduction of dense vegetation through grazing and trampling, as well as light disturbance and mixing of the upper soil horizons. Grazing will be the preferred means of ground preparation and may precede or follow selective felling.

An assessment of (temporary) fencing requirements, appropriate stocking levels and the seasonal timing of grazing will be undertaken at the site planning stage. Managed livestock grazing may include pigs or cattle.

7.1.2. Mechanised Scarifying

Mechanised scarifying in the Pinewood will be directed towards sites where there has been a build-up of acid mor humus, and/or which have a moderate heather or moss layer. Scarifying will afford some mixing of the organic and mineral layers and will help to break up competitive vegetation, thus facilitating natural regeneration. Scarifying may be used on selected sites where natural regeneration produces less than 1000 stems/ha in the first 5 years after felling.

7.1.3. Fire

The controlled use of fire may serve as a valuable management technique where there is moderate heather and/or a deep bryophyte and raw humus layer (Cairngorms Partnership, 2001). Where the number of regenerating seedlings is limited, controlled burning will enhance seedbed conditions without disturbance to the soil layers.

Burning will be restricted to dry moorland on the edge of the forest, and to the largest unstocked moraines, knolls and ridges (Dunlop, 1994). Where burning is prescribed, the aims of the treatment, the conditions under which burning will take place and the method used will be stated. The likely long-term effects on the site, flora and fauna will be discussed. The potential damage from uncontrolled fire is considerable, and stringent safeguards are essential to protect the forest and neighbouring land.

7.2. Restocking

Restocking of pinewood sites will be by natural regeneration, except where:

- increasing the broadleaved component necessitates supplementary planting. It may be useful to plant and protect broadleaves (probably in scattered clumps), so that they develop as sources of seed for the future.
- to speed up the regeneration process, particularly where dense grass rather than heather has come back after felling.

In these instances, local provenance (Rothiemurchus or Strathspey origin) planting stock will be used where possible if it can be grown on site. Due to the risk of exacerbating the spread

of Dothistroma needle blight, no seedlings of any pine species will be introduced to and planted within the native pinewood buffer zone, as defined by FCS: Map 6 or: (http://maps.forestry.gov.uk/imf/imf.jsp?site=fcscotland_ext&)

Non-native species may be accepted into the regeneration mix where timber production is a priority and outwith designated areas and areas where native woodland management grant is being claimed. Non-native species most likely to be included in the natural regeneration mix are: European larch, Norway spruce, Douglas fir.

Natural regeneration at a density exceeding 3000 stems/ha within 10 years is the target where timber production is a priority. Variable stocking levels will be more appropriate to Extended Rotation Woodland, above a minimum of 1,100 stems/ha.

Annual monitoring of regeneration areas will assess stocking density, species composition and browsing levels. If the minimum stocking levels are not achieved 5 years after felling, Rothiemurchus will initiate discussion with FCS (and SNH within designated areas) to agree the options for remedial work, e.g. weed control, planting and fencing.

See Map 23: Rothiemurchus Forest Restocking and the Thinning, Felling and Restocking Schedule in Appendix 3.2 & 4.1.

7.3. Tree Protection

7.3.1. Fencing

Fences are required to protect natural regeneration against damage from livestock (cattle and deer), unless livestock numbers are at a very low level over extensive areas. Despite the reduction in wild deer numbers (ref deer management plan section 12), temporary, marked deer fences may be required to achieve the 3,000 stems/ha required for timber production areas. The actual type and specification of fence will be appraised at site level and the appraisal will include an assessment of risk to woodland grouse.

Livestock grazing will be largely contained by the existing dykes and fences, supplemented by additional temporary scare fences if necessary to contain livestock in new woodland grazing areas and to regenerate currently grazed woodland. Some maintenance of dykes is imperative for this to be effective. Scare wires will be electrified if required.

The main form of protection for natural regeneration against wild deer is likely to be shooting. In the event of inadequate levels of natural regeneration becoming established within the desired time-scale, or unsatisfactory levels of damage occurring, fencing may be considered as a contingency measure. If this is the case, the following aspects will be appraised (in line with the Joint Agency Statement & Guidance on Deer Fencing (Deer Commission for Scotland *et al*, 2004) to safeguard the public interest:

- Cause of damage and the type of fencing required
- Public Safety
- Deer Welfare
- Biodiversity
- Landscape & Cultural Heritage
- Access
- Economics

Electric scare fencing along existing dykes, or in conjunction with new stock fencing may have the least impact. More conventional deer fencing with high visibility marking would be the minimum specification with a higher level of impact.

See also Chapter 12 Deer Management.

7.3.2. Tree shelters

Broadleaved trees are more palatable to deer than conifers so are more likely to be browsed. They may need additional forms of protection, such as tree shelters or small stock-fenced

exclosures, particularly where the scale of intervention is small. This may be especially relevant for protection against Roe deer. The alternatives will be considered on a site by site basis and after monitoring.

7.3.3. Pesticides & Fertiliser

There is no intention to apply pesticides or fertiliser within the Natura 2000 sites. If stump treatment to reduce infection by *Heteobasidion annosum* is required, then *Phlebiopsis gigantea* as a biological control will be used under licence from Forestry Commission Scotland to treat pine stumps. Outwith Natura 2000 sites and for species other than pine, urea will be used to treat cut stumps where there is a moderate to high risk of *H. annosum* infection.

In accordance with UKWAS accreditation, Rothiemurchus Forest Management policy is to reduce and minimise the use of herbicides and pesticides. Forestry Commission Practice Guide 15 Reducing Pesticide Use in Forestry, 2004 and the UKWAS website will be referred to when planning weevil and weed control and the decision making process documented.

Within the last 5 years, only Asulox has been applied to bracken at two locations.

7.4. Felling & Restocking Schedule (Pinewoods)

Period	**Cmpt**	**Area felled (ha)** (gross)	**Species (p-year)**	**Restock area (ha)**	**Species** (NR=natural regeneration)
2016-2020	1217a	2.18	SPC 1850	2.18	SPC / Bi (NR)
	1404a	5.33	SPC / NS (1900)	5.33	SPC (NR)
	1404d	1.94	SPC (1930)	1.94	SPC (NR)
	1705h	1.95	SPC (1930)	1.95	SPC (NR)
	1712d	1.55	EL/SPC (1900)	1.55	SPC/EL
2021-2025	121g	0.84	SPC (1850)	0.84	SPC (NR)
	502f	4.7	SPC (1800)	4.7	SPC (NR)
	1213a	5.12	SPC (1900)	5.12	SPC (NR)
	1606a	8.6	Bi (1930)	8.6	Bi (NR)

8 RESTRUCTURING CONIFEROUS PLANTATIONS

There are over 230ha of conifer plantations on Rothiemurchus. 110ha is planted Scots pine or small components of regenerated birch. 20ha is felled to regenerate with native species or is open ground. The remaining 100ha consists of non-native species. Most of the plantations are in early thinning stages and will continue to be thinned to maximise their economic potential. The felling and restructuring requirements of the plantations on Creag Phitiulais and Ord Ban are addressed in this section of the forest plan. These plantations were planted with a mixture of species in 1969 and 1971/2 respectively, and both sites present challenges, not least due to their considerable influences on the landscape, and the limited accessibility. The documents reproduced for the analysis include the following:

Maps:
- Species
- Yield Class
- Windfirm Edge
- Economic Optimum Felling
- Landscape Character Analysis
- Constraints & Opportunities
- Felling Years

Tables:
- ForestGALES input & output data

Images:
- Actual Perspective views
- Simulated Perspective views

8.1 Management Objectives

In addition to the Forest Plan objectives stated in Chapter 1, specific objectives relevant to these plantations include:
- Improve timber quality by thinning DF, SS, SP, EL (SBI) where stability and growth permit
- Restore up to 15% Planted Ancient Woodland Sites (PAWS) where native species are still present and to afford the best habitat linkages

8.2 Felling Decision Criteria

Several criteria have been used to aid decision-making in the choice of felling years for both plantations:
- Fell poorest LP within 10 years, while market outlets still exist
- Fell before 20% windthrow in any coup
- Fell before mean tree size reaches approx 0.6m^3 for SS & GF

8.3 Pityoulish Plantation

Pityoulish Plantation extends to 67ha and is located on Creag Phitiulais to the east of Loch Pityoulish and adjacent to the march with Pityoulish Estate. The location and predominant south westerly aspect make the plantation prominent in the landscape, being clearly visible from Guislich (view 6) and Loch Pityoulish (v11), and more distant from Ord Ban (v13) and Balvattan (v2) within Rothiemurchus (see Map 27). The plantation may also be seen from Aviemore and the A9.

The southern aspect of the plantation links well with Ancient Semi-Natural Woodland at Guislich, Achnahatnich and on neighbouring Pityoulish Estate. There is scope to enhance these links and improve the Forest Habitat Network. Approximately 21.5ha in the south-east of the plantation is shown on the Roy maps and thus constitutes a Planted Ancient Woodland Site (PAWS).

The plantation comprises several different conifer species, which are reasonably well matched to soil type and drainage. Felling some of the most vulnerable crop and blown areas started in the first phase of the plan (2006-2010). FCS approved an increase in the un-stocked area at the top of the plantation for landscape and biodiversity (black grouse) considerations. No regeneration has been established in the felled area to date. Much of the remaining plantation has been thinned and this will continue where stability permits, as a means of enhancing biodiversity and improving timber quality. Growth rates vary widely across the site, with Sitka spruce at General Yield Class 16-20, Douglas fir at GYC 16, and Scots and lodgepole pine at GYC 8-12. Sub-cmpt 205n is an area of checked SS in an area of deeper peat.

Soil type and drainage are variable and catastrophic windthrow occurred in sub-compartment 205c & 205s. On-going windblow is continuing in the lodgepole pine compartments. Drains have not been maintained and this has increased the windthrow risk. ForestGALES software has been used to calculate the age at which the various stands will reach Wind Damage Risk Status 4, 5 and 6 for overturning and breakage. See the printouts for input and output data.

8.3.1 Pityoulish Constraints & Opportunities Analysis

Factor	Constraint	Opportunity
Access	Poor access for timber extraction and haulage. Forwarder route to Guislich needed considerable reinstatement but road construction across unproductive Achnahatnich moor too costly.	Improve design to minimise future access constraints
Biodiversity	Limited structural diversity within plantation	Incorporate a wider range of planting years and use natural regeneration Use long-term retention to improve linkage with ASNW at Guislich, Achnahatnich and Pityoulish
Landscape	Woodland design restricted by internal and external linear boundaries	To accentuate site features and improve linkages with other woodland
	Contrasting woodland types across boundaries	To increase native species at restocking
Ownership Boundary	Geometric boundary shape limits landscape options	To incorporate open space and native species at restocking
Plantation age structure	Even-aged plantation limits choice of felling years	Range of species, growth rates and site types afford some flexibility to felling
Site suitability	Poor timber quality and low productivity	Future species choice to better reflect elevation and site productivity
	Bracken dominating in felled areas	Bracken indicative of soil fertility suitable for a range of species.
	Steep slopes with poor access	Restructure plantation to avoid steep ground or retain mature conifers for biodiversity and landscape benefits.
Watercourses	Wet flushes with poor drainage and watercourses lost beneath canopy	Remove conifers, apply open space and riparian broadleaves,
Wayleaves	OHPL Wayleave along Western edge of woodland. This has restricted thinning adjacent to the wayleave, as downhill extraction on the slope above the wayleave and extraction under the	To incorporate designed open space along Wayleave

	wayleave is not possible, as this section of power line can not be turned off for long periods.	
Windthrow risk	Limited windfirm boundary options	To improve woodland design at felling and restocking
Protection	Deer numbers still high in this area	Re-instate deer fence with marking to reduce strikes by black grouse; increase deer cull or regenerate with temporary deer fencing.

8.4 Pityoulish Felling and Restocking Plan

Felling is proposed in a further two phases, allied with thinning and retention of windfirm stands where continuous cover silviculture will be applied to eventually regenerate these stands. These proposals allow for restoring some of the PAWS area where ancient woodland indicator species are still present. During further felling or thinning phases, opportunities will be taken to remove non-native species to release native species where restoration to native woodland has been identified as an objective. Remnant SPC, birch and willow will be retained for biodiversity and as a source of seed, unless stability or H&S issues arise from so-doing. Some further areas currently under non-native conifer species will be restocked with native species once they have been felled (see Map 23), in an effort to co-ordinate with neighbours and to match the natural site drainage pattern. This will address several significant landscape short-comings.

Non-native species will also be used during restocking in order to match site to species requirements and to optimise use of the site, timber quality and productivity.

Non-native species will be planted to establish 2,500 stems/ha 5 years after felling phase 2, with beating up, spot weed control and weevil spraying as appropriate. It is anticipated that the perimeter deer fence will need to be re-instated after phase 2 felling and all deer driven or shot to remove them from within the deer fence. Native species will be established at 2,250 stems/ha for Scots pine and 1,100 stems/ha for birch. If the targets are not being met 5 years after phase 2 felling, Rothiemurchus will initiate discussion with FCS to agree appropriate remedial works required to re-stock the site. As most of Pityoulish Hill falls within the Caledonian pinewood buffer zone, planting Scot pine is not an option currently and birch will be planted instead.

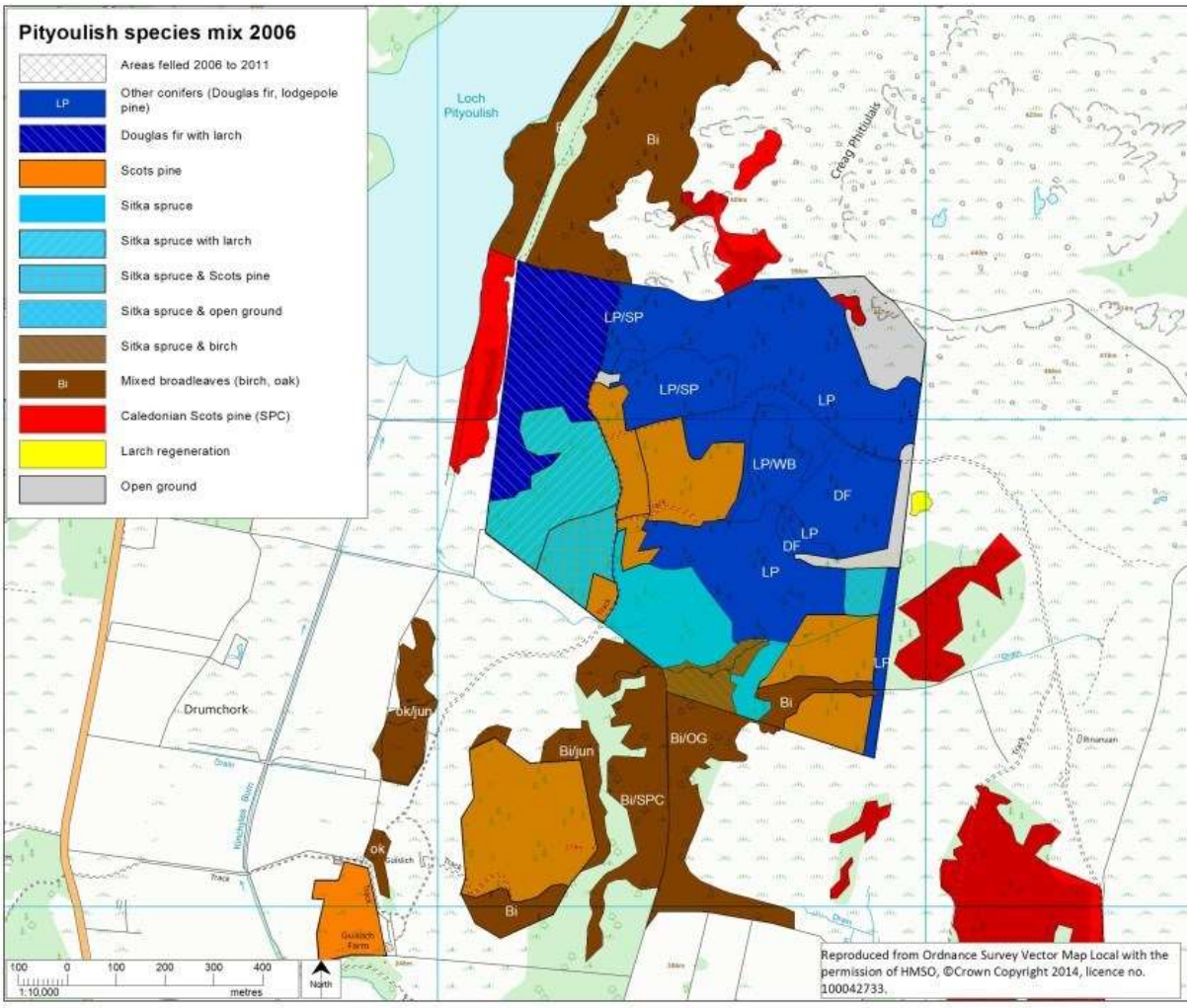
	Area felled	**Species**	**Restock area**	**species**
Phase 1 (2006-2010; felled to regenerate)	11.49	Lodgepole pine (LP)	5.81	Caledonian Scots pine (SPC) (Natural regeneration (NR)
			2.09	Sitka spruce (SS)
			3.59	Birch (Bi) (NR)
Phase 2 (2016-2020)	11.06	Mixed conifers (MC)	2.9	SPC (NR)
			4.46	SS
			3.7	Bi (NR)
Phase 3 (2031-2035)	21.81	MC	8.84	Bi (NR)
			1.31	SPC (NR)
			3.77	DF
			6.88	SS

