



Forestry and
Land Scotland
Coilltearachd agus
Fearann Alba



Ardross Land Management Plan 2022-2032

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Forestry and Land Scotland, North Region, The Links, Golspie, Sutherland KW10 6UB

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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1.0 Summary of Proposals

1.1 Vision

10 Year vision

This area will contribute to the economy by producing quality timber to support employment and supply the UK timber market. To do this sustainably, non-native species on deep peats and very poor soils will have been removed where these were ready to be harvested. These areas will be in the process to restore to peatland or replanted with native species where this is suitable. This will have improved water & soil quality, carbon capture and ecological value. Riparian woodlands will have been planted where restock has taken place and these woodlands are starting to positively contribute to biodiversity.

The resilience of the forest will have improved by blending in more native broadleaved species in productive crops and diversifying the choice in species. The species choice takes into account the predicted change in the climate to ensure long term resilience in milder and wetter winters and drier summers. Broadleaf and native woodland resource will be utilized to a larger extent to supply local markets and communities with wood fuel.

The woodlands around Ardross will continue to be valued and enjoyed by locals and visitors and the increase in diversity, species and age will improve visitor experience over time.

As a stepping stone between the Capercaillie Special Protection Areas of Morangie and Novar the woods will take into account the needs of Capercaillie. The mixed conifer woodlands of Glaick and Stittenham provide both cover and food and woodlands will be managed to enhance this.

50 Year vision

In 50 years' time the forests in Ardross will consist of a network of well-developed native woodland habitats along all watercourses creating an ideal environment for mammals, invertebrates, birds and fish. Native woodland edges will blend into the restored peatlands and onto the open hill benefiting grouse and many other species.

The nutrient poor soils in Garbhan Rock and Strathrusdale will produce timber of mixed quality through smaller scale clearfells and thinnings in native woodlands. Over time these soils will improve due to the presence of the broadleaves.

The east of the plan will produce high quality timber using a mixture of native and non-native species managed mostly by use of Continuous Cover systems. Hereby capturing carbon and producing valuable resources. The woodland edges will comprise of a multitude of broadleaved trees and shrub species ensuring high ecological value and windfirm boundaries.

The woodlands around Ardross will continue to be valued and enjoyed by locals and visitors and with the increase in biodiversity will have a higher recreational value.

1.2 Location and Context

(see **Map 1 – Location, Map 2 – Key Features and Map 3 – Water Features**)

This plan is a full revision of the LMP for the national forests and land in Ardross and replaces Ardross 030/516/251 which ran from 15/2/2012 to 14/2/2022. This new plan is Forestry and Land Scotland's LMP for the Ardross forests and will run from 2022 to 2032.

The Ardross LMP covers a total area of 2133 hectares and includes a mixture of woodland and open hill. Historically the main focus of the block has been timber production. This is due to the plan area being relatively close to timber markets and the limited amount of ecological, recreational and archaeological constraints. Within the plan area there are no scheduled monuments, no recreational facilities and no conservation designations. The plan area lies just off the Struie Road B9176 along both sides of the dead-end road into Strathrusdale and continues further inland. It is used mainly by local walkers, cyclists and anglers and contains public rights of way along the historical drove roads to Glen Calvie and Kincardine. Furthermore, the road through Strathrusdale provides access to Kildermorie Lodge.

Due to the climatic conditions, particularly in the west of the plan area, there exists a significant and important network of watercourses. The Black water and Alness River are both ecologically and economically valuable rivers containing both Atlantic salmon and sea trout. European otter has been sighted along the banks of the rivers and Loch Dubh.

The previous plan has focussed on the creation of riparian areas and continuation of timber production. These objectives remain in place for the current plan however climate adaptation and therefore peatland restoration are also becoming key objectives of this plan.

The legal status of the land is purchased freehold.

1.3 Strategic Objectives

There are a number of key strategic drivers guiding the proposals for the Ardross LMP:

- The Scottish Government's Scottish Forestry Strategy (2019) sets key objectives of making Scotland's forests more productive and more resilient. The need to redress the environmental impacts of inappropriate 20th century afforestation is also acknowledged.
- The Scottish Government's Peatland Strategy calls for the restoration of blanket bog at a landscape scale, setting ambitious targets for climate change mitigation and biodiversity conservation.
- The Scottish Government's Environment Strategy for Scotland (2020) states that the natural environment is central to our identity as a nation and our greatest national asset and details specific outcomes for wild Atlantic salmon, peatlands, native woodland and productive forests.

Even in the last years, since the aforementioned documents have been developed, it has come to light that a stronger focus on the climate and biodiversity crises is necessary. The corporate and governmental objectives set out in the strategies remain valid and have been used for developing this plan. However, integral to the plan development has been its impact on the climate and biodiversity crises and at every part mitigation against these has been a priority

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](#) and in **Appendix 10 – Key Policies and Publications**.

Most significant contributions to Corporate Priorities, Aims and Objectives (Forestry and Land Scotland, 2019)

- **Supporting a sustainable rural economy** – Developing our forest planning processes to ensure long-term sustainable productivity of the national forests and land; Providing a sustainable supply of timber to Scotland's timber processing; Support the venison processing sector through our deer management;
- **Looking after Scotland's national forests and land** – Increasing the adaptability and resilience of forests and woodland; Maintaining and enhancing our work on peatland restoration; Taking specific conservation action for vulnerable priority species (e.g. red squirrel, capercaillie, black grouse); Supporting policy development and research, and act as a testbed for new and innovative approaches to forestry and land management
- **Other national commitments** – Continuing to engage communities in decisions relating to the management of the national forests and land; Maintaining the UK Woodland Assurance Standard (UKWAS) Certification; Partnership working with others on continuous management of adjacent extensive conservation sites and projects;

Focus of effort and investment challenges

- **Shape the future forest area.** Adaptation of productive and non-productive crops is essential for future resilience of the forests. Investment will need to be made in diversifying crops and, due to use of potentially more palatable species, protecting crops through wildlife management.
- **Peatland restoration.** Peatland is a high priority habitat that is also highly successful at sequestering carbon. Programming conservation and restoration work of this important habitat will need the necessary investment.

2.0 Regulatory Requirements

2.1 Activity Summary and Monitoring Table

Monitoring tables can be found in **Appendix 2**

2.2 Tolerance Table

	Adjustment to felling coupe boundaries	Timing of restocking	Change to species	Wind throw or environmental response	Adjustment to road lines
Scottish Forestry Approval not normally required (record and notify FC)	<10% of coupe size	Up to 5 planting seasons after felling (allowing fallow periods for <i>Hylobius</i>).	Change within species group (E.g. Scots 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).		Departures of up to 60m from the centre of the roadline
Approval by exchange of letters and map	10-15% of coupe size	5 years +	Change of coupe objective 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 60m from the centre of the roadline
Approval by formal plan amendment	>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

A 5-year fallow period between felling and restocking is adopted across the LMP area to allow a natural reduction in *Hylobius* populations. Population monitoring will be carried out prior to restocking in order to ascertain population levels as a means of reducing the use of insecticide applications during subsequent restocking and establishment phase. Given the drive to minimise the use of pesticides on the NFL, delaying restocking operations might be the only realistic option to establish the next generation of trees. Where and when this happens outside tolerance limits agreed with SF, an approval from SF will be sought to deal with adjacency issues through delayed restocking.

The preferred means of dealing with any adjacency issues will be through delayed felling, i.e. a coupe will not be felled until all surrounding crops are at least 2 metres tall. Forest within the Ardross LMP area suffered from DNB infection and wind damage and as a result extensive areas have been felled in the last 10 years. As delaying felling has not been an acceptable option (from an economic and landscape point of view), delaying of restocking is the only opportunity left to create any age diversity (although on a very limited scale).

2.3 Departure from UKFS Guidelines

The Ardross LMP seeks to comply with all requirements of the United Kingdom Forestry Standard to deliver the aims and objectives of the various strategies and policies outlined in **Appendix 10 – Key Policies and Publications**. In designing these proposals we do not believe that there are any departures from UKFS requirements.

2.4 Summary of Additional Regulations

Where management proposals fall out with the scope of Scottish Forestry approvals the correct procedures will be followed to gain the relevant permissions. For this LMP that will be limited to the Prior Notification process for forestry specific roads, tracks and associated quarries and full planning applications to Highland Council for any other developments not related specifically to forestry operations.

2.5 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 (approximately 3 lorry loads of timber) per LMP per calendar year.

A record of the volume felled in this way will be maintained and will be considered during the five year LMP review.

3.0 EIA Screening Opinion Request

Environmental Impact Assessment (EIA) Screening request forms can be found in **Appendices 11, 12 and 13**. EIA screening opinion is requested for Deforestation, Afforestation and Road building.

4.0 Introduction

On **Map 1 - Location** the Land Management Plan can be seen in its wider context. Ardross Land Management Plan covers the woodlands west of the B9176 which are known as Stittenham, Glaick, Dublin, Dam Wood, Strathrusdale and Garbhan Rock. Locally parts of these woodlands might also be known as Cnoc na Sroine, Cnoc na Moine and/or Inchlumpie.

These woodlands are adjacent to Ardross village, the hamlets of Stittenham and Inchlumpie and the farmland in Strathrusdale.

4.1 The existing land holding

The forests within the Ardross plan are among many acquired and planted by the Forestry Commission in the 60's and 70's with the main objective being timber supply. The national forests and lands within this plan amount to 2133 ha and currently land use is split according to **Figure 1**.

