Forestry and Land Scotland
Coilltearachd agus Fearann Alba

Central Region

Forth Mosses Land Management Plan 2024- 2034

Approval date: *

Plan Reference No: **

Plan Approval Date: ***

Plan Expiry Date: ****

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

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

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Land Management Plan Details

LMP Name:	Forth Mosses		
Grid Reference:	NS 557 975	Nearest town or locality:	Aberfoyle
Local Authority:		Stirling Local Authority and Loch Lomond & Trossachs National Park	
Land Management Plan area (hectares):		969.8 Ha	

Owner's Details

Title:	Mrs	Forename:	Carol		
Surname:	McGinnes				
Organisation:	Forestry and Land Scotland		Position:	Regional Manager	
Primary Contact Number:	0131 370 5622		Alternative Contact Number:	07917271577	
Email:	carol.mcginnes@forestryandland.gov.scot				
Address:	Aberfoyle Office, Aberfoyle, Stirling				
Postcode:	FK8 3UX		Country:	Scotland	

Approval - to be completed by Scottish Forestry staff:

LMP Reference Number:			
Plan Period: (ten years) (day/month/year)	From:	To:	
Operations Manager Signature:		Approval Date: (dd/mm/yyyy)	

Contents

Version History

Version	Date	Comments
0.0	27/03/2023	Original Draft from Iain Walker
0.1	03/04/2023	Layout formatting
0.2	03/04/2023	Rationalise Objectives
1.0	11/07/2023	Changes based on internal FLS feedback
1.1	29/11/2023	Further formatting changes
1.2	12/02/2024	Update of consultation record based on comments received and responses provided during consultation period.

1.0 Summary of Proposals

Forth Mosses serves as an important area within Central Region for conservation, environment, landscape and recreation. This new plan will incorporate the management of the existing Flanders Moss forest plan, as well as the Cardross forest area, into a single new 10-year plan. Both of these areas are associated not only by their geographic proximity and lowland character, but also due to their deep peat areas, with Flanders Moss complex having previously been identified as one of the most important lowlands raised bogs on the National Forest Estate.

The Forth Mosses land management plan will continue the objective of lowland raised bog restoration outlined in the previous plan, where this will include both felling of remaining conifer areas at Gartrenich and Easterhill, as well as outlining areas for bog restoration on suitable areas. The current plan will also detail the establishment of native woodland on drier areas and riparian corridors which are less suitable for bog restoration. If conifers regenerate on site they will be periodically felled to waste if they threaten the integrity of either the raised bog or native woodland areas. Although bog restoration restores ground to its natural state prior to afforestation, it will also be important to consider any impacts from felling on the local water catchment. Undertaking this work will restore the huge diversity of organisms found on these UK Biodiversity Action Plan (UKBAP), improve the overall landscape of the area as well as improve their value as a carbon store.

There is some Norway spruce located on a Plantation on Ancient Woodland Site (PAWS) area and it will be retained in short to medium term as habitat for resident red squirrel population. It will also be important to maintain the access along the NCR 7 link for walkers, riders and cyclists, and maintain access to the River Forth for local and visiting anglers. In order to improve deer management the access spurs of the main forest road will be made into raised mounds in order to provide vantage points for ongoing management.

To the north east of the Forth Mosses plan area lies Cardross, which is largely afforested, located on peat, and managed as a Natural Reserve for environmental and biodiversity objectives due to the neighbouring Lake of Menteith SSSI. It is planned to continue with this management; however in the future it will be sensible to undertake peat surveys and appropriate consultation in order to see if there is scope for any peatland restoration. However it is envisaged that thinning will take place in the southernmost 19 Ha of Cardross where there is younger crop, drier ground conditions and accessibility. Here there is a diverse range of species which would benefit from a first thin to improve timber quality and a major benefit would be the coinciding clear felling of some pockets of larch due to the risk of P Ramorum. In order to facilitate these operations at Cardross maintenance of the existing forest road will be required.

Table 1 - Woodland changes

Species/land use	Area (Ha) Current	Area (Ha) Year 10	Area (Ha) Year 20
High Forest	271.9	237.8	227.8
Felled	32.1	6.3	22
Plantation Intruded Broadleaf	11.3	10	8.9
Unplantable or bare	14.9	1.2	1.1
Windblow	7.6	6.1	5.2
Open	632	708.5	704.8
Total	**969.8**	**969.9**	**969.8**

LMP Objectives

See Draft Management Objectives, Appendix II: Land Management Plan Brief.

1. Continue process started in the previous plan of restoring and protecting Flanders nationally important Lowland Raised Bog habitat

2. Maintain and where appropriate enhance valuable woodland habitat which benefits watercourses and species such as red squirrel.

3. Continue to manage to conserve the Lake of Menteith SSSI

4. Take opportunities to remove larch to prevent the eastward spread of tree disease *Phytophthora ramorum*

5. Maintain visitor offering including the National Cycle Route and access to the River Forth

2.0 FCS Regulatory Requirements

2.1 Summary of planned operations

Table 2 - Summary of planned operations

Planned Operations	Area (Ha) / Length (m)
Clear-felling (afforested area)	121.72 Ha
Thinning	14.9 Ha
Restock (Phase 1- Mixed Broadleaves)	41.52 Ha

2.2 Proposed felling in years 2024- 2034

Table 3 – Clear-felling Phase 1

Coupe No	Total Area (Ha)	Spp by Ha (Larch)	Spp by Ha (NS)	Spp by Ha (SS)	Spp by Ha (LP)	Spp by Ha (MC)	Spp by Ha (MB)	Open land by Ha
24005	2.25	1.74		0.31		0.18		0.02
26005	119.47			108.43				11.04
26007*	*62.1*			*11.64*			*35.7*	*14.75*
Mature woodland	**121.72**	**1.74**		**108.74**		**0.18**		
All woodland area	*183.82*	*1.74*		*120.38*		*0.18*	*35.7*	

- Currently crops <10 cm dbh so not technically felling but will require removal for proposed bog restoration

2.3 Proposed thinning in years 2024-2034

Proposed thinning in Phases 1 and 2, summarised by hectare of forest area.

Table 4 – Thinning

Woodland species	Area (Ha)
Sitka spruce	11.9
Douglas fir	1.7
Other conifers	0.3
Mixed broadleaves	1.0
Total	**14.9**

2.4 Proposed restocking in years 2024-2034

Proposed restocking species in first ten years, and species change over the ten-year period.

Table 5 - Future Habitats & Species First 10 Years

Coupe No	Total Area (Ha)	Spp by Ha (NMB)	Open (Ha)	Year	Restock Method & Density (Restock/Nat Regen/Alt Area/Coppice/Open)	Monitoring Comments (including and reason not to restock)
24005	2.25	2.25	0	2026	Planting, 1600 density	SDA
26005	119.47	37.61	81.86	2029	Nat regen/enrichment	lowland raised bog restoration
26009	62.1	1.66	60.44	2029	Nat regen/enrichment	lowland raised bog restoration
Total		41.52	142.3			

2.5 Access and roading 2024-2034

Map: roading proposals and maintenance (can be combined with another map if required)

Table 6 – Roading requirement First 10 years

Coupe No	Total Length (m)	Total Area (Ha)	Monitoring Comments
26003/4	111	0.11 Ha	Existing road maintenance

2.6 Standards and guidance on which this LMP is based.

This land management plan has been produced in accordance with a range of government and industry standards and guidance as well as recent research outputs. A full list of these standards and guidance can be found here: Land management plan consultations - Forestry and Land Scotland

2.7 Tolerance table

Table 7 Tolerance Table

	Map Required (Y/N)	Adjustment to felling period	Adjustment to felling coupe boundaries	Timing of restocking	Change to species	Wind throw response	Adjustment to road lines	Designed open ground
SF Approval not normally required (record and notify SF)	N	Fell date can be moved within 5-year period where separation or other constraints are met	<10% of coupe size.	Up to 5 planting seasons after felling (allowing fallow periods for hylobius).	Change within species group E.g., Scot's pine to birch, Non-native conifers e.g., Sitka spruce to Douglas fir, Non-native to native species (allowing for changes to facilitate Ancient Woodland policy).			Location of temporary open ground e.g., deer glades if still within overall open ground design Increase by 0.5 ha or 5% of area - whichever is less
Approval by exchange of letters and map	Y		10-15% of coupe size.	5 years +	Change of coupe objective that is likely to be consistent with current policy (e.g., from productive to open, open to native species).	Up to 5 Ha	Departures of greater than 60 m from the centre of the road line	Increase of 0.5 ha to 2 ha or 10% - whichever is less Any reduction in open ground
Approval by formal plan amendment	Y	Felling delayed into second or later 5-year period Advance felling into current or 2nd 5 year period	>15% of coupe size.		Major change of objective likely to be contrary to policy, E.g., native to non-native species, open to non-native,	More than 5 Ha	As above, depending on sensitivity	More than 2 ha or 10% Any reduction in open ground in sensitive areas Colonisation of open Areas agreed as critical

3.0 EIA Screening Opinion Request for forestry projects

3.1 Proposed deforestation

1. To seek an updated determination for the remaining woodland removal in Gartrenich Moss for peatland restoration, where the previous determination has expired (81.86 Ha).
2. To seek a new determination for Arnochoile Wood (60.44 Ha). (See Appendix X:– EIA Screening Opinion Request)

3.2 Proposed forest road works

N/A

3.3 Proposed forest quarries

N/A

3.4 Proposed afforestation

N/A

4.0 Introduction

4.1 The existing land holding

See Appendix I: Supporting Information sections 1.0 & 3.0

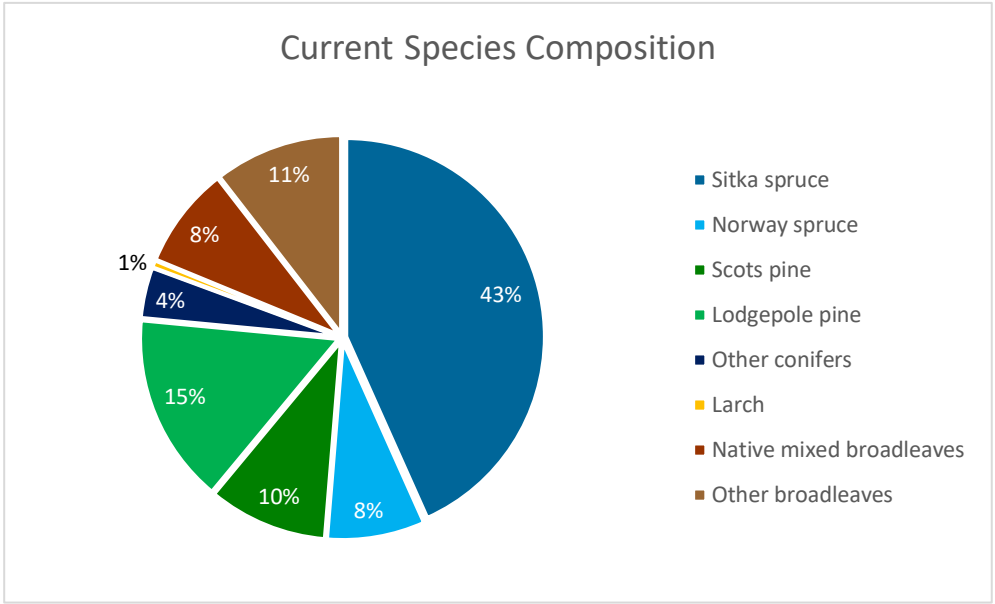
The current land matrix is as follows:

Table 8 – Current Forest Species by Area

Species/land use	Area (Ha) Current
Sitka spruce	125.9
Norway spruce	23.2
Scots pine	28.3
Lodgepole pine	45
Other conifers	12
Larch	1.7
Native mixed broadleaves	24.1
Other broadleaves	30.5
Grand Total	290.7

Note:- Other conifers consists of Western hemlock 4.2 Ha, Douglas fir 4 Ha, Noble fir 3.3 and very small areas of other unmapped mixed conifer located in the Natural Reserve area of Cardross.

Figure 1 – Current Forest Species Composition



4.2 Setting and context

Forth Mosses (969.8 ha) consist of Flanders Moss complex (822.9 Ha) and Cardross (146.9 Ha). They are located a few miles to the east of the village of Aberfoyle in Stirlingshire. The forest is also close to a number of other settlements such as Buchlyvie and Arnprior to the south, Gartmore to the west and Port of Menteith to the north. Flanders Moss complex lies on the lowland river valleys (Central Landscape Character) whilst Cardross largely lies on the Lowland Peatland and Loch Basin. The surrounding area consists of agricultural fields, peatland and a wide mixture of woodlands. In the past the Forth Mosses area was more open, and afforestation has been a significant change in the landscape. The forest primarily function is for conservation, environment, landscape, recreation as well as production (**See Map 1 – Location**).

4.3 LMP Presentation

The Forth Mosses LMP has not been divided into any particular zones, and therefore the objectives relevant to the whole plan are referred to in Section 6 with Sections 5-7 presenting the analysis of key issues and challenges and the management proposals for the site as a whole. However, it is relevant that the original Flanders Moss plan contains the areas Arnochoile/Easterhill, Gartrenich Moss, Flanders Moss and Garchell Moss; and this overall area within this document is referred to as the Flanders Moss complex.

5.0 Analysis and concept

5.1 Analysis

Through survey work and research, a broad range of factors have been identified which are potentially relevant to the future makeup and management of the land. These have been analysed in order to better understand the way these interact, and to draw out the most important features and trends. (See Map 5- Key Feature Opportunities & Constraints).

5.2 Concept

The analysis was used to develop an initial design concept highlighting general themes and outlining key considerations and activities which are likely to be most relevant during the plan period, and which formed the basis for these plan proposals for consultation with both the general public and key stakeholders (See Map 6 – Initial Design Concept).

6.0 Long Term Land Management Plan Proposals

6.1 Management

All proposals have been designed in accordance with sound silvicultural and environmental principles, falling within the framework outlined by the UK Forestry Standard, the UK Woodland Assurance Scheme, Scottish Biodiversity Strategy, Nature Conservation Scotland Act (2004), Forestry on Peatland Habitats, FCS Practice Guide- Deciding future management options for afforested deep peatland, FC Bulletin 112 Creating New Native Woodlands, FC Bulletin 115 Alternative Silvicultural Systems, FC Bulletin 124 Ecological Site Classification for Forestry, and the current FC edition of Forest & Water Guidelines. This plan has considered the natural and historic environment as well as green network opportunities.

The main felling is associated with remaining conifers located on Gartrenich Moss (See Maps 7 – Management Coupes and Map 8 – Felling Approval Areas). There is also a small area of lodgepole pine located in Arnochoile which will be felled to waste, as it is not economical to extract it. Undertaking this work will allow for the area to be aligned with the overall plan objectives for biodiversity and the environment. The impact from felling has been considered and as these coupes lie on low lying ground either side of the River Forth, the coupes are not considered to be prominent features within the landscape. Retention of broadleaves as minimum interventions and natural reserves as well as retaining Norway spruce as a long term retention will help diminish the impacts of this clear-felling. On areas unsuitable for bog restoration natural regeneration of native woodland will be managed as low impact silvicultural systems. This will allow for the felling to waste of competing conifers where they threaten the broadleaf components as well as allow for supplementary planting to be carried out if needed.

The only other clear-felling will be associated with the removal of larch located in the south of Cardross, where this work will be done in association with the overall thinning of the younger crop. Due to the small areas being felled and the area being predominately low lying there will be little impact from a visual perspective. The work in Cardross will require a new road off the existing road spur. Any operations in Cardross will need to be carefully planned due to the sensitivities associated with the Lake of Menteith SSSI. The northern part of Cardross which is mostly mixed conifers will continue to be managed as a Natural Reserve, due to its association with the Lake of Menteith SSSI, which is designated for water quality.

Final choice of harvesting method will be determined at work planning stage and will account for environment, biodiversity, landscape and recreation. All harvesting operations will be carried out in accordance with the UK Forestry Standard Guidelines, Forests and Water Guidelines (5th edition).

6.1.1 Clear Felling

As already mentioned, the operations within the lifetime of the plan is the clear-fells in Gartrenich, Easterhill and in the south of Cardross. Coupe fell years are generally based on the optimal rotation lengths to reach Maximum Mean Annual Increment. This applies to the Gartrenich and Easterhill coupes but not to the younger larch stands in Cardross which is a pre-emptive cut due to the risk associated with Phytophthora ramorum. The size of the clear-fells will be in keeping with the scale and topography of the landscape, where the impacts of undertaking the work are considered to be low.

Overall, for Forth Mosses there is a movement away from patch clear felling with a more appropriate management approach of open lowland raised bog, Natural Reserves, Minimum Interventions and LISS being viewed as the best way forward to meet the objectives of the land management plan.

During the 10 years of the plan period, a total of 121.72 Ha are designated for clear-felling, with a projected volume of ~23,638 m³ being extracted with some areas of poorer crop on wet ground expected to be mulched onsite (See Map 6 – Management Coupes).

6.1.2 Thinning

FCS policy generally assumes that all productive crops will be thinned, unless:

- Thinning is likely to significantly increase the risk of wind blow.
- Operations are likely to require an unacceptably large investment in relation to the potential benefits due to access or market considerations.
- Thinning is unlikely to improve poorly stocked or poor-quality crops.

In the past thinning in Flanders Moss complex was not undertaken, due to a single thinning operation being likely to require an unacceptably large initial investment in relation to the potential benefits due to access and market considerations. This was also previously the case in Cardross, however an opportunity to thin the southern part is now presenting itself as the p2002/p2004 crop matures. This area ranges from sheltered to moderately exposed with some small areas of brown earths, but the majority of the area is on peat (See Map 2 & 3 – Soils and Climate). Although much of Cardross is associated with peat it is important to note that the soils are largely drier in the southern end, and this area has previously been clear-felled and restocked. Appropriate consultation will be required with NatureScot in order to mitigate the sensitivities of the Lake of Menteith SSSI. Overall the thinning operation would improve the quality of the existing crop, with an added benefit of allowing the larch, which is susceptible to Phytophthora ramorum to be clear-felled at the same time as the thinning.

Thinning will normally be carried out at, or below, the level of marginal thinning intensity (i.e.,

removing no more than 70% of the maximum MAI, or YC, per year). Higher intensities (no more than 140% of maximum MAI, or YC, per year) may be applied where thinning has been delayed or larger tree sizes are being sought. In all cases work plans will define the detailed thinning prescription before work is carried out and operations will be monitored by checking pre and post thinning basal areas for the key crop components (See Map 10 – Thinning).

6.1.3 Continuous Cover Forestry (CCF)/ LISS

'Low impact is defined as the use of silvicultural systems whereby the forest canopy is maintained at one or more levels without clear-felling.

The Low impact approach is suited to multi-purpose forestry where environmental, biodiversity, recreation, and other objectives are as important as timber production. In particular, low impact forestry is a means of reducing the impact of clear-felling and the associated changes that this produces in forest landscapes and habitats.

In the previous plan 0 Ha were selected for LISS management, however during the review the following factors have been considered: -

-Does LISS now meet the objectives for that area of the forest
-Is there sufficient site suitability information available (soils, wind hazard data, thinning history)
-What level of ground vegetation competition is there with any natural regeneration
-Are the existing species suitable for the site
-Is any advanced natural regeneration present
-Age structure of forest
-Suitable roading

After review of the above factors it will be suitable to manage 183.82 Ha as low impact silvicultural systems where native woodland is the desirable species. These areas will be located on drier soils where conditions are unsuitable for lowland raised bog. Initially this will allow for the felling to waste of competing conifers where broadleaf components are threatened.