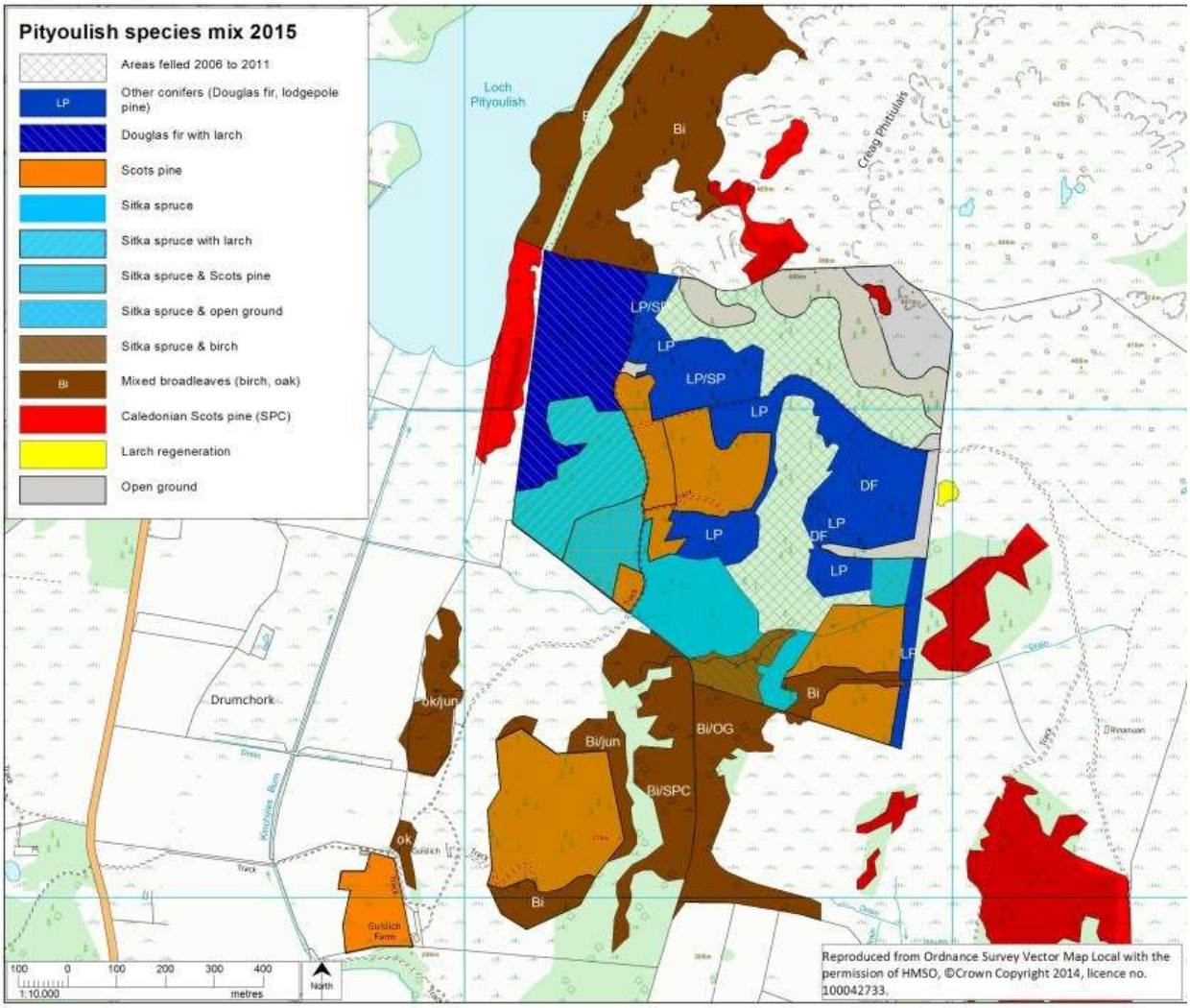
Pityoulish Hill ex Guislich B970
2005

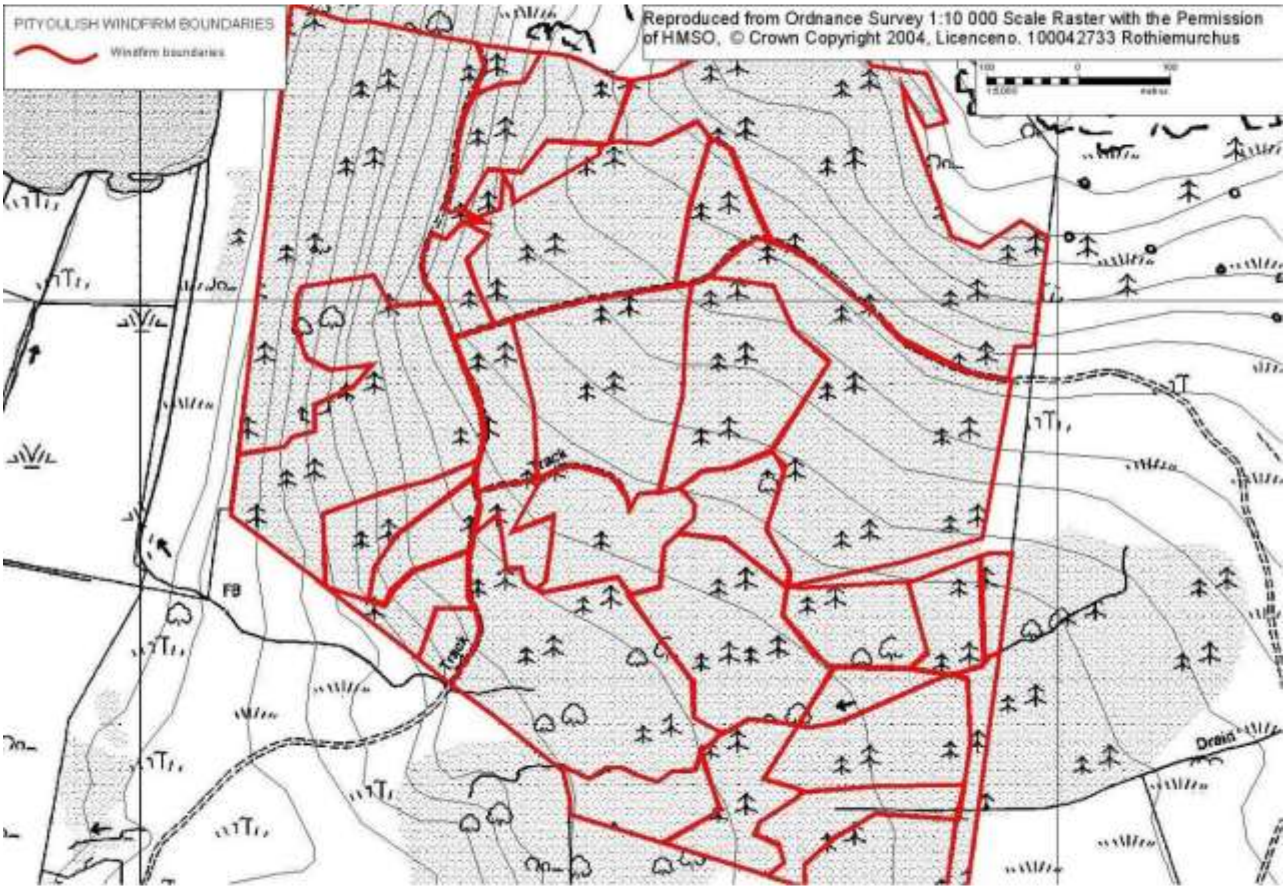
2011 with first phase felling of the upper tree line

