Moray and Aberdeenshire Forest District

Quarrelwood

Land Management Plan

Including: Cutties Hillock SSSI plan

Plan Reference No: LMP 6

Plan Approval Date:

Plan Expiry Date:

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

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

The mark of responsible forestry

FOREST ENTERPRISE - Application for Forest Design Plan Approvals in Scotland

Forest Enterprise - Property

Forest District:	Moray & Aberdeenshire FD
Woodland or property name:	Quarrelwood
Nearest town, village or locality:	Elgin
OS Grid reference:	NJ 182 633

Areas for approval

	Conifer	Broadleaf	Open
Clear felling			
Selective felling	11.1ha		
Restocking	8.1ha	3.0ha	
New planting (complete appendix 4)			

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

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

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

4. I confirm that the proposals contained in this plan comply with the UK Forestry Standard.

5. I confirm that the scoping, carried out and documented in the Consultation Record attached, incorporated those stakeholders which the FC agreed must be included.

6. I confirm that consultation and scoping has been carried out with all relevant stakeholders over the content of the of the design plan. Consideration of all of the issues raised by stakeholders has been included in the process of plan preparation and the outcome recorded on the attached consultation record. I confirm that we have informed all stakeholders about the extent to which we have been able to address their concerns and, where it has not been possible to fully address their concerns, we have reminded them of the opportunity to make further comment during the public consultation process.

7. I undertake to obtain any permissions necessary for the implementation of the approved Plan.

Signed …… Forest District Manager

Signed …… Conservator

District Moray & Aberdeenshire

Conservancy Grampian

Date ……

Date of Approval ……

Date approval ends: ……

FOREST ENTERPRISE - Request for Approval of Thinnings

To: Conservator

Grampian Conservancy

Portsoy Road
Huntly
Aberdeenshire
AB54 4SJ

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

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

Signed	…… Forest District Manager	Signed	…… Conservator
District	Moray & Aberdeenshire	Conservancy	Grampian
Date	……	**Date of Approval**	……

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Land Management Plan Summary

This plan is a review of Forest Enterprise Scotland's management of Quarrelwood.

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

The primary objective for the forest is the production of a quality crop of timber. An additional secondary objective is the management of the woodland to provide a recreational resource for Elgin and the surrounding area.

The forest road and path network in Quarrelwood and the biodiversity of the woodland are considered key elements of the recreational experience by site users.

The production of quality timber under low impact silvicultural systems (LISS) not only enhances the recreational environment, but also provides a valuable commodity produced in a sustainable manner. Quarrelwood is ideally suited to LISS.

The woodland contains a Site of Special Scientific Interest (SSSI) at Cutties Hillock which is a disused quarry that has yielded a fossil reptile distinct from any found elsewhere in the world.

There is also a scheduled monument within the woodland. Quarrelwood henge is a rare and unusually well-preserved northern example of a small henge monument and, as such, may be expected to contain extremely important and potentially vulnerable archaeological deposits.

Both these designated features will be protected and where appropriate enhance to maintain their importance.

1.0 Introduction

Refer to Map 1: Location.

1.1 Setting and context

This plan is a review of Forest Enterprise Scotland's management of Quarrelwood located 0.5miles west of Elgin. The plan covers an area of approx. 176ha.

The area was acquired by the FC in 1949 at which point it was open grazed moorland. The site was re-afforested through the 1950's and early 1960's.

Quarrelwood represents an area of coniferous woodland habitat, interspersed with smaller areas of broadleaved woodland and open habitats, including a proportion of heathland. Adjacent habitats include upland oak woods and coniferous woodland.

There are several abandoned quarries within the woodland that provide important habitat diversity, as they are unsuitable for commercial tree planting, they have been left to nature and have regenerated with broadleaves.

Topography and underlying geology combine to make the small hill on which Quarrelwood is situated generally dry. Natural watercourses are non-existent and surface water is only found in drainage channels and man-made ponds. Due to the lack of this riparian habitat any water bodies are of high biodiversity value.

1.2 Land Management Objectives

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

- the physical context and current crop;
- neighbouring landuses;
- a review of the land management objectives already established by statutory bodies;
- the physical capability of the land;

- the locational objectives identified in the Moray & Aberdeenshire Forest District Strategic Plan;
- the views expressed by the public and statutory stakeholders (see appendix 1).

The Moray & Aberdeenshire Forest District Strategic Plan highlights Quarrelwood as important:

- for the production of quality timber;
- as a block that receives significant numbers of visitors;
- as a block well used by the community.

From these factors it has been determined that the **primary objective** for the forest is the **production of a quality crop of timber**.

An additional **secondary objective** is the management of the woodland to provide a **recreational resource** for Elgin and the surrounding area.

In common with all management across the National Forest Estate the forest will be managed to meet the requirements of the UK Forest Standard (UKFS). This will ensure that the plan meets multiple land use objectives in addition to the primary objective.

2.0 Analysis of previous plan

2.1 Aims of previous plan & achievements

The previous plan for Quarrelwood was approved in 2007.

Since then FES policy themes have been updated and as a consequence previous objectives can't be directly compared with the current aspirations for the National Forest Estate.

The objectives set in the previous plans do not fit neatly with the current FES national themes. However the table below attempts to set the objectives of the previous plans against these current themes and summaries the progress made towards achieving them during the last plan period. It also shows which of the objectives, if any, will be carried forward into the next plan period, as they still meet our current aspirations for the management of the blocks.

Theme	Objective (in current approved plan)	Management indicator	Progress to date 1 – Nominal progress 2 – Some progress 3 – Progress as per FDP	Proposed action (in this plan)
Timber	Provide a framework for the ongoing sustainable management of the productive areas of the woodland.	Post fell figures recorded in Sales Recording Package tally with those produced in Production Forcast.	3 – All felling coupes identified in LMP including LISS group fellings completed. All thinning coupes have been worked.	This will continue to be a major driver in the new plan.
Community development	Support the aspirations of the local community by continuing to provide a key local recreational resource in partnership with the other members of QWWPA.	A successfully operating QWWPA with enhanced community involvement in the management of the woodland.	0 – Since the last plan review the QWWPA has ceased to operate successfully.	FES and Moray council have agreed to dissolve the WPA.

Environmental quality	Conserve the woodland's heritage value Enhance and further integrate the woodland into the local landscape	Preserve all known sites and promote awareness so that others may be discovered when carrying out operations.	3 – All known features have been preserved. All new features discovered have been recorded on the GIS system for future reference.	This will continue to be a major driver in the new plan.
Biodiversity	Increase the naturalness of the woodland to improve its ecological value, in particular enhancing the oak wood	Forest and non-forest habitats will be maintained, safeguarded and enhanced along with their important associated species.	3 – All known habitats and species have been preserved. All new features discovered have been recorded on the GIS system for future reference.	This will continue to be a major driver in the new plan.

3.0 Background information

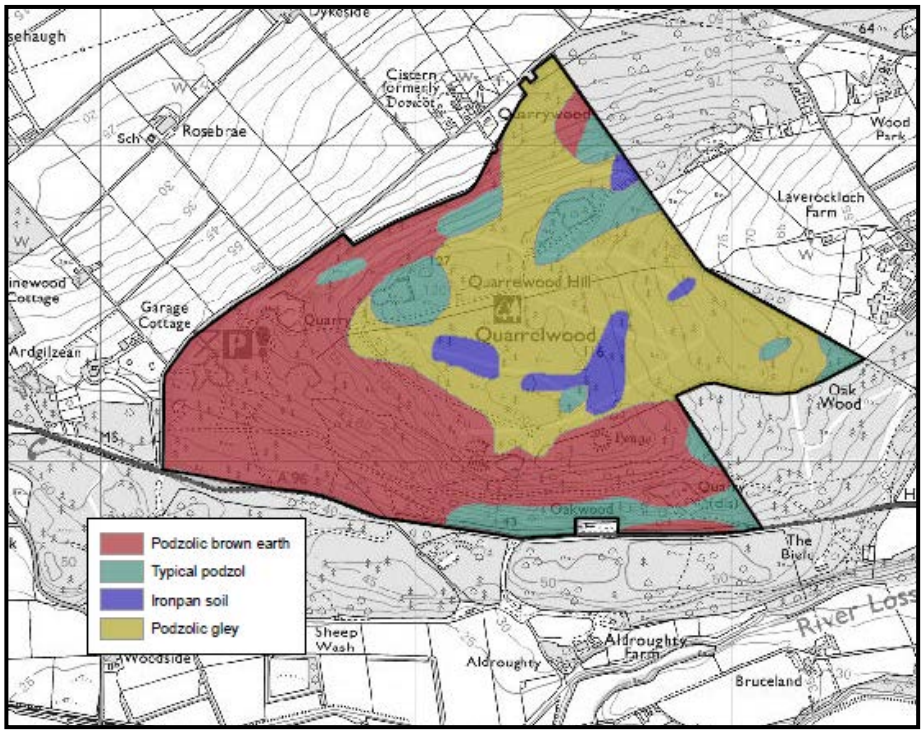
3.1 Physical site factors

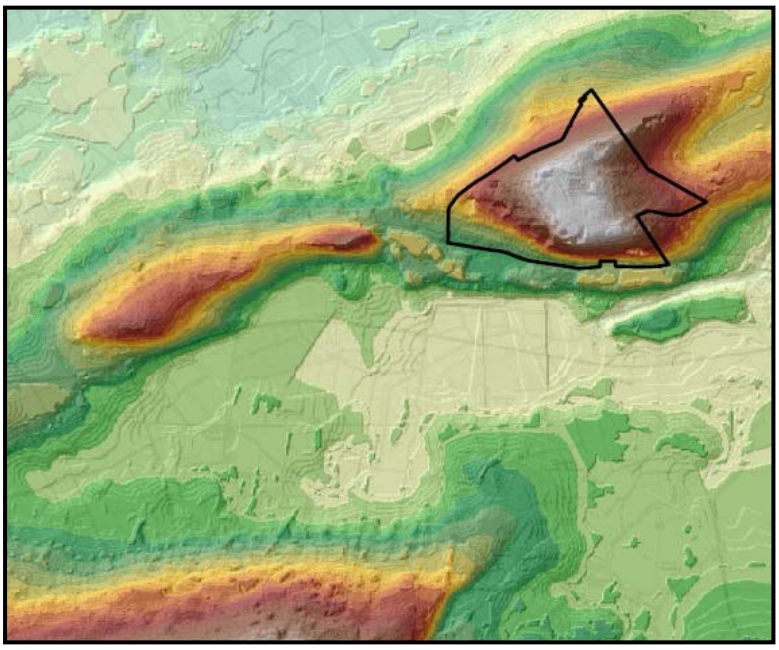
Refer to Map 2: Key Features.

3.1.1 Geology, Soils and Landform

Geology– The solid geology underlying Quarrelwood is mostly sandstone, breccia and conglomerate with conglomerate, sandstone, siltstone and mudstone. Drift deposits of glacial till entirely overlay this (British Geological Survey). The sandstone breccia and conglomerate produce soils with high nitrogen availability while the rest of the area has low levels of nitrogen available.

Soils - The influence of the till material gives rise to large areas of podzolic gley and podzolic brown earth with localised ironpan soils.
This combination of geology and soils has led to the block having growing conditions that are poor due to the poor or very poor nutrient regime across the whole area.





Landform – The forest lies between an altitude of 55m & 127m. The landform is a small hill forming part of a low ridge of hills in an otherwise flat landscape.

3.1.2 Water

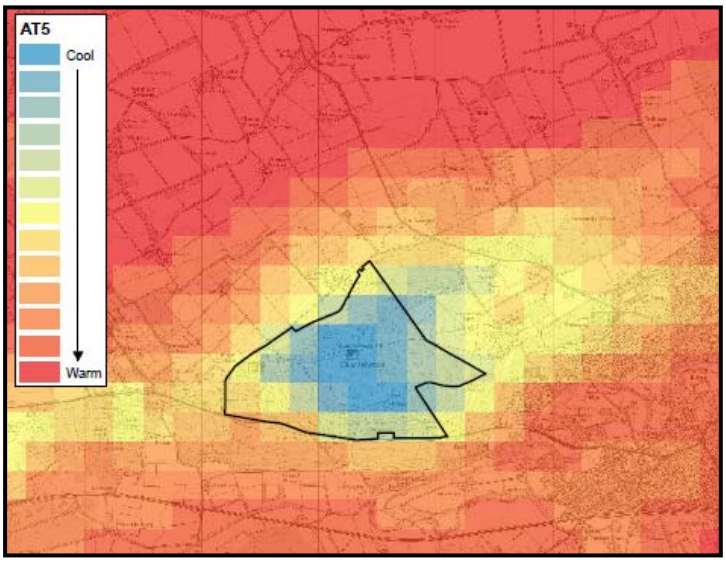
There are no watercourses within the forest. The closest one is the river Lossie that flows to the south of the block.

There is one water supply pipe recorded in the block that runs just 50m due south to the Oakwood commercial premises beside the A96.

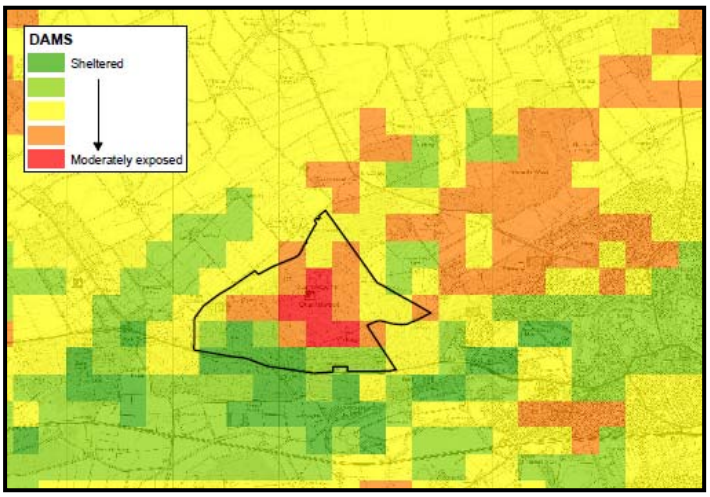
3.1.3 Climate

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

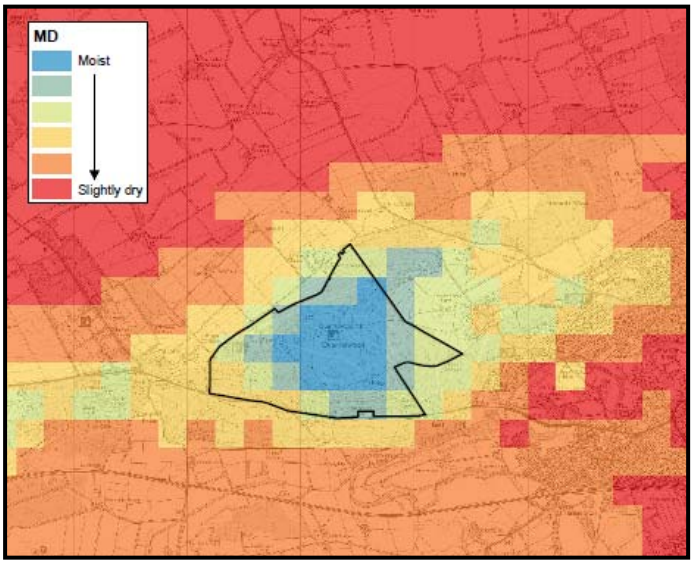
AT5	DAMS	MD
1127 – 1218 Cool - Warm	9 – 13 Sheltered – Moderately exposed	109 – 129 Moist



AT5 is the accumulated total of the day-degrees above the growth threshold temperature of 5º, which provides a convenient measure of summer warmth. The results for AT5 place this blocks on the boundary of the “cool” and “warm” zones.



DAMS is the Detailed Aspect Method of Scoring. This represents the amount of physically damaging wind that forest stands experience in the year.
The range of DAMS is from 3 to 36 and windiness is the most likely limiting factor to tree growth at higher elevations in Britain. The site description based on the DAMS score ranged from “sheltered” to “moderately exposed”, with the average (11) being “sheltered”.

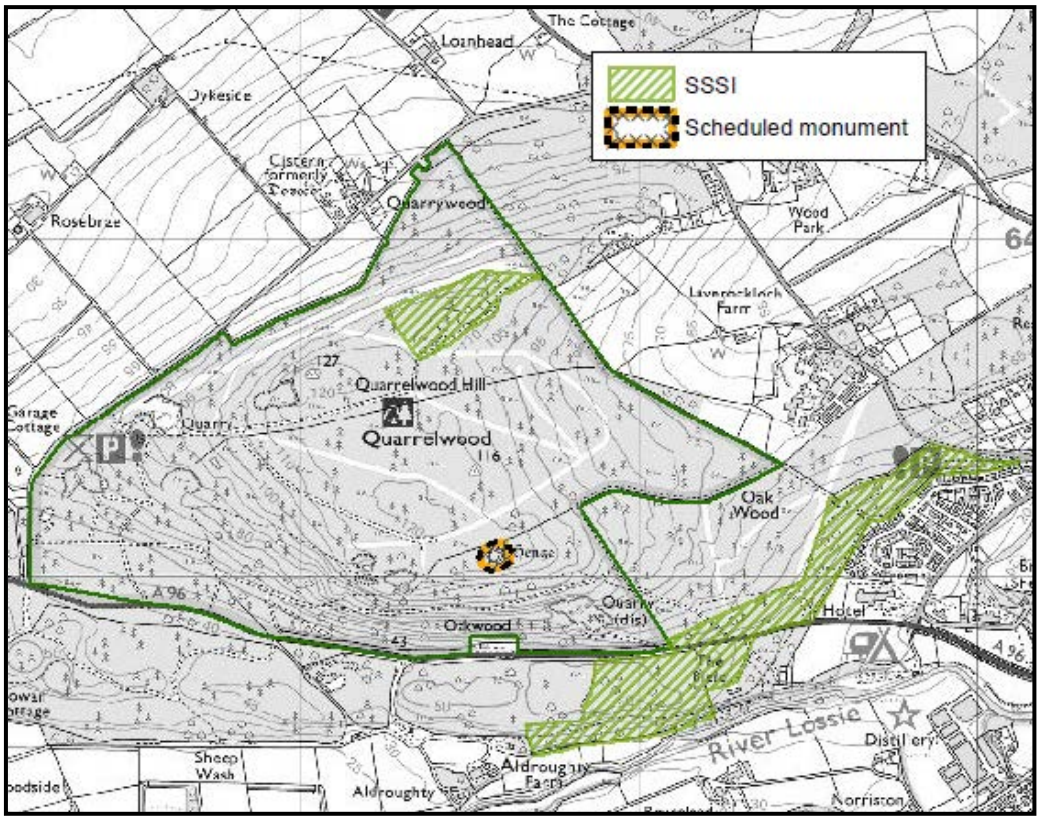


MD is the Moisture Deficit for the area. Moisture deficit reflects the balance between potential evaporation and rainfall and therefore emphasises the dryness of the growing season (rather than the wetness of the winter or whole year). These results place the blocks in the “moist” zone.