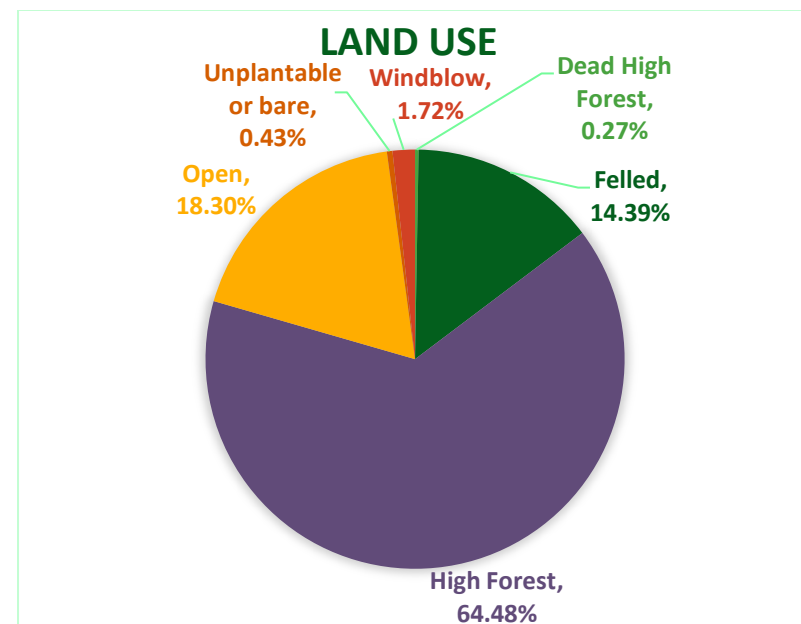


Figure 1: Current land use in the Ardross LMP Area in % of the total plan area managed by Forestry and Land Scotland in 2021

As the main objective was timber production the afforested land predominantly consists of productive conifer species with the vast majority of the forest consisting of Scots Pine (*Pinus sylvestris*), Sitka Spruce (*Picea sitchensis*) and Lodgepole pine (*Pinus contorta*). **Figure 2** demonstrates the current species composition of the Ardross Woodlands.

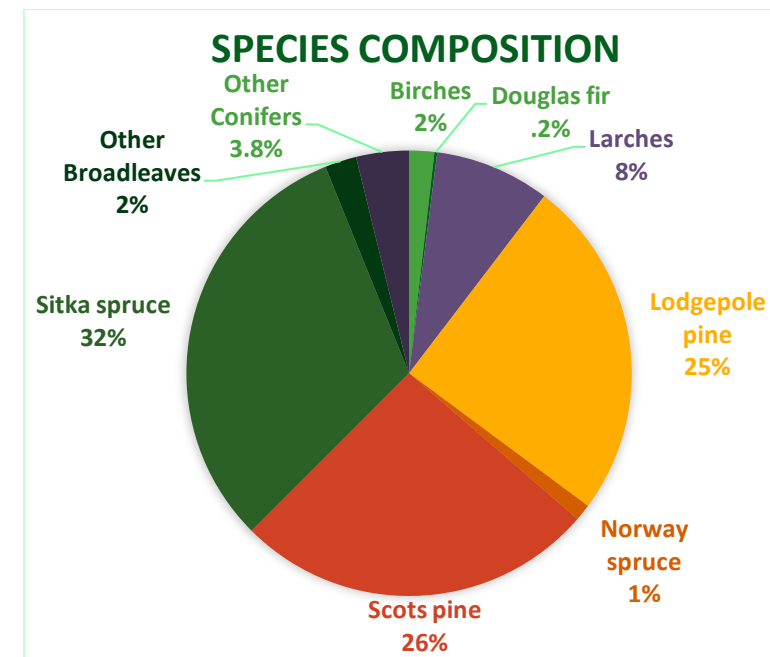


Figure 2: Species Composition in percentage of the forested land in Ardross LMP Area in 2021

The Scots Pine is largely found on the drier soils in the east of the plan area whilst Sitka Spruce and Lodgepole Pine dominate on the wetter soils in the west. Recent planting on these poorer wetter soils has been done with self-thinning mixtures of Sitka Spruce and Lodgepole Pine.

4.2 Setting and context

There is a significant difference in geology, soil, climate and landscape between the different forest blocks in the Ardross plan. Moving from east to west the forests of Stittenham and Glaick sit within an agricultural landscape and have a longstanding forest history. Dublin surrounds a section of the Tollie Burn and is directly adjacent to Ardross and has a more ecological and recreational character. Dam Wood has also been used for productive forestry for a long time but as this is bordering on the open hill the character of this woodland is markedly different. Further up the Black Water into Strathrusdale the conditions for forestry slowly grow poorer as soils grow wetter and nutrient-poorer and climatic conditions harsher. These woods are surrounded by open hill and therefore have a more inland and highland character.

The blocks of Stittenham and Glaick sit in an agricultural landscape and have more fertile soils. On **Maps 5 – Geology & 6 - Soils** the soils and geology can be viewed which demonstrates this difference. The underlying geology comprises of Old Red Sandstone as opposed to the Moine lithology further west. The drift geology is a mix of glacial till derived diamictos and some localised alluvium near significant watercourses. The soils are generally podzolic however, the northern edges of both blocks have a higher watertable resulting in a peaty top layer. The soil nutrient regime is generally poor and the soil moisture regime moist to wet. The climatic conditions are described as cool, wet and mostly moderately exposed with more sheltered ground lower down.

Strathrusdale and Garbhan Rock are situated on an underlying solid geology of Moine granulites and mixed schists characteristic of much of the North Central Highlands, which contributes significantly to a general lack of fertility, in particular to low availability of Phosphorus. The drift geology is similar to the Stittenham and Glaick blocks. Because of the underlying geology, the amount of precipitation and the climate, much of Strathrusdale and Garbhan Rock has developed a peat layer ranging from deep peat of over two meters to peaty-gleys and peaty-podzols. Soil nutrient regime is generally very poor and the soil moisture regime wet. Climatically much of this is described as cool, wet and moderately

exposed however at the top margins of Garbhan Rock the ground is highly exposed and nearing sub-alpine conditions.

Access into the woods is largely gained by the main road through Ardross which splits off the B9176. Stittenham has its own forest entrance which comes directly off the B9176. Glaick can be accessed by use of the Strathy road north of the Stittenham and Glaick blocks.

5.0 Objectives

The table below details objectives agreed for the Ardross LMP area by North Region staff and external consultees during the scoping phase of the LMP revision and is the foundation upon which the management proposals are built. During scoping the previous LMP was reviewed of which the details can be found in **Appendix 6 – Review of Previous Plan**. The full consultation record can be found in **Appendix 1 – Consultation Record**.

LMP Objectives	Land Management Plan Concept	Monitoring
<p>To optimise the productive potential of the forests by matching restock species to site conditions and by creating resilient forest structure and minimising wind damage in the next rotation.</p>	<ul style="list-style-type: none"> Use best practice in silviculture to identify productive soils and suitable species and manage these areas accordingly, thinning where climate and soils allow. 	<ul style="list-style-type: none"> Implementation of the felling and general future habitat proposals will be monitored annually through the restock programme and formally at LMP's 5 years review and 10 years revision using the Monitoring and Change Logs. Detailed restock proposals will be developed post-felling, during the work plan process and 75% site visit* and will be monitored annually through the restock programme.
	<ul style="list-style-type: none"> Create wind-firm coupes using riparian woodland, changes in landform, forest roads and areas of open ground as boundaries; allowing for development of wind resistant edge trees and improving crop resilience. 	<ul style="list-style-type: none"> Windblow will be monitored annually following high wind and felling programmes reprioritised if necessary to maximise timber recovery.
	<ul style="list-style-type: none"> Create a felling plan that will allow for timely removal of diseased trees to, maximise recovery of marketable timber. 	<ul style="list-style-type: none"> Areas affected by <i>Dothistroma needle blight</i> (DNB) will be monitored annually by the Planning team and, if necessary, felled early to maximise timber recovery. Changes to the felling order will be applied for through the appropriate channels and recorded in Monitoring and Change Logs. Areas affected by <i>Peridermium pini</i> will be monitored by the planning team and infected trees will be marked before thinning operations take place. This will be recorded through the Work Plan Process
	<ul style="list-style-type: none"> Create a roading plan which will allow for timely and adequate access into coupes for felling, restocking and wildlife management. 	<ul style="list-style-type: none"> Implementation of the roading program will be monitored formally at LMP's 5 years review and 10 years revision using the Monitoring and Change Logs.
	<ul style="list-style-type: none"> Diversify the age structure and species composition of our forests making use of silvicultural mixtures and disease resistant species to increase resilience to pathogens, reduce use of fertilizer and increase resilience to climate change. 	<ul style="list-style-type: none"> Implementation of the general future habitat proposals will be monitored formally at LMP's 5 years review and 10 years revision using the Monitoring and Change Logs. Detailed restock proposals will be developed post-felling, during the workplan process and 75% site visit* and will be monitored annually through the restock programme.