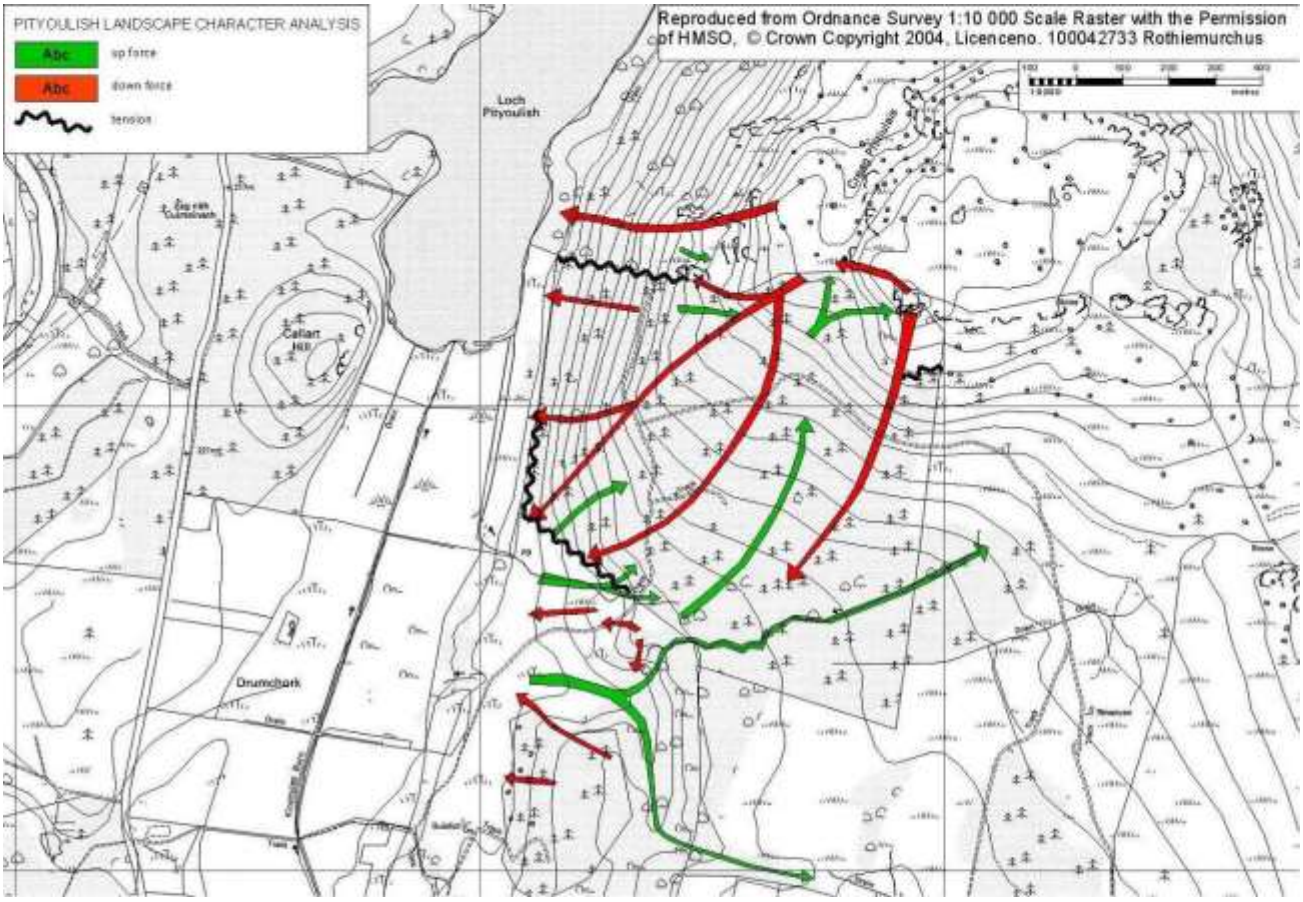
Pityoulish ex Tullochgrue 2011

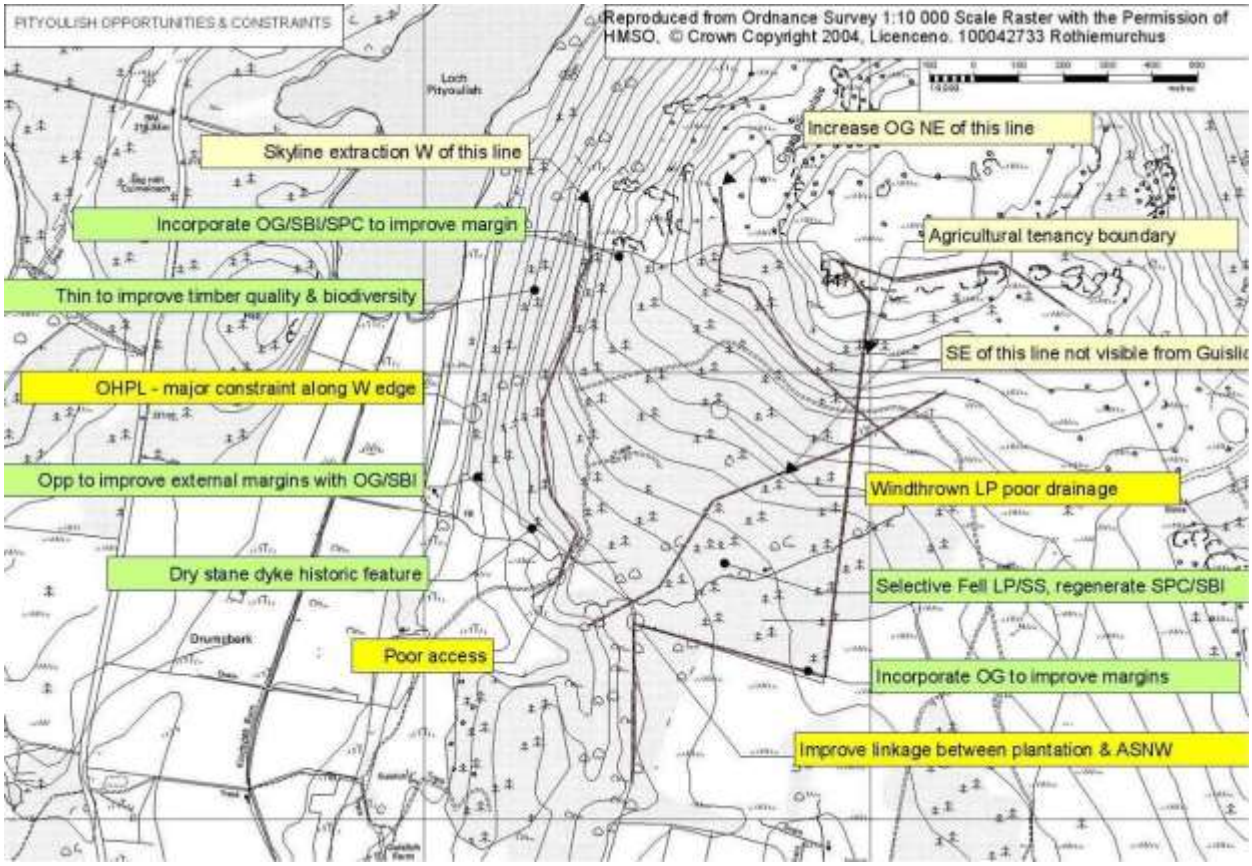
Pityoulish ex Drumintoul 2011

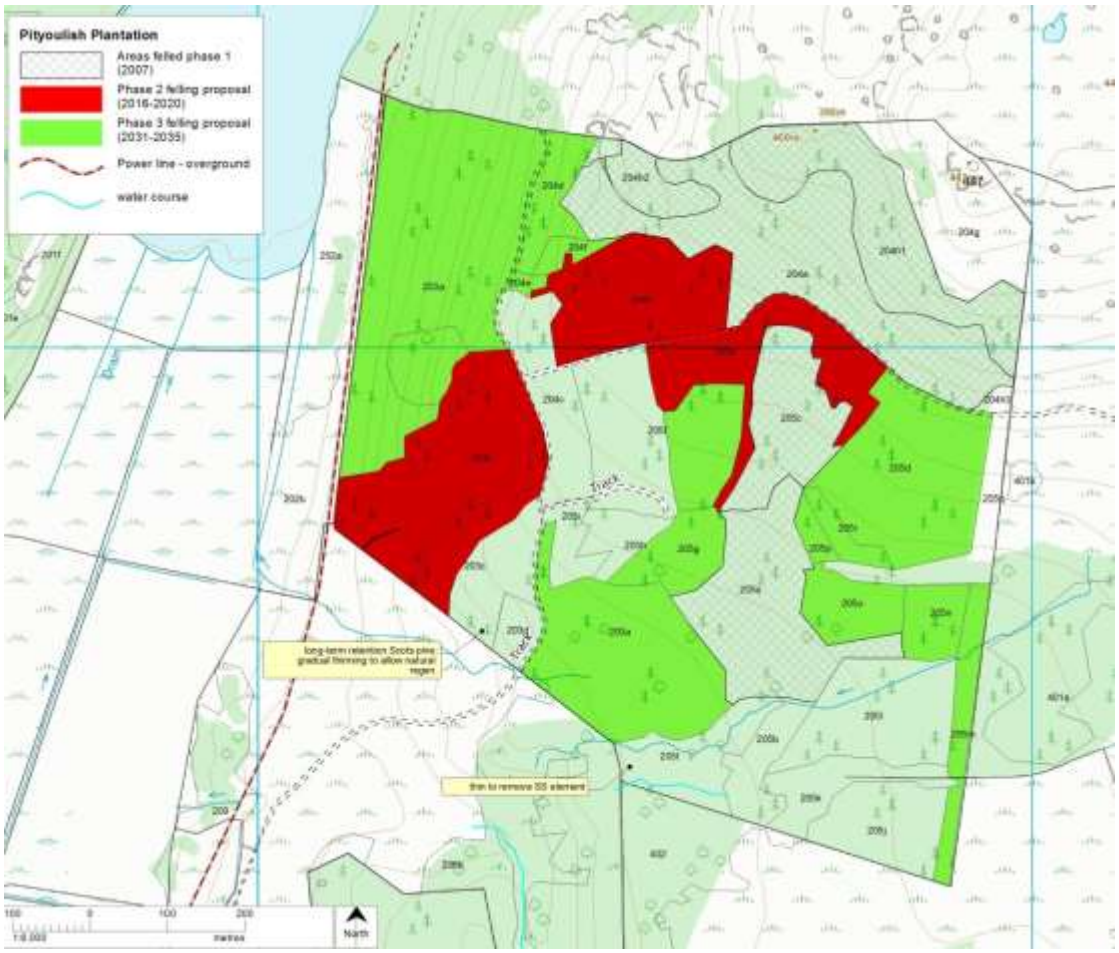


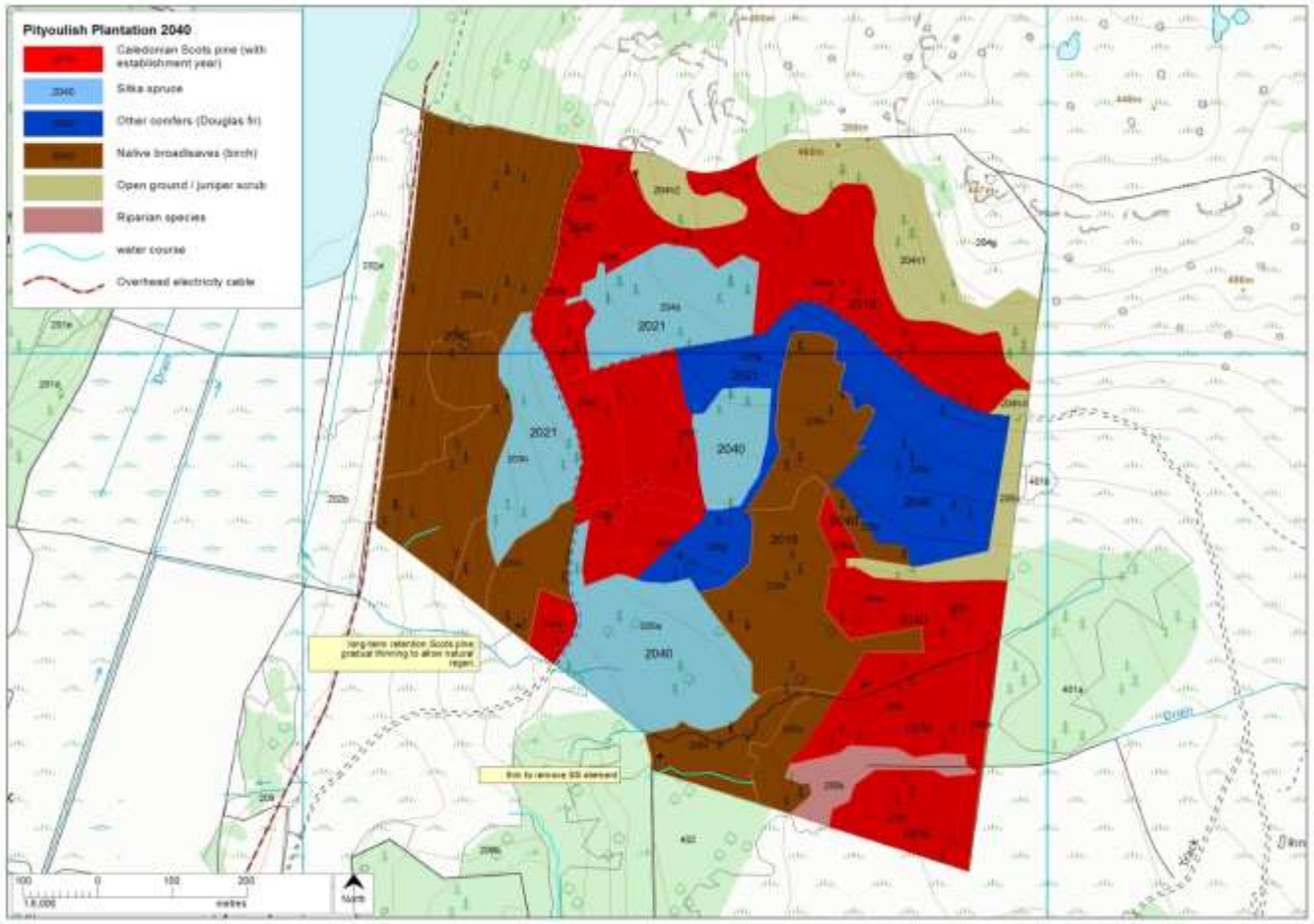

Pityoulish species mix 2015
Areas felled 2006 to 2011
LP
Other conifers (Douglas fir, lodgepole pine)
Douglas fir with larch
Scots pine
Sitka spruce
Sitka spruce with larch
Sitka spruce & Scots pine
Sitka spruce & open ground
Sitka spruce & birch
Bi
Mixed broadleaves (birch, oak)
Caledonian Scots pine (SPC)
Larch regeneration
Open ground
Loch Pityoulish
Creag Phitiulais
Drumchork
Gulsich Farm
LP/SP
LP
DF
Bi
Bi/jun
Bi/OG
Bi/SPC
ok/jun
ok
100 0 100 200 300 400
1:10,000
metres
North
Reproduced from Ordnance Survey Vector Map Local with the permission of HMSO, ©Crown Copyright 2014, licence no. 100042733.


PITYOULISH WINDFIRM BOUNDARIES
Windfirm boundaries
Reproduced from Ordnance Survey 1:10 000 Scale Raster with the Permission of HMSO, © Crown Copyright 2004, Licenceno. 100042733 Rothiemurchus
Track
FB

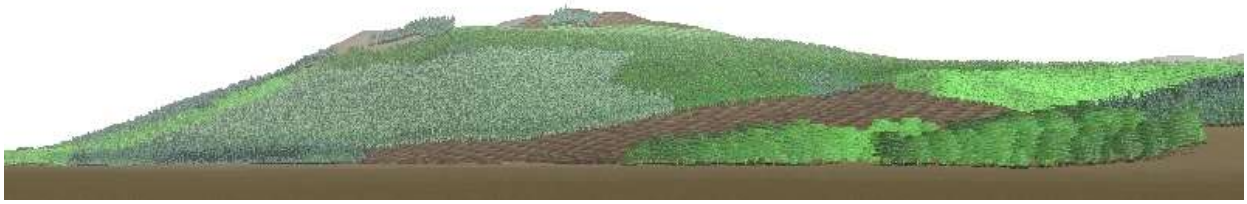

PITYOULISH LANDSCAPE CHARACTER ANALYSIS
Abc
up force
Abc
down force
tension
Reproduced from Ordnance Survey 1:10 000 Scale Raster with the Permission of HMSO, © Crown Copyright 2004, Licenceno. 100042733 Rothiemurchus
Loch Pityoulish
Drumchork


PITYOULISH OPPORTUNITIES & CONSTRAINTS
Reproduced from Ordnance Survey 1:10 000 Scale Raster with the Permission of HMSO. © Crown Copyright 2004. Licence no. 100042733 Rothiemurchus
Loch Pityoulish
Skyline extraction W of this line
Incorporate OG/SBI/SPC to improve margin
Thin to improve timber quality & biodiversity
OHPL - major constraint along W edge
Opp to improve external margins with OG/SBI
Dry stane dyke historic feature
Drumsborb
Poor access
Increase OG NE of this line
Agricultural tenancy boundary
SE of this line not visible from Guisli
Windthrown LP poor drainage
Selective Fell LP/SS, regenerate SPC/SBI
Incorporate OG to improve margins
Improve linkage between plantation & ASNW

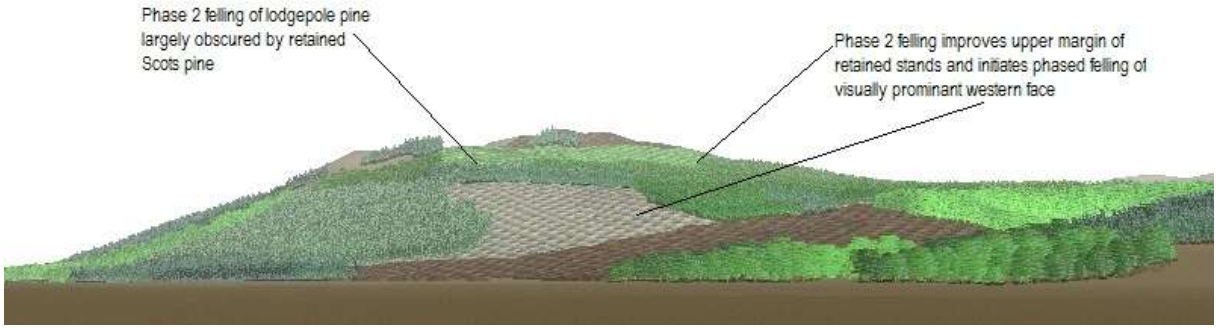

Pityoulish Plantation
Areas felled phase 1 (2007)
Phase 2 felling proposal (2016-2020)
Phase 3 felling proposal (2031-2035)
Power line - overground
water course
North


Pityoulish Plantation 2040
Caledonian Scots pine (with establishment year)
Sitka spruce
Other conifers (Douglas fir)
Native broadleaves (birch)
Open ground / juniper scrub
Riparian species
water course
Overhead electricity cable
2021
2040
2021
2040
long-term retention Scots pine; gradual thinning to allow natural regen.
fell to remove SS element
100
0
100
200
metres

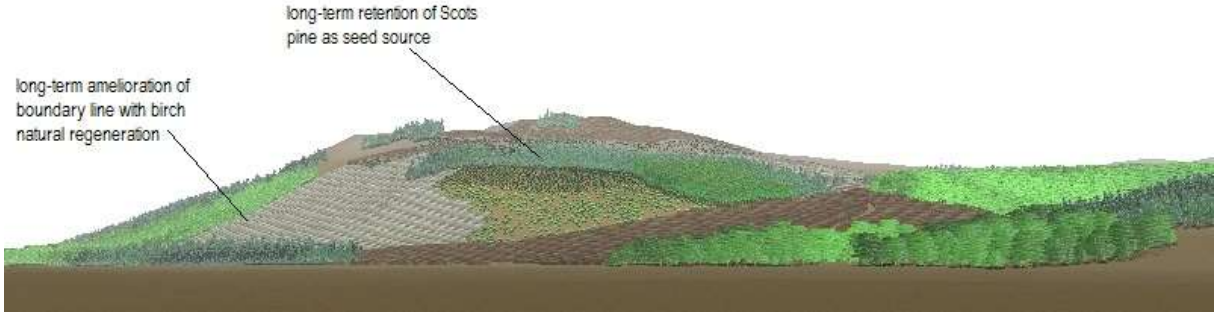
Pityoulish landscape visuals, from B970 Cambusmore (NH 9123 1215)



2015



2020 after phase 2 felling. Phase 1 felling has 'greened up', with a replacement crop still in establishment phase. Phase 2 improved upper edge of thinned stands and removed LP vulnerable to windblow. Phased felling of western face initiated.



2036 after phase 3 felling.

8.5 Ord Ban Plantation

Ord Ban Plantation extends to some 48ha on the steep west flank of Ord Ban, the prominent hill between Loch an Eilein and the River Spey. The plantation forms the immediate foreground when travelling along the B970 between Inverdruie and Feshiebridge until one leaves Rothiemurchus at Kennapole. Middle distance views from Kinrara (view 18) and the slopes of Craigellachie (v17c) give a better impression of the scale of this plantation (ref Map 27). That the plantation forms part of the Doune Designed Landscape (map 7) will have implications for the felling proposals and plans will need to be approved by Historic Scotland.

This wood is mostly of Ancient Semi-Natural origin and was shown on the Roy maps. It is now a PAWS with a range of commercial conifers. Birch continues to thrive throughout much of the plantation, and in some parts is co-dominant with the introduced conifers. This will aid restoration of some areas and allow improved linkages with adjacent ASNW.

No thinning has been undertaken to date, except for some removal of Christmas trees, which is a missed opportunity as regards many of the conifers (including Grand fir, Douglas fir, Sitka & Norway spruce) which are now considered beyond thinning age.

The site is predominately freely draining and relatively windfirm. ForestGALES has been used to calculate the age at which the various stands will reach Wind Damage Risk Status 4, 5 and 6 for overturning and breakage.

8.5.1 Ord Ban Constraints & Opportunities Analysis

Factor	Constraint	Opportunity
Access	Very poor access for timber extraction and haulage	Improve design and fencing to minimise future access constraints and conflicts with deer farm
Biodiversity	Limited structural diversity within plantation	Restructure to increase range of planting years To restore a minimum of 15% of Planted Ancient Woodland Sites
	Previous adoption of No Thin regime has reduced management options	Adopt Thinning policy for future rotations
Landscape	Woodland design restricted by external boundaries	To accentuate site features and improve linkages with other woodland Incorporate open space and native species at restocking
Plantation age structure	Even-aged plantation limits choice of felling years	Range of species, growth rates and site types afford some flexibility to felling
Site suitability	Highly productive species planted on inaccessible sites Drought crack in some species	Future objectives and species choice to better reflect site constraints Good potential to grow high value, high yielding species
Watercourse	Watercourse lost beneath canopy	Remove conifers, enhance with open space and riparian species
Windthrow risk	Limited windfirm boundary options	To improve woodland design at felling and restocking

Selective thinning is proposed in Compartment 1615c, which comprises a mix of EL and SBI on reasonable soil with good drainage. This will enhance the woodland as habitat, by

helping to sustain the ground flora, and will produce some good timber. However, thinning to date has not been practical or cost effective due to timber values and extraction constraints. Thinning is now so delayed that there is a very high risk of wind-throw.

Felling is proposed to start 2016-2020. The exact year of felling needs to consider the limited market potential for Noble or Grand fir logs if they grow too big for the chipwood markets, the current and future competition in the small-roundwood market and the retention of Douglas fir stands until the average tree size is big enough for the saw-log markets. There is a small amount of windblow in the Grand fir in Cmpt 1615.

8.6 Ord Ban Felling and Restocking Plan

The aim is to fell the areas of spruce and grand fir in phase 1 of this plan; felling to a wind firm edge to retain the Douglas fir until it has reached a more marketable size, but acknowledging that stability issues may force felling of the Douglas fir earlier than 2036.

Take opportunities as they arise with any strengthening of timber prices to fell the larch on the steeper ground, retaining most of the birch to transform these sub-compartments to native woodland. In the short-term; low timber prices and the difficulties of extraction mean that there is unlikely to be any thinning activity in the larch stands during 2016-2025.

Use deer fencing (marked to prevent bird strikes) to enclose an area of woodland that can be more easily managed in the future (avoiding steep slopes with difficult access) and restock with Douglas fir to on dry sites and Sitka spruce on damp sites, allowing a proportion of birch to regenerate naturally into the mix. This should optimise returns on a species with a good market position, whilst reducing losses due to drought crack and using birch regeneration to bulk up the stocking and allow for a return on first and second thinning.

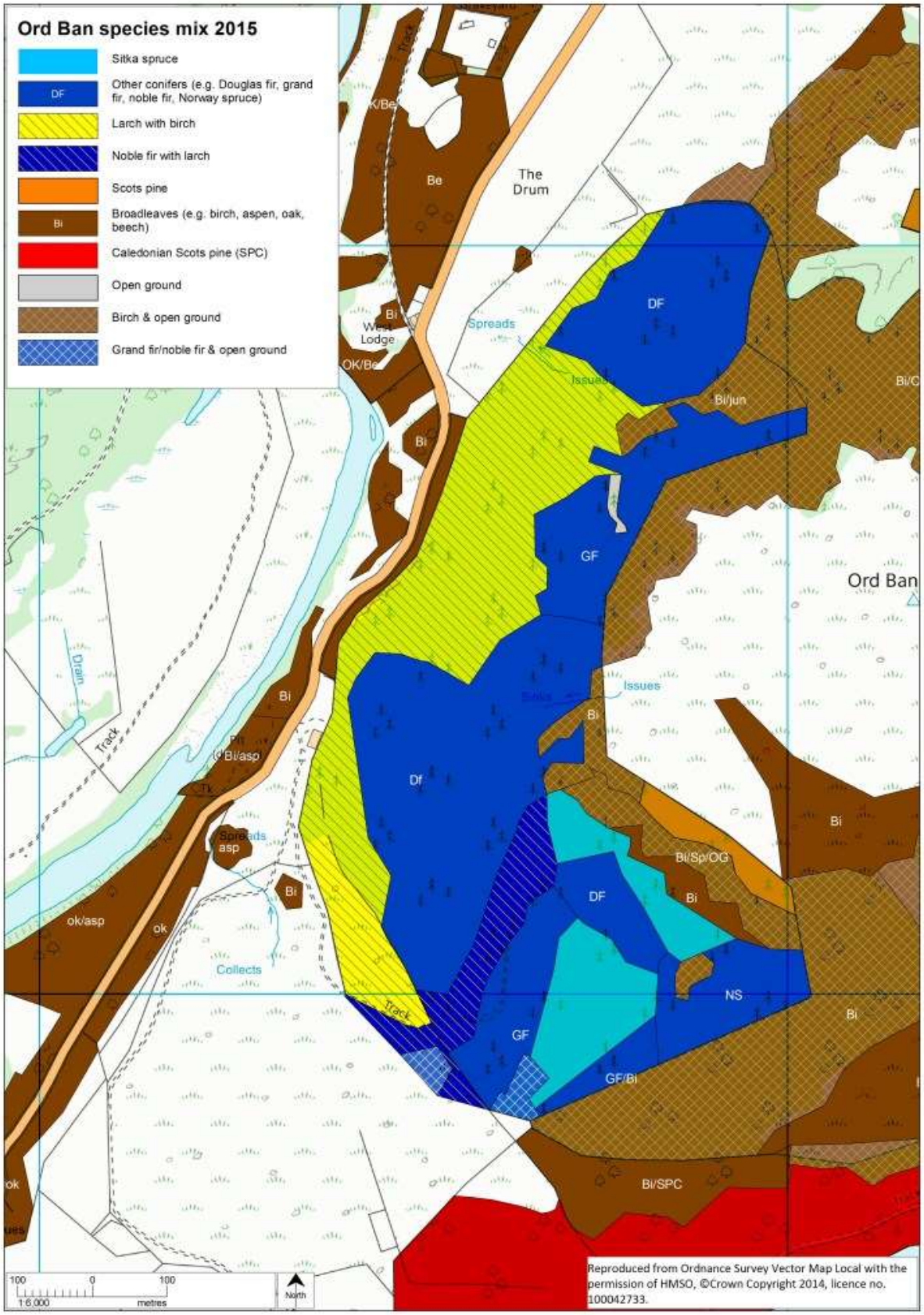
Outwith the deer fence, natural regeneration of birch will be established at 1100 stems per hectare by year 10 after felling and secured through deer management.