In the future once the native woodland has established it is likely that the prescription will be 'Single tree selection' in accessible areas, as this system allows removal of individual trees of all size classes more or less uniformly throughout the designated area. The single tree selection system generally produces a complex mixture of small, even-aged clumps which are thinned over time to theoretically produce one mature tree. In theory these clumps should yield a least one mature tree of the specified maximum diameter, although in practice these clumps are often larger. New regeneration develops in small, scattered openings created theoretically in small gaps with an area equivalent to the crown spread of a single mature tree. In practice these gaps are often larger, created through the removal of several mature tree.

It is important to emphasise that, as LISS is an approach to forest management which has flexibility to take advantage of opportunities as they arise, however 'Single Tree Selection' for future management is a good starting point. This will give scope for areas of lowland raised bog and LISS to be interchangeable depending on how sites progress (See Map 9 – Silvicultural Systems).

6.1.4 Other Tree Felling in Exceptional Circumstances

FLS will normally seek to map and identify all planned tree felling in advance through the LMP process. However, there are some circumstances requiring small scale tree felling where this may not be possible and where it may be impractical to apply for a separate felling permission due to the risks or impacts of delaying the felling. Felling permission is therefore sought for the LMP approval period to cover the following circumstances:

- Individual trees, rows of trees or small groups of trees that are impacting on important infrastructure (as defined below*), either because they are now encroaching on or have been destabilised or made unsafe by wind, physical damage, or impeded drainage. *Infrastructure includes forest roads, footpaths, access (vehicle, cycle, horse walking) routes, buildings, utilities and services, and drains.

The maximum volume of felling in exceptional circumstances covered by this approval is 75 cubic metres per Land Management Plan per calendar year.
A record of the volume felled in this way will be maintained and will be considered during the five year Land Management Plan review.

6.1.5 Restructuring

As a significant area of the forest is designated for lowland raised bog restoration along with future fringe native woodland, over time we will create a forest which is mostly open with mature native woodland on the areas which are less suitable to bog restoration. Within some of these areas there will be scope to create a diverse age structure over time by undertaking selective thinning. Age structure will also be subject to natural processes, natural regeneration and any planting initiatives.

6.1.6 Minimum Intervention and Natural Reserves

For various areas of the forest Biodiversity will be a primary objective and we are prepared to commit existing areas, which do not have foreseeable future operations as Minimum Interventions and Natural Reserves. This classification need not apply in perpetuity and these areas may be reviewed and revaluated for alternative management in future plans. In addition to the existing area of Natural Reserve in north Cardross, this plan aims to add 21.13 Ha of minimum intervention in the Flanders Moss complex. The reason for its inclusion is to retain

the native woodland for biological value. Equally in the future other native woodland areas may also be designated (See Map 7 – Management Coupes).

6.2 Restocking proposals, future habitats and species

Considering all the survey and analysis information, and the objectives set out in the brief, for the most part lowland raised bog will continue to be restored throughout the Flanders Moss complex, with native woodland being established on the drier soils. There are future prospects for Cardross to be restored to peatland habitat, however due to the association with the Lake of Menteith SSSI, any future proposals would need to be backed up by peat surveys as well as consultation with NatureScot and Scottish Forestry.

6.2.1 Proposed Restock Species

Over the years various surveys have been undertaken on Flanders Moss, Garchell, Gartrenich and Arnochoile sections, where both vegetation and hydrology have been examined (See Appendix VII: Summary of Environmental Surveys, Appendix VIII Hydrological Advice & Appendix IX Flanders Moss peatland restoration Hydrological impact assessment). The conclusions were that Flanders Moss, Garchell and Gartrenich sections were priority candidates for bog restoration, whereas Arnochoile and the northern part of Gartrenich sections were previously identified as being less suitable. However, as peatland restoration techniques have improved the Arnochoile area is now considered as having good restoration potential, so will now also be restored to lowland raised bog. The northern part of the Gartrenich along with other areas that are less suitable to bog restoration will be established with native woodland. (See Map 12- Future Species & Habitats & Map 13 Restock Approval Areas). Mapped areas will be subject to minor variation when operations commence, especially around the fringes of the bog where it might be more difficult to control natural regeneration of trees.

Restoration of lowland raised bog and establishing native woodland along riparian corridors and on the drier soils at the edge of the bog, will alleviate some of the impacts of tree removal on the overall water catchment where this is particularly relevant to flooding. It will also restore and enhance the original sense of space that would have been present prior to afforestation, and integrate Forth Mosses with adjacent lowland raised bog sites such as Offerance Moss SSSI, Flanders Moss SAC, Loch Macanrie Fens SSSI and Collymoon SSSI/SAC. By retaining existing native woodland we will be promoting further establishment along riparian corridors, which includes areas of ancient woodland. Norway spruce located in the ancient woodland area will be retained in the short to medium term as habitat for resident red squirrel population. Existing woodland species at Cardross will be retained to meet current objectives relating to the Lake of Menteith SSSI. The exception is the larch areas to the south of Cardross which will be restructured into native broadleaves, to fit in with environmental and biodiversity objectives.

Table 9 – Proposed Restock Species

Species	Net area (ha)	%
Native MB	41.52	4.3
Open	81.86	8.4

Detailed restocking information is available in Section 2.4 Table 5 – Restocking of felled areas 2024-2034. (See Map 13 Restock Approval Areas).

6.2.2 Semi-natural woodland

Native woodland establishment on site will be in line with the current FLS guidelines (Rodwell & Paterson, 1994), which details suitable National Vegetation Classification (NVC) woodland types appropriate to soils and indicator vegetation encountered on site. These woodland types will naturally align with the guidelines set out in the Forestry Commission's Ecological Site Classification (ESC) Bulletin 124, which uses climatic zone, exposure, soil moisture, and soil nutrient levels to inform the type of woodland most suited to particular areas within the site. Predominately wet woodland type 4 will be the expected species and regeneration of exotic conifers will need to be kept to a minimum (<500 stems per hectare) in all habitat areas. The woodland type, locations and species are listed in Table 10 below:

Table 10 – Native Woodland Type

Woodland Type	Location	Species
W4 (Upland birch woodland)	Poorest ground, typically along riparian corridors.	Downy birch, grey willow and alder
W7 (Alder wet woodland)	On less fertile, predominantly mineral soils where there is little peat accumulation	Alder, ash, downy birch, goat, oak, rowan, holly and bird cherry.
W9 (Upland mixed broadleaved woodland)	On more fertile soils	A wide range of broadleaved species including ash, oak, rowan, birch, wych elm, alder, holly, aspen and bird cherry.

The area associated with northern Gartrenich (coupe 26001) is prescribed for restocking due to its size (Map 9 – Silvicultural Systems). Elsewhere establishment of native woodland through natural regeneration will utilise local seed sources. In order to manage this stocking density assessments will be carried out bi-annually until the sites are established where 1600 stems per hectare will be desirable, although there is scope to accepts lower densities along watercourses and fringe peatland areas which will result in improved structural diversity as well as having biodiversity benefits. Areas identified for natural regeneration should be allowed at least 10 years prior to considering any supplementary planting. In reality there will be some deviation in the proposed native woodland areas, where some areas may be more suitable to open peatland.

6.3 Biodiversity & Environment

6.3.1 Habitat & Species Management

UKBAP Lowland Raised Bog - Deforestation will continue across Forth Mosses to create more open areas on the most suitable sites. Once all felling is complete, peatland restoration will start and be completed over a five year period by installing a series of dams which will restrict the drainage of the site and enable the water level to rise. These dams could be peat dams or a deep plastic piling type used on bog restoration projects elsewhere. When the water level rises it will create optimal conditions for bog species to regenerate across the site, and will also help to make the site less suitable for any trees or invasive species to establish. All the dams will be located within the area of the bog and any natural watercourses crossing the moss. Any drains essential for draining neighbouring farmland will not be blocked.

Natural Reserve- The northern area of Cardross is located on deep peats and has a close affinity with both Lake Menteith SSSI and Loch Macanrie Fens SSSI. It is largely afforested and in places is extremely wet, so managing the area as a Natural Reserve is ideal for protecting the Lake of Menteith SSSI. However, due to the deep peat soils on site it has been identified as a potential candidate for peatland restoration. In order to assess it potential for peat restoration it is planned to carry out future peat surveys and consultation with NatureScot and Scottish Forestry, which will help inform if any bog restoration should be undertaken.

UKBAP Woodland- Habitats on site include the Forth River, upland birch woods, upland oakwood and wet woodland. FLS will maintain semi natural and new native woodlands and maintain areas where any rhododendron and knotweed have been removed. Natural reserves, minimum intervention and long term retention areas will provide a diverse canopy and structure for species diversity. In the areas of the Flanders Moss complex which are less suitable to bog restoration, the management of these will be for natural regeneration of native woodland which will complement the existing native broadleaf areas as well as the open lowland raised peat habitat.

Forest-to-bog restoration techniques have improved greatly over the last few years, and FLS is regarded as one of the leading organisations in developing best practice and delivering positive restoration programmes: we would anticipate a more rapid recovery of water table (to suppress natural regen) and establishment of bog vegetation in restoration sites than experienced previously. The Future Habitats and Species map indicates the main areas where it is thought bog restoration is possible. (See Map 12- Future Species & Habitats).

Red Squirrels- Norway spruce, located within the ancient woodland, will be retained as they provide valuable habitat for red squirrels.

6.3.2 Riparian Areas

We will establish or maintain appropriate riparian buffers along watercourses providing an open woodland canopy with half the watercourse open to sunlight and the remainder under dappled shade. Distribution and management of the taller vegetation elements will reflect the stream orientation, ensuring that sufficient light reaches the stream and banks to support the development of a vigorous cover of ground and marginal vegetation. Conifer natural regeneration may also establish within these buffers which we will accept as a minor species component.

6.3.3 Deadwood

The aim is to use natural processes by retaining dead, windblown, or snapped stems or those created during previous operations. Deadwood can be trees or limbs in the early stage of decomposition, e.g., veterans or dying individual trees. These should be retained wherever possible to create an even mix of standing, fallen, or stacked deadwood. In Forth Moss deadwood areas will be associated with Natural Reserve, Minimum Intervention, Long Term Retentions and LISS areas. The lowland raised bog will reduce the overall deadwood Ecological Potential within the woodland; but in the wooded areas it will exceed the UKWAS average target of 20 cubic metres per ha.

6.3.4 Invasive Species

Rhododendron ponticum & Giant Hogweed- Targeted invasive control will be considered and actioned where necessary through the period of this plan, improving habitat. We will continue to seek agreement with our neighbours to prevent it spreading back into the forest.

6.3.5 Wildlife (Deer Management)

Full details of proposed deer management can be found within Appendix VI: Deer Management Plan (Forth Mosses).

6.3.6 Landscape

In producing this LMP FLS has considered the landscape character of the area and the features outlined in NatureScot's landscape character assessment. FLS has also considered the impact our proposals would have on the wider landscape and the impact will not be significant given the overall large scale and low lying landscape with the restructuring of the forest restoring and enhancing the visual amenity of the area. One of the main values of tree removal and bog restoration is the extension and link with similar habitats throughout the upper Forth Valley This sense of space and the setting of the bog will also improve the internal perspective and views from the main track to Ben Lomond, the Trossachs and the Campsie fells. (See Appendix I section 3.5 Landscape & Land use).

6.3.7 Hydrology

As Flanders in total makes up less than 5% of the River Forth and Kelty catchments its contribution to flood flows is likely to be relatively minor (See **Appendix VIII:– Hydrological advice**). Establishing riparian and native woodland on the edges of peat areas will help reduce

flood risk and of course restoration of bog will also likely have benefits for the catchment area. It is important to note that the restoration of the bog will be returning the local water catchment to its natural levels prior to afforestation of the various sites.

Appropriate care and planning will be required prior to undertaking any operations in Cardross due to the Lake of Menteith SSSI's, where the tributaries are also designated in order to protect the quality of water entering the lake. Consultation with NatureScot and Scottish Forestry will need to be undertaken prior to any operations being undertaken.

6.3.7.1 Private Water Supplies

We have identified a handful of properties around Easterhill, Barbadoes and Gartrenich which potentially may abstract water from within the LMP area. These properties will be contacted in the near future to confirm if this is the case or, more likely given the topography, that they have private connections to nearby public water supplies. We would also be in touch with these properties about any private supplies as part of the work plan process in advance of any operations such as harvesting or peatland restoration.

6.4 Heritage

The Regional Historic Asset Management Plan includes conservation management intentions for those designated historic assets in Scotland's national forests. Details of all known historic environment features are held within the Forester Web Heritage Data (built using national and regional historic environment records) and are included within specific operational Work Plans to ensure damage is avoided. This is done in accordance with the guidance provided in the Forests and Historic Environment guidelines (2011), the SF policy document: Scotland's Woodlands and the Historic Environment (2008) and the supporting FLS Historic Environment Planning Guidelines. Significant historic environment features will be depicted on all relevant operational maps and appropriate buffers would be applied by our Environment Forester to all the different features across the sites which are recorded within our heritage database. The forest design illustrated in Map 12 – Future Habitats & Species has considered the various heritage features and our future management.

The following sub-sections provide further detail as to some features which will see specific management or work on them during the life of this plan.

6.4.1 Scheduled Archaeology

N/A

6.4.2 Non-Scheduled Archaeology

There are a few undesignated features across the sites which are recorded in the heritage layer. These are a timber track, a submerged boat naust and a glass armlet find. Appropriate buffers will be applied and maintained around pertinent non-scheduled archaeological features, these will be kept open and free of trees. All operation in the vicinity of such features

will be conducted in accordance with UK Forestry Standard Guidelines on Forests and the Historic Environment, with suitable steps taken to ensure their protection.

6.5 Operational Access

6.5.1 Forest Roads

The only new roading is a spur of approximately 438 m for the coupe located in the south of Cardross, which will facilitate the management of this area. No other new roading is envisaged for this plan period (See Map 7 – Management coupes).

6.5.2 Quarries

Any stone for roading will be imported from external quarries as the soils are unsuitable for quarries.

6.6 Visitor Zones

Visitor Zones have been identified in areas where FLS encourage and manage access or where the woodland managed by FLS interacts with popular visitor sites or access routes (See Map 11 – Woodland Management in Visitor Zones).

In these areas, single trees or small groups of trees will be removed when necessary to protect facilities, infrastructure, and trails, or to enhance the setting of features, or to maintain existing views. Woodland in these zones will also be thinned, or trees re-spaced, for safety reasons (including to increase visibility to ensure that sites are welcoming and feel safe) and where it is necessary to enhance the experience of the forest setting, through the development of large trees, or preferential removal of trees to favour a particular species.

6.7 Open land

The main area is associated with the primary objective of the Forth Mosses LMP of lowland raised bog restoration as detailed in 6.3.1 Habitat & Species Management. Elsewhere the plan has an open area in Cardross, which is associated with a hydrological mire range, located on a lowland raised bog which lies adjacent to the Loch Macanrie fens SSSI.

6.8 PAWS Restoration

There is an area of Ancient Woodland in Easterhill which is largely under Norway spruce. These trees will in the short to medium term be retained in order to continue to provide suitable habitat for red squirrels. In the future it is expected that these areas will senesce or be subject to wind blow. Otherwise they will be felled where establishment of these sites will be native woodland in the long term through natural regeneration.

7.0 Critical Success Factors

The success of this plan will be based on whether the objectives set out in the **Management Plan Brief** (See Appendix II) are achieved. The table which forms Appendix IV: Objective Appraisal, Monitoring & Evaluation details how each objective will be appraised, where and when each objective will be monitored; by who and where it will be recorded. This will enable an evaluation of success a part of the mid and end of plan reviews.

Appendix I: Supporting Information

1.0 The existing forest and land

1.1 History of the land holding

Forth Mosses is a combination of Flanders Moss complex (823.12 Ha) and Cardross (146.99 Ha) forest areas. The Flanders Moss area is the larger of the two, where it lies in the upper part of the River Forth Catchment between Aberfoyle and Buchlyvie. The Cardross forest area lies to the north east of Flanders Moss, approximately 3.5 miles east of Aberfoyle and 1 mile to the south of Port of Menteith. There is network of interconnecting public roads running round the Forth Mosses, with the A81 running to the west and north, the B8034 running to the east and the A811 and B835 running along the south.

The Flanders Moss complex was originally established in two main planting phases in the 1960's and 1970's on a large area of lowland raised bog. As the conifer's matured Flanders Moss complex was identified as a large area of lowland raised bog habitat, which is listed on the Scottish Biodiversity list and is a UK BAP Priority Habitat. Therefore the main objective was to clear-fell the conifers and to restore, where possible, the land to active lowland raised bog. Environmental assessments were carried out to determine the feasibility and impact of the proposals.

Cardross was originally planted in the late 1950's and early 1960's largely with mixed conifers. Although there is no current forest plan for this area, the majority of the woodland has so far been retained as a Natural Reserve, which is mainly due to the association with the Lake of Menteith SSSI, a lack of access as well as the deep peat soils located in this area. A 30 Ha section located near the entrance, however was felled and restocked in the late 1990's and early 2000's.

The new design plan will replace the previous Forest Design Plan for the Flanders Moss complex, and it will also incorporate management proposals for Cardross.

2.0 Analysis of previous plan

The general objective of the previous plans were multipurpose where the woodland served as an important area within Central Region for conservation, environment, production and recreation. Overall the main objective of Forth Mosses was lowland raised bog restoration in the Flanders Moss complex, where it was essential to construct the planned roads and harvest the relevant areas. Objectives also included allowing establishment of native woodland on areas not suitable for restoration, riparian areas as well as enhancing established ancient woodland sites. It was also relevant to improve habitat for red squirrels and maintain access along the NCR 7 and to the River Forth. Although, there was no formal forest plan for Cardross there were a number of desirable objectives for improved access, thinning of the southern end, larch removal, and reduced shading on Lake Menteith for species diversity. Deer management was also relevant, where it contributed to sustainable forestry, conservation and farming efforts across Forth Mosses and the surrounding area.

Further detail and progress on the aims for Forth Mosses are provided below.

2.1 Aims of previous plan and achievements.

Table 1 – Progress on previous LMP objectives

Objective	Proposed management actions	Progress to date 1 - Little/No progress 2 – Some progress 3 – Progress as per LMP
Production	Clear-fell non-native conifer species in Flanders to provide material for the wood fuel market. Where this is not feasible trees will be mulched or felled to re-cycle. All felling is expected to be completed during the 10 year plan period.	2- There are still some large areas of conifers standing in Gartrenich Moss. Elsewhere there are also some small areas of slow growing Lodgepole Pine.
	It is envisaged that thinning will take place in the southernmost 19ha where good ground conditions and accessibility are available. There is also a diverse range	1- There has been no progress of this work.