LMP Objectives	Land Management Plan Concept	Monitoring
		<ul style="list-style-type: none"> • Areas affected by DNB will be monitored annually by the Planning team and, where necessary, felled early to maximise timber recovery.
<p>To contribute to climate change mitigation measures through land management by facilitating woodfuel, restoring peatland and renewable energy production.</p>	<ul style="list-style-type: none"> • Identify and restore afforested deep peat sites and create a protective broadleaf woodland buffer 	<ul style="list-style-type: none"> • Implementation of the felling proposals will be reviewed annually through the delivery of harvesting programme and formally at LMP's 5 years review and 10 years revision using the Monitoring and Change Logs. • Implementation of the future habitat proposals will be monitored annually through the restock programme and formally at LMP's 5 years review and 10 years revision using the Monitoring and Change Logs. Success of peatland restoration will be reviewed at the same time.
	<ul style="list-style-type: none"> • Ensure deer numbers are appropriate for establishment of future crops 	<ul style="list-style-type: none"> • Deer management will be monitored and reported on using existing FES deer management protocols.
	<ul style="list-style-type: none"> • Continue to make the land within the National Forest Estate available to windfarm and hydro scheme development and to work with developers to deliver projects of maximal environmental and economic benefit. 	<ul style="list-style-type: none"> • The possible change in land use will be monitored by the Planning team in liaison with the Estates team and the Renewables Forest Liaison Officer.
<p>To manage the forests in a manner that positively contributes to water quality, with a special emphasis on watercourses supporting populations of fresh water pearl mussels and migratory fish.</p>	<ul style="list-style-type: none"> • Establish riparian woodland along major watercourses and native woodland at the forest blocks' boundaries and where it is likely to secure environmental benefit and/or improve the overall management of the forest. 	<ul style="list-style-type: none"> • Implementation of the future habitat proposals will be monitored annually through the restock programme and formally at LMP's 5 years review and 10 years revision using the Monitoring and Change Logs.
	<ul style="list-style-type: none"> • Protect the integrity of all watercourses during management operations and into long term 	<ul style="list-style-type: none"> • Special measures will be identified through work plan process and will be monitored through good site management and 75% site visits*.
<p>To manage the Stittenham block in a manner that positively contributes to the Capercaillie populations in Morangie and Novar</p>	<ul style="list-style-type: none"> • Retain/restock elements of Scots Pine as food source and habitat for Capercaillie in Stittenham. Create diverse forest structure to provide the diverse habitats necessary for Capercaillie 	<ul style="list-style-type: none"> • Special measures for Capercaillie in Stittenham will be identified through work plan process and will be monitored through site management and 75% visits* • Forest structure will be reported on at LMP 5 and 10yr reviews

LMP Objectives	Land Management Plan Concept	Monitoring
<p>To manage the forests in sympathy with the landscape in order to improve their appearance and overall visitor experience.</p>	<ul style="list-style-type: none"> Implement LMP felling and restocking proposals designed in liaison with the FCS landscape architect 	<ul style="list-style-type: none"> Implementation of the felling and future habitat proposals will be monitored annually through the restock programme and formally at LMP's 5 years review and 10 years revision using the Monitoring and Change Logs.
<p>To be open to any new approaches by local communities who wish to be involved in management of their local forests; to be open to working in partnership.</p>	<ul style="list-style-type: none"> Contact local Community Councils and local interest groups within the LMP area in order to develop management approaches that reflect their aspirations and secure benefits to the local residents and forest users. 	<ul style="list-style-type: none"> Contact with Community Councils and local interest groups will be recorded by LMP Forester and monitored formally at LMP's 5 years review and 10 years revision in the consultation record.

* 75% site visits are held when a harvesting site is approximately 75% harvested. The meetings are held with delegates from the harvesting, forest management, visitor services, civil engineering, environment and planning teams to discuss how a site is finalized, what needs to be done prior and during restock and what other elements to take into account during the next phase. Comments are recorded in the workplans.

6.0 Analysis and Concept

6.1 Analysis

The objectives have been set against the key features of the current crop of which details can be found on **Maps 2 & 3 Key Features and Water Features**. This has resulted in the table below and **Map 4 – Concept and Analysis**.

6.2 Concept

Concept	Opportunities	Constraints	Detail
Optimising productivity and resilience			
Use best practice in silviculture to identify productive soils and suitable species and manage these areas accordingly, thinning where climate and soils allow.	<ul style="list-style-type: none"> Soil mapping and knowledge from the first rotation will inform decision-making for next rotations Previously unthinned areas show potential for thinning Advanced machinery may allow for working on sensitive soils in the future 	<ul style="list-style-type: none"> Less fertile soils and the exposed nature of, especially Garbhan Rock, limits the choice of suitable species Thinning windows have been missed in Dam Wood forcing another clearfell Haulage out of LMP area is capped by haulage limit of 10 lorries a day through Ardross 	<ul style="list-style-type: none"> Use site soil and climate conditions at coupe level to indicate future management prescription and species at a scale which is silviculturally appropriate. Use the Ecological Site Classification Support System to assist in correct species choice/management prescriptions Continue to introduce site improving species such as birch as an element of productive conifer sites. Push limits of thinning windows to get a better understanding of local stability which will inform future management Continue drawing on the experience of internal staff to identify which sites can or cannot stand a thinning Smoothen out peaks in production to ensure the threshold of 10 lorries a day is not passed
Create wind-firm coupes using riparian woodland, changes in landform, forest roads and areas of open ground as boundaries; allowing for development of wind resistant edge trees and improving crop resilience	<ul style="list-style-type: none"> Large scale felling in Garbhan Rock enables the introduction of riparian woodland at scale Riparian and native woodlands will provide a seed source for future crops and a permanent habitat for mycorrhiza 	<ul style="list-style-type: none"> Deer pressure may limit the successful establishment of native and riparian woodland. 	<ul style="list-style-type: none"> Effective deer control, by a variety of techniques, will be adopted to allow the establishment of sensitive species and native/riparian woodlands beyond browsing height. A phased approach to the restocking of riparian zones will be taken. Where felling has taken place riparian zones will be planted along with the productive restocks. This will prevent isolated planting of broadleaves far from access.
Create a felling plan that will allow for timely removal of wind damaged or diseased trees to, maximise recovery of marketable timber.	<ul style="list-style-type: none"> The majority of DNB infected and DNB sensitive crops has now been removed from the plan area Thinning enables removal of <i>Peridermium pini</i>, the results of recent experiments on <i>Peridermium pini</i> removal during thinnings have been cautiously positive indicating that timely removal ensures the spread is manageable Timely removal will maximise recoverability and carrying capacity of brush mats reducing soil damage 	<ul style="list-style-type: none"> New diseases will invariably arrive but the where and when is unknown Currently unplanned coupes which sustain blow or disease might result in peaks in production threatening the 10 loads a day threshold <i>Phytophthora ramorum</i> is currently not present but might arrive within the plan period 	<ul style="list-style-type: none"> Removal of the heavily infected Lodgepole pine crops will continue Restock will only be done with the more resilient Alaskan Lodgepole pine provenance <i>Peridermium pine</i> surveys will be done prior to thinnings in pine crops to mark infections and ensure removal Isolated larch will be removed preventatively where operations allow for easy removal to limit impact of <i>P.ramorum</i> in the future. In thinning with elements of larch the larch will be preferred over Scots pine for removal. When new diseases arise Scottish Forestry will be notified and if necessary crops will be prematurely felled after acquiring approval Post storm surveys will be done to ensure wind damaged crops are identified and where necessary removed In case of unplanned windblown or diseased coupes needing felling compensatory coupes will be retained

Concept	Opportunities	Constraints	Detail
Optimising productivity and resilience			
Create a roading plan which will allow for timely and adequate access into coupes for felling, restocking and wildlife management.	<ul style="list-style-type: none"> Adequate roading will reduce costs of future operations, ensure timber flow and minimise soil erosion by reducing distances travelled on unconstructed surfaces 	<ul style="list-style-type: none"> Ownership of the main access into Glaick is managed by The Highland Council and is currently unsuited for timber transport Garbhan rock road not entirely on FLS ground adding a stakeholder in the management of this road 	<ul style="list-style-type: none"> Ensure timely engagement with appropriate stakeholders through the work planning process
Diversify the age structure and species composition of our forests making use of silvicultural mixtures and disease resistant species to increase resilience to pathogens and climate change.	<ul style="list-style-type: none"> The development of native and riparian woodland on appropriate sites will add to age class diversity, provide resilience and wind firm edges Throughout the LMP area pockets of good ground are becoming available allowing for introduction of species which have seen limited use in the LMP area 	<ul style="list-style-type: none"> Due to extensive felling to limit the impact of DNB age restructuring during this rotation is limited 	<ul style="list-style-type: none"> Use watercourses, roads, existing and designed open ground as natural coupe boundaries, allowing for development of wind resistant edge trees Extend the rotation of coupes where climate and soils allow, increasing age class structure. On the nutrient poor ground a move from lodgepole pine to a variety of native species will take place On the better ground variety will be sought through introduction of broadleaves but also of a larger variety of non-native species such as Norway spruce and Douglas fir.
Riparian Woodland & Water quality			
Establish riparian woodland along major watercourses and native woodland at the forest blocks' boundaries and where it is likely to secure environmental benefit and/or improve the overall management of the forest.	<ul style="list-style-type: none"> Large scale clearfelling in Garbhan Rock allows for larger scale redesign of this zone. Riparian zones can be linked up with woodland edges thereby creating a larger permanently biodiverse wooded network 	<ul style="list-style-type: none"> Change in objectives generally only feasible where felling takes place 	<ul style="list-style-type: none"> Where felling coincides with riparian areas a riparian zone will be established at the time of restock. These zones will, over the next phases, slowly connect up to form a permanent native riparian woodland. Peat depth and soil surveying has been carried out to identify where planting along watercourse and along peatland edge is appropriate
Protect the integrity of all watercourses during management operations and into the long term	<ul style="list-style-type: none"> Appropriate roading will help reduce run-off and soil damage Riparian zones, as detailed above, will protect water quality and improve it over the long term 	<ul style="list-style-type: none"> Environmental constraints might force winter working increasing the chances of soil damage Legacy coupes are often forested to within a meter of watercourses Water intake from Loch Dubh for Ardross distillery reinforces this objective 	<ul style="list-style-type: none"> Design coupe shapes so that watercourses do not need to be crossed unnecessarily Ensure roading is in place where harvesting machinery would unnecessarily threaten water quality Identify sites with high risk of soil run off and ensure all reasonable means to prevent water pollution are taken. Apply measures outlined in UKFS Forest and Water guidance and FCS FWPM Guidelines.
Peatland Restoration			
Identify and restore afforested deep peat sites and create a protective broadleaf woodland buffer	<ul style="list-style-type: none"> Peatland restoration will increase carbon capture creating a carbon sink and a potential income stream Improved hydrology and water quality may reduce risk of flooding downstream and increase the quality of the aquatic systems 	<ul style="list-style-type: none"> Loss of productive softwood area could impact timber output of the plan area Intensive operations to rewet peatlands may lead to negative short term impact on aquatic systems 	<ul style="list-style-type: none"> Through soil and peat depth surveying and analysis of potential yield class the extent of the area of peatland restoration will be determined Where productivity has been low but no deep peats are found productive conifer will be replaced by native woodland to improve soil characteristics over the next rotation

