South Region (west)

Kirriedarroch

Land Management Plan

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.

The mark of responsible forestry

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CSM 6 Appendix 1
FORESTRY AND LAND SCOTLAND – Application for Land Management Plan Approvals
Forestry and Land Scotland – Property

Forest Region:	SOUTH REGION (west)
Woodland or property name:	KIRRIEDARROCH
Nearest town, village or locality:	GLENTROOL
OS Grid reference:	NX
Local Authority district/unitary Authority	DUMFRIES AND GALLOWAY

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

2. I confirm that the scoping, carried out and documented in the Consultation Record attached, incorporated those stakeholders which the SF agreed must be included. Where it has not been possible to resolve specific issues associated with the plan to the satisfaction of consultees, this is highlighted in the Consultation Record.

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

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

Signed *Andrew P Jarrott*..... **Signed** .....
PP Regional Manager **Conservator**

Region SOUTH (west)..... **Conservancy** .....

Date **.....**..... **Date of Approval:** .....

Date approval ends: .....

EIA Determination form if required

Contents

1.0 Summary of Proposals

Part of the Galloway Forest Park and lying within a larger area designated as an Environmentally Sensitive Area, the Kirriedarroch Land Management Plan (LMP) area is located around 18 km north of Newton Stewart, Dumfries and Galloway. One of the first areas within the region to be covered by a forest plan, at around 1616.8ha the plan area is a modest size plantation comprising a relatively varied mix of species and age classes.

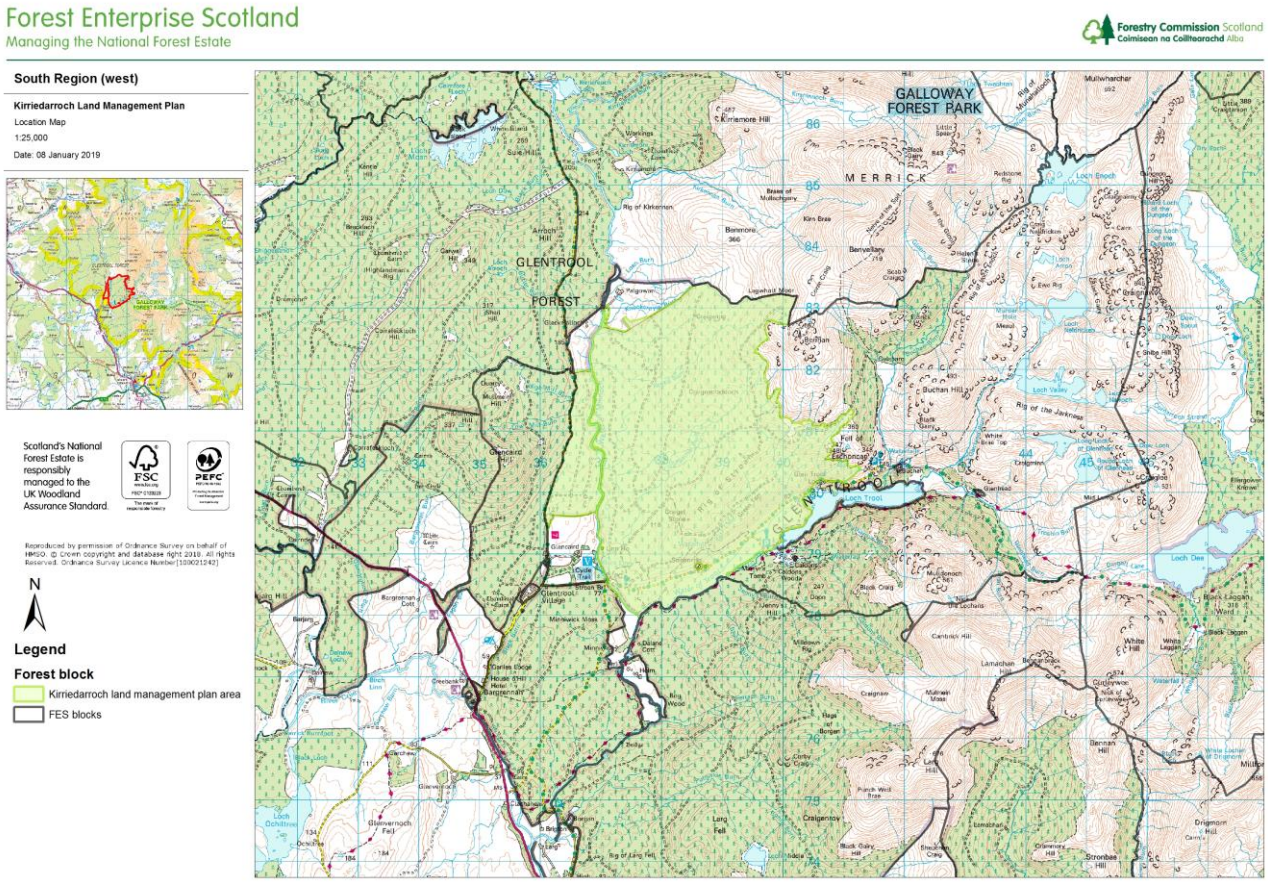
Significant felling has already taken place throughout the block, accelerated by recent sanitation felling of plantation Larch previously earmarked for long term retention and / or shelterwood management. Restructuring is well advanced.

Key management issues in this Land Management Plan (LMP) therefore remain to be timber production, forest road upgrade and formation to allow access to felling coupes and particularly the effective deer control required to promote the establishment and expansion of areas of native broadleaves and alternative conifer species for diversity and resilience.

The ten year period covered by this plan (2020-2029) presents detailed felling and replanting and forest road formation and upgrading proposals, proposals that require specific approval from Scottish Forestry (SF).

Longer-term management (beyond 2029) of the plan area is also considered in the plan but mainly to indicate the direction of travel and to provide context.

The forest is FSC certified and the management seek at all times to meet the UK Woodland Assurance Standard.



Consultation and further information

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

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2.0 FCS Regulatory Requirements

This section provides a summary of the elements of the plan that are regulated by Scottish Forestry (SF), specifically focussing on operations and activities within the ten year period of this plan.
At lower elevation, open ground does not feature as a significant part of the LMP area with only existing small areas of permanent internal open space, recreation areas and our transient clear fell sites of note. Nevertheless with large tracts of wild open hilltop and open agricultural ground to the north and east of the plan area, open space is a key element of existing diversity for this Land Management Plan as evidenced by our recent efforts to convert some plantation to open ground / woodland fringe at the previously hard plantation and open hill top interface.
Plantation area accounts for around 75% of the total LMP unit.

	Area (ha)
Plantation area	1208.1
Open ground	408.7
Total plan area	**1616.8**

2.1 Summary of planned operations

Key activities and operations planned for the first ten years of the plan:

Planned Operations	2020-2030 plan period
Clearfell	126.6ha
Thinning	355.5ha
Restock	121.5ha
Road construction	No new forest roads planned
Road upgrade	10,000m

2.2 Proposed felling in years 2020-2030

Ten coupes, around 6.5% of the plantation area, are proposed for harvesting during the 10yr period of the plan (see tables 1, 2 & 3 below).

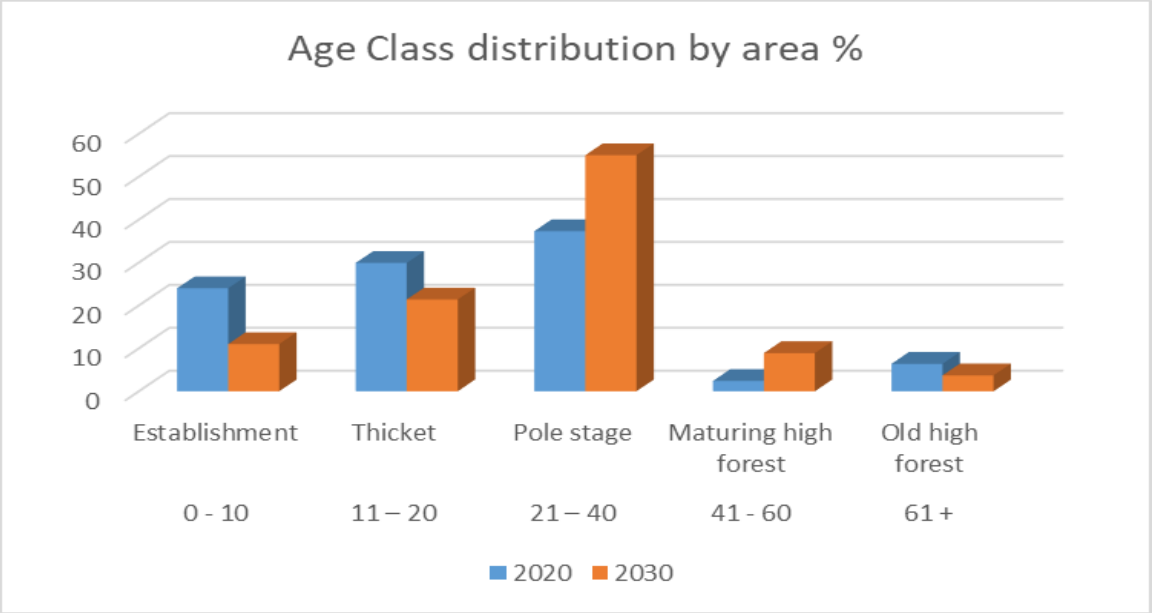
Table 1 – Proposed clearfell coupes first 10 years			
Coupe No.	**Phase**	**Operation**	**Coupe area (ha)**
06005	1	clearfell	2.5
06030	1	clearfell	10.4
06042	1	clearfell	12.6
06061	1	clearfell	8.0
06078	1	clearfell	8.4

06108	2	clearfell	4.8
06503	1	clearfell	23.1
06012	2	clearfell	23.5
06105	2	clearfell	30.0
06106	2	clearfell	3.3
Total			**126.6**

Table 2 – Proposed clearfell coupes as a % of LMP area (1616.8ha)			
Coupe No.	**Phase**	**Year**	**Percentage**
06005	1	2021	0.2
06030	1	2023	0.5
06042	1	2023	0.6
06061	1	2022	0.4
06078	1	2021	0.4
06108	2	2025	0.3
06503	1	2021	1.2
06012	2	2029	1.2
06105	2	2025	1.5
06106	2	2025	0.2
Total			**6.5%**

Table 3 – Proposed LISS felling coupes first 10 years			
Coupe No.	**Phase**	**Operation**	**Coupe area (ha)**
NO PROPOSED LISS FELLING DURING PERIOD			
Total			

Table 4 – Change in Age Class over plan period			
Age of trees	**Growth stage**	**Percentage of class at given year**	
		2020	**2030**
0 - 10	Establishment	24.0	11.0
11 – 20	Thicket	29.9	21.4
21 – 40	Pole stage	37.3	55.0
41 - 60	Maturing high forest	2.4	8.9
61 +	Old high forest	6.4	3.7
		100.0	**100.0**



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 40 cubic metres per Land Management Plan per calendar year.
A record of the volume felled in this way is detailed below will be considered during the five year Land Management Plan review:

Table 5 - Other Felling					
LMP/Coupe	**Date**	**Calendar year**	**Location OS NGR**	**Volume estimate (m3)**	**Comments**

2.3 Proposed thinning in years 2020-2030

Thinning will be completed in line with the district thinning plan after an assessment of the coupes against the given criteria.
Coupes identified for LISS methodology will require to be thinned and have been assessed as suitable for such.
Proposed thinning in Phases 1 and 2 for the 10 year period of the plan are shown in table 6 below.

Table 6 - Proposed thinning

Felling phase	Proposed thinning year	thinning area (ha)	% plantation area
Phase 1	2020	156.9	11.1
Phase 1	2021	0.0	0.0
Phase 1	2022	28.3	2.0
Phase 1	2023	0.0	0.0
Phase 1	2024	0.0	0.0
Phase 2	2025	16.6	1.2
Phase 2	2026	101.0	7.2
Phase 2	2027	0.0	0.0
Phase 2	2028	52.7	3.7
Phase 2	2029	0.0	0.0

2.4 Proposed restocking in years 2020-2030

Our restocking proposals on clearfell sites have been selected by ESC, on-site observations and the previous rotations. Where appropriate, species diversification has been undertaken utilising both BL and alternative conifers for species diversification. Species choice also meets the criteria for restocking under UKFS, UKWAS and internal FC policy.
Inverted mounding will be preferred, but hinge and trench mounding may also be used as site dictates. No ploughing will be undertaken due to the excess carbon release on peaty soils and the development of asymmetrical root plates which will affect stand stability.
Restocking will involve internal staff or external planting operators utilising trees of appropriate provenance sourced from various nurseries.
Deer control will be managed internally in line with the deer control strategy for the district.
Proposed restocking and the changes in species for the 10 year plan period are shown in tables 7 & 8 below (specific details in section 8.2).

