Dumfries and Borders Forest District

Upper Nithsdale Composite

Land Management Plan

V2

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

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

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FOREST ENTERPRISE - Application for Forest Design Plan Approvals in Scotland

Forest Enterprise - Property

Forest District:	Dumfries & Borders Forest District
Woodland or property name:	Upper Nithsdale Composite (Cairnhead, Shinnelhead, Polskeoch, Euchanhead, Corserig)
Nearest town, village or locality:	Kelloholm, Moniaive
OS Grid reference:	NS 679 030 (centre)
Local Authority district/unitary	Dumfries & Galloway

Areas for approval

	Conifer	Broadleaf
Clear felling	956.9ha	
Selective felling	1.5ha	
Restocking	723.6ha	184.4ha
New planting (complete appendix 4)		

1. I apply for Forest Design Plan approval for the property described above and in the enclosed Forest Design Plan.
2. I confirm that the initial scoping of the plan was carried out with FC staff in May 2017.
3. I confirm that the proposals contained in this plan comply with the UK Forestry Standard.
4. I confirm that the scoping, carried out and documented in the Consultation Record attached, incorporated those stakeholders which the FC agreed must be included.
5. I confirm that agreement has been reached with all of the stakeholders over the content of the design plan and that there are no outstanding issues to be addressed. Copies of consultee endorsements of the plan are attached.
6. I undertake to obtain any permissions necessary for the implementation of the approved Plan.

Signed ……
Forest District Manager

District Dumfries & Borders

Date ……

Signed……
Conservator

Conservancy South Scotland

Date of Approval ……

Date approval ends: ……

Description	% of forest block	Location of data
Restock main conifer species	50	Restock layer
Restock other conifer species	10	Restock layer
Open space	30	Restock layer
Native broadleaves	10	Restock layer
Managed for conservation/biodiversity	>15	Restock/Coupes layers
Long Term Retention	2	Coupes layer
Natural reserve	<1	Coupes layer

UKFS / UKWAS Summary Sheet

These proportions meet the UKFS recommendation of <75% main species, 10% other species, 10% open, 5% native broadleaves, 15% managed for biodiversity.

The proportions exceed the UKWAS recommendations of <65% primary species, >10% open space and >5% native broadleaves. The proportion of secondary conifer species is lower than the ideal 20% but this is justified by the extra open space to protect priority open habitats and the restrictions on species suited to the site and matched to the objectives of the plan.

Once approved, a summary of this Land Management Plan will be made available on the Forestry Commission website.

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II Consultation Record
III Tolerance Tables
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- Future Habitats and Species map

Maps available on request:

- Geology
- Soils
- Topography
- Climate
- Wind
- Water
- Ancient woodland
- Current Age Structure
- Current Species
- Vehicle Access
- Landscape Character Assessment
- Recreation and Communities
- Heritage

Summary of Proposals

Plan Objectives

Primary Objectives

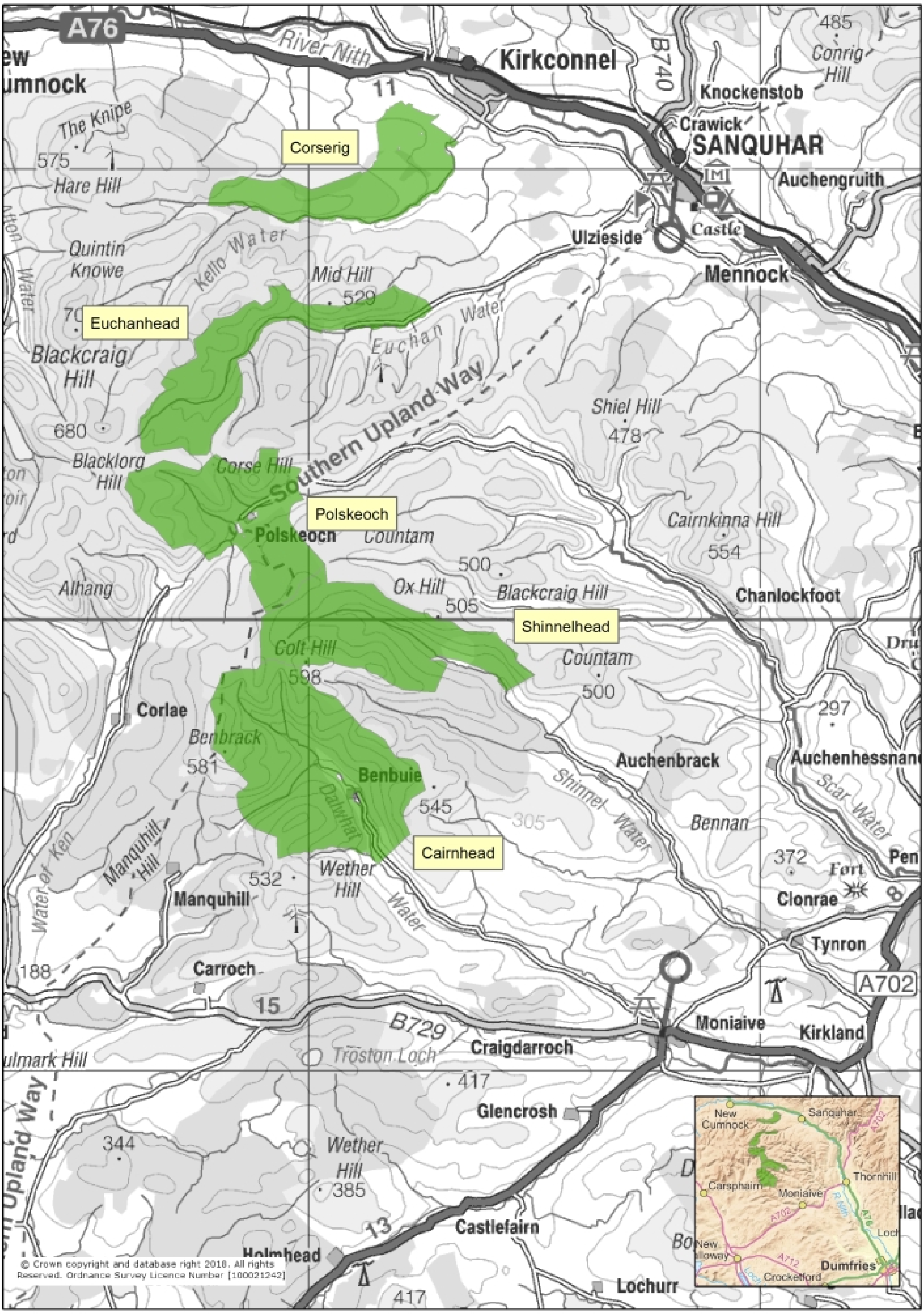
1. To maintain productivity of timber at predictable and stable levels.
2. To plan and design resilient and healthy forests.
3. To consider the impacts of our land management activities on peak water flows.

Secondary Objectives

1. To care for priority open habitats and species.
2. To facilitate opportunities for renewable energy generation.
3. To explore opportunities for woodland creation.
4. To enhance landscaping in visitor zones.

Summary of Proposals

A range of land management systems have been chosen to help deliver the plan's objectives. Clearfelling/restocking will generate an average annual timber volume of just under 40,000 m3, and over the next twenty years production levels have been 'smoothed' for a more predictable supply. Resilience measures designed into the plan include a doubling of alternative conifers; early clearance of windblow and vulnerable coupes; and clearance of all larch within the first five years. The extent and species composition of the second rotation responds pragmatically to limiting factors such as altitude, exposure and deep peats. The timber line has been lowered in some places for a better volume return on investment, but the impacts of this have been mitigated by new wet and mountain woodland elsewhere. These areas will interlock with priority open habitats including blanket bog; will support important species; and also enhance the landscape. Visitors on the Southern Upland Way and accessing the Striding Arches will benefit from more visual diversity and unobstructed access. In Cairnhead, the catchment woodland will be managed to minimise downstream flood risks, and water management across all the forests will be of the highest standard to maintain water quality. Overall, the plan for the forests of Upper Nithsdale will supply quality timber products; provide stock grazing and farming opportunities; accommodate existing renewable energy infrastructure and provide opportunities for future developments; protect and expand priority habitats for a range of important species; regulate water flow and quality; respect their cultural heritage; provide a welcoming environment for visitors; and offer engagement opportunities for local communities. This is a plan that shapes the forests into an exemplar of integrated land management.


Corserig
Euchanhead
Polskeoch
Shinnelhead
Cairnhead
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1.0 Introduction

1.1 Setting and context

This is a revision of the long term land management plan (LMP) for the forests of Upper Nithsdale, which are part of the National Forest Estate (NFE) and managed by Forest Enterprise Scotland (FES). It covers five forest blocks situated on the Southern Uplands of Dumfries and Galloway. The blocks are largely contiguous, positioned between Kirkconnel to the north and Moniaive to the south. They include Corserig (630 ha), Euchanhead (711 ha), Polskeoch (818 ha), Shinnelhead (843 ha) and Cairnhead (1351 ha) - a total of 4353 ha, and spanning a distance of over 10 miles.

1.2 History of plan

Corserig was approved for woodland creation in 2012 soon after its acquisition and currently has a plan that expires in 2022. The other four blocks were originally planted in the 1970s and 1980s and currently have an approved ten-year plan which expires in 2018. Due to their common themes and close proximity this new land management plan brings all five blocks together, to improve strategic planning and simplify future reviews and revisions.

Looking towards Martour Hill across the upper Dalwhat Glen

2.0 Analysis of previous plans

Corserig (known as Carserigg in the previous plan)

The aim of the previous plan (2012-2022) was to manage the recently acquired land for forestry purposes, expand the native woodlands, and protect open habitats and priority species. Clearfelling was identified as the favoured silvicultural system, with future opportunities for thinning in some lower areas. Important native woodland along the Kello Water would be protected and enlarged as a Natural Reserve. Priority open habitats including blanket bog, upland heathland and calcareous grassland were to be left unplanted, which would also benefit local populations of black grouse. Sitka spruce was chosen as the optimal high yielding species, with Larch added for diversity, landscaping and black grouse food. Areas of 50% native broadleaves / 50% open space were designed along riparian corridors, and near to the blanket bog - again for black grouse habitat. Two small areas of productive ash were identified on the better soils. The critical success factors for the previous plan all highlighted the need to carefully manage the impact of farm animals and deer on the establishment of woodland, and the conservation of the open habitats. Another key objective of the plan was the successful establishment of a starter farm.

Was the plan implemented in accordance with the original proposal?
The new planting was delivered through a Framework Contract in accordance with the previous plan. There are some areas of broadleaves that need beating-up, and this will be assessed prior to the end of the contract. All the proposed stock and deer fencing has been constructed, with black grouse markers installed as per the previous plan. The area of productive broadleaves was moved closer to Kelloholm, with better access and opportunities for community use being the rationale for the change.

Has implementation of the plan to date met the stated objectives?
Yes. The future forest has been planted and is becoming established (although deer damage is currently higher than desired). A tenant farmer has taken on the starter farm and is working alongside FES to manage grazing to help meet the previous plan's objectives.

Are the aims and objectives of the plan still appropriate?
Yes. There will be no significant changes in this new plan, as the previous objectives and management approach are still appropriate.

Cairnhead, Shinnelhead, Polskeoch, Euchanhead

The previous Upper Nithsdale Composite plan (2008-2018) aimed to significantly improve the economic value of the forests, whilst continuing the restructuring process by spreading the impact of felling and restocking with the advance or delay of operations. It highlighted that the initial restructuring had made the existing crop more exposed, thus more susceptible to windblow, and that any significant future windblow events would require a review of the plan. Sitka spruce was chosen as the primary species as it would produce the highest return for capital investment, but other commercial species were identified where they would produce a higher return, enhance the landscape or improve the conservation value of the plan. Biodiversity objectives focussed on improving the suitability of the woodland for black grouse, protecting and restoring areas of ancient woodland, and increasing the area of native broadleaves. The plan sought to increase recreation opportunities for a wider range of people, for a wider range of uses, and to develop the 'sense of place'.

Was the plan implemented in accordance with the original proposal?
There have been some significant changes to the previous plan, notably in Shinnelhead where catastrophic windblow required a formal amendment for large scale clearance, and associated re-phasing of the remaining coupes. There has also been a formal revision of Euchanhead with the on-going installation of an overhead interconnector powerline by Scottish Power. In Cairnhead, coupes have mostly been felled as planned, apart from an approved swap to tie in with the road building programme. Road construction has progressed in all blocks as planned, with some approved modifications.

Has implementation of the plan to date met the stated objectives?
Mostly. Restructuring continues, despite the challenges of windblow. Improvements have been made to black grouse habitat. However, new recreational developments have been limited other than the expansion of the forest road network, and previous local interest in Cairnhead as a community forest has waned.

Are the aims and objectives of the plan still appropriate?
Timber production, landscape and biodiversity are still some of the main objectives for these forest blocks and the new plan will continue to develop them.

3.0 Background Information

3.1. Physical site factors:

3.1.1. Geology, soils and topography

Geology

The bedrock underlying the forests is dominated by sedimentary wacke (sandstones and mudstones) belonging to several formations of the Southern Uplands accretionary complex. The north end of Corserig is underlain by the Scottish Coal Measures Group. Superficial deposits include till (e.g. Cairnhead valley) and peat (e.g. Euchanhead, Polskeoch).

Soils

Soils are typical for this upland location, being predominantly nutrient-poor deep peats and ironpans, mixed with richer surface water gleys. Small areas of nutrient-rich brown earths are mostly restricted to the valleys. The soil moisture regime ranges from 5 (fresh) to 2 (wet), and the soil nutrient regime ranges from 4 (rich) to 0.5 (very poor).

Topography

The area is dominated by a folded landform of large concave hills, incised by deep valleys and steep sided gullies. Towards the north at Corserig the landform becomes gentler as it merges with the upper reaches of the Nith Valley. Hill sides are very steep in places with exposed crags present on some of the highest gradients. More level ground is found in the valley bottoms, especially in the upper reaches of the Dalwhat Glen in Cairnhead, as well as over some higher ground such as the watershed at Allan's Cairn in Polskeoch. Altitude ranges from ~200m at the north end of Corserig and the south end of Cairnhead, to 630m at Meikledodd Hill on the west edge of Polskeoch.

3.1.2. Climate

Current climate

The climate of the forests ranges from warm, sheltered and moist in the Dalwhat valley in Cairnhead, to cool, extremely exposed and wet at some of the higher altitudes. The moisture deficit ranges from 0 (wet) to 83 (moist). Annual average rainfall recorded for the nearest climate station at Eskdalemuir is 1742mm. Accumulated temperature (day degrees above 5 degrees C) ranges from 600 (cool) at higher altitudes to 1250 (warm) in

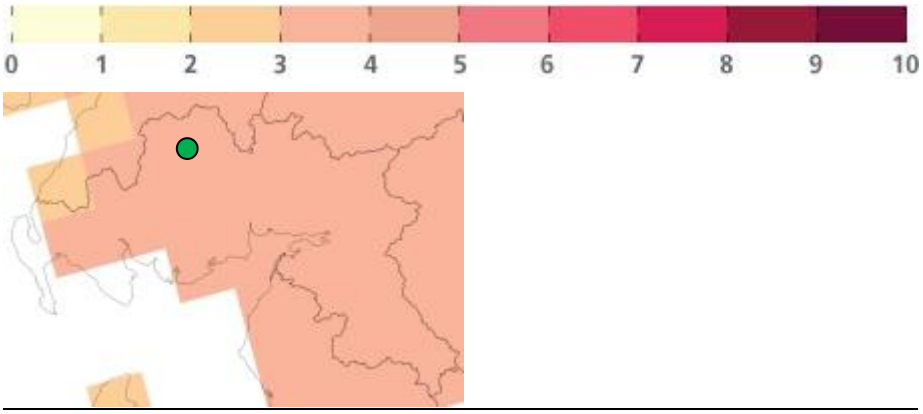
the sheltered upper reaches of the Dalwhat valley. Windiness (measured using the DAMS scale ranges from 11 (sheltered) to 24 (extremely exposed).

Climate change projections

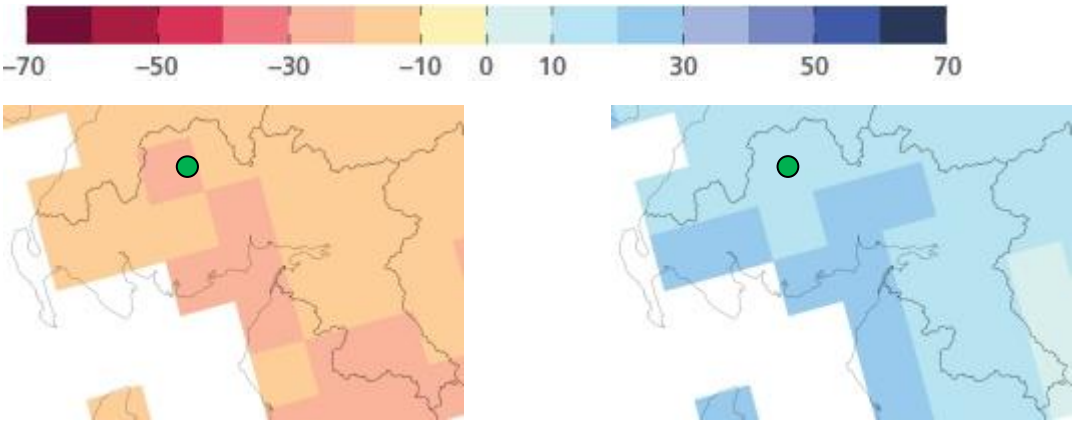
The maps below show the projected changes in climate for the 2080s around the Solway (50% probability level: central estimate. Based on 'Medium' emissions. © UK Climate Projections 2009).

The green dot is the approximate location of the forests of Upper Nithsdale.

Change in annual mean temperature (ºC)



Change in summer / winter precipitation (%)



Summer Winter

It shows that by the 2080s the forests may be 3 to 4 °C warmer, experience 20 to 30% less summer rainfall, and 10 to 20% more winter rainfall.

3.1.3. Water

Rainfall entering the plan area is collected by six rivers - the Dalwhat Water, Shinnel Water, Scar Water, Euchan Water, Kello Water (all part of the River Nith catchment) and the Water of Ken (part of the River Dee catchment). Most of the rivers are classified by SEPA as Good Quality, apart from the Water of Ken which is Poor Quality. There are several private water supplies located within the forests.