Concept	Opportunities	Constraints	Detail
Deer Management			
Ensure deer numbers are appropriate for establishment of future crops	<ul style="list-style-type: none"> Large scale felling such as in Garbhan rock has reduced shelter for deer 	<ul style="list-style-type: none"> Continuity of deer management has been threatened by internal processes Increase in elements of riparian and native woodland largely consisting of more palatable species could increase browsing damage 	<ul style="list-style-type: none"> <i>Feasibility of future crops has and will be discussed during LMP revision and MTR stages and during 75% visits where deer numbers are expected to be problematic forest design will be adjusted to prevent extensive browsing damage</i> <i>FLS Wildlife Ranger teams will maintain culling to limit the expansion of deer numbers and participate in local Deer Management Group and liaison with neighbours.</i> <i>External fences will be maintained/upgraded to assist in reducing grazing pressure.</i>
Landscaping			
Implement LMP felling and restocking proposals designed in liaison with the FCS landscape architect	<ul style="list-style-type: none"> Existing hard conifer edges provide an opportunity to significantly increase visual quality by redesigning using organic shapes and a variety of species during restock The native and riparian woodlands and open habitats will lead to a more organic transition from neighbouring land use to high forest. 	<ul style="list-style-type: none"> Deer pressure may limit the successful establishment of native and riparian woodland (more palatable species). Extent of windblow and forest health issues may mean felling coupe shapes are re-designed to recover deteriorating timber rather than improve landscape in this rotation – i.e. coupe scale may be necessarily larger than would otherwise be desirable. 	<ul style="list-style-type: none"> <i>Deer control will be used to ensure establishment of visually important elements</i> <i>A pragmatic approach to determine felling coupe shapes will be taken if windblow or disease dictates early felling and this will be managed using agreed tolerances.</i>
Environment			
Retain/restock elements of Scots Pine as food source and habitat for Capercaillie in Stittenham. Create diverse forest structure to provide the diverse habitats necessary for Capercaillie	<ul style="list-style-type: none"> Clearfelling planned over the coming years provides an opportunity to restock considering the needs of Capercaillie 	<ul style="list-style-type: none"> <i>Heterobasidion annosum</i> might impact the health of the pine which could have adverse effects the Capercaillie habitat 	<ul style="list-style-type: none"> <i>Scots pine will be planted on the higher ground which is poorer and more acidic and therefore less likely to contain problematic quantities of Heterobasidion annosum</i> <i>Mixture of conifers will be planted over different phases to ensure a diverse forest structure to provide habitat for Capercaillie</i>

Objectives	Opportunities	Constraints	Concept
Community & wider Socio-Economic Benefit			
Contact local Community Councils and local interest groups within the LMP area in order to develop management approaches that reflect their aspirations and secure benefits to the local residents and forest users.	<ul style="list-style-type: none"> The identification of stakeholders and partners with which to work can improve the local buy in and management of this LMP area Manage core paths 	<ul style="list-style-type: none"> Lack of engagement may see opportunities missed. 	<ul style="list-style-type: none"> <i>Consult with all Community Councils, known stakeholders and also publicly through web and local presence to make sure that the opportunity to contribute to the plan is known.</i> <i>Manage core paths in line with core path policy</i>
Continue to make the land within the National Forest Estate available to windfarm and hydro scheme development and to work with developers to deliver projects of maximal environmental and economic benefit.	<ul style="list-style-type: none"> Increased income and working to help Scottish Government achieve a sustainable green economy. Locally generated power can benefit communities by creating funding opportunities. 	<ul style="list-style-type: none"> Inappropriate siting of renewables projects can have dramatically negative effects on landscape quality – an important feature of the LMP area and wider countryside. Inappropriate hydro schemes can have a detrimental effect on migratory fish and dependent species. 	<ul style="list-style-type: none"> <i>There are no current plans for renewable energy developments in this area.</i> <i>Any future developments would require full planning process to be applied.</i>

7.0 Land Management Plan Proposals

7.1 Silvicultural Practise

The Activity tables in **Section 2.0 Regulatory Requirements** detail areas to be clearfelled, restocked, thinned, new planting areas and the forecast of timber volumes in the next ten years. This information can be viewed spatially on **Map 11 – Future Habitats, Map 12 – Management Coupes and Map 13 – Thinning Coupes**.

Below a detailed management prescription will be given to explain how the different aspects of forest management will be done in the LMP area. Management actions will ultimately contribute towards achieving the set objectives as detailed in previous chapters.

7.2 Woodland Management

7.2.1 Felling

See Map 12 – Management Coupes

Clearfelling in the plan area has been and remains partly driven by the need to clear up windblown and diseased crops. The size of clearfells is partly dictated by the extent of disease or windblow. In this plan a shift can be seen to smaller clearfells as this is desirable from a forest structure, regeneration and ecological perspective.

Due to damage caused by both windblow and DNB, some of the crops on very wet sites might not be recovered, leading to creation of deadwood habitat zones, the extent of which is difficult to predict prior to the commencement of harvesting operations but will be decided at work plan stage. However North Region will continue to work with customers and contractors to improve fibre recovery and in some areas may use direct production, brash recovery and/or low ground pressure machinery to achieve this aim. The maximisation of timber recovery will be secondary to the need to protect the soils and aquatic ecosystems.

The timber produced in the area is varied with mostly woodfuel in Garbhan Rock to quality sawlog in Dam Wood/Glaick/Stittenham and in parts of Strathrusdale. Harvesting will be mostly done by harvester/forwarder but opportunities will be sought to experiment with new methods of harvesting and extraction if this could potentially positively impact soils and aquatic ecosystems. Timber sales will be done either on standing sales basis or direct production whichever is deemed to give the best value for money for a coupe.

The different zones in the area present different challenges for clearfelling. In Garbhan Rock soils are wet and peaty increasing chances of siltation. Expertise of the local harvesting forester will be sought to determine when a site can and should be worked to mitigate against potential pollution incidents. When the risk of siltation is high, winter working might be avoided in this area. Dam Wood, Glaick and Stittenham have soils with higher carrying capacity and will likely

have better brash to carry the machines with. Here winter working is possible and desirable as the impact on wildlife will be reduced.

7.2.2 Thinning

See Map 13 – Thinning Coupes

On the thinning map the coupes where thinning will or might take place are shown. Thinning will be done mainly to increase timber quality and therefore selection is done predominantly on crown health (**see 7.2.11**) and form. An outline thinning prescription for the upcoming coupes has been determined and is shown in the Activity tables in section 2. Initial thinning will generally be a rack and light thin but depending on the estimated stability a more conservative approach might be taken. 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 Mean Annual Increment (MAI), or Yield Class (YC), per year). Higher intensities (no more than 140% of maximum MAI, or YC, per year) may be applied where thinning has been delayed, larger tree sizes are being sought or as part of a LISS prescription. Where trees need to be removed to accommodate facilities to support approved thinning and CCF, including stacking areas, ramps and access racks within adjacent management coupes, this should ideally be identified in thinning maps and thinning plans as part of the LMP submission. Where this is not the case, additional felling necessary for reasonable infrastructure can be agreed by exchange of email. 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.

Due to the focus on clearance of windblow and DNB a backlog of thinnings has built up leading to underthinned stands. In the coming phase crops which are still deemed thinnable will be thinned. However, FLS is aware stability might be compromised in these coupes. Risk of windblow has been assessed on a coupe by coupe basis using ForestGALES (see **Map 8 - ForestGALES**), crop and crown quality and expertise from local foresters. Map 8 shows the age minus the predicted rotation length, coupes around or below zero are at significant risk of windblow. This has been set against the advantages of thinning for soils, forest structure, ecology and timber quality. Because of the positive aspects of thinning FLS is looking to maximise thinnable area and is therefore willing to take well considered risks and thin stands which might become unstable. The results of the thinnings will be recorded in the monitoring tables and will inform future decisions on thinning.

Thinning is currently limited to stable conifer crops in areas with a DAMS score generally below 16. In the future it is expected that crops now being established in Garbhan Rock, which have a history of being unstable, will become thinnable. The species and spacing choice should ensure a stable crop and thinning would be the preferred option on these sites. FLS will keep a close eye on developments in the industry to ensure no opportunities are missed to increase our thinnable area.

On the thinning maps there are two additional thinning areas besides the regular silvicultural interventions. These are the road and riparian zone buffers. Alongside roads and inside riparian zones management is necessary at regular intervals. Alongside roads this involves felling or

mulching regenerating trees to prevent the road getting shaded and therefore damp and to prevent roadside ditches from getting blocked. In riparian zones regeneration of non-native species can threaten the objectives of these areas by outcompeting the native broadleaved species desirable for a well-functioning riparian zone. Therefore removal of these non-natives will take place when non-native populations become problematic.