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

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

3.2 Biodiversity and environmental designations



The Site of Special Scientific Interest (SSSI) within the block is Cutties Hillock which is a disused quarry that has yielded a fossil reptile distinct from any found elsewhere in the world. The last condition assessment visit in 2015 rated the site as in “favourable maintained” condition. More detail on the interest of the site can be found in the SSSI plan in Appendix 6.

The adjacent Quarry Wood SSSI is an upland oakwood. The last condition assessment was undertaken in 2012 and rated this site as “unfavourable no change”. The site is considered to be unfavourable due to the poor age structure of native trees, poor ground flora in some areas and the amount of non-native (beech) tree regeneration.

Quarrelwood represents a large area of coniferous woodland that is designated as Long-Established Plantation Origin, with woodland being depicted on 1870 maps. The NFE landholding is predominately coniferous but there are some areas of Oak, adjacent to the important SSSI designated semi-natural Oakwood.

Within the woodland, there are areas of Upland Heath within wayleaves and surrounding the henge. This priority habitat provides important diversity within the woodland environment and should be maintained as open ground.

Despite being relatively small in size, and having high visitor numbers, Quarrelwood nevertheless supports a rich variety of animal and plant species. Red squirrels are prevalent throughout but there are also records of badgers and pine marten. Glades and rides provide important open space for invertebrates including Speckled Wood butterflies.

3.3 The existing forest

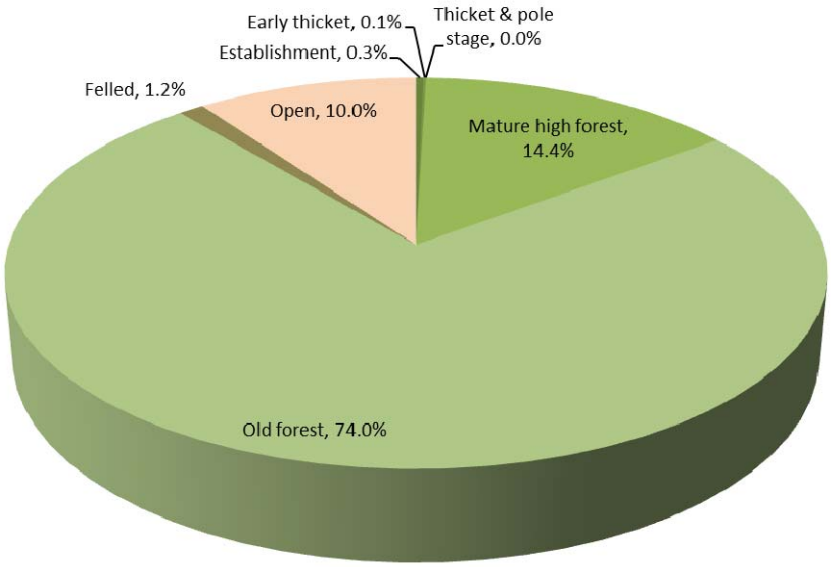
3.3.1 Age structure, species and yield class

(See Map 3)

i. Age Structure

Quarrelwood displays a very narrow age class range across the forest area due to its small area and the fact it is being managed under a LISS. There will be no attempt to artificially increase the age diversity in this plan period, but as the block continues to be managed under LISS the age structure will naturally diversify in the longer term.

Ages of Trees (years)	Successional Stage	Area (ha)	%
0 -10	Establishment	0.6	0.3
11 – 20	Early Thicket	0.2	0.1
21 – 40	Thicket & Pole Stage	0.0	0.0
41 – 60	Mature High Forest	25.0	14.4
61+	Old Forest	128.0	74.0
	Open	17.3	10.0
	Felled	2.0	1.2

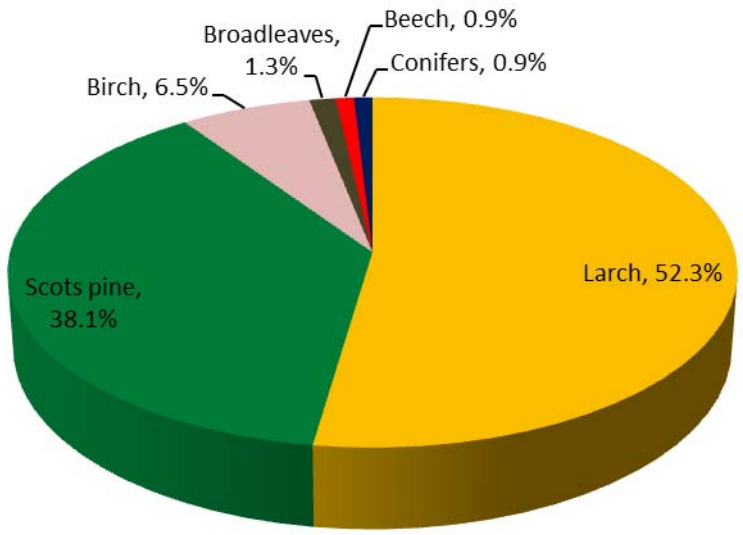


It is clear from the figures above that the current percentage of open ground just meets the UKFS requirement of 10%.

ii. Species

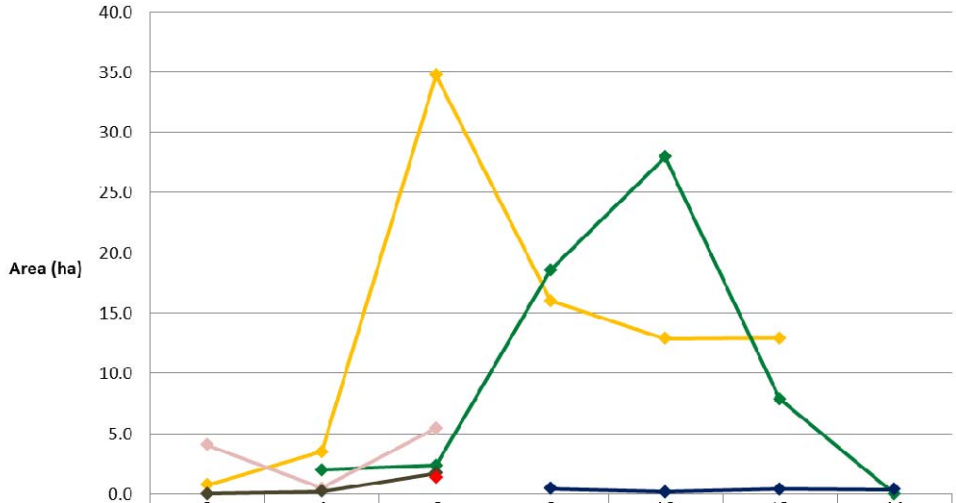
Similar to the age class the forest carries a small variety of species. Again there will be no attempt to significantly change the current species make up as the current species are suited to the site conditions and LISS management.

Species	Area (ha)	%
Larch	80.7	52.3
Scots Pine	58.7	38.1
Birch	10.0	6.5
Broadleaf	2.0	1.3
Beech	1.4	0.9
Other Conifer	1.4	0.9



iii. Yield Class

SP yield classes range from 6 to 12, while larch ranges from 4 to 12. Despite their suitability for the site conditions the species present are not high yielding. This situation is accepted due to the other objectives for managing this block.



	2	4	6	8	10	12	14
Larch	0.7	3.5	34.8	16.0	12.9	12.9	
Scots pine		2.0	2.4	18.6	28.0	7.9	0.0
Birch	4.1	0.5	5.5				
Broadleaves	0.0	0.2	1.7				
Beech			1.4				
Conifers				0.4	0.2	0.4	0.4

3.3.2 Access

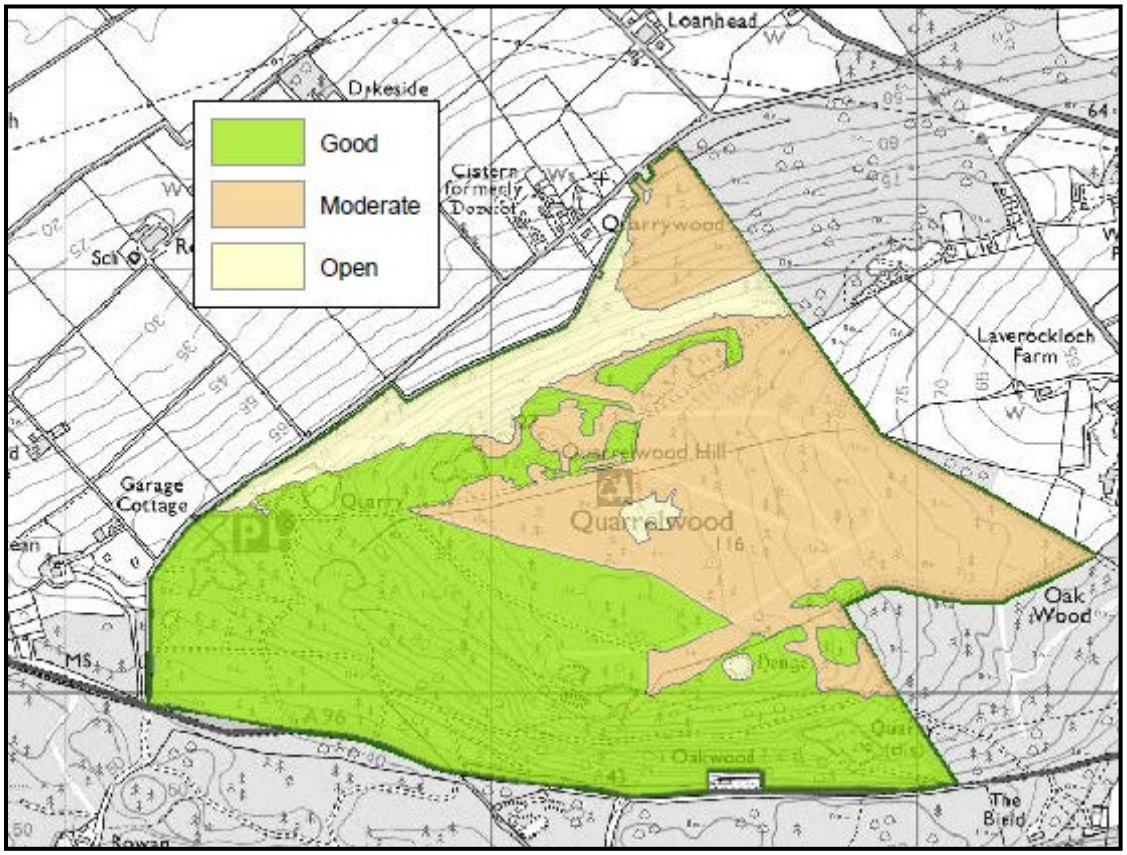
Access throughout the forest is good, with a well constructed road network and good public road links. No additional access provisions are required during the period of this plan.

3.3.3 LISS potential

LISS management systems are defined as: ‘Silvicultural systems whereby the forest canopy is maintained at one or more levels without clear felling.’

LISS normally implies that no clearfell areas larger than 2 ha will be undertaken.

LISS has been implemented out over much of the forest area with an active thinning programme delivering multiple land use objectives.



The potential for LISS is based on the wind hazard class of the crop, the soil nutrient regime, the suitability of the species to the site and the history of thinning of the site. The map above shows the potential for LISS within the block.

The group selection and shelterwood approaches currently in use can meet environmental and landscape objectives while providing economically viable quantities of timber that can be effectively marketed. Therefore the current regimes will continue in this plan period.

Scots pine and Japanese larch crop with scots pine natural regeneration.

3.3.4 Current and potential markets

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

Material	End product	Percentage
Small roundwood	Chip board, Orientated strand board (OSB), Paper, fencing	40
	Firewood/woodfuel	5
Short log	Pallets & slats	10
Log	Construction	45

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

3.4 Landscape and land use

3.4.1 Landscape character and value

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

These assessments are considered during all LMP reviews and where appropriate all efforts are made to follow the guidance given, where it matches with current FCS policy.

The design plan area is covered by Scottish Natural Heritage Landscape Character Assessment No101, Moray & Nairn, produced in 1998 by the Turnbull Jeffrey Partnership.

The whole block lies within the coastal farmlands character area. This is a flat to gently undulating coastal plain. The fertility of the soils has led to several thousand years of intensive agriculture. Extensive long bands of coniferous woodland and shelterbelts create a backdrop to large, smooth, arable fields and create a simple pattern of vegetation.

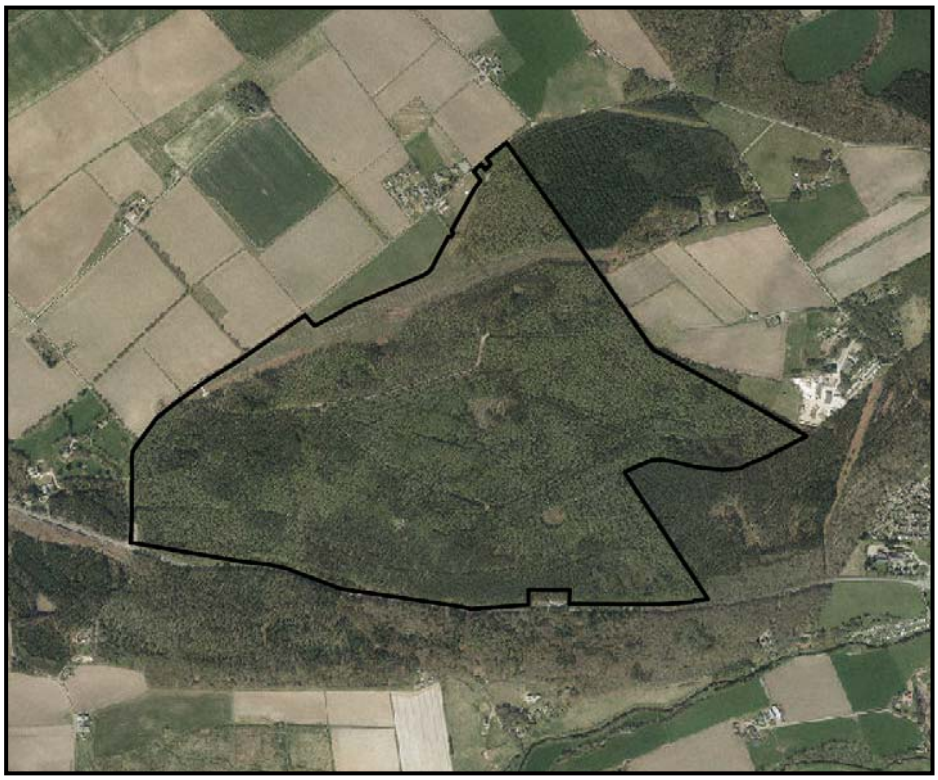
The large scale of the landscape needs to have a strong structure of forestry to compliment it.

3.4.2 Visibility

The main visual impact is from the A96 directly to the south of the forest. The southern half of Quarrelwood has a high visual impact and creates a backdrop for both the A96 and the western part of Elgin.

3.4.3 Neighbouring land use

The surrounding land use is a mix of intensive agriculture and woodland, both conifer and broadleaved. The A96 runs directly adjacent to the southern boundary of the block.



3.5 Social factors

3.5.1 Recreation

The forest is heavily used for recreational activity with most of the users being regular visitors from Elgin and the surrounding area. Many of who know the wood and the paths intimately. In addition to waymarked routes there are a number of informal but well used routes through the forest used by both walkers and mountain bikers. The forest road and track network provides a range of access routes.

The car park, waymarked routes and recreational infrastructure are centred at west end of the forest. The surrounding forest of well thinned SP and larch which creates a forest environment that can accommodate a large number of people. The forest roads facilitate access in all weathers.

Over the wider forest most of the users are walkers, runners and mountain bikers. The terrain is very suitable for mountain biking and although there are no official routes a number of informal tracks have been created.

A visitor experience plan has been undertaken and is included as appendix 5.

3.5.2 Community

Community involvement in the forest beyond using it for recreation is currently very low despite the forest being adjacent to Elgin.

The recreational infrastructure is well established and local users are happy with the provision and management of the woodlands so engagement is limited which may reflect satisfaction rather than indifference. See consultation comments in appendix 1.

3.5.3 Heritage

There is a scheduled monument within the woodland. Quarrelwood henge is a rare and unusually well-preserved northern example of a small henge monument and, as such, may be expected to contain extremely important and potentially vulnerable archaeological deposits.

Henge monuments are unusual ritual structures dating from the Late Neolithic and Early Bronze Age (c. 3000 BC – 1500 BC). They comprise circular areas defined by a bank and internal ditch. The average overall diameter of a henge monument is about 60m, although henges have been identified that were both much larger and much smaller. Some henges had external ditches, while some had banks on both sides of the internal ditch. It is possible that the tradition of stone circles developed out of the henge monument – while stone circles occur in only a very few henge monuments, most excavated examples have been shown to contain circular settings of timber posts. In some places (Stenness, Orkney – or Avebury in England) there is a direct relationship, where a stone circle can be shown to have been built within a pre-existing henge site.