Replanting will commence immediately after felling to establish a crop at 2,500 stems per hectare by year 5 after felling. Spot weeding and follow up treatment for pine weevil will be carried out, if required.

The small area of Scots pine on the upper edge of the plantation will be retained with the birch in that area, but thinned to waste to create pine deadwood and to improve the landscape transition from woodland to open hill. The adjacent area of mature birch to the South-East of the plantation (1606a) will be felled in period 2, with seed trees retained to initiate regeneration in this area and soften the interface between the plantation and adjacent native woodland.

Ord Ban Fell & restock schedule

	Area felled	**Species**	**Restock area**	**species**
Phase 1 (2016-2020)	12.5	MC	7.40	SS
			3.9	Bi (NR)
			0.4	SPC (NR)
			0.8	OG
Long-term (2036-2040)	13.25	DF	9.15	Bi (NR)
			1.4	SPC (NR)
			2.7	DF


Ord Ban species mix 2015
Sitka spruce
DF
Other conifers (e.g. Douglas fir, grand fir, noble fir, Norway spruce)
Larch with birch
Noble fir with larch
Scots pine
Bi
Broadleaves (e.g. birch, aspen, oak, beech)
Caledonian Scots pine (SPC)
Open ground
Birch & open ground
Grand fir/noble fir & open ground
The Drum
Ord Ban
Spreads
Issues
Collects
Track
Drain
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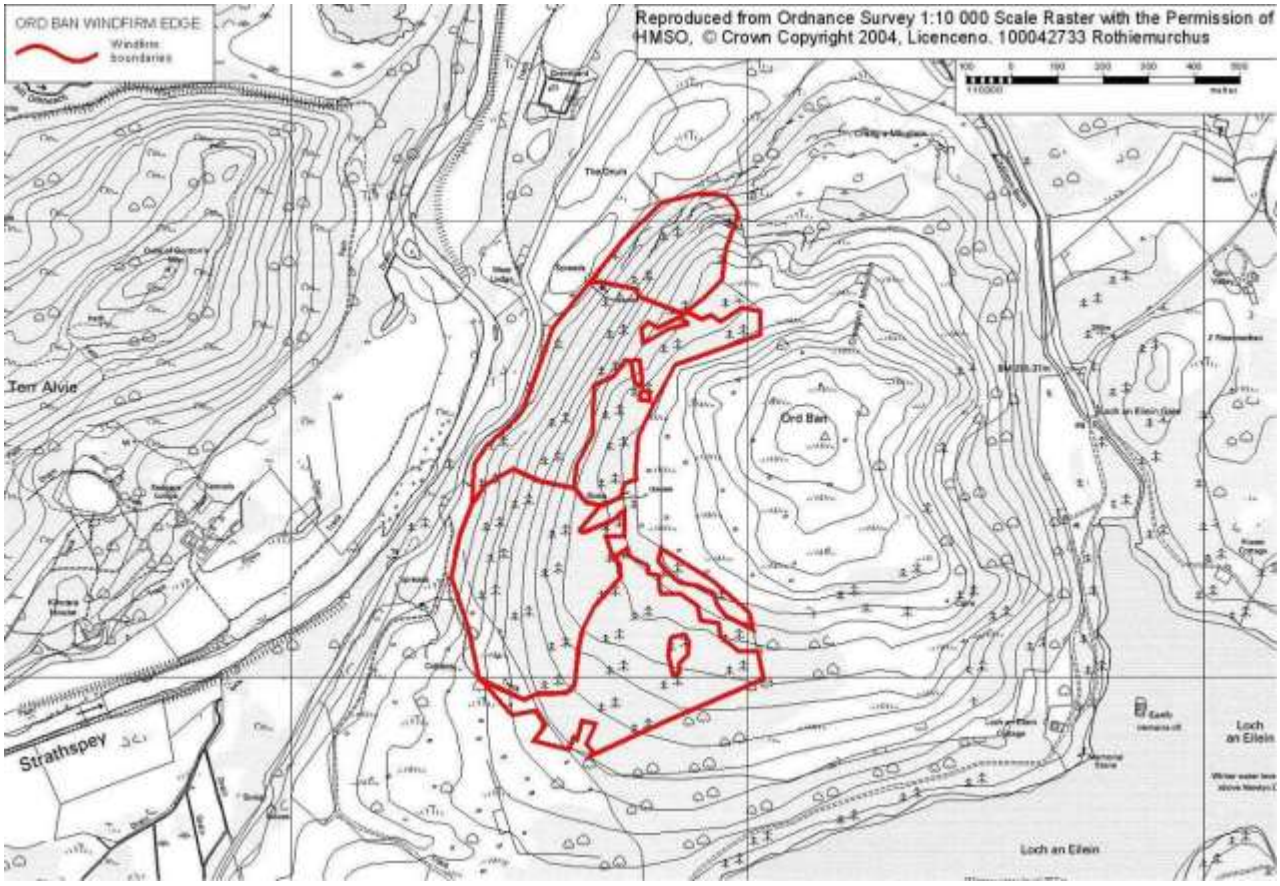
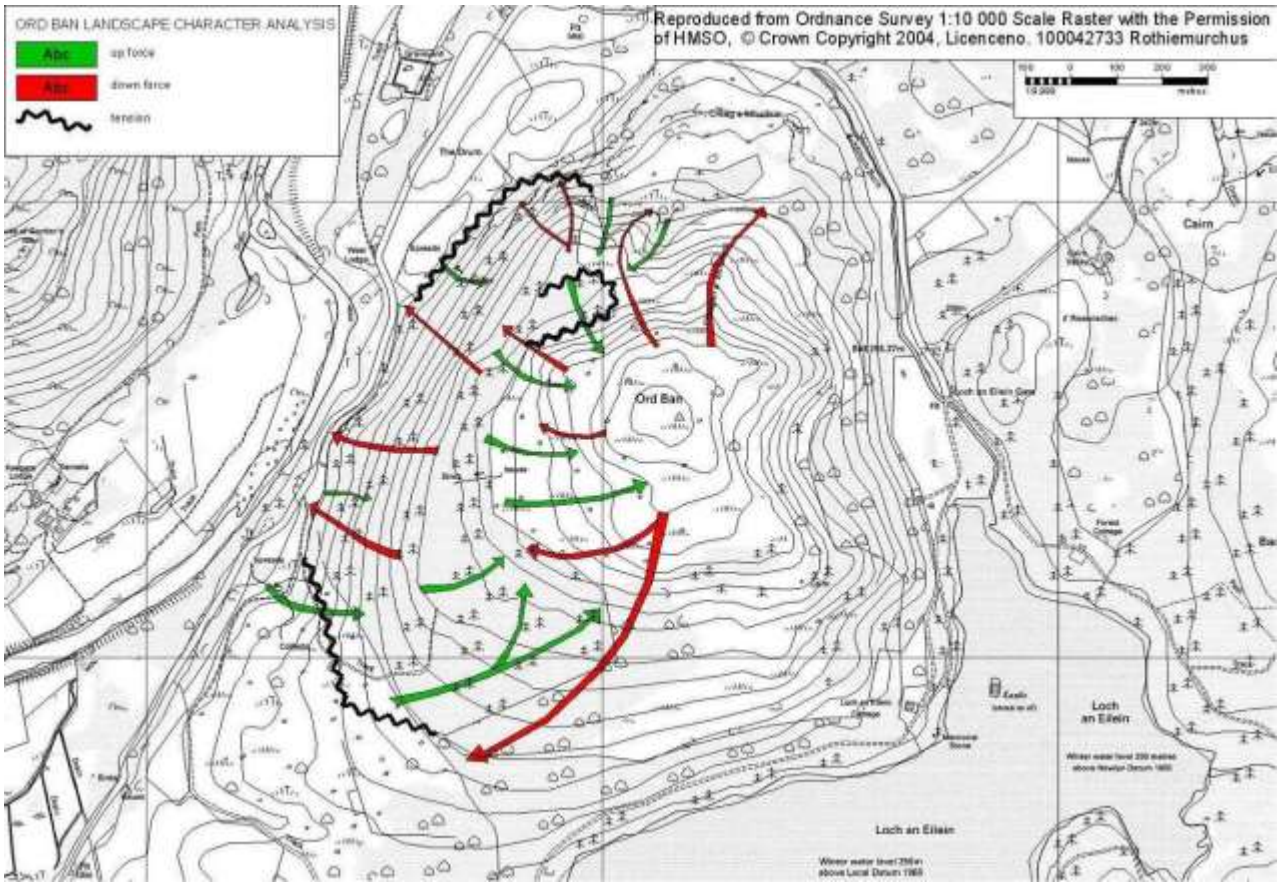
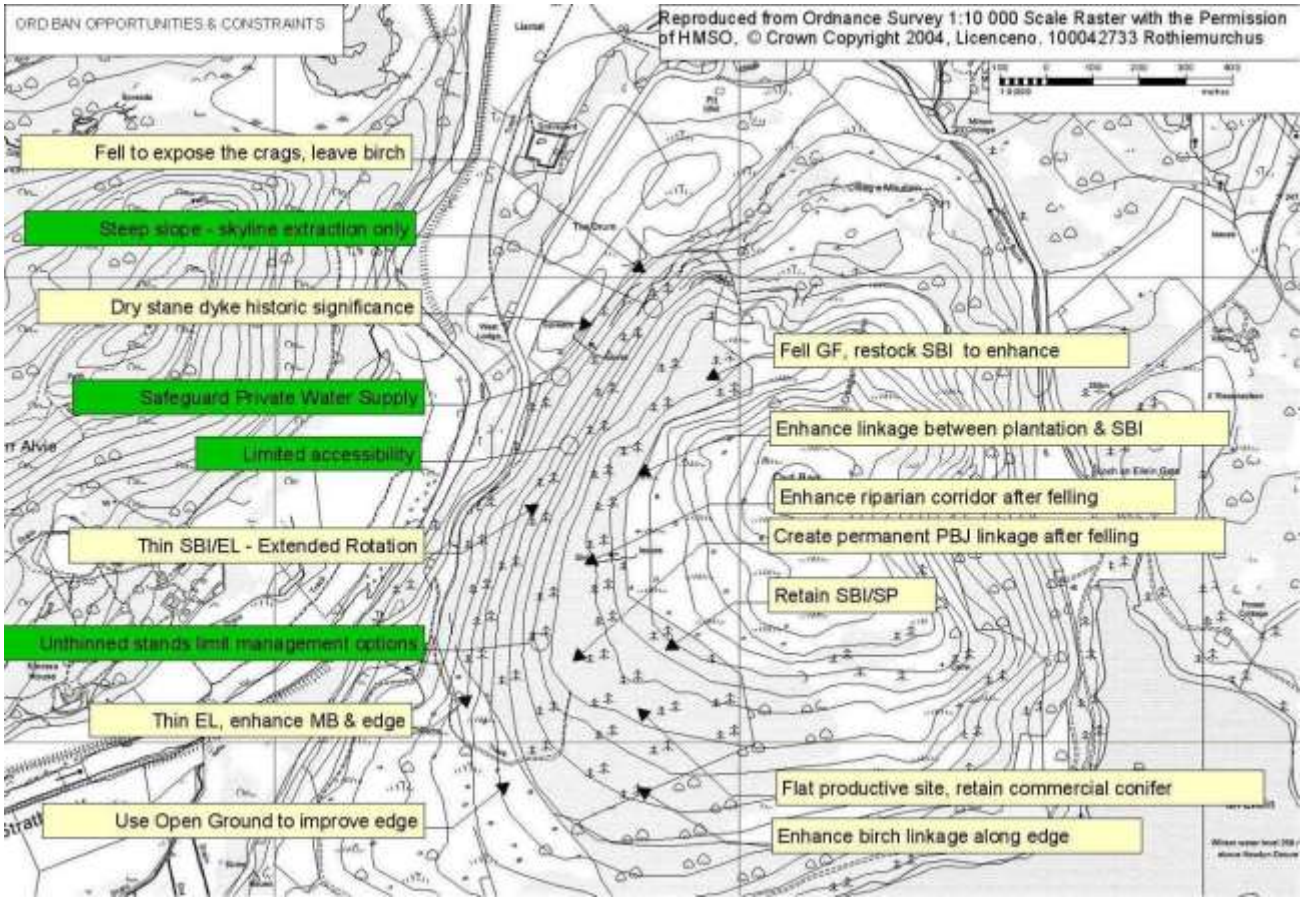
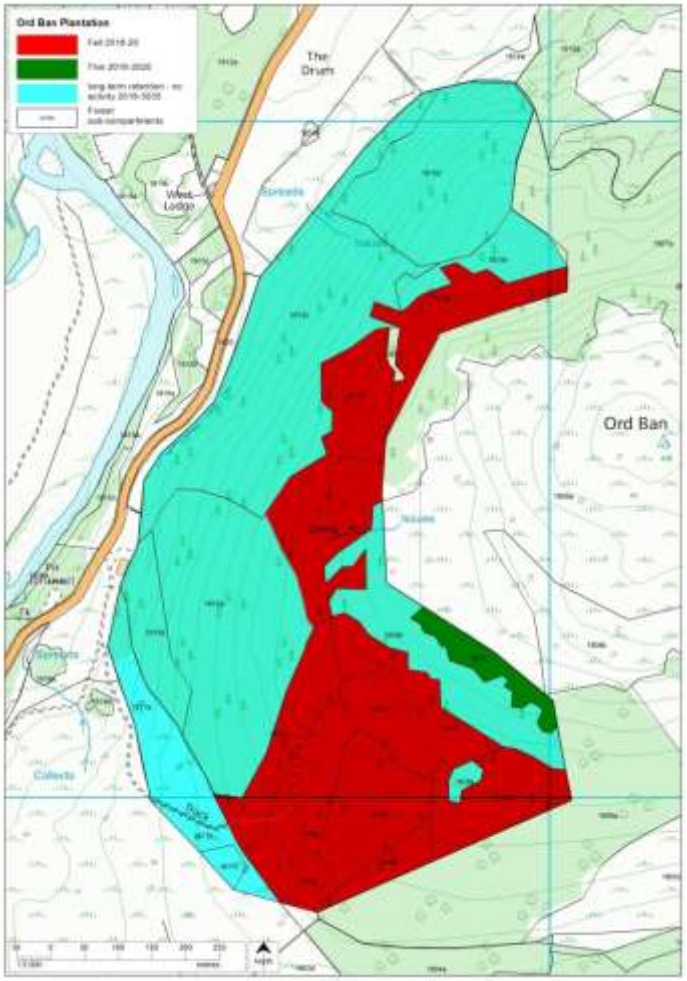
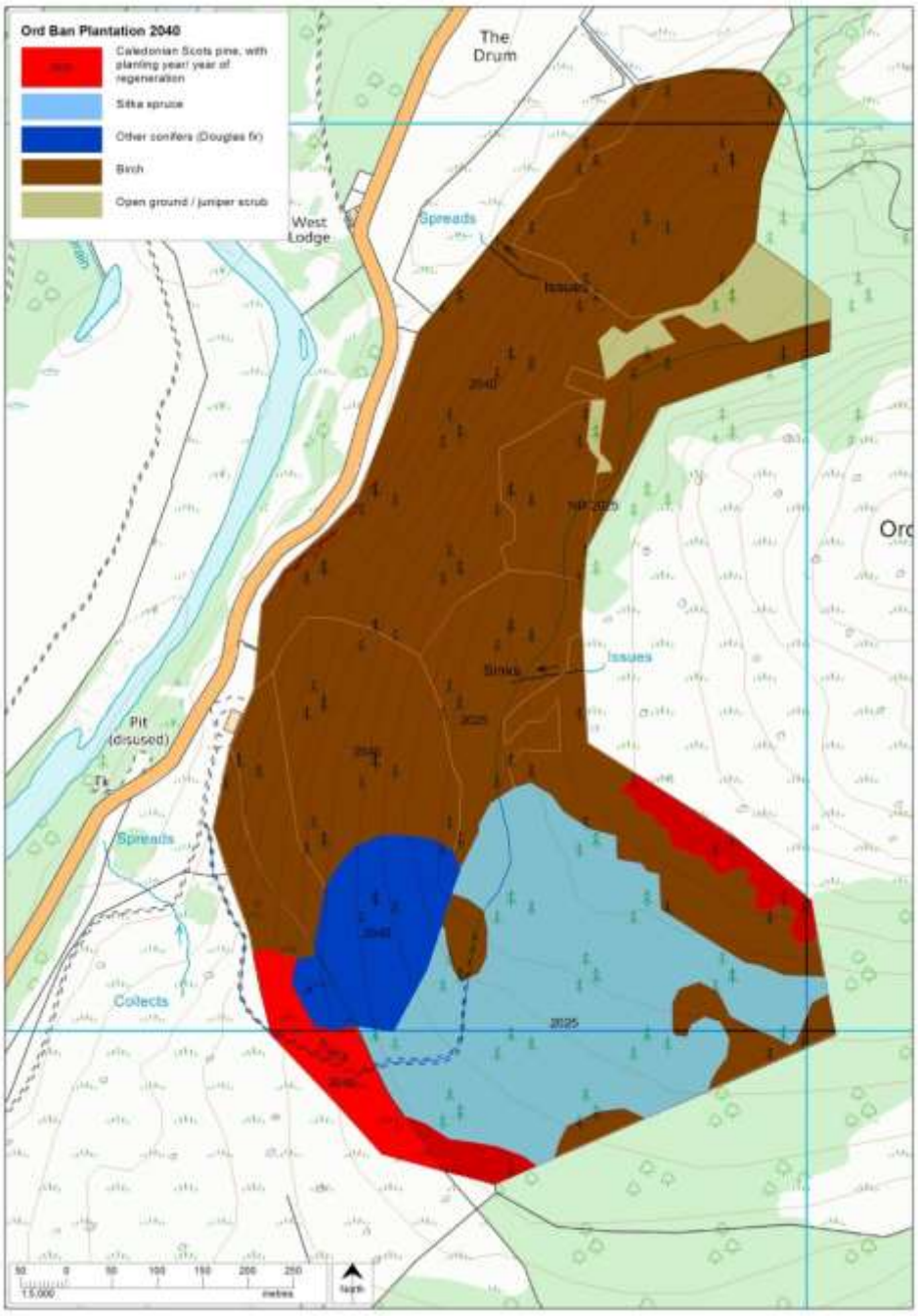

