Forestry Commission Scotland
Coimisean na Coilltearachd Alba

Planning

Cowal & Trossachs Forest District

West Strathyre

Land Management Plan

Plan Reference No: LMP1/2017

Plan Approval Date: 25th July 2017

Plan Expiry Date: 25th July 2027

FOREST ENTERPRISE - Application for Land Management Plan Approvals in Scotland

Forest Enterprise - Property

Forest District:	Cowal & Trossachs Forest District
Woodland or property name:	West Strathyre
Nearest town, village or locality:	Callander
OS Grid reference:	NN 554146
Local Authority district/unitary	Stirling Council/LLTNP

Areas for Approval	*Conifer Ha*	*Broadleaf Ha*
Clear felling	*115*	
Restocking/Underplanting	*115*	*148*
Selective Fell	*467*	
Natural Regeneration		
New Planting		

Note: restock includes areas felled under previous Plan

1. I apply for **Land Management Plan** approval*/~~amendment approval~~* for the property described above and in the enclosed Land Management Plan.
2. * I apply for an opinion under the terms of the **Environmental Impact Assessment (Forestry) (Scotland) Regulations 1999 for afforestation/road building*/ quarries*** as detailed in my application.
3. I confirm that the initial scoping of the plan was carried out with FC staff in 2016
4. I confirm that the proposals contained in this plan comply with the UK Forestry Standard.
5. I confirm that the scoping, carried out and documented in the Consultation Record attached, incorporated those stakeholders which the FC agreed must be included.
6. I confirm that 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.
7. I undertake to obtain any permissions necessary for the implementation of the approved Plan.

Signed .....
Forest District Manager

District Cowal & Trossachs

Date.....6th February 2017.....

Signed.....
Conservator

Conservancy Perth & Argyll

Date of Approval 25/7/17

Date approval ends: 25/7/27

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Summary of Proposals

The Land Management Plan (LMP) area extends to 2915Ha running along the western side of Strathyre (Stirlingshire) from near Callander in the south to near Balquhidder in the north. The LMP area includes the full sweep of the western slope of the Strath rising from 77m at the Pass of Leny to 879m at the summit of Ben Ledi.

While Sitka Spruce dominates on the upper slopes there is a diversity of conifer species on the lower slopes and significant areas of mature Native Broadleaves (NBL). Age class is diverse & much of the woodland on the lower slopes is under Continuous Cover Forestry (CCF) management.

As part of the LMP process, an assessment of the CCF suitability of the site has been carried out to take soils, exposure, slope, access and current crop into account. This assessment indicates suitable soils and exposure levels across a significant proportion of the forest. Slope is a constraint across many areas, however the good road network and the desire to stabilise slopes using CCF means that many of these steeper areas can be managed as CCF.

View across Southern Section of LMP from Ben Ledi path looking towards Callander.

The forest lies within the Loch Lomond & The Trossachs National Park (LLTNP) & the Queen Elizabeth Forest Park, and has a high visual & amenity impact. Other designations include the Pass of Leny Flushes SSSI within the plan area and the Loch Lubnaig Marshes SSSI & River Teith SAC that lie adjacent to the plan area.

There are two small areas of low ground pasture that are under agricultural grazing lets, but otherwise there are limited interactions with adjacent agricultural enterprises, although march stock fencing and sheep trespass are a consideration. To the north the forest has common boundaries with three substantial areas of commercial conifer woodland and to the south the boundary areas include elements of native woodland creation and commercial conifer woodland.

There are two small hydro schemes with catchments within the plan area.

The proposed management under the LMP builds on the approach adopted under the previous two plans, with restoration of PAWS (Plantation on Ancient Woodland Site) and CCF management being priorities. In addition to timber production, CCF management and an expansion of NBL can deliver multiple benefits including enhanced: landscape, biodiversity, slope stability, structural diversity & product diversity.

Maintaining & increasing species diversity are also priorities in terms of climate change & ecosystem/economic resilience. The site can support a wide range of species across the ecocline, however ESC modelling for species selection can lead to a diminished species palette.

Landscape & recreation are key considerations throughout the plan process, and these are balanced against the objective of maintaining a productive forest.

Change in Forest Area including only Integral Open Ground

Species Group	% cover @ 2017	% cover @ 2050	% Change
Native Broadleaves	12%	30%	18%
Mixed Conifer	18%	26%	8%
Sitka Spruce	48%	30%	-18%
Open Ground	22%	14%	-8%

Note: Felled areas awaiting restocking allocated as SS. Other Land (excluded) is estimated at 854Ha. Native Broadleaves includes a very small element of beech at around 0.2%

Note: Open hill ground is defined as those compartments containing only open ground.

Extensive establishment of upland Birch woodland is proposed, however because of the slow growing nature of the current crop on, and adjacent to the target areas, then most of these areas are proposed for action outside the plan period.

Planned operations	2016 – 2025 plan period
Felling	115Ha
Thinning	467Ha
Restock	263Ha
Road Construction	425m
Track Construction	11002m

Note: Restock area includes areas already felled & awaiting restocking (110Ha). It includes areas of integral open ground planted as part of restructuring (38Ha). It excludes areas of designed open ground included as part of the restructuring.

Significant environmental features/proposals	
Designated Sites	Pass of Leny Flushes SSSI Loch Lubnaig Marshes SSSI River Teith SAC
Woodland Creation	Potential establishment of W4/W17/W18 type woodland within the Stank Glen area utilising Scots Pine where site conditions allow. Longer term extension of NBL on upper margins.
Creation of montane native woodland and wider native woodland linkages.	Creation of native woodland at high elevations on areas of open ground and targeted former conifer restocks. Creation of linkages between PAWS areas utilising riparian woodland. Creation of NBL non-intervention areas on steep slopes unsuitable for CCF and vulnerable to slippage.
PAWS Restoration	Continuation of work initiated under the previous plan, with the focus on areas linked to the Pass of Leny Flushes SSSI & areas of existing mature native woodland
Continuous Cover Forestry (CCF)	Evaluation of CCF based on current stock, windblow, higher resolution soil survey data, slope and exposure. The objective being to maintain and expand the CCF

	area where possible
Windblow clearance	Continue clearance operations and link to CCF assessment.

Critical Success Factors:

- Continuous Cover Forestry (CCF) is a cornerstone for delivering multi-purpose forestry within the plan area. The presumption is that CCF areas will be maintained or expanded where possible. The critical success factors for CCF are considered in the following bullet points.
- CCF: Build on past management.
- CCF: Evaluate current crop in relation to stability. This relates to both mature areas and young crops with a delayed first thinning.
- CCF: Utilise new soil survey data, DAMS & slope GIS data to evaluate potential for CCF.
- CCF: Link theoretical suitability to actual stand characteristics and windblow distribution.
- CCF: Link CCF proposals to neighbouring land management proposals (new woodland creation in the south and clearfelling/restocking in the north).
- CCF: Consider & monitor current regeneration levels and species diversity in any regeneration, and implement active management to achieve objectives for specific areas.
- CCF: Continue to control deer numbers and utilise stock fencing in cooperation with neighbours to reduce sheep trespass.
- CCF: Consider deer fencing of LISS areas depending on stand lifecycle and monitoring outcomes.
- Maintain and enhance landscape value in particular with views related to Loch Lubnaig & the A84. This will require a sensitive approach to correcting landscape issues that reflects the reality of steep isolated slopes and the difficulty of intervention on these sites.
- Retain the productive capacity of the forest while balancing other factors.
- Clear accessible windblow to utilise a productive resource/site and enhance amenity/landscape.
- Retain current species diversity on the lower slopes and expand this on the upper margins where appropriate using predominantly Birch(BI) woodland & targeted Scots Pine (SP)with a wider range of broadleaved species in riparian linkages and on the lower slopes.
- Continue to work with partners to enhance the riparian environments for water quality and fish ecology with the emphasis on the River Teith SAC and the associated key species including Lamprey, Fresh Water Pearl Mussel (FWPM) & Salmon.

- Work constructively with local community initiatives to enhance recreational routes as opportunities arise. Given budgetary constraints these initiatives are likely to require external funding.
- Monitor Invasive species in particular Rhododendron, Giant Hogweed, Piri Piri Burr & Japanese Knotweed and control as required.
- Protect public & private water supplies within the forest.
- Monitor disease impacts in particular Dothistroma Needle Blight (DNB) and its impact on species selection within new native woodlands on the upper margin & in the Stank Glen.
- Seek to improve the water quality status of failing water bodies where this is impacted by forestry management.
- Protect and enhance the setting of Archaeological sites.

Consultation & further Information

During the development of this plan we have consulted with the local community and other stakeholders. For further information on the plan please contact:

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1.0 Introduction:

1.1 Setting and context

This Land Management Plan covers the forest areas of Strathyre South & Strathyre West with the amalgamated Land Management Plan (LMP) area now known as West Strathyre (2915Ha)

This plan covers the operational proposals for the next 10 years of a rolling 50 year plan.

Past management activity has created a diverse forest with a significant area managed as Continuous Cover Forestry (CCF). This diversity relates to species, age class and stand structure within the CCF areas.

CCF stands west of Strathyre village.

The underlying geology is largely metamorphic with the Highland Fault lying just to the south of the plan area.

The forest is well served by the current forest road network. A new forest road spur is required within Compt 6054 to facilitate Phase 1 felling. Other areas of younger crop not yet served by the forest road network will require roading outwith the immediate ten year plan period. The extensive existing road network facilitates CCF management which would otherwise be constrained in places by steep slopes.

The main access points from the public road include: Stronvar (NN534192); North of Strathyre (NN559178); South of Strathyre (NN556162); South of Loch Lubnaig (NN587092) & from the A821 west of Kilmahog.

Large areas of the site fall into low wind categories indicating that wind poses a low threat to the long term stability of the crop. Continentality is low. Temperature and climate wetness are favourable for tree growth at lower altitudes, less so at higher altitudes. Climate change predicts drier summers and wetter winters, but there will be more warmth and windier conditions.

The soils across the site are variable and on the lower and mid slopes comprise soils ideally suited to timber production and a wide range of species. These include brown earths & podzols with areas of gleyed soils & ironpans. Areas of peat & bog are limited. It should be noted that the soil survey data reflects the focus for the survey being directed towards the areas with potential for continuous cover, with survey data on the upper slopes having a lower resolution and accuracy.

Callander & the Pass of Leny on the A84 acts a gateway into the more mountainous part of the National Park & the entry point into the Queen Elizabeth Forest Park. The A84 is a major tourist route, and for many tourists the views along Loch Lubnaig are their first experience of Scotland's Highland landscape. The two car parks along Loch Lubnaig are very heavily used and consequently the LMP area with the Loch in the foreground is the focus for the individual visitors aesthetic experience and the photos they take to record their experience. Social media of course increases the impact and significance of landscape photos by vastly increasing the number of people experiencing the view along with the photographer; and this must have a significant positive impact economically in terms of encouraging other visitors.

The LMP area also has a high visual impact on recreational users both within the LMP area and from surrounding hills. The recreational infrastructure within the LMP includes the National Cycle Network Route 7, the Ben Ledi hill path, other core paths around Strathyre & the Forest Holidays Lodges on Loch Lubnaig.

The main environmental designations that impact on the LMP area are: the Pass of Leny Flushes SSSI (within the LMP area); the Loch Lubnaig Marshes SSSI (adjacent to the LMP) & the River Teith SAC (mainly adjacent to the LMP area but small areas of the Calair Burn lie within the LMP).