Ceremonies probably involved disposal of the dead (possibly excarnation – leaving the body exposed to nature before burial or entombment).

In addition there are several non-scheduled archaeological sites within the plan area. A check of both internal records and the Sites and Monuments Record (SMR) database has been undertaken to establish the location of these features. The details of which will be included in the work plan that is drawn up for every operation carried out within the plan area.

3.6 Pathogens and diseases

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

3.6.1 Dothistroma needle blight

Dothistroma needle blight is a fungal pathogen affecting the woods within Moray & Aberdeenshire forest district and is present within Quarrelwood.

Dothistroma needle blight is an economically important disease affecting a number of coniferous trees, pines in particular. The disease has a world-wide distribution but until recently was mainly of concern in the southern hemisphere. In much of the world, including Britain, it is caused by the fungus Dothistroma septosporum. Dothistroma needle blight causes premature needle defoliation, which results in the loss of timber yield and, in severe cases, tree mortality. Since the late 1990s the incidence of the disease has increased dramatically in Britain, particularly on Corsican pine. More recently the disease has caused significant damage and death to Lodgepole pine and Scots pine. Due to the extent and severity of the disease there is a moratorium on the planting of Corsican Pine on the national forest estate.

The reasons for the increase in the incidence of this disease are unclear but could be due to increased rainfall in spring and summer, coupled with a trend towards warmer springs, optimising conditions for spore dispersal and infection. Such conditions may become more prevalent in Britain over the next 20 years if current trends in climate change continue. On the national forest estate disease management is currently focused on silvicultural measures to reduce inoculum loads and the use of alternative, less susceptible species in future rotations.

3.6.2 Hymenoscyphus fraxineus (previously Chalara fraxinea)

Ash dieback is an aggressive fungal disease and is caused by Hymenoscyphus fraxineus (previously Chalara fraxinea). The disease causes leaf loss and crown dieback in affected trees, and usually leads to tree death.

Ash trees suffering with the infection have been found widely across Europe since trees believed to have been infected with this newly identified pathogen were reported dying in large numbers in Poland in 1992. These have included forest trees, trees in urban areas such as parks and gardens, and also young trees in nurseries.

3.6.3 Phytophthora ramorum

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

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

4.0 Analysis and Concept

Refer to Maps 4: Analysis and concept.

Theme	Issue	Analysis	Concept
Climate change	Adapting to climate change	The forest has a narrow range of tree ages.	Managing the block under LISS will gradually increase its structural.
	Adapting to climate change	The forest area is underlain with soils that have poor or very poor nutrient status.	The poor soils limit the range of species that can be successfully grown. Select species that are most suitable so they are more resilient pests and diseases.
Timber	Timber supply	Current crop age and condition allows a planned programme of production to be undertaken across the area.	LISS management across the easily accessed site gives the flexibility to react to a range of market opportunities as they arise.
	Timber quality	The ground condition in this plan area allows thinning to be undertaken across most of the block.	Undertake thinning to improve timber quality wherever possible.
Access & health	Recreation	There is currently a good provision of recreational facilities in the plan area.	Maintain the level of provision at its current level and standard.
	Designated sites	There is an SSSI and a scheduled monument within to woodland.	Continue to manage the block to ensure the designated features are maintained in favourable condition.
	Species & habitats	There are limited areas of open ground within the block.	New areas of open ground to be created to achieve the UKFS guideline figure of 10%. These areas will be selected to achieve multiple benefits including improved recreation and biodiversity.

5.0 Land Management Plan Proposals

5.1 Management

Refer to Map 6 Management & Map 7 Thinning

Thinning

Wherever possible the district will continue to maximise the area managed through thinning. FCS policy assumes that all productive conifer crops will be thinned. The only exceptions are where:

- Thinning is likely to significantly increase the risk of windblow;
- A single thinning operation is likely to require an unacceptably large initial investment in relation to the potential benefits due to access or market considerations; and
- Thinning is unlikely to improve poorly stocked or poor quality crops.

An active thinning programme is essential for LISS.

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

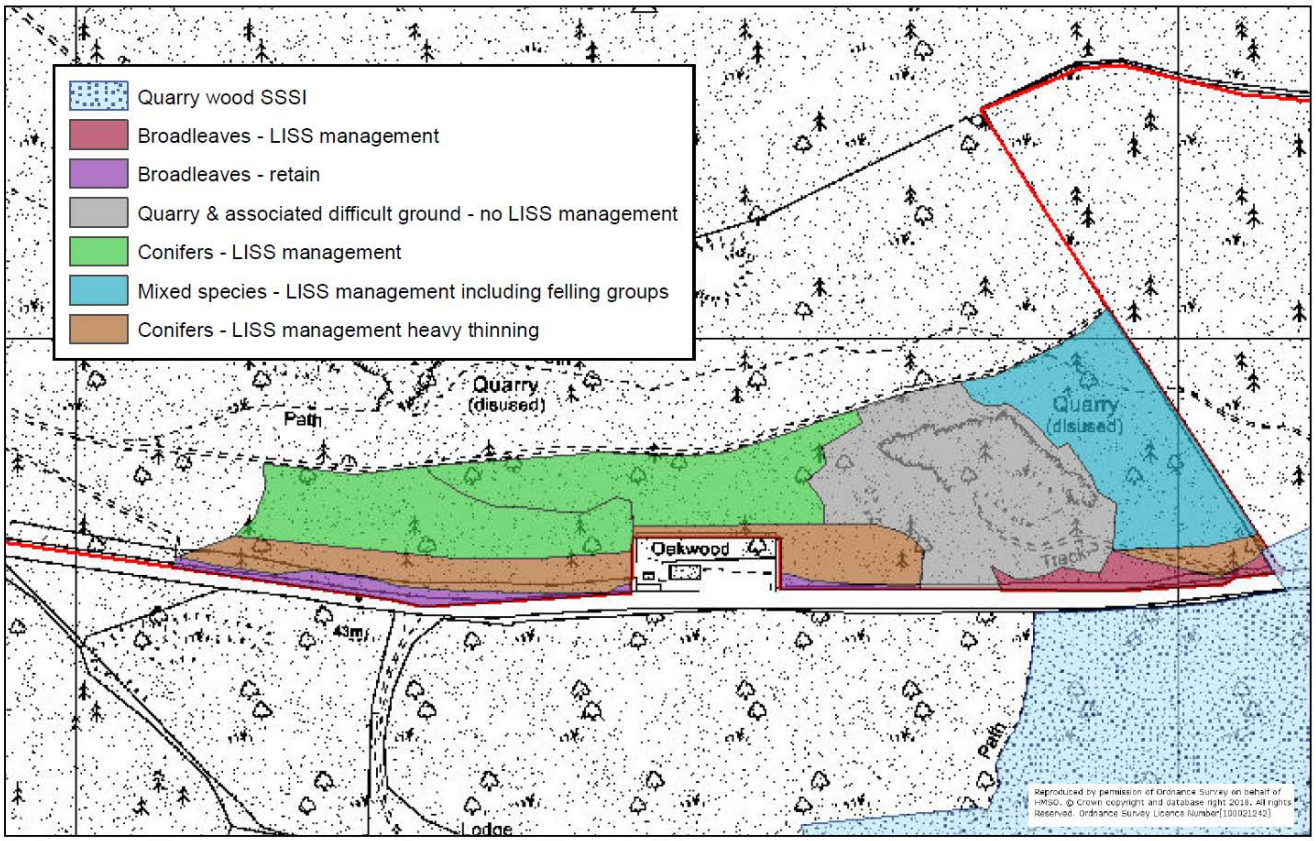
Low impact silvicultural system (LISS)

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

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

Prescriptions for each area managed under LISS are shown in appendix 3. Each prescription will be included in the site management plan before any operation commences.

Adjacent to the Quarry Wood SSSI all the crop is potentially thinnable by harvester and forwarder. Albeit it's on a steep slope and parts can only be thinned downhill. (See map below)



At the west (Green area) thinning and extraction will need to be downhill due to the slope. In order to allow this we will cut racks through the currently unthinned trees lower down and adjacent to the A96 (Brown area). However due to their proximity to the road we can't do this without some form of major traffic management. Currently the lower sections are preventing any thinning of the majority of the slope. Once the lower sections are treated with a single heavy thinning we can actively manage the area above under LISS, extracting downhill through the lower area. There's a reasonable flat area adjacent to the A96 with a pre-existing extraction route back to the turning point at the end of the lower road.

In the east section (Blue area) the area adjacent to the road again requires a heavy thinning to permit extraction. This will allow us to cut groups in the area above during thinning interventions. The groups will be focussed around any existing oak and then planted with oak. Carrying out this work is in

consideration of the Quarry wood SSSI, i.e. we are undertaking sensitive management of adjacent land that will protect and enhance the SSSI oakwood habitat. If at all possible trees raised from seed collected from Quarry wood SSSI (or from Kellas Oakwood) will be used to maintain the genetic provenance of oak in this area.

The work on the lower slopes will need to be dealt with in a one-off operation, as it will require some form of significant traffic management on the A96. This zone would be a minimum of three tree lengths back from the road, to ensure that ongoing thinning of the slope above does not cause any safety issues at a later date. While parts of the area are currently unthinned, it's reasonably sheltered, and there is very little evidence of any windblow across the slope.

The roadside beech avenue will be left untouched, unless there are any dangerous trees needing to be dealt with.

5.2 Future Habitats and Species

Refer to Map 5: Future Species, habitats and management.

Regeneration

Typically LISS seeks to perpetuate tree cover by natural regeneration which is aided and manipulated by managing the seed sources available and light levels on the forest floor. However enrichment planting can also play a key role in LISS systems.

In LISS there is an element of having to make do with what the site delivers in terms of regeneration and using adaptive management to achieve the desired outcomes. A range of regenerating species will be accepted in all areas including broadleaves, larch & Scots Pine (SP).

Enrichment planting will be actively considered to increase the density of the ground cover as required to create a more uniform crop that facilitates management and marketing. In particular areas targeted for SP regeneration may require planting, although this will be monitored as every year is different.

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

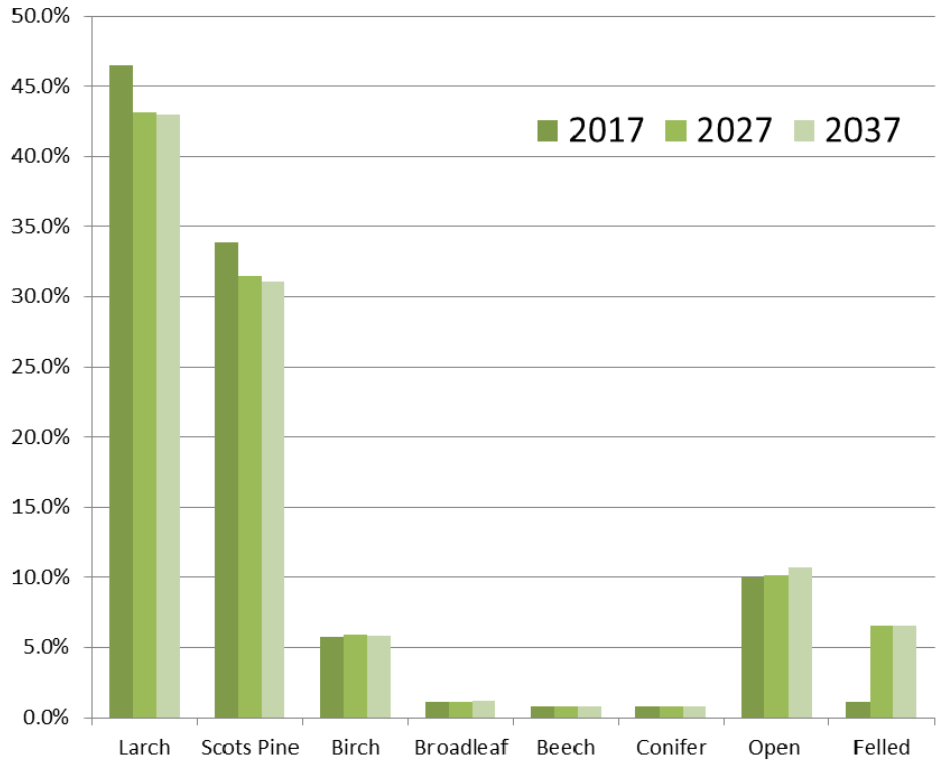
Non Commercial Areas

Areas not considered appropriate for commercial management will include permanent woodland reserves and open habitats, which will require monitoring to ensure they deliver the required objectives. Non-desirable species, such as non-native conifer regeneration, may require removal.

Additional open ground is needed to meet the 10% requirement under UKFS. Additional open ground will be targeted to powerline wayleaves and ride sides to create a network of open ground that will increase the biodiversity value of the block as a whole.

5.3 Species table

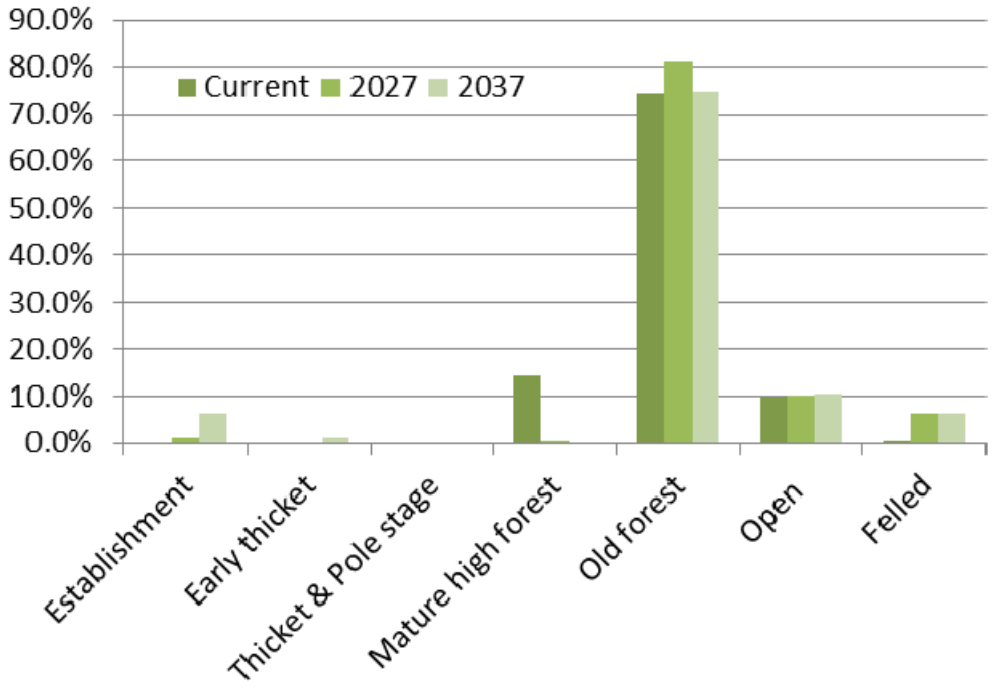
Species	Current distribution 2017	Projected distribution 2027	Projected distribution 2037
Larch	46.5%	43.1%	42.9%
Scots Pine	33.8%	31.5%	31.1%
Birch	5.8%	5.9%	5.9%
Broadleaf	1.2%	1.2%	1.2%
Beech	0.8%	0.8%	0.8%
Conifer	0.8%	0.8%	0.8%
Open	10.0%	10.1%	10.7%
Felled	1.2%	6.6%	6.6%



There is very little change in the species composition in the LMP area due to the use of LISS and the slow conversion period for the SP and larch. The amount of felled area is fairly constant as approximately the same area of group fellings will be undertaken at each thinning intervention. Each felled group should be starting to naturally regenerate prior to the next thinning intervention seven years later. It is expected that the area of open ground will gradually increase towards the 10% target as it is unlikely that all the felled area will completely naturally regenerate.

5.4 Age structure

Age of Trees (years)	Successional Stage	Current distribution 2017	Projected distribution 2027	Projected distribution 2037
0 -10	Establishment	0.3%	1.4%	6.3%
11 – 20	Early Thicket	0.1%	0.3%	1.4%
21 – 40	Thicket & Pole Stage	0.0%	0.1%	0.3%
41 – 60	Mature High Forest	14.5%	0.6%	0.0%
61+	Old Forest	74.3%	80.9%	74.7%
	Open space	10.0%	10.1%	10.7%
	Felled	0.7%	6.6%	6.6%



There is very little change in the overall structure of the forest in the period of the plan due to the use of LISS. However as successive thinning and group felling operations are undertaken a gradual change to a forest with a more normal age distribution will occur.

5.5 Deer management

All deer management will be carried out in accordance with OGB 5 - Deer management.

Our aim is to manage deer density safely and humanely at a level which is consistent with acceptable impacts on forests and other habitats. This is likely to be at a deer density level of 5 to 7 deer per 100 hectares.

Deer cull plans are prepared for each Deer Management Unit and are the responsibility of the Wildlife Ranger Manager. Quarrelwood is part of a larger deer management unit which includes Newton nursery and Monaughty Forest.

Since 2016 the cull of roe deer has been increasing due to a change in the deer control practices within the block. Due to the A96 running along the southern boundary of the block and the high recreation use all deer control is difficult. However the most productive control method is the use of night shooting by the FES wildlife ranger. In house deer culling will continue to be used in the foreseeable future to allow the establishment of natural regeneration which is essential to the success of the LISS planned for the block. If it becomes evident that the natural regeneration is being prevented by deer browsing the method of deer control will be reviewed.

5.6 Access

No new forest roads are required in the period of this plan.