7.2.3 CCF

See Map 12 – Management Coupes

Continuous Cover Forestry has a multitude of advantages over a clearfell and restock management type. It positively contributes to soil health, carbon capture, ecology and forest aesthetics (Forestry Commission, 2008). Most of the Ardross plan however is unsuited for these types of forest management due to soils, exposure to wind and the species which have been planted in the past. There are opportunities for CCF in Dam Wood and several areas have been identified. Throughout the first stages of forest development these will be managed in line with the above detailed thinning prescription. Operations will have an added focus on creating a stable stand. Once the trees start developing substantial amounts of seed the focus of operations will shift to opening up the crop and allowing the second generation to establish underneath the first. When using shade tolerant species such as Sitka spruce it is expected that this can be done by continuous matrix thinning. For light demanding species such as Scots pine and larch a strip felling or group shelterwood system will be adopted. In the case of group shelterwood the clearfells within the coupe will not exceed 2ha. Strips will on average be around 60 meters wide to allow for colonisation from a nearby seedsource and adequate light on the ground, the length is determined by the length of the coupe. Ground disturbance might be necessary to achieve the desired density in natural regeneration. In the coming phase one strip has been identified in a Scots pine and larch coupe. As this strip is effectively a long thin clearfell for regulatory and monitoring purposes it has been classed as such. Therefore details of this strip are found in the Monitoring Tables under clearfelling. Monitoring of recolonization will be done using the monitoring tables under 'restock and new planting'.

7.2.4 Long Term Retentions

See Map 12 – Management Coupes

Long term retentions (LTR) are retained for their environmental benefits. This could be to provide age class diversity or, to provide a refuge for rare and protected species (Thompson, 2021). In the Ardross LMP several LTR's have been identified as the retention of tree cover in these areas is deemed to have significant environmental benefit. In the previous plan an area near Kildermorie was marked as Long Term Retention but because this is largely on deep peat and adjacent operations are planned it will be removed entirely. This will enable restock with native species and peatland restoration which will have a higher environmental value. In Strathrusdale a new LTR has been identified as this area contains some open grown Scots pine. When the adjacent crops are felled this LTR will be a refuge for wildlife.

Through Dam Wood a strip of Long Term Retention has previously been identified. This strip runs along a watercourse with steep banks either side, in some areas the mature crop on these banks has sustained windblow. The crop is a mixture of larch, Sitka spruce, Norway spruce and Scots

pine and, with it being partly windblown, has significant ecological value. This LTR has been reduced in size to allow for harvesting of some of the standing crop. This felling in turn enables restock with broadleaves along the watercourse which should improve the ecological value further. The maps have been adjusted accordingly.

All LTR's will be managed according to the Forestry and Land Scotland guidance on LTR management. It is expected that the riparian zones which are being created will form a permanent network of LTR's in the future.

7.2.5 Deadwood Habitats

See Map 10 – Deadwood Ecological Potential

Deadwood is a vital element of the forest ecosystem, positively affecting biodiversity, carbon storage, soil nutrient cycling, energy flows, hydrological processes and natural regeneration. Consequently, retention of deadwood is a mandatory element of UKFS sustainable forest management. Guidance on quantities required is not specific but an average of 20m³/Ha has long been acknowledged as a minimum industry standard.

Deadwood also plays a vital role in the functioning of river ecosystems. Managing riparian woodland under a Minimum Intervention regime in future will encourage a high proportion of deadwood over time, helping to retain water and sediments, trapping and facilitating the breakdown of organic matter into food for aquatic invertebrates, diversifying channels by creating pools, falls and riffles and improving physical habitat structure for fish and invertebrates.

Managing Deadwood in Forests and Woodlands – A Practice Guide (Humphrey and Bailey, 2012) and the FLS internal guidance document written and reviewed by the FLS Species Ecologist on proportions and types of deadwood, will be used to guide decisions on the spatial distribution and quantities of retained deadwood and **Map 10 – Deadwood Ecological Potential** details the high, medium and low priority zones for this LMP area that underpin this approach.

The position and type of deadwood required will be directed by the Environment team in coupe workplans and agreed pre-commencement on harvesting operations. Achievement will be reviewed at each coupe 75% meeting.

7.2.6 Restocking and Natural Regeneration

Restocking will be done according to **Map 11 Future Habitats** and the **Restock Prescriptions in Appendix 9**. There is a variety of restock prescriptions depending on the main objectives of the area in question. Stocking densities, species and main objectives are given in the restock prescriptions.

Restocking in productive areas will aim to maximise the productive capacity of the forest, the brief guidelines below will be followed to ensure adequate restocking:

- To obtain maximum benefits from restructuring, contiguous restocking areas will not be less than 3 Ha per individual shape or exceed 50 ha unless forest health issues, open habitat restoration feasibility or windblow dictate otherwise.

- Restock coupes adjacent to the forest road network should be restocked to within 5 metres of the forest road for at least 30% of the coupe frontage for future access to facilitate soil protection.
- Non - productive broadleaf elements within productive coupes will be located where they will be of greatest benefit; along drainage channels, adjacent to open ground, other broadleaf woodland or around archaeological features to enhance the setting.
- Commercial restocking will not be undertaken on soil types 9e, 11c, 11d due to the intensive drainage regimes and high fertiliser inputs required.

The LMP proposal seeks approval for restocking of areas felled prior to plan approval, species enhancement operations and those coupes felled within the 1st 5 years from the date of approval. The 5 year fallow period generally means that all coupes felled in the 2nd phase of the plan are being restocked outside the approved plan period. Where weevil numbers allow restock will take place directly or shortly after felling. In order to secure approval for the restocking of coupes felled in the 2nd 5 year phase of the plan the proposed areas of 2nd phase restock are also shown on **Maps 11 & 12**.

With the changing climate and the recent and predicted issues with pest and diseases it is essential to diversify the forest where possible. On the better soils and sheltered ground there is a variety of species to choose from without compromising productivity. In the restock plans multiple species have been chosen to increase the diversity of this LMP area. Where soil conditions allow Sitka spruce will be replaced by Norway spruce, Douglas fir and/or Grand fir and on the accessible and good ground in Stittenham some productive broadleaf will be planted.

In the previous plan a network of riparian woodland was designed and throughout the plan period this has been partly implemented with the objective to improve and safeguard water quality. In the coming plan period this process will continue; along main watercourses a strip of riparian woodland will be established when the current crop is felled. The process of developing this network is slow as the change on the ground happens only after a site is felled. This means that it will take an entire rotation before the network is completely in place. Current climate change predictions indicate that freshwater biota may become threatened by increases in summer temperatures and altered river flows resulting from increased precipitation. Salmonids in particular are susceptible to temperature changes (Broadmeadow, 2002). In addition soil erosion may be exacerbated by increased flood and drought cycles. The increase in dappled shade and soil stability provided by broadleaf riparian woodland will help to protect river ecosystems from the predicted temperature fluctuations predicted to result from climate change. In addition to the riparian woodland, edge woodland will be established in several location which will add to the network of permanent native woodland. These riparian and edge woodlands will have an ecological function as well as a silvicultural one. They will provide a wind firm and natural boundary between crops, a seed source for future crops and a place to harbour mycorrhizal fungi when an adjacent site is clear-felled.

Fertiliser use

The extended fallow periods (generally up to five years) that are required prior to restocking, to allow pine weevil populations to abate, have the negative effect of compounding nutrient deficit because nutrient released from decaying leaf litter will largely have been flushed from site by year five. Therefore it is possible that post planting applications of fertiliser, containing phosphates and potassium, might be required on the upper margins of the forest and remedial applications may be required in some crops in line with industry best practice (Taylor, 1991).

However appropriate choice of silvicultural mixtures and well-timed heather control will be preferred to fertiliser. In this plan the choice of species has taken into account the fertility of the site to the extent that it is anticipated no fertiliser will need to be used. Broadleaf species will be incorporated within silvicultural mixtures to improve soil function and encourage the field layer to develop. The overall area of productive woodland will be reduced during the life of the plan through the removal of plantation from riparian and peatland restoration sites.

7.2.7 New Planting or Natural Colonisation

See Map 11 – Future Habitats and Appendix 12 - EIA screening opinion request form - Afforestation

In the previous plan new riparian planting was proposed. This has not been achieved entirely due to the pace of felling adjacent to the riparian planting. From an operational and wildlife management point of view it has proven to be more feasible to establish the riparian planting at the time of restock of the adjacent crop. Therefore the area of new planting largely resembles the area given at the last Mid Term Review. The EIA screening opinion request form regarding afforestation which is attached to this LMP gives further details on the new planting.

7.2.8 Woodland Removal

See Map 14 – Peatland Restoration Areas, Appendix 13 - EIA screening opinion request form – Deforestation and Map 9 – Yield Class.

As mentioned before in this LMP, Garbhan Rock has seen clearfelling on a large scale. Because of changes in guidance of managing organic soils we are now proposing not to restock large areas of Garbhan Rock and some in Kildermorie. Future management decisions regarding these areas are based on current UKFS requirements, Scottish Government's Policies on Control of Woodland Removal, The Environment Strategy, The Scottish Biodiversity Strategy, The Peatland Strategy, Scotland's Soil Strategy and the FCS Practice Guide 'Deciding future management options for afforested deep peatland'. Woodland will make way for peatland where the organic layer is more than 50 centimetres deep and the peatland is either part of an Annex 1 peatland habitat (as defined in the EU Habitats Directive) or hydrologically connected to one. In Garbhan Rock and Kildermorie blanket bog has been identified in the soil survey and the open habitats survey (**Maps 6 – Soils and 16 – Habitats Survey**). As can be seen in **Map 9 Yield Class** the yield class of the areas proposed for restoration is well below the threshold of 8, further demonstrating the limited potential of productive crops. Areas without hydrologically connectivity to Annex 1 peatland habitat will be restored where the peat is over 50 centimetres, yield class is below 8 and the peatland is deemed restorable. This is in line with FLS's understanding of the FCS Practise Guide.