ORD BAN WINDFIRM EDGE
Windfirm boundaries
Reproduced from Ordnance Survey 1:10 000 Scale Raster with the Permission of HMSO, © Crown Copyright 2004, Licenceno. 100042733 Rothiemurchus
Torr Alvie
Ord Ban
Strathspey
Loch an Eilein
Loch an Eilein


ORD BAN LANDSCAPE CHARACTER ANALYSIS
Abc
up force
Abc
down force
terrain
Reproduced from Ordnance Survey 1:10 000 Scale Raster with the Permission of HMSO, © Crown Copyright 2004, Licenceno. 100042733 Rothiemurchus
Cairn
Ord Ban
Loch an Eilein
Loch an Eilein

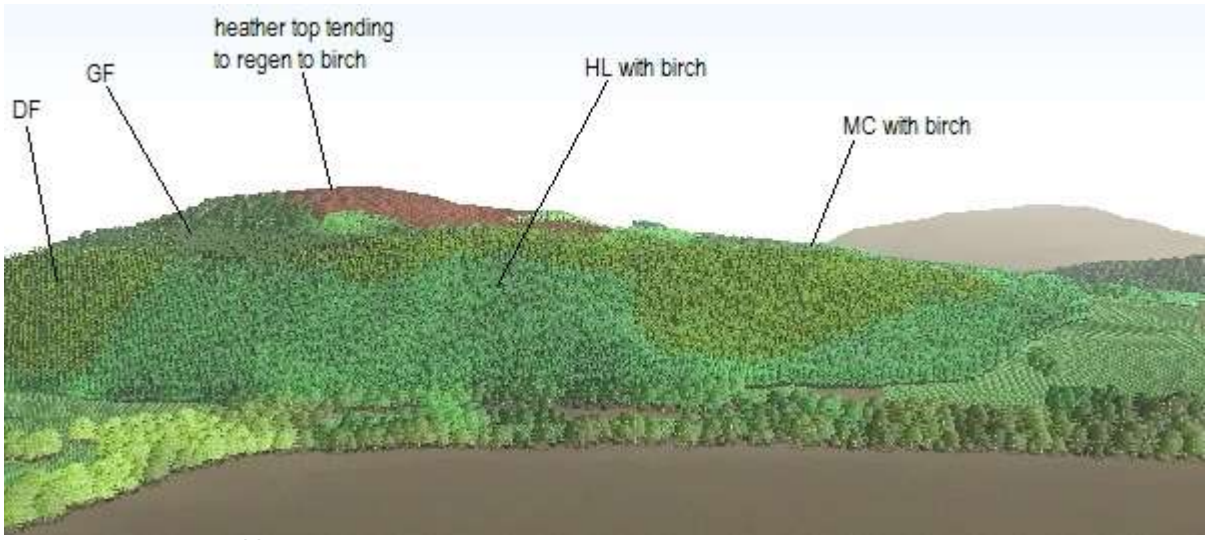

ORD BAN OPPORTUNITIES & CONSTRAINTS
Reproduced from Ordnance Survey 1:10 000 Scale Raster with the Permission of HMSO. © Crown Copyright 2004, Licenceno. 100042733 Rothiemurchus
Fell to expose the crags, leave birch
Steep slope - skyline extraction only
Dry stane dyke historic significance
Safeguard Private Water Supply
Limited accessibility
Thin SBI/EL - Extended Rotation
Unthinned stands limit management options
Thin EL, enhance MB & edge
Use Open Ground to improve edge
Fell GF, restock SBI to enhance
Enhance linkage between plantation & SBI
Enhance riparian corridor after felling
Create permanent PBJ linkage after felling
Retain SBI/SP
Flat productive site, retain commercial conifer
Enhance birch linkage along edge


Ord Ban Plantation
The Drum
West Lodge
Ord Ban

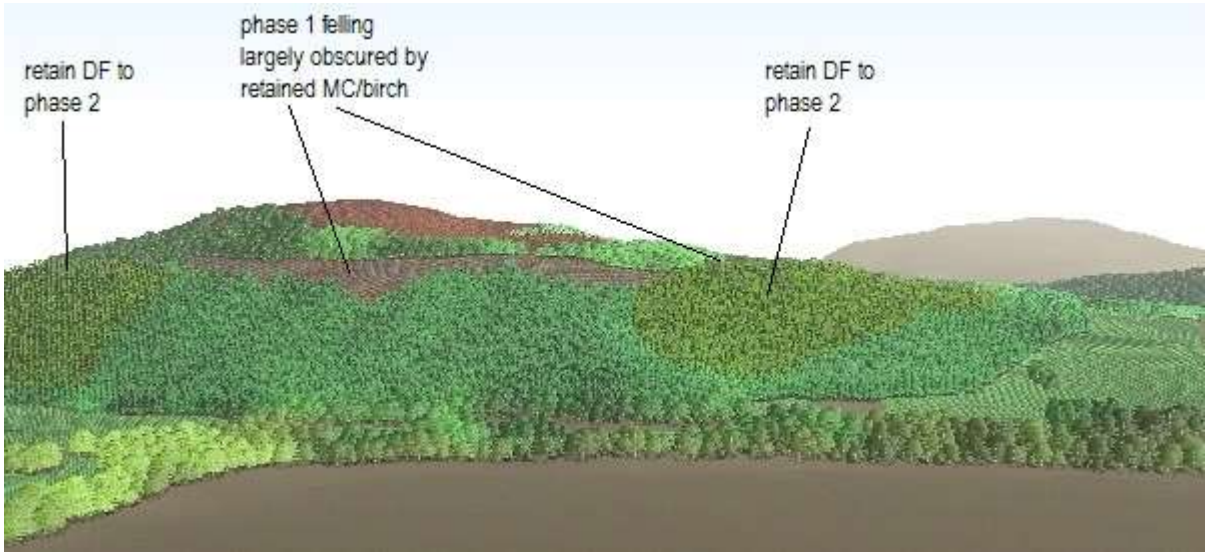

Ord Ban Plantation 2040
Caledonian Scots pine, with planting year/ year of regeneration
Sitka spruce
Other conifers (Douglas fir)
Birch
Open ground / juniper scrub
The Drum
West Lodge
Spreads
Issues
Sinks
Pit (disused)
Collects
2040
2025
Ord
50 0 50 100 150 200 250
1:5,000
metres

Ord Ban visuals, from Duke of Gordon Monument, Kinrara (NH 8774 0889). At 356m amsl this is the closest viewpoint that gives the broadest view over the plantation. The monument is well known locally but visitor numbers to the monument are probably low.

View of Ord Ban plantation from Duke of Gordon monument, Nov. 2015



Computer generated image, summer 2015



2020 after phase 1 felling

9. DOUNE & SPEY WOODLANDS

9.1 Description

The woodlands of the Doune and Spey comprise a broad range of introduced and native tree species, including a semi-natural element along the banks of the Rivers Spey and Druidh. Most of the Cairngorm woodland types are featured, but Policy woodland, Mesic Broadleaved woodland and Riparian woodland predominate (see map 13). The term "Policy woodlands" in this plan is largely used to identify trees and woods planted originally as landscape features close to the Doune and Inverdruie House, including the prominent beech hedge and dominated by non-native species. "Mesic Broadleaved and Riparian woodland" describes compartments dominated by native species. There is considerable overlap between the Policy and Mesic Broadleaved woodland types, with many formerly ornamental plantings now functioning as woodland stands.

9.2 History

The current woodland landscape is essentially a legacy of the 19th Century, although the earliest planting of trees and woodland as a designed landscape around the Doune mansion house probably stems from the late 17th/early 18th century. In the 19th century, tastes changed to favour informal or picturesque landscapes and many of the old trees close to the Doune were felled. However remnants of the formal avenues remain, providing character to routes to and from the Doune and framing long views from the house. New plantations were also created in the 19th Century through what was an intensively managed, agricultural landscape and many of these areas of mixed conifer and broadleaved woodland remain within the fabric of field and settlement.

The cultural importance of the policy and surrounding woodlands are recognised by a Designed Landscape status. See map 7. The Motte immediately adjacent to the Doune house is a Scheduled archaeological site. All plans affecting these designated sites will be notified to Historic Environment Scotland in advance of implementation.

9.3 Management – Policy Woods

Many of the oldest trees from the earliest phases of planting are over-mature and are showing significant signs of decay. Damaged limbs and large quantities of deadwood are apparent in the tree crowns and on the woodland floor. A lack of thinning amongst the younger trees and larger stands has seen fierce inter-tree competition. Many trees exhibit good stem form, but at the expense of crown development and growth. A number of trees have died back completely and there are disproportionate quantities of standing and fallen deadwood for this type of woodland. There is an urgent need for management prevent deterioration of this important landscape.

The key features to retain are: the long view South-South West from the Doune house; feature trees along the main drives to and from the Doune; the parkland trees within the fields surrounding the Doune; the ornamental character of woodland immediately to the North of the Doune; mature conifers to the West and North West of the Doune to reduce noise pollution from the railway and roads and the mature woodland character of other policy woodland stands.

9.3.1 Selective Thinning and felling

Opportunities will be taken to thin policy woodland (cmpts 1807, 1808, 1811, 1812) to remove suppressed trees and to increase the size of canopy gaps to encourage natural regeneration.

Some felling intervention will be determined by health and safety considerations or to protect archaeology from wind blow, for example on the Doune Motte (cmpt 1810a).

It is proposed to thin the Scots pine element of Compartment 1812d. These trees are over-mature and will be replaced, over time, by the beech under-storey.

No felling is intended among the parkland trees. These open-grown specimens will largely be retained, except where dead, dying or in poor condition.

The Riverbank flood defences will be maintained by felling any trees liable to windthrow.

9.3.2 Deadwood

The ornamental nature of the Policy woodlands determines that large quantities of deadwood are not applicable in some of the parklands, particularly in highly visible areas round the Doune House and Inverdruie House.

However, management will aim for the UKWAS minimum recommended figure of 3 standing and 3 fallen stems per hectare to apply to Policy Woodland stands as a whole, with deadwood accommodated where it is not highly visible. (Ref Section 6.4).

9.3.3 Restocking

Parkland trees will be replaced by planting (with protection) in good time before the mature framework of trees die, with the aim of maintaining what is understood to be the historic layout of the Doune parkland landscape. Replacement trees will be planted into gaps in existing groups not planted in new avenues or as isolated specimen trees.

Within the larger blocks of policy woodland, natural regeneration will be thinned or re-spaced when trees are 3-4m tall to favour beech with a proportion of other species, e.g. oak, Scots pine and European larch Grand fir (which has proved to be more vulnerable to wind blow and of low timber value) will largely be weeded out, and, if emergent conifers are required in the landscape, this feature will be provided by other species such as Norway spruce, European silver fir and giant sequoia. Tree guards will be used to identify and protect preferred species during the establishment phase of regeneration.

9.4 Management – Mesic and Riparian Broadleaved Woodland

Given their limited extent, these woods will largely be managed for biodiversity enhancement objectives and categorised as core or extension old growth (minimum intervention). Where timber harvesting might be appropriate they will be managed on extended rotations (see map 19).

Only one or two riparian stands of hardwoods (alder, bird cherry) could be considered for coppice management to stimulate re-growth and maintain tree and river bank stability. Opportunities will be taken during these operations to remove non-native, invasive woody shrub species prior to felling works, or as soon as possible in the regeneration phase. Sycamore or and beech will be removed (either by felling and cut stump treatment or stem injection with herbicides) to favour native species, but sycamore will be retained in gaps or where, in the future it might fill the place of ash, which, in all probability is going to succumb to Chalara dieback (*Hymenoscyphus fraxineus*),.

No old-growth or veteran trees will be coppiced. Standing deadwood will be retained, especially snags suitable for goldeneye nests.

Regeneration will be secured through deer management, but vulnerable species, such as aspen, may require additional tree guard protection.

10. FOREST ROADS

The continuation of Rothiemurchus' long history of forest management and timber production is fundamental to sustaining the area's cultural and natural heritage. These values are encapsulated in all aspects of the Forest Plan, including the issues of forest roads and timber haulage infrastructure. A modern forest road network allows cost effective forest thinning that sustains a working forest economy and benefits capercaillie. A minimal road network reduces recreation disturbance to wildlife and a well-designed, well-built road network accommodates multiple recreation activities and reduces the risk of recreation spill-over into less disturbed areas.

Highway agencies require that timber lorries exit and enter highways in forward motion, so forest roads either have to have separate entry and exit points, or at least one turning area. Access off public roads is also required for low-loaders to drop off harvesters and forwarders. Wagon and drag units can cope with more constrained access than articulated lorries, but their availability is more limited.

Sources of stone (borrow pits and small quarries) are also required to minimise the cost of importing stone for road construction and maintenance.

10.1 Appraisal of the Forest Road Network

Most routes have been used for timber haulage in the past and are suitably located for the purposes of timber haulage in this Forest Plan and much of the network is capable of being used with only minor modification.

Very few of Rothiemurchus' internal forest roads were designed with modern timber harvesting and timber haulage equipment in mind. The layout is constrained by topography and ground conditions and latterly by designations that require mitigation for any habitat lost in designated areas and assessment of likely impact on capercaillie populations.

The existing road network originates from road formations (bulldozed tracks) averaging about 3-4m in width. Over time, however, road materials were added to afford some strength and durability and to increase the load-bearing capacity. This commonly gave an average effective running surface of about 2-2.5m. Inevitably some tracks are wider, others narrower.

Appraisal of the existing internal road network, allied to the thinning and felling proposals, has identified the timing and location of routes likely to be required for timber haulage. Several broad categories have been determined:

- Existing haulage route (E)
  Existing routes requiring only some resurfacing works to render them suitable for timber haulage. E.g. Guislich farm road
- Upgrade haulage route (U)
  Existing routes requiring improvement and upgrading to allow the passage of HGVs for timber haulage. E.g. Moormore spur
- Habitat restoration (R)
  A number of tracks or track sections were restored back to natural vegetation in the first 5 years of this plan.

To this end, apart from some minor modifications to road alignment, there is no requirement for new roads to meet the Forest Plan objectives.

Map 22: Forest Road Plan shows the existing timber haulage road network, where forest roads meet public roads and where road upgrades are planned for the future to facilitate timber harvesting. Appendix 5.1 lists the forest roads by location and describes their condition and quantifies the area of habitat change required for upgrading.

10.2 Design & Specifications

This section outlines the normal minimum specifications (dimensions) for forest roads and infrastructure in use throughout the UK:
(http://www.forestry.gov.uk/pdf/FC_outline_road_specification_140401.pdf/$FILE/FC_outline_road_specification_140401.pdf).
http://www.forestry.gov.uk/pdf/unsealedroads2014.pdf/$FILE/unsealedroads2014.pdf

These specifications have evolved to meet the increasing demands of woodland and timber operations (higher costs, variable prices, larger vehicles) and the management of Health and Safety.

10.2.1 Roads

Routes used for timber haulage by HGVs require an effective width of 3.2 to 3.5m on straight sections and on bends of 90m radius. Curves with less than a 90m radius will require a greater effective width, increasing to a maximum of 6m. Widening will be achieved with a transition of up to 25m length on the inside of bends.

The effective width is the width of road that can support the 44 tonne gross of a timber lorry. Many articulated lorries are described as 'super singles' with an individual gross axle weight of 10.5 tonnes. These lorries require 100mm of compact crushed rock base over a 200mm base at least 500mm wider than the effective road width. Timber lorries with tyre inflation systems can operate on roads of a lesser standard and access to lorries with this modification is becoming easier.

10.2.2 Passing Places

Passing places have an overall length of up to 33m and an additional width of 4m.

10.2.3 Turning Points

Turning points are normally in the form of a T, with a width of 4m, length of 21m and 11m radius. These dimensions will also apply to accesses to/from a public road.

10.3 Planned Improvements

The appraisal, allied with the requirements of modern timber operations, have given rise to a number of treatments with respect to roads, which will assist with the delivery of management objectives:

10.3.1 Upgrading

Upgrading will take several forms, including both tree works and improvements to the roads themselves. Refer to Map 22 and Appendix 5.1 for details.

Tree works will include the removal of branches and some felling, to allow selected route widening and/or realignment on bends so that they are negotiable by HGVs. These improvements to the road geometry are paramount if the current network is to be used, as opposed to constructing new roads. With these changes, it will not be necessary to create any new roads to meet the aims of the Forest Plan.

The existing character of the roads and tracks, which meander between trees or adjacent to a river, will maintain the recreational values, but may limit the choice of timber lorry unless the specifications are as stated above. An example of how this was executed in 2011 was the reinstatement, post harvesting of the section of forest track South of Loch an Eilein to Inshriach (Cmpt 1502).

Timber operations must be managed effectively, and the provision of the appropriate infrastructure will assist greatly in managing timber operations and public access safely.