5.7 Biodiversity and environmental designations

The quarries throughout the wood were left unplanted and have naturally regenerated with a mix of conifers and broadleaves. These provide important structural and species diversity and will be managed as long term retentions. The exception to this will be the maintenance of the crucial area at Cutties Hillock, which will be kept clear of trees and scrub as per the prescriptions laid out in the SSSI plan in Appendix 6.

The small area of upland heath is a priority habitat and will be managed as open space. These areas will be monitored and invasive trees and scrub will be removed when it increases above 20% of the area.

The Quarrelwood henge is monitored annually and scrub and bracken invasion is cleared. The current footpath will be rerouted as per the visitor experience plan and the current access gap in the drystone dyke will be reinstated. This will contribute to a reduction in the pressure from public access across the henge which is eroding the monument.

The continued management of the woodland as LISS will retain the current species composition which will be favourable to red squirrels and other woodland species. All forest operations will be planned in line with current legal requirements and industry best practice. Pre coupe inspections are carried out as part of the work plan process.

The management of deadwood in Quarrelwood needs to be balanced against the high public usage of the woodland. The woodland is rated as a medium priority for deadwood provision therefore all veteran trees and deadwood will be retained where it does not pose a health and safety risk to members of the public. Small pockets of windblow will be retained where practical or where they are uneconomic to recover.

5.8 Pathogens

Dothistroma Needle Blight (DNB)

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

The following Crop Condition Survey (CCS) protocol has been developed by Forest Research. The crop is graded using a seven point scale based on a visual assessment of needle retention, mortality, crown density, bark condition and light levels/ground vegetation abundance.

1 - Healthy Crop. No evidence of infection.
1/2 - Intermediate between 1 and 2.

2 - Evidence of early stages of infection (e.g. some needle loss, thinning of crowns, early signs of mortality).
2/3 - Intermediate between 2 and 3.
3 - Clear evidence of infection (e.g. significant needle loss, 'lion's tail' effect, clear sight lines through the crop, presence of vegetation cover on forest floor, possible bark splitting, mortality is evident).
3/4 - Intermediate between 3 and 4.
4 - Crop is dead or is very likely to die (e.g. will die within the next few months, high mortality and is unlikely to recover).

This has led to the following action plan for dealing with Dothistroma Needle Blight infection:

- prioritise infected areas to be felled by swapping felling coupes of non-infected crops in the current program;
- include into thinning operations the felling of any infected crops within the area to minimise costs. Amendments to the land management plan will be required as specified in the tolerance table for felling such areas;
- reassess badly affected blocks and consider if a full review of the land management plan is required;
- planting programs will need to be amended to include replacement species suitable for the site.

In the plan area there are currently 10ha of pine confirmed as having DNB infection in the range of 1/2 to 3/4 on the above scale. The extent and severity of infection will continue to be closely monitored as SP is an important component of the forest make up.

Phytophthora ramorum

Phytophthora ramorum is not currently recorded within the vicinity of the forest, however the disease has expanded recently and a precautionary approach is being adapted. Larch is a species well suited to the forest and makes up a high proportion of the species make up, so this is a situation that will be kept under review. In the meantime we will encourage the natural regeneration of larch as part of the LISS management.

5.9 Critical Success Factors

- Manage the LISS area by continuing with an active thinning programme.
- Gradually increase structural diversity to improve forest resilience to potential pest and disease attacks.
- Maintain the current recreational infrastructure.
- Follow the guidelines in relation to DNB with heavy thinning and LP removal being priority actions.
- Continue the current deer management regime.
- Maintain SSSI in favourable condition.
- Reroute trail away from Scheduled monument.

Appendix 1 – Consultation record

Consultee	Date contacted	Date response received	Issue raised	Forest District Response
Forest visitors (visitor survey)	8, 15 & 18 Nov 2017		See summary table of survey responses below.	
Moray Council	19th July 2018	No response to date		
RSPB (Karen Cunningham)	19th July 2018	No response to date		
SEPA	19th July 2018	No response to date		
SNH (Shirley Reid)	3 July 2018 by email	6 July 2018	I'm supportive of the proposal to remove non-native species, thin around existing oak and plant with oak in the section adjacent to Quarry Wood SSSI. It would be good to add a sentence to explain that you're doing this in consideration of the SSSI, i.e. sensitive management of adjacent land will protect and enhance the SSSI oakwood habitat.	Plan text amended as requested.

			If at all possible, please use the existing seed (or seed from Kellas Oakwood) to maintain the genetic provenance of oak in this area (within and close to the SSSI).	
Historic Environment Scotland	19th July 2018	15 Aug 2018	…we have two comments: 1) There may be opportunities for additional open space around the monument, which would give more prominence to the site, enhancing the monument's setting. The Forestry Commission's 'Forests and Historic Environment: UK Forestry Standard Guidelines'(2011) state on page 19 'As a guide, a margin of at least 20 m should be identified and maintained around Scheduled Monuments or other identified features of importance'.	1)During the group fellings, as part of the LISS management, around the henge we will target one or more of the groups to the edges of the henge. This will clear the buffer zone (which will be at least 20m) over a period of time rather than as one operation and so be less intrusive.

			2) When our Field Officer visited in 2012, there were erosion issues caused by informal paths crossing the monument from north to south, and crossing the bank from the east. If erosion remains an issue for monument condition, there may be an opportunity to address this. Please note that any works within the scheduled area would require Scheduled Monument Clearance.	2) There have been discussions between our environment team and community & visitor services team about the best way to reroute the informal path so that it does not cross the scheduled area. We hope this will stop the erosion to monument. If any of this work requires Scheduled Monument Clearance our environment manager will contact you during the planning process for this work.
Heldon Community Council	19th July 2018	No response to date		
SSE (Fiona Maxwell)	19th July 2018	No response to date		
CONFOR (Jamie Farquhar)	19th July 2018	No response to date		

Moray SEBN (Jacquie Wright)	19th July 2018	30 July 2018	This area is close to our facility and one that we frequently use for outdoor learning sessions with our young people. The historical aspects of the area are important and are often an educational hook to engaging the pupils in a session outdoors. Environmentally, the flora & fauna, wildlife and conservation type discussions, tasks and activities are key to developing interest and love of outdoors within the younger generation. Many of the responses from the survey at Brumley Brae regarding concerns would cover our own views – track maintenance; at times the difficulties sharing trails (cyclists [dog]walkers); litter; damage to the areas around the trails, signage, trees, etc.	The district appreciates the time taken to reply to the consultation and the positive comments.

			The plans that you potentially identify in the consultation would improve the area for future enjoyment by both locals and visitors from further afield, allowing improvements to the land, tree management, better clearer and more appropriate signs, tracks, parking information, etc. These plans would certainly enhance our enjoyment of the area as whenever possible we encourage our pupils to be responsible and consider the impact of their choices for future trips that they may make. We are very fortunate to have such easy access to Quarrelwood and look forward to spending time there in the coming school year and beyond.	
Wildthings! (Holly Willmott)	19th July 2018	No response to date		
Trathmash outdoor nursery (Alastair Davidson)	19th July 2018	No response to date		

Moravian Orienteers (Roo Hornby)	19th July 2018	No response to date		
Moray Mountain Bike Club (John McMulkin)	19th July 2018	No response to date		
Member of public	Poster in wood.	30 July 2018	We like to keep informed about our local woods. As a responsible dog walker I appreciate the work of the Forestry Commission. Love the walks all over Scotland. As a teacher our forests are a valuable resource for outdoor education. Just let us know at Seafield Primary when you need trees planting! Thank you for all you do.	The district appreciates the time taken to reply to the consultation and the positive comments.
Member of public	Poster in wood.	31st July 2018	I tend to bike along the paths and tracks but not the major ones. I used to pass through the henge area, but respect that as a monument it is fenced off, and I think some education and balance should be OK there. If a path was recreated to skirt that then that would be all that is needed I think.	The district appreciates the time taken to reply to the consultation.

			I also appreciate there is a SSSI on the southern boundary. Again I would hope some consultation and give-and-take may win out in that area, so that if a certain area is retained within reason, other areas can be opened up. To re-iterate, I and many others don't take a car or vehicle to the car parks - we are fortunate to be able to cycle there. I appreciate the requests and need for all abilities trails. They are expensive to put in, and for me and others, they reduce the challenge of the trails. I appreciate there is conflict between many of the users - cyclists are seen as churning up trails and going too fast, and "shouldn't be there". Irresponsible walkers of dogs are a concern, I've been bitten in the past and there	

			seems little that can realistically be done. Dog fouling is pretty poor show, it seems more 'acceptable' in the outdoors, but there is nothing worse than a bike travelling over dog poo and it sticking on the tyre for the rest of the ride. Or worse, getting flicked up. Muddy paths are a concern, I don't ride the really muddy paths, and where they are getting churned up I avoid for the season.. If there was an easy way to mitigate muddy sections without a barrowload of chips, that'd be great. Is there scope for joint work parties to maintain trails / paths? At the least to clear wind fallen trees. I've often thought the northern edge / area could be exploited for trails - there was a lovely track that wended its way along there, but it's under a lot of brash and general undergrowth now.	

Member of public	Poster in wood	20 Aug 2018	See letter below	See response below

Visitor No	Carpark	Group size	How often	What to do	How far	Rate QW	What is good	How improve	How long spend
1	Brumley Brae	1	Daily	Walk dog	Less 1 mile	Excellent	Convenience, tranquility, history (henge)	Not much, better paths for older people	1-2 (hrs)
2	Brumley Brae	1	Weekly	Walk dog	1-5 mile	Good	Pretty reasonable, good free parking	Clear marked signage, dog bins	30 mins - 1 hr
3	Brumley Brae	1	First time	Walk	10+	Excellent	Nice paths	Bigger car park	1-2 (hrs)
4	Brumley Brae	1	Daily	Walk dog	Less 1 mile	Excellent	On doorstep, good for dog walking	More dog bins	1-2 (hrs)

5	Brumley Brae	2	Daily	Walk dog	Less 1 mile	Excellent	Local, good dog walk	Bikes going too fast & churning paths	1-2 (hrs)
6	Brumley Brae	1	More than once p/w	Walk dog	1-5 mile	Excellent	Nice paths, trees, everything	Fill in some of muddy holes	30 mins - 1 hr
7	Brumley Brae	1	More than once p/w	Bike	6-10 miles	Excellent	Bike trails, beautiful wood	Dog fouling	30 mins - 1 hr
8	Brumley Brae	2	Daily	Walk dog	1-5 mile	Ok	Peaceful, don't see people, good for families, safe	Trails chewed up by bikes, bikes, motorbikes, nasty dogs	30 mins - 1 hr
9	Brumley Brae	2	More than once p/w	Walk dog	1-5 mile	Good	Good paths, mixed woodland	Litter, car park too small	1-2 (hrs)
10	Brumley Brae	1	Weekly	Walk	Less 1 mile	Good	Quiet, good views, variety of trees	Muddy paths	1-2 (hrs)
11	Brumley Brae	5	Daily	Walk dog	Less 1 mile	Excellent	Different paths, rope swing	Gets a bit muddy, dog pooh bins at Leggat	1-2 (hrs)

12	Brumley Brae	1	Daily	Walk dog	1-5 mile	Excellent	Paths open, ambience, meet nice people	Cyclists and walkers! 2 near misses with cyclist, dog injured	30 mins - 1 hr
13	Brumley Brae	1	Daily	Walk dog	1-5 mile	Excellent	Everything whole environment, not too busy	Signage	30 mins - 1 hr
14	Leggat	1	Daily	Walk	1-5 mile	Good	Nice varied environment, well maintained	Litter bin in car park	1-2 (hrs)
15	Leggat	1	Daily	Walk dog	Less 1 mile	Excellent	Natural, plenty to see, history	Not at all	Less 30 mins
16	Leggat	1	More than once p/w	Walk dog	1-5 mile	Excellent	Walks clearly marked, pleasant place to come	Happy enough with how it is	30 mins - 1 hr
17	Leggat	1	Once a month	Walk dog	1-5 mile	Good	Whole environment	Dog bins	1-2 (hrs)
18	Leggat	1	First time	Walk	6-10 miles	Good	First visit, very accessible, looks like nice paths	Don't know	Less 30 mins
19	Leggat	1	More than once p/w	Walk dog	1-5 miles	Excellent	Paths, view points, free parking	Like people to pick up dog mess	1-2 (hrs)

20	Brumley Brae	1	More than once p/w	Walk dog	1-5 miles	Excellent	Everything natural, inspoilt	Like it as it is	30 mins - 1 hr
21	Brumley Brae	1	Daily	Walk dog	Less 1 mile	Excellent	Favourite place, love it	Dog poo bins, litter bins @ BB	1-2 (hrs)
22	Brumley Brae	1	Once a week	Walk dog	6-10 miles	Excellent	It's beautiful quiet nature	BB car park bigger, toilet facilities	30 mins - 1 hr
23	Brumley Brae	1	Daily	Walk dog	Less 1 mile	Excellent	Love it, quiet, clean	Nothing	30 mins - 1 hr
24	Brumley Brae	1	Daily	Walk dog, bike	1-5 miles	Excellent	Love it, leave it alone, use it a lot	Markers are too close	1-2 (hrs)
25	Brumley Brae	1	Daily	Walk dog, bike	Less 1 mile	Excellent	So many trails	Nothing for me	30 mins - 1 hr
26	Brumley Brae	1	Once a week	Walk dog	Less 1 mile	Excellent	Good paths, tidy, nice views	Not much, slightly bigger carpark @ BB	30 mins - 1 hr
27	Brumley Brae	4	Less than once a mth	Other	6-10 miles	Excellent	Beautiful mix of tree/plant species	Dog dirt on paths	2-4 hrs

28	Brumley Brae	1	Daily	Walk	1-5 miles	Good	Nature, trees, ambiance, quiet	By being left alone let nature take its course	2-4 hrs
29	Brumley Brae	1	Once a week	Other	More than 10 miles	Excellent	Naturalness, not a mono culture	Toilet block would be handy	2-4 hrs
30	Brumley Brae	1	Once a week	Other	6-10 miles	Good	Nice areas for meeting as group, bring friends, peaceful	Toilets, info signs about nature	2-4 hrs
31	Brumley Brae	7	Once a week	Other - Mental health well being group	1-5 miles; 6-10 miles; more than 10 miles	Good; excellent	Mixed woodlands, peace, ambiance, group work	Toilets	2-4 hrs
32	Brumley Brae	2	More than once a mth	Walk dog	1-5 miles	Good	Handy	Muddy paths; litter bins	Less 30 mins
33	Brumley Brae	1	More than once p/w	Walk dog	1-5 miles	Excellent	Plenty tracks, different walk everyday	Some of the paths are muddy	1-2 (hrs)

34	Leggat	2	More than once p/w	Walk dog	1-5 miles	Excellent	Good dog walk, free parking, clean	Sometimes flytipping	30 mins - 1 hr
35	Leggat	1	Once a week	Walk dog	6-10 miles	Excellent	Clear signpost on paths, quiet, dogs love it, safe	Nothing much	1-2 (hrs)
36	Leggat	1	More than once a p/w	Walk	Less 1 mile	Excellent	Quiet, good paths, trees, history	Dog poo bags left	1-2 (hrs)
37	Leggat	2	Daily	Walk dog	1-5 miles	Excellent	Peace, quiet, paths	Don't think it needs to be. Forestry boys do a good job. Seats	Less 30 mins
38	Leggat	1	More than once p/w	Bike	1-5 miles	Excellent	Good for biking, lots of tracks, the trees	Dogs not under control	1-2 (hrs)
39	Leggat	1	Less than once a mth	Walk	6-10 miles	Excellent	Lovely trees, good views	Benches for older people	1-2 (hrs)

40	Leggat	2	More than once p/w	Walk dog	1-5 miles	Good	Nice big open space, dogs off leads	Some dodgy people in car park & woods, being followed (once)	30 mins - 1 hr
41	Brumley Brae	4	More than once p/w	Walk dog	1-5 miles	Good	Swings, sticks	Nothing, good walk	Less 30 mins; 30 mins - 1 hr
42	Brumley Brae	3	Once a month	Walk; walk dog	6-10 miles	Excellent	Nice wood to walk the dog, good parking	Somewhere to buy a coffee	1-2 (hrs)
43	Brumley Brae	1	Daily	Walk dog	1-5 miles	Excellent	Good walks, not far, dog likes it, sheltered	Nothing really	30 mins - 1 hr
44	Brumley Brae	4	More than once p/w	Walk dog	6-10 miles	Excellent	Lots of hills to run up, lots of trails	More way marked trails, trails for kids	30 mins - 1 hr
45	Brumley Brae	2	More than once p/w	Bike	Less 1 mile	Good	Mixed trails, plenty options, interesting biking	Not much, specific bike trails would be good	1-2 (hrs)

46	Brumley Brae	2	Once a week	Walk dog	1-5 miles	Excellent	Good for families, safe, nice trees, walking	Bigger car park (BB), some dogs aren't under good control	1-2 (hrs)
47	Brumley Brae	1	Once a week	Walk dog	1-5 miles	Excellent	Nice walks, clean under foot, nice walking	Poo bins	30 mins - 1 hr
48	Brumley Brae	5	More than once p/w	Walk dog	1-5 miles	Excellent	Handy, variety of walks, different habitats	Bit guttery, rain, bikes	1-2 (hrs)
49	Brumley Brae	3	More than once p/w	Bike	Less 1 mile	Good	Good for biking, handy, trees	Better bike trails / jumps	2-4 (hrs)
50	Brumley Brae	1	Daily	Walk dog	Less 1 mile	Excellent	Local, good dog walk, sheltered, safe, trees	Could do with a litter bin as well as the dog poo bin	1-2 (hrs)

51	Leggat	2	Once a week	Bike	1-5 miles	Good	Bike trails	Damage to trails by operations, third parties putting obstacles (logs) on trails	2-4 (hrs)
52	Leggat	1	Daily	Walk dog	1-5 miles	Excellent	Different routes, safe, good dog walk	Happy the way it is	30 mins - 1 hr
53	Leggat	2	Once a month	Walk dog	1-5 miles	Excellent	Natural woodland, natural history, good dog walk	Dog poo bins, signs to say kick & flick	30 mins - 1 hr
54	Leggat	1	More than once p/w	Walk dog	6-10 miles	Good	Lots of birds, fine and sheltered	Too many cyclists, destroy trails a bit	30 mins - 1 hr
55	Leggat	2	More than once p/w	Walk dog	1-5 miles	Excellent	Good trails, views, history, natural	Not much	1-2 (hrs)
56	Leggat	1	Once a month	Walk dog	1-5 miles	Good	Close, clear defined paths	Signage	30 mins - 1 hr

Member of public letter.