The forests are within the strategic areas of two important plans – the Flood Risk Management Strategy for the Solway Local Plan District, and the River Basin Management Plan for the Solway Tweed River Basin District. Together they describe the measures required to manage flooding and protect and improve Scotland's water environment for the benefit of people, wildlife and the economy.

3.2. Biodiversity and environmental designations

Designations and Protected Species

The forests sit within the Galloway and Southern Ayrshire Biosphere Reserve. Its function is to promote conservation, support learning and foster sustainable development. Associated environmental objectives relevant to this plan include improved connectivity between habitats, protection of priority species including Black grouse, and improved water quality.

There are no other environmental designations in the plan area.

The following significant protected species have been recorded in the plan area:

Protected species	Legal protection
Natterer's bat	European protected species. All bat species receive full protection under the Conservation (Natural Habitats, &c.) Regulations 1994
Otter	European protected species. Full protection under the Conservation (Natural Habitats, &c.) Regulations 1994
Barn owl	Wildlife and Countryside Act 1981 - Schedules 1 and 3
Goshawk	Wildlife and Countryside Act 1981 - Schedules 1 and 4
Red squirrel	Wildlife and Countryside Act 1981 - Schedules 5 and 6
Hen harrier	Wildlife and Countryside Act 1981 – Schedules 1 and 1A
Badger	Protection of Badgers Act 1992 as amended by the Wildlife and Natural Environment (Scotland) Act 2011
Atlantic salmon	Conservation (Natural Habitats, &c.) Regulations 1994 - Schedule 3

Habitats

Woodland and Scrub
The primary habitat of the plan area is mature coniferous woodland, dominated by unthinned Sitka spruce with a poor understorey and ground layer. Other conifer species offer a limited amount of diversity with larch, Norway spruce and pine occurring in small patches.

Areas of native scrub and woodland have been diminished in the past due to the pressures of grazing stock and forestry expansion, but recent planting of native broadleaved species is starting to address this. Where it remains it is restricted along the valley bottoms and up the cleuchs. Two small patches of ancient semi-natural woodland occur in the deep gullies in Corserig with a rich assemblage of species including aspen, hawthorn, ash and an array of bryophytes. Several 'Plantation on Ancient Woodland Sites' (PAWS) have been recorded, such as along the Glenjaan Burn in Cairnhead.

Grassland
Acid grassland is the dominant habitat on the open hilltops, exhibiting a low floristic diversity due to a long history of stock grazing. There is a small area of calcareous grassland in Corserig which is relatively rare for this area.

Heathland
Upland wet heath occurs in some of the higher parts of the area, including at Corserig and around Allan's Cairn in Polskeoch. It is often found in a mosaic with acid grassland.

Mire
A large area of ombrotrophic blanket bog covers the gently sloping ground around Allan's Cairn and along the northern edge of Shinnelhead. Herb-rich minerotrophic mires can be found along some of the lower valley sides, such as in Cairnhead.

Open water
There are no large water bodies, but a number of ponds can be found in the valley bottoms. Numerous streams and associated riparian habitats are found throughout the forests.

Rock exposure
Several natural crags are present on the steepest slopes such as in Euchanhead and Cairnhead. Several quarries have been excavated over the years to supply road stone and where these are no longer worked they offer a niche for wildlife to exploit.

Man-made
This includes the forest roads and various derelict buildings and drystane dykes.

Species

Birds

Black grouse have been present in and around the forests for many years. Recent surveys of the current active lek sites have recorded low numbers of males which is typical for this location (average of 1.8 for East Galloway), but a jointly commissioned report in 2016 stresses the need to secure remnant populations and improve connectivity with neighbouring groups.

Raptors known to breed in the forests include buzzard, sparrowhawk, goshawk and tawny owl. Barn owls have been recorded roosting in the Cairnhead cottage and byre, and in the barn at Corserig Farm. Golden eagles have been sighted flying overhead. Red kites, although not recorded in the plan area are present in the upper reaches of the Shinnel valley.

Waders such as lapwing, curlew and snipe utilise the mires and grassland, whilst passerines such as Meadow pipits are common breeders on the upland acid grassland.

The following Birds of Conservation Concern are known to breed or overwinter in the plan area:

Red list species	Amber list species
Lapwing	Mallard
Curlew	Red grouse
Grey wagtail	Oystercatcher
Starling	Snipe
Fieldfare	Tawny owl
Redwing	Dipper
Song thrush	Meadow pipit
Mistle thrush	
Hen harrier	

Mammals

Red squirrels are present in the plan area. The forests are not part of the national series of stronghold forests identified by Forest Enterprise Scotland, but they do overlap with a Priority Area for Red Squirrel Conservation (PARC) identified by Saving Scotland's Red Squirrels as "being suitable to protect significant red squirrel populations through the development of greater 'community' responsibility for grey squirrel control / red squirrel protection".

A Natterer's bat maternity roost is located in the Cairnhead cottage, with a satellite roost in the byre. A single Brown long-eared bat has also been recorded in the cottage. It is highly

likely that bats are present elsewhere in the forest environment, and utilising other buildings.

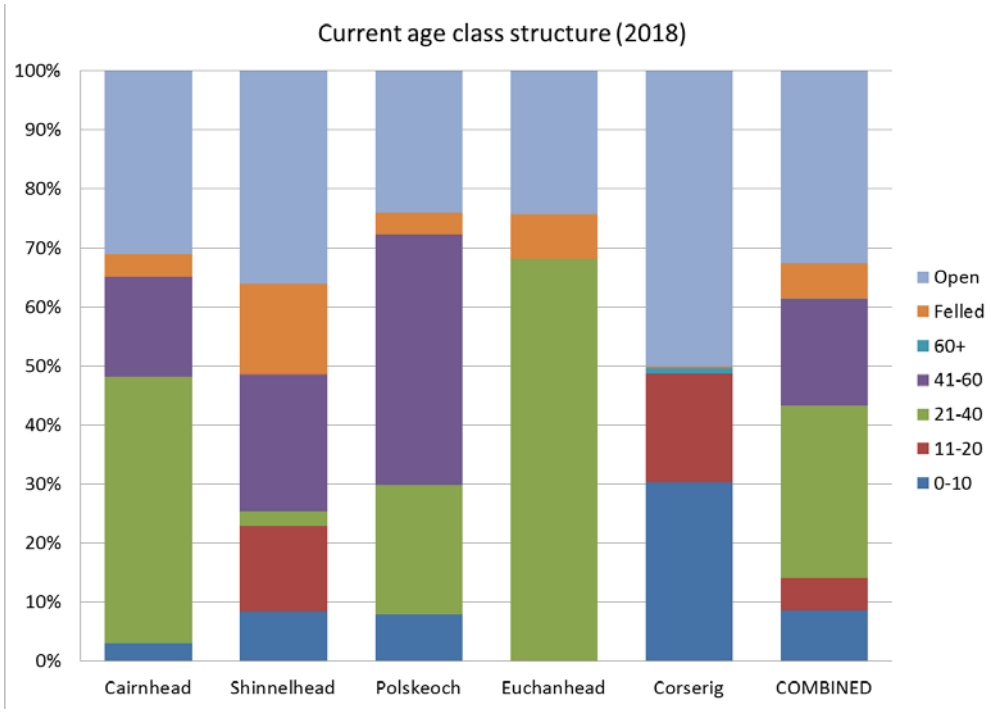
Plants
Nationally scarce species include hairy stonecrop, juniper, field gentian, filmy fern, northern bedstraw and mountain everlasting – all of which have been recorded in Corserig. Also at this location is a unique inland population of carline thistle.

3.3. The existing forest:

3.3.1. Age structure and species composition

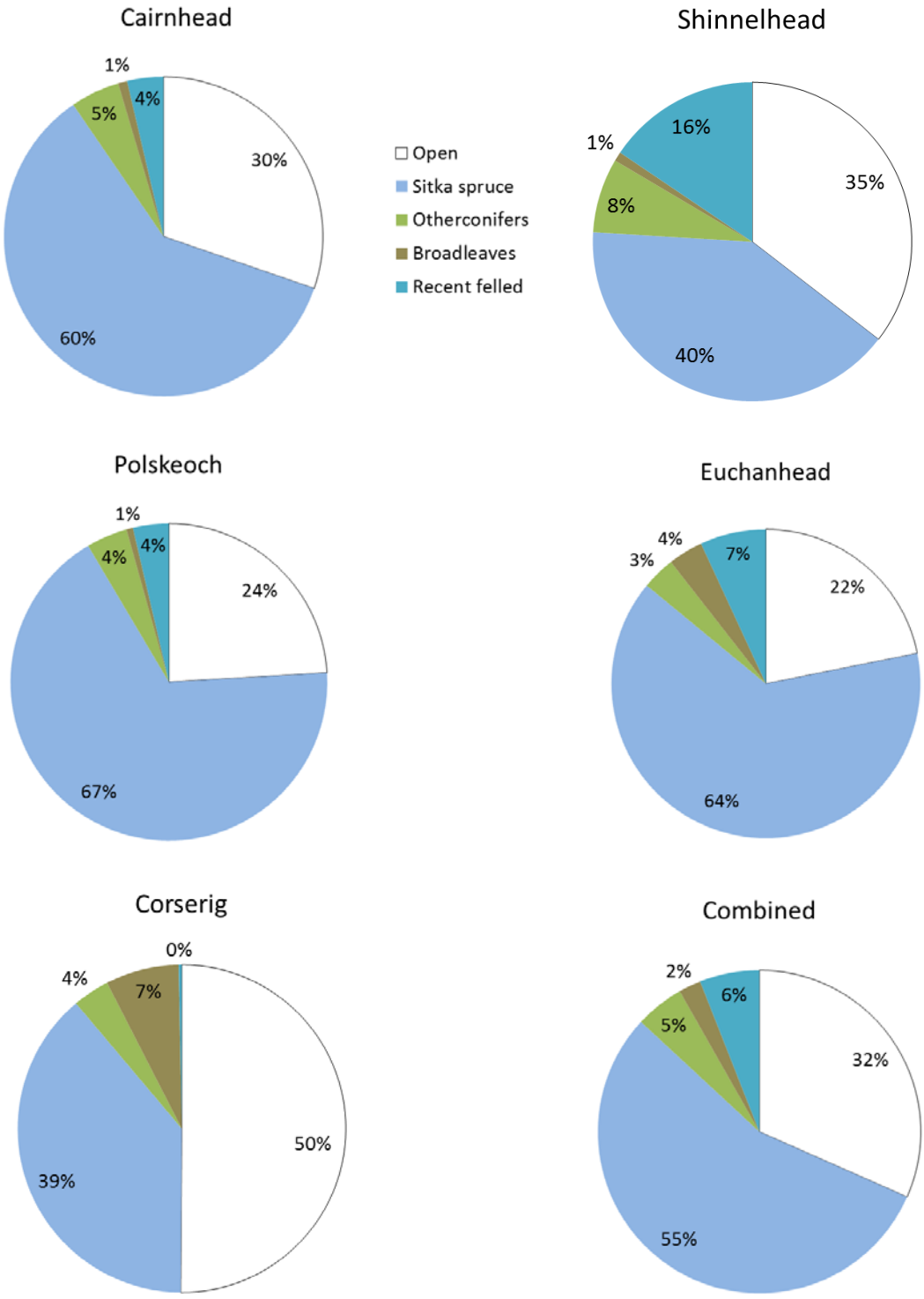
Age structure

The graph below shows the current age structure for each forest block as well as combined.



Corserig is dominated by open space and young crops, which reflects the recent woodland creation in 2013 and integration with the starter farm. Euchanhead was planted up in the late 1970s and through the 1980s, and a lack of felling has delayed the establishment of a second rotation. Polskeoch's second rotation started with some restocking in 2008, but the main area is still crops planted in the mid to late 1970s and a separate phase in the 1980s. There has been significantly more restructuring in Shinnelhead from 2000 onwards and only about a quarter of the original planting from the early 1970s remains. Cairnhead has very little second rotation and is still dominated by the plantings of the late 1970s and early 1980s. The combined age structure of the composite area indicates that the forest is significantly skewed towards the pole and mature stages (~47%) with low amounts of establishment and thicket stages (~14%). Open space makes up around a third of the composite area.

Species composition



The pie charts above show that Sitka spruce is the dominant species across all the forest blocks, and makes up just over half of the composite plan area. The relative proportion of other conifers and broadleaves is low. This is reinforced in the table below, which breaks down all tree species in the forest and shows their associated area.

Species	Area (ha)	Species	Area (ha)
Larch	76.7	Grand fir	7.3
Sycamore	2.2	Douglas fir	1.1
Oak	0.2	Norway spruce	81.8
Mixed conifers	1	Lodgepole pine	6.1
Beech	1.7	Aspen	4.5
Mixed broadleaves	50	Alder	3.4
Sitka spruce	2406.3	Birch	22.7
Ash	1.5	Wild cherry	4.2
Scots pine	31.8	Rowan	3.4
Noble Fir	7	Hawthorn	3.4

3.3.2. Vehicle access

There are five vehicle access points into the forest leading off public roads – Dalwhat Glen, Shinnel Glen, Scar Glen, Euchan Glen and Kelloholm. These link in to a network of forest roads that provides good access to most areas of the forest. However, all of the glen roads are classed as Consultation routes and have usage restrictions set by D&G council to minimise road damage and disturbance to local communities. Currently, FES choose not to use these roads for any timber haulage, with all heavy traffic accessing the forests from Kelloholm along what is known as the 'Heads of the Valley' road. This arterial route crosses multiple ownerships including FES and several private landowners, who work in partnership to maintain its condition. FES relies on servitude rights to access this route. Not all parts of the forest are well roaded, but this is improving with new constructed sections in Shinnelhead and Euchanhead.

3.3.3. LISS potential

Low impact Silvicultural systems (LISS) are not currently utilised within the forest blocks. Exposure is the limiting factor, and even opportunities for thinning are very limited. The upper reaches of the Dalwhat Glen in Cairnhead could possibly support LISS, but its remoteness inhibits the cost-effectiveness of any interventions.

3.3.4. Plant health

One of the most significant issues in the forest blocks is Phytophthora ramorum - a fungal infection which affects larch trees and ultimately leads to their death. P. ramorum was first detected in Galloway in 2012 and has since spread east at an extremely fast pace decimating larch in its path. In an effort to deal with the situation, a management zone has been identified within which all larch is classed as infected, giving managers more time to fell infected trees, whilst allowing efforts to slow the spread to be focussed on the periphery. Out with the management zone, land owners with infected trees are issued Statutory Plant Health Notices (SPHNs) and are expected to remove the trees before either the end of February or August (whichever is the earliest date). The forests of Upper Nithsdale straddle the Management Zone boundary, with Cairnhead, Shinnelhead and Polskeoch sitting within the zone, but Euchanhead and Corserig located just outside. The table below summarises the SPHNs for P. ramorum that have been issued (and complied with) to date for this area. Most of the larch in Cairnhead has been infected and is dead or dying, and consideration will be needed to address its removal and identify alternative restock species.

Site	SPHN ref	Date issued	Area net larch (ha)
Graystone Hill	STH17_0708	15/06/17	0.60
Well Hill	STH17_0899	15/06/17	0.10
Euchanhead	STH16_0217	30/08/16	1.35

3.4. Landscape and land use:

3.4.1. Landscape character and value

Using Scottish Natural Heritage's *Dumfries and Galloway Landscape Assessment* (1998), the forests of Upper Nithsdale are mostly located in an area described as 'Southern Uplands with Forest' or 'Southern Uplands'. The eastern part of Corserig is characterised as 'Upper Dale (Valley)'.

The table below summarises the main features of these landscape types.

Landscape Type	Characteristics	Guidance
Southern Uplands with Forest	Large, smooth dome-shaped hills with large scale dark green plantations on slopes and over lower summits; changing landscapes with felling and replanting.	Overall – enhance the character of this area. Forestry – further forestry planting could be detrimental to this landscape other than where this will improve their shape; large and

		medium scale plantations and felling coupes are suitable; recognition within forest design of the subtleties of this smooth landscape will improve visual diversity and a sense of place; mixed woodland and broadleaves would enliven the lower slopes and provide integration where extended up gullies or minor valleys.
Southern Uplands	Large, smooth dome shaped hills; open and exposed character; pockets of woodland in incised valleys.	Overall – conserve the 'wildland' character. Forestry – forest planting scale should be in keeping with the topography and avoid scattered isolated blocks; any large scale plantings should avoid obscuring exemplary geomorphologic features; 60% open ground would be an appropriate maximum limit for forestry.
Upper Dale	Wide 'V' shaped valley enclosed by high peaks and moorland; medium to large scale forestry plantations on the valley sides and extending over horizons from higher ground; mining settlements and remnants of industrial activity	Overall – enhance the character of this area. Forestry – prevent severance from higher land by forests; integrate valley woodlands and forests; in more open parts medium scale woodlands that leave main pastures, wall patterns and mining relics exposed is most suitable; dominance of agricultural landscape should be maintained.

The forests have limited landscape value due to their remoteness. Anecdotal feedback from users of the Southern Upland Way suggests that their experience would be enhanced with more species diversity and open space. Cairnhead has a special place in the hearts of many local residents, and of all the blocks this is the one where landscape value is highest.

3.4.2. Visibility

The forests contribute to the large-scale landscape of the Southern Uplands but do not form a dominant part of any long distance views. The visual impact of the forests increases when seen from more elevated viewpoints, especially from some of the surrounding hill summits and along the Southern Upland Way. Apart from at Kelloholm and Kirkconnel, the forests do not contribute to the visual backdrop of local villages. There

are a number of scattered residences within and close to the forests, such as in Cairnhead, and for these neighbours the forest is an integral part of their surroundings.

3.4.3. Neighbouring land use

Most of the neighbouring land is either open stock-grazed uplands or private forestry.

3.5. Social factors:

3.5.1. Recreation

Recreation activity in the blocks is generally low, with the exception of the Southern Upland Way (SUW) which passes through Cairnhead, Shinnelhead and Polskeoch and attracts around 60,000 walkers every year. Informal access is highest at Corserig and Cairnhead. The residents of Kelloholm and Kirkconnel have historically explored along the Kello Water and walked the open land across Corserig, whilst in Cairnhead the draw of the Striding Arches attracts many visitors. There are no formal FES recreation facilities in the blocks, and maintenance of the SUW is the responsibility of D&G council. A number of Core Paths pass through the area.