Table 7 – Restocking coupes, area and species

Restock coupe	Phase	Restock year	Restock species
06005	1	2024	NS, BL

06012	3	2032	SS, BL
06030	2	2026	SS, BL
06042	2	2026	SS
06061	1	2025	SS, NS
06078	1	2024	SS, BL
06105	2	2028	SS, BL
06106	2	2028	NS, BL
06108	2	2028	NS, BL
06503	1	2024	SP

Table 8 – Change in species over plan period		
Species breakdown by area %	**2020 (current)**	**2030 (end plan period)**
Primary species: Sitka spruce	49.9	48.4
Secondary species: other conifer and broadleaf *	11.2 (12.0)*	11.8 (12.0)*
Native broadleaf	2.1	3.0
Open space	25.3	24.8

2.5 Access and roading 2020-2030

There is no new forest road construction planned during the approval period for this LMP or indeed in the period thereafter in this well roaded LMP. Regular and significant lengths of upgrade and maintenance will however inevitably be required.
The proposed construction over the 10 year plan period is shown below in table 9 below.

Table 9 – Proposed Roads construction and Maintenance		
Period of Proposed Construction	**Proposed length for construction**	**Proposed length for maintenance**
2020 to 2024	0.0m	7000m
2025 to 2029	0.0m	7000m
Beyond 2030	0.0m	10000m

2.6 Departure from UKFS Guidelines

The LMP seeks to follow UKFS guidance in all aspects.
Whilst a 2m height differential should be achievable across all restock areas, given our regional trend towards a reduction in coupe size, landscape

considerations, Hylobius management and stand stability, it may not always be possible to follow the adjacency guideline.
The adjacency guideline will primarily be addressed by delayed felling i.e. a coupe will not be felled until all surrounding crops are at least 2m tall however in the mid to short term the secondary option to deal with adjacency through delay restocking i.e. a coupe will not be restocked until all surrounding crops are at least 2m tall remains (see Threshold Tolerance table Appendix III)

2.7 Tolerance table

See Appendix III
Appendix III. Tolerance Table

3.0 EIA Screening Determination for forestry projects

3.1 Proposed deforestation

There is no proposed woodland removal within the LMP however where there is an identified benefit to the wider environment modest increases to permanent open space, mainly focussed within riparian zones and on upper treeline margins, are likely.

3.2 Proposed forest road works

No new forest road construction is required to access our proposed clearfell coupes however a significant upgrading and maintenance of the existing forest road network will be required.

An assessment of the roading network throughout the National Forest Estate has been undertaken to see if a Construction licence from SEPA is required for works; none of the planned roading projects within the forest block will exceed the threshold requirements.

With a current requirement for all timber to travel internally and westwards to the sole egress point at Stroan Bridge over the Water of Minnoch, much of the existing forest road network is considered as main timber haul route.

3.3 Proposed forest quarries

There is only one modest sized quarry within the LMP; Stroan quarry (GR NX393799) however a smaller quarry; Culsharg (NX412815) lies just outside the eastern boundary within the Loch Trool LMP.

To avoid the risk of using rock of unsuitable chemical content, stone material for forest road upgrade to service the planned timber harvest will be sourced from these main quarries.

Development quarry work over the lifetime of the plan will inevitably be required to provide a regular source of material for forest road maintenance. Where this is undertaken all works shall be done in accordance with The Quarries Regulations(1999). Additional quarry development proposals outwith the agreed tolerances will be submitted to FCS for approval prior to any work taking place (see Tolerance table Appendix III).

To avoid diffuse pollution arising from rainfall derived leaching, appropriate soakaways are in place in the main quarries and all construction work will comply with the general binding rules specified in the Water Environment (Controlled Activities) (Scotland) Regulations 2011.

District policy is to target Irish pipe bridges and other inappropriately designed structures for removal as they are known barriers to fish migration; there are no known such structures identified in the Kirriedarroch LMP area.

3.4 Proposed afforestation

There are no new planting areas proposed for the period of this plan. Naturally regenerated dispersed tree cover on open ground, where the canopy cover is less than 20% of the area, will be accepted where this does not significantly impact on other management objectives such as water quality, landscape, and deer control.

3.5 Additional regulatory considerations

None.

4.0 Critical Success Factors

The following factors are deemed critical for the successful implementation of the Land Management Plan:

- Complete construction/ upgrade of the planned forest road network.
- Enhance and expand the existing areas of Native broadleaf woodland and permanent open space throughout the plan area
- Improve water quality throughout R Cree catchment through enhancement of the riparian zones (centred on Water of Minnoch and Water of Trool)

5.0 Introduction

5.1 The existing land holding

The Kirriedarroch LMP totals around 1616.8ha and lies some 18km north of Newton Stewart, Dumfries and Galloway.
It bounds directly onto the Forestry and Land Scotland (FLS) land management plan units of Loch Trool to the east, Minniwick to the south, Glencaird Hill to the west and to the north, the Shalloch plan and Palgowan farm. The Palgowan agricultural grazing tenancy forms much of the northern boundary.
Part of the Galloway Forest Park, the plan area also lies within the larger designated Western Southern Uplands Environmentally Sensitive Area (ESA).
This plan is a revised submission of an earlier 10 year plan approved in 2006. Single year extended approvals by FCS and a final extension until 31 March 2020 by Scottish Forestry have been subsequently agreed.

5.2 Setting and context

5.2.1 Core timber production

Timber production is a key objective with most of the block managed under clearfell – artificial restock silviculture.
Significant areas do however present DAMS scores < 17 suggesting that lower lying sections to the south of the block may be candidates for alternatives to clearfell silviculture such as Low-impact Silvilcultural Systems (LISS) or Minimum Intervention broadleaf areas.

5.2.2 Agricultural tenancies

The open ground to the north of the plan area although outwith the plan area is subject to a full Agricultural tenancy agreement, as such FLS has little control over specific management of the area.
Whilst the tenancy is projected to continue over the period of the plan, there are no current plans to expand the grazing area.

5.3 LMP Presentation

There are no discrete divisions within this forest block, the area is therefore presented and considered as a whole.
Management objectives are consistent with themes identified in the Scotland's Forestry Strategy 2019-2029 and the Forestry and Land Scotland Corporate Plan 2019-2029.

6.0 (Whole) Plan Objectives

6.1 Issues

Key management issues to consider for this LMP are:

- Continued sustainable commercial timber production in a plan area that, although already quite species rich and structurally diverse, has been spatially compromised by recent clearfell of *P ramorum* infected crop
- Likely long term loss of larch from species mix throughout the block
- Enhancement of Ancient Semi Natural Woodland (ASNW) relict areas, improved connectivity of and otherwise expansion of Native Woodland habitat
- Management of the R Cree water catchment, particularly the Water of Minnoch, the Water of Trool and their tributaries, to maintain water quality and address surface water acidification and flooding impact issues
- Recreation focus around Stroan Bridge Visitor Centre locus and the passing recreational traffic overview of the LMP from the Straiton road

6.2 Key Challenges

- Increase species diversity within LMP area, particularly targeting broadleaf woodland, where soil types, steeper ground, exposure and elevation limit options for species choice
- Identifying appropriate areas for the development of Low Impact Silviculture Systems
- Identifying suitable areas and the effective protection of the planned expansion of Native Woodland
- Manage operational impacts within Water of Trool and Water of Minnoch catchment riparian networks
- Reduce area of plantation crop over 15yrs of age to meet acceptable recognised levels throughout the plan period and beyond whilst minimising potential for downstream flooding impact
- Manage visitor Welcome zone around Stroan Bridge Visitor Centre within context of wider forest management

6.3 Management objectives

Objective 1: Ensure that the plantation continues to contribute to the District's timber production targets.

South Region currently contributes a large amount of timber to the national programme and requires the productive character and capacity of its component forest blocks to be maintained.

With a relatively dense and robust forest road network in place and continued conifer restocking, the Kirriedarroch plan area is well suited for the future sustainable timber production of a range of product type.

Objective 2: Restructure plantation forest and increase age and species diversity.
Restructuring over a single rotation is not practical so it will continue through subsequent rotations.
Planned expansion and improved connectivity of broadleaf areas throughout plan area will contribute towards the species diversity over the period of the plan.

Objective 3: Enhance Ancient Semi Natural Woodland relict areas and expand areas of Native Woodland.
Enhance existing relict areas to south of plan area as per approved ASNW management plans.
Identify appropriate adjacent additional areas for Native Woodland expansion both to the south for the ASNW relict areas and also to the north where new broadleave woodland creation has recently taken place on the Bennan Hill.

Objective 4: Improve water quality, minimise flooding impact AND alleviate peak flows for areas downstream from the LMP unit.
Diffuse pollution from clearfell and restocking proposals is a threat to maintaining good water quality. The proposed enhancement of riparian zone buffers throughout the plan area, following all best practices and guidance during forest operations, should contribute towards maintaining and ameliorating the good ecological status of the Water of Minnoch and Water of Trool (principal R Cree tributaries).
For additional future site stability and water quality benefits, planned increases in the area of open ground and the restocking of permanent broadleaf crop that will result in a greatly reduced operational impact will be initiated.
Liaise with statutory bodies over catchment management and Natural Flood Management (NFM).

Objective 5: Manage open agricultural ground areas.
Maintain current agricultural lease sites and explore opportunities to develop and expand other land use within the plan area.

7.0 Analysis and concept

7.1 Analysis

The following table provides an analysis of the opportunities and constraints for the plan objectives and leads us to the plan concepts that are deemed significant in influencing the long-term management of the forest block.

Table 1: Example of how the

Objective	**Opportunities**	**Constraints**	**Concept**
Commercial timber production	Provide planned sustainable timber supply.	Creation / enhance conservation habitats Concentrated timber harvesting impact by *P ramorum* over short timescale	Variety of coupe sizes to fit topography and management objectives programmed for smoothed timber supply. Reduce coupe size where appropriate and increase area under LISS. Maintain viable conifer restock programme and increase BL area in future rotations.
Species diversity	Significant areas of recently felled conifer, primarily to the south adjacent to ASNW areas and Visitor Centre zone, present opportunities to increase species diversity throughout the block.	Effective deer control. Availability of alternative species.	Increased area of Native broadleaf woodland to south of plan area using ASNW relict areas as a focus. Enhance connectivity of lowland BL areas to open hill ground through riparian corridors. Increase species diversity (BL and minor conifer)
Catchment management and peak flows	Maintain / enhance current status of Water of Trool and Water of Minnoch. Make a positive contribution to the moderation of peak flows within the Water of Trool and Water of Minnoch	Creation of additional open space and/or non-productive broadleaves with potential loss of productive conifer. Natural regeneration of	Enhance riparian corridors through additional open space and native broadleaves planting/recolonization within wider buffer zone. Monitor conifer regeneration and control where resources allow. Monitor efficacy of

	catchments.	conifer in riparian buffer zone. Broadleaf browsing damage.	browser control.
Deer control to facilitate opportunities for BL and soft conifer establishment to meet UKFS requirements	Increased access to the upper forest margin, which is the critical locality for deer control, could help facilitate future management. Effective deer control should allow for the expansion of natural broadleaf colonisation along the upper margin and riparian corridors and increased floral diversity on open ground for a relatively low cost/ ha. Link the timing of deer control effort to the timing of browsing-sensitive restock. Clearfell areas will create open areas to allow deer control.	High cost implications for track formation and deer control through shooting. Neighbours may have differing objectives and may be affected by reduced deer numbers. LISS area can constrain effective deer control Public / recreational access can constrain effective deer control.	Large scale felling coupes facilitate deer control and make restock areas less sensitive to deer damage. Group restock species sensitive to deer browsing into areas where deer control can be targeted.
Wildlife – red squirrel	Maintain red squirrel habitat and connectivity	Utilising large-seeded BL species as major component in broadleaf mixtures.	While not a stronghold area for red squirrels, use of large seeded BL will be avoided. Felling order will not isolate squirrel population.
Wildlife – black grouse	Enhance Black Grouse habitat with softer woodland boundaries with low density restock towards	Areas difficult to reach for deer control to minimise browsing of	Target areas of BL/SP where control can be maintained, otherwise reduce density of conifer planting to create more

	adjacent open ground.	alternative conifer/BL	open buffer with adjacent open ground. Identify mature conifer retention areas and extend rotation lengths throughout.
Access and Health	Enhance access and enable communities to enjoy woodlands.	Recent clearfell of *P ramorum* adjacent to Visitor Centre and surrounding recreation zones has created significant areas of broken ground.	Rapid response restocking of areas around Visitor Centre. Enhance in-forest experience through increased open space and species diversity capitalising on new viewpoints exposed by sanitation clearfells.