Dear Mr. Reeve

Quarrelwood Land Management Plan 2018 -2027 Consultation

I refer to the above Plan and your invitation for comments, which I trust is a genuine attempt to elicit non-institutional input which will inform the Plan and result in amendments to this draft version.

I would firstly argue that rather than prioritising Ouarrelwood as a timber source, that the priorities are reversed and the wood be regarded as a community resource for the benefit of residents of Elgin and its environs. Extraction should only occur where it is necessary to maintain the health of existing woodland, and not as an industrial exercise. Forestry Commission Scotland should be its caretaker on behalf of the community, and not its exploiter.

I undertake a Brumley Brae-Ardgilzean-Brumley Brae walk on an almost daily basis; did so on the days of your user surveys, and yet was not questioned by the team conducting the interviews. The three day 'consultation record' seems therefore not to be as robust or comprehensive as it could have been.

Had I been consulted, I would have complained about litter at the Brumley Brae car park; the rutting of tracks by bikes, particularly during the wet winter months; the indiscriminate construction of new tracks by bike users; the behavior of dogs not on leads; dog waste and discarded plastic bags of dog excrement; and the use of the woods around the Leggat car park by deviants has resulted in my avoidance of it.

The Plan makes no mention of the frogs, toads and newts, as well as uncommon moths and butterflies which can be found throughout the woods.

From a westerly direction on the A96, Elgin boasts the finest approach to any city in Scotland: a magnificent display of broadleaved trees. On p32 is a plan which shows extensive thinning of the conifers to the north of the broadleaves, and I would express my grave disappointment that there are no proposals to widen the area of broadleaves to the west and east of the Oakwood kitchen and bathroom retailers by planting broadleaved saplings after thinning, which in any case should not be heavy. This is a missed opportunity to enhance further that highway approach to Elgin.

It concerns me also that you propose to thin an area of broadleaved trees adjacent to the A96 by 'LISS management". This fills me with horror. I consider this intrusive action to be quite unnecessary, and again I would underline that the Forestry Commission should enhance what's already there by planting broadleaved saplings in the area where conifers have been sensitively, not heavily thinned as per your proposal.

The plan to fell sections of mixed species trees, like the appalling clear cutting which was undertaken by your contractors along the Spynie Church road some years ago, is utterly unreasonable, and would result in a deforested, ruined hillside being visible to the public for decades to come. Such a cut and run along one side of the Elgin approach road (West Road) is not something which this community would wish, nor compatible with the Commissions' role as steward of publicly-owned woodland in Scotland.

With the ongoing daylight transportation of wind farm components, Elgin's road traffic suffers from substantial disruption as it is, and will be for the foreseeable future. The suggestion that conifer thinning near the A96 will require 'some sort of major traffic management' is preposterous. These measures were not put in place when felling of the adjacent Aldroughty Woods was undertaken close to the A96, and this proposal must be abandoned. Like other aspects of the Plan, it is unnecessary if the Plan is amended, and if enacted, would bring the reputation of the Commission into disrepute.

Yours faithfully

cc MorayCouncil
Quarrelwood Association

Member of public response.

Quarrelwood land management plan consultation.

Thank you for taking the time to respond to the consultation on the draft land management plan for Quarrelwood. I will address the points you raised in the order they are presented.

The objectives for each plan are agreed with colleagues within Moray & Aberdeen Forest District including our recreation team. As I'm sure you appreciate as a public body Forest Enterprise Scotland has limited resources and we have to be able to justify how we use it. This means we have to concentrate our recreation resource to a few key locations within Moray & Aberdeenshire. The recreation offering in other woods is much less intensively managed and although Quarrelwood is close to Elgin it falls into this category.

The public consultation we undertook in Quarrelwood we never intended to be comprehensive. It was only ever intended to get the views from a random selection of people who use the wood.

I will pass on the issues you raise i.e. litter, mountain biking etc. to my recreation colleagues. They undertake the day to day management of the woodlands and are in a better position to address these issues.

On the issue of listing species identified in the plan area we found was that if we try to list species people/consultees always come up with something we have missed. We don't have the resources to fully survey all our blocks to find out everything we have. We rely on ad hoc reporting by people out on the ground. Therefore only mention the six species identified as priorities for conservation action in Forestry Commission Scotland's Woods for Nature biodiversity programme (capercaillie, black grouse, red squirrel, pearl-bordered fritillary, chequered skipper and juniper) plus other "protected" species. We are not managing the forest for particular species but rather creating a forest habitat that has the highest environmental value for all species, while ensuring we still achieve the other objectives/priorities we have for all our forests.

The heavy thinning to the north of the broadleaves along the A96 is to allow access for harvesting machines. The ground to the north of this area is steep and the only way machines can work this is to come down the slope and across the slope, parallel to the A96, at the bottom. Once this operation is completed we are confident the trees will naturally regenerate. This will give us more diverse woodland as we fully expect a percentage of the natural regeneration to be broadleaved trees.

The management of the broadleaves with LISS (Low impact silvicultural system) is in preference to clearfelling the trees. In order to create open space with enough light to allow the broadleaves too naturally regenerate we will need to fell some of the trees. If we don't undertake this work the existing trees will eventually deteriorate and become unsafe and there will be no younger trees developing to take their place.

All the felling within Quarrelwood will be as part of a LISS prescription. This means we will fell small groups of about 0.5ha spread through the woodland. Less than 10% of the woodland will be affected at each intervention, meaning that it will take us over100yrs to fell all the currently standing trees. The objective is to manage the woodland without having to great an impact at any one time.

All work we undertake adjacent to public roads must comply with all traffic management regulations as is undertaken in consultation with the local council and Police Scotland. The work along the side of the A96 is not planned until 2024 so hopefully by this time the transport of windfarm components will be completed.

I hope I have addressed the issues you raised to your satisfaction. If this is not the case please do not hesitate to contact me again either by letter, phones or email.

Yours sincerely

Appendix 2 – Tolerance table

	Adjustment to Felling period	Adjustment to felling coupe boundaries	Timing of restocking	Change to species	Changes to roadlines	Designed open space	Windblow Clearance
FC Approval not normally required	Fell date can be moved within 5 year period and between phase 1 and phase 2 felling periods where separation or other constraints are met	Up to 10 % of coupe area	Normally up to 2 planting seasons after felling. Where hylobius levels are high up to four planting seasons after felling subject to the wider forest and habitat structure not being significantly compromised.	Change within species group e.g. conifers, broadleaves.		Increase by up to 5% of coupe area	
Approval by exchange of letters and map		Up to 15 % of coupe area	Between 2 and 5 planting seasons after felling subject to the wider forest and habitat structure not being significantly compromised.		Additional felling of trees not agreed in plan Departures of more than 60m in either direction from centre line of road.	Increase by up to 10%. Any reduction in open ground within coupe area.	Up to 5 ha
Approval by formal plan amendment may be required	Advanced felling (phase 3 or beyond) into current or 2nd 5 year period	More than 15% of coupe area	More than 5 planting seasons after felling subject to the wider forest and habitat structure not being significantly compromised.	Change from specified native species. Change between species group.	As above depending on sensitivity.	More than 10% of coupe area. Colonisation of open areas agreed as critical.	More than 5 ha

Appendix 3 – LISS prescriptions

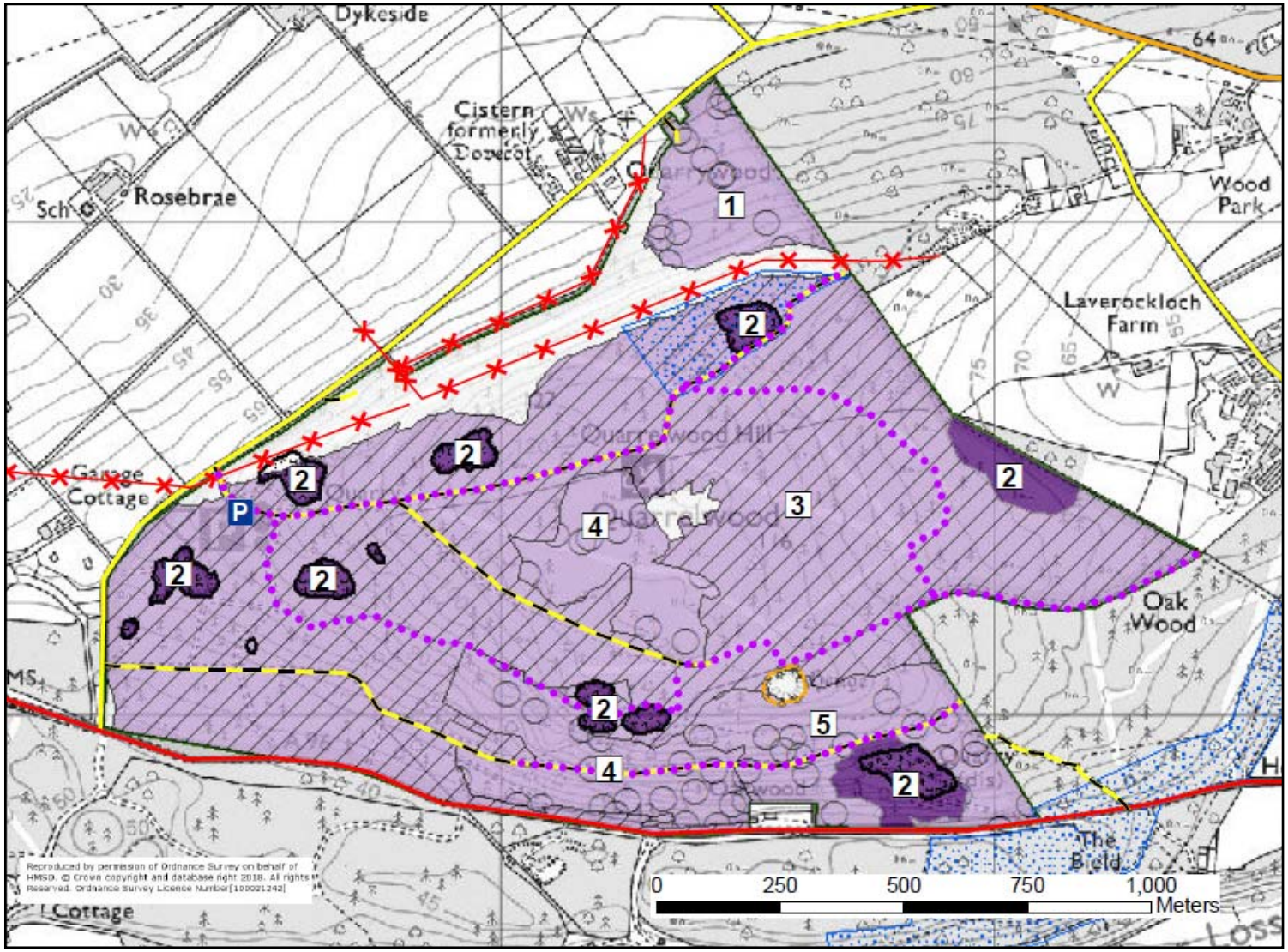
The size and number of groups in the group selection is indicative only. The actual size will depend on the conditions found in each coupe.

The shape of the groups in the group selection coupes do not have to be circular. Oval shaped with the long axis orientated to receive the most light is preferred.

The location of the felling areas in the group selection coupes will be located to reflect the conditions in each coupe. Felling areas will be located to:

- expand existing groups,
- start new groups taking advantage of existing natural regeneration,
- start new groups in areas where there is currently no natural regeneration.

The preferred restocking method is by natural regeneration. However if restocking by natural regeneration is not successful within 10years of felling then the option of replanting will be discussed with FCS.


Dykeside
Cistern formerly Dovecot
Rosebrae
Wood Park
Laverockloch Farm
Quarrelwood Hill
Garage Cottage
Oak Wood
The Bield
Cottage
1
2
3
4
5
P
0
250
500
750
1,000
Meters
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LISS no. (See map above)		Management objective	Long-term structure* and desirable species	Age Trans. period and return time (years)	Regeneration and ground flora	Observations (e.g. likely barriers to achieving objective)	Next treatment required**
1	Group selection 7.9ha	Diversify age structure. Timber production.	Complex structure. 17% BI 83% JL/SP	Age - >60yrs 100% Trans period – 100yrs Return time – 7 years		Light levels	Matrix thin with 0.6ha of group felling. (3 x 0.2ha groups)
2	Long term retention 10.6ha	Retain current tree cover beyond economic maturity for conservation and landscape value.	Complex structure. 33% MB, 67% JL/SP	Age – 20 -60yrs 38% >60yrs 62% Trans period – 100yrs Return time – 7 years		Light levels	Matrix thin

3	Group shelterwood 109.7ha	Diversify age structure. Timber production	Complex structure. 7% MB 93% JL/SP	Age -<20yrs 1% 20 -60yrs 21% >60yrs 78% Trans period – 100yrs Return time – 7 years		Light levels	Matrix thin with 8ha of group felling. (16 x 0.5ha groups)
4	Group selection 19.4ha	Timber production using natural regeneration for restocking.	Complex structure. 6% MB 94% JL/SP	Age ->60yrs 100% Trans period – 100yrs Return time – 7 years		Light levels	Matrix thin with 1.5ha of group felling. (3 x 0.5ha groups)
5	Group selection 12.4ha	Timber production using natural regeneration for restocking.	Complex structure. 20% MB 80% JL/SP	Age – 20 -60yrs <1% >60yrs >99% Trans period – 100yrs Return time – 7 years		Light levels	Matrix thin with 1.0ha of group felling. (5 x 0.2ha groups)

Appendix 4 – LISS management

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

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

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

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

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

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

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

Early crown thinning will be heavier (10-20%) than management table intensity and aim to develop 100 equally distributed 'frame' trees per hectare.
'Frame' trees are well-formed dominant trees with good crowns at reasonably even spacing.
When the trees begin to cone (see table 1 below) stands will be thinned to the basal areas shown in table 2 to develop good conditions for regeneration to establish.
If/when natural regeneration occurs it will be more variable than on a planted site, giving more variability in age, density and species.

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

Table 1. Species seed production details.

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

Table 2. Basal area guidance for natural regeneration

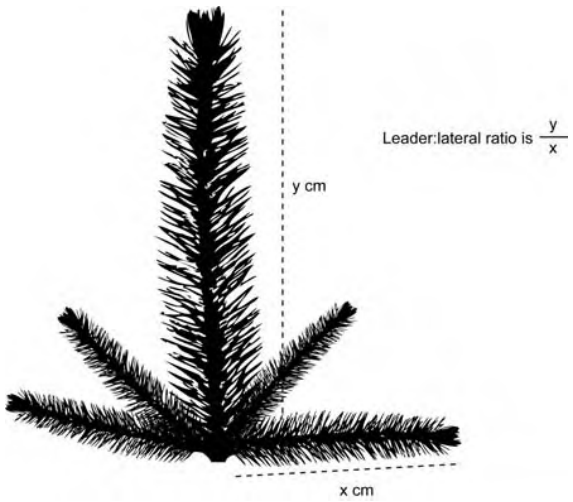
Species/ group	Shade tolerance of seedlings	BA (m2 ha-1) Establishment*	BA (m2 ha-1) Seedling growth**
Larches	Intolerant	20-25***	15-20
Pines	Intolerant	25-30***	20-25
Sitka spruce	Intermediate	30-35	25-30
Douglas fir	Intermediate	35-40	30-35
Norway spruce	Tolerant	40-45	35-40
Western hemlock	Tolerant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

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

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

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

Figure 1. Leader-to-lateral ratio.



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

The objective is to create a wider dbh range than under a simple system by:

- retaining small trees; and
- encouraging fast growth of selected frame trees

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

3. Transformation in older (>40yrs) stands

- Transformation of stands older than 40 years may be possible, especially on wind-firm sites, but the opportunity to steer the development of the young stand in thinning has been lost.
- The main implications of this are:
- for simple systems there will be reduced opportunities for developing the crowns of 'Frame' trees and the window for natural regeneration is reduced. Therefore more 'frame' trees will be retained and a longer regeneration period used.
- in complex systems the main risks are that 'Frame' trees will become too large to be marketable, and the stand will still be quite uniform when windthrow starts. The aim is to

establish groups of regenerating seedlings under an irregular overstorey while older trees are progressively felled.

Appendix 5 – Visitor experience plan

Quarrelwood

Visitor Experience Review & Plan 2017

Phil Whitfield, Doug Collins, Dan Cadle

Sept 2017

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1 The site and management history

1.1 Site description

Quarrelwood commands a hilltop position, overlooking Elgin, the Moray Firth and surrounding countryside.

The East end, owned and managed by Moray Council, is closest to the town, adjacent to housing. It's largely an ancient semi-natural Oakwood (SSSI), under planted in places with beech and conifers. The West end, managed by Forest Enterprise Scotland (FES) is largely even aged, plantation origin Scots pine.

The wood contains a complex of sandstone quarries, some of which are designated a Site of Special Scientific Interest for their rare reptile fossils (including Elginia and Gordonia) found there. These quarries produced stone to build much of Elgin and surrounding villages.

Near the top of the hill is a 4000 year old henge.