Upgrading the requisite sections of forest road will be phased according to need. This seeks to minimise the ecological impacts and to avoid unnecessary expenditure.

Over the next 10 years the following roads will be up-graded:

- Moormore spur

Within 20 years it is anticipated that the following might be up-graded:

- Croft field gate
- Loch an Eilein lime kiln to Loch an Eilein Cottage
- Kennapole Deer Farm – Loch an Eilein

It is calculated that the above road widening amounts to some 3,250m^2 in Natura 2000 sites, but even allowing for road up-grades in the period 2006-2015 that impacted on 1,180m^2 of Natura sites, the combined impact is more than offset by the 6,000m^2 of reinstatement in the period 2006-2010. Prior to any road up-grading works being carried out detailed plans will be submitted to FCS using their "determination enquiry form" in order for FCS to consult with other agencies, carry out a Habitats Regulations Appraisal and determine the need for an Environmental Statement and additional mitigation for, e.g. loss of habitat.

Any up-grading work that involves improvements to a bell mouth accessing a public road will only be made after discussion with The Highland Council (Community Services)

10.3.2 Timber Transfer Points

Some upgraded and new passing places and turning points are required (see Map 22: Timber Transfer Points and Appendix 5.1). They will serve as timber loading areas for HGVs.

Phasing of upgrading and construction of Timber Transfer Points will be as for road upgrades.

Timber haulage from Rothiemurchus on public roads will comply with The Highland Council's Agreed Timber Transport routes.

10.3.3 Borrow pits

It is proposed that as much road improvement material as possible comes from local borrow pits. This reduces the carbon costs of importing material from further away. However a number of factors need to be considered: rare species presence (e.g. tooth fungi, wood ants, *Pyrola*), revegetation of borrow pits, back filling of borrow pits with material stripped from track edges, significance of geological features, scale and re-shaping to fit the landscape.

The same considerations apply to two potential sources of road stone that are also located outwith designated areas but within forest areas. If these are to be used, full planning processes will be followed.

10.3.4 Habitat Restoration

One of the main principles for Natura 2000 sites is that management activity does not lead to significant adverse impact on designated features (habitats or species) (European Commission[2], 2003). To this end, from 2006 to 2010, habitat restoration work at a number of locations within the Cairngorms SAC on Rothiemurchus was implemented to ensure that there was no net loss of habitat caused by up-grading of forest tracks to forest road standard. That is, in addition to the considerable habitat gains, which will be achieved through implementation of the Forest Plan, further habitat enhancement was implemented by way of track restoration works. There are several facets to the habitat restoration works:

Inadequate track construction and drainage, allied with changing patterns of use, has led to widening of some tracks (where users stray from the intended route), resulting in a loss of habitat e.g. Loch an Eilein East. By adopting and maintaining the appropriate construction and use specifications, there are opportunities to simultaneously improve the route for users and restore the natural habitat. Implementation of localised drainage and surfacing

measures will help keep traffic on the intended route and promote vegetation re-establishment on the verges.

The track between Achnagoichan and Badan an Droma was reinstated and although still used by walkers and cyclists on occasion, it Is not being maintained as part of the recreation network or for use by estate vehicles. There is an alternative maintained route for visitors some 500m away.

Two sections of old public road at Altnacaber and Moormore were re-vegetated and the road accesses to/from the east closed off. (These sites are now owned by Forestry Commission Scotland.)

Habitat restoration works (2006-2010) resulted in a gain of 6000m^2 (Appendix 5.1), with a net habitat gain to date approximating to 4820m^2 allowing for road upgrading works.

10.4 Important environmental considerations

Tooth Fungi: exposed mineral soil adjacent to tracks is where rare tooth fungi are often recorded and planning in advance needs to identify sites where tooth fungi have been recorded, surveying before work commences and looking for solutions to minimise impact of track improvements on fungi.

Wood ants: Survey in advance of track improvements to identify especially narrow headed ant nests that may be damaged by operations. These might be in areas suitable for borrow pits, in old borrow pits or track edges and some distance from the track if material from track works is going to be placed there or trees felled.

11. OPERATIONAL PLANNING

All operations within the forest, be it timber harvesting or path maintenance will be carried out in accordance with the UK Woodland Assurance Scheme. Special attention to forward planning will be required for operational sites within Natura 2000 areas and where public access is promoted.

In addition to consultation through the forest plan process, annual harvesting and track management programmes will be presented to the local community councils and The Highland Council (Community Services) and within designated locations, the appropriate government agencies; with the aim of minimising impact on people and wildlife by identifying issues not picked up at the broader planning stage and where new site-specific information has come to light. Additional detail regarding forest operational planning is given in Appendices 4.2 (Forest felling) and 5.2 (Forest roads).

11.1 Biodiversity

Operational site plans within SSSI & Natura 2000 designated areas will be put to Scottish Natural Heritage at least 6 months before operations to ensure that all qualifying habitats and species are made known to the estate before operations commence.

All efforts will be made to comply with the following legislation:
The Wildlife and Countryside Act 1981 (as amended), The Protection of Badgers Act 1992 (as amended) and the Nature Conservation (Scotland) Act 2004 provide full protection for certain animal and plant species, e.g. Red Squirrel, Pine Marten and European Badger are afforded strategic and legislative protection to ensure their survival. Some species (e.g. bats, otters and wild cat) are further protected as “European Protected Species” under Regulations 39 and 43 of The Conservation (Natural Habitats &c.) Regulations 1994 and Regulations 10 and 13 of The Conservation (Natural Habitats &c.) Amendment (Scotland) Regulations 2004.

Forest Management at Rothiemurchus will aim to work in partnership with the Cairngorms National Park Authority to deliver the Local Biodiversity Action Plan (Cairngorms Nature) as many of the priority habitats and species are represented within the forest area. As part of this, implementation of the forest plan will aim to support the Cairngorms Capercaillie Framework and the Capercaillie Project Officer will be involved in the operational planning process in woodlands where capercaillie are known to be present.

11.2 Timing of Operations

Woodland operations will refer to guidelines established by RSPB and the Capercaillie Project. They will avoid known periods when woodland grouse species are nesting or sensitive to disturbance, generally from the end of February to the end of August, and they will not take place within 1000m of active Osprey nests during March to August inclusive.

River crossings will be timed to avoid the most sensitive salmon and trout spawning period from late October to May, as well as times of spate.

For public safety reasons, forest operations in areas used regularly by the public, such as Loch an Eilein will also be restricted, as far as possible, to periods when there are few or no school holidays (November and February).

11.3 Site Protection Measures

Operational planning by Forest Management includes mapping and marking of site boundaries, main extraction routes, sensitive areas, exclusion zones and site hazards. Risk Assessment will include environmental and safety measures.

Working methods will be agreed with operators in advance of work starting. It may be possible to link GIS and GPS technology so that machine operators have electronic in-cab maps of site features and constraints. Failing this, hard map copies will be provided.

Planning and preparation aims to ensure smooth and efficient woodland operations. Monitoring and supervision of site personnel by the Rothiemurchus Forester will continue throughout operations, and contingency procedures will be in place in the event of potentially harmful occurrences.

All works will comply with the latest Forestry Commission Guidelines.

11.3.1 Terrain

Ground conditions vary considerably throughout the woodlands at Rothiemurchus, and frequently there are wet, rough and steep areas in a matrix with easier terrain. Care will be taken to account for localised site conditions and to avoid areas of forest bog and to alert operators to the presence of steep ground.

11.3.2 Stand Types

Different stand types may necessitate special methods and order of working in terms of machinery, extraction routes and selection of timber assortments to be cut.

11.3.3 Watercourses (Major)

All operations will comply with the Forests and Water Guidelines (2011).

Trees will be directionally felled to minimise the amount of debris falling into watercourses and to prevent bank damage. Materials entering watercourses will be removed. Machinery will not work in aquatic zones, and the appropriate buffer zones will be maintained throughout. Stacking timber over and in watercourses will be avoided.

River crossings will be sited where bridges have previously been located or where river banks facilitate bridge construction. Crossing points will be temporary so no permanent bridge infrastructure will be necessary for forestry purposes. The construction and use of low cost ramps will support the weight of forest machinery and afford protection to riverbanks and beds. These temporary installations should not impede the passage of migrating fish.

Otters are significant along the main rivers within Rothiemurchus Forest, so survey will inform whether otters may be present and could be affected. Protective measures will be implemented to prevent disturbance if necessary.

11.3.4 Watercourses (Minor)

Crossing of minor (including ephemeral) streams or drains will be kept to a minimum and avoided if possible. If crossing is unavoidable, for example to facilitate timber extraction to a stacking/loading point, then temporary log bridges or piped crossings will be used.

Crossing points will be planned to meet the harvesting and extraction requirements of the site, while avoiding and protecting sensitive or vulnerable areas. They will be removed once they have served their purpose.

Water run-off from forest machine routes will be intercepted by sumps, brash mats, mesh barriers, or otherwise as appropriate, to prevent diffuse pollution in water courses.

11.4 Thinning, Felling & Conversion

The thinning, felling and conversion of timber may be by motor-manual and/or mechanised systems. Lop and top from these operations will be concentrated in racks or spread. Burning of lop and top will not be carried out (see Section 11.7 & ref UKWAS).

In order to minimise the risk of spread of *Heterobasidion annosum*, which causes decay of butts and roots, cut stumps will be treated with the biological agent PG Suspension or dyed urea at the time of felling on selected sites. Where timber production is a primary objective of management and timber is being removed from site, stump treatment will be used to prevent the spread of spores. Once established, *H annosum* may spread to neighbouring trees by root contact (Hibberd, 1991). (PG Suspension is a solution of the living spores of the native fungus *Phlebiopsis gigantea*, which competes with *H annosum*.)

There will be no treatment of stumps in Extended Old Growth stands so that the survival and spread of colonising species such as *Cladonia botrytes* (Stump Lichen), is not adversely affected.

11.5 Timber Extraction

11.5.1 Site Access & Egress

Site planning has accounted for timber harvesting and extraction machinery getting onto and off work sites without causing undue damage to tracks and vegetation. Access and egress points will be located an appropriate distance away from watercourses, bridges and culverts and will avoid steep or wet ground. Extraction machinery will be kept off forest roads where possible.

11.5.2 Extraction Routes

Timber extraction will be along temporary racks, with brash used to protect the ground surface. These routes will connect to access and egress points leading to stacking areas and landings. They will avoid vulnerable steep, soft or wet areas to prevent erosion and avoidable damage and to ensure their viability for the duration of the operation.

Previously thinned stands already have extraction racks, which allow access by low ground pressure mechanised harvesting machinery. If additional racks are needed, they will be carefully routed to avoid sensitive vegetation and habitat. Forwarder extraction will be the most suitable form of extraction in most stands.

Timber extraction methods may also include skyline, mechanised skidder or horse. Site disturbance by skidder or horse extraction will help break up coarse ground layer vegetation such as heather, and afford some mixing of mineral and organic layers, thus promoting natural regeneration.

11.5.3 Timber Transfer Points

Timber transfer points are the interface between the extraction and haulage operation. They may also provide places where HGVs may turn. They are identified on Map 22 and will be sited on firm, level ground a suitable distance away from watercourses, bridges and culverts.

11.6 Machine Maintenance, Fuel, Oil and Urea Storage Areas

The Scottish Environment Protection Agency (SEPA) will be notified in the event of spillages of fuel, oil or urea. Their contact details, including Emergency 24 hour, will be provided on site plans.

Rothiemurchus Forest Management Policy is that chainsaws and machines working in the forest will operate using biodegradable oils. A requirement to use biodegradable lubricants will be specified in all contract tender documents and contracts.

Refuelling and machine maintenance areas will be located on hard, dry, flat ground, a safe distance from watercourses. Fuel and oil will be stored in double-skinned or bunded tanks, and fuel transfer should be by closed systems. Care will be taken to check that pipes do not drip fuel or oil onto the ground.

Site personnel should be trained in how to prevent and deal with oil or fuel spillage. A spillage action plan and a simple spillage kit will be maintained and provided to operators to use in the event of a spillage. It should consist of the following materials, will be present at fuel and urea storage and maintenance points for the duration of each operation:

- oil absorbent pads
- oil absorbent pillows
- lengths of oil absorbent boom
- a spade
- large sealable plastic bags
- personal protective equipment

Rothiemurchus will hold an emergency spill kit at the Dell in case additional materials are required when contractors are working on site.

Brash or soil bunds may be a useful added precaution to trap any spilt fuel or oil, so that contamination can be contained and to prevent it reaching watercourses. Contaminated materials will be stored onsite until disposed of to a licenced waste disposal site. The spillage plan and risk assessment will include contact details and emergency numbers.

Used fuel and lubricant containers will be the responsibility of contractors to dispose of appropriately; to registered recycling/hazardous waste points. Containers produced by Rothiemurchus will be disposed of through the contract with Ritchies waste recycling facility near Aviemore.

11.7 Fire Control Measures

Rothiemurchus Forest Management Policy is to prevent fire where possible.

There is a considerable risk to habitat biodiversity, rural development and recreation from fire. In addition, fire would have serious consequences for the delivery of the forest management objectives. Regular fire patrols will be undertaken during the highest risk periods and the current warning sign system will be continued. Fire control equipment and training will be kept up to date for use in the event of fire. Rothiemurchus will continue to participate in the Badenoch & Strathspey Wildfire Group.

11.8 Waste Management

Rothiemurchus policy is to ensure that all waste is disposed of safely to minimise environmental contamination, minimise risk to staff, contractors and members of the public and to maximise recycling opportunities. Contractors working on Rothiemurchus have responsibility for their own rubbish and will be motivated through contracts and site management to dispose of it safely.

Unused chemicals will be returned to the supplier. Chemical containers will be rinsed out into sprayers.

All other waste is currently collected on contract by Ritchies Waste Recycling which takes all fuel and oil containers, metals, plastics, glass, etc.

11.9 Health & Safety Planning

All forest operations will be planned and carried out in accordance with the Rothiemurchus Estate Health & Safety Policy and for due regard to relevant legislation and FISA or other industry guidelines. This is to ensure that the risks from forest operations are managed to prevent injury to operators, managers or visiting public and guests.

All work will be risk assessed both by the operations manager and the contractor / agent. The operations manager will prepare a site map identifying hazards and environmental constraints and this and all relevant operational safety information will be discussed with the contractor and agent at a pre-start site meeting.

All relevant staff, partner organisations and community groups will be informed re the nature and dates of the operation. Warning signs and path closure notices will be used as necessary.

All site maps, risk assessments, pre-start meeting record, operational inspection records, and contractor training and insurance documents will be kept on file and accessible to the operation manager's line manager.

12. DEER MANAGEMENT

This Deer Management chapter aims to meet Forestry Commission standards as partial fulfilment of the Forest Plan, the recommendations of SSSI Site Management Statements and to comply with the Deer (Scotland) Act 1996, the Wildlife and Natural Environment (Scotland) Act 2011, the SNH Code of Practice on Deer Management and Wild Deer Best Practice Guidance (WDBPG). It aims to provide a general understanding of deer management for communities of interest and support the objectives of the Estate Plan and the Forest Plan. It will provide the means of prescribing, implementing, monitoring and reviewing progress against targets.

Red and roe deer are resident on the estate. Sika deer are rare visitors. Red deer move widely through the landscape and animals that might have spent the summer in Gleann Einich would have moved to low ground and forest areas (e.g. Moormore and Loch an Eilein) during the winter months. Cull figures and population estimates are given in the tables below. A considerable influence on how the estate can meet its stated deer management aims and objectives is the approach of its neighbours towards deer management. Forest Enterprise, Glen Feshie, SNH Invereshie and Mar Lodge are all focussed on maintaining low populations of deer in order to secure woodland regeneration and expansion.

12.1 Long Term Vision, Management Statement, Objectives

Long Term Vision

Rothiemurchus aims for the full integration of objectives in relation to the management of wild deer, through the application of sound knowledge and Best Practice, leading to the enhancement of the Natura 2000 interests.

Management Statement

Deer are an important element of the biodiversity of the forest. They are also important for our cultural heritage, wildlife tourism and for venison. They contribute in many ways to the public benefits delivered by the estate.

Rothiemurchus' deer management practice is designed to reflect this and to ensure that deer continue to populate these woodlands and hills in numbers, which complement these public benefits. Deer Management at Rothiemurchus aims to:

- Enable the ongoing expansion and enhancement of Caledonian woodland (including mixed, native broad-leaf, riparian and montane woodlands) by natural regeneration, at levels commensurate with a wide range of management objectives and as appropriate for SSSI and Natura 2000 designation objectives;
- Maintain balanced populations of healthy wild deer based on sound knowledge, Best Practice and co-ordination with neighbours;
- Achieve successful establishment and promote enhancement of planted woodlands, including restock sites;
- Protect agricultural and farm land against damage from wild deer;
- Provide employment and sustain the viability of stalking and its contribution to the rural economy;
- Maintain the sporting heritage of Rothiemurchus;
- Manage the cull so that deer may still be seen by the public;
- Provide quality venison for processing and retailing;
- Exclude non-indigenous species such as Sika deer.

Objective

Development and maintenance of a sustainable forest habitat including; based on monitoring of the following targets over the 10-year plan period:

- >60% of pinewood sub-compartments with a dwarf shrub component averaging >45cm in height, with blaeberry as a component of >20% ground cover;

- >75% of Scots pine seedlings and > 50% of native broadleaf seedlings in clearings and other regeneration areas achieving positive leader growth each year, combining to achieve 1100 established stems/ha in native woodland areas within 15 years of felling or initiation of regeneration;
- Establishment of other conifer species within Timber Production areas (ref forest habitat management categories, section 5.1) with > 90% showing positive leader growth each year;
- >8ha of montane or treeline woodland established

12.2 Management Policy

Control
Shooting will continue to be the preferred method of deer control at Rothiemurchus. This will be largely in the Open Season for resident animals; however an out of season licence is in place to control stags that encroach on farm land and a night and out of season licence is now in place for forest areas bordering Upper Rothiemurchus Forest in order to facilitate collaboration with Forest Enterprise and secure Caledonian and montane woodland regeneration objectives. Monitoring and review of objectives will inform overall cull targets.