The extent of the overplanted peatland areas in Garbhan Rock can be viewed spatially in **Map 14 – Peatland Restoration Areas**. This data represents peat depth measurements undertaken at 50m centres across most of the forested blocks and very effectively demonstrate the continuity of the blanket bog systems at a landscape scale. The EIA screening opinion request form gives further details of the likely impact of the operations.

7.2.9 Recreation Management

No formal facilities are managed by Forestry and Land Scotland for the purpose of recreation. However, recreation in the area is welcomed under SOAC. The public rights of way and core paths will be managed according to their respective designation. Where possible these will be left accessible. If, for safety or another reason, the path needs to be closed FLS will liaise with The Highland Council Access Officers to determine mitigation.

7.2.10 Protection Strategy and Deer Management

For deer management see **Appendix 3 – Deer Management**.

Tree guards will be used where shooting and/or fencing is not possible or deemed not to provide adequate protection. Depending on the pest the size of the tree guard will be chosen. In general this will be done using the smallest size possible providing the right protection to get the tree established and out of reach of browsing. Once the trees are established and no longer in need of the tree guard tree guards will be removed and reused where possible and otherwise disposed of as industrial waste.

7.2.11 Management of Tree Health

Several forest health issues limit the current management of the forests in the Ardross LMP area. *Dothistroma* needle blight has led to the large scale clearfelling off Garbhan Rock which will continue in the next plan phase. It is expected that with the removal of provenances susceptible to DNB the fungus should no longer present a serious management issue, however infection rates will be monitored throughout the pine stands. *Peridermium pini* is present throughout the plan area in the mature Scots pine and it remains essential that thinnings done in Scots pine target *Peridermium*. Prior to thinnings the infected trees will be identified visually and marked to ensure removal. *Peridermium* prevalence will be monitored and in the event of significantly increased levels of infection Scottish Forestry will be contacted.

Phytophthora ramorum is currently not present in the plan area but has been taken into account during the development of this plan. The accessibility of larch coupes has been reviewed to ensure larch coupes do not become isolate. In the event *Phytophthora* would appear in the plan area the coupes can be felled without the need for roading or long extractions through restocks or over open land. During thinnings in mixed crops of Scots Pine and Larch the Larch will be favoured over the Scots pine for removal.

Large pine weevil (*Hylobius abietus*) remains a constraint to forest management. Because of weevil populations density assessments will be done to determine when restock success will be

likely. Ideally restock will follow felling within one or two years as this reduces nutrient run-off and reduces the need for herbicide. Whether this is possible will be determined using the *Hylobius* Management Support System. If weevil populations are too high restocking early would risk high mortality or excessive use of pesticide which is undesirable and therefore a fallow period of maximum five years will be applied.

In Stittenham conifer root and butt rot (*Heterobasidion annosum*) is present. The fungi is causing staining in the mature Sitka spruce and butt rot in the larch and it can be expected that, unless management mitigates against the fungi, the prevalence and intensity of rot will increase. *Heterobasidion* is currently mostly found on the better soils in the south of the forest block and in the central northern part. The other more acidic soils like the peaty gleys and peaty podzols show little sign of *Heterobasidion* presence which is in line with research showing the fungi is more vigorous on sites with high pH (Rishbeth, 1951). Management options include stump removal, a rotation of broadleaves and/or using species that tolerate *Heterobasidion*. In management plans of the area mention of *Heterobasidion* is found as far back as 1964. Because of the minor issues the fungi is causing at the moment and the cost of stump removal it is decided that future management aims to manage the disease through species choice rather than stump removal. In the nutrient richer areas a mixture of *H. annosum* resistant conifers and broadleaves will be used to ensure a healthy next rotation and create an opportunity for CCF management. Grand fir, Douglas fir, sycamore and oak will all be used as they should tolerate *H. annosum*. Urea will be used when thinning to avoid further spread.

7.3 Management of Infrastructure

The road network throughout the plan area is extensive and there is limited need for new roads. Roads and road upgrades are detailed in **Map 15 – Civil Engineering** and **Appendix 11 - EIA screening opinion request form - Roads**.

An upgrade and road built will be required to access the final coupe in Garbhan Rock and a coupe towards Braeantra. These should be the last adjustments to infrastructure in Garbhan Rock. To gain access to the coupes north of the Kildermorie road two planned roads have been drawn up as per map and EIA screening opinion request form. No felling is planned in this area in the coming phase but roads have been planned and added to this LMP as a contingency. In the event of disease or windblow there might be a need to get into these coupes and having permission to build the roads will reduce response time, increase recoverability and decrease the likelihood of soil disturbance and siltation. Depending on future developments in regards to local land ownership the 'Kildermorie Loop' will be built to retain access into Garbhan rock and back into Braeantra.

To allow harvesting and haulage out of the Glaick coupes a road upgrade is planned there. The far western coupe in Cnoc na Sroine, which is due to be felled near the end of the plan, currently has limited access. To reduce forwarding distances and thereby reducing the risk of siltation a new road section has been drawn up which can be found in the maps and EIA. The last planned road upgrade will be in Dam Wood to allow for harvesting of coupe number 63010. Currently this road is not up to the specification necessary for haulage therefore the top surface needs to be reinstated and a turning area built.

General maintenance will be done whenever necessary. This LMP only details new roads, major upgrades and/or other major infrastructure work.

Timber haulage through Ardross village is capped at ten lorries per day. Liaison will take place between FLS and neighbours to ensure each stakeholder gets allocated a part of this 10 load a day limit in case of multiple active sites.

7.4 Management of Environment

7.4.1 Historic Environment

The management of the historic environment in the Ardross LMP will be done according to UKWAS and UKFS standards and in line with FLS's *Practise Guide; Archeology and the Historic Environment* (Forestry and Land Scotland, 2021). Considering there are no scheduled monuments in the plan area that does not mean there is no obligation to management of historic features. As stated in UKFS: "It is important that all significant heritage features, and not just designated ones, are protected and that consideration is given to the preservation and enhancement of cultural and historic landscapes" (UKFS).

Prior to work commencing, workplans will be produced and historical features identified and assessed. Where relevant they will be buffered to prevent any damage to the historic feature. At the time of restock consideration will be given to the historic element and where deemed beneficial a buffer around the archaeological feature will be implemented.

Newly found historic features will likely be professionally surveyed and data added to the heritage database.

7.4.2 Habitats and biodiversity

Key habitats and key species can be found in **Appendix 7** and the Habitats Regulations Appraisal in **Appendix 8**. Environmental features will be managed according to the management prescriptions in these documents. Two environmentally significant species were considered more thoroughly as the possible impact was deemed high. Below the management of these species will be explained.

Most red squirrel sightings in Inchlumpie, near the Alness river, have been in a mature stand of Sitka Spruce which is past its thinning window. To ensure available habitat for the red squirrel the coupe will be split into multiple coupes. Restock will partly take place with Norway spruce which will further improve the habitat for red squirrel.

Through Dam Wood a strip of Long Term Retention has previously been identified. This strip runs along a watercourse with steep banks either side, in some areas the mature crop on these banks has sustained windblow. The crop is a mixture of larch, Sitka spruce, Norway spruce and Scots pine and, with it being partly windblown, has significant ecological value. Most of this Long Term Retention will remain the same as it was in the previous plan but where possible harvesting of the standing crop will take place. This felling in turn enables restock with broadleaves along the watercourse which should improve the ecological value further.

Stittenham and Glaick form an important potential stepping stone for capercaillie between the Novar and Morangie SPA's. Therefore the restock plan is taking into account the needs of capercaillie. Along the edges existing bands of mature Scots pine exist with a healthy understory of blueberry which is deemed beneficial for capercaillie. These will not be felled and at the time of restock localized introduction of native broadleaves will be used to enhance the biodiversity in these edges further. On the top of both Stittenham and Glaick nutrient poor soils exist which show little signs of *H. annosum* presence and have a limited timber yield potential. Scots pine will form the main element for these areas to enhance the habitat for capercaillie. Thinning of these crops will be essential to provide the mature Scots pine with well-developed understory essential for the food supply of capercaillie. The denser forests necessary for shelter for capercaillie should exist in the more shade tolerant species surrounding the pine areas.

The plans to restore peatland, increase riparian and edge woodland and reduce deer numbers should also positively impact black grouse (*Tetrao tetrix*). The increased variety of habitat should improve their food supply and areas of open ground in and around the forest can provide lekking sites. Especially the large scale transformations in Garbhan Rock should, in the next decades, be beneficial to black grouse.

7.4.3 Peatland Restoration

Peatland restoration will be done according to **Map 14 – Peatland Restoration Areas** and **Appendix 13 - EIA screening opinion request form regarding Deforestation**. As mentioned in paragraph 7.2.8 Woodland Removal, current guidance has been followed to determine the extent of woodland removal and subsequent peatland restoration. Peatland restoration will be carried out in all areas where woodland removal is taking place. The results of this will be monitored and reviewed at MTR and full revision. If rewetting has not been successful future management will be re-evaluated at MTR and/or full revision.

7.4.4 Invasive Species

Management of invasive species in the Ardross LMP area is currently limited to Rhododendron. Rhododendron is present in Dublin and Glaick and removal has taken place in the past. Presence will be monitored by the environment team and when deemed necessary further control will be carried out.

7.4.5 Water

Details of the management of water can be found in **Appendix 5 Forestry Water and Catchment Management and Map 3 Water Features**.