The woods are important for local people: walkers, runners, cyclists and mountain bikers. There are currently two circular waymarked trails: the Elginia Trail and the Ancestors Trail. A series of orientation and interpretive panels were installed in the wood in 1999. A permanent orienteering course is set out in the wood starting from the Leggat car park. Maps can be downloaded from the Moravian Orienteers website.

1.2 Statement of Site Significance

The Statement of Significance identifies the ***unique characteristics*** of the site and project.

Quarrelwood is important for its natural and built heritage and as key green space for the people of Elgin.

It includes --- SSSIs and ---- SAMs.

1.3 Recent Management History and Quarrelwood Woodland Park Association

Quarrelwood Woodland Park was established in 1992 and the QWWP Association shortly afterwards. The objectives of the Association were to:

> *"…promote the benefit of the local community and visitors of Moray by assisting Forest Enterprise and Moray Council in the management of the wood regarding recreation, conservation, heritage, archaeology, the environment and good silvicultural practice."*

The association had ordinary members and an elected committee which met regularly, particularly during the grant funded work periods from the late 90s to 2002. Two rounds of partner funding took place, the last amounting to >£100k worth of works.

Interest in the Association gradually fell away following completion of the works. The Association is no longer meeting and effectively disbanded.

Woodland management has always been carried out by the two owners separately, with some volunteer input, largely in the Council's Oakwood.

1.4 Relevant Plans and Strategies

- Hugh Muschamp 1998 *Quarrelwood Interpretive Plan*
- 2006 *Quarrelwood Land Management Plan*
- Paul Hibberd 2010 - *WIAT Visitor Experience Strategy*
- Donald McPhillimy Associates 2009 *Review of the Designation and Management of Woodland Parks on the National Forest Estate*
- 2013 All Forests Survey

2 Review – Quarrelwood in 2017

This is a review of the visitor experience across the whole of the old Quarrelwood Woodland Park.

2.1 Across both ownerships

- The original cross-ownership leaflet for QWWP is no longer in print. The FES Forests of Moray leaflet features Quarrelwood. Moray Council's Morayways website features the routes, as does FES website and a number of other third party sites such as WalkHighalnd.
- On-site panels and signage all relates to out of date organisational structures – Forest Enterprise, Moray Forest District and QWWPA. Branding is out of date. Overly elaborate signage has not been maintained.
- Panels have survived remarkably well. The original picture stone panels at Leggat (GRP panels set in sandstone monoliths) have endured for twenty years.
- Waymarking scheme for the two formal trails used small local stone markers: intended to be subtle and complement sense of place. In reality, the scheme was far too subtle to be visible and likely insufficient numbers were installed. The many informal paths through the wood make marking of every junction very difficult. Locals simply use routes they are familiar with. FES has now replaced these markers with standard timber markers for the FES Quarrelwood area.
- There is no all ability (and buggy friendly) trail. The originally intended all ability "squirrel trail" from the Spynie car park is not waymarked.
- No formal evaluation has been completed on the effectiveness of the interpretation or the waymarked trails. The "Time Trails" theme however seems dated.
- Bench and other infrastructure maintenance has slipped and items are deteriorating.
- Behavioural issues: Periodic dumping and dog fouling is evident but perhaps no worse than other similar locations. No dog waste bins are provided.

2.1.1 Does the Woodland Park work as an entity for visitors?

Donald McPhillimy Associates were commissioned by FES in 2009: Review of the Designation and Management of Woodland Parks on the National Forest Estate.

> *A typical visitor would not see any real value in the WP label in terms of management compared with any other FES site in Moray. They would find it difficult to distinguish between Moray Council woodland and FES woodland. FES staff considered the Woodland Park was a good vision at the time it was established but that the site has not developed the way it was intended.*
>
> McPhillimy *(2009).*

McPhillimy's comments are probably accurate: the Woodland Park as an entity, probably has little impact with visitors. Whilst the two ownerships are contiguous and boundaries not evident, the visitor start points (East or West) are quite distinct, as are the woodland characters: the plantation origin pine with quarries of the East and the Oakwood of the West. Local people in fact more often call the East end "The Oakwood" and by contrast, the East end "Quarrelwood."

For first time visitors, the cross-ownership woodland park is less important than a well waymarked introductory route. For repeat visitors, waymarked routes and who manages each piece of woodland are largely irrelevant.

2.2 The Quarrelwood experience from the west end (FES)

- The waymarked routes do not always offer the most attractive routes available. The Elginia trail, for example, starts with a long section on forest road whilst perhaps one of the key features of the site, the quarries, are barely visited at all. Both trails are now graded Moderate under the Standard Waymarked Path Grading System for Scotland.
- Some sections of the Elginia trail have always suffered from exposed roots and therefore very rough. The lack of consistency of surface is perhaps more an issue than the roughness itself but many older users will struggle with this route.
- Thinning of forest stands in and around the quarries or any other difficult to access locations has been neglected, leaving these areas dark and unattractive.
- Path erosion over Henge is an issue for management of this Scheduled Ancient Monument. The location of paths up to the henge and the interpretive panel itself probably contribute to the problem.
- The view from the Henge is obscured by tree cover below.

- Multi use path pressure was seen as an issue by the QWWPA in the past – mountain bikes conflicting with walkers but this is now thought not to be any more of an issue than other similar sites nationally.
- Mountain bike use has increased and informal “ridden in” lines have emerged. Infrequently, “guerrilla” trail built features have appeared and been removed but for the most part, bike desire lines here are no different under SOAC than walking desire lines.
- The Leggat car park has some design issues, including the power line and associated safety signage and has long been known as an outdoor sex venue but limited to particular times.
- On-site panels and their huge stone lecterns are excessive and not contemporary best practice. Being so difficult to change, they are also a warning for future projects: some materials are a poor legacy for future managers. Possibly an excess of on-site interpretation and yet very for the quarries and their link to the town and people of Elgin.
- There is still a dated panel, adjacent to the Elgin reptiles display in Elgin Museum. This panel invites visitors to explore the waymarked trails in Quarrelwood, where the reptiles were discovered.

2.3 The Oakwood experience from the east end (Moray Council)

- The Oakwood experience remains less formal than the rest of the wood. The mix of woodland is attractive as recognised by locals, even though this does present a conflict with the condition of the SSSI as a rare acid semi-natural Oakwood. Silvicultural management and change here has long been an issue with local people and Moray Council have often been criticised for forest operations that would go almost unnoticed in the West end of the woodland.
- The Brumley Henge – a feature created as part of the last European funding package is hard to discover unless following the Ancestor’s trail.
- East of Brumley Brae, the woodland is less attractive, a relatively thin plantation origin strip, sandwiched between housing.
- The waymarking for the Squirrel Trail at Spynie is no longer evident although the panel at the Spynie car park still refers to it
- The ambitious Spynie sundial remains for now, as a serviceable bench structure but other essential features such as the gnomon has long since disappeared.
- Curiously, at Spynie, FES branded signs are present.

2.4 Decommissioning the Woodland Park designation – FES and Moray Council

From the visitor's perspective, the Woodland Park concept is now unnecessary (see Does the Woodland Park work as an entity for visitors?)

This document highlights the policy drivers for future development of the offer in the FES woodland.

Both organisations have increasingly constrained resources and need to ensure that management of any visitor infrastructure is sustainable.

The Woodland Park and its association, no longer operates. The legacy of signs and other media that relate to the WP need to be removed or updated. FES will finance removal / replacement of shared infrastructure relating to the previous joint projects across both ownerships as a one-off contribution.

The two organisations will continue a good dialogue as neighbours and may occasionally join together for communications or consultations with the community where issues affect both ownerships.

3 Our Visitors – our Audiences

There has been comparatively little data gathered on visitors to Quarrelwood. Quarrelwood is understood to be used mainly by local residents. Those that come here (and many do), like it and don't want or need much improvement.

Walking, often with dogs, is the most popular activity although the wood is also used for running, mountain biking and orienteering and occasionally, horse riding.

The All Forests Survey 2 (AFS2) was conducted by Forestry Commission Scotland with fieldwork from November 2012 to October 2013. The main purpose of this work was to provide a national estimate of visitor numbers to the national forest estate. The methodology was not intended to provide accurate, site level data. At Quarrelwood, the survey estimated only 20,231 visits annually (55 daily), although this could be an underestimate.

What AFS2 did provide was interesting qualitative data on the very small sample of 11 visitors interviewed:

- 82% had travelled <6 miles to the wood (i.e. locals) but 90% of all visitors had arrived by car.
- 82% were repeat visitors.
- All were walking – 55% with a dog.

There has been no work carried out to survey non-users and to understand the "barriers" to their access: what would it take to encourage increased use.

4 Aims and Objectives

Quarrelwood Visitor Management Objectives

1. Meet or exceed visitor expectations by providing enjoyable, quality experiences.

2. Encourage a sense of community "ownership" – a resource known by and connected to the social history of Elgin.

3. Accessible and open - welcoming new as well as existing users.

4.1 Target Audiences

An often expressed opinion amongst the QWWPA committee members, was that their role was to look after the site for the wildlife there and those in the community who knew how to appreciate the woodland responsibly. There was generally less emphasis on promoting the woodland to the wider Elgin community and increasing visitor numbers. Prioritising protection over sharing is quite common for regular users of green spaces.

It is also a small woodland with some physical constraints on easy access and there are other woodlands in the area, including Torrieston and Roseisle, both with fewer terrain constraints to easy access. Never the less, Quarrelwood is unique as a sizable green space adjoining the city of Elgin. There are no other woods around the city that allow easy access on foot or bicycle from the doorstep. It is our policy to use the estate as much as we can to improve quality of life in Scotland's towns and cities.

Our objectives then should be as much about making the woodland more welcoming for new users as respecting existing users.

Likely barriers to new users could include:

- Lack of an effective introductory waymarked route for new users, who are unfamiliar with the site or wider countryside access. Both waymarked routes are

not easy to follow and likely too long. Trailheads and waymarking are substandard.

- Lack of consistent and easy path surfaces and gradients.
- Lack of effective promotion and reasons to visit. What's special about the place and why should I…
- Poor signing to main access points

4.2 Visitor Experience Objectives

Visitor Experience Objectives result from place, audience and our objectives:

What's special about Quarrelwood, who our target audience are (what they may need and be interested in) and our own management objectives.

The things we hope visitors will ***feel, understand,*** and ***do***.

Emotional objectives

Visitors will feel:

- Welcomed – regardless of personal background and interest
- relaxed and able to enjoy the place at a chosen level of effort and exercise
- connected: a place that's inseparably linked to the origins of Elgin.

Learning objectives

Visitors will understand :

- their way to and about the site
- something of the unique heritage of the site
- that Quarrelwood is managed by Forestry Commission Scotland and that there are also other interesting and attractive forests in Moray

Behavioural objectives

Visitors will:

- Be encouraged to visit as first time visitors
- Find their way here

- consider visiting other Moray forests
- discuss the heritage significance with others
- Use the site less as a sex venue

4.2.1 Social Inclusion

As wide an audience as possible should be given the opportunity to access and connect with the site. In particular, any suggested developments must comply with the Disability Discrimination Acts (DDA) of 1995 and 2005, Equality Act 2010 and the Race Relations Act of 2000. The seven strands of diversity identified by the FC are race, disability, gender, age, sexual orientation, transgender identity and religion & belief. FC employees will promote equality of opportunity to everyone.

5 Visitor infrastructure proposals

5.1 Identity, Naming and Branding

The joint ownership formality of a “Woodland Park” is not a benefit to users who see the Oakwood and Quarrelwood as connected but different. Whilst we hope to continue to work in partnership with Moray Council and jointly promote access through each other’s land, the formality of a Woodland Park is no longer considered necessary or helpful in management.

It is proposed then to re-brand the FES offer in the West as **Quarrelwood** with standard FES branding and initially work with the Council to provide new Council branded signage for **The Oakwood**.

5.2 Path and route strategy for Quarrelwood

The considerable network of informal, made and unmade paths throughout the wood are neither desirable, nor possible to effectively waymark. New users need some way of safe and easy introduction to the site and then encouragement to gradually explore further. Proposal:

1. Retain only the Elginia trail from Leggat. Establish a much clearer trailhead to start the walk.
2. Remove all the original stone waymarking. Unexplained artefacts are simply confusing. Consolidate the standard FCS waymarking system.
3. Remove off-shoots to the Laichmoray viewpoint and Cuttieshillock from the actual waymarked route and replace with fingerposts to these.
4. Install fingerposts at key junctions throughout the wood to provide some security for those exploring further and to highlight to users, new areas and highlights.
5. Investigate options for shortening the Elginia route, retaining the Henge as the culmination of the outing but removing the Eastern area and reducing the length of trail on the forest road. Funding for a new trail section required.
6. Initial ideas for a very short introductory waymarked route from Leggat: likely enjoying the views to the North and introducing the quarry heritage of the site, has been shelved due to lack of resource.
7. Review thinning and felling proposals, particularly for the quarries, as part of the 2017 Forest Plan review, focussing on visual improvements and sense of place for heritage significance and visitor experience.

5.3 Orientation and interpretation structures

Fewer fixed interpretation panels are required in the new scheme and orientation structures on arrival should be in the standard FES suite rather than inflexible stone structures.

Whilst there is a significant cost involved in removing the stone structures, done together will contain unit costs and resolve an otherwise long term, unwanted legacy.

1. Leggat orientation stone monolith – replace this, and the temporary covered info structure, with standard FES information panel suite. Ensure the site map indicates key locations such as Cuttie's Hillock where the fossils were found. Encourage ongoing exploration beyond the waymarked route.
2. Retain Leggat picture stones – and re-run an arts competition exercise when panels expire. Replace explanatory panel with update (removing QWWPA references)
3. Brumley Brae Henge panel - blast off panel recess (portable sand blasting), restoring the installation to a simple folly with no visitor information.
4. Spynie orientation monolith – remove.
5. Spynie sun dial – future maintenance a matter for Moray Council

6. Remove the threshold sign from Spynie. Replace with an Oakwood sign if required by Council.
7. Remove 3x interpretive panel lectern stones – (Elginia at Cutties Hillock, Henge, Loch Spynie viewpoint) – New standard wooden interpretation lecterns will be used at Cutties Hillock, Henge (new location to reduce traffic over henge) and a quarry site. See below for interpretation proposals.
8. Replace panel in Elgin Museum. This panel is of the same vintage as onsite materials, references QWWPA and indicates current trail network. The link from the fossils to the woodland is however a strength.

6 Interpretive Themes and Messages

6.1 Reviewing themes from Hugh Muschamp's 1998 Report

The 1998 interpretive scheme has endured really very well, as have the panels themselves. The stories were well researched and extensive. The "Time Trails" theme and the unifying idea of footprints across the themes does however now appear a bit twee and likely over-sold. The writing style is also quite mixed: from the formal vocabulary of the Loch Spynie viewpoint panel to the text to encourage users.

6.2 Thematic Approach

The new approach intends to be more focussed and particularly keep to one topic and theme per panel location:

- Quarries and building of Elgin – Did your house come from here?
- Unique fossils – Elginia was discovered here, older than the dinosaurs
- The Henge – This was a special place to stone age people

We will avoid using an overall site theme this time, other than promoting welcome, easy exploring on the waymarked trail and to keep exploring.

7 Project Proposals

7.1 Proposals summary

The following are indicative media proposals only, enabling the project to be budgeted. Further work will be required for implementation.

	Project	Cost
Structures	x 5 Stone monolith/ lectern removal: Leggat, Spynie orientation monolith, 3x interpretive panel lectern stones – (Elginia at Cutties Hillock, Henge, Loch Spynie viewpoint)	4000?
	Brumley Brae Henge panel removal and portable sand blasting	200?
	Replacement Leggat panels in standard FES information panel suite. 2 panel structure	2000
	Replace Leggat picture stones explanatory panel	200
	3x New interpretation panels and structures: Cutties Hillock, Henge (new location), a quarry site and Elgin Museum.	3000
	New interpretation panel Elgin Museum.	200
	Remove / replace Spynie threshold sign	?
	Replace Leggat FES Threshold sign	?
Waymarking	Remove all stone waymarking	?
Benches	x 4 Replace aged QW benches with standard FES bench with back units	?
	Update Elginia trail only FCS waymarking	?
Web	Full content update	-
Print	Update Forest of Moray leaflet	-

7.2 Pre visit experience & promotion

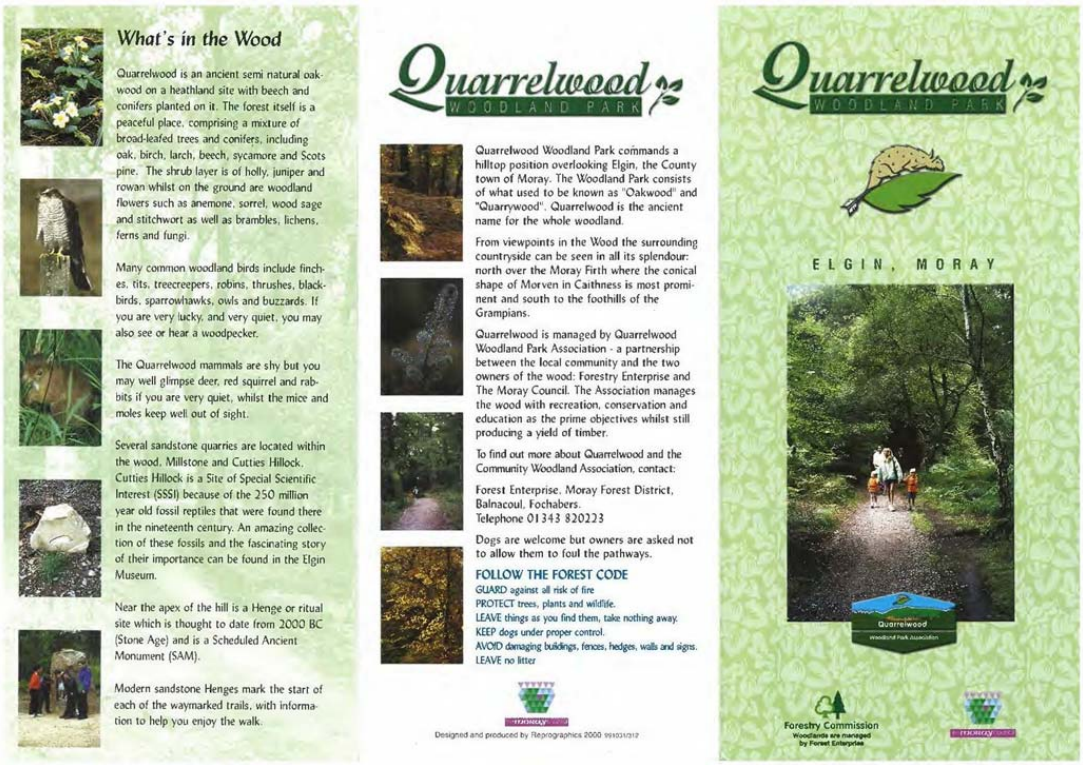
7.2.1 Web

Web content should be updated promptly with all site and trail changes. The interpretive content here is still largely fit for purpose.