Red Deer
Rothiemurchus has achieved an effective population reduction in red deer numbers and this has been reflected in the overall success of woodland regeneration.

Red Deer Cull Records

Year	Culls				
	Stags	Hinds	Calves	Total	5 year average
1986	31	22		53	-
1987	41	19		60	-
1988	36	46		82	-
1989	35	148		183	-
1990	39	115	60	214	118
1991	52	67	26	145	137
1992	69	236	44	349	195
1993	51	66	9	126	203
1994	40	114	28	182	203
1995	30	130	32	192	199
1996	51	147	29	227	215
1997	46	92	20	158	177
1998	39	65	10	114	175
1999	35	40	1	76	153
2000	28	43	10	81	131
2001	67	119	35	221	130
2002	57	107	37	201	139
2003	52	98	38	188	153
2004	39	117	25	181	174
2005	31	36	7	74	173
2006	31	63	26	107	153
2007	33	47	8	88	111
2008	33	46	23	102	98
2009	33	56	40	129	103
2010	21	50	19	90	106
2011	41	60	18	119	105
2012	36	33	16	85	105
2013	35	47	15	97	104
2014	57	68	31	156	109

(Note that there may be a slight discrepancy between these figures and the Deer Commission for Scotland records because of staged changes from a year-end of February 15th to March 31st.) 2015 figures will be added in April 2016.

Roe Deer

Rothiemurchus is sustaining a higher cull of roe since introducing a 'reduction' cull in 2001/2. Roe have increased in vigour with the reduction in red deer numbers and have expanded their range up-hill. Roe deer will be controlled in the Open Season.

Roe Deer Cull Records

Year	Culls			
	Buck	Doe	Kid	Total
1996	27	40		67
1997	26	27		53
1998	27	33	9	69
1999	29	32	11	72
2000	28	9		37
2001	39	73	25	137
2002	58	84	30	172
2003	51	56	13	120
2004	35	23	4	62
2005	29	36	9	74
2006	33	51	11	95
2007	38	53	10	101
2008	44	60	16	120
2009	49	40	12	101
2010	34	46	14	94
2011	50	52	14	116
2012	38	62	18	118
2013	42	85	17	144
2014	48	33	16	97

Sika Deer

Rothiemurchus policy aims to exclude Sika deer. They are not resident and will be controlled by immediate culling using safe and legal means.

Fencing & Protection

The only permanent deer fence runs the length of the woodland area to separate farmland from hill / forest land. The final section of this was marked to prevent bird collisions in 2010. The deer fence around Moormore plantation has also been marked

Other deer fences, e.g. Callart Wood no longer work as deer fences, but they are not in areas that will cause problems for woodland grouse.

Deer fencing is designed to meet current and future requirements in relation to the protection of agricultural land and grazings, as well as supporting biodiversity enhancement and complying with the Joint Agency Statement & Guidance on Deer Fencing (Deer Commission for Scotland *et al*, 2004) to safeguard the public interest (see Section 7.3.1).

It is anticipated that direct deer control by shooting will effect sufficient protection for felled sites to be restocked by natural regeneration. As a contingency measure, however, temporary fences may be used to support this and fence style and design will follow best practice, particularly with reference to woodland grouse.

Fence inspections will be undertaken at least annually and after gales or heavy snow, with maintenance as required. Good maintenance can extend the life of deer fences but the aim will to remove them as soon as the required stocking levels of established regeneration have been reached.

Woodland Operations
Forest management to enhance habitat diversity for species such as capercaillie also works well for deer, providing a mix of woodland structure for shelter and food. Forest thinning provides better feeding on dwarf shrubs; compensating for areas where dense regeneration shades out the field layer. Thinning will also facilitate deer control.

The winter Red deer range at Rothiemurchus currently approximates to 640ha. in woodland areas South of the strategic deer fence (designed to restrict red deer movement into agricultural areas)

Designed Open Space
Designed open space for deer management is important both as diversionary feeding sites but also to provide adequate sight lines for safe and efficient shooting. The former croft sites at Achnagoichan, Cairn Valley and Moormore provide useful greens to attract deer and the Croft fields can also be opened up to provide additional feeding areas in hard winters..

High seats may be used to improve sight lines into these areas for deer control. As access to deer control areas becomes more difficult in future, some brashing or cutting of racks may be required to facilitate stalking, particularly in densely stocked and previously unthinned stands and plantations.

Carcass Recovery
Some outlying areas and the open hill are challenging and can present problems in relation to the recovery of carcasses. Extraction is often over wet, steep and broken terrain, which is largely inaccessible by motorised vehicle. Approximately 4 carcasses a year are left on the hill in inaccessible places and these can provide valuable food for eagles at certain times of the year.

Middens
3 middens are located on the estate for the disposal of heads & legs.

Diversionary feeding
Some limited diversionary feeding of silage/turnips/mineral supplements was undertaken in the past to attract red deer to locations, where they may readily be seen by the public. This also served to keep browsing pressure off young trees when snow is frozen. It is unlikely that diversionary feeding will be carried out within the period of this forest plan.

Liaison between Owners Agent, Controllers and neighbours
The applicant/owner is the same person, J P Grant of Rothiemurchus. There is regular internal discussion between JP Grant, the Stalker and the Forester about deer management, woodland development and public relations. Consultation with neighbours is through the Cairngorms & Speyside Deer Management Group.

Named Controllers
The Grants of Rothiemurchus take an active role in wild deer management and in ensuring that high standards of monitoring, husbandry and control are maintained. The Biodiversity Manager is resident on the property and responsible for day-to-day management of deer and game, covering forest, farm and hill land. Additional assistance is employed in the busiest periods and all client stalking is accompanied by the named controllers (Appendix 8).

12.3 Target Culls & Analysis

The revision of the cull forecast is influenced not only by the reduction in forest area managed by the estate, but also the fact that surrounding neighbours are having a significant impact on deer numbers in order to achieve their woodland expansion and enhancement objectives. Until more in depth analysis can be made of browsing levels on natural tree regeneration and other population monitoring, the figures below are best estimates from management experience.

Roe Deer
An ongoing management cull of around 100 to 120 roe per year (probably split 50:50 by gender) should be achievable and should maintain, but ideally slightly reduce the current population level.

Red Deer
A management cull of approximately 30 animals (20 hinds & 10 stags) should be achievable off the whole estate area; with the majority of stags from the high ground in the autumn, but some out of season on agricultural land. The majority of hinds will be from woodland areas during the winter months.

12.4 Risk Assessment

The main risks assessed under this plan are:
1. Failure to meet biodiversity enhancement targets – designated areas revert to 'unfavourable' status
2. Failure to secure sufficient regeneration to fulfil the economic objectives of Timber Production areas
3. Failure to optimise the economic potential of deer management; leading to difficulties in sustaining employment of the biodiversity management staff team

12.5 Mitigation

Maintaining collaboration with Forestry Commission Scotland, Scottish Natural Heritage to review and monitor woodland / designated site condition. Assessment of deer impacts will be undertaken annually in the spring and in the event of incursion. The outcome will be used to inform cull levels.

Maintain liaison across the Cairngorms & Speyside Deer Management Group, but especially with Forest Enterprise and Pityoulish Estate

Ensure that all nominated controllers are trained in and apply best practice and that they are equipped to carry out deer management efficiently.

The Rothiemurchus Stalker is equipped with a Land Rover and Argocat. The contract Stalker has a Land Rover and quad bike. Rothiemurchus is able to call on neighbours, should further additional resources be required.

If concentrations of deer are observed causing damage, they will be controlled by shooting, seeking permission from SNH if out of season or night shooting is required

Within the limits of efficiency, to focus deer management efforts on target areas for natural regeneration.

If predicted cull levels/methods cease to be sufficient to be viable, measures will be taken to find alternative sustainable activity that will maintain the position of a full time professional red deer stalker in Rothiemurchus.

12.6 Monitoring

Population Assessments
A new baseline assessment will be required for Rothiemurchus, as a result of the sale of land and the impact of neighbours in reducing der numbers across a wider area.

Assessing Deer Impacts
Forestry Commission Scotland and Scottish Natural Heritage best practice guidance will be used to monitor tree regeneration in target areas, annually or biannually. Elsewhere, Rothiemurchus will ensure that woodland areas are surveyed at least every 5 years for browsing impacts.

12.7 Communications

Neighbours
The main forum for communicating with neighbours is through the Cairngorms & Speyside Deer Management Group. Both Forest Enterprise (Glenmore, Upper Rothiemurchus, Inshriach) and increasingly, Glen Feshie have had a significant impact on deer numbers on Rothiemurchus by sustaining high annual culls over recent years. Mar Lodge has a similar deer management policy to Rothiemurchus, but deer movement between the two estates is less significant than with Glen Feshie.

Access for open hill stalking
With a limited fencing policy and co-operative working there are no restrictions to access to the open hill. Walkers are encouraged to keep to the promoted paths during the stalking seasons. Scottish Natural Heritage-approved leaflets are distributed and signs are erected to support this.

12.8 Review

Cull plans are monitored weekly during culling, and are updated on a 6 monthly basis. More formal plan review will take place after 5 years.

13 TOLERANCES

The tolerances chapter has been divided into Natura 2000 and non-Natura 2000 sites.

13.1 Natura 2000 Sites

	Adjustment to Felling Coup Boundaries	Timing of Restocking	Changes to Species	Windthrow/fire Clearance	Changes to Roadlines	Designed Open Space
Forestry Commission Scotland Approval not normally required	0.25ha or 5% of coup (coup < 5ha) 0.5ha or 5% of coup (coup > 5ha) - whichever is less	Up to 15 planting seasons after felling by natural regeneration	Change within native species by natural regeneration	Up to 0.25ha		Location of temporary open space eg deer glades if still within overall open space design Increase by 0.5ha or 5% - whichever is less
Approval by exchange of letters & map	0.25ha to 0.5ha or 10% of coup (coup < 5ha) 0.5 to 1ha or 10% of coup (if coup > 5ha) – whichever is less	Up to 20 planting seasons after felling by natural regeneration		0.25ha to 2ha – if mainly windthrown/burnt trees		Increase of 0.5ha to 2ha or 10% - whichever is less Any reduction in open space
Approval by formal plan amendment	> 0.5ha or 10% of coup (coup < 5ha) > 1ha or 10% of coup (coup > 5ha)			> 2ha	Departure of > 4m in either direction from centre line of road	More than 2ha or 10% Any reduction

13.2 Non-Natura 2000 Sites

	Adjustment to Felling Coup Boundaries	Timing of Restocking	Changes to Species	Windthrow/fire Clearance	Changes to Roadlines	Designed Open Space
Forestry Commission Scotland Approval not normally required	0.5ha or 5% of coup – whichever is less	Up to 5 planting seasons after felling	Change within native species	Up to 0.5ha	N/A	Location of temporary open space eg deer glades if still within overall open space design Increase by 0.5ha or 5% - whichever is less
Approval by exchange of letters & map	0.5ha to 2ha or 10% of coup – whichever is less			0.5ha to 2ha – if mainly windthrown/burnt trees > 2ha to 5ha in areas of low sensitivity	Additional felling of trees not agreed in plan Departure of > 30m in either direction from centre line of road	Increase of 0.5ha to 2ha or 10% - whichever is less Any reduction in open space
Approval by formal plan amendment	> 2ha or 10% of coup	Over 10 planting seasons after felling	Change from specified native species Change between species groups	> 5ha		More than 2ha or 10% Any reduction

14 MONITORING

14.1 Monitoring Management Outcomes

Monitoring aims to be efficient and cost effective. This means it is carried out when necessary to plan forest management operations; to meet the requirements of forest grant reporting and to help management monitor performance as per the stated performance indicators listed in the aims and objectives (Section 1.3). Internal annual reviews of the forest plan will be made by Rothiemurchus staff and as part of the UKWAS review/inspection. Formal reviews of the LTFP will be made with FCS at 5-yearly intervals (next review at the end of 2020)

Monitoring Activity	Frequency	Monitoring outputs	Performance indicators assessed	Forest plan objective
Walk-over surveys	Incidental to other management activities, carried out by owner and all field staff, but all areas covered by owner or forester once every 5 years.	General woodland condition, tree health, windblow	Structural diversity, enhanced forest views. No forest fires	Improve woodland internal views
		Presence / absence of invasive species	Enhance native woodland condition	Viable populations of BAP species
		Relative browsing levels on natural regeneration	Agricultural viability	Herbivore impacts commensurate with woodland regeneration & expansion, Woodland grazing commensurate with other woodland objectives.
		Requirement for more detailed surveys		
Health & Safety checks	Annually by rangers & forester, or as required after storms	Condition of recreation infrastructure	Zero incidents	Best practice management of recreation infrastructure
		Tree hazard identification	Zero incidents	Best practice management for staff & public safety and building damage limitation
Pre-timber harvesting surveys	Forester, as required	Standing timber volumes, deadwood component, environmental features, road and other infrastructure condition. Markets and economic return forecast. Approval of plans by SNH, key staff, business partners & local community	Stakeholder engagement in operational plans.	Maintain geographical features, retain important view points
Post harvesting	Forester, during & post	Health & safety compliance,	Habitat enhancement for	Enhance woodland management

Monitoring Activity	Frequency	Monitoring outputs	Performance indicators assessed	Forest plan objective
surveys	harvesting	species, standing volumes, deadwood component, condition of environmental features & infrastructure. Economic outputs.	BAP species No economic loss during operations. Protection of archaeology Deadwood targets achieved No disturbance to forest bogs	contribution to local rural development. Cultural heritage management, long-term enhancement of internal views.
Regeneration surveys	Forester, as required per forest plan, felling licence or grant requirements	Seedlings per hectare per height class, species, browsing levels, environmental features	Increased stocking densities Montane woodland expansion	Retain important view points Increase carbon sequestration Enhance BAP habitats & species
Fixed point photography	Forester, or other, 5 – 10 years	Time-lapse images	Woodland expansion, landscape impacts	Improve woodland integration in landscape
Fence inspections	Forester – tree guards; stalker – deer fences; annually.	Condition of fences (inc evidence of incursion by deer) and tree guards	Efficient woodland establishment where tree planting required – e.g. Doune designed landscape, plantations.	Multiple: Forest enhancement for landscape, biodiversity & timber.
Deer cull records	Stalker – weekly, as required by best practice	Deer larder records re number, species, sex, weight, age, etc.	Contribution to local economy, deer population condition, meeting cull targets	Sustainable deer and woodland management. Contribution to local economy.
Review of forest records	Annually – forest plan review, UKWAS audit	Annual income / expenditure per forest account heads. Progress against forest plan.	Viable Rothiemurchus business model. Compliance with standards.	Enhance forest product values. Contribution to local economy.
	Every 5 years – forest plan review	Areas per habitat network categories, species distribution	Woodland expansion, increase in minor tree/shrub species	Increase carbon sequestration
	Every 10 years – forest plan development	Age-class distribution	Old growth % of forest area. Normal age-class distribution. Gaps between habitat types	Enhance BAP habitats & species
Review of Business	Estate management	Employment numbers Annual income / expenditure per forest, recreation and wildlife management account heads.	Contribution to local economy	Sustainable business model

Monitoring Activity	Frequency	Monitoring outputs	Performance indicators assessed	Forest plan objective
Designated Site condition monitoring	SNH, every 6 years	As per rolling programme – habitat & species surveys	Designated sites in favourable condition	Enhance BAP habitats & species
Woodland Grouse surveys	Black Grouse BAP Group, RSPB, annually. National Caper survey (SNH/RSPB) 1/5 yrs	Lek counts, brood counts Sightings along transects	Support delivery of capercaillie framework	Enhance BAP habitats and species
Recreation	As per Recreation Plan (App7.1)	Visitor numbers, customer feedback, sales & business performance, other visitor behaviours/trends (e.g. incidents log)	Customer satisfaction; positive integration with other estate activities.	Visitors feel welcomed; visitors understand and care for the special environment; visitor activities compliment other estate objectives.
Other research projects & monitoring	Forest Research, university groups, etc SEPA; winter 15-16	As per research brief River habitat – physical condition of rivers in the Spey catchment	Facilitate research Compliance with Forests & Water guidelines	Increase level of understanding of woodland processes. Operating within UKWAS framework.

14.2 Summary of Monitoring Results & Work Carried Out

Management Objective	Monitoring Type	Results
Woodland expansion	Sample plots	Natural regeneration 3rd instalment paid on 224.34ha from 2006-2010 Natural regeneration 2nd instalment paid on 220.18ha from 2006-2010 Natural regeneration 3rd instalment paid on 101.32ha from 2010-2014
Woodland regeneration	Inspections	Sample plots and up-date of compartment records (2006-15) Use of tree guards to identify and monitor broadleaf regeneration (2012-15)
Woodland & tree health	Sample plots for thinning plan	*Heterobasidion annosum* damage widespread throughout North Cambus (Cmpts112-113)

Management Objective	**Monitoring Type**	**Results**
Woodland & tree health	Site inspection	*Heterobasidion annosum* well established in Callart Wood, Cmpt 201
	Site monitoring	Annual (minimum) inspection of areas of public access for dangerous trees Woodland Trust survey for ancient trees – 2011 FCS confirmation of *Phytopthera austrocedrae* in Juniper, Am Beannaidh, Upper Tullochgrue, Balvattan, 2014. FCS monitoring surveys re pine tree lappet moth (2013-15)
Wildlife management	Research reports	Pine and aspen hoverfly work initiated 2009/10
	Deer cull figures	Annual summary – cohort analysis
	Annual Cairngorm & Speyside Deer Count	Annual summary – cohort analysis
	Capercaillie & black grouse lek & brood counts	Annual surveys by GWCT / SNH / RSPB. Rothiemurchus caper & black grouse population monitoring record, combined with report on predator control. RSPB/SNH national capercaillie survey winter 2015/16.