3.5.2. Community

Cairnhead has been the focus of community engagement for a number of years. In 1999 the Cairnhead Community Forest Trust (CCFT) was formed to “conserve, develop and manage the Cairnhead Forest for the greater benefit of the community”. The highlight of the group’s work was the installation of four ‘Striding Arches’ by internationally renowned artist Andy Goldsworthy – one as part of a restoration of Cairnhead byre, and the others on the surrounding hill tops of Colt Hill, Bail Hill and Benbrack. Other activity included a programme of education visits from Moniaive primary school, the provision of on-site interpretation, and the creation of a picnic area. Unfortunately, the group’s interest has waned in recent years, but it is hoped that there may be a renewed interest in the future.

At Corserig, there has been some engagement with the residents of Kelloholm and Kirkconnel especially during the consultation following the acquisition of the land in 2012, but this has never developed further. Several incidents of anti-social behaviour have been recorded here including vandalism and unauthorised use of vehicles and we are working closely with the community council and Police Scotland to monitor the situation and take action when necessary.

3.5.3. Heritage features and designations

There are no designated heritage features in the plan area. However, there is a rich legacy of the historic farming communities that lived here and worked the land. Features such as drystane dykes and sheep stells can be found throughout the area. Numerous points of interest were recorded in Cairnhead during an archaeological survey commissioned by the local community.

3.5.4. Renewables

All of the forest blocks are 'option' areas identified by the Scottish Government for potential renewable energy projects. Currently there is interest for an extension of a neighbouring windfarm on to land in Cairnhead, and scoping is underway for a possible new windfarm in Euchanhead. Also in Euchanhead there is a recently constructed sub-station at Glenglass which will connect to a new overhead interconnector powerline that is currently being constructed through the valley, and which will feed energy from renewables into the National Grid. There are several windfarms on neighbouring land at various stages of construction, waiting to feed in to the sub-station once the interconnector is complete.

3.6. Statutory requirements and key external policies

Through the delivery of this plan, the forests of Upper Nithsdale will contribute to the goals of both the Scottish Forestry Strategy, and at a local level to the Dumfries & Galloway Forestry and Woodland Strategy.

Forest Enterprise Scotland is committed to sustainable forest management. Scotland's National Forest Estate is managed to the UK Woodland Assurance Standard (UKWAS) – the standard endorsed in the UK by the International Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC). We are independently audited against this standard to ensure compliance.

Additionally, as part of the approval process, this plan will be checked by the regulator (Forestry Commission Scotland) against the UK Forestry Standard (UKFS) to ensure we have considered all of its requirements. The UKFS guidelines for Biodiversity, Climate Change, Historic Environment, Landscape, People, Soil, and Water underpin our decision making.

4.0 Analysis and Concept

The opportunities and constraints identified in the plan brief (Appendix I) have been revisited following stakeholder consultation, and analysed further against the plan's objectives. This is an important stage in the development of the plan, allowing the design concepts to be developed further. The following table is a summary of this analysis.

Factor	Opportunity	Constraint	Concept Development
Regular output of quality timber to supply the markets	Restock felled areas with productive species. Sitka spruce can tolerate the wet, poor soils and would meet this requirement by achieving a good yield class (YC) in most places. Smooth the annual production forecast over the next 30 years to avoid peaks and troughs in supply (by adjusting the felling dates of coupes). This will produce a reliable, steady output of timber. Identify the potential range of timber products that the forests are likely to supply, to support marketing decisions.	Some of the existing trees are in check – e.g. along some upper edges due to exposure, and on some deep peats due to nutrient deficiency and waterlogging. FES's policy on reducing the use of chemicals limits the opportunities to use fertiliser and so future YC may be lower than the current crop. Steep ground makes harvesting awkward and expensive. Sky lines are often necessary. Other objectives may reduce available ground for planting – e.g. priority open habitats. Poor growing conditions and restricted vehicle access make productive broadleaves an unrealistic proposition.	Timber production is a primary objective of the plan and so the maximum amount of land should be utilised to grow productive conifers. This must be compatible with other objectives of the plan. Consideration should be given as to whether areas with poor quality crops or on very steep ground should be restocked, or taken out of productivity for alternative uses. The size of an area taken out of production does not necessarily correlate with the loss in productivity. The resources required to extract poor crops from awkward locations could be better used to boost productivity elsewhere.

Factor	Opportunity	Constraint	Concept Development
Vehicle access for managing the forest and harvesting timber	The forest is fairly well serviced with existing forest roads, but there are some sections of the forest that require better access. New roads could help with this. Are there any other options for timber haulage vehicles to access the forest from the public roads?	New roads are expensive to build, especially in these forest blocks due to the steep ground. They should be seen as an investment, but must be justified against the benefits they will deliver. Reliance on one public road access point (and servitude rights) for timber lorries and HGV's is a business risk.	Any new planned roads should have a financial appraisal against their current and future value. For example, it is perhaps not worth building a new road just to harvest a coupe if the preferred future land use is native woodland. Consider the use of forwarder tracks as an alternative. Explore alternative options for access to the public road network.

Factor	Opportunity	Constraint	Concept Development
Impacts of climate change projections	New tree species, previously unsuitable for growing in the current climate, may become a viable alternative option to either supplement or replace the current species. Increasing the diversity of tree species in the forest will increase resilience to climate change. The forests will help to mitigate against climate change through carbon sequestration, both in the tree biomass as well as in intact deep peats.	Current timber markets and processing plants would need to continue adjusting to alternative conifers, which requires long term planning and investment. Warmer, drier summers will increase the risk of drought and the associated stress on trees. As Sitka spruce has a preference for moist growing conditions this may not bode well for its future suitability.	Climate change projections do not suggest that conditions will adversely affect Sitka spruce in the foreseeable future and so this should still be used as the primary conifer species. Suitable alternative conifers should feature more in the future forest to increase resilience to any unforeseen climate change impacts. Consider the shape and size of coupes to promote wind firmness.

Factor	Opportunity	Constraint	Concept Development
Tree health	The revision of this plan is a timely opportunity to take stock of the situation with P. ramorum. Consideration can be given to felling the larch in the most effective way and identifying alternative species to replace it. Increasing the diversity of productive conifers will make the forests more resilient to potential biological threats, and help to secure timber supply in the future.	There is consideration from FES to undertake sanitation felling of all larch within a 10km buffer inside the management zone. This would apply to Cairnhead, Shinnelhead and Polskeoch. The timeframe for dealing with larch removal would reduce. Some of the larch areas are poorly roaded meaning access for operations will be challenging. Road building may need to be accelerated, or alternative methods used to deal with the situation (e.g. fell to waste). The timber processing industry is beginning to invest in new technologies to process alternative conifers, but there is still a high demand for Sitka spruce as the preferred species.	Where economically feasible clear all larch in the first 5 years. The impacts of climate change (noted above) and the associated increased risk in new pests and diseases forces us to make prudent decisions about species choice and diversity. Over the next rotation Sitka spruce will still be the dominant conifer species but the area of forest planted with alternative conifers should increase to add resilience. At the next revision of this plan (2028), climate change projections and the presence or risk of tree pests and diseases should be re-evaluated to assess whether Sitka spruce is still suitable as the primary conifer species.

Factor	Opportunity	Constraint	Concept Development
Native / ancient woodland	There are good growing conditions for native woodland, especially in the valley bottoms. Existing remnants of native woodland up the gullies could be expanded and linked to new planting in the valley bottoms. Enclosed areas of grazed land could accommodate more broadleaved planting. Some of the open hilltops are no longer leased for grazing and may offer opportunities for the establishment of montane scrub habitat. Connectivity of native woodland from the valley, up the cleuchs and onto the hilltops would provide the best ecological benefits for biodiversity.	Establishing broadleaves will be expensive, especially protecting them from the impacts of deer browsing. Access for stalking would need to be considered. There are virtually no remnants of montane scrub woodland that could be encouraged to expand. Specialist species tolerant of the exposed upland environment would instead need to be planted on the hilltops.	The obvious place to expand native woodland is in the valley bottoms and up the cleuchs and these areas will be prioritised. Careful consideration will be given to the different options available for establishing montane scrub on the hilltops, and this may need to be a long term aspiration. Access for stalking and carcass extraction must be carefully planned to ensure broadleaves can establish.

Factor	Opportunity	Constraint	Concept Development
Open habitats	The existing areas of upland heath, acid and calcareous grassland, mires, open water and rock exposure can be protected to maintain their biodiversity value. Some of these areas will benefit from active management to keep them in a favourable condition. New open habitats could be developed. For example, re-establishing blanket bog on areas of deep peat where current crops show poor form and low productivity.	Active management requires the necessary resources of time, expertise and money. There is a risk that the condition of these habitats may deteriorate to an unfavourable condition if management ceases or is inefficient. Removing areas out of productivity may be unappealing to some stakeholders, and this should be based on solid decision making.	Ensure that the existing priority open habitats are protected. Consider buffer zones to ensure an appropriate ecotone with neighbouring habitats. Very steep and craggy slopes should be left unplanted to allow the development of micro-habitats. Identify the areas that would benefit from active management (for example, conservation grazing or removal of unwanted natural regeneration) and consider the options available.

Factor	Opportunity	Constraint	Concept Development
Protected species	There is a lot of mature forest, and although unthinned it does offer nesting opportunities for goshawks. Identify areas of long term retention to protect resident population. Black grouse habitat enhancements have already been delivered in Polskeoch and Corserig, but there is further opportunity to expand this elsewhere. Natterers and Brown long eared bats both favour open broadleaved woodland for foraging and an increase in this habitat would benefit the populations recorded in Cairnhead.	The exposed nature of the forests limits opportunities for retaining trees. Intensive black grouse habitat works can be expensive to deliver – feature such as scrapes and ponds require numerous resources.	Using DAMS and local knowledge identify stable coupes for long term retention to benefit goshawks and other raptors. Consider less intensive methods to further improve the habitat for black grouse – such as designing low-density woodland edges in targeted areas. Expand broadleaved planting in area close to the Cairnhead cottage.

Factor	Opportunity	Constraint	Concept Development
Heritage features	Although there are no designated historical features in the forests, visitors would be better able to view features such as sheep stells if there was more open space around them. With careful planning, the upper Dalwhat valley in Cairnhead could develop a 'spirit of place' that captures some of its historical legacy.	New open space takes areas of the forest out of productivity. Natural regeneration may encroach into areas of open space around heritage features.	Where practicable, heritage features should be given a minimum buffer of open space to reduce the risk of damage. Those that are identified in more popular areas (e.g. Cairnhead) should be provided with extra open space where this helps to integrate the feature into the landscape.

Factor	Opportunity	Constraint	Concept Development
Water quality	The revision of the plan allows us to review private water supplies located within the forests, and consider options to further protect them in the future. The plan can reinforce how water management best practice, especially on clearfell sites and along forest roads will minimise the risks of diffuse sediment pollution into watercourses. The identification and establishment of riparian buffer zones along all watercourses will help maintain the local water quality. This can be further enhanced where areas of native woodland are established close to watercourses, and by enlarging the buffer zone to include mires and flushes.	Water management efforts are hampered by the steep slopes and high rainfall encountered in the forests. Clearfelling is the most appropriate forest management system for this location due to the climate, but is more intensive than other systems and can lead to more ground disturbance. The limited vehicle access to the forests results in heavy use of the Heads of the Valley route. This creates more wear and tear of the forest road surface and increases the risk of diffuse sediment pollution.	Consideration for water management is one of the plan's primary objectives. Water quality can be protected by designing riparian buffer zones, which in places may be larger than the recommended best practice to increase their contribution to protecting water quality. Hotspots on the main forest roads where there is a higher risk of diffuse sediment pollution will be identified, allowing them to be protected and monitored during civil engineering and forestry operations.

Factor	Opportunity	Constraint	Concept Development
Water flow / flooding	Trees and woodland slow the rate at which rainwater enters watercourses. This is due to interception and evapo-transpiration, as well as by increasing the roughness of the ground, and by increasing the organic content of the soil and its capacity to absorb water. The presence of forests in the plan area helps to regulate the flow of water into the catchment streams and rivers. Conifers are more effective at regulating water flow than broadleaves, and the continued planting of them in the forests will contribute to local water flow regulation. The most important factor influencing the intensity of flood events is the speed at which rainwater enters watercourses, and additional methods to slow this down may be possible.	The forests experience high levels of rainfall, and winter rainfall is projected to increase by 10-20% by 2080. As outlined above, clearfelling is the preferred forest management system, but this temporarily reduces the trees' positive effect on water flow and can lead to localised increases in run off. The regulatory effect of the trees planted to restock the clearfelled site does not take full effect until they are around 10 years old.	Use information and advice gathered by the D&B FD/FES Cairnhead / Dalwhat Glen peak flows pilot project. The phasing of felling coupes should be smoothed over time to avoid years with a disproportionately high amount of felling. Clearfelled sites should be restocked in the next planting season (known as hot planting) to minimise the time the site is left open. Methods to further slow water flow into the watercourses could include offline ponds, with outflows designed to keep them at low capacity - ready to temporarily fill up during heavy rains. The inclusion of riparian buffer zones and permanent native woodland in the forests will also increase water retention.

Factor	Opportunity	Constraint	Concept Development
Recreation / public access	The landscape encountered by walkers on the Southern Upland Way (SUW) and around the Polskeoch bothy could be improved with increased open space and woodland diversity. This would also reduce the problems with windblown trees blocking the route. A corridor of open space connecting to the forest road network would retain access to the Striding Arches. The design of the forest can ensure there are future views from each of the Arches.	The SUW mostly passes along the hilltops of the forests where growing conditions for trees are poor. This limits the opportunities for introducing alternative species.	Design appropriate open space to maintain/improve access and enhance the experience for walkers using the SUW and visiting the Striding Arches. Where the opportunity exists, integrate the above with other concepts, particularly heritage features, open habitats and native woodland.

Factor	Opportunity	Constraint	Concept Development
Renewable energy	Liaison with the energy companies developing wind farms (and associated power transmission networks) in and around the forests will give us an opportunity to make pragmatic design decisions based on both existing constraints, as well as proposals.	Obtaining the necessary permissions to build a wind farm can take a long time, or indeed may not be given. Designing the forest around early proposals can be premature if plans change (e.g. location of turbines and access tracks) or the project does not proceed.	Consider the existing infrastructure and their associated risk/exclusion zones when designing the forest. Consider changes to the forest design to support future proposals only where this does not significantly conflict with the plan's other objectives, and does not incur significant extra costs or loss of revenue.

5.0 Land Management Plan Proposals

This plan proposes a range of land management approaches, a variety of future habitats, and a mixture of tree species which together will help deliver the objectives of the plan. Analysis of the environmental, social, and economic information identified during the scoping and consultation phases supported the decision making process, allowing consideration for the aspirations of all stakeholders. The final plan seeks to integrate those aspirations where this is in keeping with the overall objectives, whilst ensuring that proposed future management activities will be both efficient and effective.

5.1 Approaches to land management

The distribution of the different management types is shown on the 'Management map'.

Clearfell

This is the most appropriate management system here for several reasons. Firstly, the remote location of the forests and the upland setting makes this approach more cost effective due to the economies of scale when felling large coupes. Additionally, alternatives to clearfelling are very limited due to the poor soils, altitude and exposure; even opportunities for thinning are severely restricted.

The size and shape of the clearfell coupes have been carefully chosen to fit with the local landform and with consideration for the landscape value. Wherever possible, straight edges and geometric blocks have been avoided, in favour of more organic shapes and natural edges. However, the mature even-aged structure of the forest, and the high risk of windblow creates a challenge to achieving this. In some places, felling coupe boundaries have had to follow straight wind firm edges (e.g. rides). This problem will be rectified during restocking, with the establishment of more sympathetic and resilient coupe shapes.

Coupe sizes have been kept smaller in the small-scale landscape of the valleys (especially in Cairnhead) and increase in size on the hill tops where this scale is more appropriate. One anomaly is coupe 39085 that is being taken as one large coupe due to the high proportion of infected larch.

Another challenge posed by the uniform age of these forests is in creating structural diversity. The legacy of the large-scale planting of the first rotation in the 1970s and 80s (and a lack of felling interventions) is a forest that has almost uniformly reached its optimal felling age. The consequences of this have become apparent over recent years with

increasing incidents of catastrophic windblow. Wherever possible, coupes have been allocated for felling to achieve the desired restructuring, and also to meet the UKWAS requirement of a 2m height difference between coupes. Where this has not been possible, the adjacency difference will be achieved by adjusting restock years accordingly.

Long term retention

Trees left standing beyond their optimal felling year help to create structural diversity within the forest, and can also deliver environmental benefits. Long term retentions (LTRs) have been identified in the valley bottoms and elsewhere, where analysis of the 'Forest GALES' decision support system suggests a more sheltered micro-climate, and where there will be conservation value. These areas will be of particular importance to red squirrels and goshawks.

Minimum intervention

Areas of land have been classified as minimum intervention where the objective is to develop semi-natural habitats. However, in the future it may be desirable to change the management type – for example to diversify the species composition. The two main areas in the plan are in Euchanhead and Polskeoch, the former on the steep, scree slopes to the east of the block that are to be restocked with Scots pine and broadleaves, and the latter on the eastern edge including black grouse habitat.

Although not shown on the Management map, all riparian zones will be managed with minimum intervention and left to gradually colonise with native trees. Management will be restricted to deer management; removal of natural regeneration of non-native trees; and actions to benefit specific species of conservation priority.

Natural reserve

Biodiversity is the primary objective for these sites and the classification will last in perpetuity. Minimum intervention is the desired system of management to develop woodlands rich in biodiversity through use of natural processes and long periods of ecological continuity. Natural reserves have been designated for the ancient woodland along the Kello Water, and also at Glenjaan Burn.

Low impact silvicultural systems (LISS)

Consideration was given to establishing continuous cover forestry (CCF) along the lower slopes of Martour Hill for landscaping however this was discounted for two main reasons: 1) the large proportion of larch in this areas is infected with P.ramorum and will be felled early to help slow the spread of this disease; 2) Cairnhead is the most remote block for

forestry vehicle access and interventions for thinning would be relatively expensive. However, a small area of LISS has been designated around Cairnhead cottage and the Striding Arch where a lighter touch is appropriate for this interactive visitor zone.