Areas identified as Ancient Semi Natural Woodland areas on the Ancient Woodland Inventory occur as discrete blocks along the lower margin of the LMP area. Many of these areas carry mature native woodland, and under the current plan Plantation on Ancient Woodland Sites (PAWS) located around the Pass of Leny Flushes SSSI have been clearfelled to facilitate regeneration of these areas. The PAWS areas north of Loch Lubnaig are potentially suitable candidates for fairly rapid restoration. The two PAWS areas on Loch Lubnaig have a very high landscape impact and a more gradual restoration here retaining some mixed conifers to create landscape diversity is desirable.

In addition to a varied but sporadic cover of W7,W9, W11 & W17 woodland there are areas of Juniper generally associated with the proximity of the two SSSIs. While broadleaved cover is developing along the Loch shore, linkages between the ASNW areas are limited.

Hill ground on Ben Ledi.

The open hill is recovering from a long history of sheep & deer grazing, with the flora constrained by this past management. Deer numbers have been reduced from average historical levels and sheep numbers are much reduced with marauding sheep from the north continuing to have an impact.

A range of iconic and important species occur across the forest including Red Squirrel, Otter, Pine Marten, Peregrine and Black Grouse. Black Grouse are generally located on adjoining open land areas, although the forest margin contributes to their habitat.

Red and Roe deer occur across the forest. Deer management has facilitated regeneration of a range of tree species across many parts of the forest managed as CCF. Positive impacts are apparent on the lower slopes, with regeneration tending to diminish with elevation and seclusion.

Neighbouring land uses include commercial forestry, hill farming & conservation management. Sheep trespass has been an ongoing problem across the forest. No opportunities have been identified for agricultural integration at this stage.

A range of unscheduled ancient monuments occur across the site with the Pass of Leny area having the highest concentration of features (although this distribution may reflect intensity of survey rather than past activity).

All operations will be carried out to the internationally recognised forestry standards as required under UK Woodland Assurance Scheme (UKWAS) and Forest Stewardship Council (FSC). All management proposals and implementation will meet the UK Forestry Standard.

This woodland is part of Cowal & Trossachs Forest District and is certified by the Forest Stewardship Council (FSC). Certified woodlands are subject to regular audit by an independent audit body against the requirements of UK Woodland Assurance Standard (UKWAS). UKWAS is the independent certification standard for verifying sustainable woodland management in the UK.

1.2 History of the site

The OS 6 inch maps (1888 – 1913) show dense enclosed woodland on both sides of the Pass of Leny; scattered unenclosed areas of broadleaves along Loch Lubnaig and smaller discrete and enclosed plantation blocks along the lower slopes north of Strathyre.

The open ground areas were historically farmed utilising hill cattle & sheep. The unenclosed woodland along Loch Lubnaig was likely to have been grazed woodland.

The current forest schedule demonstrates the very wide range of planting dates present (Map M3), with broadleaved areas dating from 1845, large areas of native broadleaves dating from 1910 and significant areas of mature mixed conifers planted during the 1930's & 1940's.

Restructuring under previous plans has been ongoing since 1984 with wide areas of second rotation crops and significant woodland expansion.

1.3 Planning Context

The management of the Forestry Commission Scotland's NFE (National Forest Estate) is guided by Scottish Forestry Strategy (SFS) 2006, which sets out seven key themes:

- **Climate change**
- **Timber**
- **Business development**
- **Community development**
- **Access & Health**
- **Environmental quality**
- **Biodiversity**

The principles within the Forestry Commission & Cowal & Trossachs District Strategic Plan will be followed and these in turn relate to the National Strategic Plan for Forestry Commission Scotland 2013 – 2016. The six aspirations are listed below.

Healthy – achieving good environmental and silvicultural condition in a changing climate
Productive – providing sustainable economic benefits from the land
Treasured – as a multi-purpose resource that sustains livelihoods, improves quality of life, and offers involvement and enjoyment
Accessible – local woodlands and national treasures that are well promoted, welcoming and open for all
Cared for – working with nature and respecting landscapes, natural and cultural heritage
Good value – exemplary, effective and efficient delivery of public benefits

Specifically in relation to the LMP area the opportunity to contribute towards these aspirations are:

Healthy: Potential for productive broadleaves from the expanded NBL areas, and maintenance of species diversity on the mid and lower slopes. Maintain & expand the area of Continuous Cover Forestry (CCF). Control of invasive species. Protection of drinking water quality. Flood management and slope stability enhancement.

Productive: Minimise disruption to public road system via partnership working. Provision of renewable energy. Production of high quality timber. Increase productive broadleaved area. Facilitation of tourism businesses.

Treasured & Accessible: The forest environment, forest trails, core paths & the Sustrans Cycle Route facilitate recreational access and wildlife spotting opportunities for a wide range of visitors & residents.

Cared for: Protect and expand NBL buffer around the Pass of Leny Flushes SSSI. Create wider network of NBL linkages connecting the ASNW areas including areas adjacent to the Loch Lubnaig Marshes SSSI. Create upland native woodland with a strong pine element on appropriate sites. Protect and consider expansion of Juniper habitat. Maintain water quality within the River Teith SAC by following the UK Forestry Standard (UKFS).

Good Value: Facilitate the production of renewable energy via hydro. Increase the efficiency of timber transport and reduce impacts on the public road system. Continue to manage the deer population to ensure effective establishment of planted trees and enhancement of habitats, as well as creating an income from venison production.

The plan follows the UK Forestry Standard (UKFS), and has used aspects of the guidelines listed below as appropriate in the planning process.

Forests & Biodiversity Guidelines
Forests & Climate Change Guidelines
Forests & Historic Environment Guidelines
Forests & Landscape Guidelines
Forests & People Guidelines
Forests & Soil Guidelines
Forests & Water Guidelines

The following codes of practice will be adhered to during implementation of the plan.

Managing Health and Safety in Forestry
The UK Pesticide Guide
The Use of Herbicides in the Forest
Road Haulage of Round Timber Code of Practice
COSSH in Forestry
FC Protected species guidance notes: 31, 32, 33, 35,35c,

2.0 Analysis of previous plans

The two Forest Design Plans covering the LMP area ran for the following periods. Strathyre South: 2004 to 2013. Strathyre West: 2004 to 2013.

Extensions & amendments have been secured as required for ongoing forest management, mainly in response to windblow.

The previous plans have achieved an extensive restructuring of the forest which has increased resilience and increased landscape and ecological diversity. The main themes in each plan are continued in the current plan, these being:

- Maintain & expand the continuous cover area.
- Build native broadleaved linkages along the Loch shore and riparian zones to link and restore PAWS areas and ASNW fragments.
- Create upland native woodland areas with Scots Pine on appropriate sites on the upper margins.
- Maintain the productive capacity of the forest with the emphasis on quality timber production.
- Maintain and enhance the forest landscape.
- Maintain & enhance the recreational contribution of the forest subject to available budgets.

Most of the proposed road upgrades and extensions have been implemented, and the forest is well roaded.

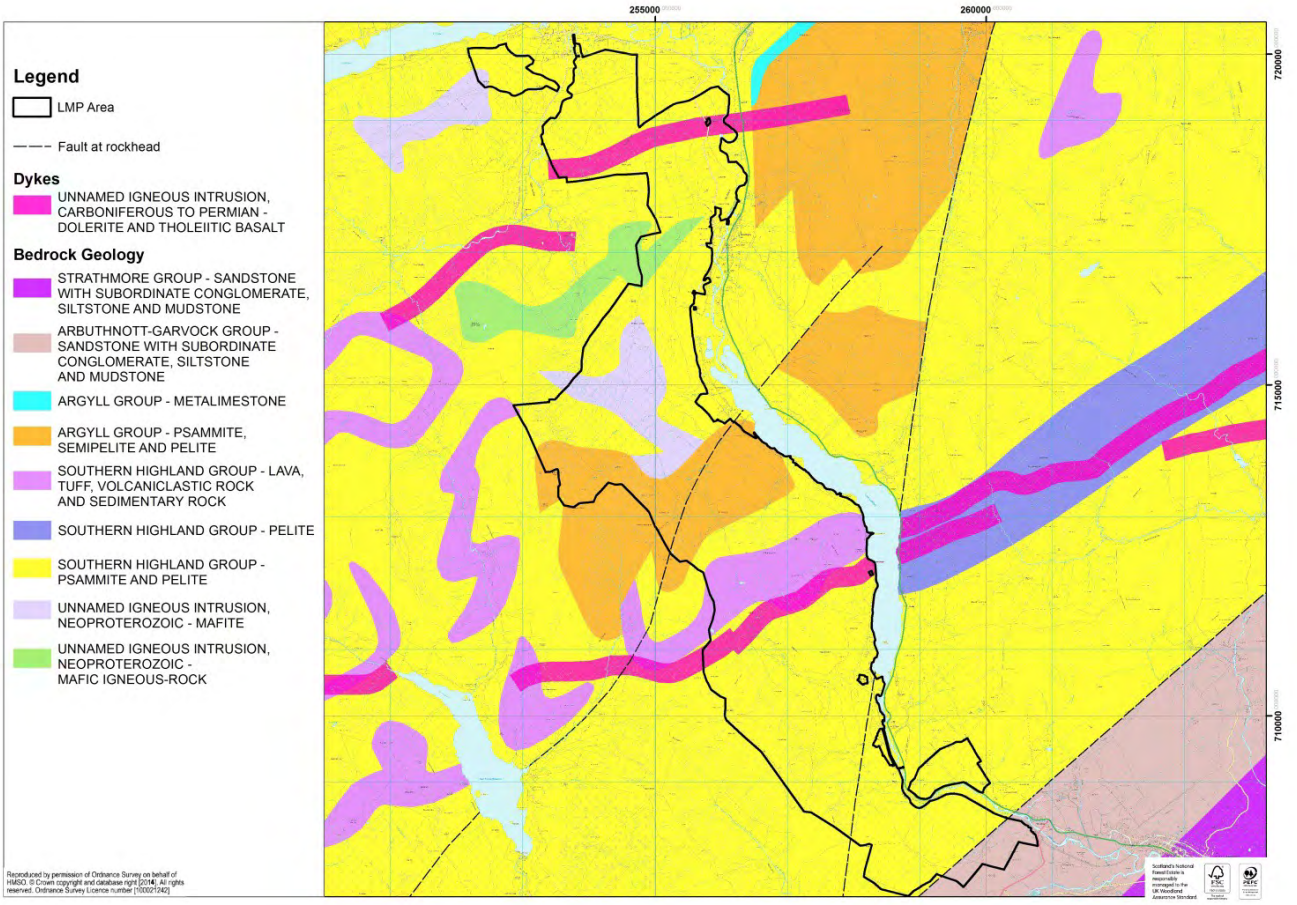
Windblow has had an impact on some areas, and some areas of CCF around the neighbouring Stronvar block will require clearfelling. The purpose of this is to both clear the windblow and match felling activity with neighbouring plans to reduce adverse landscape impacts. The scale of these proposed remedial clearfellings is small and could be considered analogous to large group fellings under CCF.

In summary the previous felling and restocking plans have been largely implemented, particularly with regard to CCF management. Windblow has had a negative impact on the current forest plans by requiring larger felling coupes, mainly at the southern end of the LMP area.