7.2 Concept

The concept forms the broad framework for the detailed design and is presented graphically in the Analysis and Concept map. There are five main strands to the overall design concept outlined as follows:

Commercial confer zone / Core timber production

The block comprises upland Sitka spruce and mixed conifer plantation that has over the years provided a significant timber volume stream for the district. The impact of the recent felling for *P ramorum* will significantly reduce the sustainable felling volume available within the plan area however the timetable of conversion of conifer to broadleaf to the south of the plan area has been substantially brought forward.
Where appropriate, opportunities will be taken to extend rotation length, increase species diversity and generally reduce average coupe size throughout the plan area.

Ancient Semi Natural Woodlands

To the south there are scattered areas of ASNW remnant within and adjacent to the design plan unit.
This plan offers a significant opportunity to restore our existing fragmented PAWS areas through conifer removal and additional broadleaf restocking and to enhance them through linkages to other more favourable external ASNW areas along the Water of Trool valley. Alternatives management types to clearfell will also be pursued.

Roadside corridor

The LMP area is bounded to the west by the Straiton / Glentrool minor road that affords a range of linear views into the plantation and to the south by the unclassified road to Bruce's Stone where the views are more intimate. An enhanced diversity of restocking options particularly focussing on broadleaf planting and greater use of open space associated with the main watercourses will be pursued in and around both sites with the further potential for alternatives to clearfelling explored.

External open ground / internal open ground

There is no intention to reduce the area of open hill currently associated with the plan through additional conifer restock however additional opportunities for broadleaf expansion adjacent to the recent Bennan new woodland creation area (riparian zones extending into the open ground) remain a possibility. The open hilltop / plantation margins provide important habitat for Black Grouse.

There are discreet areas of open ground such as deer glades throughout the plan area. Improved connectivity of these spaces along with the riparian corridors can generally provide a link from the lower valley bottoms to the open hill ground.

Lochs (water bodies) / Water of Trool and Water of Minnoch riparian zone enhancement

There are no significant water body features within the plan landscape however the two principal watercourse valley systems are of critical importance for water quality.

Riparian enhancement with the creation of new areas of open space and groups of native BL restocking in excess of the basic proposals of the legal drivers and voluntary codes i.e. the UK Forestry Standard (UKFS) the Forest and Water Guidelines (FWG) and the UK Woodland Assurance Standard (UKWAS) are considered to be a priority.

8.0 Long Term Land Management Plan Proposals

8.1 Management

The Kirriedarroch plan has been designed in accordance with sound silvicultural and environmental principles within the framework outlined by the UK Forestry Standard, the UK Woodland Assurance Standard and the FLS Interim Corporate Plan and our National Spatial Overview.
The accompanying Management map provides details of our coupe management proposals and the table below provides a summary of the average annual felling and thinning volumes (m3 ob) expected for the next 10 years (plan period) and beyond:

Fell period	Thinning / LISS	Clearfell	Total
2019-2021	2068	5540	7608
2022-2026	1806	4897	6703
2027-2031	1916	2751	4667
2032-2036	1483	5248	6731
2037-2041	1247	10933	12180

8.1.1 Clear Felling

During previous iterations of the plan the Kirriedarroch block has been significantly impacted on by programmed clearfell and recent felling for P ramorum bequeathing a relatively diverse plantation with crops at all stages of development but also a reduced programme for the next 10-20 year period.
Further block restructuring, with 8-10yr age gaps developed between felling coupes (and possibly even wider gaps immediately adjacent to Black Grouse areas) remains an objective. Further conifer restocking and our intentions, where possible, to retain mature conifer species through extending their rotation length (mainly Scots Pine and Norway spruce) will maintain and probably generate a more diverse age class structure in the plantation thus improving the spatial appearance and structure of the block.
Efforts have also been made to introduce alternatives to clearfell coupes and also to reduce the size of clearfell coupes for landscape and biodiversity considerations within the plan area particularly in areas adjacent to the county roads and river valley bottoms.
The following table reflects proposals contained within the Management map for the Kirriedarroch LMP area and shows

- the coupe clearfell proposals by species and hectare for the 10 year period of the plan

Clearfell proposals for 10 year plan period

Coupe	SS	NS	Larch	SP	LP	Other con.	BL	Open space	Total
06005	2.2	0.3	-	-	-	-	-	-	2.5
06012	23.0	-	-	-	-	-	-	0.5	23.5
06030	8.0	1.8	-	-	0.2	-	-	0.4	10.4
06042	11.0	-	0.6	-	0.5	-	-	0.5	12.6
06061	1.5	5.3	-	-		-	-	1.2	8.0
06078	5.5	-	0.7	-	0.8	-	-	1.0	8.0
06105	27.8	-	-	-	-	-	-	2.2	30.0
06106	0.2	3.1	-	-	-	-	-	-	3.3
06108	2.0	1.5	-	-		-	0.8	0.5	4.8
06503	9.0	-	9.5	0.5	1.6	-	-	2.5	23.1
Total	***90.2***	***12.0***	***10.8***	***0.5***	***3.1***	***0.0***	***0.8***	***8.8***	***126.2***

Given the site types virtually the entire plan area will be managed under a clearfell management type using conventional harvester and forwarder working.
Adjacency issues will either be dealt with through delay felling i.e. a coupe will not be felled until surrounding crops are at least 2m tall or, more infrequently, through delay restocking i.e. coupe not restocked until surrounding crops are at least 2m tall.
All proposed operations sites will be surveyed prior to work taking place to identify the presence of species such as Otter, Squirrel, Bats and Badger or adjacency of other species sensitive to disturbance that may require specific management treatments i.e. avoiding breeding seasons**.**
The following table confirms that, as per paragraph 2.10.2 in the UK Woodland Assurance Standard (fourth edition), no more than 10% of the plan area is due to be felled in any five year period (unless justified in biodiversity impact terms) within this plan approval period.

5yr Fell period	Area felled	Area felled

	(ha)	as % of total area
2021-2025	**102.8**	**6.4**
2022-2026	**64.3**	**4.0**
2023-2027	**56.3**	**3.5**
2024-2028	**33.3**	**2.1**
2025-2029	**46.8**	**2.9**
2026-2030	**23.5**	**1.5**
2027-2031	**33.8**	**2.1**
2028-2032	**33.8**	**2.1**
2029-2033	**70.7**	**4.4**
2030-2034	**47.1**	**2.9**

It is of course important to manage forestry activities in acid sensitive water catchments and this LMP area is impacted on by two catchments identified as being either "at risk" or "failing".
Calculations involving our proposed felling and restocking for these catchments have been prepared and are included at Appendix V**.**
The "at risk" or "failing" catchments, due to the generally low levels of clearfell planned for the LMP, both satisfy the felled area threshold however because of the already heavy concentration of conifer woodland in the plan area they do not meet the closed canopy forest >15yrs requirement of less than 30% of the catchment in 15 years' time.
In extensively (>50%) forested catchments like these in and around the Kirriedarroch LMP area, additional measures to reduce the impact of forestry will be more closely considered.
For conservation, biodiversity and water quality considerations efforts have been made

- to increase conversion of conifer stands to broadleaf woodland
- to extend the felling period between some coupes to over 7yrs
- increase the area to be managed under alternative to clearfell systems
- to marry coupe shape better to landform and where possible to reduce the overall size of the remaining clearfell coupes
- Robust open riparian corridors

8.1.2 Thinning

Thinning, mainly the lower lying and more sheltered areas to the west has previously taken place within the LMP unit. Success has been variable. Carried out on a 5-7yr cycle in accordance with our local policy, the crops have been thinned to improve timber quality but also to realise amenity, biodiversity and landscape objectives.

Opportunities to dramatically increase the overall thinnable area and move more of the block from a clearfell to Group Shelterwood management system exist in many of the second rotation crops.

8.1.3 Continuous Cover Forestry (CCF) / LISS

Although CCF is unlikely, site type constraints and crop ages suggest that more areas of the LMP area may be appropriate for management under some type of Low Impact Silviculture System (LISS) to try and maintain permanent woodland cover and contribute to the protection and improvement of water quality, soil quality and biodiversity.
Using Group Selection systems, where appropriate, in some second rotation crops and through regular crown thinning and occasional small-scale clearfells of <2ha (perhaps centred on windthrow) we may be able to provide spatial diversity and areas for either natural regeneration or targeted restock of small seeded native tree and shrub species.
Group Selection generally encompasses:

- progressive thinning
- clearance of windthrow patches
- small-scale felling patches of 0.5ha up to 2.0ha to stimulate restructuring and promote regeneration of target tree species

If there is a management requirement for any coupe greater than 2.0ha to be felled then that prescription will be initially agreed with Scottish Forestry (SF) as per the agreed Tolerance Table in Appendix III.

8.1.4 Restructuring

Significant areas of the plan area have been impacted by the sanitary felling of *P ramorum* infected larch crops. Along with previous approved clearfell these additional fellings including windblow and additional areas of associated spruce for access has completely changed the appearance of the plan area both internally and as viewed from external viewpoints.
Low levels of planned clearfell over the plan period, their subsequent restocking coupled with some conifer conversion to broadleaf, Long-term Retention of mature conifer species such as Norway spruce and the creation of additional open space will continue to gradually alter and improve the spatial appearance and structure of the block and provide a greater diversity of habitat.

8.2 Restocking proposals, future habitats and species

A modest amount of clearfelling is scheduled for the first two phases of the LMP, six coupes in phase one and four coupes in phase two, restocking is limited to these sites.

The accompanying Future Habitats and Species map provides detail of our proposed restock species and habitats for the Kirriedarroch LMP area where areas mapped as broadleaf essentially comprise 60% broadleaf within an unmappable 40% of open ground.

Ground preparation and planting of quality nursery stock of appropriate provenance will take place with our target stocking density for commercial conifer species being 2500stems/ha at year 5 and for the non-commercial broadleaf around 1600stems per hectare (2.5m spacing).

Where the opportunity arises natural regeneration will necessarily play a larger part in establishment, particularly in LISS areas where no ground preparation or disturbance is anticipated. The possibility remains however that regenerating trees will not provide sufficient stocking so where natural regeneration is anticipated the areas will be surveyed at year 4 and where the density of tree cover is insufficient (i.e. not established at 1100 stems per ha.) then the site will be enriched / restocked with appropriate conifer or native broadleaf in the following planting season.

The following tables accommodate this and show

- the coupe restocking proposals by species and hectare for the first 10 years of the plan
- the proposed change to area by species at current, 10 and 20 year intervals

Restock proposals for 10 year plan period

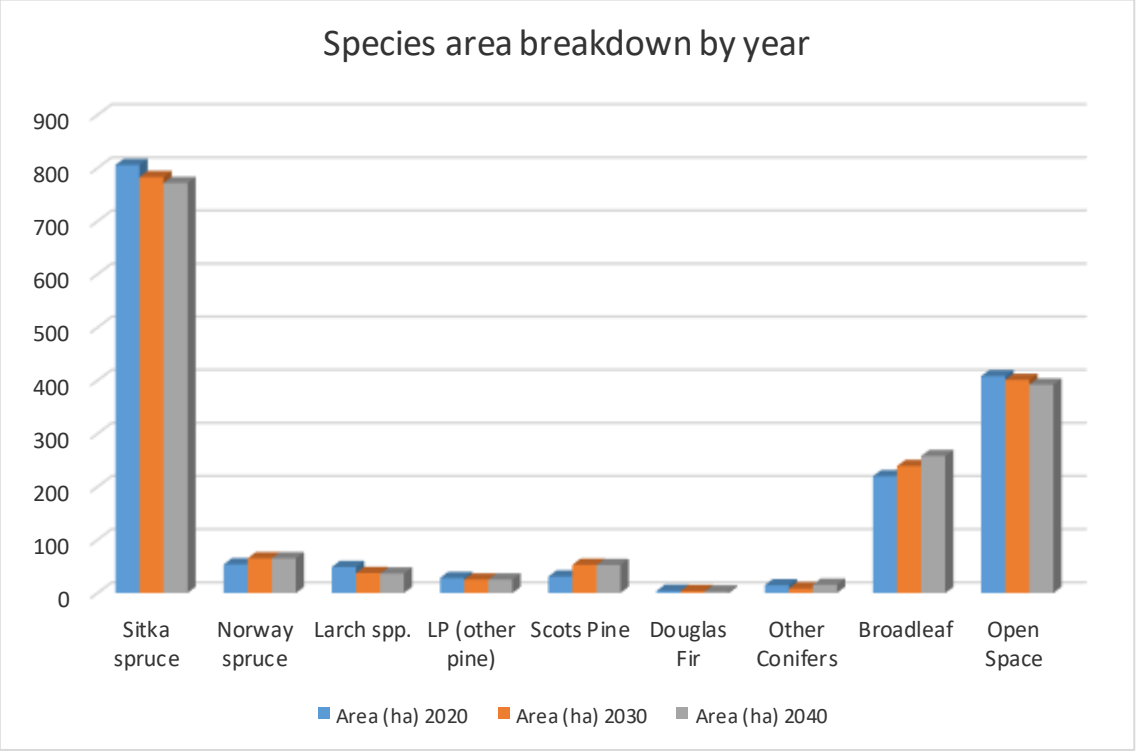
Coupe	SS	NS	Larch	SP	LP	Other con.	BL	Open space	Total
06005	-	1.8	-	-	-	-	0.5	0.2	2.5
06012	18.5	-	-	-	-	-	4.5	0.5	23.5
06030	8.5	-	-	-	-	-	1.5	0.4	10.4
06042	12.6	-	-	-	-	-	-	-	12.6
06061	3.7	3.8	-	-	-	-	-	0.5	8.0
06078	5.8	-	-	-	-	-	1.2	1.0	8.0
06105	9.8	-	-	-	-	-	19.0	1.2	30.0
06106	-	1.5	-	-	-	-	1.2	0.6	3.3
06108	-	2.0	-	-	-	-	2.5	0.3	4.8
06503	-	-	-	23.1	-	-	-	-	23.1
Total	***58.9***	***9.1***	***0.0***	***23.1***	***0.0***	***0.0***	***30.4***	***4.7***	***126.2***

