



Forestry and
Land Scotland
Coilltearachd agus
Fearann Alba

Fleet Basin

Land Management Plan

2023-2033

South Region

Plan Reference No:

Plan Approval Date: 2023

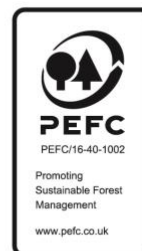
Plan Expiry Date: 2033

We manage Scotland's national forests and land 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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1.0 Objectives and Summary

1.1 Plan overview and objectives

Plan name	Fleet Basin
Forest blocks included	Fleet Basin
Size of plan area (ha)	5780.2 ha
Location	See Location map (Map 1)

Long Term Vision
The Fleet Basin will continue to provide significant sustainable timber volumes as part of the Regional programme, however, over time it will transform into a more diversely structured conifer-focussed woodland with a greater variety of land uses. The plan area will support and provide habitat for both nationally important species like Red Squirrel and Black Grouse, and will also contribute towards carbon sequestration and improvements in water quality.
Management Objectives
<ol style="list-style-type: none"> 1. Continued contribution towards sustainable production of quality commercial timber from a variety of species 2. Manage open ground and other habitats for Priority species (Red Squirrel and Black Grouse) 3. Manage and improve water quality within Fleet Basin water catchment, particularly the Little Water of Fleet and the Big Water of Fleet and help mitigate potential downstream flooding risks 4. Provide resilience against future pests and disease 5. Restore peatland and contribute to Scottish Government Climate Change Plan 6. Maintain and enhance internal Designated sites and heritage features across the plan area
Critical Success Factors
<ul style="list-style-type: none"> • Sustainably maintain the productive timber capacity of the plantation • Effective establishment of all species particularly soft conifer and broadleaf • Timely thinning and other interventions for establishing and maintaining mature trees • Effective habitat creation/management for priority species • Maintain and enhance watercourse condition (poor) throughout Fleet Basin catchment through enhancement of the riparian zones (centred on Little Water of and Big Water of Fleet) • Removal of Larch infected by <i>P ramorum</i> as per National Strategy • Successful targeted peatland restoration

Table 1

Summary of Operations over the Plan Period	
Clear felling (gross)	615.1 ha
Thinning (potential area)	395.1 ha
Restocking (gross)	541.3 ha
Afforestation	0.0 ha
Deforestation	73.8 ha
Forest roads (new)	5690 m
Forestry quarries (existing)	2.4 ha

The forest is managed to the UK Woodland Assurance Standard – the standard endorsed in the UK by the *Forest Stewardship Council and the Programme for the Endorsement of Forest Certification*. Forestry and Land Scotland is independently audited to ensure that we are delivering sustainable forest management.

2.0 Analysis and Concept

The planning process was informed by collecting information about the woodland, which is presented in **Appendix I** and on the Key Features map (**Map 2**). During the development of this plan we have consulted with the local community and other key stakeholders, and a Consultation Record is presented in **Appendix III**.

Below lists the objectives for the site and how the key features present opportunity or constraint. The Analysis of these form the concept for this Land Management Plan.

Objective 1: Sustainable production of quality timber to meet Regional programmes

Analysis: Fleet Basin is a well roaded, core timber production area.

Opportunities: Significant areas of accessible productive crop.

- **Constraints:**
 - Presence of acidified catchments
 - Site types are generally unsuited for thinning / LISS
 - Significant areas across the plan area have previously been clearfelled
 - Creation of significant future additional open space (including potential for peatland restoration) may negatively impact on productivity
 - Mature coning crops required for priority species (Red Squirrel)
- **Concept:**
 - Minimise area of clearfell within plan period
 - Introduce additional areas of Long Term retention management type
 - Generally extend rotation length to create older, more mature crop for priority species benefits

Objective 2: Management of open ground and enhance area for Priority species (Red Squirrel and Black Grouse and others) management

Analysis: Fleet Basin currently has significant internal areas of valuable open ground (designated or otherwise) that are generally disconnected from each other within the conifer monoculture matrix.

The area is also seen as being a key area for both Red Squirrel (Red Squirrel Stronghold site) and Black Grouse (regionally important area) however the current structures are becoming limiting factors.