3.0 Background information

3.1 Physical site factors

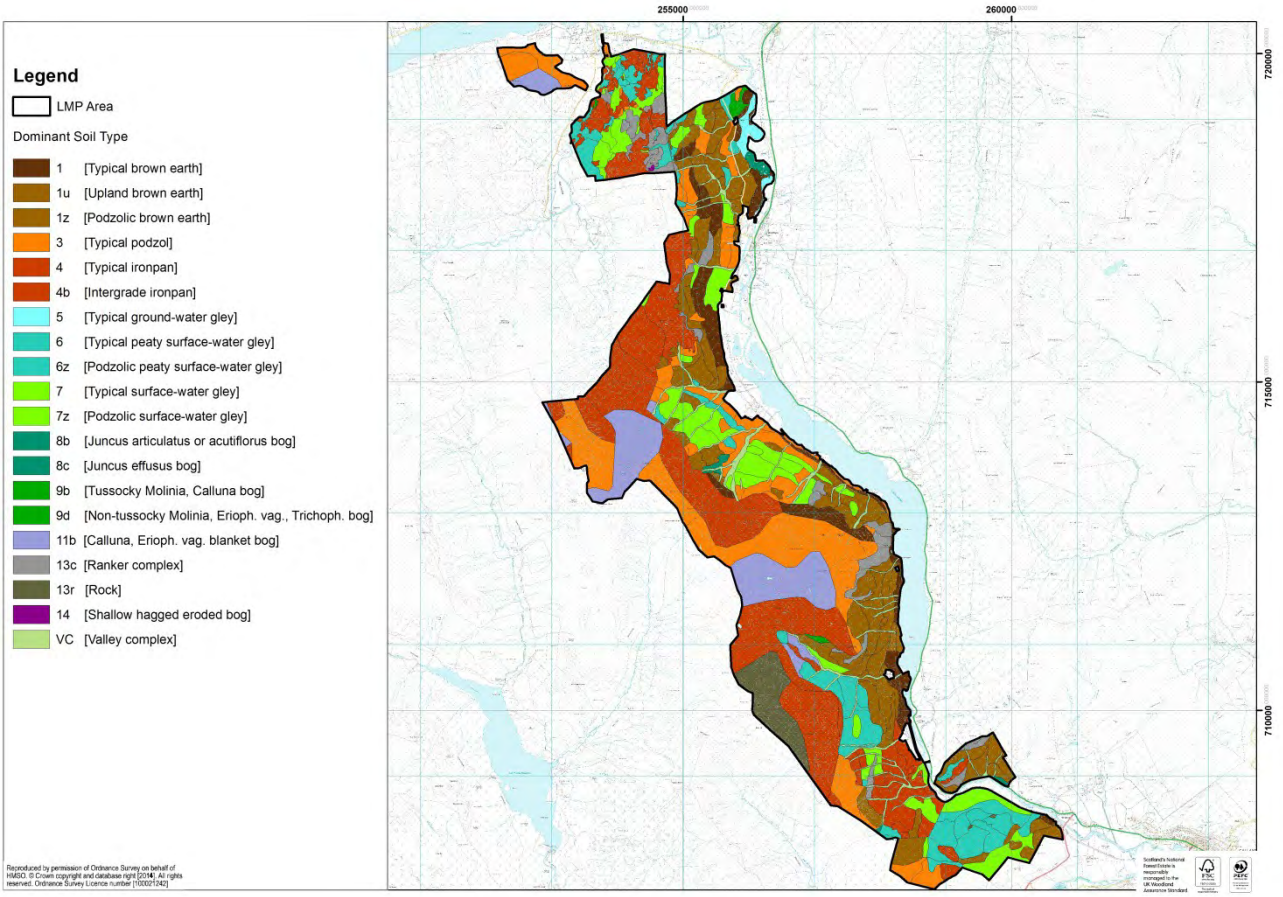
3.1.1 Geology Soils and landform



The underlying geology follows the grain of the Highland fault to the south, with a more complex geology over the northern part of the LMP area.

The dominant soils (see map below) are brown earths, podzols & gleys, all of which provide scope for productive forestry and a wide range of commercial species. Rooting depth is generally good except over rankers and in some of the wetter gleys. The wetter gleys are often located on more accessible gentle slopes that would otherwise be ideal for CCF. The reduced rooting depth under gleys is a significant constraint to CCF because it increases the risk of windblow; soil damage from CCF is also more likely to occur on wetter soils. Site amelioration via pre planting drainage including interception drains can reduce the adverse impact of gleyed soils, but consideration needs to be given

to the potential impacts on slope stability and water quality or intercepting and altering drainage patterns significantly.



3.1.2 Water

See map M8.

Water Course	Status	Cause
Calair Burn	Moderate.	Not identified.
River Balvag	Good	None
Loch Lubnaig	Moderate	Barriers to fish migration.
Garbh Uisge/River Leny	Good	None

The two operational hydro schemes within the LMP area have a very limited impact, being located on minor water courses with steep slopes limiting the potential for upstream fish migration.

Water quality across the site is generally good. Landslips during periods of exceptional rainfall have occurred in places in the northern half of the forest, these have been largely controlled by forest cover.

The River Teith SAC is considered in section 3.2 below.

Community hydro scheme in the Stank Glen.

3.1.3 Climate

The current climate is classed as Warm Moist on the lower slopes grading to Cool Wet on the upper slopes; Continentality is low. The Soil Moisture Regime is classed as slightly dry being the dominant type. The Soil Nutrient Regime ranges from Medium to Very Poor.

Climate projections point to a warmer climate with lower summer rainfall and higher winter rainfall.

Average Ecological Site Classification Site Data (5000m resolution)

Scenario	AT5	CT	DAMS	MD	Summer Rainfall (mm)	Winter Rainfall (mm)
Baseline 1961-1990	1098.3	5.4	9.9	73.6	782.5	1329.4
UKCIP02 Low emissions 2050	1391.1	5.4	9.9	28.5	710.0	1377.4
UKCIP02 Low emissions 2080	1526.6	5.4	9.9	41.6	679.7	1397.6
UKCIP02 High emissions 2050	1461.8	5.4	9.9	48.3	667.3	1405.7
UKCIP02 High emissions 2080	2019.8	5.4	9.9	97.7	583.0	1461.7

(AT5: Accumulated Temperature (day-degrees above 5°C) :
CT: Continentality;
DAMS: Detailed aspect method of scoring (measure of exposure);
MD: Moisture Deficit)

3.2 Biodiversity and environmental designations

There are a range of designations across the site and these are shown in map M4. Biodiversity issues are also considered in map M7.

Designations include:

Pass of Leny Flushes SSSI
Loch Lubnaig Marshes SSSI (adjacent)
River Teith SAC

Open Habitats

The main open habitat is upland heathland which is located as a matrix of open ground across the upper slopes. Open ground has also been retained over the following areas:

- Steep slopes, rock outcrops and cliffs.

- Flushes
- Riparian buffers

The upper margin of the forest is diverse with areas of mixed regeneration contributing to the ecological diversity. Many of the open ground areas can be considered successional habitats.

The development of W4/W17/W18 Upland woodland types on the upper slopes would expand areas of priority habitat, strengthen linkages and create an enhanced habitat for a number of key species. The development of this woodland by planting or natural regeneration would be facilitated by reducing deer pressure or extensive deer fencing.

Stank Glen showing recently planted Scots Pine & mixed regeneration.

Ancient Woodland Sites

Ancient Woodland Sites are located along the lower slopes in discrete areas. Many of the areas carry mature mixed native woodland with elements of W7,W9,W11,W17 & W19 NVC woodland types being present. The woodland

around the Pass of Leny including the SSSI represents the largest expanse of native woodland. NBL natural regeneration in these areas has been very successful.

NBL regeneration in Leny Wood linking to mature NBL within SSSI.

Long Established (Woodland) of Plantation Origin also occur north of Strathyre, and these sites can have a high conservation, particularly as many of these areas are managed under CCF.

Currently many of these woodland fragments are poorly linked.

Species

Red & Roe deer occur throughout the woodland and deer management is considered in more detail further in the plan.

Mountain Hares occur on the upper slopes in low numbers with Brown Hares occurring on the agricultural low ground margins.

A range of raptors are resident in the locality including Peregrine, Osprey and Kestrel.

Black Grouse is a priority species for FCS to protect and expand its range where possible. Black Grouse occur on adjacent open ground.

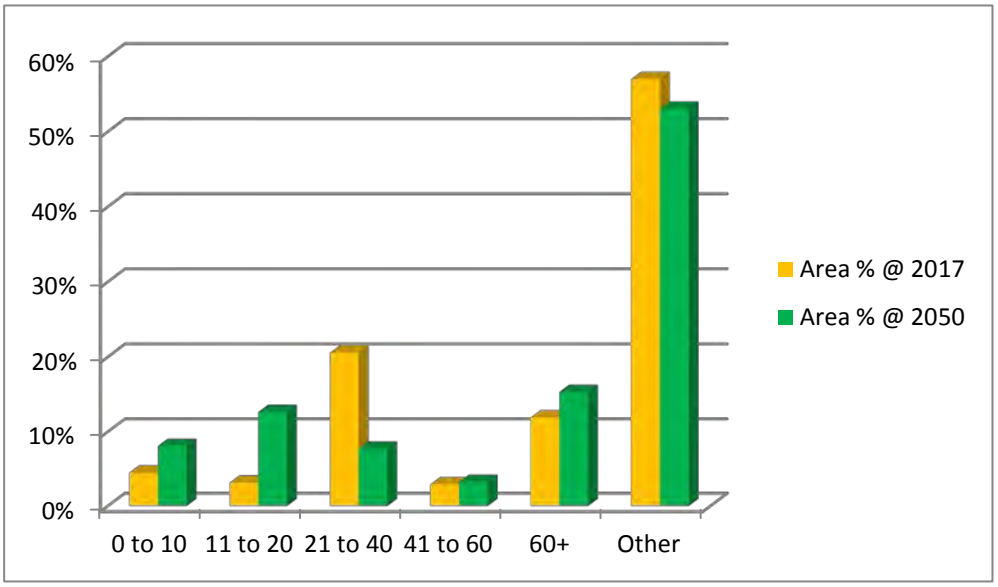
A range of significant mammal species occur in the forest including Red Squirrel, Pine Marten and Otter. Protection of these species is largely carried out through Protected Species surveys followed by implementation of the appropriate guidance to protect & conserve these species.

The current CCF management, by maintaining and expanding species and age class diversity, creates a resilient feed source for Red Squirrel. Pine Marten have a strong presence in the forest and current work suggests that this strongly reduces the risk of Grey Squirrel colonisation.

3.3 The existing forest:

3.3.1 Age structure & species change over plan period.

Age Class (years)	Successional Stage	Area % @ 2017	Area % @ 2050
0 to 10	Establishment	4%	8%
11 to 20	Scrub & Early Thicket	3%	13%
21 to 40	Thicket & Pole Stage	21%	8%
41 to 60	Mature High Forest	3%	3%
60+	Old Forest	12%	15%
Other	Open/felled	57%	53%



Change in Gross Forest Area including all Open Ground

Species Group	% cover @ 2017	% cover @ 2050	% Change
Mixed Broadleaves	8%	21%	13%
Mixed Conifer	12%	19%	7%
Sitka Spruce	35%	21%	-14%
Open Ground	45%	39%	-6%

Note: Felled areas awaiting restocking allocated as SS

Change in Forest Area including only Integral Open Ground

Species Group	% cover @ 2017	% cover @ 2050	% Change
Mixed Broadleaves	12%	30%	18%
Mixed Conifer	18%	26%	8%
Sitka Spruce	48%	30%	-18%
Open Ground	22%	14%	-8%

Note: Felled areas awaiting restocking allocated as SS. Other Land is estimated at 854Ha

Note: areas excluded from the % calculations in the lower table ("Other Land" OL) comprise areas excluded from forestry due to landuse

(Farming/recreational infrastructure) or elevation/site conditions. The boundary of the “other land” on the upper slopes is somewhat arbitrary and may change in relation to succession or a further expansion of montane scrub amongst other factors. Climate change may raise the tree line for native tree cover, while increased storm events may lower the treeline for productive high forest.