Notes on restock coupe work schedule

06005	Coupe visible from Straiton road and adjacent to Palgowan farm; NS matrix with open space to forest road and BL to unnamed burn.
06012	Core production coupe; SS matrix with open space to forest road and BL targeted on Keltie Burn and unnamed burn to north and south.
06030	Core production coupe; SS matrix with open space to forest roads and BL to unnamed burn.
06042	Core production coupe; SS matrix.
06061	Core production coupe; SS matrix with NS for species diversity and open space to forest road.
06078	Coupe at elevation bordering open ground to north; primarily SS matrix with open space connecting to open hill ground and BL targeted to unnamed burns.
06105	Coupe at elevation bordering open ground; primarily BL matrix connecting to open hill ground and new woodland creation area to east for landscape and habitat considerations, SS to west as part of core plantation matrix
06106	Core production coupe; NS with open space to forest roads and BL targeted towards Pulnagashel burn riparian zone.
06108	Coupe visible from /adjacent to Straiton road; NS matrix with BL woodland along Low and High Mill burns and road front.
06503	Coupe visible from /adjacent to Loch Trool; SP matrix for species and habitat diversity and long term retention.

Species	**Area (ha) 2020**	**Plant Area %**	**Area (ha) 2030**	**Plant Area %**	**Area (ha) 2040**	**Plant Area %**
Sitka spruce	**805.8**	**66.7**	**783.1**	**64.4**	**772.0**	**62.9**
Norway spruce	**54.1**	**4.5**	**65.7**	**5.4**	**65.7**	**5.4**
Larch spp.	**49.2**	**4.1**	**37.7**	**3.0**	**36.7**	**3.0**
LP (other pine)	**28.6**	**2.4**	**25.4**	**2.1**	**25.4**	**2.0**
Scots Pine	**31.2**	**2.6**	**53.2**	**4.4**	**52.8**	**4.3**
Douglas Fir	**4.3**	**0.3**	**4.1**	**0.3**	**3.1**	**0.2**
Other Conifers	**14.9**	**1.2**	**8.9**	**0.7**	**15.8**	**1.3**
Broadleaf	**220.1**	**18.2**	**239.1**	**19.7**	**257.9**	**20.9**
Open Space	**408.6**	**-**	**401.6**	**-**	**392.5**	**-**
Total	**1616.8**	**100.0**	**1616.8**	**100.0**	**1616.8**	**100.0**

(Areas of restocked broadleaves in tables are based on an average minimum of 1100 stems/ha)



8.3 Open land

8.3.1 Open land; Quarries

Stroan quarry (NX 39267989), the single active quarry in the plan area is identified as such on the features map. The quarry will remain as an area of permanent open space during its active life. Future quarrying, without major boundary expansion, may well be required to provide source material for forest road construction and maintenance in the area. Any significant quarry development proposals will be submitted to FCS for approval prior to work taking place (see Tolerance table Appendix III).

8.3.2 Open land; Grazing

To the north of the plantation area outwith the plan area, the open hilltops are subject to a full Agricultural tenancy agreement that is projected to continue over the period of the plan. FLS has little control over this grazing area due to the lease conditions.

There are no plans to increase the area under tenancy.

Locally regional staff have entered early stage discussions with SNH regarding grazing levels of sheep grazing on the Merrick.

8.4 Visitor Zones

The viewpoint at Bruce's Stone overlooking Loch Trool is considered to be one of the "must see" attractions in the Galloway Forest Park. Although the viewpoint lies to the east and outwith the Kirriedarroch plan area, the single track road access to the viewpoint crosses the Water of Minnoch at Stroan Bridge and passes through the plan to the south. Accordingly virtually the entire southern section of the LMP, centred on the trails and cycle routes associated with the Stroan Bridge Visitor Centre, falls into the local FLS interactive and passive visitor zones. The visitor centre itself is considered one of the district's principal recreation facilities.

Recreational demands within these visitor zones will impact greatly on our management choice with our standard regimes heavily modified to improve the internal and external views associated with the facility and its associated walking trails and cycle routes.

The principal facilities are listed in the table below.

Facility	**Concept / Opportunity**	**Constraint**	**Plan Development**
Stroan Bridge Visitor Centre (and associated trails & cycle routes)	Enhance the plantation backdrop to the complex	Sanitation felling of larch	Restock target areas with BL and open ground to enhance riparian zone, maintain new views and provide long term backdrop to trails Improve immediate trail & cycle route surrounds through species diversity and bespoke management operations
SUSTRANS National Cycle route	Enhance views from the route and plantation backdrop		Provide a range of near and distant views Develop BL tree cover for visual diversity along route
Core paths	Enhance views from the route and plantation backdrop	Appropriateness of current route	Provide a range of near and distant views Develop BL tree cover for visual diversity along route

8.5 PAWS (Plantation on Ancient Woodland Site) Restoration

Relict Ancient Semi Natural Woodland centred around Stroan House currently identified as a priority PAWS site for restoration is under threat from shading by the existing mature conifer crop.
Recent sanitation clearfell in and around the site has commenced the restoration process hopefully facilitating colonisation of the area by the surrounding broadleaves. The situation will be monitored and should undesirable species colonise the site then further clearance and enrichment planting may be required.
The area will ultimately resort to a Minimum Intervention management system.

8.6 Natural Reserves, Minimum Intervention and Long Term Retention

Natural Reserves are predominantly wooded, permanently identified locations of high wildlife interest or potential managed for high conservation or biodiversity value in perpetuity.
There are only two small areas of predominately windblown deadwood identified as Natural Reserve within the plan area. The objective here is to allow natural processes to develop and provide diverse structure and composition and natural quantities of deadwood.
Around 12.5% of the plantation area has been identified as either Long Term retentions or Minimum Intervention.
As there are sufficient selected Natural Reserves of higher biodiversity value to be found throughout the district, broadleaf areas and isolated conifer retentions will provide our focus for Minimum Intervention management within this LMP area. Minimum intervention has management with no systematic felling or restocking although operations such as fencing, control of exotics and pests, safety work and trail maintenance are permitted.
In Long-term Retention areas, trees are retained for environmental benefit significantly beyond the age or size generally adopted by the woodland enterprise.

9.0 Management Prescriptions

Forest Management Types

- Clearfelling
  Generally clearfelling will be carried out by harvester and forwarder however to the south, above Loch Trool, where the slopes are slightly steeper there are some areas that may necessitate skyline felling. All timber will be processed as cut to length (CTL) and will utilise brash mats and appropriate machinery to reduce ground damage and compaction.
- Thinning
  As determined by the district thinning programme, much of the block will now comprise second rotation crop first thinnings that will predominately be racks cut into the coupe, every 6-8 rows. Where terrain and slope allows, chevron patterns will be utilised and where an area is not possible to thin, a severance rack will be cut to split the thinned and unthinned coupes. Subsequent matrix thinning will focus on improving timber quality with suppressed, double stemmed, wolf and co-dominants the focus of removal, where this will not create instability in the stand.
  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, larger tree sizes are being sought or as part of a LISS prescription. 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, with inspections to ensure the stand quality is being enhanced.
- Low Impact Silvicultural System (LISS)
  Group shelterwood – Small scale group fellings or areas which have been subject to windblow will be harvested to a maximum of 50m diameter (2 tree lengths) to ensure that humidity and windspeed levels are at their optimum levels for natural regeneration to occur. The regeneration will be monitored (see Natural regeneration / Management of Open Ground).
- Natural regeneration
  Natural regeneration will be utilised where appropriate and managed under the district guidance and the guidance from the natural regeneration working group. Conifer regeneration will be closely monitored to inform and facilitate interventions such as respacing, enrichment planting or ground scarification and a prioritised programme of work will be drawn up and pursued as resources allow. This will apply to all management type coupes (clearfell, LISS, LTR & Minimum Intervention) but particularly coupes where

permanent broadleave cover has been identified and high levels of conifer regeneration will negatively impact on our objectives e.g. coupe 06052 where the conifer regeneration will either be removed by year 5 of the plan or a revised future management will be outlined in the 5yr review".

- Long Term Retentions
  Long Term Retentions (LTR) are an important area of the forest for biodiversity and also for providing and maintaining spatial diversity. There are several identified within the plan area, mainly conifer but with some broadleaf and it would be expected that ultimately they would provide standing deadwood and large woody debris, especially of native broadleaves in excess of 20cm diameter.
- Natural Reserves/Minimum Intervention
  Whilst the overall deadwood ecological potential for Kirriedarroch is generally low, opportunities do exist in and around the Ancient Semi Natural Woodland sites to the south of the plan area to increase levels of deadwood. Currently there are only two small areas of conifer reserve in the plan area, both areas of windblown deadwood.
  There are however significant areas of Minimum Intervention (mainly Broadleaf) identified within the plan where, in the long term, as much deadwood as possible will be retained, in excess of the $20m^3$/ha as recommended by the UKFS. This will include a variety of heights and species where available. No trees will be ring girdled or cut above stump level to create deadwood habitat.

Operational Access

- The LMP unit has excellent operational access within the forested areas. Road upgrades will however be required for the thinning and LISS operations with an additional limited amount of new road construction. ATV tracks may require construction to allow for deer control, this will be assessed as part of the operational assessment.

Management of Open Ground

- Post clearfelling, there will be no conifer restocking within 20m (and on occasion up to 50m) within the main watercourse riparian zones. It is expected that in some of the riparian zones, the inherent and designed open ground and broadleaf areas will fill in with natural regeneration of both conifers and broadleaves. Through the delivery of this Land Management Plan (LMP) FLS will manage natural regeneration in such a way as to ensure that, where practicable, it does not significantly impose a negative impact upon the objectives of the plan. Natural regeneration will be managed so that any negative impact upon designated, protected or promoted habitats, species, landscapes and catchments within or adjacent

to the LMP area is minimised and where possible mitigated. The advice of the Galloway Fisheries Trust and comments from SEPA will be taken into account when planning management of natural regeneration. All Native broadleaves will be retained.

- For areas designated as permanent open space natural colonisation and regeneration will be managed in line with the management objectives for the areas.
- With significant areas of conifer plantation on blanket bog, that could prove marginal for economic woodland, some reduction in conifer plantation and the creation of some native peatland edge woodland that will contribute towards linking the lower valleys to the slopes and hill summits is planned.
- There appear to be limited opportunities for peatland bog restoration in this LMP area.

New Woodland Creation

- There are no areas identified for the creation of New Woodland.

PAWS Restoration

- PAWS Restoration PAWS restoration will look to remove all non-native conifers, especially where there is mature cone-bearing and shade tolerant conifer.

Deer Management

- Current Deer Management is maintained in line with the districts deer management strategy. A sustainable deer population exists such that there is a potential for some natural regeneration of broadleaves.

Public Access & Core Paths

- There are Core paths as identified in the Dumfries and Galloway Core Paths Plan to the south of the plan area, contiguous with the waymarked forest trails and others peripheral to the block eastwards up to the Merrick and on to Loch Dee. The block is considered core for recreational development.