Opportunities: Maintain existing and create additional areas of connecting open habitats to create wildlife corridors and provide additional diversity.

Expansion of cone bearing mature crop for Red Squirrel (RS) and creation of additional and connected habitat for Black Grouse (BG) (for effective species translocation and maintaining population).

- **Constraints:**
 - Undesirable Natural Regeneration in areas of planned open space
 - Fragmented coupe structure restricting species movement (RS)
 - Limited areas of mature crop to provide food source (RS)
 - Creation of additional open ground habitat (BG)
 - Successful establishment and effective deer management of broadleaves (BL) and alternative conifer (BG)
- **Concept:**
 - Commit to controlling undesirable Natural Regeneration incursion through budgeted thinning and Environment-specific plans (possibly in partnership with other agencies)
 - Extend rotation length of targeted existing mature conifer areas to provide mature coning crop (RS) and potential raptor sites
 - Thin select second rotation crops to extend rotation lengths
 - Enhance habitat connectivity across the plan area for species

Objective 3: Management of Fleet Basin water catchment

Analysis: Fleet Basin covers several acidified water catchments and two principal watercourses, the Little Water of Fleet and the Big Water of Fleet. Both systems rise and fall very quickly and have significant potential for flooding impact on areas external to and well downstream from the LMP area.

Opportunities: Reduce/ mitigate future acidification through creation of more open space, conversion to LISS where appropriate and reduction of water run-off through programmed peatland restoration.

Link identified peatland restoration areas to external areas where similar work is being undertaken and provide potential water quality and downstream flooding benefits.

- **Constraints:**
 - General persistence of densely forested conifer monoculture and continued lack of species diversity
 - Modest areas of open riparian space

- Maintenance of open riparian ground and control of invasive conifer natural regeneration
- Watercourse dynamics (speed of rise/fall)
- External impacts on watercourses (private land landslips)
- **Concept:**
 - Increase area of buffered riparian zones
 - Targeted reduction of conifer plantation
 - Increase species diversity, particularly BL
 - Identify areas for peatland restoration to reduce water flow/run-off across plan area

Objective 4: Resilience against future pests and diseases

Analysis: Although not a large component of the plan area, there remain significant areas of larch across the plan area that require to be removed as per National Strategy for larch within the Management Zone

Opportunities:

- **Constraints:**
 - Fragmented/ isolated areas of larch constrain access
 - Larch removal potentially reduces visual and species diversity
 - Larch removal diminishes potential food source for priority species
 - Successful establishment and effective deer management of BL and alternative conifer
- **Concept:**
 - Larch removal as per National strategy
 - Restock larch areas with site appropriate alternative species for diversity

Objective 5: Identify areas for Peatland restoration to improve carbon capture, ameliorate water movement through the LMP profile and contribute to Scottish Government Climate Change plans

Analysis: Fleet Basin contains significant areas of 'Scenario A' deep peat soils (edaphically unsuited for woodland; Forestry Commission Scotland, 2015) where future tree growth would be poor and peatland restoration would therefore be the default position.

Opportunities: Creation of additional open ground and the reduction of water run-off through peatland restoration coupled with linking the identified restoration areas to external areas where similar work is being undertaken should provide potential water quality and downstream flooding benefits by reducing the loss of aquatic carbon.

- **Constraints:**
 - Deforestation and the creation of significant future additional open space (including potential for peatland restoration) may negatively impact on commercial timber productivity
 - Reductions in areas of mature crop that provide food source for priority species
- **Concept:**

- Identify priority areas for Peatland Restoration (or alternative) and action through clearfell and restoration
- Additional species diversity and/or Peatland Edge Woodland to benefit habitat for priority species

Objective 6: Maintain and enhance internal Designated sites and heritage features across the plan area

Analysis: Small but significant areas of heritage or Designated status are present.

Opportunities: Raise designated sites' status and generally enhance existing features

- **Constraints:**
 - Potential clearfell impacts on Lea Larks site
 - Little evidence of existing features
- **Concept:**
 - Conifer removal and additional open ground/species diversity to enhance sites

Different management options for achieving the plan's objectives were considered against the constraints and opportunities identified during scoping and consultation. The preferred approach is summarised on the Concept map (**Map 3**).