3.3.2 Access

There is a good forest road network throughout most of the forest. A new road is proposed in Compt. 6054 to harvest a Phase 1 coupe.

Public access is encouraged across the LMP whether on foot, horseback or bicycle. The access is managed under the Scottish Outdoor Access Code (SOAC).

Core paths and forest roads deliver a recreational asset to the area with the Ben Ledi path being particularly well used.

The National Cycle Route 7 runs the length of the forest and forms a strategic recreational asset.

Ben Ledi hill path passing through developing mixed woodland.

3.3.3 Continuous Cover Forestry (CCF) potential

Continuous Cover Forestry (CCF) is a key component of the current forest management and the LMP proposes a continuation of this approach.

CCF issues are considered in details on maps M10, M11, M12, and this level of consideration reflects the significance of CCF to the delivery of the LMP objectives and the extensive areas involved.

Much of the site is ideally suited to CCF being sheltered and having good soil characteristics in terms of facilitating production and good rooting depth. The soil characteristics and associated drainage creates soils with a good bearing capacity which is important in CCF due to limited brash mat availability for some CCF stages.

Slope is a constraint to CCF in places, but the good road network facilitates harvesting and reduces the economic burden with winch working. Winch working also reduces soil damage and the potential for slope instability. In economic & practical terms slopes are a significant constraint to harvesting, however slopes are also areas where stability and landscape considerations are paramount. Slopes are often also highly productive and have good drainage. To summarise the slope issue in relation to CCF: higher operational costs are offset by the enhanced delivery of ecosystems services.

Norway Spruce CCF stand above Loch Lubnaig.

3.3.4 Current and potential markets

The LMP area contributes a diverse range of forest products to the economy, with a wide range of species and timber sizes meeting a range of end user requirements. The larger areas of pure Sitka Spruce on the upper slopes complements the more diverse species mix on the lower slopes and this creates economic resilience for both forest and end users. Woodfuel continues

to develop as a market and this greatly improves the economics of early thinning which is a cornerstone of successful CCF.

In the more complex CCF areas the diverse range of species and timber sizes can create additional costs and generate lower returns due to the practical difficulties of marketing and harvesting such a diverse forest resource.

Hydro schemes create a renewable energy resource and generate a significant income stream for the National Forest Estate.

3.4 Landscape and land use

3.4.1 Landscape character and value

Under the revised draft of the SNH Landscape Character Type (LCT) appraisal, the LMP area falls within the Highland Summit Landscape Type and the Straths & Glens/Straths & Glens with Lochs type

A more detailed Landscape appraisal has been carried out for the specific LMP area and this is shown on map M14. The more localised analysis identifies 5 distinct areas: The Pass of Leny; Strathyre; Balquhidder; Loch Lubnaig South & Loch Lubnaig North.

Appendix 3: Landscape Character & Visibility describes the characteristics of both the SNH LCT & the specific LMP appraisal.

3.4.2 Visibility

A number of prominent viewpoints have been chosen around the forest and these are shown on Map M1. Viewpoints for detailed appraisal were selected based on number of viewers, landscape impacts and proposed operations. A range of other design viewpoints were used to inform the proposals.

The forest is visible from a wide range of viewpoints with the A84 and tourist car parks on Loch Lubnaig having the greatest impact. The cabin car park on Loch Lubnaig has a very high footfall of tourists and is often the first “Highland” landscape seen at close quarters by arrivals. Social media multiplies up the impacts of photographs and results in the site having a very high virtual footfall.

The cycle route, core paths, mountain trails and summits, Callander Town & Crags and the minor road at Balquhidder all provide significant views across the forest. The visual impacts and viewpoints are considered in Appendix 3: Landscape Character & Visibility.

The site also provides the landscape backdrop for the Forest Cabins, a range of hotels and self-catering accommodation and houses along the Strath.

3.4.3 Neighbouring land use & local businesses

The neighbouring land use is varied with agriculture, conservation, forestry tourism & recreation all playing an important role in the local rural economy.

Map M13 shows details of neighbouring landuses.

Areas of grazing are let along the strath floor, but the opportunities for further agricultural grazing are limited due to the conservation objectives on neighbouring land. The limited number of farming neighbours may exacerbate sheep trespass, which is a problem, as fencing deteriorates and sheep roam for longer distances.

Cattle grazing has been proposed as part of the management of the SSSI, and this is carried out annually.

There are also a number of adjacent woodlands owned by the private sector. These include Ardchullarie Forest north of Leny wood and Stronslaney, Ballimore & Muirlaggan at the north end of the forest. These forests are of a similar nature to the LMP area but generally display lower diversity & utilise CCF to a lower degree.

The Forest Cabins, Strathyre Caravan Park and a range of self-catering tourist accommodation complement the hotels in Strathyre in terms of local provision. All of these facilities benefit from the landscape backdrop and recreational potential that the LMP area delivers.

Renewables both within the forest and on adjacent land hydro schemes make a significant contribution to the generation of renewable energy.

Fishing in the Teith catchment provides a recreational resource and boosts the local economy.

3.5 Social factors

3.5.1 Recreation

See map M6.

The National Cycle Route network 7 runs the length of the forest, generally the route follows the former railway line and in places the route passes along timber haul roads. This is an important strategic route and is well used. The path offers a number of panoramic views of the forest and passes through stands of CCF forestry and broadleaved woodland.

The core path at Strathyre offers a route to the summit of An t-Sithein & associated peaks, with the forest road network facilitating alternative circular routes back to the village.

Forest Cabins on Loch Lubnaig within the LMP area.

The Ben Ledi path is very popular. Many people return by the same route but alternative circular routes may take in the ridge to the north returning via the path in the Stank Glen. A longer ridge walk to Benvane then requires a descent through the woods above Laggan. Consultation feedback suggests that an informal route created by brashing or the creation of open ground passages at restocking would be welcomed in this area.

Restructuring has been extensive in the proximity of the Ben Ledi path, and windblow has increased the felled area. Mixed woodland restructuring is beginning to have a positive impact where the path passes through the upper part of the forest, but restructuring of the lower felled section will be required within the next LMP period.

The forest road network around the Forest Cabin site provides an important recreational asset for this tourism hub.

Within Leny wood a current path network and low key car park provide a recreational resource. The setting for the path is greatly enhanced by recent restoration of PAWS areas which has created an attractive mix of mature Native Woodland with areas of abundant mixed Native regeneration and a diverse forest flora. The Callander Landscape Partnership are in discussion with the FC with regard to upgrading the path network in Leny Wood, and providing linkages with path networks across the Garbh Uisge to the west via a proposed bridge. The purpose of the bridge is envisaged as both a functional link and as a landscape feature presenting a gateway to the hills beyond the pass.

3.5.2 Community

As mentioned above the Callander Landscape Partnership are in discussion with the FC and other partners to take forward recreational enhancements to Leny Wood. The work carried out under the previous plan in successfully restoring the PAWS areas has created a valuable backdrop for any recreational/cultural development.

Callander Community Development Trust has developed a Hydro scheme in the Stank Burn under a lease from the FC. This delivers an economic return to the Trust and consequently facilitates other non-income generating activities in the Community.

Strathyre village has cultural connections with the development of forestry in the Strath, and some long term residents were involved in the establishment of the forest. The community link to the forest is now focussed on the provision of recreation & tourism with facilities such as the Forest Cabins & the Broch Café contributing to the local economy and providing employment.

3.5.3 Heritage

There are no scheduled ancient monuments, but a scattering of Unscheduled Ancient Monuments occur across the site. Leny wood has a high concentration of features. This concentration of features may be derived from its location and limited ground disturbance, but it may also reflect an increased intensity of survey activity.

3.6 Deer & Sheep

Deer

Red & Roe deer are present across the forest.

Impacts vary across the forest with mixed regeneration on the lower slopes being widespread, but sparse on the upper slopes and in the quieter more inaccessible areas. The distribution & diversity of regeneration will also be affected by other factors including seed source, ground vegetation & soil type.

The strategic deer fence that runs along the upper slopes of the eastern side of the Strath reduces deer migration from Glenartney deer forest to the east. There are no strategic deer fences to the west, and softer species restock areas are generally deer fenced to reduce the risk of deer damage. A full strategic deer fence enclosing the full LMP area is not feasible for a range of reasons, but there may be scope for enclosing larger areas than the immediate restock areas as this may create wider benefits at a lower cost than fencing individual restock sites. The southern end of the forest with extensive NBL restocks/regeneration sites proposed and the SSSI could benefit from a semi-strategic deer fence linking to the deer fencing around new woodland creation schemes in Glen Finglas.

Deer control is facilitated by the extensive open ground, widespread restructuring activity and the road network. Areas of higher deer impacts are associated with poor access, low footfall and dense cover.

Historically sheep trespass has caused damage to tree crops during establishment, and this has been an intermittent problem since the commencement of forestry activity. Long fence lines on exposed sites and treefall across fences are all factors that have contributed to this problem. Reduced agricultural activity on some neighbouring hill ground may exacerbate the problem as fences deteriorate and shepherding declines.

4.0 Analysis and Concept

4.1 Analysis

Map M15 Design Concept shows the main factors that have significantly influenced the development of design and long term vision of this forest. Map M12 also shows concepts guiding the development of Continuous Cover Forestry (CCF) in specific areas. Landscape analysis in terms of character type is shown on map M14, with a detailed analysis in terms of landscape in appendix A3.

The main factors considered in the analysis were identified as:

- A presumption in favour of CCF due to its ability to deliver landscape, ecological, recreational, water quality, flood management and slope stability benefits.
- Target CCF using an appraisal of CCF potential & viability of current CCF area. Carry out the appraisal using GIS soil, climate & slope data in conjunction with stand characteristics and stability assessments.
- Slope constraint adverse impacts on CCF economics & practicality are reduced by the dense road network which allows winch working at practical distances. While slope impacts negatively on the economics of CCF harvesting operations the enhanced delivery of ecosystem services outweighs the lower immediate financial returns in most cases.
- Link management to proposals on neighbouring land where feasible.
- Maintain a productive forest that makes a positive economic return, and utilises the intrinsic comparative advantages that the site has for productive conifers.
- Maintain recreational infrastructure, and explore partnership working to secure additional funding given budgetary constraints.
- Deer management within the context of the Deer Management Group.
- Building on the current restructuring to maintain & improve landscape.
- Protect archaeology and enhance setting of features.
- Restore PAWS, maintain/enhance condition of SSSI, increase NBL buffer around SSSI. Strengthen NBL linkages using riparian zones and link with NBL new woodland creation on Glen Finglas in line with the Great Trossachs Forest theme.
- In the longer term create montane NBL habitat buffers on the upper slopes linked to lower elevation NBL habitats.
- Maintaining and enhancing the habitat for key species.
- Many areas because of young age or access difficulties require management actions post the plan period.

4.2 Concepts of the plan

The Design Concept map M15 & the CCF Concept map M12 indicate the guiding concepts that have emerged from the LMP process.