Objective	Proposed management actions	Progress to date 1 - Little/No progress 2 – Some progress 3 – Progress as per LMP
	of species contained within this area which require a silvicultural first thin to improve timber quality. Approval for this operation will be undertaken by submission of a standalone licence application.	
Roading	Upgrade existing access and construct additional spurs in order to facilitate harvesting in Flanders. Access into Cardross from the neighbouring ground is substandard and will require upgrading before any operations can take place. In order to gain access to the northern most areas of the woodland for operational activity it is envisaged a road will be required. Any vehicular access required in future through this area will be required to be established in conjunction with NatureScot in order to manage the sensitivities of the SSSI.	3- Road upgrades and new spurs completed to aid felling in Flanders. 1- No thinning or roads works undertaken.
Phytophthora ramorum	If larch infection becomes present before the first thinning intervention it is recommended that all produce be felled to recycle as removal for a small quantity is inefficient. Should the crop remain uninfected	1- There has been no progress of this work as there has neither been a thinning operation or a disease outbreak.

Objective	Proposed management actions	Progress to date 1 - Little/No progress 2 – Some progress 3 – Progress as per LMP
	until the first thinning intervention then all larch should be clear felled and removed to market in order to recoup costs and maximise income to the public purse.	
Lowland raised bog	Restore and maintain lowland raised bog where this is feasible. This will involve blocking drains in key locations and monitoring, and removing, tree regeneration where necessary.	2- Some progress- Large areas of conifers have been cleared and operations are being planned.
Wet woodland habitat	Allow establishment, primarily through natural regeneration, of wet woodland on those areas of bog not suitable for restoration. In addition native trees will be allowed to establish along riparian corridors, enhancing the establishment ancient woodland and contributing to reduced flood risk along this section of the River Forth and its tributaries.	2- Some progress- native woodland is establishing around the edges of the lowland raised bog. In general this is in mixture with regenerating Sitka spruce and Lodgepole pine.
Red squirrels	Improve habitat for Red squirrels by retaining small stands of Norway spruce in the riparia zone.	3- Progress as per LMP- Norway spruce is still standing in ancient woodland area.
Lysimachia thyrsiflora	In Cardross fell an area of birch by hand 50m long by 30m wide to reduce shading of the *Lysimachia thyrsiflora* on the loch shore.	3- Progress asper LMP- Hand cutting completed.
Deer Management	Significantly reduce the deer population in the wider area	3- Progress as per LMP- It is clear that the deer management is well conducted and

Objective	Proposed management actions	Progress to date 1 - Little/No progress 2 – Some progress 3 – Progress as per LMP
	which is not only impacting sustainable forestry but also farming and the conservation efforts across the Flanders Moss complex.	the general pressure lower. There is natural regen occurring across the Flanders and Cardross areas.
Recreation	Maintain the access along the NCR 7 link for walkers, riders and cyclists, and also maintain access to the River Forth for local and visiting anglers.	3- Progress as per LMP- Continued access along the NCR 7 was aided by the construction of road spurs. Appropriate liaison allowed for continued recreation use of the River Forth by anglers.

2.2 How previous plan relates to today's objectives.

This new revision of the plan largely follows on from the objectives of the previous plan to achieve a multi-purpose forest (See Appendix II).

3.0 Background information

3.1 Physical site factors

3.1.1 Geology Soils and landform

The Flanders Moss complex is around 10 to 20 metres above sea level and largely located on a large area of lowland raised bog which forms one of a series of raised bogs in the upper Forth catchment. These bogs have formed from organic material lying on alluvial terraces and short steep slopes, which causes the central domes to be several metres above the level of the terrace where their only source of water is rain water. This gives them a characteristically wet and acid nature in which a particular range of vegetation flourishes. Peat depth is up to 9 m in places and the surface remains wet where drainage is poor. Attempts to drain the area have been made over the years and some drains can be seen on 19th century ordnance survey maps. A more extensive drainage system was installed during afforestation but the majority of these drains now work inefficiently if at all. Over most of the area water tables remain at or very close to the surface for much of the year.
Cardross is also a relatively flat site with just 20 m of differential between the highest ground at the southern tip sitting around 40 m, to beside the Lake of Menteith at 20 m. In general the area is also largely located on a large area of lowland raised bog similar to the Flanders Moss complex. There are also some smaller fringe areas of Forth Mosses which are associated with gley soils and brown earths, where these have formed respectively from estuarine and lacustrine raised beach clays and old red sandstone sediments and lavas.

3.1.2 Water

The Flanders Moss complex is within the catchment of the River Forth. The Forth bisects the forest and there are several tributaries which are incised into the moss and remain independent of the artificial drainage system. Both the Forth and its tributaries are prone to flooding during periods of heavy rainfall with little impact on the moss itself. Therefore, it is important to consider the implications of tree removal to flooding in the surrounding area. The Flanders Moss complex covers ~ 820 Ha, which is 3.9% of the River Forth catchment above the forest (21,000 Ha) and 2.5% (100 Ha) of the Kelty River catchment (3,700 Ha). In general where tree removal forms < 20% of the overall catchment area of a river, its impact on flooding will not be discernible. Therefore the scale of felling and time periods of felling in the previous forest plan, were well within the current standards set out in the Forest and Water Guidelines to mitigate against flood risk. In addition the small size and poor quality of the trees suggests that the impact of even rapid removal would be minimal.
Leaving brash on site, and flailing where harvesting was not possible, will also slow water flow off the moss. Encouraging the spread of riparian woodland, also helps reduce flood risk. **See Appendix VIII:– Hydrological advice.** It is also important to note that the restoration of lowland raised bog will be returning the local water catchment to natural water levels prior to afforestation.

Cardross forest drains into the Lake of Menteith and then to the River Forth by means of Goodie Water . It is a lowland loch with an average depth of 6 metres, reaching 24 metres at its deepest point. The boundary of the Lake of Menteith along with most of its feeder burns forms a Site of Special Scientific Interest (SSSI). The tributaries were included in the SSSI boundary to help protect the quality of water entering the lake that could be affected by activities in the catchment area. Topographic data suggests that as 82% of the woodland is under 30 m, this combined with the fact that there is in excess of 20 miles before the outflow reaches tidal water at Stirling, means that the outward flow from the area is low.

3.1.2.1 Private Water Supplies

GIS analysis of the site using locations of neighbouring properties, current Scottish Water asset data, Local Authority data of registered existing PWS and contour elevation data indicates that vast majority of neighbouring properties are both served by existing public water supplies and are at higher elevation to the site and therefore water would not be abstracted from within the site by those properties. There are a handful of properties identified that could potentially abstract water through private supplies from the site.

3.1.3 Current climate & exposure

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

	AT5	DAMS	MD
High	1777	13	105
Low	1724	11	99

AT5 is the accumulated total of the day=degrees above the growth threshold temperature of 5 degrees Celsius, which provides a convenient measure of summer warmth. The results for AT5 place this block in the “warm” zone (<775 dd = alpine, 775-1,200 dd = cool and >1,200 dd = warm).

DAMS is the Detailed Aspect Method of Scoring. This represents the amount of physically damaging wind that forest stands experience in the year. The overall range of DAMS is from 11 (Sheltered) to 13 (Moderately Exposed). Windiness is the most likely factor to tree growth at higher elevations in Britain.

DAMS	**Exposure**
19-22	Severely Exposed
16-19	Highly Exposed
13-16	Moderately Exposed
<13	Sheltered

MD is the Moisture Deficit for the area. Moisture deficit reflects the balance between potential evaporation and rainfall and therefore emphasises the dryness of the growing season (rather than the wetness of the winter or whole year). These results place the block within the " moist" zone (0-90 = wet, >90-160 = moist and >160 = dry). Further information on these criteria and the application of ESC can be found in Forestry Commission Bulletin 124 – An Ecological Site Classification for Forestry in Great Britain.

3.1.4 Future Climate

Climate data projections for 2050 and 2080 have been used to predict the anticipated future climate, which is expected to have warmer and drier summer, but with an increase in the frequency and severity of winter storms. Although this suggests that the range of suitable species may expand to accommodate more demanding species, and that the growing season may extend, it may also indicate an increased risk of drought which may, in future rotations, limit the site suitability of species which are currently suitable.

3.2 The existing forest

3.2.1 Age structure, species, and yield class

Table 2 below shows the species make-up of Forth Mosses with Figure 1 further illustrating this. Both the table and figure show that the forest is predominantly open space which is mainly associated with the Flanders Moss complex. There are components of LP, SP, NS, DF, JL and NF where these are mainly located within Cardross. Native broadleaves make up a smaller area of the woodland area. See Map 4 – Existing Crop.

Table 2 – Current Forest Species by Area

Species/land use	Area (Ha) Current
SS	131.15
LP	2.38
NS	6.1
DF	2.31
JL	2.25
NF	0.23
MC	107.25
MB	39.14
Felled	125
Open	554.3
Total	970.11

Note:- Mixed Conifers (MC) consists of LP 41.77 Ha, SP 31.59 Ha, NS 24.39 Ha, SS 3.88 Ha, WH 3.48 Ha and DF 2.14 Ha located in the Natural Reserve area of Cardross.

Figure 1 – Current Forest Species Composition

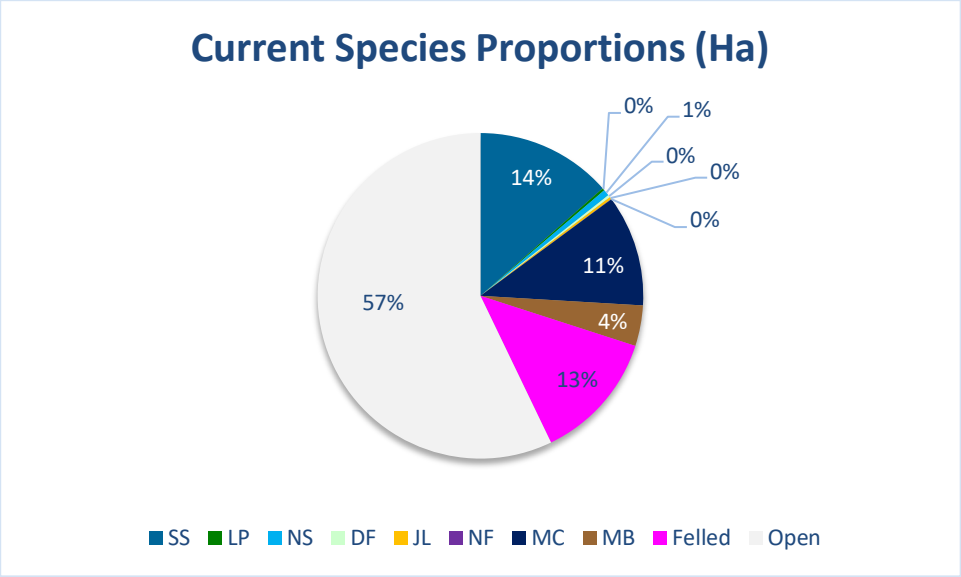
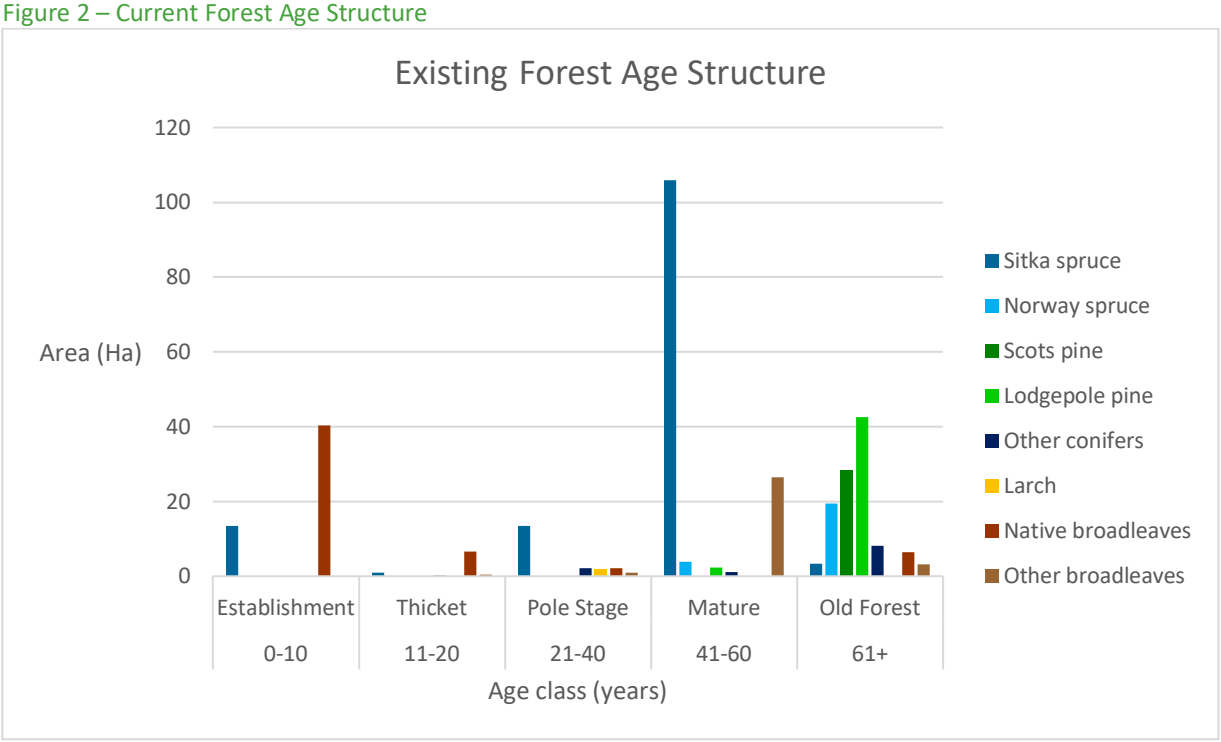


Figure 2 below illustrates that the general picture of species structure across the forest with a large area currently under Sitka spruce and other conifers. The majority of the forest was planted in the 50's, 60's & 70's with some restructuring occurring in the 2000's.

Figure 2 – Current Forest Age Structure



There is a wide variety of yield classes (YC 0-24) associated with the forest where this is skewed to lower values due to the majority of species being located on peaty soils. Based on the information we hold in our sub-compartment database (SCDB), yield classes for broadleaf species range from 0 – 6, Sitka spruce range from YC 2 – 24, Lodgepole Pine 2-14, Mixed Conifers 2-24, Norway spruce 2-16, Douglas fir 10-24, Japanese larch 14, Noble fir 16 and Native broadleaves 0-8.

Table 3- Area by species

Species/land use	Area (Ha) Current	Area (Ha) Year 10	Area (Ha) Year 20
Sitka spruce	125.9	19	5
Norway spruce	23.2	21.6	20
Scots pine	28.3	25.6	22.9
Lodgepole pine	45	38.7	34.4
Other conifers	12	21.5	29.5
Larch	1.7	0	0
Native mixed broadleaves	24.1	100.3	105.2
Other broadleaves	30.5	27.2	25
Total	**290.7**	**253.9**	**242**

Table 4- Area by age

Age Class	Area (Ha) Current	Area (Ha) Year 10	Area (Ha) Year 20
All 0-10 Years	11.1	89.4	21.6
All 11-20 Years	8.3	9.9	86.4
All 21-40 Years	20.5	26.6	17.1
All 41-60 Years	139.6	0	2.5
All 61+ Years	250.9	128	116.9
Total	**430.4**	**253.9**	**244.5**

3.2.2 Operational Access

The area of Flanders south of the River Forth is bisected by an old railway track and this has been used to extract timber to the B835 Buchlyvie to Ward Toll road. At the junction, all timber lorries should turn right towards Ward Toll and join the A81 there. No timber traffic should enter Buchlyvie via the B835. The Gartrenich section, north of the River Forth is accessed from an existing track which meets the A81 near Cobleland. Timber from Arnochoile can be extracted out by Easterhill.

Forestry and Land Scotland does not have direct access from the public into Cardross forest but only permissive rights. Access into the forest is substandard and will require upgrading before any operations can take place. For haulage, the only permitted access is from the A81 at the Port of Monteith village, and the Dykehead to Arnprior road is an excluded route. On

approaching Cardross the turn at Dykehead is a very narrow with poor visibility leading on to a single lane road with few passing places for 1.3 km.

It is relevant to note that the previous forest plan identified a 750 metre spur to be constructed into Gartrenich, to facilitate access and this work has recently been completed. The previous plan also identified a series of spur roads of the track to the south of the Forth River which were constructed to allow timber to be stacked and loaded onto lorries. This was done largely to minimise obstruction to the forest road which is a core path. Elsewhere in the Flanders Moss complex roading options are limited and the large areas of timber were extracted by forwarder or a winch system.

3.2.3 Low Impact Silvicultural Systems (LISS) potential

This management approach is defined as: 'Use of silviculture approaches whereby the forest canopy is maintained at one or more levels without clear felling.' Under LISS there are no felling areas larger than 2 Ha. The previous forest plan did not have any areas identified for low impact silvicultural systems, however it could be a suitable management system for native broadleaf areas, as it would allow components of Sitka spruce to be removed. Also if an area was to have lower levels of natural regeneration of broadleaves then a LISS management prescription would allow for underplanting.

3.2.4 Thinning potential

A large area of the forest was designated for lowland raised bog restoration as well as a Natural Reserve which reduced the possibility of thinning. Elsewhere, the thinning operations have so far been limited, due to a single thinning operation being likely to require an unacceptable large initial investment in relation to the potential benefits due to access and market considerations.

3.3 Land Use

3.3.1 Agricultural land

Much of the surrounding land has been improved for both pastoral and arable farming. There are also areas of rough grazing where ground conditions have not been suitable for improvement. In the Flanders Moss complex an extensive series of drains have been developed in the past to maintain water levels at an acceptable level in the adjacent agricultural areas. Bog restoration needs to be carried out in such a way to ensure that functioning drainage networks are not impeded in any way.

3.3.2 Neighbouring land use

There are a number of medium to small settlements located around the forest area as well as individual properties. These are associated with a wide array of road networks encircling the

forest area. Farmland constitutes a significant land use adjacent to the forest, and there is also a mixture of smaller conifer and semi-natural woodland, which often forms shelterbelts. Further afield there are larger conifer forests especially to the west. Nature conservation is important for river and associated habitats where designated sites include the SSSI Loch Macanrie Fens (west of Cardross), SSSI Offerance Moss (west of Flanders), SSSI Lake of Menteith (Lake of Menteith and its tributaries), SAC Flanders Moss (west of Flanders), Loch Lomond and Trossachs National Park (Cardross) and the Central Scotland Green Network (Flanders and part of south Cardross).

3.4 Biodiversity and environmental designations

3.4.1 Designations

Lake of Menteith SSSI

The boundary of the Site of Special Scientific Interest (SSSI) encompasses the Lake of Menteith and most of its feeder burns. It was designated a SSSI in order to help protect the quality of water entering the lake that could be affected by management activities in the catchment area.

Objectives for management:-

To maintain the condition of the Quaternary of Scotland feature (favourable condition)

The most important management objective for the geological feature is to keep the exposures of Quaternary of Scotland rocks clearly visible. Loose blocks of rock should be left in situ where it is safe to do so and access to the geological features should be maintained for visiting geologists.

To maintain the moderate nutrient status of the mesotrophic loch (favourable condition)

The pressures affecting the nutrient stats of Lake of Menteith SSSI include the surrounding agricultural practices, fish farming and forestry. Forestry operations can increase risk of enrichment and siltation, and there have been problems in the past. Any work, such as track creation or timber extraction, needs to be done sensitively to ensure that impacts are minimal. In addition, any development or building works in the vicinity of the SSSI should be sensitive to the presence of the lake and avoid runoff of pollutants.