3.0 Management Proposals - regulatory requirements

This land management plan was produced in accordance with a range of government and industry standards and guidance as well as recent research outputs, recognised at the time of its production. A full list of the current standards and guidance which guide the preparation and delivery of FLS Land Management Plans can be found using the link [HERE](#).

3.1 Designations

The plan area forms part of, includes, or is covered by the following designations and significant features.

Table 2

Designations and significant features		
Feature type	Present	Note
Site of Special Scientific Interest (SSSI)	YES	Cairnsmore of Fleet SSSI Lea Larks SSSI Laughenghie and Airie Hills SSSI
National Nature Reserve (NNR)	NO	
Special Protection Area (SPA)	NO	
Special Area of Conservation (SAC)	NO	
World Heritage Site (WHS)	NO	
Scheduled Monument (SM)	NO	
National Scenic Area (NSA)	YES	Fleet Valley NSA Key Cultural and heritage issues within the NSA are the <ul style="list-style-type: none"> • Conservation of designed landscapes • Safeguarding of archaeological sites from disturbance and damage
National Park (NP)	NO	
Deep peat soil (>50 cm depth)	YES	There are fragmented examples of deep peat within the block; targeted peatland restoration opportunities particularly adjacent to Cairnsmore of Fleet SSSI exist
Environmentally Sensitive Area	YES	Western Southern Uplands
Tree Preservation Order (TPO)	NO	
Biosphere reserve	YES	Galloway Hills and South Ayrshire Biosphere
Local Landscape Area	NO	
Ancient woodland	NO	
Acid sensitive catchments (at risk and/or failing)	YES	Little Water of Fleet Big Water of Fleet Airie Burn Pullaugh Burn
Drinking Water Protected Area (Surface)	NO	

The Key Features map (**Map 2**) shows the location of all designated areas and significant features. Any deep peats are indicated on the Soils map (**Map 9**).

3.2 Clear felling

Under previous plan iterations, large areas of the Fleet Basin block have been clearfelled both through approved felling plans and as a response to recent *P ramorum* infestation.

Sites proposed for clear felling in the plan period (including larch areas) are identified as Phase 1 and Phase 2 coupes on the Management map (**Map 4**) and in Table 3 below.

Table 3

Clearfell Summary by Phase and Coupe Number			
Phase	Coupe Number	Fell Year	Gross Area (ha)
1	50018	2026/27	76.5
2	50026	2030/31	4.0
1	50027	2026/27	43.0
1	50028	2026/27	10.3
1	50034	2023/24	26.6
1	50036	2023/24	21.3
1	50039	2023/24	23.3
2	50041	2030/31	53.4
1	50043	2025/26	37.1
1	50054	2023/24	21.5
2	50059	2028/29	28.5
2	50078	2031/32	14.0
2	50080	2031/32	62.3
1	50085	2024/25	52.0
1	50091	2023/24	11.4
1	50102	2025/26	19.3
2	50131	2031/32	34.3
1	50146	2024/25	11.6
1	50147	2025/26	40.3
1	50148	2023/24	17.1
1	50153	2025/26	3.1
1	50606	2023/24	4.2
Total			615.1