Key issues

Factor	Opportunity	Constraint (limitation or restriction)	Concept Development
Continuous Cover Forestry (CCF)	Much of the area is already under successful CCF management with good regeneration in many places. Practical management and operational experience of working the forest as CCF, together with the good road network facilitates ongoing CCF management. The site has many features that favour the adoption of CCF including rich soils with good rooting depth, good drainage and shelter. CCF can deliver a swathe of additional benefits including enhancements to: landscape; recreation & aesthetics; slope stability; water quality; biodiversity; diverse stand structure with	Some areas of CCF have been affected by windblow and require clearfelling. Areas adjacent to proposed clearfells on neighbouring forestry need to be clearfelled to avoid adverse landscape impacts (Stronslaney). Some crops showing rapid growth rates may have been thinned past their felling window and this may create stability issues. Some areas of CCF are located on inappropriate soils. Slope is a constraint in places in terms of practical harvesting and economic considerations. Regeneration may be poor, dominated by Sitka Spruce or be of species that don't fit with strategic	Continue management of CCF areas unless windblow or adjacent felling proposals conflict. Where soil type and exposure suggest CCF isn't appropriate, but CCF has commenced, continue CCF management but monitor for stability issues. Where stability is an issue then convert area to clearfell productive forest or non- intervention areas where slopes are steep. In terms of operational detail rather than strategic planning, monitor CCF operations on slopes in relation to costs/benefits. Monitor regeneration and consider range of management options to steer restructuring in the desired direction. This may include:

Factor	Opportunity	Constraint (limitation or restriction)	Concept Development
	increased structural and economic resilience.	restructuring objectives.	increased deer control; respacing; selective thinning by species; group fellings to promote clumps of established regeneration; irregular shelterwood or heavy thinning to promote a wider spectrum of species by management of floor light levels; enrichment planting of desired species. Beech may play a key long term role in CCF on the lower slopes.
Link LMP management proposals to adjacent landuse proposals.	Matching felling and restocking to adjacent approved Forest Plan proposals offers the opportunity to enhance the landscape and reduce adverse impacts from forest boundaries at odds with landform. Restructuring of the southern boundary area offers the potential to enhance the positive environmental and landscape impacts of adjacent woodland creation proposals and to strengthen linkages with the SSSI and	Many of the areas in the proximity of Stronslaney could deliver wider benefits if managed under CCF. The southern section of the forest is suited to commercial conifers and is well roaded with relatively low harvesting costs on more gentle slopes, restructuring with NBL carries a cost in terms of production and carbon sequestration. NBL restructuring requires deer fencing and has higher associated costs with lower economic	The key area for synchronising felling and restock proposals is along the march with Stronslaney. In this area the landscape impacts are very high and synchronising operations is essential. Reversion back to CCF further back from the march is proposed with landscape friendly coupes linking the two silvicultural systems. Areas of windblow in this locality will also be felled as small coupes to complement the above approach.

Factor	Opportunity	Constraint (limitation or restriction)	Concept Development
	wider landscape in line with the Great Trossachs Forest objectives. Enhancing the forest margin by increasing diversity of age class, species & structure can improve the habitat for Black Grouse where these are present on adjacent ownerships.	output.	At the southern end of the LMP area, NBL will be established at restructuring to complement NBL establishment across the march. This approach fits with the wider strategy of strong linkages through to the SSSI and along the Loch shore to take in other ASNW areas and restore PAWS. Areas of productive conifers will be retained in the southern sector to provide a landscape balance and deliver economic and carbon sequestration benefits.
Maintain a productive forest.	The forest is located close to markets, has good transport connections, a good internal road network, and is ideally suited for timber production in terms of intrinsic site features. The forest carries a range of productive species and has great structural, age class & species diversity. All of the above factors suggest that the forest can continue to supply a	The wide range of demands on the forest are often met by compromising short term economic considerations. For example greater species diversity and CCF can all lead to higher harvesting costs, higher management costs and lower revenues. Replacement of productive conifers with NBL offers substantially lower returns and higher costs, and this is often	CCF plays a key role in delivering multi-purpose forestry which includes a strong economic delivery. Target NBL restoration to key areas that deliver the maximum environmental gain. Maintain traditional clearfell conifer forestry on areas unsuited for CCF. Expand the forest area to create wider areas of protection montane forest, which may reduce pressure for

Factor	Opportunity	Constraint (limitation or restriction)	Concept Development
	significant timber resource in a sustainable manner while meeting multiple objectives. The forest's current structure and intrinsic attributes represent a resilient asset both economically and ecologically.	exacerbated as PAWS areas often occupy productive forestry ground.	conversion of more productive areas to NBL. Consider potential for productive broadleaved management in all areas where access is feasible.
Maintain Recreational Infrastructure	High visitor numbers on Ben Ledi path justifies investment in infrastructure. Sustrans cycle route provides a well used recreational feature via alternative funding sources. Forest paths, core paths and forest roads offer a range of routes. Potential to work with Community Partners to enhance recreational infrastructure and source external funding. Potential for low key access route down from Benvane.	High visitor numbers on Ben Ledi path increases maintenance costs and makes path diversions more problematic. Cyclists and timber traffic should be kept separate wherever possible and this may constrain options for both parties. Limited budgets available for expansion of recreational opportunities.	Maintain existing level of recreational infrastructure where budgets allow. Work with Community partners and the third sector where appropriate to take forward partnership proposals which may source external funding. Consider potential for Ben Vane path during future restructuring in the appropriate area.

Factor	Opportunity	Constraint (limitation or restriction)	Concept Development
Deer Management	Existing Balquhidder Deer Management Group offers a forum for collaborative management. The forest has a scale that lends itself to effective deer management. The strategic deer fence along the upper margin of West Strathyre limits deer migration from the east. The deer management objectives of the Woodland Trust to the west complement the objectives for the LMP area. Extensive past restructuring and the road network creates a good environment for deer control. Regeneration on the lower slopes and particularly in Leny Wood suggests low deer pressure in these areas, continue good levels of control. Scope to consider sub strategic deer fences that take in more than	Deer Management Groups are comprised of owners with a wide spectrum of interests and objectives in terms of target deer populations. A strategic deer fence enclosing the full LMP area is not feasible for a variety of reasons. Significant areas of young restocks provide ideal habitat and shelter for deer and makes control problematic. High recreational use of forest constrains control options and procedures. High deer pressure in CCF areas may lead to the development of SS monocultures.	Monitor deer damage and adjust control accordingly in terms of overall effect and targeting. Work with the DMG & direct neighbours to provide more effective control at a landscape level. Where fencing is required to ensure the survival of softer species consider fencing wider areas to spread costs and deliver wider benefits. Deer fenced units can also aid deer control in the wider forest by constraining deer movement and increasing the potential control opportunities. Link the deer control effort implicitly with CCF management via monitoring and liaison.

Factor	Opportunity	Constraint (limitation or restriction)	Concept Development
	individual restock sites, in order to spread fencing costs and broaden the benefits from lower deer pressure.		
Build on current restructuring to maintain/enhance landscape.	Many areas of the forest carry a stable CCF crop making a positive contribution to the landscape. Opportunity for CCF to deliver a successor crop while maintaining forest cover. Opportunity to improve the landscaping of the upper margin and increase diversity across areas of younger crop.	Some CCF areas are windblown and some felling coupes have been extended to take in areas of progressive windblow. Some areas with high landscape impacts are isolated by younger crops and/or occur on inaccessible steep and rocky slopes.	Continue CCF management and extend this where site conditions and current crops are suitable. Utilise restocking or enrichment planting where regeneration under CCF is not delivering the desired outcome, for example where a specific species is desired to highlight landform. Monitor inaccessible areas for landscape impacts which may occur from windblow or stand deterioration. Deal with hanging inaccessible crops as the younger crop comes into active management. In the longer term replace difficult to access areas with species and stand structures that can form stable non-intervention areas making a positive

Factor	Opportunity	Constraint (limitation or restriction)	Concept Development
			contribution to both landscape & ecology. This may arise by natural regeneration. Restructure young crops to increase diversity, but maintain scale appropriate to landscape.
Heritage	A high density of archaeological features occur in Leny Wood where the proposed low key CCF/non-intervention management will provide the best environment for the protection of features. Potential to work in partnership with the Callander Landscape Partnership to enhance the setting of features, and to link interpretation with the proposed path network upgrade. Restructuring provides opportunities to enhance the setting of features.	None	Follow the UKFS in relation to the Historic Environment. Work in partnership with the Callander Landscape Partnership and others to protect, promote and interpret features.
Restore PAWS; Protect the SSSI;	Opportunity to build on previous restoration	NBL produces lower volumes of less valuable	Continue with concepts developed in the

Factor	Opportunity	Constraint (limitation or restriction)	Concept Development
Strengthen NBL linkages.	work and to create stronger NBL habitat linkages that connect the ASNW areas. Riparian NBL and NBL on steep slopes unsuitable for productive CCF can play a role in slope stabilisation and provide landscape continuity. Linkages with woodland creation projects on Glen Finglas and sweeping south around the lower slopes of Ben Ledi and on northwards along the shores of Loch Lubnaig create robust habitat linkages with a positive landscape impact. Riparian linkages and the creation of upland NBL habitats on the upper margin provides the opportunity to extend the habitat linkage concept. Upland fringe NBL woodland can play a key role in landscape, slope stabilisation, increasing prey availability for	timber (generally) and costs more to establish & manage. NBL areas sequester less carbon per year but may build higher soil carbon reserves and store carbon in timber that remains in situ. Where budgets are limited and National objectives encourage production of timber products then this needs to be balanced against the benefits provided by NBL woodland. In order to achieve NBL establishment by either planting or natural regeneration deer fencing and/or intensive deer control is required. These both have high costs associated with them, and in the case of fencing can have detrimental landscape, ecological and recreational impacts. The establishment of NBL on the upper margins is made more difficult by slower growth rates, and more	previous plan to create wider habitat linkages including more Scots Pine woodland in the Stank Glen area. Restore PAWS areas by felling conifer crop & restocking with NBL. In the two PAWS areas opposite the car parks on Loch Lubnaig accept a more steady conversion to NBL due to landscape priorities. Intervene in CCF areas to encourage NBL regeneration in targeted areas. Work towards the establishment of NBL on the upper margin, subject to budgetary factors. Many of the areas proposed for upland NBL creation/conversion are outside the plan period and are a longer term aspiration. Many of the species proposed for NBL areas or establishing by natural regeneration can produce a return, and this option should

Factor	Opportunity	Constraint (limitation or restriction)	Concept Development
	moorland raptors and the habitat suitability for a range of species including Black Grouse. With the demand for woodfuel remaining strong there is scope for NBL areas to be managed to deliver an economic output where access is feasible.	severe weather impacting on both fences & trees. While management & utilisation of NBL areas can enhance the biodiversity of Native Woodland, in some cases interventions can diminish the ecological site value.	be considered as these areas mature.
Enhancing habitat for key species	The extensive restructuring and large areas of Mixed Conifer (MC) under CCF provide a resilient habitat for Red Squirrel and Black Grouse on the margins, as well as many other woodland species and open ground generalists. NBL linkages and an expansion of upland NBL woodland will enhance Black Grouse habitat.	Creating multi-purpose forests carries an economic cost in terms of lost production and higher operational costs.	The proposals for restructuring and maintaining/expanding CCF will provide direct benefits for a range of key species, with Black Grouse & Red Squirrel being priorities in this area. This approach builds on the work undertaken in previous plans.
Inaccessible areas & young restock sites.	Some of the inaccessible and hanging crop areas make a positive contribution to landscape. Opportunity to manage	The options for management of hanging areas are severely constrained, and many of these areas have a high visual impact. Some areas are expensive, impractical	The options for interventions on some of the very steep slopes are severely constrained not only by cost but also by H&S considerations, and these are paramount.