To improve the vascular plant assemblage (Unfavourable- recovering condition)

Many of the plant species found at Lake of Menteith are characteristic of the mesotrophic conditions therefore safeguarding the nutrient status of the lake is vital in maintaining these populations.

The presence of the invasive non-native species *Elodea nuttallii* within the lake is cause for concern as it may spread across the site and out compete native plant species present. Grazing and bracken encroachment have been cited as possible threats to the terrestrial plant species

that are part of the assemblage. Bracken control should possibly be considered in the future if it spread continues.

To maintain the number of pink footed goose using the lake (favourable condition)
Activities as currently carried out appear to be compatible with Lake of Menteith as an important centre for pink-footed geese in Scotland. Key management objectives to maintain the number of geese using the lake include minimising unnecessary disturbance and maintaining the extent of the different habitats used by the geese.

Loch Macanrie fens SSSI
Loch Macanrie Fens lie to the west of Cardross woodland. It is centred on a cut-over lowland raised bog, and the peatland site supports a wide range of wetland communities, which have developed as a result of the natural impeded movement of nutrient-poor groundwater. The hydromorphological mire range feature is comprised of a range of vegetation communities including basin fen, fen woodland, open water transition fen, and lag fen, and together these represent the largest and most species rich area of poor fen vegetation in the Stirling Council area.

Flanders Moss (SAC)/ Ofference Moss (SSSI) and Collymoon Moss
There are some smaller areas of lowland raised bog in the vicinity of Forth Moss, which should be considered within the overall landscape. The overall objectives for these sites are to restore the healthy condition of the areas of active raised bog, and to restore the areas of degraded raised bog to become active raised bog.

National Park
The Loch Lomond and Trossachs national park aim is to protect and enhance Loch Lomond and the Trossachs National Park. The National Park covers an area of outstanding landscape , habitats, and communities. Loch Lomond and The Trossachs National Park Authority has legal status as a statutory body with statutory duties for planning and outdoor access. As a Planning Authority they are responsible for deciding all planning applications in the National Park area. As an Access Authority, they have the responsibility of upholding access rights as set out in the Land Reform (Scotland) Act 2003.

Ancient Woodland
There are several stands listed on the Ancient Woodland Inventory. The highest value woodland is the ancient semi-natural woodland in the north-western corner of Arnochoile. This area is associated with a PAWS as there is a mature stand of Norway spruce, which had been classified as a long term retention as it is valuable habitat for red squirrels.

3.4.2 Habitats and species

Lowland raised bog is an important UKBAP priority habitat and the Flanders Moss complex has been identified within the ‘Strategy for Lowland Raised Bog and Intermediate Bog on The National Forest Estate in Scotland 2012-2022’, as one of the three most important lowland

raised bogs on the National Forest Estate. Within this document there is reference to Key Theme 7 (Biodiversity) from the Scottish Forestry Strategy, which outlines notes that 'the biodiversity value of some open ground habitat, such as raised bogs and internationally important blanket bogs, has been reduced in the past by poorly planned woodland expansion, encroachment or lack of appropriate management'. Of the actions proposed to reverse biodiversity decline, the following are relevant:

- Restore and improve the condition of native woodland and associated open habitat in line with the UK Biodiversity Action Plan's revised Habitat Action Plans and Species Action Plans.
- Restore and expand priority open ground habitat at key locations where the benefits of woodland removal outweigh the benefits of retaining woodland cover.

Extensive surveys were previously carried out for the Flanders Moss complex in order to assess the potential for restoration to bog habitat. (See Appendix VII Summary of Environmental Surveys). The results were largely favourable for restoration and the process will be different for each area depending on site specific conditions. Around the drier fringes of the bog it where it will be more difficult to control the regeneration of trees the recommendation is for native broadleaves.

Cardross woodland lies within a peat bog which was largely afforested in the past with mixed conifers. It has a high structural diversity with slow growing trees on the wetter ground and mature woodland on the drier ground. The tributaries flowing through Cardross fall under the Lake of Menteith SSSI, and the Loch Macanrie Fens SSSI borders the woodland to the west. Due to the associated Lake of Menteith SSSI, the peaty ground and the high levels of species diversity found in this area, the preference has been to maintain the northern section of Cardross as a Natural Reserve. In the future operations may be planned, to improve the condition of the SSSI status in line with the management plans agreed with NatureScot. This could include proposals for peatland restoration; however this would require favourable peat surveys and consultation with NatureScot and Scottish Forestry.

Other UKBAP habitats located on site include the Forth River, upland birch woods, upland oakwood and wet woodland. Priority Habitat & Species are protected under the Scottish Biodiversity List (SBL) https://www.nature.scot/scotlands-biodiversity/scottish-biodiversity-strategy/scottish-biodiversity-list and FLS policy is to protect, enhance and expand these habitats where appropriate. Overall species of particular conservation concern recorded on site include Red squirrels, Pine martens and badger setts. It is also relevant that the Lake of Menteith supports large numbers of wintering birds and is a winter roost site for large numbers of pink-footed geese. Ospreys also nest and in the areas and fish on the lake and there is a large heronry associated with the lake.

3.4.3 Riparian habitat

In the riparian areas associated with the Forth River and Lake of Menteith there is a variety of ground conditions, which are suitable for native woodland. This includes areas of ancient woodland which are currently under stands of Norway spruce. Elsewhere there are groups of broadleaf trees along the main riparian corridors as well as on some drier soils. Regeneration of mixed native woodland has previously been encouraged with an expectation that wet woodland will develop. Some areas of bog are not a good proposition for restoration and are more likely to be associated with natural regeneration of trees. There is potential for natural regeneration of conifers in native woodland areas.

3.4.4 Invasive species

Rhododendron ponticum is found within the land management plan area mainly alongside the old railway track though there is also evidence of invasion onto clear-fell areas. Giant Hogweed is also present where it is associated with the River Forth and riparian corridors.

3.4.5 Pests and diseases

3.4.5.1 Dophistroma Needle Blight (DNB)

DNB (also known as Red Band Needle Blight because of the colourful symptoms it shows on pine) causes premature needle defoliation, resulting in loss of yield and, in severe cases, tree death. Recent surveys have shown outbreaks of DNB across Central Region. This is of concern as Forth Mosses contains both Scots pine and Lodgepole pine crops.

3.4.5.2 *Phytophthora ramorum* (*P. ramorum*)

P. ramorum is a fungus-like pathogen of plants that is causing extensive damage and mortality to trees and other plants in parts of the United Kingdom. Larch in particular is extremely vulnerable, and high infection and mortality levels are currently causing significant issues in South and West Scotland. Several isolated instances of *P. ramorum* have been detected within Central Region forest blocks, although these were isolated trees rather than large-scale infections. Any statutory Plant Health Notice would require removal of all larch within both the affected stand as well as a 250 m buffer surrounding the affected stand. As we are likely to get a plant notice is would be prudent to carry out pre-emptive Larch felling.

3.4.5.3 *Ash Dieback* (*Hymenosoyphus)*

Chalara dieback of Ash is a serious disease of ash trees caused by a fungus called *Hymenosoyphus faxineus.* The disease causes leaf loss and crown dieback and is usually fatal in younger trees whereas mortality in older trees is more associated with the combined impact of root pathogens such as the honey fungus (*Armillaria mellea*). Ash dieback is present across Scotland. Management efforts are now focused on mitigating safety risks from diseased trees, while allowing for natural regeneration of potentially disease-tolerant or resistant trees wherever possible.

3.4.6 Wildlife (Deer Management)

Forth Mosses is currently covered by the Forth Mosses deer management plan. The aim of the plan is to significantly reduce the deer population in the wider area which is not only impacting sustainable forestry but also farming and the conservation efforts. The plan is an ambitious one which views deer management on a landscape scale (8100 Ha).

The area is associated with both populations of red and roe deer. As felling in the Flanders Moss complex has proceeded many of these have been displaced onto neighbouring land. As more open ground appears following clear-felling deer management should become easier. In addition, shooting tenancies on neighbouring land will help keep deer numbers under control. Although a reduction cull would be beneficial the nature of the ground makes access, and therefore control, difficult. Due to the density of cover within the Cardross, it has the potential to hold a reasonably high volume of deer per km². As there is currently limited access or provision for long term deer management in Cardross, it seems to be the case that the deer largely stay within the forest.

3.5 Landscape

3.5.1 Landscape character

Forth Mosses comprises three landscape character types, the Flanders Moss complex is located on Lowland River Valleys- Central Landscape Character, whereas Cardross is largely located on Lowland Peatland And Loch Basin with the southern portion of Cardross on the Rolling Farmland and Estates type. The key characteristics of these Landscape Character Types that relate to the LMP area are described below:-

Table 5 – Landscape character assessment

Landscape type	Key characteristics
152- Lowland River Valleys- Central Landscape Character	Well-defined river corridors, most with flat valley floor enclosed by often commanding hills. Strong topographic and visual identity, with varying scale and character. Relatively high proportion of tree cover, with roadside and hedgerow trees and semi-natural woodland. Nature conservation importance of river and associated habitats.
Summary: The river valleys create a strong sense of transition, gradually slowing and broadening from the upper reaches, where they are fed by the open hills, hill fringes and elevated	

Landscape type	Key characteristics
	plateaus, before flowing towards the low lying carse/carselands, where they meander along their slow moving wooded courses. The ongoing changes to the Forth Mosses block within this LCT from open to restored peatland mean the key features of the local area have features more in common with Flanders Moss in the Carselands LCT than with the Lowland River Valley type. **Consideration for the LMP:** Integrate the proposed restoration at Arnochoile with adjacent landcover, give consideration to transition between the bog landscape and adjacent pasture and woodland to the west.
262- Lowland Peatland And Loch Basin	Varied landform ranging from gently domed bogs to flatter floodplain areas, with a gently undulating low ridge marking the north-western boundary of this landscape character type. Key focus of the Lake of Monteith forming a shallow, rounded basin fringed by woodland. Lowland raised bog, interspersed and contrasting with semi-improved grazing land. Coniferous forestry on former areas of moss to the south of Lake of Menteith. Broadleaf woodlands form clumps and thick shelterbelts around the Lake and drier well-managed pastures. Very sparsely settled with isolated farms sited on the outer margins of moss and coniferous forest within Stirlingshire, often reached by long access tracks. Difficult to access due to the wet terrain and absence of tracks and roads. Lake of Menteith is a popular destination for visitors- boat trips to Inchmahome provide extensive views to the dramatic scarp of the Parallel Ridges- Loch Lomond and the Trossachs and the Highland landscapes of the National Park.
Summary: The northern portion of the Cardross block forms sits within this LCT, situated on the southern side of the Lake of Menteith.	

Landscape type	Key characteristics
A fragmented pattern of moss, dark blocky coniferous woodlands and wet pasture covers the flat to gently undulating landform. The Lowland Peatland and Loch Basin Landscape Character Type lies within the broad valley of the Carse of Forth within Loch Lomond and the Trossachs National Park. It includes areas of natural and restored moss, coniferous forestry and marginal farmland as well as the Lake of Menteith. Areas of similar lowland peatlands occur at Flanders Moss. **Consideration for the LMP:** There is a phase 1 felling coupe proposed within this LCT part of the ongoing peatland restoration.	
Rolling farmland and estates LCT 259	This is a well-wooded landscape with mixed policy and semi-native birch and oak woodlands. Bright green pastures covering gently rolling ridges, partly enclosed by woodlands and neatly trimmed beech, holly and thorn hedges. Estate houses set within wooded grounds and parkland on gentle south-facing slopes, bounded in places by high stone walls. Rich woodlands enhancing the diverse shoreline of the Lake of Menteith and are reflected in the ornamental plantings on Inchmahome, the small island which is a key focus on the Lake.
Summary: The southern portion of the Cadross block sits within this LCT and is associated with the landscape to the east of farming and estates. Tree cover is a distinctive feature and varied with farm woodland, shelter belts and policy woodlands and parkland, Boundaries are well defined usually by trees or hedgerows and semi native woodlands are interspersed with spruce on wetter ground. **Consideration for the LMP:** The proposed Larch felling within this LCT is very small scale with no other felling of management changes proposed within period of this LMP.	

Landscape Analysis

- There is one main area of conifers left to be felled in Gartrenich, which already has new road network in place for haulage. Some of this area will be more difficult to work due to wet ground conditions and winching or mulching will be required.
- Where bog restoration is not suitable, such as the northern part of Gartrenich, establishing native woodland will benefits for landscape and biodiversity.

- Bog restoration and native woodland will help Forth Mosses integrate habitat linkages with adjacent lowland raised bog sites such as Offerance Moss SSSI, Flanders Moss SAC, Loch Macanrie Fens SSSI and Collymoon SSSI/SAC.
- Restoration of lowland raised bog and establishing native woodland along riparian corridors and on the drier soils at the edge of the bog, will alleviate some of the impacts of tree removal on the overall water catchment where this is particularly relevant to flooding.
- There are several small areas of native woodland located in Forth Mosses where these are largely concentrated along the River Forth, Arnmach peninsula as well as along other watercourses.
- There is a stand of Norway spruce located on an area of ancient woodland in Arnochoile Wood.
- There are component of Larch located in the south part of Cardross which will need to be felled due to issues with Phytophthora ramorum.
- The access into Cardross is currently limited to a short spur of the public road.

3.5.2 Landscape designations

The Northern portion of Cardross sits within the Loch Lomond and Trossachs National Park

3.5.3 Visibility

The original Flanders Moss forest plan area occupies low lying ground either side of the River Forth and, although visible from surrounding hills it is not a prominent feature in those views. As the previous forest plan has progressed the areas which have been redesigned to lowland raised bog habitat, have had minimal impact on the visual amenity of the area. Proposed restoration at Arnochoile will reveal internal and long distance views to surrounding hills, in particular from the Buchlyvie to Aberfoyle cycle route.

Cardross is not easily viewed from many vantage points. The majority of visitors outside fishermen will see the forest from the opposing shoreline or from the loch. The horizon line encompasses more tree line than that owned by Forestry and Land Scotland with up to 700 metres of water in between. From the village of Port Menteith where the highest point is the primary school, the vantage point affords glimpses of Cardross but it is mostly obscured by mature trees in the foreground around Menteith House.

3.5.4 Design and management considerations

The main area remaining to be felled is at Gartrenich Moss, which will remove the remaining Sitka spruce. There is also another smaller area of Lodgepole pine located in Arnochoile. The impact of felling these areas and restoration of lowland bog in the Flanders Moss complex will not have a significant impact on the overall large scale and low lying landscape. Overall appropriately designed lowland raised bog and native woodland will both have benefits for flooding, landscape and biodiversity.

3.6 Social factors

3.6.1 Recreation

The old railway track that runs through Flanders Moss is designated as a core path and connects Buchlyvie to Gartmore and Cobleland, both of which the National Cycle Route 7 passes through. Core paths are drawn up by each access authority, to establish a system or network of paths to give the public reasonable access throughout their area (section 17 of the Land Reform Act 2003). Core paths help people to exercise their access rights with confidence, and help to harmonise access and land management operations. Other activities associated with the Flanders Moss complex include fishing especially along the River Forth.

The remote location and poor access of Cardross mean that there limited public footfall within the area. There has been past indications of geocaching on the Arnmach peninsular by the Lake of Menteith, however, investigations on the ground have not located the cache. The main recreation is associated with the Lake of Menteith, where it is popular with boat trips and in particular fishing.

Currently there are no formal visitor facilities planned in Forth Mosses, however there may be opportunities to provide interpretative material describing ongoing forest operations and the value and process of restoring lowland raised bog.

3.6.2 Community

Both Gartmore and Buchlyvie Community Councils have in the past showing interest in adopting the dismantled Strathendrick and Aberfoyle Railway, which currently forms the core path that runs through the Flanders Moss complex. Forestry & Land Scotland will continue to consult with both councils on potential developments in the forest.

Green Aspirations are currently located at the entrance into Cardross where Forestry and Land Scotland share an access into the forest with Cardross Estate. They are a woodland-based social enterprise, with a mission to inspire outdoor learning. By teaching new skills, from woodland management to whittling, they aim to encourage and inspire a new generation to care for their environment.

Forth Mosses is located in the Central Scotland Green Network (CSGN), which is one of the largest environmental projects of its kind in Europe. It is designed to support link up and build on existing partnerships and programmes with the objective of improving the social, physical, cultural and environmental wellbeing of central Scotland. The vision of the CSGN is to improve rural and urban landscape, so that central Scotland will be transformed into a place where the environment adds value to the economy and where people's lives are enriched by its quality.

3.6.3 Heritage

Our key priorities for archaeology and the historic environment are to undertake conservation management, condition monitoring and archaeological recording at our significant historic assets; and to seek opportunities to work in partnership to help to deliver Our Place in Time: The Historic Environment Strategy for Scotland and Scotland's Archaeology Strategy.

Significant historic environment features will be protected and managed following the UK Forestry Standard (2017). Harvesting coupes, access roads and fence lines will be surveyed prior to any work being undertaken to ensure that upstanding historic environment features can be marked and avoided. At establishment and restocking, work prescriptions remove relevant historic environment features from ground disturbing operations and replanting. Where appropriate, significant historic assets are recorded by archaeological measured survey, and may be presented to the public with interpretation panels and access paths. Opportunities to enhance the setting of important sites and landscapes will be considered on a case-by-case basis (such as the views to and from a significant designated site).
The Regional Historic Asset Management Plan includes conservation management intentions for those designated historic assets in Scotland's national forests. Details of all known historic environment features are held within the Forester Web Heritage Data (built using national and regional historic environment records) and are included within specific operational Work Plans to ensure damage is avoided. Significant historic environment features will be depicted on all relevant operational maps.

Analysis of PastMap (https://www.historicenvironment.scot/archives-and-research/archives-and-collections/pastmap/), shows that the only currently known features are 2 unscheduled monuments, which are a timber track (Canmore ID- 44619) located off the core path running through Flanders Moss and a boat naust (Canmore ID 86385) located by Lake of Menteith. The road is 12 feet wide and formed by trees laid across each other. The trunks of the trees have been squared by an axe at each end, with marks of bolts, or pins, in the longitudinal sleepers. Its direction was from SE to NW. The boat naust is of the shore into Lake of Menteith, 0.4 m underwater, and was discovered 1 m off the SW shore of the lake. It consists of two 9 m long lines of stones (each 2 m thick) which meet forming a V-shape. There are also records of wooden tramways crossing Flanders Moss but no remnants are known and there are no other notable features.