Table 4

Clearfell by Species													
		Net Area (ha) by Main Species >20% (or MC, MB)											
Coupe No	Fell Year	C P	DF	E L	HL	JL	LP	NS	SP	SS	MC	MB	Coupe Total
50018	2026/27	-	-	-	-	7.8	-	6.0	-	44.9	-	1.4	60.1
50026	2030/31	-	-	-	2.5	-	-	-	-	1.5	-	-	4.0
50027	2026/27	-	-	-	-	4.5	-	-	-	38.5	-	-	43.0
50028	2026/27	-	-	-	-	-	3.7	-	-	6.4	-	-	10.1
50034	2023/24	-	-	-	-	-	-	-	-	22.8	-	-	22.8
50036	2023/24	-	-	-	-	-	-	-	-	21.0	-	-	21.0
50039	2023/24	-	-	-	-	-	-	-	-	22.8	-	-	22.8
50041	2030/31	-	-	-	-	-	-	-	-	50.7	-	0.2	50.9
50043	2025/26	-	-	-	0.8	0.4	5.9	-	-	29.0	-	-	36.1
50054	2023/24	-	0.7	-	-	2.1	6.0	0.3	-	7.2	-	-	16.3
50059	2028/29	-	-	-	1.3	-	3.8	-	-	22.9	-	-	28.0
50078	2031/32	-	-	-	-	4.0	4.5	-	-	5.3	-	-	13.8
50080	2031/32	-	-	-	-	6.6	25.8	-	-	27.4	-	-	59.8
50085	2024/25	-	-	-	-	-	11.3	-	-	29.5	-	-	40.8
50091	2023/24	-	-	-	1.0	-	1.0	-	-	9.4	-	-	11.4
50102	2025/26	-	-	-	-	1.2	2.1	-	-	16.0	-	-	19.3
50131	2031/32	-	-	-	-	3.8	16.8	-	-	13.0	0.4	-	34.0
50146	2024/25	-	-	-	-	5.5	1.9	-	-	3.5	-	-	10.9
50147	2025/26	-	-	-	-	-	13.1	-	-	27.0	-	-	40.1
50148	2023/24	-	-	-	-	1.0	8.0	-	-	8.0	-	-	17.0
50153	2025/26	-	-	-	1.6	-	-	-	-	0.5	-	-	2.1
50606	2023/24	-	-	-	-	-	-	-	-	3.3	-	0.3	3.6
Plan Area Total		-	0.7	-	7.2	36.9	103.9	6.3	-	410.6	0.4	1.9	567.9

NB Coupe totals: Table 3 shows gross coupe area / Table 4 shows net area of species

Table 5

Scale of Proposed Felling Areas										
Total Woodland Area			5780.2 ha							
Felling	Phase 1	%	Phase 2	%	Phase 3	%	Phase 4	%	Long Term Retention	%
Net Area(ha)	418.6	7.2	211.5	3.6	481.7	8.3	372.7	6.4	152.4	2.6

3.3 Thinning

Thinning helps to maintain healthy, resilient forests that are able to lock up carbon from the atmosphere and store it as woody biomass. Potentially, thinning rather than clearfelling can also reduce impacts on soil and water quality.

Despite the fact that large areas of the Fleet Basin are classified as DAMS 16 or below, many crops have passed their thinning windows and this coupled with a variety of inappropriate site types identifies virtually the whole block as a no-thinning area.

Several areas, totalling 395.1ha (**see 4.1.2 and thinning Map 5**), have been identified as potential thinning sites. Some second rotation coupes could be thinned for conservation benefits, specifically for priority species and their habitats (other opportunities for timely thinning of all future second rotation crops will also be assessed as those crops reach pole stage) and areas identified as low density BL and open areas should also be thinned to remove inappropriate levels of regenerating conifer.

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, as part of a LISS prescription or where conifer encroachment into planned open ground/ broadleaf areas is present.

Where trees are to be removed to accommodate facilities to support approved thinning and CCF i.e. stacking areas, ramps and access racks within adjacent management coupes, then this should ideally be identified in thinning maps and thinning plans as part of the LMP submission. If this is not the case, additional felling for reasonable infrastructure can be agreed by exchange of email. In every instance, the comprehensive thinning prescription will be outlined in advance in work plans, and operations will be monitored by assessing pre- and post-thinning basal areas for key crop components.

3.4 Other tree felling in exceptional circumstances

FLS will normally seek to map and identify all planned tree felling in advance through the LMP process.

However, there are some circumstances requiring small scale tree felling where this may not be possible and where it may be impractical to apply for a separate felling permission due to the risks or impacts of delaying the felling.

Felling permission is therefore sought for the LMP approval period to cover the following circumstances:

Individual trees, rows of trees or small groups of trees that are impacting on important infrastructure (as defined below*), either because they are now encroaching on or have been destabilised or made unsafe by wind, physical damage, or impeded drainage.

**Infrastructure includes forest roads, footpaths, access (vehicle, cycle, horse walking) routes, buildings, utilities and services, and drains.*

The maximum volume of felling in exceptional circumstances over the plan area covered by this approval is 40 cubic metres per calendar year.