Factor	Opportunity	Constraint (limitation or restriction)	Concept Development
	hanging areas as younger crop on lower slope matures. As the crop on the lower slopes matures the impacts of hanging areas are reduced. Replacing inaccessible conifer crops, by planting or natural processes, with NBL or NBL/Mixed Conifer (MC), offers scope to leave these areas as non-intervention areas. Some species such as Larch can be self-thinned by wind, although the outcome of this process is unpredictable. Many of the young restock areas occupy large areas and this may be in keeping with the landscape scale of the mid and upper slopes. Opportunity to develop younger crops during subsequent plans as either CCF or clearfell areas.	or unsafe to harvest or thin, even in conjunction with younger maturing crops below them. Roading to access hanging crops has a high cost, adverse landscape impacts and the returns from the timber are often low. Self thinning of isolated hanging areas can be variable in its landscape impacts, and full windblow across prominent upper slopes can create very adverse impacts.	Monitoring of these hanging isolated areas should be ongoing with the impacts from the key Loch Lubnaig viewpoints being the main consideration. Windblow events and their impacts need to be considered on a case by case basis in terms of remedial action. The inaccessible mature Larch areas have a high landscape impact, and endemic windblow can occur across these areas without adverse landscape impacts. Windblow in Larch can often leave an even stand of standing Larch which from a distance looks intact. In the longer term replacement of these areas by NBL and NBL/MC as non-intervention areas is the best option, and this is likely to occur with time naturally. This process will also tend to reduce the impacts of these hanging areas as the stand margins are

Factor	Opportunity	Constraint (limitation or restriction)	Concept Development
			blurred by developing mixed regeneration. An attack of *Phytophthora ramorum* or other disease on these mature hanging stands in areas of high visual impacts would potentially be very damaging from a landscape perspective and very hard to ameliorate.

5.0 Forest Design Plan Proposals

5.1.1 Management Types

Felling/Management Analysis

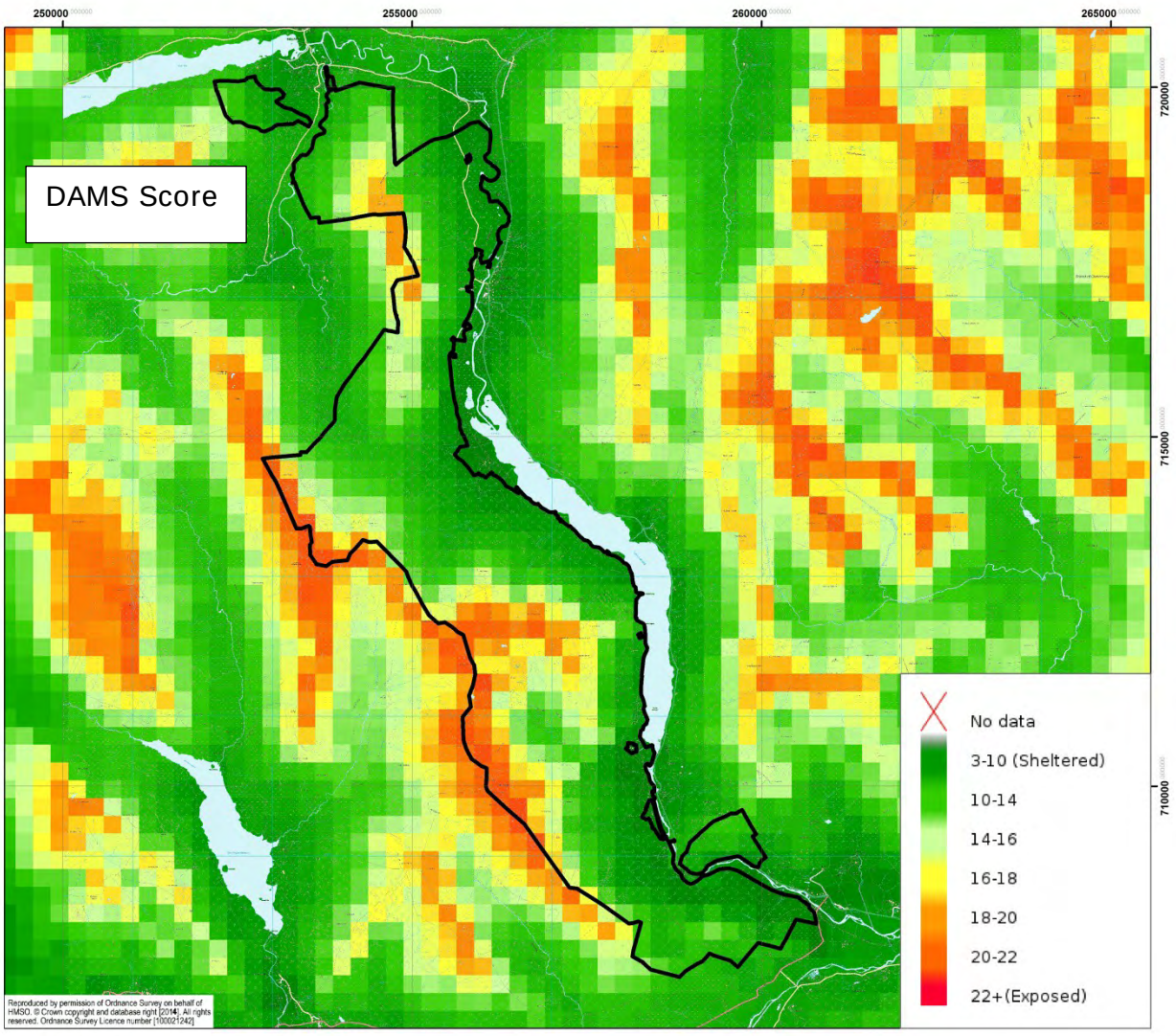
Management	Area Ha	%
Phase 1: 2016 - 2020	74.19	3%
Phase 2: 2021 - 2025	41.12	1%
Phase 3: 2026 - 2030	106.11	4%
Phase 4: 2031 - 2035	46.61	2%
Phase 5: 2036 - 2040	37.91	1%
Phase 6: 2041 - 2045	88.69	3%
Phase 7: 2046 - 2050	93	3%
Conifer Long Term Retention	38.64	1%
Felled	109.5	4%
CCF Irregular Shelterwood	124.72	4%
CCF Uniform Shelterwood	341.81	12%
Mixed Broadleaved Long Term Retention	246.39	8%
Open ground	367.81	13%
Other Land	944.94	32%
Outside Plan Period	253.11	9%
Total	2914.55	100%

Note: Felling areas shown above indicates stocked area & excludes open ground.

Average Annual felling Volumes by Phase	Clearfelling m^3	Thinning m^3
Phase 1: 2016 - 2020	27,000	21,000
Phase 2: 2021 - 2025	15,000	23,000
Phase 3: 2026 - 2030	38,000	24,000
Phase 4: 2031 - 2035	17,000	26,000

Indicative Felling Volumes

Continuous Cover Forestry (CCF). The LMP area has a number of comparative advantages for the development of CCF, with shelter being one of the most significant. With climate change uncertainty shelter is even more of a key consideration in assessing the long term viability of CCF. Experience across all Districts suggests that CCF is considerably more prone to windblow than unthinned short rotation Sitka Spruce crops. Taller crops, wider spacing with canopy opening being an ongoing process & the fact that the stand has a longer lifespan, all contribute to the vulnerability of CCF crops.



As the above DAMS (Detailed Aspect Measurement System) indicates the LMP area has a high proportion of very sheltered areas.

Soil is another linked key determinant of a site CCF suitability, with good rooting depth being vital. Poorly drained or shallow soils increase the likelihood of windblow. The site fertility is generally medium under ESC, and this can also facilitate CCF by tending to reduce the vigour of competing weed growth.

Slope and ease of working and access are important considerations, with more gentle slopes generally reducing harvesting costs. Within the LMP the advantages in terms of slope stability and landscape that are derived from adopting CCF on slopes tend to outweigh the economic constraints. The dense road network also facilitates winch working with shorter working distances reducing costs proportionately. Winch working also offers advantages to the site in terms of lower compaction and soil disturbance at depth. Winch work can lead to shallow scarification but this may work to advantage by encouraging regeneration.

Within the LMP area CCF offers the following advantages:

- Enhanced landscape, with forest cover being a consistent landscape element which emulates natural European montane forest.
- Increased slope stability and reduced flood risk.
- Increased ecological continuity which is of benefit to the evolving forest ecosystem and specific species such as Red Squirrel.
- Ability to produce diverse and significant yields of a range of timber products including high quality timber.
- Creates a more aesthetic recreational environment.
- Can lead to reduced establishment costs, although often this is not the case.

CCF also has some disadvantages:

- Higher management, marketing & operational costs.
- Marketing smaller volumes of a very diverse output can be difficult particularly to larger heavily automated mills.
- Due to deer pressure and the relative shade tolerance and vigour of different tree species then there is a tendency towards the development of monocultures. Sitka Spruce, Western Hemlock & Beech will all thrive under CCF, often to the exclusion of other species.
- Determining outcomes and mensuration within CCF stands can both be difficult. In areas where a specific desired outcome in terms of succession is required, (for instance NBL along riparian zones and Norway Spruce to emphasise knolls), then expensive respacing or enrichment planting may be required to achieve the desired outcome.

Monitoring and active management of LISS is required to achieve wider LMP objectives. Enrichment planting and modifying light levels on the forest floor substantially can be used to manipulate the forest environment.

Uniform shelterwood is the most applicable silvicultural technique for most of the forest area as this reduces many of the disadvantages of CCF while delivering many of the advantages. As the CCF stand matures, areas managed under Uniform Shelterwood can either continue on to the final removal of seed trees and the successor crop or evolve into Irregular Shelterwood or Group Shelterwood system. The latter may encourage more light demanding species and facilitate enrichment planting.

Some areas of NBL are also suitable for consideration in the longer term as CCF candidates, and these need to be considered on a case by case basis as the trees mature. Ensuring that any interventions have a positive environmental impact would be important. Some of the areas unsuitable for productive conifer CCF may produce a yield under NBL due to the lower tree heights involved and the potentially lower intensity and smaller scale of working.

Clearfelling (CF) will be applied where productive conifers are proposed but site limitations constrain CCF. These will mainly be at higher elevations. Coupe design will seek to work with the landform and scale will vary with larger coupes on the upper slopes scaling to smaller coupes on the lower slopes. Building on the current age class diversity will be an objective, however the fast growth rates associated with the dominant SS cover may limit the options for retaining crops past the standard 30 to 50 year rotation length.

The presumption is that no felling will take place until the neighbouring restock areas have reached 2m.

Clearfelling is used as a management approach to remove Larch species where there is Phytophthora infection, and to salvage windblow.

Some small areas of crop have been identified as areas of **Long Term Retention (LTR).** These are often areas with severe access issues or where it is environmentally beneficial to retain these areas. Subsequent plan reviews may move these areas into CCF management or integrate future felling with the surrounding crop as appropriate.