Heritage Features

- There are a significant number of heritage features throughout the area but there are no Scheduled Monuments or Category A listed buildings present.

Waste Management (including felling to recycle)

- Commercial felling operations generate felling debris in the form of brash and lop / top. Unless being recovered for biomass production, this material is generally left on site for soil protection, nutrient cycling and site amelioration. Generally there are no plans to carry out chipping, mulching

or spreading of forest waste over the plan area for ecological site improvement however in response to the infection of *P ramorum* in larch crops, some small scale felling to recycle and chipping trials with the product removed from site for wood fuel may take place.
Detailed plans will be submitted to FCS and SEPA for approval prior to any work taking place (see Appendix II Tolerance table).
Tree guards are not truly bio-degradeable and will be removed for recycling or disposal.

Habitats Regulations Appraisal

- Although Galloway Oakwoods SSSI / SAC borders the LMP to the south east the natural heritage interests of the SAC will not be impacted on by proposed plan work.
  A Habitats Regulations Appraisal is not required.

Appendix I: Land Management Plan Consultation Record

Statutory Consultee	Date contacted	Date response received	Issue raised	Forest District Response
Rosemary Green	15 April 2019	25 April 2019	• Invasive species control (Grey Squirrel within ASNW expansion areas) • Adder conservation policy • Care and expansion of riparian zone and BL habitat networks noted as of benefit to Otters	• Noted in LMP text
SEPA	15 April 2019	26 April 2019	• Forest drains management issues • Identification / protection of Private Water Supplies (PWS) • Potential Construction Site Licences requirements for planned new road / road upgrade construction and associated road drainage • "Management of Forestry Waste" guidance reference • Minimise ground disturbance during ground preparation through use of low intrusive techniques • Concerns regarding increased use of natural regeneration management	• Noted in LMP text
Historic Scotland	15 April 2019	30 April 2019	• No scheduled monuments, category A-listed buildings or designed landscapes within LMP boundary	• Noted in LMP text
Dumfries & Galloway Council	15 April 2019	08 May 2019	• Landscape importance and setting of Merrick wild land area	• Noted in LMP text

			• Recreation importance of corridor towards and integrated management around core visitor facilities (Merrick core path & Bruce's Stone parking and viewpoint) • Biodiversity importance of Native woodland (Glentrool Oakwoods SAC & SSSI) expansion and connectivity	
Cree Valley Community Council	15 April 2019	09 May 2019	• Area important for tourists so greater emphasis on roadside treatment areas • Commitment towards flood amelioration work to slow water run off into burns	• Noted in LMP text
SNH	15 April 2019	10 May 2019	• No impact foreseen regarding adjacent protected areas (Glentrool Oakwoods SSSI / SAC and Merrick Kells SSSI / SAC)	• Noted in LMP text
RSPB	15 April 2019	14 May 2019	• Support for maintenance of open hill top and forest edge management (native broadleaf establishment) and their benefits for Black Grouse	• Noted in LMP text
Scottish Forestry; South Scotland Conservancy	15 April 2019	No response received		
CONFOR	15 April 2019	No response received		
Galloway Fisheries Trust	15 April 2019	No response received		
Saving Scotland's Red Squirrels	15 April 2019	No response received		

Consultee	Issues raised from LMP being on public register	Forest Region Response to consultee	FCS consideration
SNH: Francois Chazel; Operation Officer	• **No objections raised, the natural heritage interests of the Galloway Oakwoods SSSS/ / SAC will not be impacted on by the Kirriedarroch LMP so no Habitats Regulations Appraisal is required.**	• **Noted, main text contains references to Galloway Oakwoods and our proposed BL restock that should benefit the SSSI / SAC and improve connectivity**	•
RSPB: Ed Tooth; Conservation officer	• **Generally welcome plan objectives** • **Comments raised focussing on open hilltop and woodland edges management specific to Black Grouse management and habitat** • **Grazing regimes for Palgowan tenancy** • **Larch removal restocking**	• **Black Grouse issues are addressed throughout LMP text (proposed management should enhance species diversity, increase age gaps difference between coupes, soften woodland edge, create linkages from valley floor to open hill and improve habitat connectivity** • **Restock of larch areas has and will continue to focus on BL and other secondary conifer species** • **Grazing conditions are outwith FLS direct control under terms of the tenancy lease (see additional text 8.3.2)**	•
Dumfries & Galloway	• **Sole record identified as not in LMP data**	• **Site and some additional text included at Appendix II**	•

~~Council:~~ AJ Nicholson; Archaeologist		**~~3.6.3~~**	
SEPA: Simon Watt; Senior Planning Manager	• **No objections raised (welcome enhancement of riparian zones with general advice provided on RBMP, Pollution prevention and Environmental Management, Natural Flood Management, Private water supplies, Waste Management and other Good Practice)**	• **Noted, general advice in the main already contained throughout LMP text)**	•

Appendix II: Supporting Information

II/1.0 The existing forest and land

1.1 History of the land holding

The area covered by the Kirriedarroch LMP was entirely acquired as part of a much larger land purchase in the 1940s (see table below).

Acquisition date	Deed No	Title	Seller
April 1940	118	Glentrool	Earl of Galloway

Afforestation in the block began in the early 1940s and contained some of the earliest FES forests to have significant harvesting programmes. The area has been regularly harvested since the 1980s, starting a programme of restructuring across the plan area and creating a mix of first rotation and second rotation conifer crops.

One of the earliest forest plans prepared for the (as was) Newton Stewart FD this modest scale plan is virtually contiguous with other FES plantation to the south, east and west and FES tenanted open hill ground to the north. Initially a separate land management plan unit for site type considerations, there are good reasons to consider amalgamation of this plan area with one or more of the other LMP areas within the Glentrool forest "massif" that contain common issues.

The creation of larger scale Land Management plans that might additionally focus on landscape scale management of open hill ground areas has been considered but for now a definitive decision on potential plan amalgamations will be delayed until around the 5yr review date for this plan (other plans in the area also have review periods within this timeframe).

II/2.0 Analysis of previous plan

2.1 Aims of previous plan and achievements

Objectives from the previous 2006 plan were as follows:

Previous plan objectives	Assessment of Objectives during plan period
Maintain commercial softwood timber production in forest core	Clearfell and restock with commercial conifer species is ongoing. Premature

	felling of infected Larch (along with some associated Spruce crop) has compromised the medium term sustainable timber supply.
Restructure even aged plantation to create more diverse age structure between coupes to benefit habitat and visual diversity	Planned / approved clearfelling along with *P ramorum* sanitation felling has resulted in improved spatial diversity in many parts of the block.
Increase area of BL, Scots Pine and open space to enhance conservation value of area	Block currently contains around 15.0% by area broadleaf, increased open space particularly at elevation and along riparian corridors and more Scots Pine areas where the species has been used as a replacement for much of the Larch area restocking.
Maintain the current high quality Recreational facilities and investigate further developments	Visitor centre and associated trails / cycle routes remain active but as yet not significantly upgraded or developed.
Link PAWS woodland remnants within LMP to existing Oak woodlands south of Water of Trool	Clearfell to the south east of the plan and subsequent BL restock has enhanced the link to the Glentrool Oakwoods.
Enhance landscape value of area in accordance with scale of landform	Clearferlling and Larch removal has resulted in opening up of views not seen for many years. Large scale coupe at elevation with smaller more intimate coupe size towards the valley bottoms and county roads fit well with landform.

2.2 How previous plan relates to today's objectives

Whilst the 2006 approved plan objectives have generally been met, they have over the period become slightly outdated.
Key Scottish Forestry Strategy themes and objectives for the plan, see table below, are now more directly related to the revised brief (see Appendix IV).

	Priority
Productive; Promote sustainable timber supply through revised felling and restocking plans along with a supporting road construction / maintenance programme.	HIGH

Increase broadleaf woodland creation.	
Healthy; Identify additional non clearfell coupes e.g. LISS / Minimum Intervention management coupes to maintain woodland cover and contribute to the protection and improvement of water and soil quality and provide enhanced resilience. Control invasive species. Utilise Natural regeneration where appropriate. Restructure even aged crops.	HIGH
Cared For; Secure and restore PAWS remnant areas. Follow / exceed UKFS standards and Forest and Water guidelines to maintain and improve water quality in the R Cree catchment. Protect water soil and air and contribute to Scotland's landscape through the management of views from surrounding minor county roads and hill tops. Improve external / internal design through revised, more diverse species choice. Maintain and enhance plan area for priority species. Manage minor Heritage as per FLS guidelines.	HIGH
Accessible; Retain and enhance existing facilities in partnership with local communities	MODERATE

II/3.0 Background information

3.1 Physical site factors

3.1.1 Geology Soils and landform

Lying close to the confluence of the Water of Minnoch and the Water of Trool valleys the area displays many signs of glaciation and is quite diverse. Most of the area is gently sloping save for the Water of Trool valley where the northern slopes are steep.

Peaty gleys cover most of the area (75%) with other peat class soils (20%) and stony brown earth types (5%) in the valley bottoms the remainder. Generally the terrain tends towards stony with a covering of coarse, generally indurated boulder till.

Elevation rises from 70m to the south of the plan area rising up to the north east to the Bennan summit at 562m.

Determined by the altitude and predominance of peaty gley soils, the James Hutton Institute "Land Capability for Forestry" classification for the area is a mixture of F5 rising to F6 on the lower slopes of the Bennan hill (land with

limited rising to that with very limited flexibility for growth and management of tree crops). This has resulted in a relatively limited species choice throughout comprising mainly Sitka Spruce and Sitka Spruce / Lodgepole Pine mixtures.

3.1.2 Water

A number of watercourses drain the plan area principally the Water of Minnoch and the Water of Trool to the west and south respectively and their associated tributaries. The Water of Minnoch tends to move between moderate and good ecological status with the Water of Trool currently classified as having moderate status. Both have a long term expected condition of good.

Water quality in the area is a high priority and our commitment to improve it through enhancement of riparian zones is critical.

All of the principal burns are considered important for water quality so specific treatments that exceed water guidelines recommendations in Forest and Water guidelines 5th edition will be made to create significantly wider aquatic and riparian zones to provide long term protection against disturbance from future forestry operations and loss of light from canopy closure.

The plan area lies within the heavily forested Newton Stewart drainage area. There are significant areas of open ground associated with the plan area and only moderate percentages of forest canopy cover are found over 300m (a figure likely to drop further given our proposed restructuring and planned reduction in future conifer restocking).

No part of the plan area lies within a Potentially Vulnerable Area (PVA) that is affected mainly by river flooding however downstream of the LMP area there are known periodic flooding instances in both Newton Stewart and Minnigaff which are SEPA identified Objective Target Areas (OTA) within a local PVA.

No Natural Flood Management Actions have been identified for the drainage area however a series of actions to manage flooding in the PVA focussing entirely on non-forest activities have been set by SEPA and agreed with flood risk management authorities and are identified in the table below.

Selected Actions
Flood protection scheme/works
Flood forecasting
New flood warning
Community flood action groups
Awareness raising
Emergency plans/response

Strategic mapping and modelling
Self help
Maintenance
Planning policies

Overall management of waterbodies and catchment areas is a key environmental issue and we aim to comply with best practice in minimising sediment release from any forest operations and preventing any deterioration in their ecological status / potential. FES has considered flood risk of peak flows at the exit of the site and also further downstream.
It is appreciated that new planting with associated operations of draining and ploughing can give rise to a very slight increase in peak flow (up to 20% at site scale), there are however no additional areas of new planting proposed for this LMP. With well-designed and significant riparian buffers and, where appropriate, forest wetland creation to minimise the effect and given that the projected felling across all plantation land within the Newton Stewart drainage area is around 12%, it is anticipated that our planned felling within the Kirriedarroch LMP will have no negative impact on the existing flooding risk within the drainage area.
The significance of the potential increase in peak flow will reduce as more water joins from other tributaries and the peak flow is diluted. Clearly if whole water catchments were being proposed for planting this would require greater examination and consideration.
There are private dwellings within or close to the block but there are no known private water supplies; details of all known private water supplies are held in a District GIS layer (see constraints map) and are afforded adequate (50m) buffer areas protection.
All work undertaken will comply with the Forests and Water Guidelines (Fifth Edition).

3.1.3 Climate

The south west of Scotland, relatively close to the Firth of Clyde, has a predominantly mild windy oceanic climate influenced by the Gulf Stream. Annual rainfall in the block is generally above average for the district. Falling mainly during the winter months, October to February rainfall ranges from 1600mm at lower elevation up to 2000mm on the Bennan Hill. Although primarily a mid-elevation plantation, much of the block is susceptible to the prevailing westerly winds with damaging gales likely during the early part of the year. Winters can be severe and a low cloud base is common.
Guidance on Climate Change suggests that the District can expect an increased frequency of extreme weather events with the climate remaining

wet and mild. Whilst there may be little impact on this DP block with regard to primary species choice (mainly conifer) there may be future threats to wildlife habitats. The development and maintenance of a diverse range of habitat networks is considered to be important.