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

[N.B. Trees may be felled without permission if they: are of less than 10 cm diameter at breast height (1.3 m); pose immediate danger to persons or property; are completely dead; or are part of Authorised Planning Permission works or wayleave agreements].

3.5 Restocking

Our restocking proposals on clearfell sites have been selected by ESC, on-site observations and the previous rotations. Utilising both BL and alternative conifers, diversification of species has been implemented where appropriate. Species choice also meets the criteria for restocking under UKFS, UKWAS and internal FLS policy.

Native small seeded broadleaves will comprise most of the proposed restocking as well as some native Oak for Ancient Woodland restoration. Proposed restocking is shown on the Future Habitats and Species map (**Map 6**).

Table 6

Restocking							
Phase †	Coupe Number	Gross Area (ha)	Proposed Restock Year	Species	Method *	Minimum stocking Density (s/ha)	Note
2	50018	40.0 23.5	2029	SP NativeBL	R	2500 1600	
2	50026	4.0	2033	SS	R	2500	
2	50027	18.9 5.6 18.0	2029	SS SP NativeBL	R	2500 2500 1600	
2	50028	10.3	2029	SS	R	2500	

Restocking							
1	50034	10.0 16.6	2026	SP NativeBL	R	2500 1600	
1	50036	2.0 19.0	2026	SP NativeBL	R	2500 1600	
1	50039	18.4 3.1	2026	SP NativeBL	R	2500 1600	
3	50041	14.8 12.4	2033	SS SP	R	2500 2500	
2	50043	17.8 19.3	2028	SS NativeBL	R	2500 1600	
1	50054	15.5	2026	SS	R	2500	
2	50059	28.3	2031	SS	R	2500	
3	50078	9.8	2034	BL	R	1600	
3	50080	51.5 4.0	2034	NativeBL SP	R	1600 2500	
1	50085	34.9	2027	NativeBL	R	1600	
1	50091	11.4	2026	SS	R	2500	
2	50102	19.3	2028	SS	R	2500	
3	50131	34.3 23	2034	SS	R	2500	
1	50146	7.3 4.3	2027	SS SP	R	2500 2500	
1	50147	37.5 2.8	2027	SS NativeBL	R	2500 1600	
1	50148	17.1	2026	SS	R	2500	
2	50153	3.1	2028	NativeBL	R	1600	
1	50606	4.2	2026	NativeBL	R	1600	
Total		541.3					

† recently felled awaiting restock (F) / Phase 1 (1) / Phase 2 (2)

* replant (R) / natural regeneration (NR) / plant alternative area (ALT) / no restocking (None)

If the Restock or natural regeneration should fail to reach 1600 stems per hectare (Native Broadleaves) or 2500 stems per hectare (productive Conifers) the site will be beaten-up to the required planting density. This will be assessed at year 3 and year 5 after planting with beat up by at least year 5 for conifers and year 7 for broadleaf.

3.6 Species diversity and age structure

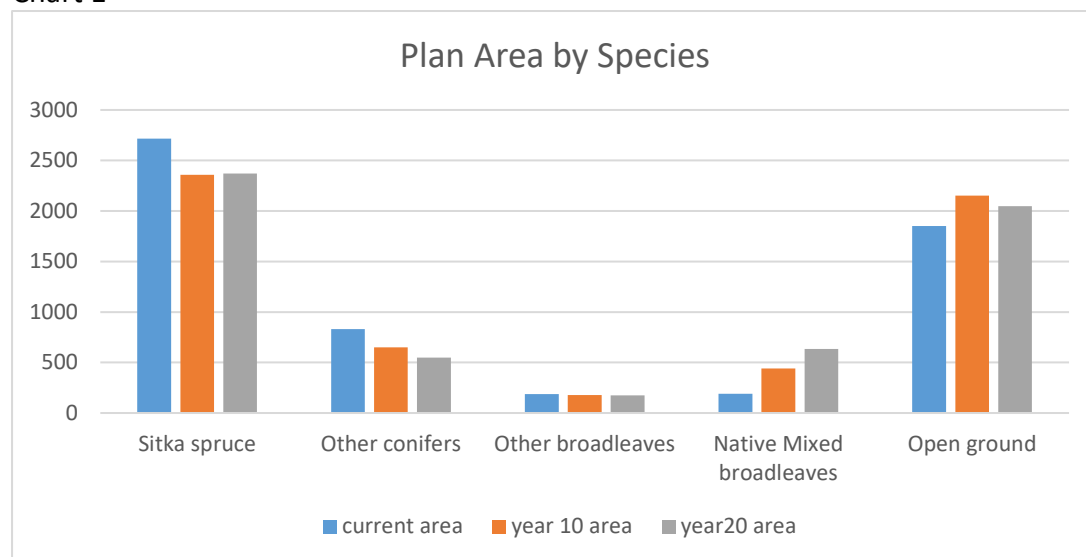
The following tables show how the proposed management of the forest will help to maintain or establish a diverse species composition and age-class structure, as recommended in the UK Forestry Standard. The current woodland composition is shown on **Map 8**.