3.7 Statutory requirements and key external policies

In addition to those already referenced within the main text the following key policy or guidance documents which have influenced this plan are listed here:

- UK Woodland Assurance Standard 4, 2018
- Scottish Lowlands Forest District Strategic Plan
- Central Scotland Forest Strategy 1995
- Central Scotland Green Network Vision
- Glasgow and Clyde Valley Forestry and Woodland Strategy 2012
- The Glasgow and the Clyde Valley Strategic Development Plan (SDP) 2017
- East Dunbartonshire Local Development Plan (LDP) 2017
- East Dunbartonshire Green Network Strategy 201
- SNH Landscape Character Assessments for Glasgow 'Glasgow and Clyde Valley' 1999
- Natural Environment Planning Guidance 2017
- Scottish Lowlands Forest District- Black Grouse Strategy 2015-2019

- Black Grouse and Forestry: Habitat Requirements and Management
- The Vincent Wildlife Trust- Managing forest and woodlands for pine martens
- SEPA Flood Risk Management Maps
- Forestry Commission Bulletin 62- Silviculture of Broadleaved Woodland
- Forestry Commission Bulletin 119- Cultivation of Soils for Forestry
- Forestry Commission Practice Guidance- Deciding Future Management Options for Afforested Deep Peatland
- Forestry Commission Practice Guide- Managing Open Habitats in Upland Forests
- Forestry Commission Practice Guide 3- The management of semi-natural upland mixed ashwoods.
- Forestry Commission Practice Guide 8- The management of semi-natural wet woodlands
- Forestry Commission Practice Guide 14- Restoration of Native Woodland on Ancient Woodland Sites
- Forestry Commission Practice Guide 21- Choosing stand management methods for restoring planted ancient woodland sites
- Natural Reserves- Guidance for their selection and management on the NFE in Scotland
- Minimum Intervention Areas- Guidance for their selection and management on the NFE in Scotland
- Long-Term Retention- Guidance for their selection and management on the NFE in Scotland
- FLS- Larch Strategy

Appendix II: Land Management Plan Brief

Contents

Key Background Information

Introduction

- This management plan will revise the Flanders Moss forest plan and will also incorporate the Cardross forest area into a single new 10-year plan. These areas are associated with a close geographic proximity to each other, lowland raised bog as well as being located within the River Forth catchment area.

- Forth Mosses (969.8 Ha), consists of Flanders (822.9 Ha) and Cardross (146.9 Ha) and are located a few miles to the east of the village of Aberfoyle in Stirlingshire.

- Proposed roading in the Flanders Moss complex has been undertaking which has allowed the programme of felling to move forward. Currently there is only a short spur of the public road into Cardross, which means that there is limited access .

- Flanders lies on the lowland river valleys (Central Landscape Character) whilst Cardross largely lies on the Lowland Peatland and Loch Basin. Both areas occupy low lying ground within the River Forth catchment area and are not prominent features in the landscape. Elevation ranges from around 20 to 40 m above sea level. Prior to afforestation Forth Mosses comprised of large areas of open bog. As areas of conifers are cleared with future management prescriptions to restore lowland raised bog, the forest area is starting to integrate better with the wider landscape of agricultural fields, peatland and woodland in the surrounding area.

- The River Forth bisects Flanders forest and there are several tributaries which are incised into the moss. It is relevant that the moss is raised above the river and its only source of water is precipitation. Cardross drains into Lake Menteith via several tributaries, which then feed into the Goodie Water that then flows out towards the Forth River. Overall Both the Forth and its tributaries are prone to flooding during heavy periods of heavy rainfall, however, it is likely that any impact of clear-felling on flooding would be discernible due to the larger scale of the Forth catchment.

- Forth Moss contains some of the most important lowland raised bog complexes on the National Forest Estate which are identified as UKBAP habitats. Reports have been undertaken on Flanders Moss, Garchell, Gartrenich and Arnochoile where both vegetation and hydrology have been examined. The conclusions were that Flanders Moss, Garchell and Gartrenich sections were good and priority candidate for bog restoration. Out with the main areas of these sites the recommendation was for wet woodland to be allowed to develop on the better soils. Analysis of the Arnochoile and northern part of Gartrenich sections have identified them as being less suitable for bog restoration, however as bog restoration techniques have improved Arnochoile is now considered as having considerable potential.

- Cardross is also located on deep peat, and is associated with woodland as well as Lake of Menteith SSSI, which was designated for water quality. The northern area has previously been managed as a Natural Reserve, which fits in well with environmental and biodiversity objectives, however as there is potential bog restoration in this area, it needs to be considered as a potential objective in the future.

- Other UKBAP habitats located on site include the Forth River, upland birch woods, upland oakwood and wet woodland.
- The area is associated with SSSI Loch Macanrie Fens (west of Cardross), SSSI Offerance Moss (west of Flanders), SSSI Lake of Menteith (Lake of Menteith and its tributaries), SAC Flanders Moss (west of Flanders), Loch Lomond and Trossachs National Park (Cardross) and the Central Scotland Green Network (Flanders and part of south Cardross). It will be important for the Forth Mosses land management plan to integrate these local land designations, where these are relevant to conservation, biodiversity and landscape objectives.
- There are pockets of young larch located in southern Cardross which are under threat from Phytophthora ramorum.
- The forest has a number of ancient woodland areas some of which are designated planted ancient woodland sites.
- Overall species of particular conservation concern recorded on site include red squirrels, pine martens and badger setts. It is also relevant that the Lake of Menteith supports large numbers of wintering birds and is a winter roost site for large numbers of pink-footed geese. Ospreys also nest and in the areas and fish on the lake and there is a large heronry associated with the lake.
- The forest is associated with access along the NCR7 link for walkers, riders and cyclists. There is also access to the River Forth for local and visiting anglers.
- Currently approximately 30% of the Forth Moss is under woodland cover, with the remainder given over to peatland restoration and felled areas. Presently broadleaves account for 4% of the woodlands and conifers for 26% with just under half of that being Sitka spruce.
- The current split in terms of age class's structure is approximately 0% establishing crop (0-10 years), 1% thicket (11-20 years), 2% pole stage (21-40 years), 15% mature (41-60 years) and 12% old forest (61+ years). Felled is 13% and open areas account for 57%.

Current Management Approach

- Clear-fell non-native conifer species to provide material for the wood fuel market. Where this is not feasible trees will be mulched or felled to re-cycle.
- Undertake planned civil works in order to facilitate planned operations.
- Restore and maintain lowland raised bog where this is feasible.
- Allow establishment, primarily through natural regeneration, of wet woodland on those areas of bog not suitable for restoration.
- Consider thinning the southernmost area of Cardross where there is easier access and better ground conditions, in order to improve timber quality.
- Monitor larch for Phytophthora ramorum in Cardross, and if there is an outbreak before any thinning takes place, fell the trees to waste.
- Improve habitat for Red Squirrels by retaining small stands of Norway spruce in the riparian tributaries.

- Maintain the access along the NCR7 link for walkers, riders and cyclists, and also maintain access to the River Forth for local and visiting anglers.
- Where any future operations are planned in Cardross , opportunities should be sought to improve the condition of the associated SSSI to improve the condition and increase protection of the SSSI status in line with the management plans, agreed with NatureScot.
- Significantly reduce the deer population in the wider area which is not only impacting sustainable forestry but also farming and the conservation efforts.

Main Considerations

Production

- Fell the remaining area of standing conifers in Gartrenich Moss and Arnochoile to provide material for the wood fuel market.
- Where harvesting and extraction is not feasible, the trees will be mulched or felled to re-cycle. All felling at Flanders is expected to be completed during the ten year design plan period.
- There is potential for thinning of the better ground located to the south of Cardross.
- Plan sensitive future woodland removal in Cardross where any operations would require to be planned in conjunction with NatureScot in order to manage the sensitivities of the SSSI.

Disease

- Tree health- how to access and manage the Larch areas as per FLS- SF zones.

Access

- Plan an appropriate forest road infrastructure in Cardross, in order to allow appropriate access to future coupes. Again any operations in Cardross would require to be planned in conjunction with NatureScot in order to manage the sensitivities of the SSSI.

Conservation

- Restore and maintain lowland raised bog where this is feasible. This will involve blocking drains in key locations and monitoring, and removing tree regeneration where necessary. Follow and provide evidence in accordance with ‘Practice Guide: Deciding future management options for afforested deep peatland’ as well as ‘Strategy for Lowland Raised Bog and Intermediate Bog on the National Estate in Scotland’.

- Retain existing native woodland and encourage its spread by natural regeneration onto site boundaries to deliver benefits for habitat, wildlife, landscape and contribute to reduced flood risks along the River Forth River and its associated tributaries.
- Native tree establishment along riparian corridors will contribute to reduced flood risk along the River Forth and its tributaries.
- Ancient Semi-natural woodland sites located on site include some planted ancient woodland sites. It will be important to consider the future management of these areas.
- There is conifer regenerating on site where these trees could threaten the viability of both bog restoration and fringe woodland.
- Protection and management of the Lake of Menteith SSSI, which is associated with a Quaternary of Scotland feature, vascular plant assemblages and pink footed geese. Protection and management of the Loch Macanrie Fens SSSI which has a wide range of wetland communities associated with the hydromorphological mire.
- Consider impact of future operations on red squirrels, herons, pine martens and badger sets.
- There is a need to review access of the site for Deer Management will require appropriate access to extract deer from the site.

Recreation

- The main access track through Flanders is a designated core path and has also been adopted as a local link connected to National Cycle Route 7. It is widely used by locals and visitors for walking, cycling and horse riding.
- It will be relevant to maintain the access to the River Forth for local and visiting anglers.

2. Strategic Drivers

To succeed in realising the vision as set out in the Scottish Forestry Strategy 2019 - 2029, six priorities for action been identified for implementation:

1. ***Ensuring forests and woodlands are sustainably managed.***
2. ***Expanding the area of forests and woodlands, recognising wider land-use objectives***
3. ***Improving efficiency and productivity, and developing markets***
4. ***Increasing the adaptability and resilience of forests and woodlands***
5. ***Enhancing the environmental benefits provided by forests and woodlands.***
6. ***Engaging more people, communities and businesses in the creation, management and use of forests and woodlands***

In order to demonstrate how we will have regard to the Forestry Strategy in our work, we have identified the relevant Forestry Strategy 'Priorities for Action' in our Corporate Outcomes section of the FLS Corporate Plan 2022-2025. Our Corporate Outcomes and the associated Operational Actions to deliver them have informed the objectives for this LMP illustrated in Table 12 below.

3. Draft Management Objectives

Table 12 – Relevant Corporate Outcomes and Operational Actions informing the LMP Objectives

Corporate Outcomes Relevant to LMP	Operational Actions to Deliver Outcome Relevant to LMP	Draft LMP Objectives
Outcome 2: Looking after Scotland's national forests and land. • **Tackling the twin crises of climate change and biodiversity loss** • **Protecting our forests and land from other threats.**	• Increasing our contribution to the Peatland Action programme. • Managing the national forests and land to further the conservation ad enhancement of biodiversity. • Taking targeted action to maintain and bring designated sites into favourable condition – and working beyond designated sites at the landscape scale with partners where we can – for example Scotland's rainforests. • Taking targeted action for vulnerable priority species (e.g. red squirrel, capercaillie, and black grouse).	1. Continue process started in the previous plan of restoring and protecting Flanders nationally important Lowland Raised Bog habitat 2. Maintain and where appropriate enhance valuable woodland habitat which benefits watercourses and species such as red squirrel. 3. Continue to manage to conserve the Lake of Menteith SSSI 4. Take opportunities to remove larch to prevent the eastward

Corporate Outcomes Relevant to LMP	Operational Actions to Deliver Outcome Relevant to LMP	Draft LMP Objectives
	• Implementing the asset management approach to the historic environment within Scotland's forests and land. • Increasing ancient woodland restoration. • Implementing a programme to improve the resilience of the national forests and land to the impacts of climate change and tree health threats. • Continuing to implement the FLS Deer Management strategy while working in partnership with others to support the Scottish Government's response to the Independent Panel's recommendations on deer management in Scotland.	spread of tree disease Phytophthora ramorum

Corporate Outcomes Relevant to LMP	Operational Actions to Deliver Outcome Relevant to LMP	Draft LMP Objectives
	• Continuing to implement the Larch Strategy in order to reduce the rate of expansion of Phytophthora ramorum.	
Outcome 3: Supporting a sustainable economy. • **Increasing opportunities for communities to benefit from the national forests and land.**	• Maintaining safe walking, biking trails, and improving entry level experiences for everyone to enjoy and gain health benefits.	5. Maintain visitor offering including the National Cycle Route and access to the River Forth

Appendix III: Land Management Plan Consultation Record

Statutory Consultee	Date contacted	Date response received	Issue raised	Central Region Response
NatureScot	08/01/2024	19/02/2024	Thank you for consulting us on the 8 January 2024 regarding the Forth Mosses Land Management Plan (LMP). The LMP covers the Flanders Moss complex (Arnochoile/Easterhill, Gartrenich Moss, Flanders Moss and Garchell Moss) as per the existing forest plan but will now also include the Cardross forest area in a new ten year plan. The area covered by the plan lies close to parts of Flanders Mosses Special Area of Conservation (SAC), Collymoon Moss Site of Special Scientific Interest (SSSI), Offerance Moss SSSI, Lake of Menteith SSSI and Loch Macanrie Fens SSSI. The new LMP shares similar aims to the existing plan, with a focus on	

Statutory Consultee	Date contacted	Date response received	Issue raised	Central Region Response
			peatland restoration and the proposals include tree felling followed by lowland bog restoration at areas called Gartrenich Moss and Easterhill and also felling/thinning of trees at a southern part of Cardross forest. Much of Cardross forest is located on deep peat with limited access and so the remainder of this area is to be left as "Natural Reserve" with no management proposed in this LMP. We support the overall aims of the Forth Mosses LMP and provide general comments and advice below in relation to the nearby protected areas. **NatureScot Appraisal and Advice Statutory Designated** **Flanders Mosses SAC** The Forth Mosses LMP area is close to parts of the Flanders Mosses SAC protected for active raised bog and degraded raised bog habitat. Further details of the SAC including the site conservation objectives can	Noted

Statutory Consultee	Date contacted	Date response received	Issue raised	Central Region Response
			be found on SiteLink at: https://sitelink.nature.scot/site/8258 The Flanders Mosses SAC active and degraded raised bog habitats are exclusively rain fed and the Carbon and Peatland 2016 map: https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/soils/carbon-and-peatland-2016-map shows that the Flanders Moss (Forth Mosses LMP) area does not share the same peat body as Flanders Mosses SAC, which is hydrologically distinct. Therefore we do not consider that there is connectivity between the Forth Mosses LMP proposals and the Flanders Mosses SAC. Our advice is that it is unlikely that the Forth Mosses LMP will have a significant effect on any qualifying interests of the SAC either directly or indirectly. An appropriate assessment is therefore not required.	

Statutory Consultee	Date contacted	Date response received	Issue raised	Central Region Response
			Collymoon Moss Site of Special Scientific Interest (SSSI) and Offerance Moss SSSI Collymoon Moss SSSI and Offerance Moss SSSI are both protected for raised bog habitat. These SSSIs are situated to the east and west of the proposed felling/peatland restoration at Gartrenich Moss. Further information about both of these SSSIs can be found on SiteLink at: https://sitelink.nature.scot/site/393 and https://sitelink.nature.scot/site/1253 respectively. Both Collymoon Moss SSSI and Offerance Moss SSSI are part of Flanders Mosses SAC and therefore our comments above regarding lack of connectivity are also relevant for these sites and we do not consider that the objectives of designation and overall integrity of these SSSIs will be compromised as a result of the Forth Mosses LMP proposals.	Noted

Statutory Consultee	Date contacted	Date response received	Issue raised	Central Region Response
			Lake of Menteith Site of Special Scientific Interest (SSSI) The proposed felling/thinning in the southernmost Cardross area near "Big Wood" would be adjacent to a watercourse/tributary that is part of the Lake of Menteith SSSI, protected for mesotrophic loch, vascular plant assemblage, pink-footed goose (non-breeding) and Quaternary of Scotland see: https://sitelink.nature.scot/site/900 The mesotrophic loch and vascular plant assemblage features of Lake of Menteith SSSI are sensitive to activities that can impact water quality and forestry operations near one the SSSI tributaries could increase the risk of enrichment and siltation within the lake. However, provided that the UKFS and Forest and Water guidelines (https://www.confor.org.uk/media/247469/fcpg025.pdf) are followed at all times during operations then we do not consider that the mesotrophic loch and vascular plant	Noted

Statutory Consultee	Date contacted	Date response received	Issue raised	Central Region Response
			assemblage features of the Lake of Menteith SSSI will be affected by the tree felling/thinning at Cardross forest. The LMP summary states that a new forest road will also be required to facilitate the Cardross forest felling/thinning works but contrary to this the Forth Mosses LMP – Management Map states that only maintenance works to the existing road are required. The location for the track to be built/worked on is 300m from the Lake of Menteith SSSI boundary. Therefore regardless of whether a new short stretch of track is to be built or only upgrades to an existing track we do not consider that the mesotrophic loch and vascular plant assemblage features of Lake of Menteith SSSI will be affected given the separation distance. The wintering pink-footed geese ornithology interests of the SSSI use the waterbody to roost overnight and then move to feeding areas during daytime. The proposed	The summary was incorrect and has been amended now only maintenance to the existing road will be needed.

Statutory Consultee	Date contacted	Date response received	Issue raised	Central Region Response
			felling/thinning and track works at Cardross are approximately 1km away from the Lake of Menteith waterbody where the geese roost, as such we do not consider that the wintering geese will be disturbed or negatively impacted by the Forth Mosses LMP proposals. The geology interests of the Lake of Menteith SSSI will also not be impacted by the proposed felling/thinning and access track works at Cardross forest as the Quaternary of Scotland geological interest is located on the eastern shoreline of the Lake of Menteith SSSI over 1km away. **Loch Macanrie Fens SSSI** The LMP proposed felling and peatland restoration works at Gartrenich Moss are within 400m of Loch Macanrie Fens SSSI, which is located to the north and is protected for raised bog and hydromorphological mire range, see:	Noted

Statutory Consultee	Date contacted	Date response received	Issue raised	Central Region Response
			https://sitelink.nature.scot/site/1005 The Carbon and Peatland 2016 map: https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/soils/carbon-and-peatland-2016-map indicates that Loch Macanrie Fen SSSI and Gartrenich Moss may have hydrological connection through a shared peat body. Therefore we consider that the peatland restoration works at Gartrenich Moss may have positive benefits on the hydrological regime at Loch Marcanrie Fen SSSI. **Wider Countryside/General comments** **Riparian planting** We note the proposals to establish native woodland on drier areas and riparian corridors within the Flanders Moss complex, which are less suitable for bog restoration.	