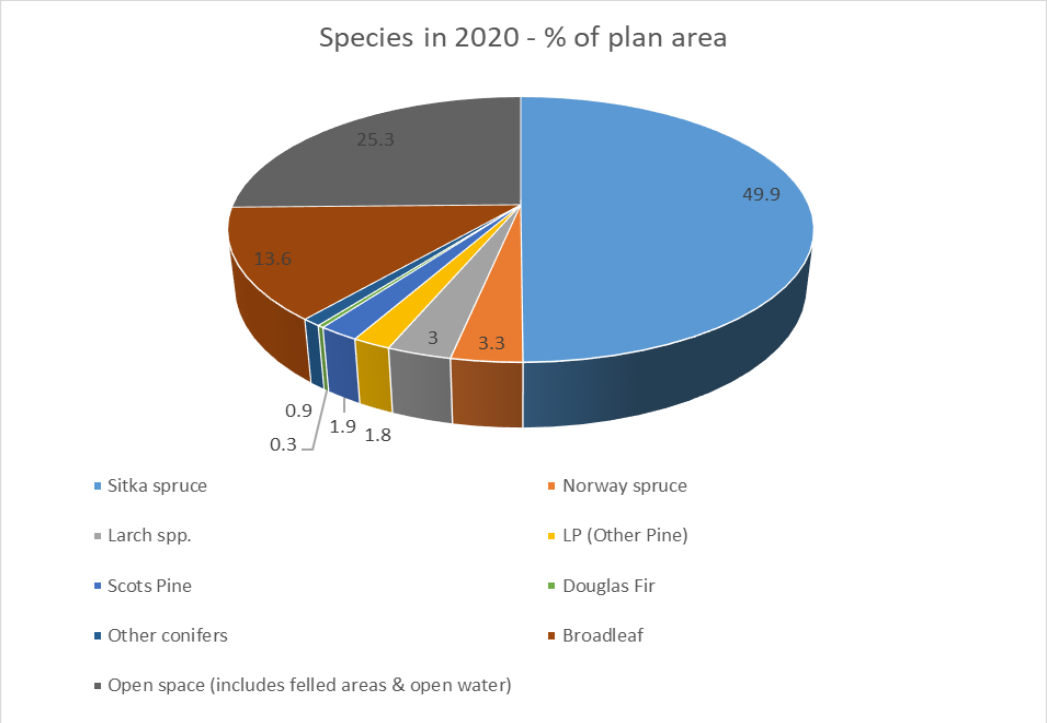
3.2 The existing forest

3.2.1 Age structure, species and yield class

Species / Yield class

Species diversity in the plantation area is now considered to be good, generally improving in line with the 2006 species projections and then accelerated by the premature felling of infected larch.

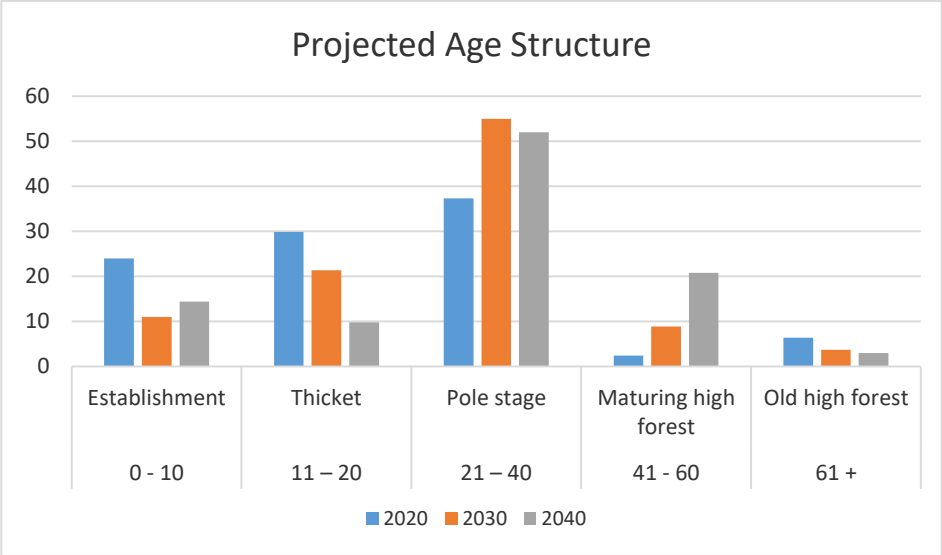
Species in 2020	Total area (ha)	% of plan area
Sitka spruce	805.8	49.9
Norway spruce	54.1	3.3
Larch spp.	49.2	3.0
LP (Other Pine)	28.6	1.8
Scots Pine	31.2	1.9
Douglas Fir	4.3	0.3
Other conifers	14.9	0.9
Broadleaf	220.1	13.6
Open space (includes felled areas & open water)	408.6	25.3
Total	**1616.8**	**100.0**



Pure Sitka Spruce and Sitka Spruce / Pine mixtures still dominate the poorer site types present in the block and they account for around 52% of the plan area. The minor conifer species of Norway spruce, Scots Pine, Larch and other conifers (around 9.5%) and broadleaf (now almost 14.0%) found in the more fertile sites, account for the remainder of the area. Alternative conifer species diversity, with much of the larch component removed under plant health notice for the widespread infection of *P ramorum*, has been compromised in the short term but a substantial increase in Broadleaf planting has improved the situation.
Yield class is variable across the block but generally poor in the areas of deeper peat. Options available to optimise the value of the site include restocking with alternative conifer species better suited to site conditions such as Scots Pine or converting the poorer spruce crops on the peat land areas to low density BL woodland or permanent open space.

Age Structure

There is already a degree of spatial diversity within the Kirriedarroch LMP with all stages of crop growth represented.



Age of trees	Growth stage	Percentage of class at given year		
		2020	**2030**	**2040**
0 - 10	Establishment	24.0	11.0	14.4
11 – 20	Thicket	29.9	21.4	9.8
21 – 40	Pole stage	37.3	55.0	52.0
41 - 60	Maturing high forest	2.4	8.9	20.8
61 +	Old high forest	6.4	3.7	3.0
		100.0	**100.0**	**100.0**

There is a fairly even spread of growth stage from establishment through to pole stage crops but currently fewer areas of Maturing high forest and Old high forest. Over the course of the plan, as the clearfell programme diminishes, the area of maturing woodland increases.
Block restructuring, with 8-10yr age gaps developed between felling coupes (and possibly even wider gaps immediately adjacent to Black Grouse areas) remains an objective and our intentions, where possible, to retain mature conifer species through extending their rotation length (mainly Scots Pine) will maintain and continue to improve the spatial appearance and age class structure of the block.

3.2.2 Access

Although there is light vehicle access into the block at Palgowan farm to the north, the sole egress for timber haulage from Kirriedarroch is to the south

onto the severely restricted unclassified minor public road that runs east from Glentrool village to Bruce's Stone above Loch Trool. This road exits to the west crossing the narrow Water of Minnoch bridge and joins the C46W at Glentrool village (categorised as "consultation route" on the Timber Transport Group Agreed Routes map for Timber Haulage).
The LMP is well roaded and having an extensive internal forest road system (31,350m) across the plan area.

3.2.3 LISS potential

Much of the plan area has low to moderate DAMS scores (Detailed Aspect Method of Scoring) up to 17, so significant opportunities potentially exist for an expansion of areas identified for LISS management (Low Impact Silvicultural System).
To the west of the plan area around the Water of Minnoch valley small areas have already been identified for thinning and LISS. These should be enhanced and expanded on by the inclusion of other adjacent second rotation crops and will be added to the district thinning layer in due course.
LISS is defined as "Use of silvicultural system whereby the forest canopy is maintained at one or more levels without clearfell of areas over 2.0ha".

3.2.4 Thinning potential

Areas to the west and south of the plan area have previously been identified for thinning.
Potentially other second rotation crop areas with low DAMS scores and generally within the valley systems can provide and expanded area for inclusion in the thinning layer.

3.3 Land Use

3.3.1 Agricultural land

FLS open hill ground to the north of the plan is under a full Agricultural tenancy and is projected to remain so for the period of the plan.

3.3.2 Neighbouring landuse

A remote rural area in Dumfries and Galloway, this block generally adjoins other FES Land Management Plan units in all directions as part of the Glen Trool plantation massif and bounds with either other conifer plantation or more commonly onto open hill ground dominated by heather moorland, rough grassland and areas of exposed rock.
Stroan House is a private residence within the plantation to the south, to the north lies the privately owned Palgowan farm where neighbouring land use is more agricultural.

Outwith the plan area to the south lies Glen Trool lodge.

3.4 Biodiversity and environmental designations

3.4.1 Designations

There are no environmental designations (e.g. SSSI, SAC) within the LMP however the Galloway Oakwoods SSSI / SAC and the Merrick Kells SSI /SAC respectively lie immediately to the south and north east of the plan area. Operations within the plan area should have minimal impact on these designated sites.

3.4.2 Habitats and species

The Kirriedarroch LMP, adjacent to the Shalloch LMP to the north, is considered part of the core Black Grouse area for the district (an area of regional importance for the species). A red listed UKBAP species, Black Grouse has been recorded at numerous locations, including lekking areas, on the surrounding open ground along the north and east boundaries of the LMP unit. Large numbers of the species were reportedly present prior to canopy closure and while numbers have fluctuated as tree canopy closure has increased the plan presents a great opportunity to provide for the species. Whilst management to improve habitat will essentially be concentrated around any known lekking areas, the plan will look to both maintain the species range and enhance it through a greater degree of habitat connectivity by creating habitat linkages between valley floor and the woodland edge and by establishing stands of native broadleaf species for winter browsing on adjacent sites and through enhancing the wetter brood rearing areas in the valley floors with scattered broadleaf planting and increased amounts of open ground.

There is Native Woodland (including PAWS sites) to the south of the plan area both within the plan area around Stroan House and externally towards the Galloway Oakwoods. These areas provide a focus for Native woodland expansion.

Red Squirrel is present within the block at low densities however the area is not considered to be a "Red Squirrel Stronghold site". These stronghold areas are highlighted as sites where the assisted survival of Red Squirrel can be prioritised through positive management practices. Whilst we have a significant commitment towards Native woodland expansion to the south of the plan area (including large seeded species within the Oakwoods) and external links to other external broadleaf areas exist, our continued commitment to second rotation conifer plantation throughout the block with increased areas of Scots Pine, Norway Spruce and other small seeded Broadleaf restock will generally ensure that the block remains advantageous

towards Red squirrel and less so for Grey squirrel that are also present. Grey squirrel numbers will be controlled wherever possible.

Pine marten are well established in the area.

Merlin and other upland LBAP priority bird species are associated with the open ground within and surrounding the design plan. All of these wide ranging raptors should benefit from the planned creation of open ground and low density broadleaf corridors linking the lower elevation valley sites to the open ground hill-tops and the other management prescriptions already identified for Black Grouse.

The principal water bodies and existing riparian habitats are well used by Otters for breeding and movement and Water Vole is also present. Positive riparian zone management measures, often exceeding basic water guidelines, such as increasing small seeded BL cover coupled with our aim to keep sections of stream banks permanently vegetated and persisting throughout subsequent rotations will increase both the availability and connectivity of good breeding and feeding habitat for both species.

Environment staff regularly request the construction of brash piles along water courses, to specifically provide excellent cover for rearing, resting and breeding otters. The provision of these features additionally benefits FLS by greatly reducing the likelihood of otters creating resting places or breeding sites within commercial forest stands, provides an alternative valuable deadwood habitat and the brash piles may also be used by a range of other species.

Current government policy via the UK Forestry Scheme (UKFS) dictates that a proportion of standing and fallen deadwood be left in each LMP unit.

Although in general decline, bog habitats (UKBAP priority) are nationally important supporting numerous flora and fauna species. Any conservation or restoration and expansion of bog habitat within the plan would therefore make a significant contribution to biodiversity in particular the targeted creation of additional open ground or peatland edge woodland and their associated conifer plantation removal could significantly improve groundwater levels essential for mire and bog habitats. Although areas of water-logged peat exist, restoration opportunities are generally limited in this LMP area.

3.4.3 Riparian Habitats

The Water of Minnoch and the Water of Trool are classified as having "moderate" overall ecological status but from an acid risk perspective are either "at risk" or "failing".
Accordingly, improving water quality through riparian zone enhancement is a key objective (see section 6.3) and will be addressed through the creation of significantly wider aquatic and riparian zones (with increases to permanent open space and broadleaf areas within and associated with the riparian zones) to provide long term protection against disturbance from future forestry operations and loss of light from canopy closure.