7.2.2 Promotion and marketing

A96 brown tourist signage would be appropriate if affordable. Further specific marketing is unlikely to be cost effective at present, beyond existing distribution of the Forests of Moray leaflet. Trail and other site improvements are likely to generate word of mouth interest and recommendations.

8 Addendum 1 – Original QWWPA leaflet



What's in the Wood

Quarrelwood is an ancient semi natural oakwood on a heathland site with beech and conifers planted on it. The forest itself is a peaceful place, comprising a mixture of broad-leafed trees and conifers, including oak, birch, larch, beech, sycamore and Scots pine. The shrub layer is of holly, juniper and rowan whilst on the ground are woodland flowers such as anemone, sorrel, wood sage and stitchwort as well as brambles, lichens, ferns and fungi.

Many common woodland birds include finches, tits, treecreepers, robins, thrushes, blackbirds, sparrowhawks, owls and buzzards. If you are very lucky, and very quiet, you may also see or hear a woodpecker.

The Quarrelwood mammals are shy but you may well glimpse deer, red squirrel and rabbits if you are very quiet, whilst the mice and moles keep well out of sight.

Several sandstone quarries are located within the wood, Millstone and Cutties Hillock. Cutties Hillock is a Site of Special Scientific Interest (SSSI) because of the 250 million year old fossil reptiles that were found there in the nineteenth century. An amazing collection of these fossils and the fascinating story of their importance can be found in the Elgin Museum.

Near the apex of the hill is a Henge or ritual site which is thought to date from 2000 BC (Stone Age) and is a Scheduled Ancient Monument (SAM).

Modern sandstone Henges mark the start of each of the waymarked trails, with information to help you enjoy the walk.

Quarrelwood
WOODLAND PARK

Quarrelwood Woodland Park commands a hilltop position overlooking Elgin, the County town of Moray. The Woodland Park consists of what used to be known as "Oakwood" and "Quarrywood". Quarrelwood is the ancient name for the whole woodland.

From viewpoints in the Wood the surrounding countryside can be seen in all its splendour: north over the Moray Firth where the conical shape of Morven in Caithness is most prominent and south to the foothills of the Grampians.

Quarrelwood is managed by Quarrelwood Woodland Park Association - a partnership between the local community and the two owners of the wood: Forestry Enterprise and The Moray Council. The Association manages the wood with recreation, conservation and education as the prime objectives whilst still producing a yield of timber.

To find out more about Quarrelwood and the Community Woodland Association, contact:

Forest Enterprise, Moray Forest District,
Balnacoul, Fochabers.
Telephone 01343 820223

Dogs are welcome but owners are asked not to allow them to foul the pathways.

FOLLOW THE FOREST CODE

GUARD against all risk of fire
PROTECT trees, plants and wildlife.
LEAVE things as you find them, take nothing away.
KEEP dogs under proper control.
AVOID damaging buildings, fences, hedges, walls and signs.
LEAVE no litter

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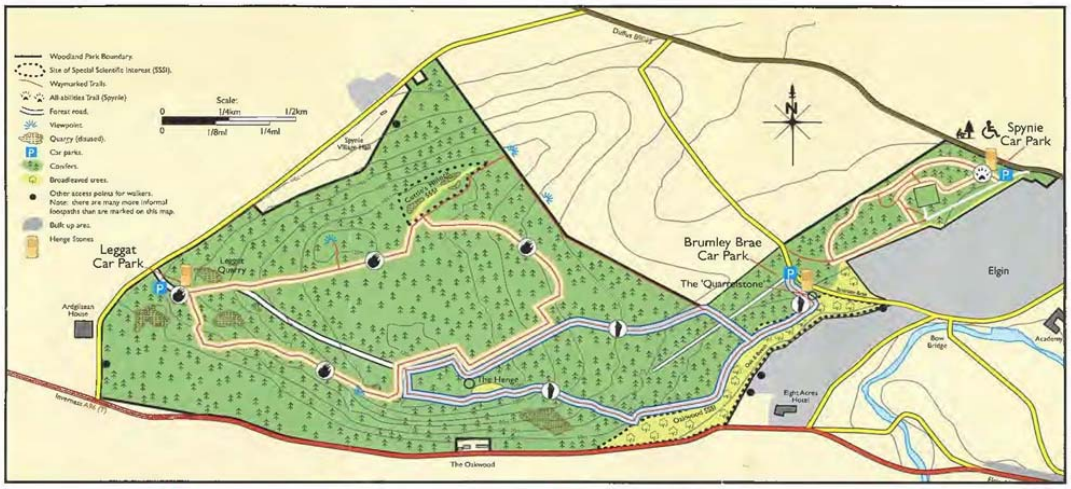
Quarrelwood
WOODLAND PARK

ELGIN, MORAY

Forestry Commission
Woodlands are managed by Forest Enterprise



The Elginia trail is graded (easy) - allow 1½hrs.

The Elginia Trail of Quarrelwood

This trail is a circular route, which begins at the Leggat Quarry car park and leads to the Cutties Hillock Quarry (SSSI) and the viewpoint. It links with The Ancestors Trail and then leads back to the car park. The trail acquaints the visitor with the prehistory of the site. It is marked with a stylised reptile footprint and links with *Elginia mirabilis* (Model in Elgin Museum) and *Rhynchdipterus Eligensis*, a prehistoric fish whose fossils were discovered in Cutties Hillock Quarry.

The Ancestors trail is graded (easy) - allow 1½hrs.

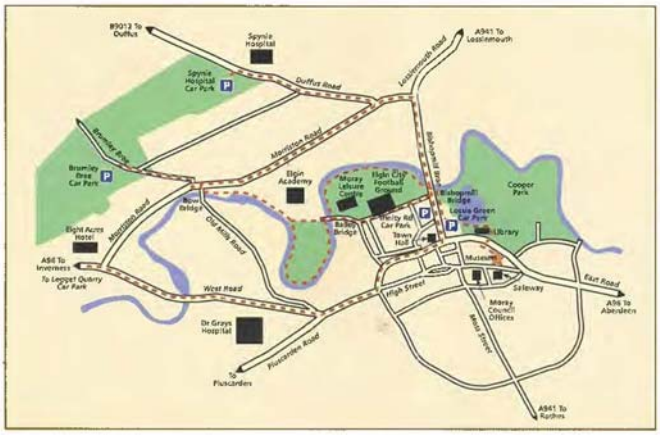
The Ancestors Trail of Quarrelwood

This trail leads from The Spynie Trail at Brumley Brae to the Henge site. It joins the The Elginia Trail then returns. We think that Neolithic man used the wood built henge for ceremonial purposes, about which we know very little. Decorative pottery and a stone Bronze Age axe mould have been found on this site. The trail is marked with a footprint to remind us of the earlier people who walked in these woods.

The Spynie trail is graded (easy) - allow ½hr.

The Spynie Trail of Quarrelwood

This trail starts at the Spynie Hospital car park and follows a circular loop within the Northeast section of the Oakwood with an extension for those who wish a longer stroll. The surface is suitable for visitors of all abilities. The trail passes a bird feeding station and birds to look out for include blackcaps, coal and blue tits. Sorrel, bracken, primrose and bluebell all grow in this part of the wood.



How to get there on foot

Elgin Trail to Quarrelwood

This trail directs walkers from Elgin to Quarrelwood and starts from the Museum where links to the wood are exhibited. Walk over the footbridge to Cooper Park, past the Elgin Library and follow the footpath under the Bishopmill Bridge to avoid the heavy traffic. From there, you can follow one of two routes to the Bow Bridge on Morriston Road. Cross the main road at Bow Bridge with care and walk up Brumley Brae, just beyond the turn off to Hamilton Drive, to the car park on the left.

To get to Bow Bridge you can choose either the "Riverbank" or the "direct route".

The Riverbank

Start at the Bishopmill Bridge and follow the riverbank path all the way to Bow Bridge. This is the longest route (30 minutes) and the most scenic. It tends to be muddy underfoot after rain.

Direct Route

From Bishopmill Bridge, walk along the pavement in front of the Football Ground and Moray Leisure Centre. Cross the Bailey Bridge over the River Lossie, follow the path straight ahead past Elgin Academy and emerge at Morriston Road. Turn left and walk about 100 metres to the Bow Bridge.

How to get there by car

The motorist can access the Woodlands from three sites:

1. Leggat Quarry Car Park
2. Brumley Brae Car Park
3. Spynie Hospital Car Park

Leggat Quarry Car Park

Take the A96 from Elgin towards Inverness. Drive past the Eight Acres Hotel and Oakwood on your right and take the next road on the right, signed to Rosebrae. Look out for the car park about 300 yards on the right.

Brumley Brae Car Park

Proceed along the road to Lossiemouth and turn left onto the B9012 Hopeman/Burghead Road. Continue along Morriston Road and take the first road on the right past the Elgin Academy, signed to the Pet Centre. Go up the hill and you will find the car park on the left side of the road.

Spynie Hospital Car Park

From Lossie Green follow the Lossiemouth road through Bishopmill, turn left onto the B9012 Hopeman/Burghead Road, then first right, up the hill until you reach Spynie Hospital. The car park is situated on the left-hand side of the road opposite the Hospital.

Quarrelwood

WOODLAND PARK

Quarrelwood Woodland Park commands a hilltop position overlooking Elgin, the County town of Moray. The Woodland Park consists of what used to be known as "Oakwood" and "Quarrywood". Quarrelwood is the ancient name for the whole woodland.

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AVOID damaging buildings, fences, hedges, walls and signs.
LEAVE no litter

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Appendix 6 – Cutties Hillock SSSI plan

Start Date of Plan - Same as LMP

End Date of Plan - Same as LMP

Overall Management Aims & Objectives for each designated site

The overall objective for Cutties Hillock SSSI is to protect the site and to maintain or where necessary, enhance the special features of the site. In essence, the key aim for Cutties Hillock will be to maintain the rock exposures at or above the current level and to maintain the visual integrity and access to the site. This will require the periodic removal of trees and scrub from the crucial areas. (See SCM photo from 2015 below).

Section 1 Designated Sites covered by this appendix

Designated Site Name	Site code	Site Type	Total Area of designated site (ha)	Area within this FDP (ha)	% With in this LMP	Annex containing SNH site documentation
Cutties Hillock	482	SSSI	5.16ha	5.16ha	100%	Annex 2
Quarry Wood	1317	SSSI	22.3	0.02ha	<1%	

Refer to annex 1 which highlights the location of the above designated sites in relation to the LMP boundary and the NFE management area. Cutties Hillock is a disused quarry lying entirely within the FES managed Quarrelwood, about 3km west of Elgin.

For further detail on the designation refer to the SNH documentation in the above listed annexes, which refers to the entire designated site area. The remainder of this plan will refer in detail to the element of the above designated sites on the NFE.

Describe below how the area of each designation integrates with the NFE and with the other designations:

Cutties Hillock SSSI is completely contained within the NFE landholding and is designated for geology. Quarry Wood SSSI is designated for its biological interests and is adjacent to the south west boundary of the NFE. There is a slight overlap on the south west corner but it is a very small fragment.

Section 2 Features on the NFE and condition

Only features that exist on the NFE within this FDP are listed in the table below.

Site Type	Site code	Feature description	SCM Condition (Date assessed)	Condition on NFE	Management Classification (if relevant)
SSSI	482	Permian-Triassic Reptilia	Favourable Maintained (19th March 2015)	Favourable Maintained	

Permian-Triassic Reptilia – Cutties Hillock Quarry is a key locality for its unique fossil reptile fauna of the very late Permian period, approximately 250million years ago, and this age sets it apart from the well-known late Permian reptile beds of South Africa and Russia. The quarry consists of bedded layers of various types of sandstones, reflecting the different depositional and erosional processes of the desert conditions in which the sediments were laid down.

Fossil remains within the Permian/Triassic rocks of Elgin were first found by a quarryman in 1836 and subsequently the area became a focus of much scientific debate. In 1878 it was noted the rock sequence was sufficiently exposed to allow its description and the presence of an 8 foot long reptile track was noted.

In 1882 the quarry was reopened with sandstone being worked for building purposes. Between 1882 and 1884 a remarkable fossil find was made at the bottom of a trial pit that prompted further excavation in 1885.
The fossils found during the working life of the quarry became widely known and attracted the attention of many eminent geologists including Dr Edwin T Newton who was the first person to realise that the Cuttie's Hillock sandstone and hence its fossil fauna was distinctly older than the other Permian/Triassic rocks/ fauna of the Elgin area.

There are rarely any bone remains in the rocks, since these would have usually been dissolved by percolating waters, leaving behind “natural moulds” of the generally complete reptile skeleton. The reptiles so far discovered seem to have been mainly herbivorous animals, which ranged around the lakes and rivers of the desert-like environment.

Cutties hillock is a site of international importance as it has yielded the youngest Permian reptile fauna in existence. It is also important in the history of geology because of its association with some of the 19th century's most eminent scientists.

Section 3 Pressures and proposed actions

Site Type	Feature description	Pressures	Proposed action	Timescale	Location Map highlighting work & other key limiting factors
SSSI	Permian-triassic reptilian	Tree and scrub encroachment from adjacent mature woodland	Monitoring and removal of tree regeneration and scrub	Annual monitoring and 3-5yearly removal as required	

Section 4 Operations within the LMP that could impact on the designated features on the NFE

Operation Type	Detailed description of operation and method	Mitigation measures to be applied	Timing	Map reference & other relevant comments
Thinning	This is the thinning of the mature stands of trees within the designated area which is to be managed as continuous cover woodland. Thinning will be done using a harvester and forwarder.	Mechanised harvesting will only be undertaken in mature stands of trees and will not encroach into the main quarry exposures. Existing harvesting routes will be utilised. Workplans and maps will clearly identify the SSSI and rock faces. The Forest & Water guidelines will be adhered to. Pollution control kits will be on site during all operations.	2020, 2027	Refer to LMP Map 6 - Thinning
Tree and scrub removal	The removal of tree and scrub regeneration from the crucial area to maintain the visual integrity of the exposed rock. This will be done using chainsaws and/or scrubsaws. Cut stumps and regrowth will be treated with glyphosate.	Trained operators will be used who will follow industry best practice at all times. Cut material will be removed from the quarry area where feasible or cut/chipped and stacked in previously agreed locations.	Throughout the lifespan of the plan as required.	See Annex 2
Facilities maintenance	The current stone waymarking and interpretive	Trained operators will be used who will follow industry	Throughout the lifespan of the plan as required.	See appendix 5 - visitor experience plan.

	panels are to be removed from short trail that runs through quarries in line with Visitor Experience Plan (see appendix 5). These will be replaced with a single fingerpost at the forest road junction and a new wooden lectern at Elginia. The footpath that passes the edge of SSSI requires limited maintenance. No major works are proposed during lifespan of this plan. Scrub and/or windblown trees will be cleared using chainsaws and/or scrubsaws as required.	best practice at all times. Care to be taken to ensure that cut material is processed and stacked in agreed areas so as not to obscure the rock faces. Care to be taken when removing stone interpretation. The wooden lectern will be sited in same position as the current interpretation. Footpath condition to be monitored to ensure and “spread” or deterioration can be remedied.		

Section 5 Operations within the LMP or aspects of the national forest estate within the LMP that could impact on designated sites adjacent to national forest estate

Operation Type / Aspect of forest	Detailed description of issue or operation	Proposed action &/or mitigation	Timing	Map reference & other relevant comments
Species Choice	The NFE woodland is adjacent to the Oakwood SSSI. The aim of this LMP is to increase the proportion of oak within the current species mix through the use of LISS management. During thinning operations any hemlock, spruce or fir will be removed.	Natural regeneration of exotic conifers (Western hemlock, fir, spruce) and rhododendron will be removed. During thinning operations a number of small open areas will be created and these will be planted with oak. If at all possible trees raised from seed collected from Quarry wood SSSI (or from Kellas Oakwood) will be used to maintain the genetic provenance of oak in this area.	Throughout the lifespan of the plan when thinning operations occur.	See LMP map 7

Section 6 Appropriate Assessment/s undertaken on work contained within the FDP

None required.

Section 7 Approvals, agreements & signatures

I confirm that the above management plan which covers the SSSI "Cutties Hillock" (Site code 482) within land management plan "Quarrelwood" contains the necessary detail, content and mitigation measures to comply with the statutory requirements contained within the Nature Conservation (Scotland) Act 2004 and in particular in relation to Part 2, Chapter 1, Section 14 (d), which covers consents via an agreed management plan (i.e. "SNH's consent under section 13 is not required in relation to carrying out an operation of the type described in subsection (1) of that section – …….(d) in accordance with the terms of a management agreement between SNH and the public body or office-holder carrying out the operation").