Thinning

Thinning is an important part of the sustainable management of the National Forest Estate and can help to meet various silvicultural, economic, social and environmental objectives. However, there are factors that can constrain this, and for the forests of Upper Nithsdale this is windiness and wet soils. Thinning in most locations would significantly increase the risk of wind damage, particularly where DAMS scores exceed 17. It is therefore deemed inappropriate to thin these blocks.

5.2 Future habitats and species

The desired pattern of habitats and tree species is shown on the 'Future Habitats and Species map'.

The proposal for the future forest composition can be split broadly into three types – open ground (hilltops, agricultural, peatland); productive forest; and mixed broadleaves/conifers for landscape and environmental enhancement.

The physical environmental factors (climate and soils) of the forests determine which tree species will grow here. Use of the Ecological Site Classification (ESC) decision support tool provided suggestions on the suitability of different tree species for various locations, which were then ground truthed where possible. From the list of suitable trees, those that best met the plan's objectives were then chosen.

The table below compares the current proportions of tree species and open space with that forecast after the plan has been implemented (green = increase, red = decrease).

%	Corserig		Euchanhead		Polskeoch	
	current	forecast	current	forecast	current	forecast
Sitka spruce	39	43	64	48	67	55
Other conifers	4	3	3	19	4	7
Broadleaves	7	16	4	3	1	7
Open space	50	39	22	30	24	31
Recently felled	0	-	7	-	4	-

%	Shinnelhead		Cairnhead		**Combined**	
	current	forecast	current	forecast	current	forecast
Sitka spruce	40	55	60	49	55	50
Other conifers	8	9	5	10	5	10
Broadleaves	1	8	1	14	2	10
Open space	35	28	30	26	32	30
Recently felled	16	-	4	-	6	-

There is a reduction in the proportion of Sitka spruce for Euchanhead, Polskeoch and Cairnhead due to the increase in other conifers to introduce greater species diversity and resilience.

Productive conifers

Not surprisingly, the high altitudes and poor soils offer very few suitable tree species, with Sitka spruce being the only viable productive conifer option in most of the plan area. In some locations this will be planted in a mix with Lodgepole pine to overcome the low nutrient status of the soil and potential heather check. Even Sitka begins to struggle at the higher altitudes, which is clearly evident along some of the current upper edges where yields drop significantly. The decision has been made to lower the upper planting limit in some locations, guided by tariff data from recent production surveys and local knowledge. Restocking to the current upper edge offers poor return on investment, with the establishment and extraction costs outweighing the timber value. This situation is often exacerbated by the need for expensive steep ground extraction. It could be argued that new improved varieties of Sitka spruce would increase yields in these sites, but this is countered by the FES chemical reduction policy which now limits the use of herbicides and fertilisers that were liberally applied when the forests were first planted. Where productivity reduces along the upper edges a spruce / open space mix will create a feathered, low-density edge that will help to soften the visual impact, whilst also providing shelter for upland birds such as black grouse. It must be remembered that the higher conifers are planted the more challenging it will be to get them established, with associated drops in productivity.

Where soils are richer, other conifer species will be planted to create diversity. This adds colours and textures to the landscape, but perhaps more importantly builds resilience into the forest. Current climate projections do not suggest a significant change in the growing conditions for most of the current tree species, but it is predicted that the changing climate (combined with human activity) is likely to lead to an increase in tree pests and diseases. Sitka spruce will continue to be the main productive conifer, but a proportion of other productive species (e.g. Noble fir, Norway spruce) will offer some insurance against potential outbreaks.

In line with FES's *Restocking Strategy for the National Forest Estate* (2017) this plan seeks to maintain timber production capacity whilst diversifying the composition of restocking.

Restocking on deep peats

Blanket bog, a UK Biodiversity Action Plan (UKBAP) priority habitat is present over higher altitude areas of the forests. It is most abundant at the watershed over Allan's Cairn in Polskeoch where unflushed blanket bog dominates the southern end of the block. This area is predominantly covered in Sitka spruce planted in the 1970s, but shows widespread signs of check in many places, especially where the ground is waterlogged – indeed sphagnum has started to colonise ditches and hollows, indicating that the site is too wet for restocking.

Sphagnum moss colonising a waterlogged ditch near Allan's Cairn

Undamaged peatlands and fast-growing forests both act as carbon sinks and have an important part to play in tackling climate change. The FCS practice guide *Deciding future management options for afforested deep peatland* explains that "for conventional restocking … Sitka spruce, general yield class 8 is likely to produce enough growth that the second rotation will create a positive greenhouse gas balance, sufficient to offset what would be lost from cultivation". Therefore, an estimated upper limit for establishing YC8 Sitka spruce was determined using the methodology in FC Bulletin 72 *Predicting the Productivity of Sitka Spruce on Upland Sites in Northern Britain* (combined with on-site yield class measurements and local production survey tariff data). There was also a presumption that the most waterlogged areas of bog would not be drained and there would be no fertiliser/herbicide applications – both of which benefitted the first rotation crop when it was planted. Where ESC suggests Sitka spruce will be suitable with a nursing mix (and

would produce >YC8) this species will be planted along with common alder. Much of the remaining land (classed as unsuitable for productive conifers) will however be suitable for low-density peatland edge woodland, which will also enhance the landscape along the Southern Upland Way, and create favourable habitat for black grouse. Species choice will be largely limited to downy birch due to the soil nutrient regime, but there is occasional goat willow and rowan already growing on site which suggests that these could contribute to the mix in suitable locations.

Peatland edge woodland is defined as "low density woodland which avoids the net carbon loss that would result from conventional restocking on unsuitable land, and combines some of the biodiversity and visual benefits of woodland and peatland."

Timing of restocking

Delayed restocking (leaving the ground fallow after felling) can help reduce the impacts of the damaging *Hylobius* weevil, and the Hylobius Management Support System (HMSS) will be used to determine where this is appropriate. However, as highlighted in the FES *Restocking Strategy* a fallow period may not always be appropriate, as is the case for the forests of Cairnhead and Shinnelhead where downstream flood-risks predicate a need for 'hot planting' (restocking in the next planting season).

Ground preparation

As discussed in the plan's section on Water, ground disturbance can make a significant difference to the speed at which rainfall leaves the catchment and enters watercourses. In Cairnhead and Shinnelhead preparation for planting should avoid ground disturbance, with straight planting and minimal drainage as the ideal. This will not always be possible for a number of operational reasons, but the recommendations provided in the UK Forestry Standard's Water guidelines will be applied as an absolute minimum.

Native woodland

The plan seeks to increase the area of native woodland in the forest by expanding existing areas and establishing new planting. The challenge for successfully establishing broadleaved species will be to protect them against the pressures of deer and rodent damage, and this will be helped by clumping larger areas together in easily accessible sites, rather than trying to establish lots of small areas dotted across the forest blocks.

Ancient woodland

The ancient woodland fragments at Glenjaan Burn and along the Kello Water will be protected from future disturbance by pulling back the conifers, and will be bolstered with adjoining new broadleaf planting. Tree species planted in these areas must reflect the local

composition and should be of local provenance. Aspen is present in both of these sites, and new planting of this species does not need to be planted at the standard stocking densities due to the tree's ability to spread through suckering – thus reducing establishment costs.

Enhancing native woodland below the timber line

In the Dalwhat Glen between Benbuie and Cairnhead the proposal is to create new areas of wet woodland (W7 willow/alder carr) on the floodplain north of Benbuie (merging with the herb-rich Molinia mire), and around the watercourses and flushes in the open ground between Blairoch and Cairnhead cottage. The existing precursor vegetation of valerian, meadow sweet and angelica will determine the most suitable locations for this type of woodland. An initial period without grazing to establish a patchwork of woodland and scrub may be the easiest approach followed by extensive light cattle grazing with traditional breeds.

The wet woodland will merge with a proposed strip of broadleaves along the lower eastern slopes of Martour Hill, and together this will improve connectivity with existing broadleaf woodland fragments along the valley and up the cleuchs. This will be of a significant size to enhance the 'spirit of place' in Cairnhead, whilst also increasing the proportion of native woodland in the plan area. It is envisaged that this would ideally be a mix of sessile oak, hazel and silver birch, interspersed with Scots pine, however with the desire to deter grey squirrels from these forests a decision will need to be made as to whether large-seeded species should be planted. Alternative species that may be appropriate on the richer soils could include aspen and wych elm.

A similar planned area of Scots pine and broadleaves on the recently felled steep slopes to the east of Euchanhead will also have juniper planted where it is suitable.

Opportunities for mountain woodland

An assessment was carried out of the hilltops around Cairnhead of their suitability for establishing mountain woodland, in response to these areas having recently come out of a grazing tenancy. Although, as explained earlier, the timber line for these forests is restricted by higher altitudes and lower temperatures, the tree line would naturally extend towards the highest summits (merging into montane scrub). The biggest challenge to re-establishing mountain woodland in this location however is the lack of remnant patches from which expansion could be encouraged; a general lack of floristic diversity in the existing acid grassland due to over-grazing; and pressure from red deer browsing.

The majority of the open hill (according to the open habitats survey) is acid grassland and blanket mire. The acid grassland could be planted with high elevation provenances of native species such as downy birch, rowan, dark-leaved willow, eared willow, goat willow (variety *sphacelata)* and juniper. This would not deliver habitat of high biodiversity value

(at least not in the medium-term) but would contribute to woodland cover if there was >20% tree cover. The remaining areas of blanket mire would add to a mosaic of upland habitats that would enhance the landscape and add structural/species diversity to the forest.

Linking these areas to the valley through riparian woodland in the cleuchs would provide the greatest ecological value. Planting in these cleuchs could include more demanding species such as aspen and wych elm, which would merge into the hardier species at higher elevations.

Three areas have been identified for potential mountain woodland – Colt Hill, Mullwhanny and Benbrack. These locations offer the best access (listed in order of best access) and significant areas of suitable planting ground. It is proposed that early trials of planting and establishment take place (using best practice from similar sites in Galloway and the Borders) which will then inform future management decisions. Deer grazing will undoubtedly be the greatest threat to success and deer fencing of these areas would deliver the best results, however this would be very expensive and require additional financial support. The chosen locations also sit along the access routes to the Striding Arches and would in time improve the visitor experience with a more varied landscape.

Open ground

The management of open ground within the plan area combines the delivery of environmental benefits with opportunities for agricultural tenancies.

Existing agreements for grazing will continue at Corserig, the lower reaches of the Dalwhat glen, around Shinnelhead farm, and on the hilltops of Polskeoch– managed in liaison with the leaseholder to fulfil other conservation objectives where appropriate.

In the upper reaches of the Dalwhat glen the existing open ground will be left ungrazed for a number of years after the current agreement ends in 2020 to encourage patchy wet woodland to develop. Light grazing will then be reintroduced to help maintain floristic diversity, and establish wood pasture.

Consideration for new woodland planting is an objective of the plan, and the greatest opportunity for this is on the Cairnhead tops that have recently come out of a grazing tenancy. The options for this are explored in the previous section on 'native woodland'. However, some of this open space will not be appropriate for woodland creation as it comprises priority open habitat – predominantly M20 *Eriophorum vaginatum* blanket bog (often in mosaic with U6 *Juncus squarrosus* acid grassland). It is envisaged that these open habitats will merge through an ecotone with the adjoining areas of proposed low-density mountain woodland, ensuring that woodland area is maximised where it is a viable option.

Along the Kello Water, further upstream from the ancient woodland are important open habitats made up of skeletal soil, bare rock and flushes supporting important populations of juniper and carline thistle. The reduction in grazing is allowing the juniper to expand and it is proposed that minimum intervention continues here. Any scrub development will need to be monitored to ensure it is not compromising any important species.

5.3 Restructuring and resilience

Age structure

The proposed staggered felling phases will improve structural diversity over time, and create the desired difference in height between coupes. However, as most of the forests are at their optimum felling age, and trees are reaching their terminal height, there will undoubtedly be significant challenges dealing with incidents of windblow.

Impacts of climate change

It has already been discussed earlier that the predicted changes in rainfall and temperature for these forests in the mid-term are unlikely to significantly affect the suitability of the tree species, however there are other impacts of climate change that need to be considered.

With summers predicted to become drier there is an increased risk of forest fires in the future. Although in a UK context the area has a low risk of fire, in times of drought there is still a considerable risk. This was evident with the recent fire in 2017 at Euchanhead that spread through a felled area and demonstrated the challenges of fire fighting in remote areas and on steep slopes. Several grass fires also had to be tackled in Corserig in the same year. The FC Practice Guide *Building wildfire resilience into forest management planning* advises that "wildfire management planning should be proportionate to the level of risk." The main risk area for this plan area is at Corserig where habitat with a high

wildfire risk (grassland and future young, even-aged conifers) combines with areas of easy public access (where fires may be started accidentally or deliberately). It is not deemed necessary to undertake a full wildfire risk assessment as part of this plan; however this should be reviewed as the forest here develops.

Tree health – pests and diseases

Phytophthora ramorum
As outlined in section 3, the greatest impact to tree health in this area in recent years has been the spread of larch disease (*Phytophthora ramorum*). Where the infection has been out with the 'management zone', the trees have been felled in compliance with statutory plant health notices (SPHNs), but this has opened up pockets that will be more vulnerable to windthrow, and complicated the restructuring of the forest. Within the 'management zone' (predominantly in Cairnhead) large areas of infected larch has been left standing.

As part of this plan, all areas of larch have been identified, and where economically feasible these have been allocated a felling year in the first 5 years of the plan (Phase 1). All infected larch will be felled within 2 years – this may be part of a programmed felling coupe, or where this is not possible (e.g. due to poor road access), some smaller areas of larch will need to be 'felled to waste'.

The FES *Larch Strategy* (2017) prioritises removing infected larch within the 'management zone' where there is a high risk to members of the public, thereafter prioritising the recovery of timber based on the timber value (net of roading/harvesting costs) and time since infection (recognising that timber value declines rapidly >3 years after infection). The strategy also advises allocating a fell year for all uninfected larch during the revision of land management plans in forests within the 'vulnerable area'. In relation to restocking, the strategy stipulates no larch will be planted in the 'management zone' or 'vulnerable area'. The approach of this plan is consistent with this advice.

Of particular importance for Cairnhead is the need to plan felling carefully to minimise environmental damage; given the lack of brash available from larch, ground disturbance and associated diffuse sediment pollution is a higher risk, which is exacerbated by the steep slopes. However, the larch is mostly in an intimate mix with spruce, which will provide additional brash mat material.

Dead larch trees in Cairnhead infected by P.ramorum

Other tree pests and diseases

There are no recorded outbreaks of the great spruce bark beetle (*Dendroctonus micans*) or red band needle blight (*Dothistroma septosporum*) in the forests covered by this plan. Impacts could be significant if they do appear; for example if the proposed increased areas of Scots pine became infected by *Dothistroma* this could lead to defoliation, a gradual weakening of the trees, and potentially their death.

Wind

The resilience of the current forests is severely hampered by exposure to high winds, and recent years have seen an increase in catastrophic windthrow events. Much of the crop is approaching its critical height at which windthrow is predicted to start, and indeed in some areas has reached its terminal height, blown and required clearfelling/recovery of timber (e.g. Troston Hill in Shinnelhead).

The plan has identified existing patches of windthrow that have not been cleared and allocated them to early felling coupes where possible, minimising the risk of expansion. As the remaining first rotation crop waits to be felled, it is inevitable that there will be further endemic windthrow caused by normal winter gales, however severe storms around the UK have become more frequent in the past few decades and of more concern is the possible increase in catastrophic windthrow events in these forests which may require significant amendments to the proposed plan.

As mentioned in a previous section, the shape and size of felling coupes have been carefully considered against landscape, but due to the risk of windthrow, their edges have often been forced to follow wind firm boundaries such as rides and roads. Future planting will develop more resilient coupe shapes.

Deer management

Both roe and red deer are present in the forests, which are part of the Upper Nithsdale Deer Management Unit (DMU). Damage assessments for the four southerly blocks within this plan have improved in recent years (1% 2016, 3% 2015) and are largely a reflection of the control having come back to FES from previously leased syndicates (Cairnhead has always been in-house). This success has not been reflected in Corserig which has recorded 90% damage rates. The deer control here has been part of the framework contract to establish the woodland here, and consequently there are areas of broadleaves that need beating-up before the contract ends. The problem here is that there is thicket stage spruce providing cover for deer to graze on the newly planted pine and broadleaves nearby.

There is constant red deer pressure from the west, where neighbouring landowners' deer management objectives are often for trophy stags. Recent years have seen some of the highest numbers of red deer kills within the plan area – an indication of their numbers.

To ensure that the broadleaves and more palatable softer conifers proposed in this plan reach establishment, it will be imperative that deer are managed effectively. However, for this to succeed the deer management team must have both the resource capacity and the necessary infrastructure in place to enable them to work efficiently. Deer glades/lawns situated on fertile soils close to tree cover attract deer by providing safety, food and sunshine and can assist with control. The plan protects existing glades and provides opportunities for new ones in future open space and wider riparian zones. Of most importance is how these glades (and other stalking areas) are serviced by forest roads and quad tracks. The extraction of carcasses (especially red deer) is physically demanding and often involves walking across rough terrain; poor access to a vehicle increases the risk of staff accidents, and also decreases efficiency. This plan identifies the long-term infrastructure required to access areas of the forests for operational delivery – forest roads and forwarder tracks; however short-term infrastructure requirements (quad bike tracks) should be identified at the work plan stage.

The plan has some ambitious targets for native woodland expansion, including the establishment of mountain woodland, as well as for more diverse conifers. Effective deer management will be a critical success factor.

5.4 Public access and local communities

Recreation and public access

The plan has considered the landscape impact of the forests for visitors using the Southern Upland Way (SUW) and accessing the Striding Arches. A mixture of open space, native

broadleaves and alternative conifers such as Scots pine will develop in time to create a more intimate and attractive experience. Open space corridors have been maintained or enhanced along the hill tops to the Arches, which also pass the proposed new areas of mountain woodland. Narrow corridors of open space have been avoided for the SUW to reduce windblow blockages, and either passes through wider open ground or solid crops. For the latter, the SUW has not been used as a coupe felling edge to minimise disturbance.