3.4.4 Invasive species

There are no non-native invasive plant species (Japanese Knotweed, Giant Hogweed and Himalayan Balsam) known to be present in the block. If discovered they will be treated as per the District's Invasive Species Policy. Rhododendron is present in a few scattered locations and is being controlled.

3.4.5 Pests and diseases

Dothistroma Needle Blight (DNB) has been identified on Corsican and Scots Pine crops in the district. Whilst DNB has thus far not been found in the Kirriedarroch LMP future DNB surveys may intensify and it's wider presence throughout the block cannot be ruled out.
Phytopthora ramorum infection has recently been confirmed on Larch throughout the district. Significant areas of sanitation felling has already taken place throughout the plan area and it seems likely that in the long term Larch will become a less prominent component of the woodland with increased areas of broadleaf woodland providing most towards species diversity in the block.

Hylobius, the Pine weevil, can cause extensive damage to young conifer crop. As part of the districts chemical minimisation strategy, the *Hylobius* Management Support System (HMSS) is used to measure *Hylobius* numbers on clearfell sites. Using billet traps a sample of the districts conifer restock areas are assessed. Weevil numbers are recorded and are used along with other site data to determine the optimum time for site restocking. This more flexible fallow period between felling and re-stocking may result in restocking not taking place within two years of felling. (see Tolerance table Appendix III as agreed with Scottish Forestry (SF).

3.4.6 Wildfire resilience

Wildfire risk for this LMP is currently low.

Climate Change guidance for the south west of Scotland suggests that significant change to this rating over the period of the plan is unlikely however there are elements of the plan such as the long external boundary links to open moorland to the north, our greater public access focussed around the Visitor Centre and trails and some remnant areas of infected larch crop with poor tree health that should be continually considered and monitored for Wildfire resilience.
Our long term aims within the LMP to reduce the conifer area, increase the area of broadleaf and open space, to increase the use of LISS and to create wider riparian corridors should maintain the overall Wildfire risk as low.

3.5 Landscape

3.5.1 Landscape character

The Land Management plan is adjacent to some of the most remote and unpopulated parts of Dumfries and Galloway, the Merrick Wild Land Area, a small and isolated yet nationally important asset, lies virtually adjacent to the north east of the plan area. The Scottish Natural Heritage National Landscape Character Assessment categorises the entire Kirriedarroch plan area as character type type 181 "Rugged Uplands with Forest" where typically "dark green sitka spruce dominated forest on lower slopes of rugged granite uplands, forest cover reflecting large scale topographic change".
The landscape scale is grand with the essential landscape characteristic that of the unrestricted view of granite outcrops and unforested peaks with a forestry subset where afforestation has taken place.
The land cover of the uplands is dominated by heather moorland and rough grassland and areas of exposed rock.
The area is extremely sensitive to any development that would impact on this distinctive character.
The main issues arising over this character type are

- modification of existing forests and landscape character enhancement through forest design
- restricting forest expansion to prevent the incremental loss of hill farm land, the loss of moorland or Wild Land areas
- inappropriate wind power development given the landscape sensitivity keeping hilltops and summits unwooded and maintaining the Wild land character of the area

In developing this plan design the following key landscape specifics have been addressed:

Improved forest design should reflect topographic diversity in open space patterns, species mix and coupe pattern with the relatively large scale relief allowing for some larger scale felling coupe design in the plan hinterlands.
There are areas within the plan where first rotation conifers have been established on blanket bog that has subsequently proven to be marginal for economic woodland. A prioritised targeted reduction of conifer plantation to be replaced by a graded edge of low density Native woodland will result.
A variety of habitat networks using existing scattered semi natural woodland will be created linking the lower valleys to the slopes and hill summits.
To sustain the constituent features of agricultural areas and hill farming as an essential feature of this forest dominated landscape, there are no plans to diminish associated agricultural land use and all known and discovered heritage features will be buffered within areas of open space.

3.5.2 Landscape designations

Although not located within a nationally designated area, the Kirriedarroch Land Management plan lies to the immediate foothills south of the Merrick, the highest mainland hill in South Scotland, adjacent to the Merrick Wild Land Area, a small and isolated yet nationally important asset.
The area will also lie within a Local Landscape Area designation as identified by Dumfries and Galloway.

3.5.3 Visibility

Whilst there are extensive and dramatic views in all directions from the Bennan hill summit that rises above the surrounding plantations, the LMP is viewed mainly from the minor county roads that fringe and dissect the plan to the west and south and also from the extensive internal forest road network.

3.6 Social factors

3.6.1 Recreation

Kirriedarroch LMP includes the Glen Trool Visitor Centre and its associated car park, one of the core recreational facilities for the South region.
Although low key in nature suited to the forest environment, these facilities nevertheless provide an important, hub for pedestrian trails and cycle routes that link to other major recreation facilities external to the plan area.
Core paths, identified in the Dumfries and Galloway Core Paths Plan, are also present essentially extending eastwards, mainly along the forest road network, towards Loch Trool and further east up to the Merrick and on to Loch Dee and Clatteringshaws.

3.6.2 Community

Lying a little over 1km to the west of the plan area, Glentrool village is the largest discernible local community although there are two small residential properties and other agricultural neighbour interests (Palgowan) that are either contained within or directly neighbour the block.
To facilitate local comment on the plan as part of the Land Management plan process an open drop in meeting was held in the village.
The local Community Council is in receipt of the latest version of our local Strategic Plan and was consulted as a stakeholder in the early scoping of this plan.

3.6.3 Heritage

Text Following *FES Historic Environment Planning Guidance*, this Land Management Plan describes and considers the conservation and management of the historic environment. The LMP includes details of all relevant scheduled monuments, listed buildings, designed landscapes and the most significant undesignated features.
Designated historic environment features are recorded in the Designated Historic Assets Register (maintained by the FCS Archaeologist). Scheduled monuments and listed buildings are managed within a programme of individual Monument Management Plans and Condition Surveys respectively. FCS also maintains a programme of detailed measured survey of our most significant sites in order to enhance the national historic environment record and inform conservation management.
Whilst there are no Scheduled Monuments or Category A listed buildings present in the plan area, a raft of other archaeological heritage features, settlement remains and sheep pens are present and listed in the table below.

Feature name	Feature Description	Grid Reference	Importance
CRAIGNACRADDOCH	ENCLOSURE	NX389815	Local Importance
STROAN	FARMSTEAD	NX384788	Regional Importance
SHEEP PEN	SHEEPFOLD	NX371818	Local Importance
LOW MILL BURN BRID(	FIELD SYSTEM	NX366804	Local Importance
LOW MILL BURN BRID(	STRUCTURE	NX367813	Regional Importance
PULNAGASHEL GLEN	ENCLOSURE	NX371801	Local Importance
LINN CROSH	STRUCTURE	NX372812	Regional Importance
WELL	WELL	NX369791	Regional Importance
STROAN BRIDGE	STRUCTURE	NX376790	Regional Importance
SHEEP PEN	SHEEPFOLD	NX403805	Local Importance
SHEEP PEN	SHEEPFOLD	NX379825	Uncategorised
SHEEP PEN	SHEEPFOLD	NX390823	Uncategorised
KENTIE BURN	STRUCTURE	NX385822	Regional Importance
KNOCKFAD	STRUCTURE	NX370822	Regional Importance
KNOCKFAD	STRUCTURE	NX374823	Regional Importance
WHISKEY BURN	STRUCTURE	NX374820	Regional Importance
WHAUPS NEST KNOWI	STRUCTURE	NX375817	Regional Importance
PULNAGASHEL BURN	HAY REE	NX376798	Regional Importance
PULNAGASHEL BURN	STRUCTURE	NX378799	Regional Importance
STROAN BRIDGE	BUILDING	NX375788	Regional Importance
KNOCK BRACKS	STRUCTURE	NX369816	Regional Importance
HIGH MILL BURN BRID	STRUCTURE	NX368818	Regional Importance
LINN OF GLENCAIRD	SHEEPFOLD	NX369792	Local Importance
LINN HOUSE	BUILDING, ENCLOSURE	NX370791	Local Importance
ENCLOSURE	ENCLOSURE	NX378793	Uncategorised
LOW MILL BURN BRID(	FARMSTEAD, FIELD SYSTEM	NX368810	Regional Importance
PULNAGASHEL GLEN	STRUCTURE	NX379800	Regional Importance
GLENCAIRD MILL	ENCLOSURE, SHEEPFOLD	NX368799	Local Importance
GLENCAIRD MILL	BUILDING(S), HEAD DYKE (POSSIBLE), MILL	NX369799	Regional Importance
KNOCKCRAVIE BURN	FARMSTEAD	NX378828	Regional Importance
WHISKEY BURN	STRUCTURE	NX377822	Regional Importance
KNOCKCRAVIE BURN	HEAD DYKE	NX381830	Local Importance
LOW MILL BURN BRID(	FIELD SYSTEM	NX366812	Local Importance
GLENCAIRD MILL	CORN DRYING KILN	NX369801	Regional Importance
WATER OF MINNOCH	FARMSTEAD, FIELD SYSTEM	NX371807	Regional Importance
STRANFASKET	STRUCTURE	NX377811	Regional Importance
STRANFASKET	FIELD SYSTEM, SHEEPFOLD(S)	NX381812	Local Importance
PULNAGASHEL BURN	HEAD DYKE, STRUCTURE	NX386808	Regional Importance
PULNAGASHEL GLEN	ENCLOSURE, FARMSTEAD, HEAD DYKE, STRUCTURE	NX380807	Regional Importance
RIG OF STROAN	ENCLOSURE, SHEEPFOLD	NX388805	Local Importance
GLENTROOL LODGE	FIELD SYSTEM, SHEEPFOLD	NX402802	Local Importance
GLENTROOL LODGE	STRUCTURE	NX404801	Regional Importance
GLEN TROOL LODGE	ENCLOSURE, HEAD DYKE	NX408803	Local Importance
LINN OF GLENCAIRD	FIELD SYSTEM, SHEEPFOLD	NX370797	Local Importance
PULNAGASHEL BURN	SHEEPFOLD, WALL	NX374799	Local Importance
TORR LANE, GLEN TRC	FIELD SYSTEM	NX390792	Local Importance
STROAN, GLEN TROOL	FARMSTEAD (POSSIBLE)	NX394790	Regional Importance
STROAN, GLEN TROOL	FARMSTEAD, FIELD SYSTEM, KILN, STRUCTURE	NX390790	Regional Importance
KENMURE WOOD	FARMSTEAD, FIELD BOUNDARY(S)	NX403796	Regional Importance
KILN KNOWE, STROAN	CORN DRYING KILN	NX386789	Regional Importance
STROAN BRIDGE	FARMSTEAD, FIELD SYSTEM(S), STRUCTURE	NX375787	Regional Importance
LINN HOUSE	FIELD SYSTEM	NX372792	Local Importance
KNOCKFAD	STRUCTURE	NX376823	Regional Importance
KNOCKFAD	BOUNDARY DYKE	NX371824	Local Importance
WHAUPS NEST KNOWI	ENCLOSURE, STRUCTURE	NX378817	Regional Importance
KNOCKFAD	STRUCTURE	NX373822	Regional Importance
GREEN TORR, GLEN TF	ENCLOSURE	NX399799	Local Importance
PULNAGASHEL GLEN	FARMSTEAD (POSSIBLE), FIELD SYSTEM, SHEEPFOLD(S), STRUCTURE	NX383802	Regional Importance
RIG OF STROAN	FIELD SYSTEM, STRUCTURE(S)	NX381795	Regional Importance
CRAIGET STONE	STONE	NX384795	Other Sites
PULNAGASHEL BURN	FARMSTEAD, STRUCTURE	NX380802	Regional Importance
PULNAGASHEL GLEN	SHEEPFOLD(S)	NX379801	Local Importance
KNOCKBRACKS	FIELD SYSTEM, SHEEPFOLD, STRUCTURE	NX370819	Regional Importance
Bennan Hill Crash Site	PLANE CRASH SITE	NX397823	Local Importance
Pulnagashel	Hay ree	NX389812	Local importance

All significant features will be protected and managed following the *Forestry and Archaeology Guidelines* (2011), the FCS policy document *Scotland's Woodlands and the Historic Environment* (2008) and the supporting *FES Historic Environment Planning Guidelines* (available from the FCS Archaeologist) and ultimately notified to the Council Archaeologist so that they can be recovered and recorded in line with the requirements of the law of Treasure Trove in Scotland.