Statutory Consultee	Date contacted	Date response received	Issue raised	Central Region Response
			We support the proposals for riparian planting along the Kelty Water and River Forth. However, we advise that native woodland should not be planted elsewhere around the edge of raised bog habitat as this could compromise the peatland restoration works and will introduce a seed source for woodland to regenerate on the main dome of the raised bog habitat. Woodland regeneration will impact the hydrology of the exclusively rainfed raised bog by limiting rain from reaching the bog surface and drying out the raised bog via transpiration. Woodland regeneration will also shade peatland vegetation and prevent important bog species such as sphagnum from developing and thereby reducing the overall success of peatland restoration works. We advise that all regenerating conifers on or around the edge of the raised bog should also be removed.	We envisage and plan for natural regen at low density only where the wider peatland hydrology will not be compromised. We expect native broadleaf woodland NVC W4 type to develop on the edge of the rand on mineral and organo-mineral soils governed by the hydrological conditions created by the effective rewetting of the raised bog. The "FLS general statement regarding native woodlands near peatland" states that *'Native woodland cover, consisting of a complex of woody and shrubby margins existing on the non-deep peat soils within or surrounding peatland units, should improve the resilience of near natural and restored peatlands'*. Non-native conifer regenerating on or around the fringes of the raised bog will be monitored and controlled. That guidance was written by former members of FLS Peatland Team, Ian

Statutory Consultee	Date contacted	Date response received	Issue raised	Central Region Response
			Ongoing monitoring will be required for the duration of the LMP to identify any woodland regeneration on the bog surface and we recommend that a programme of follow up treatment/tree removal should be incorporated into the plan.	McKee and Amanda Ophof (now with PeatlandACTION see key extracts with regard native planting around peatland habitats further below in italics.) The 'additional native area north of Gartrenich Moss' comprises of mineral soils which through LiDAR imagery the edge of the rand of the raised bog is evident. We will monitor the efficacy of the restoration and the establishment of any regen in line with the PeatlandACTION Monitoring Strategy and will intervene where deemed necessary. **Extracts from** *"FLS general statement regarding native woodlands near peatland"* *……Native woodlands are a natural part of a peatland ecosystem, typically found in mosaics on drier areas associated with bogs and fens.*

Statutory Consultee	Date contacted	Date response received	Issue raised	Central Region Response
				Bog woodland, an Annex 1 priority habitat, is a valuable and rare component of the peatland landscape in some areas in Scotland. *These are generally small non-intrusive groups of trees and shrubs that occur in a relatively stable ecological relationship as open woodland without the loss of bog species or disruption to the normal peatland hydrology…….* ***Threats to peatlands**…..* ***2. Natural regeneration**……Native regeneration on near- natural or well re-wetted restoration sites appears to be very rare. Therefore, there is a presumption towards establishing native species as a natural, less invasive habitat component within the peatland landscape…..* ***Benefits of native woodland in close association with peatlands*** *Native woodland cover, consisting of a complex of woody and shrubby*

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				margins existing on the non- deep peat soils within or surrounding peatland units, should improve the resilience of near natural and restored peatlands. A native woodland ecotone will provide shading and shelter from drying winds and solar rays on the edges and margins of the peatland unit, which is where drying out and suppression of the water table is most acute and common. Native trees and shrubs are generally low growing and provide light, dappled shade and shelter typically during the hottest months. *It is likely that biodiversity will be improved by providing rare habitat for species that rely on this mosaic and varied edge effect. This cover is likely to mimic the native woodland cover found around peatlands in prehistoric times.* ***Guidance*** *FLS will restore the peatlands and, where possible, establish a mixed*

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				density native woodland fringe within and around the site. The woodland cover must be established in close proximity to the peatland without affecting the hydrology. It is anticipated that these trees will create a future seed source to allow for this mosaic to develop further naturally, governed by hydrological conditions.
			Natural Reserve We note that much of the Cardross forest is located on deep peat and due to the lack of access for tree removal and risk of impacting the nearby Lake of Menteith SSSI the majority of this area is proposed to be left as "Natural Reserve" with no management planned during the ten year LMP. However, the plan summary states that peat depth surveys may be undertaken to see if there is scope for any peatland restoration in the future. We would welcome peat depth surveys in this	Noted

Statutory Consultee	Date contacted	Date response received	Issue raised	Central Region Response
			area and would be happy to provide advice on feasibility and appropriate methods for tree felling, extraction and peatland restoration in the Cardross forest. **Deer** We welcome the aims of the Appendix VI: Deer Management Plan – Forth Mosses to maintain low deer numbers to ensure effective peatland restoration and for collaborative working with neighbours to reduce deer numbers in the wider landscape. Ongoing monitoring of deer populations in the area will be essential in providing information to inform and adapt cull targets during the ten year Forth Mosses LMP. **Protected Species** We fulfil our advisory role on protected species through the provision of standing advice, which is available on our webpages: https://www.nature.scot/profession	Noted Noted

Statutory Consultee	Date contacted	Date response received	Issue raised	Central Region Response
			al-advice/planning-and-development/planning-and-development-advice/planning-and-development-protected-species and https://www.nature.scot/doc/standing-advice-planning-consultations-birds . The requirement for a protected species licence should be considered and if required the applicant should contact our licensing colleagues (licensing@nature.scot). There is information at the end of our species advice notes on the circumstances in which a licence is likely to be granted. We are aware that adders have been found on Flanders Moss during recent restoration works. Therefore we strongly recommend that you undertake a reptile survey at Gartrenich Moss and Easterhill prior to any tree felling and bog restoration works commencing. If reptiles are found to be present and	Yes reptile surveys will be conducted in areas of suitable habitat and a reptile protection plan will be prepared if required.

Statutory Consultee	Date contacted	Date response received	Issue raised	Central Region Response
			could be affected by the proposals then you must prepare a reptile protection plan, which details mitigation measures to minimise impacts on reptiles. Advice on reptile survey methods and mitigation can be found at: https://www.nature.scot/doc/standing-advice-planning-consultations-reptiles-adder-slow-worm-common-lizard I hope you find these comments useful at this stage. This advice is given by NatureScot, the operating name of Scottish Natural Heritage.	
Loch Lomond and Trossachs National Park	08/01/2024	02/02/2024	Thank you for consulting with LLTNPA on the Flanders Moss, Cardross Forest, Arnochoile & Easterhill Forest, Gartrenich Moss and Garchell Moss LMP. As only Cardross forest is located within the NP we have limited our comments to that area only. Access Of the Forth Mosses complex, only Cardross Moss is within the Loch	Thank you for your feedback on our Forth Mosses LMP consultation. I forwarded on your queries to my colleagues in the Visitor Services, Environment and Peatland Teams and they have provided responses below. Access Maintaining the access opportunities on this site across

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			Lomond and The Trossachs National Park (LLTNP), although the NCN cycle route that crosses Flanders Moss to Buchlyvie starts within the LLTNP at Cobleland and is designated a core path up to the Stirling Council boundary at the River Forth. Although the general right of access applies to the area, there are no core paths or routes we are aware the public use on a regular basis within Cardross Moss. We agree with the statement that Forth Mosses serve as an important area within Central Region for conservation, environment, landscape and recreation, and that the focus of this LMP is on habitat restoration, notably wetland and peatland habitats, to align with objectives within the Flanders Moss SAC and Lake of Menteith SSSI. The recreation focus of this LMP is, as with the previous Plan, limited to maintaining the access along the	our existing road and bridge infrastructure and any additional roading would be part of our ongoing inspection and maintenance programme which will reflect our prioritisation across our sites. The site will be managed in line with the Scottish Outdoor Access Code (SOAC). Access improvements were considered, however, this is not a priority for FLS currently, as the demand for access onto restored bog is available in the local area on other sites. We will continue to review this as the site develops under the new plan. The NCN route should be monitored and managed by Sustrans. Ecology This is a complex site with many environmental issues to be considered. The site is a Natural Reserve and has been designated due to the range of sensitive

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			NCR 7 link for walkers, riders and cyclists, and maintaining access to the River Forth for local and visiting anglers. The fifth LMP objective is to: • Maintain visitor offering including the National Cycle Route and access to the River Forth We note in Appendix 1 that an additional 750m of forest road was built to access Gartrenich, that a series of spur roads of the track to the south of the Forth River were constructed to allow timber to be stacked and loaded onto lorries and (from the LMP) that a short length of road may be needed to access south Cardross Moss for thinning. All of these can be used as of right by the public for non-motorised recreation and, apart from when operations are taking place, should be managed for this i.e. any gates should be left unlocked and usable by walkers, cyclists and horse-riders,	species that are present. These include nesting osprey (several pairs), nesting goshawk, red squirrel, pine marten, otter, there is also a heronry near the loch shore and an extensive badger sett within the mature conifers on site. The wide range of species present rely on the undisturbed woodland habitat currently on the site. Access by machinery to carry out peatland restoration would require the construction of access tracks and the removal of large areas of this sensitive woodland habitat, this could have a negative impact on these species. The area of raised bog within Cardross is extremely wet and the lodgepole pine trees are dying through natural processes, this area was assessed by our previous open habitats ecologist who recommended that the site should be left undisturbed. It is also thought to be part of a separate hydrological unit to Loch

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			unless a fully inclusive 'bypass' is provided to the side of the gate. Sections 3.6.1 to 3.6.3 of Appendix 1 relate to access, the local community and heritage. We support the potential opportunities to provide interpretative material describing ongoing forest operations and the value and process of restoring lowland raised bog as well as 'Where appropriate, significant historic assets are recorded by archaeological measured survey, and may be presented to the public with interpretation panels and access paths'. We note and support outcome 3 of the draft objectives. However we would like to see some firmer proposals and locations to achieve this within the lifetime of the Plan. Otherwise, how, in the future when the habitat and species objectives of the LMP have been met and wet woodland and blanket	Machanrie Fens so the impact on the SSSI is likely to be minimal but a hydrological survey would be helpful to confirm this. The rhododendron issue has also been highlighted, any ground disturbance in this area would provide further opportunities for rhododendron to colonise along with invasive Western Hemlock which is also present. Overall, the decision to maintain the block as a Natural Reserve has been taken to ensure the biodiversity on the site is protected, any habitat enhancement work should be low impact, with no machinery accessing the site to minimise disturbance. Our Environment Forester, Katy Anderson, would be happy to meet you Malcolm to discuss the site further if that would be helpful. Peatland restoration

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			bog expanded, will the public be able to access these areas and understand what has been achieved? We would also like to see more detail or commitment made on what level of maintenance will be undertaken on the NCN route. Will this include bridge replacements if the bridges over the Forth and Keltie Water are damaged or found to be structurally unsound? How will condition of this route be monitored to ensure remedial work is carried out if the route is damaged by vehicles and harvesting/ thinning operations? Ecology and peatland restoration Overall, we're supportive of the focus on peatland restoration and appreciate the reasons for maintaining woodland on the majority of Cardross block as Natural Reserve due to the challenges of restoring this area	While it's accepted that on a wider scale, the move away from plastic piling is definitely true, plastic piling still remains a valid restoration treatment in NatureScot's Peatland Action Technical Compendium which was only published last year. Both in the forms of a plastic only dam, but also part of a composite dam (peat/timber/plastic). When designing a restoration site, plastic is always a last option, but sometimes a necessary option – the aspiration would be to always block drains by a different method.

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			without having an adverse impact on the Lake of Menteith SSSI. Throughout the LMP numerous references are made to peatland restoration at Cardross, such as: • "however in the future it will be sensible to undertake peat surveys and appropriate consultation in order to see if there is scope for any peatland restoration." • "as there is potential bog restoration in this area, it needs to be considered as a potential objective in the future" The wording suggests any peatland restoration, or assessment of, at Cardross is aspirational rather than a firm commitment. We would urge FLS to firmly commit and make it an objective (not a "future objective" as termed above) to assess the potential for peatland restoration at Cardross and its potential impacts (positive and negative) on Lake of Menteith SSSI, in the first half of the	

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			LMP period; and similarly making it an objective to undertake restoration work if the assessment indicates that restoration can be carried out without harming Lake of Menteith SSSI. This would help FLS deliver against Outcome 2 of the Draft Management Plan Objectives: • "Managing the national forests and land to further the conservation and enhancement of biodiversity" • "Taking targeted action to maintain and bring designated sites into favourable condition – and working beyond designated sites at the landscape scale with partners where we can" • "Continue to manage to conserve the Lake of Menteith SSSI". The NPA are happy to lend advice where required for the work within the Park boundary. As Cardross is covered by our NPPP plan, we would be keen to see peatland restoration at Cardross prioritised	

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			as a work area as it will contribute towards the peatland targets set out within the NPPP. Plastic Piling is mentioned in Section 6.3.1, and there are a couple of references to 'piling' thereafter. Within the NP, and at national level, moves are being made away from the installation of plastic piling dams due to the risk of microplastic pollution within the water environment. Plastic also doesn't 'behave' like a natural material and doesn't shift with the bog e.g. when the bog dries out, it shrinks and gaps form around the piling that can then allow water through afterwards which means it's likely to be less effective over the longer term. It also doesn't look that great visually! We would consider plastic piling very much as a last resort (Inchmoan is currently the only place that it's actively being	

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			installed, and this is only due to the near impossible cost and logistics of getting anything else digger onto the island and then onto the bog). The preferred method would be the use of timber dams which can be reinforced where necessary, or a composite solution across wider channels where timber dams are installed and shored up with peat on the downstream side to provide stability, which will then backfill on the upstream side over time as material builds up behind (this can be accelerated through the addition of peat and brash). Although some thinning is proposed for the southern section of the Cardross block and larch is to be removed from this area, the existing area of Sitka is to be retained. Given the potential for this Sitka to seed into the existing and proposed native woodland in this area, this seems like a missed opportunity to maximise the biodiversity benefits	

Statutory Consultee	Date contacted	Date response received	Issue raised	Central Region Response
			of the plan. As a result, we recommend these areas of Sitka are removed in conjunction with the other felling work that is proposed in this area. We note that rhododendron is present in the plan area, primarily alongside the old railway line but these is also evidence of the colonisation of clear-felled areas. Section 6.3.4 of the LMP states that "control will be considered and actioned where necessary through the period of this plan, improving habitat". Effective control of rhododendron will be vital for success of the plan, and although it doesn't sound as if it is particularly extensive at present, a firm commitment should nonetheless be made to eradicate it. National Park Consultation Response.pdf	
RSPB	08/01/2024	-	No response	
Scottish Water	08/01/2024	10/01/2024	***Drinking Water Protected Areas***	Noted

Statutory Consultee	Date contacted	Date response received	Issue raised	Central Region Response
			A review of our records indicates that there are no Scottish Water drinking water catchments or water abstraction sources, which are designated as Drinking Water Protected Areas under the Water Framework Directive, in the area that may be affected by the proposed activity. ***Scottish Water Assets*** A review of our records indicates that there are no Scottish Water assets (including water supply and sewer pipes, water and waste water treatment works, reservoirs, etc.) in the area. This should be confirmed however through obtaining plans from our Asset Plan Providers, listed in the SW list of precautions for assets, which can be found on the activities within our catchments page of our website at **www.scottishwater.co.uk/slm**.	

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			In the event that asset conflicts are identified then early contact should be made with the Highway Authorities and Utilities Committee (HAUC) at Hauc.diversions@scottishwater.co.uk. It should be noted that the proposals will be required to comply with Sewers for Scotland and Water for Scotland 4th Editions 2018, including provision of appropriate clearance distances from Scottish Water assets.	
Stirling Council (Roads, Planning, Flooding)	08/01/2024	24/01/2024	Archaeology Dept - I have no comment on the detail of the application but note that it's clear that not all non-scheduled features have been captured by your assessment. This appears to be because your internal system relies solely on sites identified by CANMORE and not by local HERS. The information can on these missing sites can be gained from Stirling Council	Noted

Statutory Consultee	Date contacted	Date response received	Issue raised	Central Region Response
SEPA	08/01/2024	16/01/2024	General comments, no specific comments on the plan.	Noted
Forth District Salmon Fishery Board	08/01/2024	-	No response	
Sustrans Scotland	08/01/2024	-	No response	
WoSAS	08/01/2024	16/02/2024	Unfortunately, I am afraid that we have been unable to assess this proposal due to a lack of staff time. As you may be aware, the provision of free advice to the forestry industry is not covered by our Service Level Agreement with our member Councils and is essentially unresourced. Although we do try to provide comments in response to enquiries of this type when we have time, if we are dealing with a high volume of planning-related casework, we have to prioritise our core function, which is to provide advice to the Planning Departments of our member Authorities on the archaeological implications of development proposals. During such periods, providing comments in relation to forestry proposals has to be assigned a lower priority. As a result of this, it is unlikely that we	Noted

Statutory Consultee	Date contacted	Date response received	Issue raised	Central Region Response
			will be able to provide comments in response to your consultation request. This should not be taken as indicating that it does not raise an archaeological issue – rather, it simply means that we have not had time to assess it.	
Scottish Wild Land Group	08/01/2024	-	No response	
Port of Monteith Community Council	08/01/2024	-	No response	
Gartmore Community Council	08/01/2024	-	No response	
Buchlyvie Community Council	08/01/2024	-	No response	
Green Aspirations Scotland	08/01/2024	-	No response	
Site Users - Posters at site entrances	08/01/2024	-	No response	
Local Community - Posters in local community hubs Press release in Stirling Observer, Local community Facebook groups, Lodge Facebook page	08/01/2024	02/02/2024, 03/02/2024, 04/02/2024	Pendicles of Collymoon residents of 3 properties concerned that removal of remaining trees at Flanders Moss will increase the flood risk to their properties which have recently suffered from flooding of the River Forth	Thank you for your feedback on our Forth Mosses LMP consultation. This plan is a continuation of our previous approved plan to restore the nationally important Flanders Moss complex of Lowland Raised Bog both to restore this important habitat but its hydrological function. The advice from Dr Tom Nisbett provided as part of the current plan back in 2012 has more recently been added to in Appendix IX where in 2023 FLS

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				commissioned a Hydrological Impact Assessment of Flanders Moss to assess the impacts of peatland restoration. As you will no doubt be aware the majority of the former forest has been felled however the process of restoration at an early stage. The ongoing felling and restoration will work to retain water within the bog itself and slow peak flows thereby hopefully mitigating against the risk of future flooding of your properties. Although it sounds counter intuitive that removal of the forest might improve the flood risk situation to your properties, which in itself it wouldn't, it is the subsequent peatland restoration works which will restore the function of the bog to hold water back on the site. Currently the forest has a drainage network which acts to divert water off the land which can lead to heavier peak flow

Statutory Consultee	Date contacted	Date response received	Issue raised	Central Region Response
				events downstream. Our plans however are to hold the water within the bog, reducing peak flows and therefore reducing the flood risk downstream to your property. In conjunction to this FLS is proactively working to reduce the impacts of peak flows upstream particularly through the Duchray catchment through the land management plans of our other forests within it. If we were to leave the remaining non-native conifer trees at Flanders Moss onsite they would undoubtably blow down in time further destabilising the hydrology and increasing flood risk. Our plan, which again is a continuation of the previously approved long term aim, is to remove the trees from this important habitat and hydrological feature and restore its function to hold water

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				and store carbon both of which are of the highest priority in this time of climate emergency.

Appendix IV: Objective Appraisal, Monitoring & Evaluation

Objective	Assessable Criteria	Appraisal Method	Monitoring Method	Monitor Where	Monitor When	Monitor Who	Record Monitoring Where	Evaluation. *How does the Appraisal and Monitoring method inform current & future proposals? If you cannot answer this question, then the methods may not be appropriate.*
Restore and maintain lowland raised bog where this is feasible, managing unwanted natural regeneration.	Lowland raised bog habitat	Drainage operations on site Habitat restoration	Habitat surveys	On site/ Forester Web Land Management Plan Tool	During and after operations	Forest Management /Environment teams/programme manager	LMP/work plans/habitat surveys	Monitoring as described will determine whether habitat restoration has been successful.
Where appropriate retain native woodland and establish, primarily through natural regeneration, native wet/edge and riparian broadleaved woodland.	Woodland habitat Red Squirrel population	Condition of trees Natural regeneration of broadleaves	Habitat surveys	On site/ Forester Web Land Management Plan Tool	Yearly	Forest Management /Environment teams/Programme Manager/Planning Forester	LMP/work plans/habitat surveys	Monitoring as described will determine condition of existing woodland and its contribution to natural regeneration and red squirrels. It will also determine if natural regeneration of broadleaves is occurring. If not there may be opportunity to programme operations to encourage its spread.
Retain some Norway spruce in short-medium term as habitat for resident red squirrel population.	Woodland habitat Red Squirrel population	Condition of trees Natural regeneration of broadleaves	Habitat surveys	On site/ Forester Web Land Management Plan Tool	Yearly	Forest Management /Environment teams/Programme Manager/Planning Forester	LMP/work plans/habitat surveys	Monitoring as described will determine condition of existing woodland and its contribution to natural regeneration and red squirrels. It will also determine if natural regeneration of broadleaves is occurring. If not there may be opportunity to programme operations to encourage its spread.