Younger crop areas where management would occur beyond 2050 are designated as **“Outside Plan Period” (OPP)** (Map M16) and again subsequent plan reviews may move these areas into CCF management or integrate future felling with the surrounding crop as appropriate.

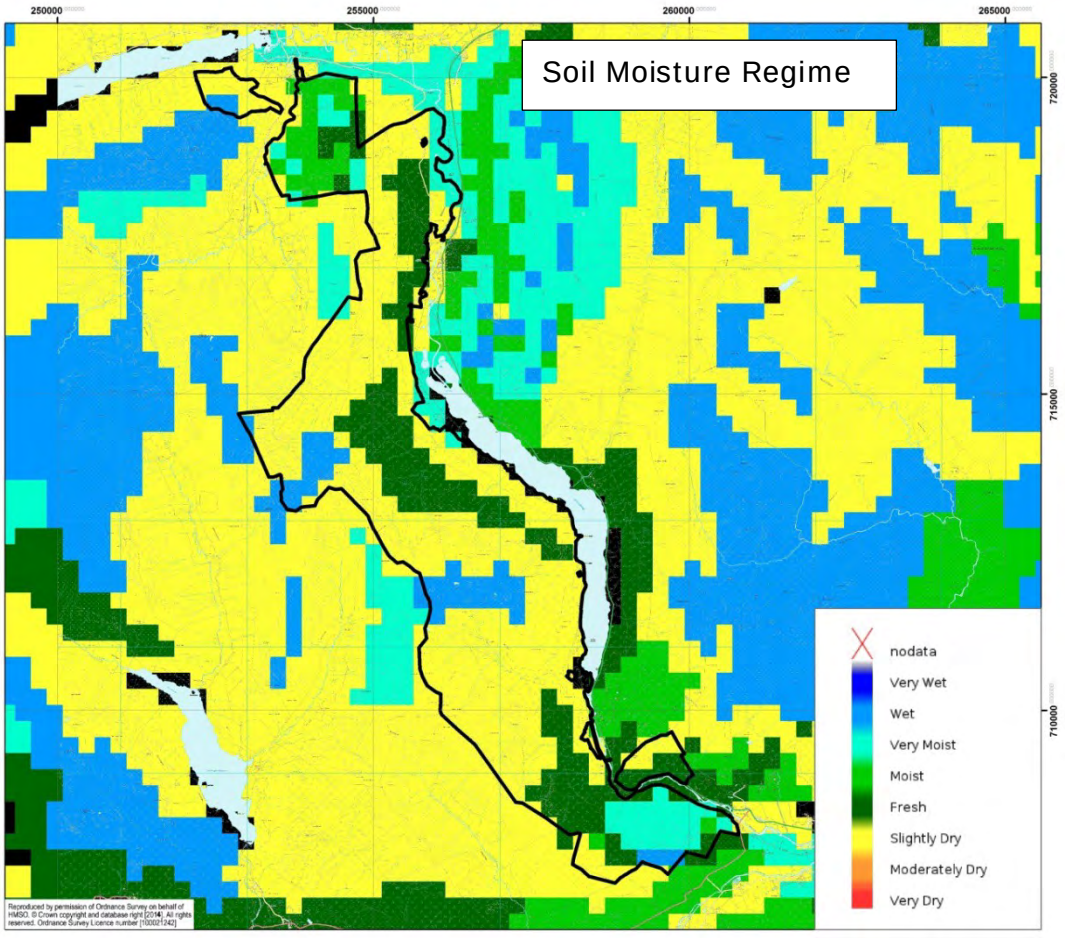
Open ground is an important part of the forest plan with extensive hill tops and a matrix of open ground associated delivering biodiversity and landscape benefits.

The intention is to retain most of the areas of open ground but with some slight adjustments to the upper margin. The landscape appraisal has identified areas where removal or realignment of forest cover will enhance the landscape, and these operations will be carried out as felling commences. Many of these areas fall into the category of “outside plan period”.

Many areas of open ground across the forest, and on the upper slopes have the capacity to regenerate as open mixed woodland. This woodland type would complement the existing open ground with much of the flora persisting, or indeed being enhanced under the open woodland type envisaged. Black Grouse in particular could benefit from an expansion of this habitat associated with areas of open moor and grassland.

In terms of other land uses, the open ground within the LMP area has limited scope for integration with any adjacent or additional agricultural activity.

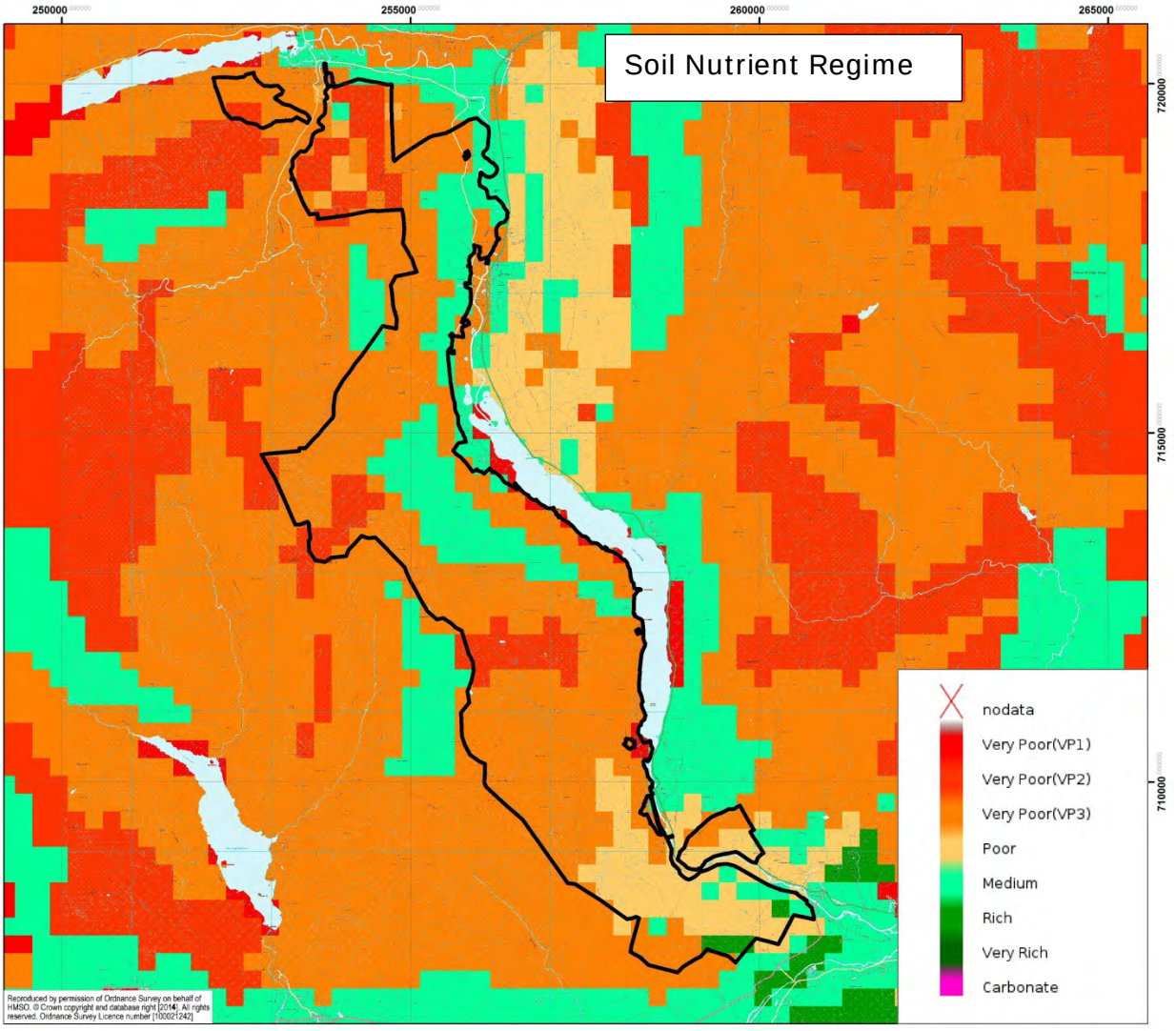
5.1.2 Future Habitats and Species



Permanent native woodland habitats are proposed throughout the woodland to link the current NBL resource, PAWS restoration areas, and new woodland creation across the southern march and on the upper margins and riparian zones. There is some scope for recreating elements of the natural ecocline from the loch shore to the treeline. NVC woodland types, or elements thereof, which may play a role across the forest include W7, W9, W11, W17 & W19. This wide range of NVC types reflects the diversity of soils, aspect and microclimate across the site as well as significant areas of long established native woodland.

The CCF areas and restocks on the lower/mid slopes will include a wide range of mainly conifer species with Sitka Spruce (SS) on more challenging sites and as an element in other crops, Norway Spruce (NS) Grand Fir (GF), Western Hemlock (WH), Scots Pine (SP), Noble Fir (NF) and European Silver Fir (ESF). While Larch is not currently on the restock list, natural regeneration of this species will be significant across the forest. A range of other minor conifers (Western Red Cedar (WRC) Serbian Spruce (OMS) Japanese Cedar (JCR) would form elements of restocked areas where appropriate.

There is some scope for productive broadleaves managed as CCF on the lower slopes. Juniper is present on site and there is clearly potential to promote this species in any NBL restocking.



Exposure, poor nutrient status and impeded drainage are factors limiting the choice of productive species at the highest elevations, with Sitka Spruce (SS) being the only commercially viable species (see DAMS map on page 50). Across most of the site a wide range of species can be grown, although protection from deer is required for all softer species. Small scale variations in soil, drainage, aspect and exposure are used to guide the final operational planting plan.

As indicated above, the ESC data suggests that there are a wide range of species potentially suitable for the site, and this remains fairly constant under climate change models. Species range declines with altitude. Site amelioration via drainage, fertiliser and the first rotation may negate many limiting factors and widen species range in practice.

Climate change models suggest that the general trend will be towards a significantly warmer climate with higher winter rainfall and lower rainfall in the summer leading to a partial soil moisture deficit during the summer months. In terms of the next rotation these figures have limited impact on species choice according to ESC models. However this level of climatic change is likely to interact in the longer term with soil characteristics and this may have a positive impact on soil structure and widen the range of species potentially suitable for the site. There are also threats to the suitability of SS as a timber species if severe summer droughts become the norm.

A number of other factors have been considered in addition to ESC data, and these include:

- Current actual growth rates.
- Economic value & physical volume production.
- Landscape.
- Ecology and linkages.

The impact of tree diseases has guided species choice. *Phytophthora ramorum* in Larch; Dothistroma needle blight (DNB) & Ash Dieback have all had an impact on species choice and crop management across the UK. Within the LMP area Larch and Ash would have played a key role in both landscape and production, but these species are currently unavailable as restocking options. This situation should be reviewed at intervals in light of prevailing guidance.

Cowal & Trossachs FD LMP provenance guidance chart

Species	Guidance
SS	Improved QSS standard throughout
VPSS	Limited use in best locations
SP	High rainfall type specified as standard. W20
NSP	From the nearest appropriate zone near CFR areas
LP	Only ALP being used in mixture with SS on poorer sites
DF	Seed stand or coastal origin
ESF	Czech or central European
NF	Registered seed stands
GF	Scottish registered seed stands

WH	Registered seed stands with low fluting
WRC	Scottish seed stands
NS	Seed stands, Eastern European or Harz
JCR	Northern Japanese range
NBL	Region of Provenance 10, Native Seed Zone 106
XC	PSSB will advise on any other minor species
Notes: PSSB can provide the most up to date guidance on provenance selection including advice on best suited seed stands. Virtually all seed supplied by PSSB comes from registered seed stands and is based on geographic area compatibility. Use of VPSS has declined as seed orchard QSS improves and this also has a wider genetic base for resilience purposes.	