Known heritage features are marked on workplans before the start of forestry operations. Machine operators are fully briefed on their responsibilities prior to all sites being worked. The known record is based on features recorded on the 1st edition OS Map (1850).

Felling 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. Historic environment features, including drystane dykes, coming to light during forest operations will be surveyed, recorded, mapped and monitored for inclusion in future versions of the Design Plan and to demonstrate Forestry and Land Scotland compliance with the UK Forestry Standard.

At planting and restocking, historic features will be removed from ground disturbing operations with opportunities to enhance the setting of important sites considered on a case-by-case basis (such as the views to and from a significant designated site).

Any recent archaeological surveys that have been undertaken on behalf of FCS have been incorporated into the Forester GIS Heritage Module geodatabase - and any new archaeological surveys required (in unimproved upland areas for example, or areas within which the archaeological record is unusually rich) are undertaken to the standards laid out in *FES Historic Environment Planning Guidelines.* This will ensure that undiscovered historic environment features are mapped and recorded prior to forestry establishment and management operations - and will ensure the continued comprehensive protection of the known archaeological resource.

3.7 Forest Renewables

Forestry Enterprise Scotland (FES) is working to develop the wind and hydropower potential of the land and forests that we manage for the Scottish Ministers. Our aim is to ensure that the potential of the National Forest Estate is developed and managed in ways that

- contribute to the Scottish Government's renewable energy target
- maximise financial returns from the National Forest Estate
- secure benefits for local communities and

- achieve a reasonable and sustainable balance with other FCS objectives

Currently there are no renewable developments planned for the Kirriedarroch LMP.

3.8 Statutory requirements and key external policies

The legal status of the land is purchased.

This Land Management plan is in accordance with guidance supplied in

- UK Forestry Standard (4th edition)
- FCS, the role of Scotland's National Forest Estate and strategic directions
- Forest & Woodland strategies
- Design techniques for forest management planning
- Native Woodland Survey of Scotland
- Rationale for Woodland Expansion
- Policy on Control of Woodland Removal
- Managing Forests in Acid Sensitive Catchments
- Historic Land Use Assessment
- Deciding future management options for afforested Deep Peatland

Appendix III. Tolerance Table

PROCESS TO BE APPLIED IN RESPECT TO ANY ALTERATIONS TO APPROVED FOREST PLANS

1) Adjacency issues will normally be dealt with through delayed felling i.e. a coupe will not be felled until all surrounding crops are at least 2m tall.

2) Where this cannot be achieved then adjacency issues may be dealt with through delayed restocking i.e. a coupe will not be restocked until all surrounding crops are at least 2m tall. Where this approach is adopted an assessment must be made and recorded, at the time of the decision being taken, to ensure wider forest and habitat structure is not being significantly compromised. Such evidence must be presented at 5 year review.

3) Tolerance Table (next page):

	Maps Required (Y/N)	Adjustment to felling period *	Adjustment to felling coupe boundaries **	Timing of Restocking	Changes to Restocking species	Changes to road lines	Designed open ground* ***	Windblow Clearance ****
FC Approval normally not required	N	• Fell date can be moved within 5 year period where separation or other constraints are met.	• Up to 10% of coupe area.	• Up to 3 planting seasons after felling.	• Change within species group e.g. evergreen conifers or broadleaves.		• Increase by up to 5% of coupe area	
Approval by exchange of letters and map	Y		• Up to 15% of coupe area	• Between 3 and 5 planting seasons after felling, subject to the wider forest and habitat structure not being significantly compromised.		• Additional felling of trees not agreed in plan. • Departures of > 60m in either direction from centre line of road	• Increase by up to 10% of coupe area • Any reduction in open space of coupe area by planting.	• Up to 5ha
Approval by formal plan amendment may be required	Y	• Felling delayed into second or later 5 year period. • Advance felling (phase 3 or beyond) into current or 2nd 5 year period.	• More than 15% of coupe area.	• More than 5 planting seasons after felling, subject to the wider forest and habitat structure not being significantly compromised.	• Change from specified native species. • Change Between species group.	• As above, depending on sensitivity.	• In excess of 10% of coupe area. • Colonisation of open space agreed as critical.	• More than 5ha.

NOTES:
* Felling sequence must not compromise UKFS, in particular felling coupe adjacency
** No more than 1ha, without consultation with FCS, where the location is defined as 'sensitive' within the Environmental Impact Assessment (Forestry) 1999 Regulations (EIA)
*** Tolerance subject to an overriding maximum 20% open space
**** Where windblow occurs SF should be informed of extent prior to clearance and consulted on where clearance of any standing trees is required

TABLE OF WORKING TOLERANCES SPECIFIC TO LARCH WITH THE INFECTED ZONE

	Adjustment to felling period *	**Adjustment to felling coupe boundaries**	**Timing of restocking**	**Changes to Species**	**Changes to road lines**
SF Approval normally not required	Fell date for all larch can be moved and also directly associated other species	Larch areas can be treated as approved coupes. Other conifers directly associated with larch being felled, may also be removed up to an equivalent of 20% of the area occupied by the larch or 5 ha, whichever is greater	To be undertaken within the overall plan approval period	Replacement as per the agreed restock plan, but where this is not specified or is larch this may be replaced with either another diverse conifer (not SS) or Broadleaves.	

Approval normally by exchange of letters and map. **In some circumstances Approval by formal plan amendment may be required**		Removal of areas of other species in excess of the limits identified above.	Restocking proposals outwith the plan approval period	Restocking proposals for other species which do not meet the tolerances identified above.	New roadlines or tracks directly necessary to allow the extraction of larch material

Appendix IV. Land Management Plan Brief

The main management objectives for this medium sized plan focus on Timber Production, Biodiversity (Native Woodland habitat restoration and additional habitat creation for Black Grouse and other moorland guild species), Visitor Services (Stroan Bridge Visitor Centre) and Water Quality (for the Water of Minnoch and Loch Trool)

Key Strategic Directions from Role of Scotland's National Estate	Local District Strategic Plan Priorities	Actions / Prescriptions
Healthy: good environmental and silvicultural condition in a changing climate	• Commitment to high quality silviculture and increased use of alternatives to clearfell • Stewardship of carbon resources locked up in Estate's trees and soils • Adapt to climate change and make woodlands more resilient to pressure • Deal with invasive species that threaten habitats and biodiversity	• *Increase* the use of alternatives to clear fell to provide an improved heterogeneous structure to the forest. • *Improve* resilience through smaller coupe size and increased use of woodland managed under LISS, alternative to clearfell and other continuous cover systems where appropriate • *Increase* use of natural regeneration in our restocking • *Control* invasive species as per FES guidelines (specifically *R. ponticum*) • *Continue* with *P. Ramorum* management as per district guidance
Productive: provide sustainable economic benefits from the land	• Contribute to the local economy by maintaining core timber production and providing an appropriate roads infrastructure • Consider species diversity and use of mixtures in forest resilience	• *Meet* production forecast commitment through revised felling and thinning plans • *Enhance* the productive yield by selecting the correct species for site type restocking in line with district goals for diversity • *Increase* the area within the forest block which is part of the district thinning programme to enhance timber quality and provide a wider range of products • *Implement* road construction / maintenance programme and quarry development required to service proposed harvesting operations
Treasured: a multi-	• Involve and engage with local people / encourage	• Continue to *consult* with local communities and stakeholders

purpose resource that sustains livelihoods, improves quality of life and offers involvement and enjoyment	partnership working • Create uniquely special places across the Estate • Recognise the Estate as a place for research and development	through Land Management Plan process • *Incorporate* Research and Development into Land Management Plans including monitoring of *P. Ramorum* • *Maintain and Enhance* views of the forest along county road access to Bruce's Stone
Accessible: woodlands that welcome and are open for all	• Improve access and enhance existing facilities • Use for health benefits and outdoor learning	• *Retain and enhance* Visitor centre environs and carpark facilities for access to Stroan Bridge trails and cycle routes • *Maintain* general accessibility for block
Cared for: working with landscape and the natural and cultural heritage	• Increase area of broadleaf cover in block focussing on creation of habitat networks • Maintain open habitats in good ecological condition • Landscape • Conserve vulnerable species • Safeguard heritage features	• *Increase* area of native BL throughout plan area for added biodiversity, targeting a permanent BL woodland infrastructure along riparian zones and connecting to (expansion of) Caldons Oakwoods • *Create* additional permanent open habitat at elevation linking to recent new woodland creation areas on Bennan Hill • Southern and Western edges block are visually prominent as viewed from surrounding county road network (Straiton road and Bruce's Stone access); *maintain and enhance* local landscape through additional species diversity, open space integrated management and revised coupe shapes to better suit landform • The block is core for Black Grouse (priority species); *maintain* lek and nesting areas for Black Grouse and *enhance* habitat through creation of woodland fringe • The block is not part of the priority area for Red squirrel; *maintain and enhance* area for Red Squirrel (priority species) • *Manage* watercourses and private water supplies within DP unit in keeping with UKWAS standards, Water Framework Directive and Forest and Water guidelines to *maintain and improve* water quality. • *Manage* minor heritage features as

		per FES guidelines
Good value	• Seek diverse range of income streams • Reduce carbon emissions from business activities	• *Facilitate* energy infrastructure as required by national policy • *Manage* resident deer population with wildlife team resource

Appendix V. Assessment of felling and restock proposals within catchments at risk and failing

Whilst Kirriedarroch LMP lies entirely within the larger River Cree catchment, this heavily afforested area impacts on (is impacted by) two acidified sub catchments that are identified as "at risk" or "failing"; Water of Trool incl. Gairland Burn and Water of Minnoch us Water of Trool.

On instruction from South Scotland conservancy and as per the calculation procedure agreed in the recent Laurieston LMP submission, the National Forest Inventory (NFI) dataset will be used to calculate the standing tree cover for the acid sensitive calculations.
The following categories from the NFI dataset are included:

Assumed woodland
Conifer
Mainly mixed conifer
Windblow

The following categories from the NFI dataset have been excluded:

Agriculture land	Mixed mainly broadleaves
Bare area	Open water
Broadleaved	Other vegetation
Failed	Quarry
Felled	River
Grassland	Road
Ground prep.	Shrub
Low density	Urban
	Young trees

Plantation over 30% of catchment
As neither FLS or Scottish Forestry South Scotland conservancy hold stock data for privately owned plantation forest outside of the National Forest Estate (NFE), plant year information is generally unavailable for included categories.
ALL categories included are therefore considered to be mature conifer crop (*figures presented below are therefore notional given that private companies have access to their own stock data figures and could of course supply more precise forest cover figures).*
The calculation also disregards any fallow period (used extensively on the NFE as part of our *Hylobius* Management system), assumes like for like restocking and assumes

no additional felling for *P ramorum* diseased larch which may be felled under a separate management agreement.
From the dataset, there will inevitably be movement from the young trees category into conifer and assumed woodland over 15yrs age and given the current age structure, the intensity of clearfelling may well increase through time.
New Woodland creation (0.0ha) for the LMP duration period 2020-2029 will not impact on the calculation.
The area of closed canopy conifer forest (age > 15years) in these two catchments needs to be less than 30% of catchment in 15 years' time.

See below for base catchment area details as at 06 January 2020.

Catchment name	Water of Minnoch us Water of Trool
Catchment area	5815.0ha
30% of catchment	1744.5ha
Estimated conifer coverage over 15 years old	2709.0ha
Estimated percentage conifer cover over 15 years old	46.6 %

Catchment name	Water of Trool inc Gairland Burn
Catchment area	4720.75ha
30% of catchment	1416.2ha
Estimated conifer coverage over 15 years old	2966.90ha
Estimated percentage conifer cover over 15 years old	62.8%

Plantation cover for both catchments totals 53.9% and therefore exceeds the 30% of catchment threshold.

Felling over 20% of catchment
On instruction from South Scotland conservancy the data used for the calculation stems from the NFI dataset and the NFE.
Although felling dates are variable, all felling here is assumed to be for the same year and not restocked for the entire 10 year period, which would maximise the impact for acidification purposes.
The felled area within the catchment in any 3 year period needs to be less than 20% of the catchment.

Catchment name	Water of Minnoch us Water of Trool
Catchment area	5815.0ha
20% of catchment	1163.0ha

FLS felling areas (in period)	95.1ha
Private sector felling areas	None
Felling percentage in catchment	1.6%

Catchment name	Water of Trool inc Gairland Burn
Catchment area	4720.75ha
20% of catchment	944.2ha
FLS felling areas (in period)	31.5ha
Private sector felling areas	None
Felling percentage in catchment	0.7%

Proposed total clearfell for both catchments amounts to 1.2% and therefore does not exceed 20% of catchments.