Management Objective	Monitoring Type	Results
Wildlife mgt ctd	Fox & Crow cull numbers, locations	Annual report and map (2009-2015)
	Species monitoring	Annual return to HBRG / NESBREC 2010 SNH site condition monitoring, Cairngorms & NRP SSSI's, lichen assemblage, favourable declining. 2013 SNH site condition monitoring, Cairngorms & NRP SSSI's, invertebrate assemblage, favourable maintained. 2014 SNH site condition monitoring, North Rothiemurchus Pinewood SSSI, breeding bird assemblage, favourable maintained. 2014, 2015: Edinburgh University blue tit breeding response to climate variables. 1995-2015: Spey Fishery Board; smolt & fry monitoring, Beannaidh, Druidh, Milton Burn. 2015: University of Cumbria; Scotch Argus butterfly genetic variability. 2015: University of Aberdeen, wood ant colonisation of woodland sites.
Enhance Forest Habitat Network	Inspections	Additional compartment records
	Woodland survey 2010	FCS native woodland survey of Scotland and National Forest Survey
	Deadwood monitoring	Additional compartment records
	SNH Site condition monitoring	Fungal assemblage survey, North Rothiemurchus Pinewood SSSI, 2014. Published late 2015. Favourable maintained. 2015 SNH site condition monitoring, habitats & vascular plants, various sites in Cairngorms SAC/SSSI. Awaiting results. 2015 SEPA condition monitoring of water courses – Milton Burn

Management Objective	Monitoring Type	Results
Public access & recreation	Visitor numbers	Reports from people counters Numbers booked through commercial activities Numbers booked through groups & events Numbers of leaflets distributed, numbers of guide maps sold
	Visitor experience	Feedback from visitor questionnaires Feedback on social media Ranger record of 'incidents'
Landscape Enhancement	Viewpoint photography	Photo monitoring files 2015 SNH site condition monitoring, Cairngorms SSSI, geomorphology. Awaiting results.
Protection of Archaeology	Site inspection	Trees removed from old field dykes during felling operations

14.3 Forest plan review 2006-2015

CRITERIA	OBJECTIVES	PERFORMANCE INDICATORS / OUTPUTS	Proposed changes to plan	Are changes significant or outwith agreed tolerances? Y/N/NA
Access, Information & Recreation	Promote Rothiemurchus' sustainable access policy in line with Scottish Outdoor Access Code/Land Reform (Scotland) Act	Visitors enjoying the estate in 2014 estimated at 380,000 through a methodology including people and car counters at various locations throughout the in estate. Numbers have increased annually since 2006 and ethnic origin broadened Feedback and meeting with user groups confirmed Rangers observations indicate a very significant increase in the number of cyclists since 2006. Planning surveys for An Camas Mòr (2013) and CNPA Visitor survey (2015) indicate a high proportion of visitors. Visitor guides and walks map are redesigned or updated annually to ensure up to date and effective. Mountain biking map and other publications reviewed as required	None	N

CRITERIA	OBJECTIVES	PERFORMANCE INDICATORS / OUTPUTS	Proposed changes to plan	Are changes significant or outwith agreed tolerances? Y/N/NA
Access, Information & Recreation ctd	2003 and local social and economic needs	20,000 Freepost feedback forms each year handed to visitors and actively promoted. Those returned are read daily so action can be taken on feedback and are analysed monthly across a range of indicators. Training on effective promotion and handling of feedback given to visitor services team. Feedback is regularly received that the increasing number of people enjoying access in different ways is creating significant problems for the enjoyment of shared paths in the forest, particularly regarding conflict between Mountain bikers and walkers and dogs not under close control. This is being actively addressed together with user group representatives through identifying best practice. A range of innovative initiatives such as dog walking areas, composting dog bins and shared path signs have been trialled and adopted. In 2010, 1640 participants in 11 organised outdoor events on Rothiemurchus raised over £891,000 for charity. Loch an Eilein voted Scotland's best picnic site in 2008, 9 & 10 and U.K.'s best picnic site 2010. Youth groups welcomed free to a dedicated camp site at Loch an Eilein.		
	Promote the understanding and enjoyment of visitors	The main visitor Centre at Inverdruie, opens daily and welcomed 170,000 visitors in 2010. Together with three other centres which are open all or part of the year, the visitor services team use them to promote enjoyment of the forest through weather forecasts, information on species that can be enjoyed each month, walks, outdoor activities & camping. Also 5 main information boards at Inverdruie (2), Loch an Eilein (2) and Coylumbridge Campsite have daily weather forecasts as well as other topical information. The annual print run of 80,000 copies of the generic Rothiemurchus visitor guide is distributed widely throughout the Highlands as well as on the Estate. It includes promotion of the walks map, mountain biking map and advice on responsible fire lighting, camping and dog exercise. Implementation of the interpretation plan through active, multi-media communications programme (posters, press releases,	No change	NA

CRITERIA	OBJECTIVES	PERFORMANCE INDICATORS / OUTPUTS	Proposed changes to plan	Are changes significant or outwith agreed tolerances? Y/N/NA
Access, Information & Recreation ctd		rangers, website and social media) The website was redesigned in 2008 and 2011. New activities introduced reaching new audiences through additional staff in partner businesses: river tubing, Segway treks, TreeZone. A significant Increase in fire lighting is causing concern, particularly those using dead wood and involving disposable BBQs. The Living Forest" distributed as free publication (stocks ran out in 2013, no re-print)		
	Protect/restore condition of permissive paths during forestry operations	Forest operations plan to avoid peak visitor periods. Diversions and signs put in place during operations. Comprehensive advance warning of operations given through media channels Operational plans include path and track repairs. Plan in place for monitoring and removing dangerous trees. Dangerous trees removed as part of thinning Cmpt 1811; annual tree safety work at Coylumbridge campsite; 9 trees felled or managed to improve safety; 10 instances of trees or major limbs falling across roads or paths.	No change to plan	
Carbon Sequestration	Increase the sequestration of carbon through sustainable forest management	Areas of core old growth and core old growth extensions identified. No management of trees or timber on or across forest bogs. On-going forest regeneration although regeneration after felling requires patience. Deadwood creation as part of timber harvesting programme. Could do more (see SNH 2015 site condition monitoring, North Rothiemurchus Pinewood SSSI, fungal assemblage, favourable maintained.) Thinning and small coupe shelterwood felling avoids the need for clear-felling. Forest fires not significant during period, although increase in camp fire incidents. See below for regeneration figures. Bracken spraying in 2 areas of limited success to date for natural regeneration	No change to plan	

CRITERIA	OBJECTIVES	PERFORMANCE INDICATORS / OUTPUTS	Proposed changes to plan	Are changes significant or outwith agreed tolerances? Y/N/NA
Community Development	Economic & social sustainability	Ongoing liaison with Aviemore, Rothiemurchus and Vicinity Community Council, Rothiemurchus & Glenmore Community Association, CRAGG, and Voluntary Action Badenoch & Strathspey as well as individual user groups. Rothiemurchus business and employment based on tourism, farming, timber production, deer stalking and property rental. Direct full-time permanent staff: 24 including a full-time forester. Direct seasonal or part time staff: 38 Partner businesses and tenants using the forest FTE: approximately 20	No change to plan	
Cultural Heritage & Archaeology	Promote knowledge and understanding of the area's cultural heritage	Comprehensive map of all features referred to when planning operations. Opportunities taken to fell trees off archaeological features during timber harvesting / deadwood operations. Regeneration controlled by grazing and cutting.	No change to plan	
Farm Shelter & Crop Protection	Identify & maintain important woodlands for stock and crop shelter, increase effectiveness and continuity of shelter	86.1ha of "in hand" forest used for grazing tenant livestock 93ha of Tullochgrue grazing lease managed as woodland, regenerating woodland, juniper scrub for grazing cattle and sheep.	No change to plan	
	Control rabbits, deer and other potentially damaging fauna to farm crops to acceptable levels	Strategic deer fence between high and low ground maintained. 0 tolerance on rabbits maintained Deer cull figures (Section 12)	No change to plan	

CRITERIA	OBJECTIVES	PERFORMANCE INDICATORS / OUTPUTS	Proposed changes to plan	Are changes significant or outwith agreed tolerances? Y/N/NA
Landscape	Maintain and enhance the character and quality of the landscape	Cambusmore trees getting away to improve screen between B970 and Aviemore and future An Camas Mòr development. Views from Tullochgrue maintained by trimming of birch trees. Some tree removal on & adjacent to old dykes during harvesting work.	No change to plan	
	Improve woodland internal views and roadside corridor. Improve external woodland shape where straight line boundaries have been followed in the past	Felling coupe boundaries as per approved plans – especially regarding Pityoulish and Ord Ban. Restructuring felling commenced on Pityoulish – 2007 with removal of 10ha unstable LP. In comparison with plan map: additional 1.5ha felled due to windblow; 0.4ha additional area felled; 0.8ha area not felled. Restocking with approved species and within agreed timescale. No appreciable natural regeneration to date on sites felled since 2006, except where there was advanced regeneration. Some negative feedback re short-term visual impact of selective felling close to Drumintoul, in relation to setting for weddings. Snags, windblown trees retained and lop and top have an impact on visual amenity, but this is reduced within 3 years by increasing ground cover and hopefully will be transformed by natural regeneration.	Pityoulish plan adjustments, in timing rather than boundaries; programme on-going	N
	Maintain the Doune Designed Landscape	Thinning in some of the Policy Woods to improve tree safety and release natural regeneration. Re-spacing of natural regeneration to improve overall stem form and stability.	No change to plan	
Natura 2000	Practice sustainable forest management in compliance with Natura 2000	Deer control to secure natural regeneration. Tracks reinstated to compensate for track widening. 886m reduced to a footpath, 724m re-instated entirely; equivalent to 6,000m^2 of restoration. Track widening was completed equivalent to 1,100m^2 within Natura areas.	See Map 23	N

CRITERIA	OBJECTIVES	PERFORMANCE INDICATORS / OUTPUTS	Proposed changes to plan	Are changes significant or outwith agreed tolerances? Y/N/NA
Natura 2000 ctd	requirements:	Two deer traps removed. Equivalent to 1600m^2 of Natura 2000 restoration. Exotics removal / reduction in Natura 2000 areas – aligned with deadwood creation.		
Natural Heritage	Maintain geographical and physiographical features	See above. Existing borrow pits and quarries used to source material for road & path improvements.	No change to plan	
	Enhance populations of UKBAP & Cairngorms Nature priority species & habitats	2015 lek counts in Rothiemurchus highest since recent recording began. On-going effort through interpretation to prevent fire and use of deadwood for camp fires. Favourable condition for SSSI's maintained, although lichen assemblage favourable declining due to both over and under grazing in different locations through Cairngorms SSSI and too much regeneration in NRP SSSI. Breeding bird assemblage maintained as favourable and good levels of woodland regeneration recorded in NRP SSSI.		
Water & Water Courses	Restore woodland floodplain & riparian zone ecology within the SAC/SPA	Exotics removed from Cmpt 104 when thinning / coppicing Start made on controlling sycamore in Cmpt 101 and 102	No change to plan	
	Flood control & river bank stabilisation	Water guidelines followed when harvesting – use of bridges and culverts – removed after use.	No change to plan	
Wildlife Management	Maintain deer populations and species balance at levels commensurate with achieving	WGS third instalment claimed on a total of 123.54ha during 2006-2010. 76.95ha 2011-2015. Deer management plan in place. Annual cull figures 2006-2014	Sale of land reduced area under WGS. Rothiemurchus plan to respond	

CRITERIA	OBJECTIVES	PERFORMANCE INDICATORS / OUTPUTS	Proposed changes to plan	Are changes significant or outwith agreed tolerances? Y/N/NA
Wildlife Mgt ctd	woodland regeneration	Hinds; 75, 47, 51, 79, 65, 69, 41, 55, 83 Stags; 32, 38, 51, 50, 25, 50, 44, 42, 73 Does; 23, 30, 72, 47, 60, 59, 71, 92, 41 Bucks; 5, 64, 48, 54, 34, 57, 47, 51, 56	according to land sale & strategy introduced by neighbours.	
	Enhance wildlife and stalking value	7,626m of existing deer fence marked to reduce bird strikes. Predator control – foxes, crows, mink, feral cats, stoats, weasels (see annual SRDP report 2009-2014). For 2014-2016 working with Forest Enterprise across Rothiemurchus Forest.	No change to plan	
Woodlands & Timber	Enhance Forest Habitat Network by practising appropriate silviculture	2006-2010 plan identified 481ha for thinning & 50ha for clear or selective felling. Actual thinning in period covered 273ha with some additional areas covered for deadwood creation and exotics removal only. It includes variable density thinning specific to 41ha under the Species Action Framework. Selective felling in small coupes totalled 16.7ha within native woodland, introducing structural diversity. Clear felling for restructuring covered 10.24ha. Deadwood creation during timber harvesting plus additional deadwood creation and exotics removal over 25ha. Consideration needs to be given to changing silviculture of North Cambas, Cmpts 112&113, due to Fomes. E.g. No further thinning, or felling to re-stock with Fomes resistant species	Progress of harvesting plan subject to economic constraints	N
	Compliance with the UK Forestry Standard and the UK Woodland Assurance Scheme Standard	All forest area certified under FSC/UKWAS – Group number SGS-FM/COC 000429. Memb no. G065.	No change to plan	

CRITERIA	OBJECTIVES	PERFORMANCE INDICATORS / OUTPUTS	Proposed changes to plan	Are changes significant or outwith agreed tolerances? Y/N/NA
Woodlands & Timber ctd	Woodland expansion & regeneration	See above re WGS claims & restocking/restructuring areas	No change to plan	
	Increase woodland structural and species diversity	See caper /predator control report 3,300m of linear features & 1.4ha of clearings swiped in heather under Species Action Framework funding. Ref: SPC & Bi age class structure analysis, area by species	No change to plan	
	Development of sub-montane scrub at natural upper tree-line	Aspiration to establish monitoring programme for areas between 400-700m above sea level. Ref An Camas Mòr compensatory habitat management plans On-going deer control	Proposed focus on montane woodland Creag a Chalamain	
	Enhance public benefits & woodlands' contribution to local rural development	See recreation numbers. Timber volumes sold to national / local markets annually 2006-2010: 1600, 4055, 5320, 1800, 2955 tonnes. 2011-2015: 500 tonnes Road upgrades to facilitate timber harvesting: 445m Drumintoul; 109m R. Luineag; 976m Coylumbridge; 1030m Lochan Deo; Lochan Eilein 720m. Total 3280m	Plan respond to crop stability (plantations) and strength of market.	
	Enhance value of timber products and develop non-timber benefits of woodlands in compliance with Natura 2000 where relevant	Niche markets for timber – 50tonnes for Feshie bridge construction, 27t special spruce poles, local sawmill and construction markets for DF and EL, large GF logs for chainsaw carving. Tourism enterprises on the estate include: special interest tours, pony trekking, quad biking, Segway treks, Landrover driving, Landrover safaris, wildlife watching and wildlife photography, aerial rope course (TreeZone), river tubing, venison sales through farm shop, weddings, corporate events, pheasant shooting and deer stalking.	No change to plan	

Additional Notes on Timber Harvesting

Environmental protection
The marking and protection of ant nests, squirrel dreys, badger setts and other features has generally been good; with the use of red and white barrier tape, pre-harvesting meetings and site visits with contractors, use of maps, etc. Water courses have been bridged or culverts and silt traps used and cleared at the end of operations. Licences have been applied for when harvesting close to badger setts.

Ground damage.
Pityoulish hill a challenge due to long and steep access for forwarder extraction, then associated run-off. Forwarder track required re-instatement with the installation of cut-off drains to reduce erosion.

Ground damage elsewhere is limited to some deep ruts over soft ground – pine does not produce the quantity or quality of brash required to create strong brash mats over wet ground and small round wood produce has to be used instead.

Haulage roads
Road upgrades are required to get timber lorries in to those areas suitable for timber harvesting. Most road upgrades will be to a special standard so that the aesthetic quality of the roads is not lost for those using them for recreation. However, this does limit the type of lorries that can be used on the roads (e.g. wagon and drag units with on-board tyre inflation systems, rather than more conventional articulated 'super-singles') and therefore the number of haulage contractors available to extract timber. It also means that repair work after harvesting operations will be necessary to re-instate tracks for use by the public.

Stump treatment
No stump treatment is used in the Caledonian Scots pine areas and the use of alternatives to urea has been tried. It is difficult to find contractors who use any form of stump treatment and winter operations create additional problems with freezing temperatures. There are two sites where *Heterobasidion annosum* is well established – North Cambus and Callart Wood

Pollution incidents
None

Public feedback
The timber harvesting programme is managed as much as it can be to fit timing to quiet periods of the year. This is not always possible if contractors are busy and if weather causes delays. Using out-turn sales means that we are reliant on the buyer finding the most appropriate contractors, rather than the estate working with a regular contracting team. However, for 2006-2010 the estate did work with a single buyer using one main contract team with a fairly small harvester and forwarder particularly suited to the task.

A comprehensive multi-media communications programme is delivered to explain the forest plan, timber harvesting and temporary path closures. In the previous plan period there was some comment from mountain bikers (local night time bikers who had not seen the signs) through social media, which was

replied to and one feedback form. Considering the significant disruption to one popular path and delays in the programme the general public showed great understanding and patience.
It continues to be important to pay attention to the timing of contracts, including the uplift of all timber stacks and to update the estate team on a daily basis. It is necessary to advertise operational plans with all stakeholders, especially within the local community and to maintain regular liaison with the SNH area manager.

Piers Voysey October 2015

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