The Striding Arches are a popular destination with visitors to the area

The forest on Lorg Hill will be restocked to create a more natural edge – an example of how the plan will improve the landscape

Community engagement

A recent interest in resurrecting the Cairnhead Community Forest Trust bodes well for involving the local community in the management of the forest. Opportunities will be available for the group (or other interested parties) to contribute to projects such as the mountain and wet woodland creation and the formation of ponds.

Neighbours

Careful consideration has been given to the impact of any forestry activities on the environs and infrastructure associated with private residents living in or close to the forests. Private water supplies have been identified, with open space or permanent broadleaf woodland planned in the next rotation to protect extraction points.

Farming

The plan incorporates open ground with opportunities for grazing, and we will continue to support the starter farm in Corserig. This offers the chance for local farmers to take advantage of these areas, and at the same time assist us with open habitat management.

5.5 Biodiversity

Black grouse

Based on records of recent active lek sites, this plan has incorporated habitat improvements at key locations that will benefit the species. These improvements will also enhance conditions for a range of wildlife, whilst adding structural and species diversity to the landscape. Ideal black grouse habitat is a mosaic of tall vegetation for nesting and cover, low density woodland for roosting and feeding, and wet flushes to provide invertebrate food for chicks.

The key locations within the plan area where habitat improvements will benefit black grouse are: around the eastern edge of Euchanhead where Scots pine, birch and other broadleaves will offer food and shelter next to the adjoining open ground; around Allan's Cairn where designed areas of open ground and low-density peatland edge native woodland will enhance the existing heather and cotton grass vegetation; along the upper edges of most of the blocks where lower density planting of conifers will break up previously hard edges; and along the cleuchs linking high ground to the valleys where a continuous mixture of native woodland and open ground will allow birds easier movement to find food and shelter. This is in addition to the areas in Corserig and Polskeoch where work has already been done.

The native tree species identified for planting in the plan area include birch, alder, willow, rowan, hawthorn, juniper and Scots pine – all of which are excellent food sources for black grouse.

Raptors

Areas of 'long term retention' have been identified to ensure that there is sufficient mature forest habitat for goshawks, within which there will be individual trees large enough for nest building. Although this species generally prefers thinned mature woodland, the absence of thinning interventions here has not discouraged successful breeding and so it is vital that suitable nesting habitat is available, even if this is in different parts of the forest over time. There are excellent hunting opportunities within the forests and on the adjoining open ground, with access to prey items such as crow, greater spotted woodpecker, jay, grouse, wood pigeon, rabbit and red squirrel.

The previously recorded sightings of hen harrier at Corserig, and also in 2017 along the top of Bank Hill in Euchanhead suggest that this species is utilising the open ground for hunting, and possibly also nesting. As restructuring of the forests continues, areas of young plantation may also be utilised by this species for nesting.

Also of note are the recent sightings of golden eagle passing overhead within the plan area. This species could find suitable nesting opportunities here as the second rotation of forestry matures, with good access on to the open hilltops for hunting.

Red squirrel

The populations of red squirrel resident in the forests will benefit from the retention of mature Norway spruce for feeding, and the phased felling of coupes which maintains connectivity between woodland blocks. In addition, the selection of small-seeded broadleaved tree species for restocking and in areas of new woodland will deter grey squirrels from establishing in the area. Planning for all felling operations will follow the conditions set out in the 'FES licence for managing red squirrels during forest operations' recently issued by Scottish Natural Heritage.

Bats

Delivery of the plan will provide a range of feeding and roosting opportunities for bat species by increasing the structure and composition of the forest, and incorporating open space around riparian corridors and along flight lines between roosts and feeding areas. Any works in the vicinity of the Cairnhead cottage will be planned and monitored to ensure protection of the Natterer's bat maternity roost. If necessary, these will be carried out under licence.

Fish

Water quality is important for fish survival. Effective water management will ensure that water quality is not compromised during forestry activities, reducing the chances of diffuse sediment pollution entering watercourses. Designed buffer zones around watercourses will also reduce future disturbance, whilst riparian native woodland will create shade, produce small woody debris for micro-habitats, and add organic feeding matter for invertebrates. There are few barriers to fish movement, but where they do occur, for example at the Polskeoch ford, improvements will be considered in liaison with SEPA and the fisheries board.

Plants

The designation of the deep gullies of the Kello Water as a Natural Reserve assures no management activities in perpetuity. This ensures no human intervention and protection of this valuable habitat and its rich flora. The recent discovery of filmy fern here highlights the value of this site. Also in Corserig, the patch of calcareous grassland to the west of the site will be monitored and managed to maintain its floristic diversity (including the population of carline thistle). The plan seeks to protect and develop a mosaic of habitats throughout the forests including elements of woodland, wetland and grassland that will provide niches for a wide range of plant life.

Invasive non-native species (INNS)

The only significant species present in the plan area is Himalayan balsam, a small patch of which is present on the edge of the forest road close to Shinnelhead Farm at NX 7301 9916. This needs immediate intervention to stop it spreading further, particularly into any watercourses.

5.6 Heritage

There are no scheduled ancient monuments in the plan area requiring special protection, but in line with the UK Forestry Standard's Historic Environment guidelines consideration has been given to the heritage features present. A legacy of the farming communities who once lived and worked the area, features include sheep stells, dykes and derelict buildings, and the future forest has been designed around them where practical, to allow more open space and to integrate them into the landscape. This is especially the case in Cairnhead where they contribute to the 'spirit of place' and enhance the visitor experience.

A sheep stell in Cairnhead typical of the area

5.7 Water and flooding

Private water supplies

The following water supplies and pipes have been identified, and sources will be protected from disturbance by establishing open ground or native riparian woodland within a 50m buffer of supply points.

Forest block	Property / location	Approx. grid reference of supply
Cairnhead	Benbuie	NX71179640 and NX71259626
Cairnhead	Blairoch	NX70719665
Cairnhead	Cairnhead cottage (unoccupied)	NX70089727
Shinnelhead	Shinnelhead Farm	NX72749941
Polskeoch	Polskeoch Cottage	NS68820253
Euchanhead	Bank Cottage	NS70390647
Euchanhead	Glenglass Cottage	NS70710656
Euchanhead	Euchan water works	NS70230639
Corserig	Covered reservoir	NS71991045

Water flows and flooding

Early on in the scoping process for this plan it became clear that water management would be an important factor, and consideration for the impacts of our land management activities on peak water flows became a primary objective. In 2016 FES undertook a national screening exercise to identify priority catchments where forestry may be having an effect on peak water flows. The Dalwhat catchment was one of those identified, and it was then used for a pilot flood risk project undertaken by Dumfries and Borders Forest District staff to develop a protocol to analyse potential Land Management Plan impacts on peak flow. Particular consideration was given to developing a repeatable methodology for application across the National Forest Estate.

Flooding is directly linked to rainfall, and with winter rainfall in the plan area predicted to increase by 20% by the 2080s, flood events may also become more frequent. Indeed, there has already been a 69% recorded increase in winter flows for the River Nith between 1961 and 2005.

The role of trees and woodland in reducing the risks of flooding are well documented. The following is a summary of the key points:

- Water is taken up by tree roots from the soil and evaporated through the leaves (at similar rates for both conifers and broadleaves).
- Rainfall is intercepted by leaves, branches and trunks, which is subsequently evaporated (25-45% of annual rainfall for conifers; 10-25% for broadleaves).
- Trees add organic matter to the soil increasing absorption rates.
- Roots channel water into the ground, increasing infiltration and groundwater storage.
- Trees, undergrowth and woody debris increase 'hydraulic roughness' and slow down surface water flow (maybe 5 times more than grassland).
- There is an overall reduction in peak flows after planting catchment woodland.

Forestry activities can have a range of effects on peak flow. The UK Forestry Standard explains that "forest growth has the potential to decrease peak flows, while clearfelling can have the opposite effect until the trees are replanted and regrow. Overall … the different stages of the forest cycle may even out at the catchment scale, especially as forest areas become more diverse in age". It is therefore important to carefully consider Cairnhead in this context. The UKFS goes on to recommend that in flood risk management plans "consider opportunities for woodland creation and management to reduce flood risk", and "within areas of high flood risk, phase clearfelling to minimise the risk of increasing local flood flows".

There is a recent history of flooding in the village of Moniaive, with particularly severe events in 2015 and 2013. Within the Flood Risk Management Strategy for the Solway Local Plan District, Moniaive is identified as 'Candidate Potentially Vulnerable Area 14/25c'. Flood risk in the area is mostly attributed to river flooding from the Craigdarroch Water and the Dalwhat Water from which there is a risk of flooding to residential properties. The actions identified in the strategy to manage flooding here focus on: maintaining flood protection schemes; flood forecasting; self-help; and raising awareness – with D&G Council and SEPA responsible for the different aspects of delivery.

National Forest Estate land at Cairnhead occupies roughly one third of the Dalwhat Water catchment, and so FES has a responsibility (along with other land owners/managers) to consider the impact of its land management activities on water flow.

There has been much attention in recent years on 'working with natural processes' (WWNP) to deliver 'natural flood management' (NFM), to provide flood protection measures that protect, restore and emulate natural functions – and often deliver other social, environmental and economic benefits. '*Working with Natural Processes – Evidence Directory'* (UK Environment Agency, 2017) sets out the current state of the scientific evidence underpinning WWNP, and includes information on catchment woodland which is summarised below:

- Interception, evapo-transpiration and soil porosity are higher in catchment woodland compared to grassland.
- Well-managed woodland is generally associated with low sediment losses.
- The effects of forest felling and planting on peak flows appears to be greatest for small and medium flood peaks, declining with increasing flood size.
- The overall effects of planting or felling conifer forest on peak flows tend to be greater than those for broadleaves.
- Evidence for catchment woodland reducing flood flows is greatest for small catchments (<10km2) however modelling also predicts benefits in medium sized catchments (10-100km2). *The catchment of the Dalwhat Water is ~33km2.*
- In general, the larger is the extent of woodland cover in a catchment, the greater the expected impact on flood flows. *The Dalwhat catchment has ~11.5km2 woodland cover (35%) made up of 83% FES and 17% private, the remainder being mostly grassland.*
- Timber harvesting within productive woodland represents a temporary reduction or loss of the flow reduction benefits (for 10–15 years), but the effect of this can be minimised at the catchment scale by phasing felling operations (limiting felling to <20% of catchment area) and by rapid restocking.
- Catchment woodland is beneficial across all ecosystem service categories, particularly for 'habitat' and 'climate regulation'.

The following table outlines the land management measures that will be taken within FES land at Cairnhead to minimise flood risks in the Dalwhat catchment:

Phased clearfell programme	The forest has been split into management coupes, most of which will eventually be clearfelled. The 'fell years' have been allocated to stagger the felling over time. This ensures that we do not exceed the 20% rule mentioned above. Between 2018 and 2050, the amount of the forest either felled or <10 years old (in any one year) ranges between 7% and 16% of the catchment area.
Hot planting	Rapid restocking, or 'hot planting' re-establishes the flow reduction benefits of woodland quicker than if the land is left fallow.
Best practice water management during ground preparation	Excavation of the soil to establish drains or planting positions can increase run off and sediment loss if not managed carefully. Planning of ground preparation works will start from the premise that disturbance to the ground should be kept to an absolute minimum. Where works are required, there will be STRICT adherence to the *UK Forestry Standard's Water Guidelines* in work plans and site supervision/monitoring.

Best practice water management during road construction / maintenance	As with ground preparation, road construction and maintenance activities will be planned and delivered with a clear awareness of the water management implications. Appropriate techniques such as silt traps and disconnects will be implemented to the best effect.
Woodland creation	The creation of 47ha of new native woodland will increase the extent of woodland cover in the catchment, and although this is all broadleaved and will have lower interception rates than conifers, its permanence will provide sustained hydraulic roughness and improved soil porosity.
Offline ponds	New ponds will be constructed on the open ground in the head of the Dalwhat glen. These will be located and designed to intercept fast water-flow pathways, slowing natural runoff. Outlet pipes will be positioned to allow the pond to partially drain to allow further storage.

Open ground in Cairnhead where planned wet woodland and offline ponds, along with retained open ground for grazing will integrate multiple land uses.

Water / drainage management

Water management across all the forest blocks in the plan area will support the aims of the *Solway-Tweed River Basin Management Plan* and the *River Basin Management Plan for the Scotland river basin district.* Of particular importance, the plans seek to tackle 'rural diffuse pollution' – which in the context of forestry activities includes soil picked up by rainfall runoff entering watercourses. Actions in the plan include the enforcement of General Binding Rules which lay down minimum requirements for how land management activities liable to cause pollution must be undertaken to help protect and improve water

quality. These are incorporated into the *UK Forestry Standard's Water Guidelines* and which are met by all of our land management activities.

5.8 Operational access

Access into the forests

There are several light-vehicle access points into the forest as outlined earlier in the plan, however there are significant constraints on access for HGVs. An options appraisal was carried out on how timber lorries and other HGVs gain access to the forests. This is summarised below:

Access option	Advantages	Disadvantages	Viable option?
Kelloholm – Heads of of the Valley road	Access infrastructure and agreements already in place. Direct access onto A76.	Reliant on servitude rights over third-party land. Heavy usage by multiple landowners creates high levels of wear and tear, with associated maintenance costs.	Yes
Glen roads – from Moniaive, Tynron, Penpont and Sanquhar	Shorter distances from public road to forest blocks.	D&G Council / Timber Transport Forum 'consultation routes' with restrictions on use. Narrow, fragile rural roads. Impact on local communities.	No
New road between Polskeoch and Lorg to access the A713	Access onto a major trunk road. Relatively shorter access to the southernmost forest blocks.	Reliance on agreement with neighbour, and subsequent servitude rights. Impact on communities in the Glenkens. Very expensive.	No
Current/future windfarm access	Build costs incurred by energy companies.	Reliant on third-party landowners' agreement.	Maybe

roads (e.g. Cairnhead, Euchanhead)	Access to remote top edges of forests.	Conflict with windfarm vehicles.	

For the present time, the Kelloholm access will remain the preferred option for all HGV vehicles.

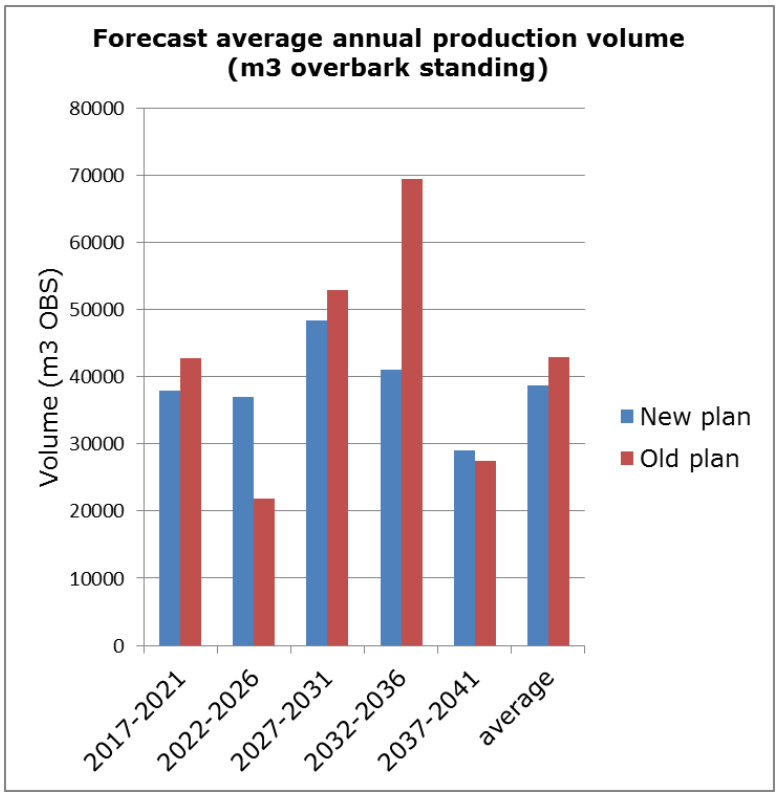
Access within the forests

Sections of new road are planned to access felling coupes in all blocks apart from Corserig. The combined distance is 22km, and this is made up mostly of new build, but also some sections of access tracks put in for the SWS interconnector project which will be upgraded and retained.

In addition, 2km of forwarder tracks are proposed where construction of a full spec forest road is unnecessary or undesirable.

5.9 Productivity

Timber



One of the primary objectives of the plan is 'to maintain productivity of timber at predictable and stable levels'. As has been noted throughout this plan, the majority of the forest is mature and consequently approaching its maximum mean annual increment (Max MAI) and so there is a careful balance needed between felling large areas for optimum timber yields and maintaining forest cover for landscape, wildlife and other important objectives of the plan (such as water management). Felling years for coupes have been carefully selected with this balance in mind, whilst also seeking to achieve a more smoothed profile of timber output over time to achieve a more reliable and consistent supply.

The graph above compares the timber volumes (across the plan area) for the old and new plans, illustrating the desired smoothing effect.

Non-timber benefits

In addition to timber production, the forests will also deliver a range of other benefits.

The natural capital derived from assets including the soil, water, and plants present in the forests provide local communities and wider society with a range of ecosystem services. The most obvious service is the provision of timber as a versatile material and for fuel, but other services delivered by the forests include the capture and storage of carbon by trees and peatland (helping to combat climate change), and the regulation of water quality and flow. There are also cultural services that benefit society – visitors to the forests gain spiritual enrichment, healthy recreational opportunities and aesthetic experiences. Placing a financial value on these benefits is difficult, but it is clear that nature is not valueless. Common monetary assessments include considering the savings made through preventative measures, and the social returns on investment. Examples for the forests of Upper Nithsdale include recreation opportunities and active lifestyles reducing healthcare costs; natural flood management reducing the repair costs of flood events; and volunteering opportunities building individual/community capacity and resilience.

5.10 Critical Success Factors

- Continued access to Kelloholm vehicle access point and 'Heads of the Valley' road.
- Protection of broadleaves and soft conifers from grazing.
- Construction of forest roads.
- Effective water management during forestry activities, especially during larch clearance.
- Swift action and adaptation in response to catastrophic wind blow damage.