Objective	Assessable Criteria	Appraisal Method	Monitoring Method	Monitor Where	Monitor When	Monitor Who	Record Monitoring Where	Evaluation. *How does the Appraisal and Monitoring method inform current & future proposals? If you cannot answer this question, then the methods may not be appropriate.*
Maintain existing Natural Reserve designation in Cardross in order to uphold environmental and biodiversity benefits associated with Lake of Menteith SSSI.	Peat restoration	Consultation with NatureScot and Scottish Forestry Peat habitat surveys	Site evaluation	Onsite/ Forester Web Land Management Plan Tool	Prior/during and after surveys and consultation	Environment Manager/Peatland Manger	Against the LMP/Peat strategy	Monitoring as described will determine condition of peatland at Cardross as well as the potential for bog restoration.
Thin young mixed crop at Cardross, removing larch and improving remaining stand.	Timber volumes	Production Forecast	Forester Web Land Management Plan Tool query Site mensuration/ Tree health	Forester Web Land Management Plan Tool On site	Prior, during and after operations and at appropriate intervals e.g., mid-term and 10-year reviews.	Programme Manager/Harvesting Forester	Against the LMP/work plans	Monitoring the volumes and quality produced and levels of income received will allow the Programme Manager & Harvesting Manager to gauge what returns might be expected from future interventions and which customers would most likely be interested. This monitoring also allows the Planning Forester to gauge the quality of conditions and whether future crops might fetch improved revenues if managed differently.
	Forest roads	Civil works undertaken	Forester Web Management Coupes & Road layers	Planned roads layer	At LMP, before operations and at appropriate intervals e.g., mid-term and 10-year reviews	Planning Forester/Programme Manager/Civil Engineer	Against the LMP	Monitoring as described will determine whether required roading has been constructed as per LMP.

Objective	Assessable Criteria	Appraisal Method	Monitoring Method	Monitor Where	Monitor When	Monitor Who	Record Monitoring Where	Evaluation. *How does the Appraisal and Monitoring method inform current & future proposals? If you cannot answer this question, then the methods may not be appropriate.*
Convert turning areas off the main forest road at Flanders into raised mounds providing vantage points and access for wildlife management.	Raised mounds	Visual reference	Wildlife Management	On site	Prior and during construction of raised mounds	Wildlife Manager	Against the LMP/Deer Management plan	Monitoring as described will push forward the raised mounds to be made to facilitate deer management.
Maintain access along the National Cycle Route 7 link for walkers, riders and cyclists, and also maintain access to the River Forth for anglers.	Local community opinion	Visual reference, Contact lists numbers. Event & Project activity	Site evaluation Contact list check, number of events/project progressing	Within the local community	At mid-term and 10-year review On-going engagement with local stakeholders	Visitor Services Manager	Against the LMP & Site contact list	By monitoring when and who we have contacted as well as what events and projects are being progressed the VS Manager can evaluate how active we have been in engaging with local community as well as being better able to plan budgets for upcoming events/projects.

Appendix V: List of maps

The table below lists the maps which support and form part of this Land Management Plan.

1. Location
2. Soils
3. Climate
4. Existing Forest Stock
5. Key Feature Opportunities & Constraints
6. Initial Outline Draft Concept
7. Management Coupes
8. Felling Approval Areas
9. Silvicultural Systems
10. Thinning
11. Woodland Management in Visitor Zones
12. Future Habitat & Species
13. Restock Approval Areas
14. Timber Haulage
15. EIA Deforestation

Appendix VI: Deer Management Plan (DMP) – Forth Mosses

Background

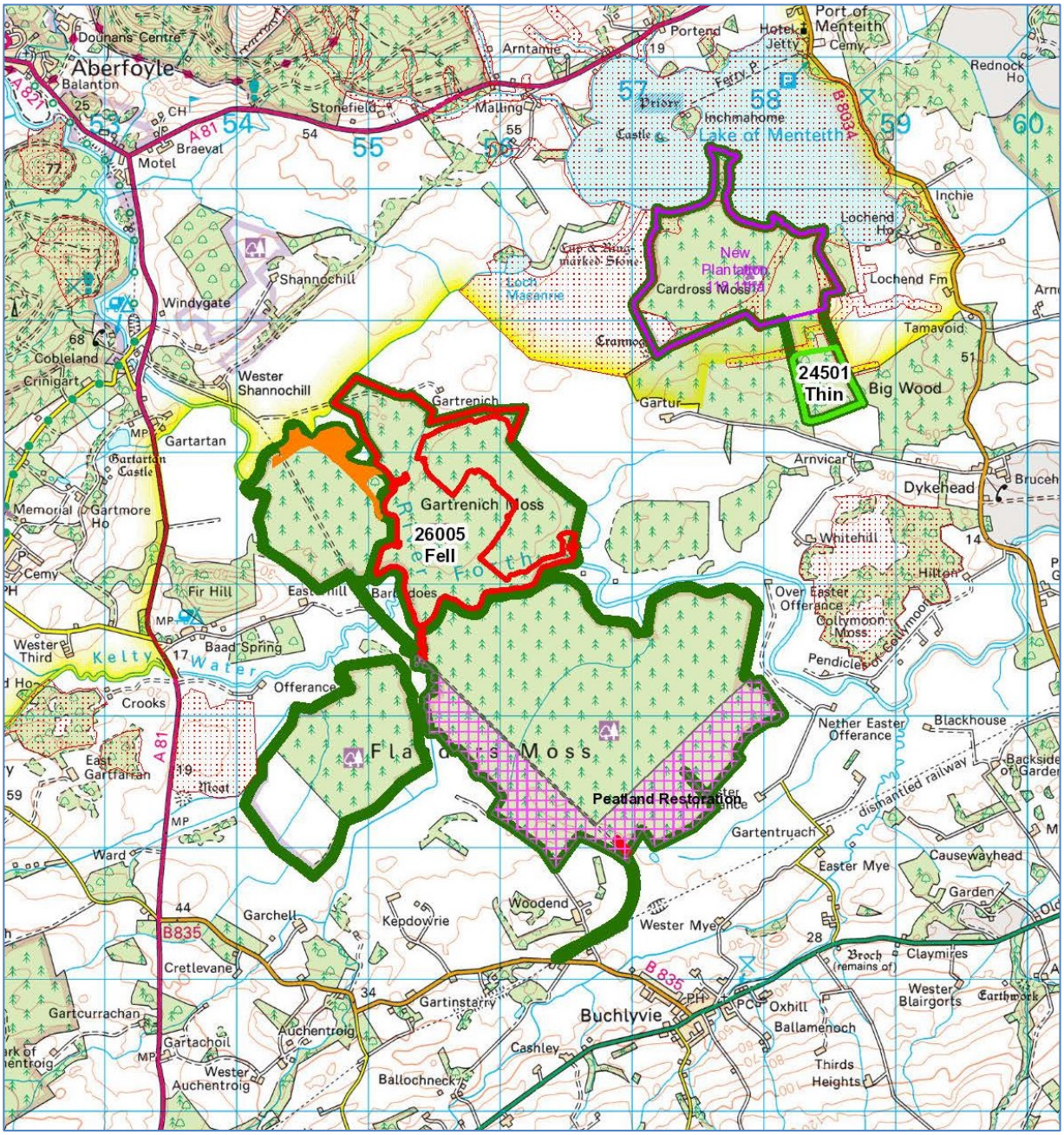
- This DMP should be used as a supporting document/annex for the Land Management Plan (LMP). The DMP should also relate/be used in conjunction with FLS Deer Management Strategy.

National & Local objectives

- Local and National objectives should be linked in here.
- National
    - Contributing to Scottish Forestry - Forestry Strategy (also includes Climate Change)
    - Deer Management Strategy Deer management strategy - Forestry and Land Scotland
    - Scottish Biodiversity Strategy Biodiversity strategy: consultation - gov.scot (www.gov.scot)
- Local
    - Central Region Deer Management Plan (available on request)

What are we going to protect?

- **Cardross**. The northern part of Cardross is a **Natural Reserve** (marked in purple in the map below) and will remain as is for the next LMP. It consists of Mature Conifers and the watercourses are part of the **Lake of Menteith SSSI** (marked with red dots in map below). The southern part is a mix of tree species which is scheduled to be thinned in 2024/25. An area of Larch is scheduled to be removed within the next LMP and the area will be left open for natural regeneration. We will thus be protecting natural **native regeneration**.



- **Flanders Moss**. This area will be open ground due to the **peatland** restoration scheduled for the area. The large areas (marked in pink hatch on the map above) have been scheduled for mulching due to these areas seeing regeneration of Sitka Spruce and Birch. These areas are now acting as shelter for deer and the clearance is vital to maintaining low deer densities in the area.
- **Gartrenich Moss**. The mature Sitka Spruce in this area is scheduled for harvesting (marked in red on the map above) within the next LMP. The area will be left open as **peatland** scheduled for restoration. A small area of **Norway Spruce** to the west within a **PAWS site** (marked in

orange on the above map) will be left unharvested due to the high numbers of Red Squirrels found here.

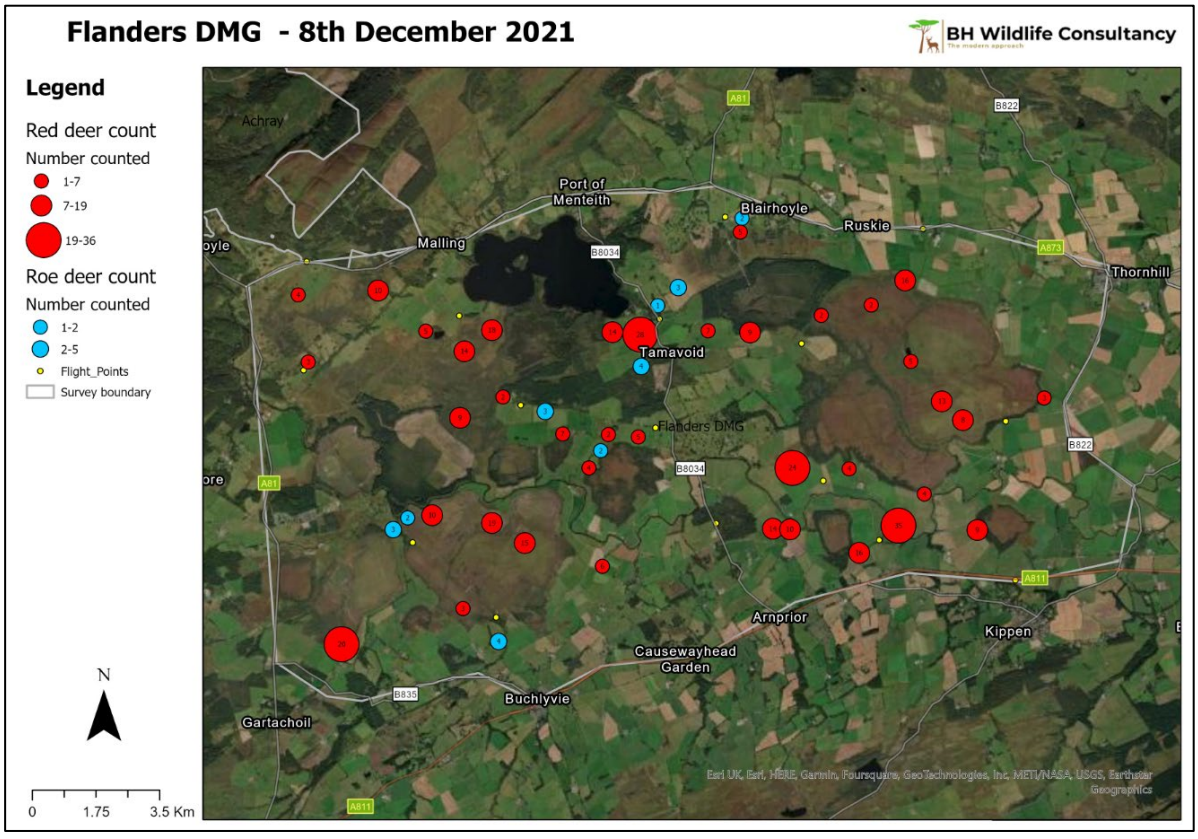
- Low deer numbers needs to be maintained to ensure effective restoration of the **Peatland**.

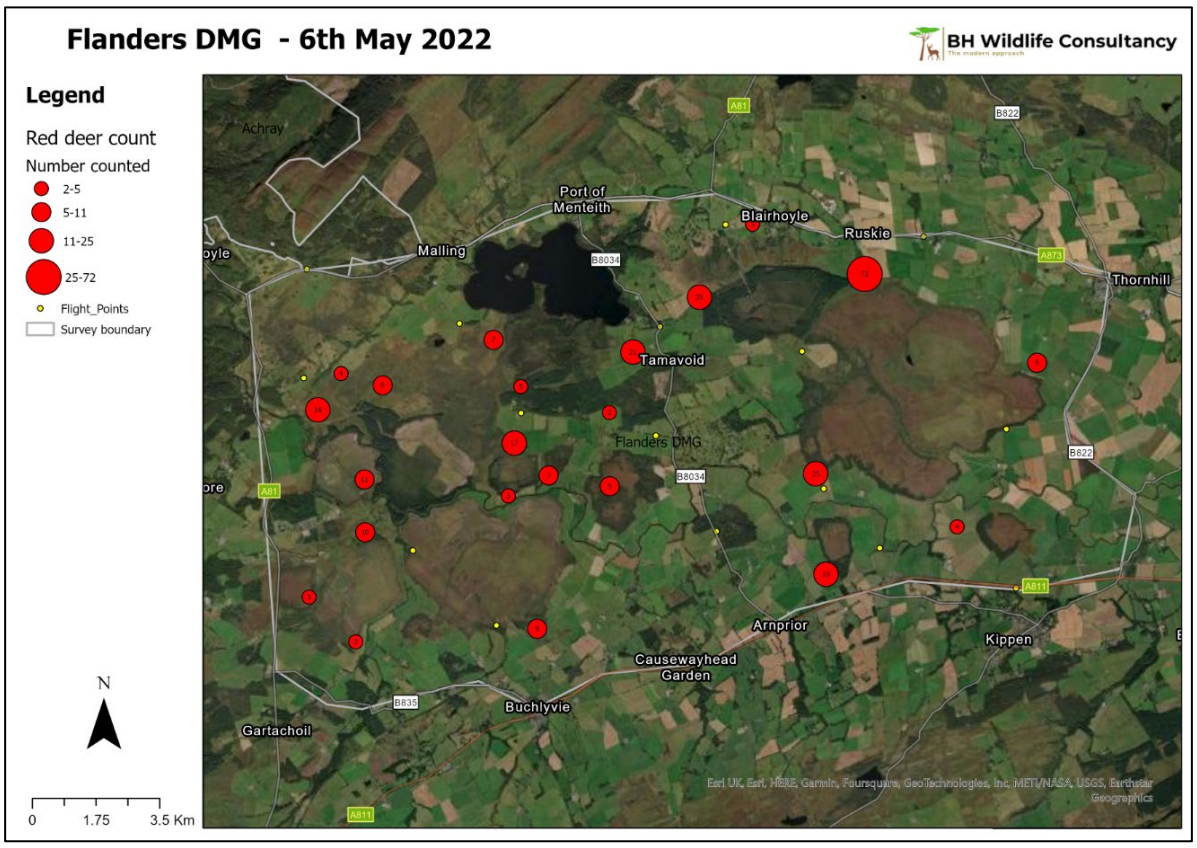
Deer Species (and other herbivores/feral pigs)

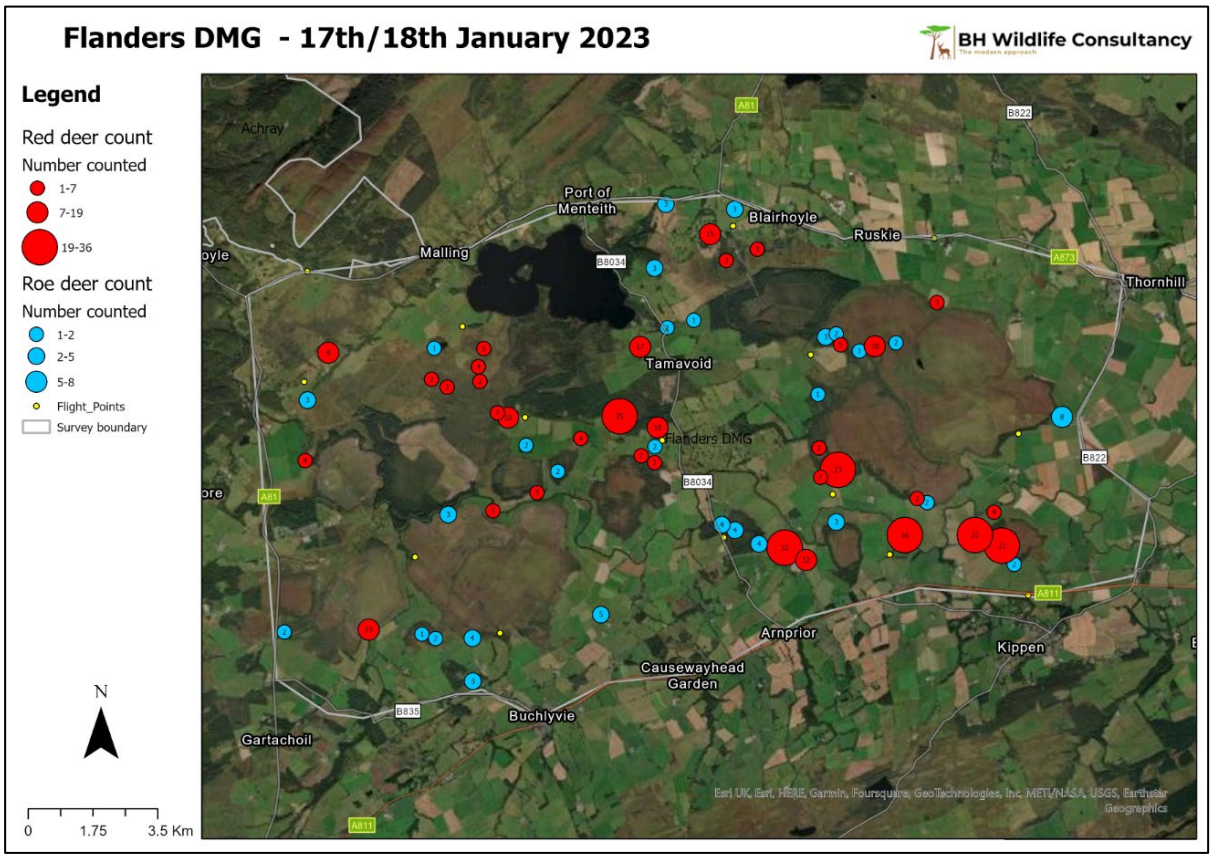
- Red and Roe deer are found within the DMP area and the larger area within the Flanders Moss Deer Forum.

What have we done to date?