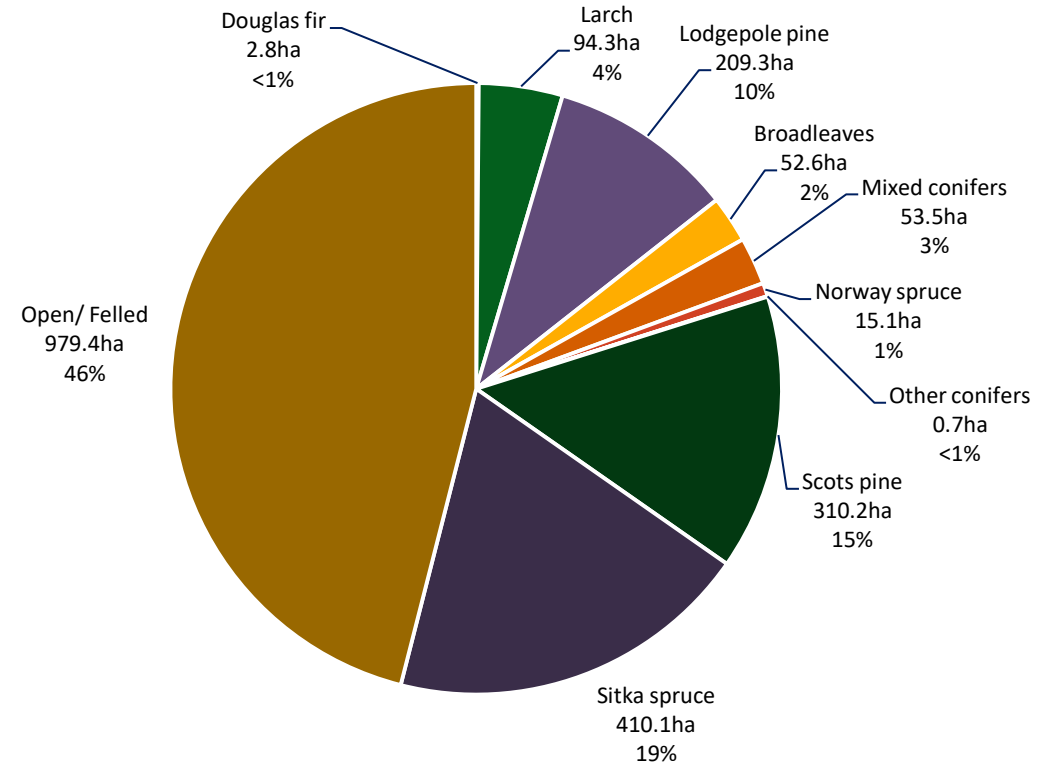
7.4.6 Landscape

A landscape appraisal has been undertaken, details of which can be found in **Appendix 4 – Landscape Appraisal and Map 7 – Landscape Character**.

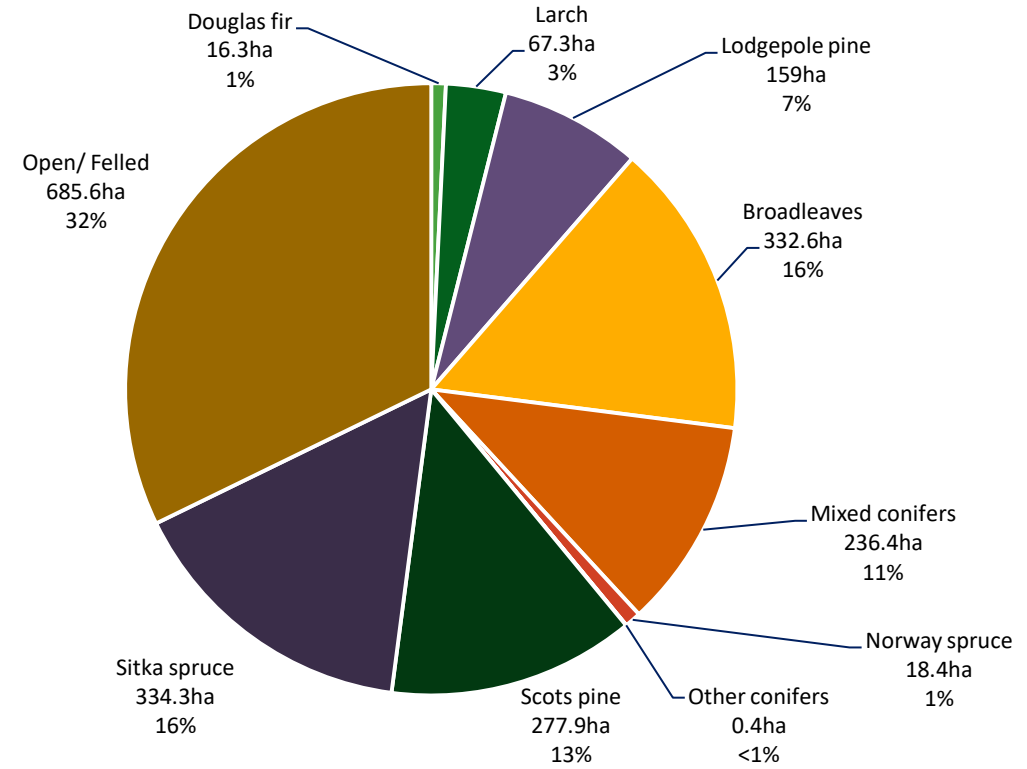
7.5 Species Composition

Plan area by Species						
Species	Current Area (ha)	%	Year 10 Area (ha)	%	Year 20 Area (ha)	%
Sitka spruce	410.2	19	334.3	13	259.5	12
Lodgepole pine	209.3	10	159	7	53.5	3
Larch	94.3	4	67.3	3	47.3	2
Douglas Fir	2.8	0	16.3	1	32.8	2
Norway spruce	15.1	1	18.4	1	13.2	1
Scots pine	310.2	15	277.9	13	174	8
Other conifers	53.5	3	236.4	11	393.4	18
Broadleaves	52.6	2	332.6	16	413.5	19
Open/Felled	979.4	46	685.6	32	735	35
Total		100		100		100

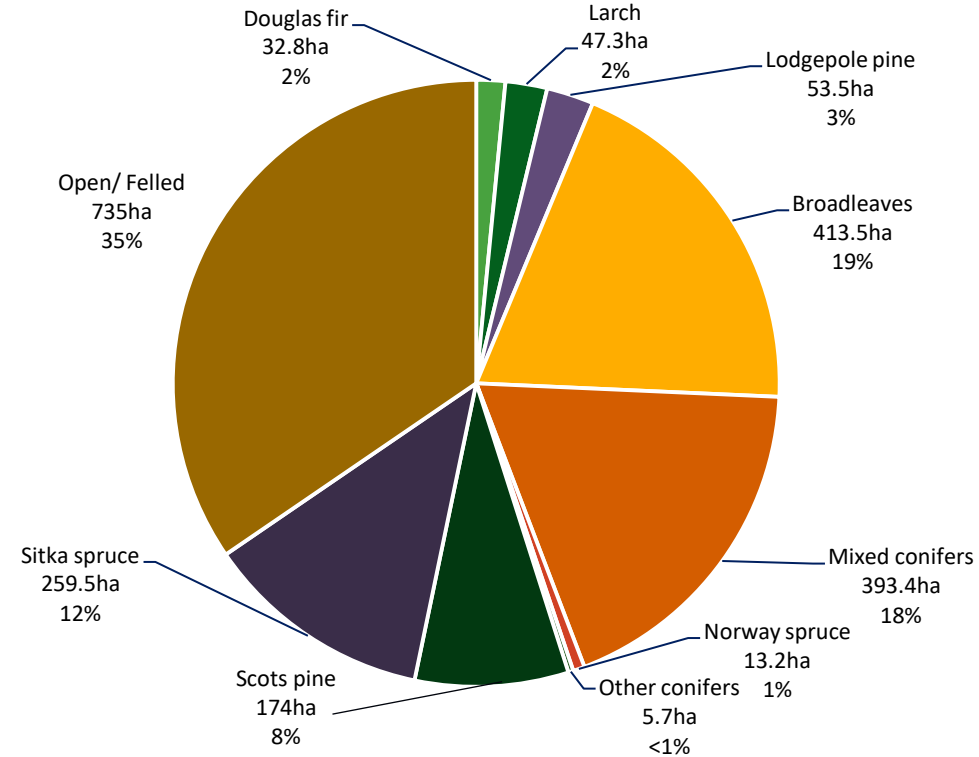
Species Composition 2022 (Species, area(ha), area(%))