Appendix I: Brief, Stakeholder Analysis, and Analysis and Concept map (separate documents)

Appendix II: Consultation Record and Correspondence

External Consultation

Consultee	Date contacted	Date of response	Issues raised	Forest District Response
Dumfries and Galloway Council - Access Team	23/05/17 (Brief)	23/05/17	*Bryan Scott*: Views and landscaping around Polskeoch bothy - potential for more broadleaves and open space.	This has been incorporated into the plan, with a more sympathetic mix of open space, broadleaved tree species and Scot's pine featuring in the design around the bothy. The future forest on the slopes of Lorg Hill incorporates more organic shapes and edges to replace the current straight edge.
Saving Scotland's Red Squirrels	20/06/17 (Brief)	30/06/17 24/08/17*	*Stephanie Johnstone:* Forests are within Nithsdale 'Priority Area for Red Squirrel Conservation' - need to manage woodlands to support red squirrels and deter grey squirrels.	Areas of mature Norway spruce have been retained in the valley bottoms to provide suitable red squirrel habitat. Small seeded broadleaved tree species will be favoured for new planting. Planning for all felling operations will follow the conditions set out in the 'FES licence for managing red squirrels during forest operations' issued by SNH.
Dumfries and Galloway Council - Biodiversity Officer	20/06/17 (Brief)	13/07/17	*Peter Norman:* Important large patch of non-planted Juniper along upper Kello Water.	The botanical value of the Kello Water has been highlighted in the plan, with direction on how to manage its unique habitats.
RSPB	20/06/17 (Brief)	17/07/2017	*Julia Gallagher:* This area is potentially very strategic for region's black grouse population.	Existing habitat improvement works in Corserig and Polskeoch will be supplemented elsewhere with low-density conifer planting on the upper

				edges, open space corridors to improve connectivity, and planting of suitable native broadleaves for food.
Historic Environment Scotland	20/06/17 (Brief)	20/07/2017 24/08/17*	*Kevin Grant:* "It would appear that no designated features would be affected by the land management plan. Therefore HES has no comments to make regarding the supplied brief.	None required.
Dumfries and Galloway Council - Landscape Officer	20/06/17 (Brief)	24/08/17*	Straight edges	This will be rectified over time as restocking creates more organic shapes and feathered upper edges.
Dumfries and Galloway Council - Roads Dept.	20/06/17 (Brief)	19/09/17	*Bob Green:* Options for timber transport access to these blocks are limited. DGC historically imposed restrictions on the small glen roads to encourage timber transport to use access at Kelloholm/A76 - thus reducing impacts on villages (e.g. Moniaive). There is unlikely to be any significant changes to this situation in the next 10 years. Shinnel Glen has had upgrades through STTF, but is restricted to 6 loads a day (summer only). The road to Lorg has also had STTF improvements - could a link be established?	Having carried out a review of vehicle access it is proposed that the voluntary ban on HGVs using the valley roads will continue, with the continued use of the Heads of the Valley route and the access onto the A76 at Kelloholm. A possible link road to Lorg would be costly and so has been discounted at present – any future reconsideration would require early discussions with the neighbouring landowner.

Scottish Power Renewables	20/06/17 (Brief)	13/06/17	*David Boyd:* SPR interests with proposed Wether Hill extension and Euchanhead windfarms.	Both of these proposals are at a relatively early stage and so the plan has been developed without trying to pre-empt what may happen. Any successful applications will require a revision of the plan.
Dumfries and Galloway Council - Archaeology Officer	20/06/17 (Brief)	24/08/17*	Lack of appropriate open space around features of historical significance	Especially in Cairnhead where there is a number of farming heritage features (buildings, stells) these have been incorporated into open space to allow visitors to better appreciate their historical relevance in the context of the surrounding landscape.
SEPA	20/06/17 (Brief)	09/08/17	*Simon Watt:* Refer to separate letter.	FES response to relevant sections of letter: 1.1 Riparian buffer zones of open space and native broadleaves have been designed into the future forest. 1.2 A full EIA is not necessary for this plan revision, however all forest activities will comply with the UK Forestry Standard water and soils guidelines to ensure adherence to best practice. 2.1 The plan aims to support the objectives of the *Solway Tweed River Basin Management Plan*. 2.2 Appropriate UKFS buffers will be used. 2.3 We will continue to work closely with the local Fisheries Trusts, identifying opportunities and resolving issues for fish movement and water quality. This includes reviewing options to adapt the current ford to improve passage for fish. 2.4 A small patch of Himalayan balsam is

				present in Shinnelhead. This is addressed in the plan. 3.2 and 3.3 The plan highlights the importance of all forestry activities complying with the relevant standards and regulations in relation to water quality and management. 3.4 A section of the plan focusses on water management to avoid pollution incidents. 3.5 This land management plan provides the strategic overview of how we wish to manage these forests and highlights the importance of water management. All operational works go through a separate 'work plan' process that identifies specific precautions to prevent pollution. This is backed up by our *Incident and Fire Plan* to deal with any pollution incidents that may occur. 3.6 The forests are not located in acidified water catchments. 4.1 – 4.5 Although some planned new forest roads are proposed in this plan, the process outlined in 3.5 above would pick up the detail of any new civil engineering projects. These proposals would also be submitted for EIA determination at the time. 5.1 Where deep peats do occur, we have followed guidance set out in the FC Practice Guide *Deciding future management options for afforested deep peatland*. 5.2 No new planting is proposed on deep peats.

				5.3 Peatland restoration is not proposed in the plan; however some areas of deep peat will not be replanted and left as open ground with peatland edge woodland. 6.1 Flushes have been incorporated into the riparian buffers. The proposals to create new ponds in Dalwhat Glen and to restore some areas of plantation to bog and peatland edge woodland will all enhance the provision of wetland habitats. 7.1–7.2 Discussions with neighbours have confirmed/updated our records of private water supplies. These will be flagged up as major constraints during our work planning process to avoid any damage or disturbance. Areas of open ground or native woodland have been designed around these features to create permanent buffers in the future. 8.1 The plan contains a section on flooding in recognition of the concerns expressed by some residents in Moniaive. This looks at the timing and scale of felling in the catchment, restocking policy, and water management. 9.1 Brash and lop/top will mostly be retained on site to protect the soil from compaction and erosion during operations, helping to avoid soil disturbance and diffuse pollution. All activities will comply with the relevant regulations and guidance.
Galloway and Southern Ayrshire Biosphere Officer	20/06/17 (Brief)	22/09/17	In regards to biodiversity one of our core objectives is to see improved connectivity between habitats. As such we welcome the	The future forest will have more native woodland in the valleys and up the cleuchs, with open space around watercourses, heritage features and on

			commitment to maintain open and native woodland habitats in good ecological condition and would encourage FCS to also explore opportunities for extending and linking such areas creating a more diverse structure across the whole LMP and not just around the periphery. We are highly supportive of the commitment to development of Black Grouse habitats one of our priority species in the Biosphere alongside blanket bog, herb rich mire and acid grassland. Although we appreciate that Sitka will continue to be the main timber species, particularly due to constraints on replanting larch, we would like to see more diverse planting in the medium and longer term to ensure forestry and woodlands in the area are more resilient to pests and diseases and climate change. We'd encourage consideration be given to developing / promoting new recreational routes linking the communities of mid Nithsdale and Upper Nithsdale through a combination of quiet forest road routes that could be used to	the hill tops. This will improve connectivity between habitats and benefit species including black grouse. We recognise the need to make the forests more resilient in the face of climate change and more pests and diseases. Other productive conifer species have been incorporated into the future forest, such as Noble fir and Norway spruce. FES actively encourages public access on the National Forest Estate and we would welcome initiatives using the forest road network to link the communities of mid and upper Nithsdale. Water quality has been addressed in the plan – both spatially with the creation of riparian buffer zones to reduce ground disturbance around watercourses, and also by advocating best working practices during forestry and civil engineering works. Significant areas of wet woodland are planned for biodiversity and woodland expansion, which will also have natural flood management benefits by increasing water retention.

			stimulate new tourism opportunities in Nithsdale. Poor water quality is a widespread issue across the Biosphere, so work to improve riparian and aquatic zones by increasing areas of open space, reducing areas of high density conifer plantations, the creation of buffer zones and blocking artificial drains in open areas and buffers zones should all be considered key objectives of the LMP. Allowing some natural regeneration of native species in wetland areas is also important as wet and riparian woodland have biodiversity and natural flood mitigation benefits.	
SNH	20/06/17 (Brief)	24/08/17*	No significant concerns. Generally supportive of plan's objectives and the Brief's analysis and concepts.	None required.
CONFOR	20/06/17 (Brief)	No response.		
Nith District Salmon Fishery Board	20/06/17 (Brief)	24/08/17*	Diffuse sediment pollution entering watercourses is a significant threat to fish survival.	The plan highlights the importance of managing water sensitively in these headwaters, and abiding to the UK

			Natural deposition of organic material into the watercourses provides food for invertebrates, and in turn fish. Broadleaved riparian woodland contributes significantly to this, and also offers shade for fish.	Forestry Standard's water guidelines. A planned increase in the amount of riparian woodland along the main watercourses and up the cleuchs will improve and enrich conditions for fish.
Nith Catchment Fishery Trust	20/06/17 (Brief)	24/08/17*	As above	As above
Kirkconnel and Kelloholm Community Council	20/06/17 (Brief)	24/08/17*	Generally supportive of the plan's objectives and proposals.	None required.
Royal Burgh of Sanquhar Community Council	20/06/17 (Brief)	No response		
Penpont Community Council	20/06/17 (Brief)	No response		
Tynron Community Council	20/06/17 (Brief)	No response		
Glencairn Community Council	20/06/17 (Brief)	24/08/17*	The recent flood events in Moniaive have raised concerns with residents that tree felling in Cairnhead may have contributed to the problem. Keen to have reassurance that FES are taking this on-board. Would like to maintain historical link between community and forest, and to encourage more involvement. The Striding Arches do attract	A dedicated section of the plan considers the potential impacts of forestry activities on water flow and downstream flooding. Recent local meetings have been held to discuss re-establishing the Cairnhead Community Forest Trust. FES is fully supportive of this and will work closely with the community to consider their aspirations. Access to the arches, including approach road, parking and walking access have

			visitors to the forest and it is important that access to them is maintained.	been considered in the plan.
Public meeting (Moniaive)	26/06/17	n/a	See below	
Public meeting (Kirkconnel)	28/06/17	n/a	See below	
'Forestry Panel' event – site visits to the forests	24/08/17	n/a	These have been captured above (*)	

Public Meetings

What is your connection to the forests of Upper Nithsdale?	Why are they important to you? How do you think we can help?	Do you have any issues or concerns about the way we manage these forests? How do you think we can help?	How has this been addressed in the LMP?
Moniaive 26/06/17			
Professional interest, as project worker with Moniaive Initiative	Moniaive is a rarity - a thriving local small town. We have a varied local economy: forestry and agriculture are important elements, but so too is tourism. The local open space attracts large numbers of visitors, especially walkers, wildlife enthusiasts, fishing/shooting enthusiasts, mountain bikers etc. We need to manage the local environment in a	Moniaive flooded two years in a row, and so sensitive management of upper catchments to mitigate extra run-off caused by forestry operations is important to the local community. Maintaining good quality access to areas that can support recreational use is key to maintaining a healthy local tourist industry - but so too is swift action should unauthorised /	Concerns over flooding have been addressed in the plan. The design of the forests aims to improve the visual landscape and appeal for visitors, thus supporting the local tourist industry.

	way that continues to facilitate and promote this usage.	anti-social use become evident.	
Local resident, recreational user of forests for walking, mountain biking, wildlife watching, etc.	Forestry is a defining feature of mid-Nithsdale, and very much an under-used resource by local residents for recreational purposes. The Striding Arches and Southern Upland Way are important to the local tourist economy, and should be managed to maximise their potential. Easy access to the forest estate at Cairnhead could and should be a primary purpose in local management plans.	No concerns, but would like to see more made of the forest estate for both recreational and environmental purposes. Sensitive management of both hilltops and valley bottoms to improve biodiversity, mitigate potential flood issues, and to promote responsible access to and enjoyment of the wide range of wildlife habitat on offer. Unobstructed views of the Striding Arches from the Southern Upland Way are important but so too is the maintenance of vehicular access / parking provision / walking routes at Cairnhead. As a local resident I am keen to see FES work alongside other local landowners to manage these areas - to maintain vehicular access, and to discuss and encourage wider flood-mitigation schemes in the form of new water catchment areas. The forestry could also do more to promote the benefits - in terms of biodiversity -	The SUW and Striding Arches were critical factors considered during the planning stages, and the final design of the future forest reflects the need to maintain access and improve visual diversity. The plan highlights the need to maintain good road conditions and parking space into Cairnhead for visitors to use. The plan covers how native woodland will be managed and expanded, and how this will benefit biodiversity.

		of expansion of native woodland.	
Neighbour, user, community woodland interest	Connel's Well (346) - protect heritage site. Community woodland, Cairnhead - support community assets, pond. Wildlife management. Woodland creation/visitor zones. Deer fence around planted trees by river.	'Treasured' - revive interest and support Cairnhead community woodland (perhaps focussed on a smaller area) - can you help or suggest/advise?	There have been recent local meetings discussing the resurrection of the CCFT, with a possible focus on the lower reaches of the Dalwhat valley.
Live very locally to both Dalwhat and Shinnel	Walking and taking family and visitors to see beautiful countryside	Access to Striding Arches. Ensure forest road fit for purpose.	See above.
Neighbour	Private water supply located in forest (Shinnel)	Water supply dried up a few weeks ago - concerned that the large trees are using up all the water. When are these trees due to be felled - if not soon, could it be brought forward? Could the area around the springs and water tank be left unplanted?	The area around the header tanks has been identified and will be left as open ground. Felling of this coupe is planned for 2020.
Neighbour, user	Views, walking, wildlife habitats - wider environmental concerns. Son wants to be a forester. Community forest interests e.g. Cairnhead.	Impact of timber extraction on local roads. Increase biodiversity and native woodland. Would like to enhance the community planting of native trees by the river (Cairnhead).	A review of the timber transport access routes is included in the plan. We will continue the voluntary ban of HGVs down the valleys. The plan encourages community involvement in the establishment

			and management of native woodland in the Dalwhat Glen.
Neighbour (Cairnhead)	Striding Arches - lack of signage, poor access road, no facilities. Lochan. Poor or no mobile signal.	Take note of how flooding can be helped in village - don't blame farmers for poor drainage! Mix of trees. Would forest ever be extended down Dalwhat Glen? Would FC be interested in purchasing land?	The plan highlights the need to review current on-site (signage) and off-site (internet) information. Land acquisitions, especially where they adjoin existing FES landholdings are considered as and when suitable opportunities arise.
Resident of Moniaive	Walking - consider opportunities for links (e.g. Dibbin Lane)	Property was flooded last winter. Concerned about impact of forestry operations on flood risk.	The positive and negative impacts of woodland management on water flow have been carefully considered in the plan.
Kirkconnel 28/06/17			
Neighbour (Polskeoch)	Live in forest	See email for more detail and suggested solutions. Summary: • Private water supply - has been marked on ground, but would like site visit prior to any operations. • Rowan trees between Polskeoch and Dalgonar in poor condition. • Road side ditches - volume of water increases as	The water supply will be considered (in liaison with the neighbour) during the work plan stage before any felling commences. The feeder area will be left as open ground in the next rotation. Proposed broadleaved planting between Polskeoch and Dalgonar will utilise suitable species for the

		coupes of trees are felled, leading to flooding on roads. • Path between Polskeoch and Lorg - extremely boggy in places; hidden sheep stell. • SUW - big puddle at Polskeoch barrier. • Trail motorbikes - forest regularly used, especially on summer weekends. • Unauthorised vehicle access to bothy for parties - bonfires, rubbish, chainsaw use. • There is no useful path to the arch on Bail Hill. • Striding Arches fingerpost at Colt Hill / Benbrack / Byre junction not clear if approaching from north. Also, revisit Striding Arches information panels as they talk about paths to the arches that do not exist. • Please do not allow any more windfarms to be visible from my property and environs.	site. Water management has been flagged up in the plan as an important consideration during all operations requiring strict adherence to the UK Forestry Standard's water guidelines. FES will continue to work with D&G Council to discourage anti-social and illegal activities in and around the bothy. Open ground will be left between Colt Hill and the Striding Arch on Bail Hill. The planned new road across the flanks of Bail Hill will also improve access to the arch here. FES will work with any energy companies submitting wind farm applications on FES land, providing appropriate advice including the need to liaise with neighbours.

		• Mobile phone masts - any future requests should be sited for max effect yet min negative impact.	
Local community residents	We would like to use forests for recreation (mountain biking mainly) but don't have the information needed for safe access. A plan/map of forest roads/paths would be helpful, as well as additional access points, perhaps near Sanquhar.		FES encourages responsible use of the National Forest Estate for recreation, and simple maps of the road network can be requested from our local offices. There are currently no plans to develop new access points or recreation facilities in the forests covered by this plan.
Member of Sanquhar community council	Tourism, recreation, employment	Perhaps information (accessible and visible) as to how local community can use/benefit from the forests.	As above.
Neighbour (on timber transport access route)		The access for your timber haulage has an adverse impact on our business and home. We would like you to police the code of conduct and find an alternative access road. Our complaints are well documented. This is a huge problem for us.	The 'Heads of the Valley' haulage route will continue to be the access for all HGV's accessing the forests. A review of options is included in the plan but does not identify any current alternatives. New road signs have been erected enforcing the HOV code of conduct (15mph speed limit and caps on daily usage).