- In the last 5 year 274 deer has been culled within the DMP area.
- FLS was also involved in culling deer within the larger Flanders Deer Forum and this added another 168 deer to the 5-year cull of the larger area.
- 42% of the cull on FLS land was Red Deer and 58% Roe deer.
- Thermal drone counts have been completed in December 2021, May 2022 and January 2023. Throughout this period a marked reduction in deer on FLS land is evident.
- The deer numbers within the larger Flanders Deer Forum saw a marked reduction, however immigration into the area has led to an increase in the last 12 months.
- Please see Thermal Drone Count maps below.




Flanders DMG - 6th May 2022
BH Wildlife Consultancy
Legend
Red deer count
Number counted
2-5
5-11
11-25
25-72
Flight_Points
Survey boundary
N
0
1.75
3.5 Km
Achray
Port of Menteith
Blairhoyle
Ruskie
Malling
Thornhill
Tamavoid
Flanders DMG
Arnprior
Kippen
Causewayhead
Garden
Buchlyvie
Gartachoil
A81
B822
B8034
A873
A811
B835
Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS, Earthstar Geographics


Flanders DMG - 17th/18th January 2023
BH Wildlife Consultancy
Legend
Red deer count
Number counted
1-7
7-19
19-36
Roe deer count
Number counted
1-2
2-5
5-8
Flight_Points
Survey boundary
N
0
1.75
3.5 Km
Achray
Port of Menteith
Blairhoyle
Ruskie
Malling
Thornhill
Tamavoid
Flanders DMG
Arnprior
Kippen
Causewayhead
Garden
Buchlyvie
Gartachoil
A81
B822
B8034
A873
A811
B835
Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS, Earthstar Geographics

Geography

- The terrain in Forth Mosses is flat and very wet.
- Future peatland restoration plans will see the area getting even more wet and will limit deer management access into the area.
- Removal of regen next to the roads that do exist is vital for effective deer management.

Have an evidence based approach

FLS use an information based decision making process to set its deer management operations with the data received from varies internal and external reports and include;

- Thermal drone counts
- Herbivore dung counts
- Historical cull data
- Near neighbour cull and sighting data
- Ranger daily/monthly reports
- Deer Management Contractor daily/monthly reports
- Helicopter counts
- WRM surveys
- Survey data are independently obtained – i.e. Deer density figure, impacts - NN/HIA, SDA, etc.
- All data obtained are then combined as best possible and applied to a population model which is used to set culls.

Link to Deer Dashboard

- Most of data is used to create this DMP can be found in the Deer Dashboard, please see a link below. Currently only available to FLS staff, however to be made public soon.
- https://fls.maps.arcgis.com/apps/MapSeries/index.html?appid=19d7887f055f469e9e472b5fec0d0630

Population Modeling and Future Culls

- Due to the extremely low numbers of deer on FLS land within the larger Flanders Deer Forum (FDF) we are unable to run a population model.
- Through thermal drone counts we will monitor the deer numbers on FLS closely and adjust our pressure on the area accordingly.
- **The cull for Forth Mosses is set at 100 for 2023/24**, however in the 2022/23 season this has been unreachable due to low deer numbers.

- High immigration into the larger Flanders Deer Forum area and the high number of deer within the eastern area of the FDF leads us to use professional judgment in setting this high a cull for Forth Mosses even with the lack of deer present within thermal drone counts.

How will objectives be met? Staff, contractor?

- The DMP area will be/is currently being managed by a Wildlife Management Contractor.
- Wildlife Management Contractors are qualified to Deer Stalking Certificate levels 1 & 2. In addition the they are required to carry out an annual firearms skills test, ensuring the highest levels of safety and competency when undertaking their duties. Wildlife Management Contractors are supported by a Wildlife Ranger Manager and Area Wildlife Manager.
- Contractors are selected after satisfying FLS of their competence via a competitive tender. This work is arduous and critical to the success of the impact reduction strategy and only very experienced and appropriately qualified contractors are considered. All Wildlife Contractors have the same qualifications as FLS Wildlife Rangers and compliance and H&S are continually monitored by the Wildlife Ranger Manager.
- Out of season shooting is an essential tool in the protection of vulnerable tree crops and natural habitats. This is conducted either under the General License issued by NatureScot for enclosed woodland or by 5(6) authorisation on application to NatureScot for un-enclosed woodland. Male deer of all species will be shot year round on FLS land following permission, the shooting of females out of season will be limited to the periods 1st of September to 20th October and from the 16th February to the 31st March. When early out of season shooting of females is carried out any dependent young will be shot first.
- Night shooting is permitted by the Deer (Scotland) Act 1996 as amended by the Wildlife and Natural Environment Act 2011 (WANE Act), under section 18(2) authorisations granted by NatureScot. Applications for night shooting will only be made where unacceptable levels of damage would occur, and where the use of all other legal means of control, including out of season shooting have been considered. Operational dates for night shooting will be kept under review and can be changed should circumstances dictate. All operations will conform to current Best Practice Guidance and a copy of the guides will be held at the district office and issued to Wildlife Rangers as necessary. Night shooting is a valuable tool in areas of high deer management pressure where the population has become wise to deer management practices.

Infrastructure? Roads/ATV tracks/glades/larders/equipment

- Infrastructure in Forth Mosses is very limited due to the nature of the ground and our peatland restoration goals.
- A new road has been built in Gartrenich moss and along with the road some winching mounds have been installed that will aid in deer extraction from the road in the future.

- The larger Flanders Moss area has only one road going through it and no ATV tracks into the moss, again due to the nature of the ground and future rewetting plans.
- Removing regen to open up the areas next to roads are vital to effective deer management of the area.
- Cardross has limited vehicular access and this will remain unchanged due to protecting the Lake of Menteith SSSI and the usage of the water here for drinking water.
- All FLS Wildlife Rangers have to following kit as standard:
    - 4 x 4 vehicle with either a winch or loading crane attached to the back to aid in loading carcasses safely.
    - Capstan which and rope to aid in extraction when far away from roads.
    - 4 x 4 ATV with winch.
    - Trailer to transport ATV.
    - Slee Sledge/hill trailer to aid in extraction using the ATV.
    - .270 caliber rifle with high magnification scope. Some rangers have smart scopes where applicable.
    - Binoculars.
    - Handheld thermal imager to increase herbivore detection.
    - Various knives, saws and PPE.
    - Access to thermal drone and pilot.
- Two larders are within the area of Forth Mosses with a total capacity of 115 deer.

Collaborative working opportunities

- NatureScot has previously placed a Section 10 on the FDF area and this has lead to an increased cull on the land neighbouring FLS.
- A significant reduction in deer within the FDF area led to farmers seeing less damage to crops and NatureScot has since lifted the Section 10.
- Through the FDF, FLS is continuing to work with all the neighbours in the area and closely with NatureScot.
- NatureScot has pervious and will again in the future use the FLS larder at Aberfoyle to aid in the deer cull of the larger area.

DMG present

- The Flanders Deer Forum is the active DMG in the DMP area and FLS is an active member of the forum.

Venison

- FLS subscribe to the Scottish Quality Wild Venison (SQWV) scheme. This set the standards for our larders and actions of our staff to ensure we provide a safe food item to market.
- All venison is quality assured and sold to Highland Game where it is further processed.

- The Trossachs has 2 deer larders with a capacity of 115 Red deer.
- All waste from the larders are removed by a licensed waste disposal contractor.
- All animal by-products are sold to Highland Game along with the venison.
- Venison is also sold privately from the Aberfoyle larder under our Venison Dealer's license.

Appendix VII: Summary of Environmental Surveys

Anderson R (1999) Report on Suitability of West Flanders Moss Forest for Bog Restoration.

Following extensive vegetation and hydrological surveys this report concluded that approximately half of the Flanders section was suitable for bog restoration, allowing wet woodland to develop in remaining areas.

Mountain Environments (2001) West Flanders Moss Hydrological Survey

This survey examined water flows in three key drainage channels and made recommendations on drain blocking that would minimise the impact on surrounding farmland.

Forestry Commission (2001) A environmental Statement for West Flanders Moss Forest proposed Deforestation.

This environmental statement was prepared for a full environmental impact assessment which considered road construction, haulage and hydrology. As well as the above listed reports further advice was sought from R. Anderson and Dr T Nisbet (both Forest Research) regarding the ecological, chemical, and hydrological impacts of the deforestation of the Moss and associated road construction. The operations were considered to have minimal impact and following further consultation the project was allowed to proceed.

Waddell J (2008) Survey of Part of Flanders FDP

A survey was carried out of the three remaining sections of the forest to assess suitability for bog restoration. Both vegetation and hydrology were examined. The conclusion was that both the Garchell and Gartrenich sections were good and priority candidates for bog restoration. However, the Arnochoile and northern Gartrenich sections were less suitable but could be allowed to develop as wet woodland.

In addition to these surveys further advice was sought from Dr T Nisbet, in 2012, regarding the hydrological implications of deforestation and drain blocking. Dr Nisbet re-iterated that these operations are likely to have minimal impact on the timing and size of peak flows following heavy rainfall and therefore little impact on risk of flooding.

Appendix VIII: Hydrological advice

The following is a summary of advice received from Dr. Tom Nisbet (Forest Research) in February 2012 with regard to the possibility of increased risk of flooding following tree removal at Flanders.

In general terms, tree removal is considered to be negative for flood risk. However, predicting the actual impact is rather complex and inevitably depends on many factors, the importance of which vary from site to site.

Scale is probably the most important factor, with the impact on flood flows usually increasing with the proportion of catchment felled. It is difficult to detect any impact of clear-felling on water flows (or chemistry) when less than 20% of a catchment is felled (with the catchment defined as the area upstream of the nearest asset at risk).

While the area of felling is large at Flanders, its contribution to flood flows is likely to be relatively minor in terms of the catchment of the River Forth, to which it drains.

Much will depend on whether there are any local assets/houses at risk of flooding, in which case the planned felling could have a significant impact. This would need to be explored by defining the catchment area draining to any affected property and determining the scale of planned felling. The new Forests and Water guidelines advice that the best way of mitigating any impact in areas of high flood risk is to phase (which would involve restricting the felling to <20% of the affected catchment in any three year period).

(Total area of Flanders is about 820 Ha i.e. 4% of 21,000 Ha of the Upper Forth catchment; 100 Ha of the Garchell section are within the Kelty catchment i.e. 2.5% of the total 3700 Ha).

The impact of felling on flood risk largely results from the reduction in forest water use, which can exert a small, but potentially significant effect on flood volume. Conifer crops tend to have the highest water use and thus exert a larger effect on flood flows. The water use effect declines with increasing flood size and is probably marginal for extreme floods (>1 in 100 year) but could reduce smaller flood peaks (<1 in 5 years) by 10-20% (for 100% cover/clearance).

The risk posed by felling is short term, but can have a longer-term impact if trees are not planted or there is a change in forest type to one with a lower water use. Conversion to native wet woodland could in due course create greater hydraulic roughness than plantation conifer and exert a larger slowing effect, although only within the floodplain.

Finally, drain blocking and rewetting of Flanders Moss could also be expected to exert an impact of flood risk, although the effect will probably be small. Drain blocking can slow runoff but this is not always beneficial, as it can sometimes lead to synchronisation, rather than desynchronisation of downstream flows. Raised water-tables will reduce the potential for soil water storage, while the scope for surface water retention will depend on local topography and antecedent conditions.

In summary, the main issue is likely to be the effect on local flood risk associated with streams draining Flanders Moss, depending on the location of affected properties or infrastructure.

Removal of floodplain conifers could have an effect on the timing of flood response in the River Forth and thus it would make sense to replace and potentially extend such areas by conversion to native floodplain/wet woodland.

Forestry and Land Scotland
Coilltearachd agus Fearann Alba

Appendix IX: Flanders Moss peatland restoration Hydrological impact assessment

(See separate report)

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Appendix X (EIA: Screening Opinion Request)

Scottish Forestry
Perth & Argyll Conservancy
Upper Battleby
Redgorton
Perth
PH1 3EN

Our Ref:

Your Ref: 26th March 2023

Dear Sir/Madam

FORTH MOSSES EIA SCREENING OPINION REQUEST

This determination is two-fold –

1. The land management plan has identified 62.1 Ha in Arnochoile for deforestation and restoration to lowland raised bog. This area was originally considered not suitable for bog restoration after surveys by Jeff Waddell (Appendix VI Summary of Environmental Surveys), however as peat restoration knowledge has progressed it is now proposed to also restore this area and a screening opinion is now needed.
2. To seek an updated determination for the remaining 119.47 Ha of woodland removal on Gartrenich Moss for peatland restoration, where the previous determination has expired.

Please see Map 15 Deforestation EIA which outlines the new and existing areas for deforestation and restoration of lowland raised bog. Appendix VI Summary of Environmental Surveys outlines the existing surveys which give justification of deforestation for the original areas. The attached EIA determination details the original and the new deforestation at Arnochoile, which are suitable for bog restoration, and identifies the key sensitivities of carrying out the work.

Kind Regards
Carol McGinnes

Proposed Work							
Please put a cross in the box to indicate the type of work you are proposing to carry out. Give the area in hectares and where appropriate the percentage of conifers and broadleaves							
Proposed Work	Select (x)	Area in hectares	% Conifer	% Broad-leaves	Proposed work	Select (x)	Area in hectares
Afforestation	-	-	-	-	Forest roads	-	-
Deforestation	X	142.3	67	33	Forest quarry	-	-
Location of work	Forth Mosses Deforestation – OS Grid Refs NS 555 973 & NS 546 975						

Description of Forestry Project and Location
Provide details of the forestry project (size, design, use of natural resources such as soil, and the cumulative effect if relevant). Please attach map(s) showing the boundary of the proposed work and other known details.
Forestry and Land Scotland (FLS) are applying for 142.3 Ha of deforestation to facilitate restoration of lowland raised bog UKBAP priority habitat (see Map 15 Deforestation EIA). This area includes the 81.86 Ha of deforestation previously approved as part of the previous Flanders Moss Forest Design Plan but where tree removal was not carried out within the approval period. A renewed Land Management Plan (LMP) sets out FLS's felling and restocking proposals for the next 10 years and re-include this area for felling and habitat restoration. Originally Arnochoile Wood/Easterhill Moss was considered less suitable for restoration and since the felling of the last plan has partially restocked itself through natural regeneration of wet woodland species such as Downy birch and Goat willow as well as Sitka spruce (approx. 8 years old). However with improved understanding of peat restoration and associated techniques in recent years this part of the site is now considered a good candidate for lowland raised bog restoration and therefore this 60.44 Ha area is also included as part of the renewed LMP.

Provide details on the existing land use and the environmental sensitivity of the area that is likely to be affected by the forestry project.
The current land use is a mix of tree cover and open space, gross area of 142.3 Ha, made up of a net tree cover of approximately 90% and open space of 10%. There are significant areas of unproductive, windblown, dead and failed crop with low yield classes below 8. The surrounding areas consist predominantly open areas of formerly afforested peat at various stages of restoration and broadleaved riparian woodland. The River Forth as well as Auchentroig burn and Kelty water runs alongside and between proposed bog restoration areas.

Provide details on the existing land use and the environmental sensitivity of the area that is likely to be affected by the forestry project.
Lowland raised bogs are well understood to be a resource of global significance for biodiversity and carbon storage. Afforested peatlands have been a sensitive environmental topic receiving even more scrutiny since the Climate Emergency was announced by the First Minster in April 2020 and previously Stirling Council recognised the climate and nature emergency in October 2019. These proposals are supported by the Scottish Peatland Strategy, the Scottish Biodiversity Strategy and the Scottish Forestry Strategy. The literature supports the supposition that poor growing trees such as the Sitka spruce on these sites are probably acting as a net carbon source, once the oxidisation of the soils are taken into account. The Scottish Government Environmental Strategy supports using the precautionary principal to protect these sites. When originally planted the nutrient demanding spruce would have likely been heavily fertilised but despite this is still generally growing very poorly. It is very likely that a second rotation of any suitable species would not achieve a carbon positive balance at these sites over the next rotation. There is an urgency to extract the standing timber to ensure that the carbon captured in the trees is stored, before it degrades and releases carbon back into the atmosphere. The proposed project will ensure that the function of the carbon storage in the peat soil is secured, by counteracting the modifications made at time of afforestation (drains, ploughing).

Description of Likely Significant Effects
Provide details on any likely significant effects that the project will have on the environment (resulting from the project itself or the use of natural resources) and the extent of the information available to assist you with this assessment.
Atkins were commissioned to undertake a Hydrology Survey of the sites and that report was published in July 2023. That report as well as the previous surveys carried out by our then Open Habitats Ecologist, Jeff Waddell, suggest there would be no likely significant negative effect from the removal of the trees and that after the drain blocking at Arnochoile Wood/Easterhill it would be expected that the peak flows transported by the two ditches bordering the road would reduce following restoration of the rest of the ditch network and water quality would increase. Undertaking this work will restore the huge diversity of organisms found on the UKBAP lowland raised bog, improve the overall landscape of the area as well as improve their value as a carbon store. Tree removal and bog restoration will link with similar habitats throughout the upper Forth Valley.

Include details of any consultees or stakeholders that you have contacted in order to make this assessment. Please include any relevant correspondence you have received from them.
FLS environmental team - peat probing undertaken in the area to highlight areas of deep peat. FLS open habitat ecologist - overview of site indicates site should be restored as lowland raised bog.

Include details of any consultees or stakeholders that you have contacted in order to make this assessment. Please include any relevant correspondence you have received from them.
SEPA, NatureScot and RSPB were consulted on the proposals as part of the previous Land Management Plan and its associated screening opinion request and those issues and responses are recorded in the consultation record of that plan. No significant changes have occurred since then A survey and report by a consultant hydrologist has additionally fed into and supports this proposal and is attached to the is request.

Mitigation of Likely Significant Effects
If you believe there are likely significant effects that the project will have on the environment, provide information on the opportunities you have taken to mitigate these effects.
None. Please note that this area could not be afforested if current regulation had been applied, since it would not comply with UKFS or Scottish Biodiversity Strategy.

Sensitive Areas	
Please indicate if any of the proposed forestry project is within a sensitive area. Choose the sensitive area from the drop down below and give the area of the proposal within it.	
Sensitive Area	Area
Deep peat soil	142.3

Property Details			
Property Name:	Forth Mosses		
Business Reference Number:		Main Location Code:	
Grid Reference: (e.g. NH 234 567)	NS557975	Nearest town or locality:	Aberfoyle
Local Authority:		Stirling Local Authority	

Owner's Details				
Title:	Mrs	Forename:	Carol	
Surname:	McGinnes			
Organisation:	Forestry & Land Scotland		Position:	Regional Manager
Primary Contact Number:	0131 370 5622		Alternative Contact Number:	07917271577
Email:	carol.mcginnes@forestryandland.gov.scot			
Address:	Five Sisters House, Five Sisters Business Park, West Calder, West Lothian			
Postcode:	EH55 8PN		Country:	Scotland
Is this the correspondence address?			Yes	

Forestry and Land Scotland
Coilltearachd agus Fearann Alba

Agent's Details					
Title:	N/A	Forename:	N/A		
Surname:	N/A				
Organisation:	N/A		Position:	N/A	
Primary Contact Number:	N/A		Alternative Contact Number:	N/A	
Email:	N/A				
Address:	N/A				
Postcode:	N/A		Country:	N/A	
Is this the correspondence address?			N/A		

Office Use Only	
GLS Ref number:	