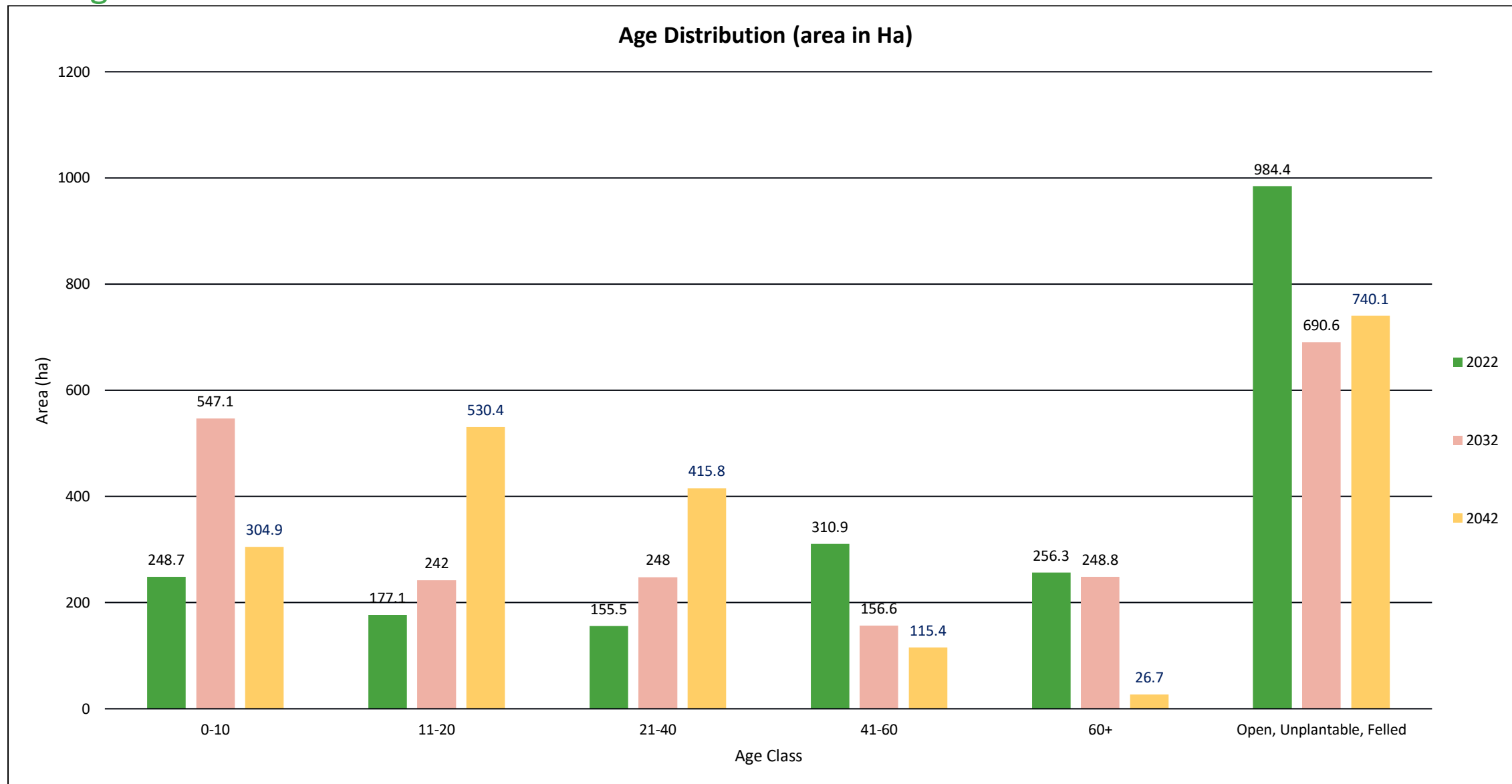
Species Composition 2032 (Species, area(ha), area(%))



Species Composition 2042 (Species, area(ha), area(%))

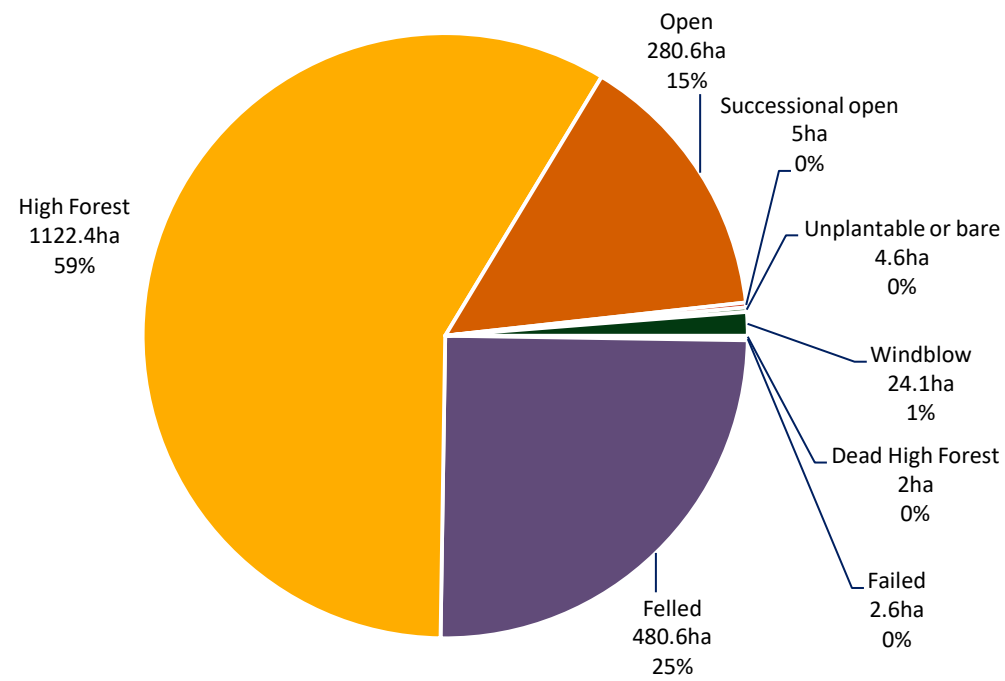


7.6 Age Distribution

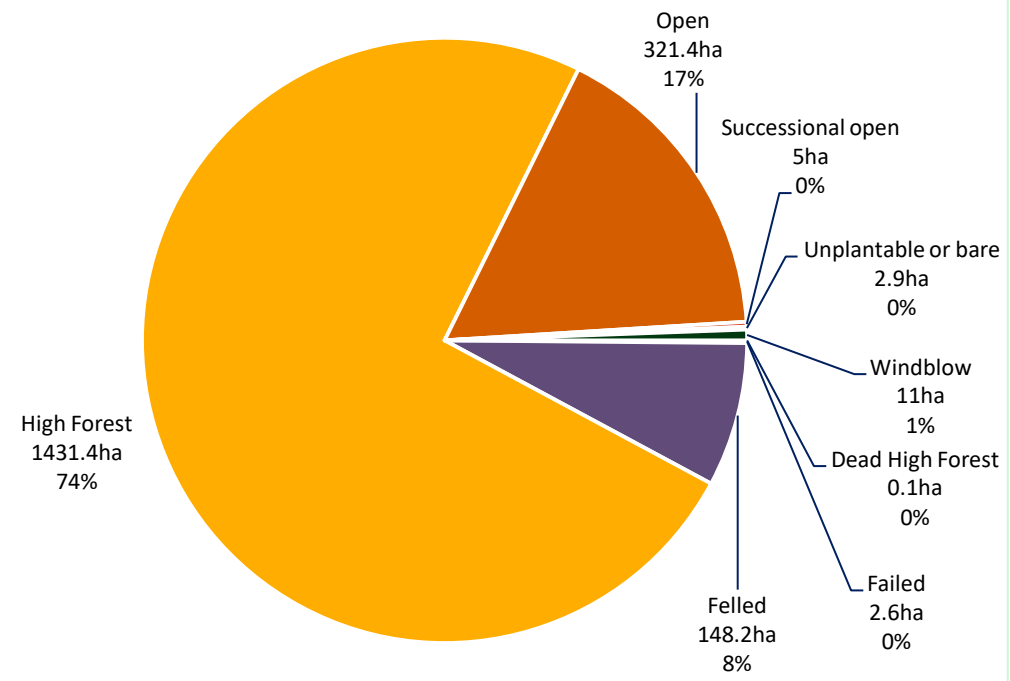


7.7 Land Use

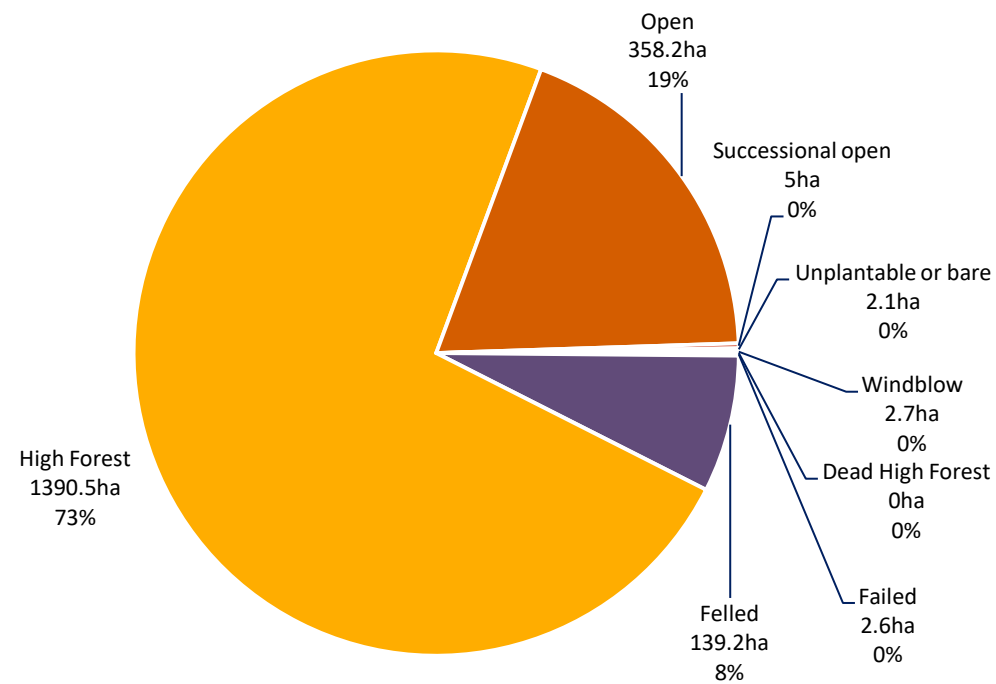
Land Use 2022 (Use, area (ha), area (%))



Land Use 2032 (Use, area (ha), area (%))



Land Use 2042 (Use, area (ha), area (%))



7.8 Volume forecast