Internal Consultation

FES consultee	Date of initial scoping meeting	Issue raised (constraints and opportunities)	How has this been addressed in the LMP?
Forest District Manager: Sallie Bailey	15/05/17	1. Timber production needs to be primary objective. Large coupes are more appropriate. 2. Potential increased peak flows and associated impact on downstream flooding is a prime risk – need to be mindful of this in the preparation of the plan. Consider NFM in Cairnhead and Shinnelhead. Address concerns of local communities that felling is a contributing factor to the recent flooding events. Need early discussions with SEPA and DGC on catchment management. Important to have a quantifiable cost-benefit analysis. Integrate this issue with other drivers (e.g. environment). 3. Cairnhead – exemplar of integrated land use? (NFM; timber; arts/tourism; grazing; native woodland; recreation). 4. Cairnhead tops – explore potential opportunity for woodland	1. This has been incorporated in the plan objectives. 2. Meeting with SEPA to discuss this issue has helped shape the approach outlined in the section on flooding. Ongoing liaison with FR to consider monitoring of water flows to quantify impact of felling and NFM. 3. The rationale for the future habitats and species is underpinned by this aim. 4. Investigation into this with the FES native woodland ecologist revealed poor opportunities at present. Resources for native woodland will be targeted mostly in the valley bottoms; however several areas for mountain woodland

		expansion (partially to offset recent increase in felling, but also an opportunity for mountain woodland). 5. Euchanhead windfarms – interactions between proposed SPR/NFE and neighbour's developments. 6. Euchanhead interconnector. 7. Shared roads – HoV agreement; code of conduct.	development have been identified. 5. The plan for Euchanhead takes into account the current renewables infrastructure, but does not attempt to pre-empt how a potential windfarm may fit into the forest. Any developments will require a revision of the plan. 6. As above. 7. Vehicle access has been reviewed in the plan.
FD Planning Manager: Colin Binnie	20/03/17	Suggested key issues / objectives (not in any order): • Renewables • Timber production • Flooding • Timber haulage • Landscaping • Woodland creation • Forest composition (inc Blvs) • Community • Biodiversity • Resilience (especially wind blow) • Forest roads	These factors were used to kick start the analysis process and contributed to identifying the plan's objectives
FD Programme Manager: Richard Raverty	11/05/17	1. Try and retain coupe shapes for next few years' programme – unless windblow or adjacency issues. 2. Windblow is most significant	1. This has been done. 2. Significant areas of windblow have been allocated early felling dates.

		constraint – to achieve successful smoothing of production in the future, it may be necessary to take out windblow and retain other areas even if it means re-phasing. 3. If crop hasn't done well due to exposure – perhaps consider alternative approach. 4. Hot planting will be undertaken especially in Cairnhead and Shinnelhead to speed up establishment of next rotation (max flood mitigation effects after 10 years) 5. Mature conifers in riparian zones – perhaps best to clear before they fall into watercourses. Establish broadleaves and minimise future disturbance? 6. There will be minimum ground prep (especially in Cairnhead) to reduce potential impacts on flooding.	3. A pragmatic approach has been taken to 'volume return on investment' when considering the upper planting limits. 4. Hot planting in these blocks will be the default position. 5. After discussion with the Environment team, much of the Norway spruce along riparian zones has been retained for red squirrel habitat. 6. The recommendation of this plan is for minimum ground disturbance during all forest operations.
FD Forest Management Team: Colin Saunders, Colin Watret	19/05/17	1. Consider opportunities to diversify species, in particular for resilience towards pests and diseases. 2. Cairnhead tops are better suited for montane scrub than commercial timber. 3. Establishing any trees on the hill tops is very hard. 4. This is an upland productive forest – remember productivity. 5. Greatest potential to expand broadleaves is in the valleys.	1. A significant increase in the secondary conifer species has been planned to improve resilience and add visual diversity. 2. This has been recognised. 3. The timber line has been lowered in places to maximise volume return on investment. 4. Sitka spruce is the primary

		6. Opportunities for thinning are very limited (non-existent!) due to exposure. 7. CCF – there may be some limited opportunities but need to look at younger crops in lower valley bottoms and plan early e.g. early thinning would be beneficial. 8. Restocking of steep areas – need for cost-benefit analysis. Is it worth it? 9. Existing larch is not healthy – future options? Phytophthora policy.	species and makes up the largest proportion of the forest. All suitable land has been considered for productive conifers. 5. There is a significant increase in the amount of broadleaves in the valleys. 6. Agreed. 7. The cost-benefit balance between successful CCF and high operating costs in these remote blocks means that CCF will not be appropriate for this plan. In the long term there may be options in Corserig. 8. To maintain reasonable levels of productivity, steep ground working will be unavoidable in many locations. However, some particularly steep ground has been excluded from future productive planting. 9. All larch within the PR management zone is identified for early felling.
FD Harvesting Team: Colin Saunders, Andy Hutchinson, Ben Biddlecombe-Hall, Drew	19/05/17	1. Roads – avoid pinch points, i.e. coupes with small frontage for operations. 2. Roads running across steep slopes	1. This has been avoided wherever possible – only a couple of coupes have this

Rogerson		– awkward for machines moving up/down slope due to steep batter. Requires lots of ramps. 3. Haulage – consideration for neighbours. Policing HoV code of conduct – timing restrictions; low ground pressure tyres; number of lorries. 4. Diffuse pollution from roads. 5. Avoid leaving 'hanging' coupes. 6. Extraction methods – sky lining is the preferred method but is considerably more expensive than machines, and requires landing bays/processing areas. However, we should encourage this approach where possible to reduce ground disturbance and rutting. Need to be stricter with standing sales, and clarify expectations in contracts.	challenge. 2. The route of new roads has been carefully considered with FCE, with forwarder tracks helping with access. 3. This has been addressed in the plan. The HoV partnership / code of conduct are in place to address specific issues. 4. SEPA have also flagged this up as a significant issue. Some hotspots have been allocated broadleaves downslope of the road to improve filtering of diffuse sediment runoff. 5. The new coupe pattern avoids this problem. 6. Sky lining is advised as the most appropriate extraction method for steep coupes (particularly in Cairnhead and Shinnelhead).
FD Civil Engineering Team: Colin McEwan	19/05/17	1. Quarries –Mynwhirr Hill (Polskeoch), recently reopened; Well Hill (Euchanhead), currently leased to SPEN but quality of stone is just acceptable; Allan's Cairn (Polskeoch), poor quality; Shinnelhead, good quality stone; Cairnhead, excellent stone. Hard to	1. No new quarries have been identified in this plan. 2. This will be addressed through Planning and FCE liaison. 3. New roads have been kept to a minimum, with forwarder tracks planned as a substitute

		find consistent good stone in Upper Nithsdale, generally better in the south blocks. Potential expansion of some quarries in future. 2. Future planning – due to long lead in times for road construction it would be useful to look at road requirements >10 years, and even recce possible routes to include in LMP. This could allow us to request felling approval for corridor in advance / simplify prior notification process. Perhaps look at starting construction planning process 3 years in advance (FCE/Ops/Planning input). 3. Terrain in this area will always be challenging for road construction. 4. Conflicts with contractors/lease holders when working in windfarm/renewables sites (e.g. blame for diffuse pollution).	in some locations. 4. It is important that contractors are fully aware of the LMP and the precautions expected of them.
FD Estates Team: Chris Dickie, Bill Coombes	15/05/17	1. Scottish Water access rights in Corserig (reservoirs). 2. HoV agreement. 3. FES access rights – off public road past Kelloside Plantation; HoV links (x3). 4. Starter farm at Corserig. Tenant has access rights. 5. Euchanhead interconnector (SPEN) – servitude area to be determined. Substation will be popular with local energy producers looking to connect to the grid – potential for	1. No conflict. 2. Important to retain/enforce, especially as no other access options are currently available. 3. No conflict with LMP proposals. 4. No conflict. 5. The plan has been developed in light of existing renewables infrastructure. Future developments may require plan amendments/revision.

		future approaches for wayleaves. 6. Wham Rig (Fountains Forestry) – link to HoV road. 7. Wayleaves – several OH powerlines; water pipelines; water supply points; underground/overhead telephone lines present. New emergency services mast (Cairnhead). 8. Residents/neighbours with access rights – Blairoch (Cairnhead); Shinnelhead farm; Polskeoch bothy; field at Polskeoch; Polskeoch cottage; Hillend (through Corserig). 9. Potential future renewables projects – Wether Hill windfarm extension (Cairnhead); 'option' for further SPR projects through whole FES area. 10. Southern Upland Way – established through statutory order, responsibility of DGC. 11. Agricultural tenancies / grazing leases – various active agreements, and historical areas. Cairnhead tops grazings have recently come back in house.	6. No conflict. 7. These have been considered during the design of the future forest, to minimise disruption or damage. 8. No conflict with proposals of LMP. 9. Any future developments will require a revision of the plan. 10. Restock will be further away from the path thus avoiding windblow blockages. 11. Proposals have taken these into consideration.
FD Wildlife Team: Ronald Rose, Gordon Bevan	18/05/17	1. Blocks form part of Upper Nithsdale Deer Management Unit. 2. Species – Roe and Red. 3. Impact assessments for these blocks indicate low pressure. 4. Cairnhead, Shinnelhead, Polskeoch and Euchanhead all managed in	1. Noted 2. Noted. See 7 below. 3. Maintaining this will be a critical success factor for establishing broadleaves and soft conifers.

		house. 5. Corserig is managed under framework contract until 2018. When we take it back in house the problem will be the thicket crop ideal for cover. 6. Pressure from neighbouring land: Red - especially from the west (from Kyle/Carsphairn; Manquhill), also from Cruffel and small blocks of woodland to the north of Corserig. Roe – especially from Appin, also blocks adjoining Corserig. 7. Red deer can graze tubed broadleaves once they emerge. 8. Access tracks for extracting carcasses (especially for Red). These should be considered strategically in the LMP. We can't rely on neighbours' good will for access. 9. Deer lawns - need to be strategically located where pressures are greatest. Make use of open space and wider riparian zones. Tie in to access infrastructure. Target good soils (brown earths, surface water gleys) which will grow soft, sweet grass. Remember the deer are looking for – Safety, Sunshine and Food. Some good sites already exist – review, protect. 10. An increased planting requirement	4. This will assist with 3 above. 5. Noted. 6. See 7 below. 7. This has been addressed in the future species section of the plan, as significant damage from red deer grazing will prevent establishment as required. Deer fencing has been considered as an option for the large area of scots pine and broadleaves in the south west of Cairnhead. 8. The position of future broadleaves has been chosen with many factors in mind, but none more so than access for protection. Existing quad tracks will need to be supplemented with new sections where necessary. 9. Existing deer lawns have been retained, with new opportunities becoming available as restructuring of the forest continues. 10. This is paramount and must be given proper attention and resources if the plan is to

		in the next few years (as a result of large areas reaching maturity/being felled) highlights the need to address protection issue.	succeed.
FD Environment / Heritage Team: Bill Coombes, Tony Lightley	15/05/17	1. Potential for more broadleaves – especially large areas in valleys with connectivity up the stream riparian zones. 2. Consider the value of undertaking black grouse habitat work on the upland edges when numbers are low and lek sites a distance away – invest money in broadleaves and ponds instead? 3. Create series of large ponds in valley bottoms – biodiversity and flood mitigation. 4. Identify opportunities for wet woodland – maybe where conifers have been unproductive due to poorly drained ground. 5. No heritage designations. Some heritage features which should be considered (e.g. in Cairnhead - site of fortified house; lazy beds; cairns; sheepfolds; enclosures). Consider 'linking' features (i.e. with open space, broadleaves, lines of sight) to create context for their settings. 6. Consider potential areas for LTR to provide habitat for raptors (e.g. goshawk in Shinnelhead). Aim for something in most blocks.	1. This has been designed into the new plan. 2. Management of land to benefit black grouse has been targeted close to known lek sites where improvements are likely to have a significant effect. Many other management decisions will benefit the species, such as lowering of the timber line and low density planting on the top edges; creation of peatland edge woodland around Allan's Cairn; and open cleuchs with native woodland/scrub planting. 3. This is proposed in the plan – especially in Cairnhead. 4. Wet woodland will be created on the floodplain and flushed side slopes of the Dalwhat Water. 5. Particularly in Cairnhead, heritage features have been opened up, with sympathetic

		7. Ancient woodland – Glen Jaan Burn and Kello Water. Protect, enhance, expand? Restore PAWS site in Cairnhead? Look outside our boundary for connectivity opportunities. 8. Scrub line on upper slopes – opportunities to expand suitable montane species. Establishment challenges? 9. Black grouse – habitat improvements in Corserig (broadleaves, scrapes). 10. Juniper planting in Corserig not shown on scpt db. 11. Natterer's bat maternity roost in Cairnhead cottage and byre.	surrounding planting to enhance the setting. 6. LTR coupes have been identified to support viable breeding populations of raptors. 7. AW sites have been identified and will be connected to new native woodland planting. 8. See response to FDM. 9. These are retained. 10. Update required. 11. The roost will be protected. The plan continues to provide suitable feeding habitats for this woodland foraging species.
FD Recreation Team: Hugh McKay, Malte Iden, Neill Whitelaw	23/05/17	1. No FC recreation facilities in the blocks. No plans to create any. 2. Responsible public access is encouraged within the spirit of SOAC. 3. Striding Arches – still promoted locally/nationally as a visitor destination so ensure good walking access (SOAC) to each sculpture. Also consider lines of sight between them, and other locations where they may be visible (e.g. SUW). 4. Visitor zones – buffer around core paths and SUW classified as	1. Noted 2. Noted 3. Appropriate areas of open space have been left around the arches and along access routes to ensure good access and visibility. 4. The passive zone has been considered when designing the forests to improve visual diversity where appropriate. 5. This should be done in conjunction with the

		'interactive zone'. No currently designated 'passive zones' (key views/backdrops from trail) but consider potential opportunities. 5. Cairnhead – review legacy of CCFT projects (signs, structures) and consider preferred options (new FC orientation board?) 6. Southern Upland Way (SUW) – design coupe edges and open space to avoid future windblow problems and enhance visitor experience (species diversity, internal/external views, open space/sunlight). 7. Avoid sanitised parallel corridors along interactive zones. 8. Polskeoch bothy – improve views towards Lorg Hill and Polskeoch Burn; design in more broadleaves and open space around bothy and along Water of Ken. 9. Avoid creating any unnecessary duty of care (e.g. actively encouraging visitors out with the existing interactive zones).	resurrected CCFT group. 6. Internal and external views have been considerably enhanced. Coupe edges have been pulled back from the route to minimise problems with windblown trees. 7. As above. 8. This has been done. 9. Noted. Nothing proposed within the plan will hamper this. Access under SOAC is the preferred approach.
FD Communities Team: Bill Coombes, Lesley Smith	15/05/17	1. Anti-social behaviour in Corserig – unofficial boardwalk and building; fires; unauthorised vehicles; fly tipping; firearms; vandalism. 2. Consider how north edge of Corserig provides back drop for residents in Kelloholm and Kirkconnel. 3. Design north edge of Corserig to	1. Noted. 2. Noted. 3. The north edge will comprise Sitka spruce for productivity; however there may be opportunities here to thin the crop to create more open

		address points 1 and 2 above (diverse open woodland?) 4. Cairnhead – although the Cairnhead Community Forest Trust was very active here in the past, there has been no interest in recent years. Maintain potential for future community engagement if there is staff capacity and local interest. 5. Striding Arches – ensure access to the arches. Maintain forest road between end of public road and barrier to a high standard (currently very rough and pot holed). 6. Flooding concerns – there has been engagement with communities in Moniaive, Penpont and Tynron to discuss the impact of our land management on local flooding episodes (perception vs reality/ anecdotal vs scientific). This needs to be seriously considered in the LMP process.	woodland. 4. Recent local meetings to re-establish CCFT may allow more engagement in the future. 5. See Recreation. 6. See section on Flooding.
FES Landscape / Planning: Alison Grant	19/07/17 (site visit to Cairnhead)	• Access to main road - 12 miles. Consider investment vs return. • What is 'production' here? • Consider visitor experience - 'welcome entrance' to valley, views along road and from byre - passive zone (key views / backdrop). Also, interactive zones along SUW and	All of these observations / suggestions guided the analysis and concept stage.

		core paths. • Lower edge on right (as entering) poorly related to landform. • Design smaller coupes along lower glen slopes, larger coupes on upper slopes and summits. • See annotations for coupe shape/size ideas. Note use of spurs, breaks of slope, open space, contours, access considerations. • Lower slopes provide - buffer for water run-off; setting for valley floor; shelter for farmland. Potential options: 1. Bold blv fringe. Pros - biodiversity/buffer/long-term reduced management. Cons - deer management/internal access/reduced conifer productivity. Risks - failure to establish/political. 2. Diverse conifers and blvs. Possibly requiring thinning (CCF). 3. SS in smaller coupes with wind firm rides, and some blvs.	

		• Is road access required to achieve these? • Consider roading access as an 'investment' to achieve future forest management requirements (e.g. CF, CCF, thinning). • Relationship between valley land (flat, grazed, sheltered) and forest boundary is a key issue. Objectives include continued management of priority open habitats, and expansion of blvs in valley to extend habitat range and diversity. • Byre - take out mature trees on right to open up site (would have been good to do it with recent felling). • Two areas left above recently felled coupes - how are we planning to access them? • Would be useful to map winch ground (Perhaps: >35% Definitely: >45%) and poor growing crop (<YC8).	
FES Native Woodland Ecologist: Richard Thompson	03/08/17 (site visit	See Richard's separate notes. Main points:	See section on Native Woodland

	to Cairnhead)	• Priority for native woodland expansion is definitely in the valley bottom along the Dalwhat Water and up major tributaries such as the Glenjaan Burn, Dibbin Lane and Ramscleuch. Establish this as a seed source for future natural regeneration. • Scope to do something bold along the western slopes above Benbuie. • The upper forest margin … provide[s] the best scope for treeline woodland to develop as there is minimal vegetation competition. However, resources should be prioritised in valley bottom /cleuchs. If conifer edge is lowered, plant patches of broadleaves in accessible locations. Species suggestions: Dry - Downy birch; very dry - Rowan; wetter - eared willow. Also see full notes. • The acid grassland could be planted … [and] would help to increase the water holding capacity and help reduce the risk of flood events.	

Appendix III: Tolerance Tables

	Maps Required (Y/N)	Adjustment to felling period *	Adjustment to felling coupe boundaries **	Timing of Restocking	Changes to Restocking species	Changes to road lines	Designed open ground ** ***	Windblow Clearance ****
FC Approval normally not required	N	• Fell date can be moved within 5 year period where separation or other constraints are met.	• Up to 10% of coupe area.	• Up to 3 planting seasons after felling.	• Change within species group e.g. evergreen conifers or broadleaves.		• Increase by up to 5% of coupe area	
Approval by exchange of letters and map	Y		• Up to 15% of coupe area	• Between 3 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 > 60m in either direction from centre line of road	• Increase by up to 10% of coupe area • Any reduction in open space of coupe area by planting.	• Up to 5ha
Approval by formal plan amendment may be required	Y	• Felling delayed into second or later 5 year period. • Advance 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.	• In excess of 10% of coupe area. • Colonisation of open space agreed as critical.	• More than 5ha.