SNH Signature …… Date ……..

SNH Name ……..

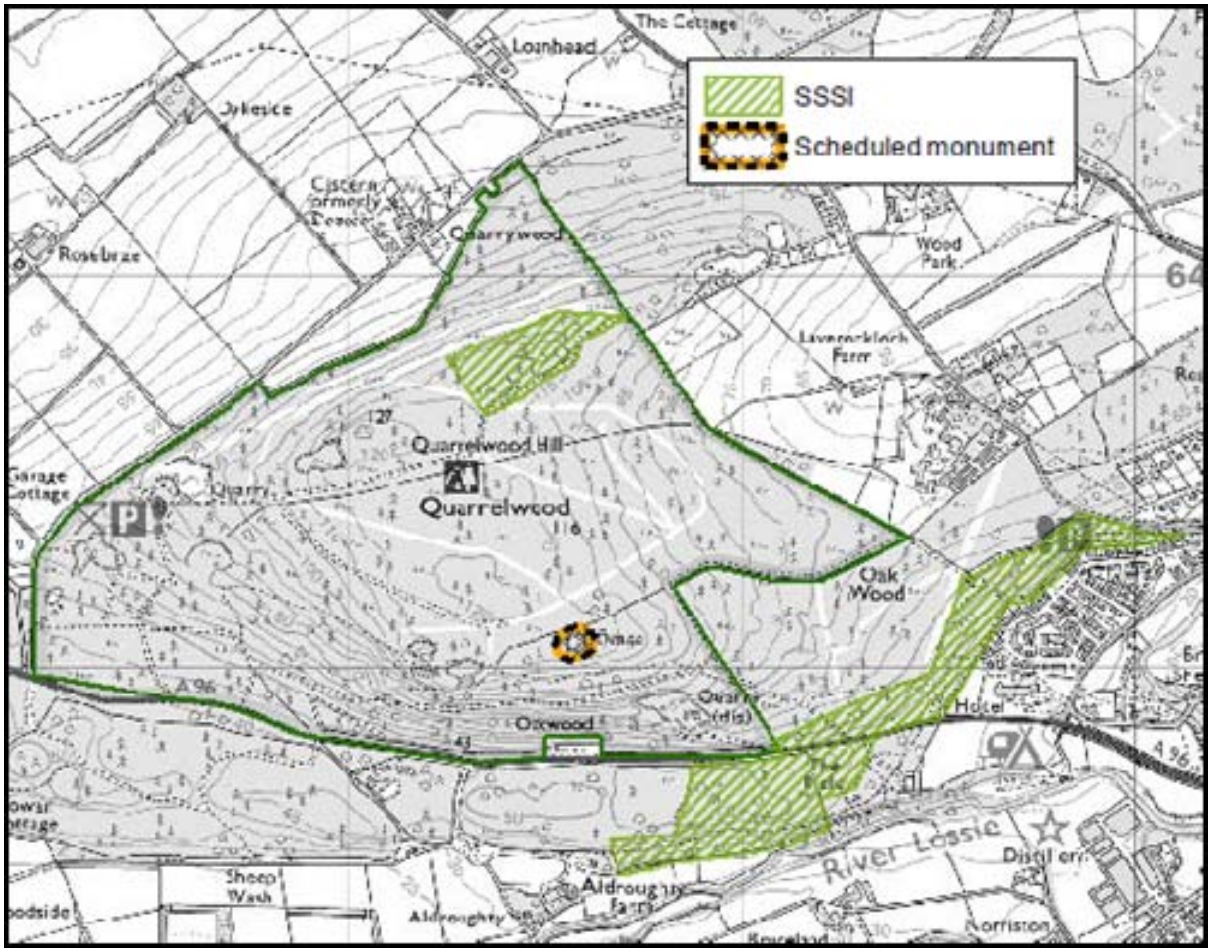
SNH Job Title ……..

Address……..

Email ……..

Contact telephone number ……..

Annex 1 - Map highlighting the location of the designated sites in relation to the FDP boundary and the NFE management area.



Annex 2 – SNH Site Documentation

Citation

File Ref: 460/N

CUTTIES HILLOCK
SSSI

DISTRICT	:	**MORAY**
DATE NOTIFIED UNDER THE 1949 ACT	:	**1965**
DATE NOTIFIED UNDER THE 1981 ACT	:	**1987**
NATIONAL GRID REFERENCE	:	**NJ 184 638**
OS 1:50,000 SHEET NO.	:	**28**
1:25,000 SHEET NO.	:	**NJ 06/16**
AREA (hectares)	:	**5.4**

DESCRIPTION

Geological:

Cuttie's Hillcok Quarry has yielded a fossil reptile fauna quite distinct from any found elsewhere in the world. Its age (very late Permian) sets it apart from the well-known late Permian reptile beds of South Africa and Russia. The pareiasaur Elginia, with its bizarre specialisations, is the most recent known member of the group. The dicynodont Geikia is also unique, while Gordonia compares more closely with South African forms. These are the only dicynodonts known from western Europe. The youngest Permian terrestrial reptile locality in the world.

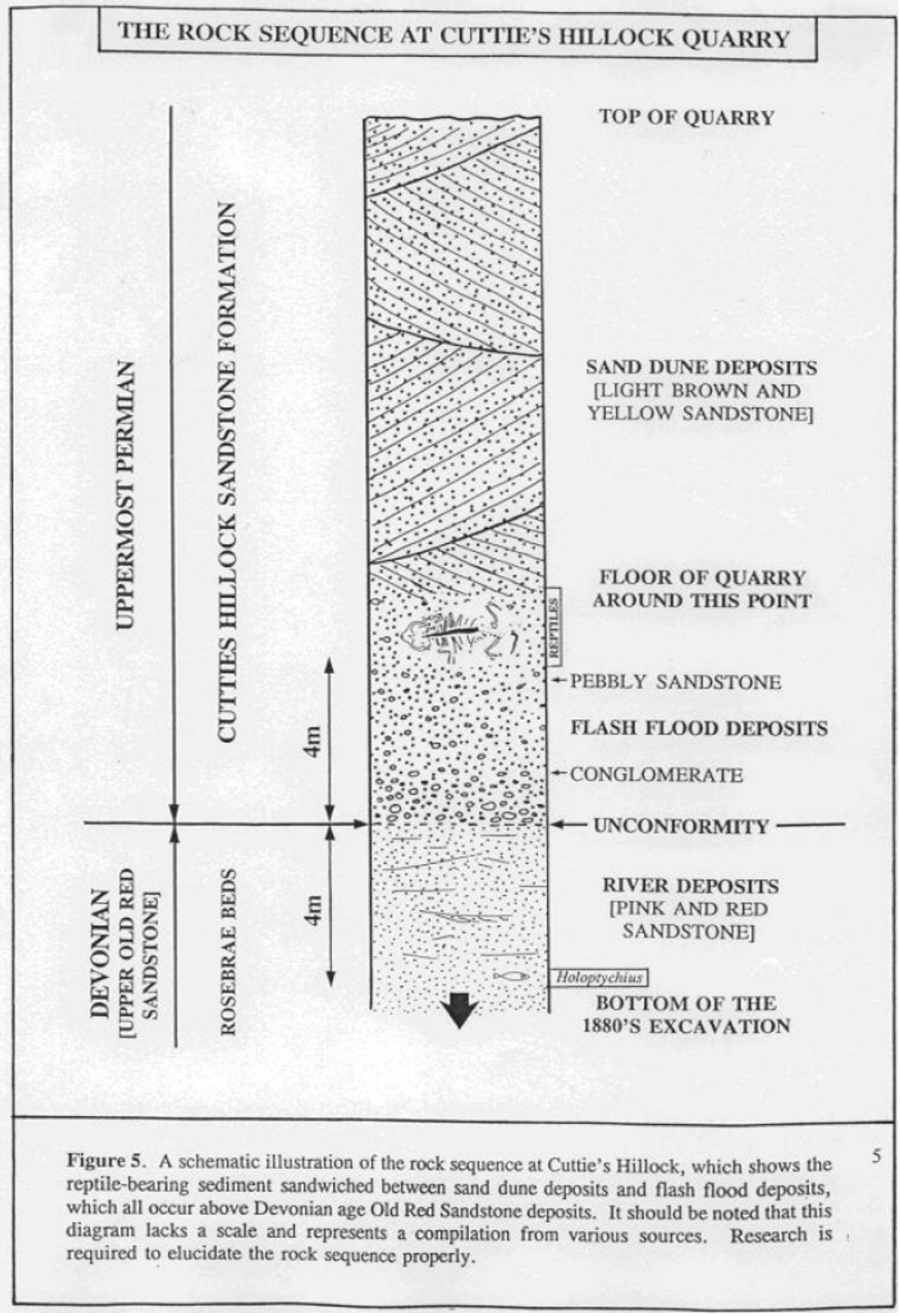
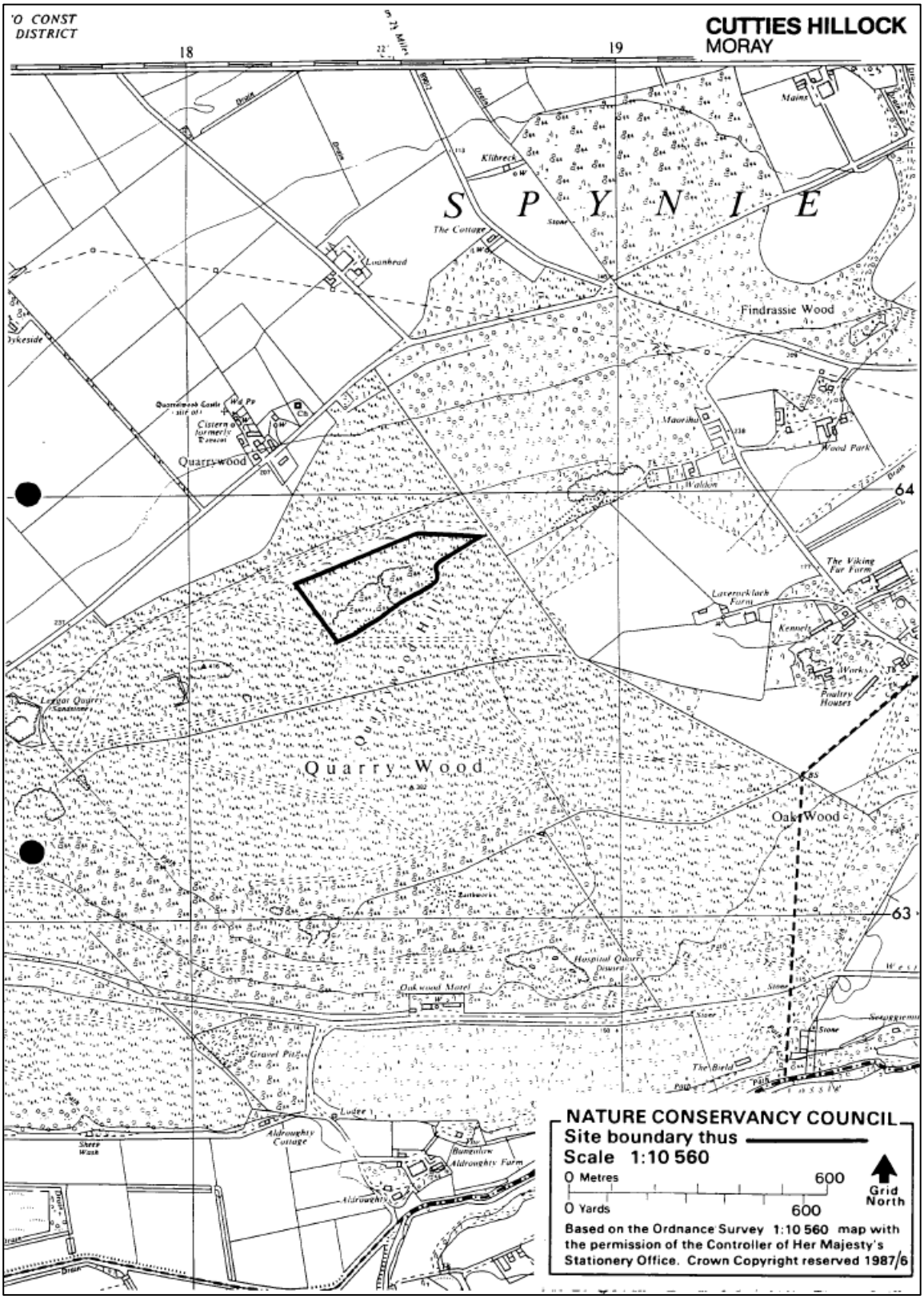


Figure 5. A schematic illustration of the rock sequence at Cuttie's Hillock, which shows the reptile-bearing sediment sandwiched between sand dune deposits and flash flood deposits, which all occur above Devonian age Old Red Sandstone deposits. It should be noted that this diagram lacks a scale and represents a compilation from various sources. Research is required to elucidate the rock sequence properly.

5

Maps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CUTTIES HILLOCK
MORAY
18
19
S P Y N I E
Findrassie Wood
Quarry Wood
Oak Wood
Quarrelwood
64
63
NATURE CONSERVANCY COUNCIL
Site boundary thus
Scale 1:10 560
0 Metres 600
0 Yards 600
Grid North
Based on the Ordnance Survey 1:10 560 map with the permission of the Controller of Her Majesty's Stationery Office. Crown Copyright reserved 1987/6

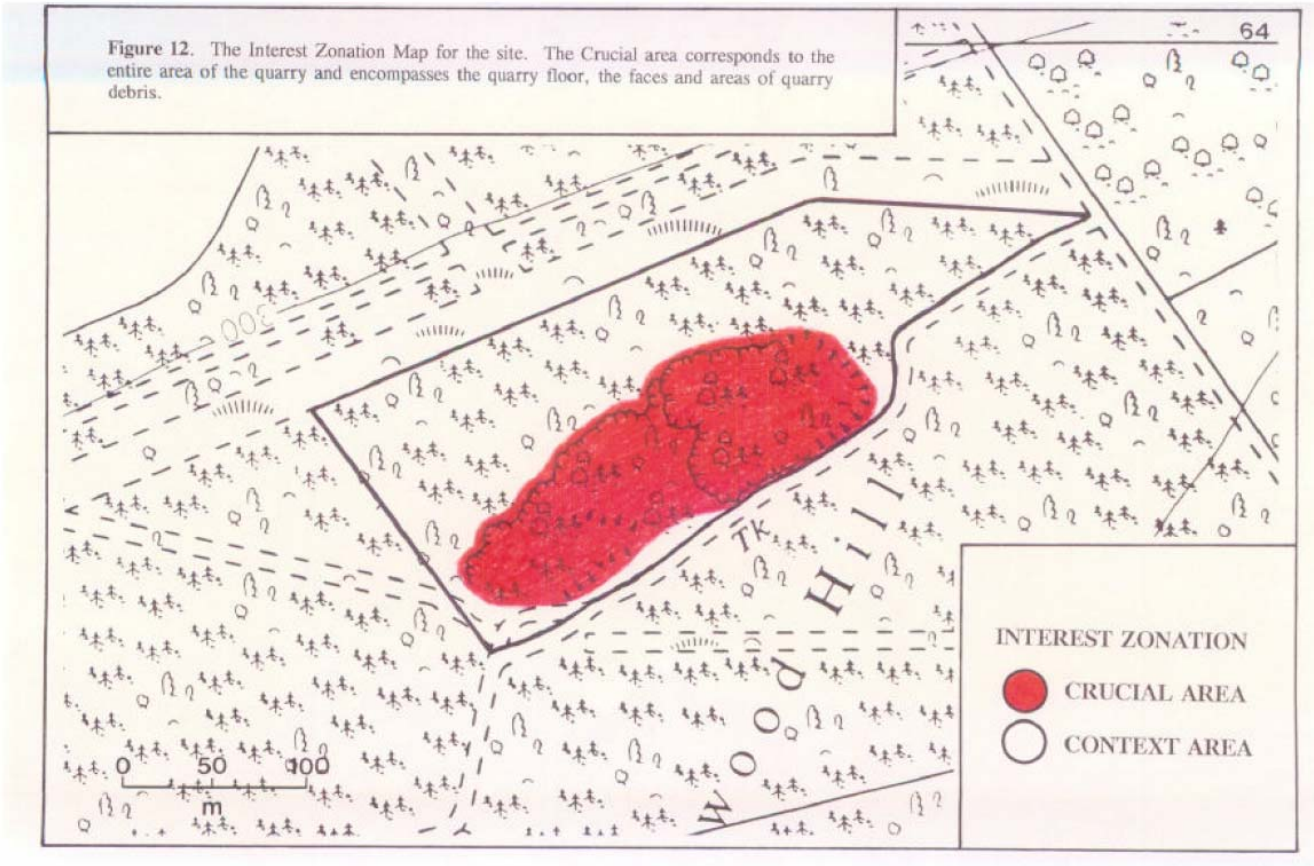

Figure 12. The Interest Zonation Map for the site. The Crucial area corresponds to the entire area of the quarry and encompasses the quarry floor, the faces and areas of quarry debris.

List of operations requiring consent

Date Notified:
23 JUN 1987

CUTTIES HILLOCK
SSSI

Operations Likely to Damage the Features of Special Interest

Standard Ref. No.	Type of Operation
7.	Dumping, spreading or discharge of any materials.
12.	Tree and/or woodland management (including afforestation, planting).
20.	Extraction of minerals.
21.	Construction, removal or destruction of roads, tracks, walls, fences, hardstands, banks, ditches or earthworks or the laying, maintenance or removal of pipelines and cables, above or below ground.
22.	Storage of materials on or against rock outcrops.
23.	Erection of permanent or temporary structures or the undertaking of engineering works including drilling.
24.	Modification of natural or man-made features, clearance of boulders, large stones, loose rock, scree or spoil and battering, buttressing, grading or seeding rock faces, outcrops or cuttings, infilling of pits and quarries.