5.1.3 Restructuring

Restructuring offers the opportunity to apply the latest principles of sustainable multi-purpose forest design to existing forests. In many cases the primary objective of woodland creation in the past was to optimise timber production, and this was often achieved very successfully, but sometimes compromised landscape and biodiversity. The main purpose of restructuring is to create truly multi-purpose forests meeting a wide range of objectives. In terms of productivity, objectives and perceptions have changed over the last few years, and the maintenance of a forest's productive capacity is now considered an imperative in most forests. Clearly each forest has a different set of objectives but the guidance provided in the UK Forestry Standard (UKFS) offers a clear guide to multi-purpose forestry that can be applied to any forest.

In summary restructuring offers the opportunity to:

- Enhance landscape
- Enhance biodiversity
- Increase productivity
- Protect and improve the setting of heritage features
- Protect and restore priority habitats
- Increase species and age class diversity to increase resilience
- Enhance the recreational value of the forest and fine tune woodland layout and structure to address community needs.

Specifically in relation to the LMP area large areas have been extensively restructured over a long time period, so actions proposed within the LMP are a fine tuning and continuation of the restructuring process within the practical parameters set by previous management. Windblow issues require an adaptive approach and this has been implemented in the past. Activity over the next 10 years will not differ greatly from the current plan but specific landscape issues will be addressed.

Areas of younger first rotation crop further add to the diversity of age class & structure.

Complex landscape & operational issues along Loch Lubnaig. Image demonstrates: positive landscape features; hanging crops; NBL regeneration & mixed regeneration on the upper slopes; in summary a highly diverse landscape and operational environment.

5.1.4 Operational Access

See map M5. The forest is well roaded with access to almost all the Phase 1 & Phase 2 coupes and CCF areas being served by the current road network. A new

road is proposed in Compt. 6054 to harvest a Phase 1 coupe already committed under the current Forest Plan; the other proposed roadlines shown on map M5 are proposed for construction beyond the ten year plan period, and are only indicative at this stage. Windblow or disease impacts may require the construction of new roads not envisaged at this stage.

Access tracks are required to facilitate harvesting and restocking on sites across the plan area, and these are shown in map M5. A number of ramps will be required to enable harvesting machinery to access felling coupes from the forest road. The precise location of these will be determined during operational planning but the expectation is that there will be up to a maximum of 6 ramps per felling coupe. Ramps will be approximately 3m wide and up to 15m long; they will not be treated as permanent features and will be removed when no longer needed.

Slopes are a constraint in places with winch working and cable cranes being required to work many areas effectively and safely. The relatively dense road network facilitates winch or cable crane harvesting. In some limited areas crops are practically inaccessible with even hand cutting being constrained by H&S concerns.

5.1.5 Thinning plans

Thinning will be undertaken in all areas where there is a benefit to the woodland or it will help deliver the wider management objectives, and early intervention in CCF areas is generally desirable where economically viable. There is a presumption to thin all crops but there are limitations to thinning due to soils and wind at the higher altitudes and these areas must be avoided. Typically thinning will be undertaken in the mineral soils where the wind is less than DAMS 17. The thinning will normally be undertaken in a 5-7 year cycle and the detailed areas will be worked up and packaged for sale in the 3 years before thinning.

Map M18 indicates the potential thinning areas as determined by exposure, soils and crop characteristics. These areas correlate with areas proposed for CCF.

5.1.6 Deer Management

Deer activity across the forest is negatively correlated with human activity. Many areas on the lower slopes show medium deer impacts with significant regeneration of vulnerable species. On the upper slopes observation would indicate that deer (and sheep) grazing have a significant impact on regeneration and biodiversity. In addition to potential higher activity in these more secluded

areas, the impact on regeneration may also be derived in part by slower growth rates widening the vulnerability window.

Restocks of vulnerable species are currently deer fenced.

Without the benefit of a strategic march fence around the main forest area any increased culling effort may require close cooperation with neighbours and common objectives in terms of target deer levels in order to achieve cost effective results. The Balquhidder Deer Management Group provides a vehicle for collaborative working, although member's objectives cover a wide range of aspirations. The Woodland Trust at Glen Finglas share similar management objectives to the FC deer management strategy.

There may be scope for semi-strategic deer fencing which enclose areas larger than individual restocks and take advantage of existing deer fencing both within the LMP area and on neighbouring land. Any fences of this type would need to be assessed for wider impacts on road safety and welfare.

5.1.7 Management of Open Land (see Map M14)

There is extensive open land retained mainly across the hill tops. Timber production is not an option for the highest ground due to the limitations of soil and climate. The agricultural options for these areas are very limited because of the low productivity of the grazing, the distribution of the open ground, and the limited agricultural activity in Glen Finglas. Stock fencing and stock control are prohibitively expensive and impracticable.

Sheep trespass is an ongoing problem for the forest and maintenance of march stock fences in the key northern section is essential. Restocking should aim to leave an adequate buffer in relation to fencelines to avoid trees damaging fences following windblow.

Agricultural land let out along the Strath floor is managed as grazing land.

Consideration of semi-strategic deer fencing options and costs/benefits should consider that where a reliable stock fence is required then this has potential to be converted to a deer fence at a lower cost. This consideration may apply to the Northern section of the forest.

The open hill ground delivers a significant part of the forest's ecological value. Scattered mixed regeneration has the potential to add to biodiversity,

particularly for species such as Black Grouse. In specific locations such as flushes, and where conifer regeneration becomes too dense, then this may have adverse ecological impacts. Many of the highest elevations are too exposed for any tree cover and these areas will remain as open ground with minimal management input.

There is an elevation band between the open tops and exposed ridges and the lower forested slopes where montane scrub or upland Pine/Birch wood could greatly enhance biodiversity. These areas are currently located on the upper forest margin. The afforestation/conversion of these areas with appropriate native woodland types would deliver multi-purpose benefits including carbon sequestration, expanded priority habitats, maintaining forest cover, ecological benefits and an enhanced landscape. Suppressed/advance regeneration is likely to be present in many areas which could respond quickly to reduced grazing pressure. Juniper is scattered across the site and could become a feature of areas protected from deer grazing. Further trial enclosures within target native woodland creation areas could indicate the potential for natural regeneration, and would be a useful first step in evaluating the proposed sites. Within the LMP the application of the above approach is proposed mainly outwith the plan period, but these proposals could be brought forward if required and subject to budget constraints.

Diverse open ground matrix and mixed tree species below Ben Ledi, established by mixture of planting and regeneration; generally considered an ideal habitat for many species including Black Grouse.

5.1.8 Public Access and Core Paths

The Ben Ledi path is very heavily used and has been formed & maintained to a high standard across most of the forest areas. Some areas on the open upper slopes are showing wear & tear from the heavy use. Enhancing the environs of the path during restructuring is a priority for the LMP.

The Car Park serving the main path is generally considered too small for the visitor numbers, although the car park serving the alternative access from the south by Kilmahog offers an alternative starting point for walkers. The option of increasing the size of the car park if feasible in terms of budgets would require careful evaluation. Terrain/river features adjacent to the car park and traffic flow on the A84 are significant considerations in any evaluation.

The Sustrans Cycle Route along the length of the forest is a recreational asset for the forest, although this can add to pressures on the car park, and further complicates any plans for car park expansion.

The forest path and core path at Strathyre that takes in An t-Sithein and associated peaks offers a pleasant route for locals and visitors with a lower footfall compared with the Ben Ledi path.

The Forest Holidays development, local tourism businesses, wild campers & anglers all benefit from the path networks and landscape setting provided by the forest.

Public access is encouraged across the National Forest Estate and this is managed under the Scottish outdoor Access Code.

5.1.9 Heritage Features

Felling coupes, access roads and fence lines will be surveyed by Forest District staff prior to any work being undertaken in order to ensure that upstanding historic environment features can be marked and avoided. At planting and restocking, work prescriptions remove relevant historic environment features from ground disturbing operations and planting. Opportunities to enhance the setting of important sites are considered on a case-by-case basis (such as the views to and from a significant designated site). The *Forest District Monument Management Plan* includes conservation management intentions for all of our designated historic assets – and details of all known historic environment features are held within our *GIS Heritage Data* and are included within our work plans for specific operations to ensure damage is avoided. In areas of significant archaeological potential (such as open ground and native woodland), professional archaeological walkover surveys will always be considered in advance of ground disturbing operations and planting."

5.1.10 PAWS Restoration

There are a number of areas across the site where there are records existing on the Ancient Woodland Inventory. Ancient of Semi Natural origin (category
1a and 2a) woodlands will be restored as felling progresses. Within the areas identified as Long Established of Plantation origin (1b, 2b and 3), the proposal is to establish or maintain via LISS areas of mixed broadleaves and mixed conifers.

5.1.11 Critical success factors

The main critical success factors for plan development are:

- Continuous Cover Forestry (CCF) is a cornerstone for delivering multi-purpose forestry within the plan area. The presumption is that CCF areas will be maintained or expanded where possible. The critical success factors for CCF are considered in the following bullet points.
- CCF: Build on past management.
- CCF: Evaluate current crop in relation to stability. This relates to both mature areas and young crops with a delayed first thinning.
- CCF: Utilise new soil survey data, DAMS & slope GIS data to evaluate potential for CCF.
- CCF: Link theoretical suitability to actual stand characteristics and windblow distribution.
- CCF: Link CCF proposals to neighbouring land management proposals (new woodland creation in the south and clearfelling/restocking in the north).
- CCF: Consider & monitor current regeneration levels and species diversity in any regeneration, and implement active management to achieve objectives for specific areas.
- CCF: Continue to control deer numbers and utilise stock fencing in cooperation with neighbours to reduce sheep trespass.
- CCF: Consider deer fencing of LISS areas depending on stand lifecycle and monitoring outcomes.
- Maintain and enhance landscape value in particular with views related to Loch Lubnaig & the A84. This will require a sensitive approach to correcting landscape issues that reflects the reality of steep isolated slopes and the difficulty of intervention on these sites.
- Retain the productive capacity of the forest while balancing other factors.
- Clear accessible windblow to utilise a productive resource/site and enhance amenity/landscape.
- Retain current species diversity on the lower slopes and expand this on the upper margins where appropriate using predominantly Birch(BI) woodland & targeted Scots Pine (SP)with a wider range of broadleaved species in riparian linkages and on the lower slopes.

- Continue to work with partners to enhance the riparian environments for water quality and fish ecology with the emphasis on the River Teith SAC and the associated key species including Lamprey, Fresh Water Pearl Mussel (FWPM) & Salmon.
- Work constructively with local community initiatives to enhance recreational routes as opportunities arise. Given budgetary constraints these initiatives are likely to require external funding.
- Monitor Invasive species in particular Rhododendron, Giant Hogweed, Piri Piri Burr
- & Japanese Knotweed and control as required.
- Protect public & private water supplies within the forest.
- Monitor disease impacts in particular Dothistroma Needle Blight (DNB) and its impact on species selection within new native woodlands on the upper margin & in the Stank Glen.
- Seek to improve the water quality status of failing water bodies where this is impacted by forestry management.
- Identify and protect undesignated historic environment features via operational planning and constraint maps and undertake conservation management where appropriate.