NOTES:

* Felling sequence must not compromise UKFS, in particular felling coupe adjacency

** *No more than 1ha, without consultation with FCS, where the location is defined as 'sensitive' within the Environmental Impact Assessment (Forestry) 1999 Regulations (EIA)*

*** *Tolerance subject to an overriding maximum 20% open space*

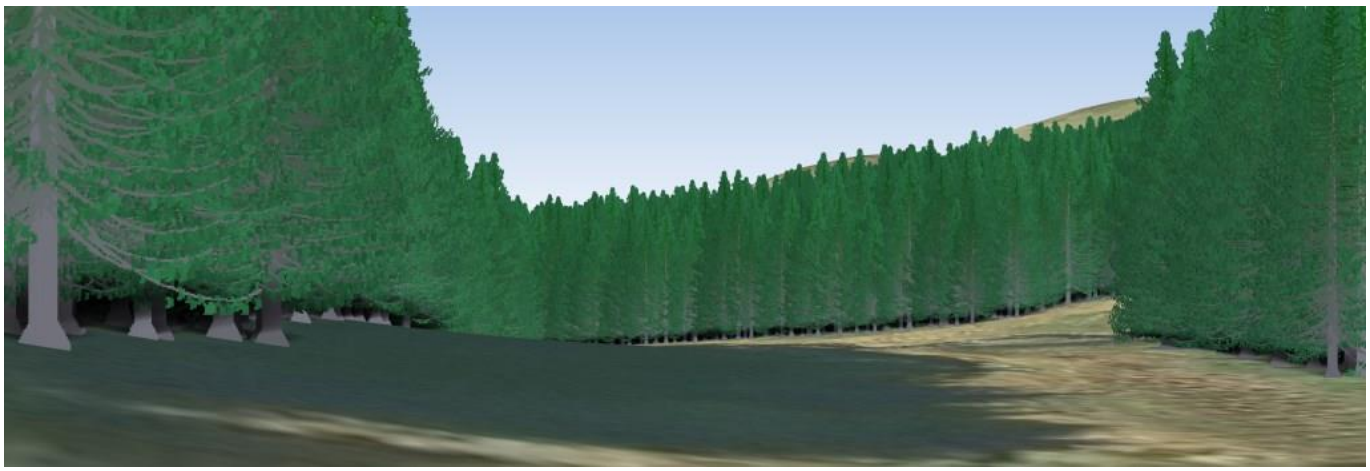
**** *Where windblow occurs FCS should be informed of extent prior to clearance and consulted on where clearance of any standing trees is required*

Table of Working Tolerances Specific to Larch within the Infected (Management) Zone

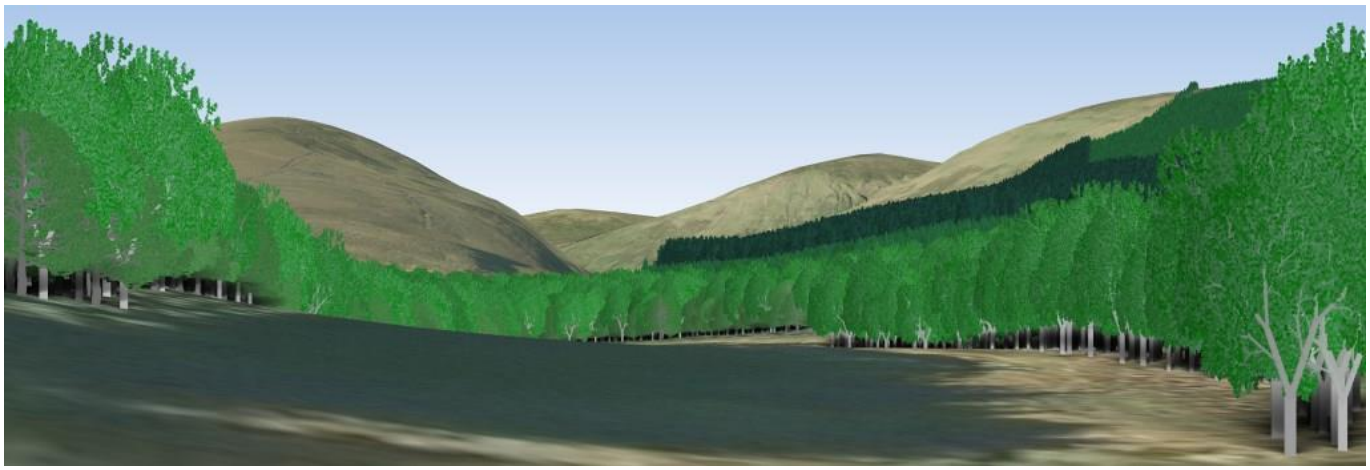
	Adjustment to felling period	Adjustment to felling coupe boundaries	Timing of restocking	Changes to species	Changes to road lines
FC Approval not normally required	Fell date for all larch can be moved and also directly associated other species	Larch areas can be treated as approved coupes. Other conifers directly associated with larch being felled, may also be removed up to an equivalent of 20% of the area occupied by the larch or 5ha, whichever is greater	To be undertaken within the overall plan approval period.	Replacement as per the agreed restock plan, but where this is not specified or is larch this may be replaced with either another diverse conifer (not SS) or Broadleaves.	
Approval normally by exchange of letters and map. In some circumstances Approval by formal plan amendment may be required		Removal of areas of other species in excess of the limits identified above.	Restocking proposals outwith the plan approval period.	Restocking proposals for other species which do not meet the tolerances identified above.	New roadlines or tracks directly necessary to allow the extraction of larch material.

Appendix IV: 3D visualisations

View from Polskeoch bothy (summer)
NS68560186

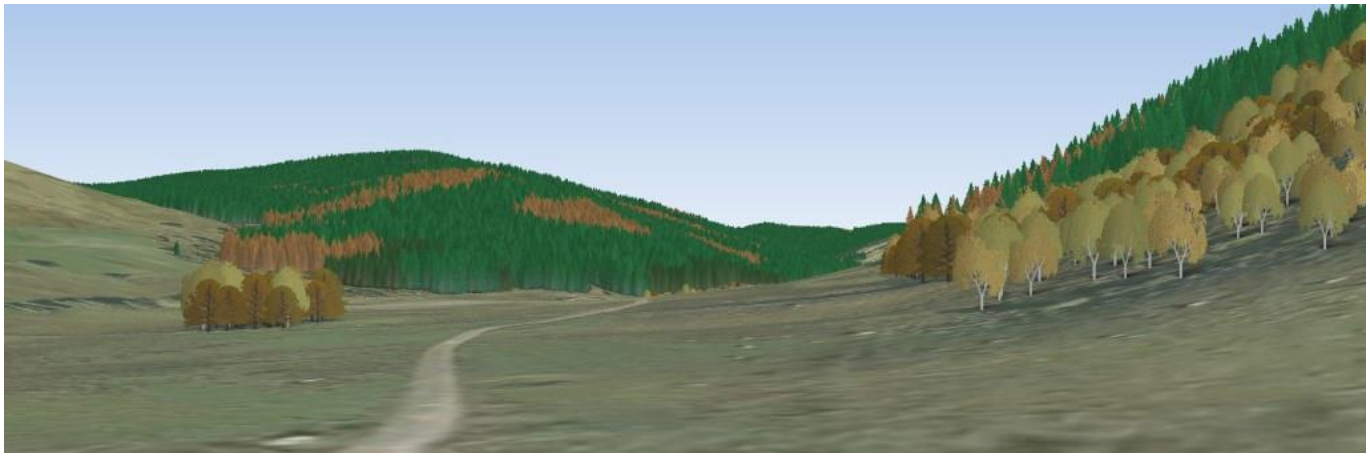


2018

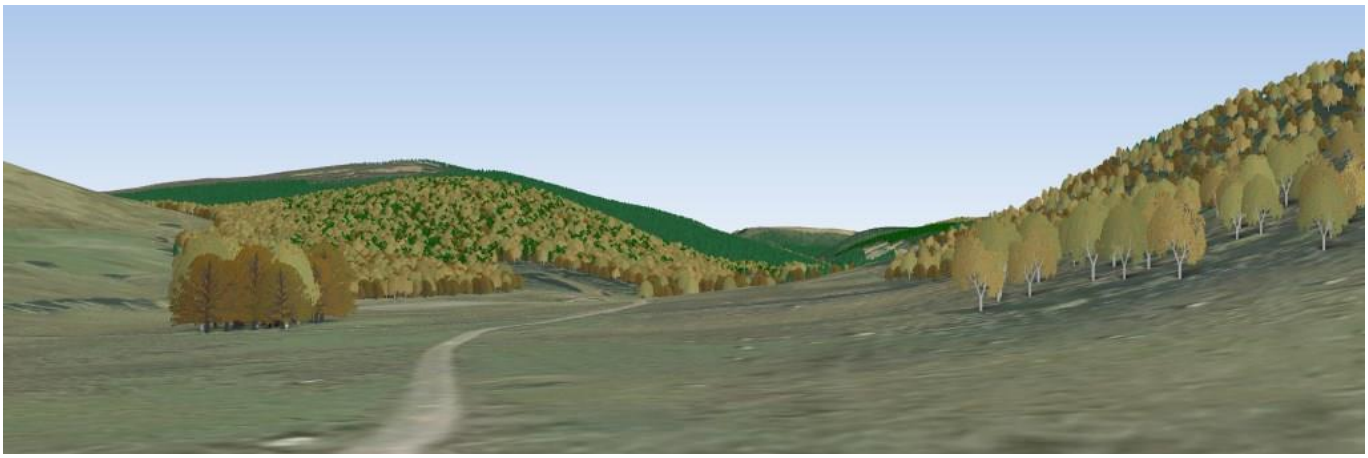


2050

Approach towards Cairnhead (autumn)
NX71929443

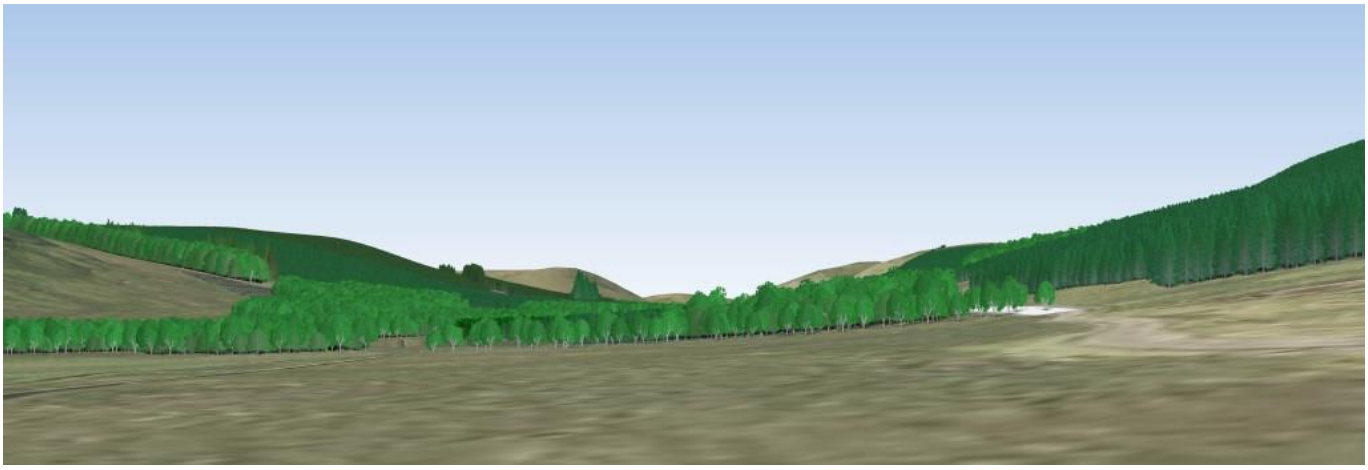


2018

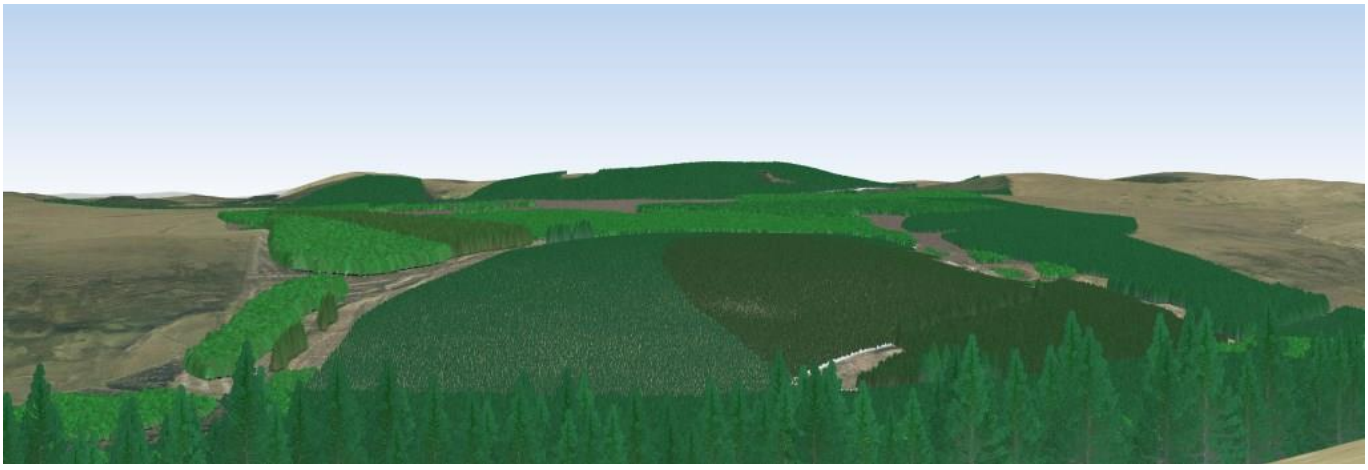


2050

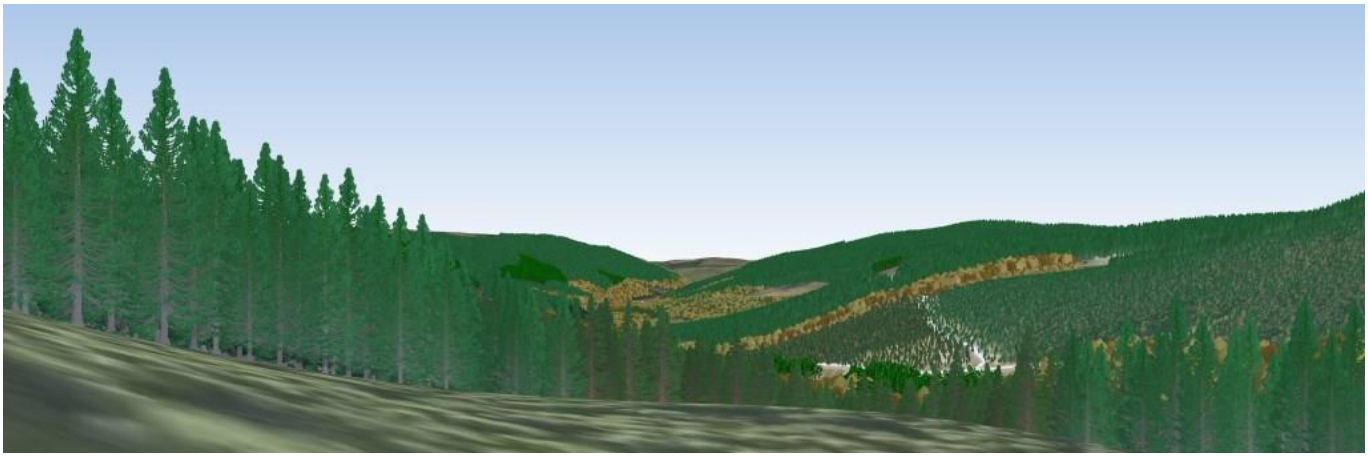
Approaching Polskeoch from the east on the Southern Upland Way near Dalgonar (summer 2050)
NS69960302



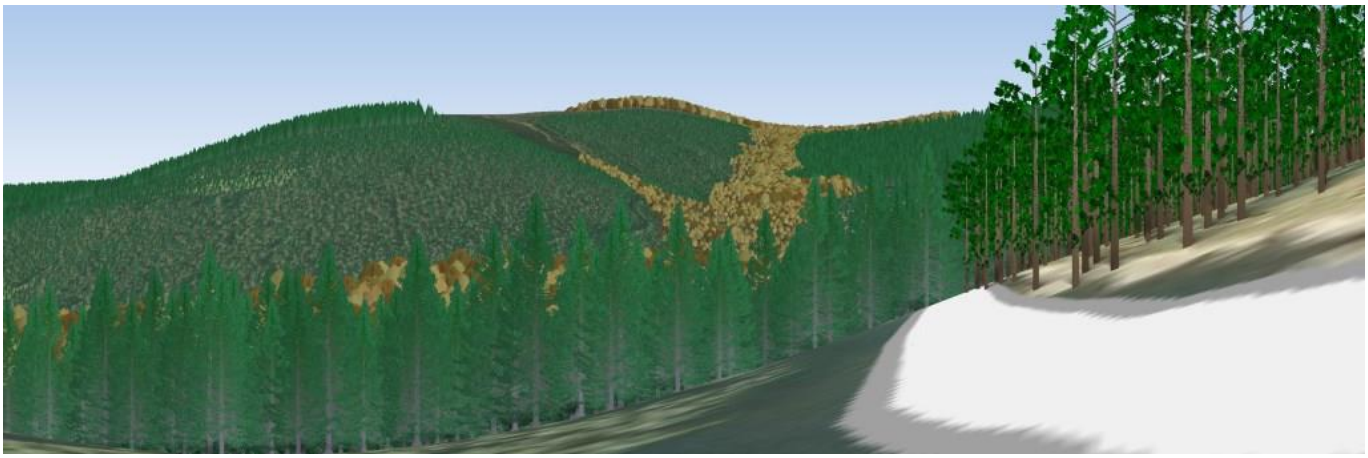
View from the top of Carnine in Polskeoch (summer 2050). Peatland edge woodland visible in the middle-distance
NS68800303



Views from roadside viewpoint on Black Hill in Cairnhead (autumn, 2070)
NX69099794



Looking down the Dalwhat Glen



Looking towards Benbrack with native broadleaves in the riparian corridors merging up the hill into new mountain woodland

View towards Martour Hill in Cairnhead (summer 2070). New wet woodland running down the valley.
NX70229711