Stands adjoining felled areas will be retained until the restocking of the first coupe has reached a minimum height of 2m. Where this is not possible (e.g. due to windblow risk), the planned approach to achieving height separation between adjacent coupes is outlined in section 4.1 – Clear felling.

Table 7

Plan area by species						
Species	Current		Year 10		Year 20	
	Area (ha)	%	Area (ha)	%	Area (ha)	%
Sitka spruce	2717.4	47.0	2359.2	40.8	2372.1	41.0
Other conifers	831.9	14.4	649.3	11.2	550.0	9.5
Native broadleaves	191.0	3.3	440.7	7.6	635.2	11.0
Other broadleaves	187.4	3.2	178.8	3.1	174.0	3.0
Open ground	1852.5	32.1	2152.2	37.3	2048.9	35.5
Total	5780.2	100.0	5780.2	100.0	5780.2	100.0

Chart 1

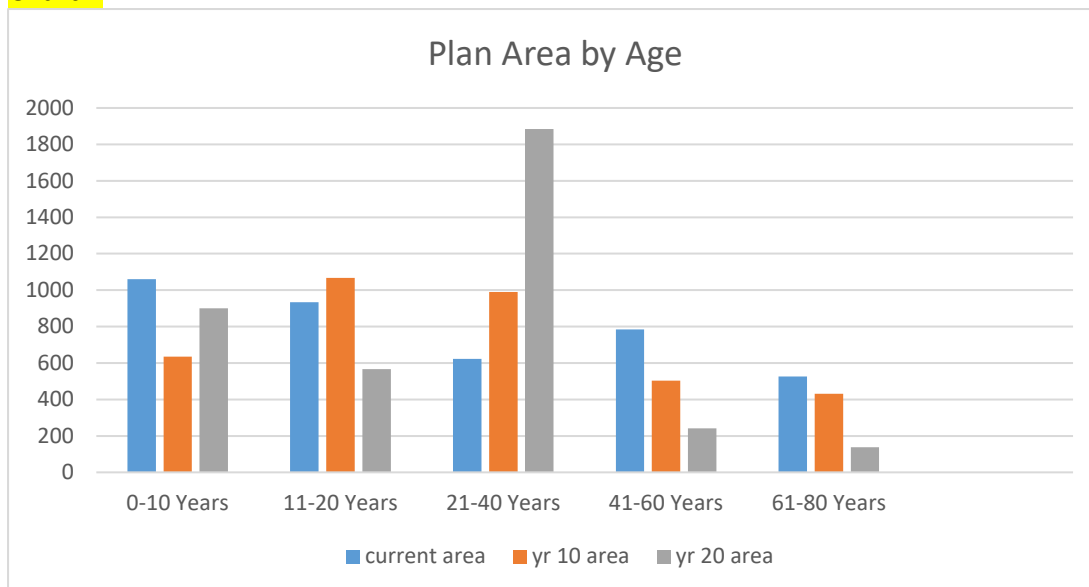


Over the period of the plan the area of native broadleaf cover and open ground increases at the expense of the existing primary and secondary conifer species cover.

Table 8

Plan area by Age						
Age Class (years)	Current Area (ha)		Year 10 Area (ha)		Year 20 Area (ha)	
		%		%		%
0 – 10	1061.1		635.7		900.0	
11 – 20	933.5		1068.0		566.9	
21 – 40	622.6		989.5		1884.0	
41 – 60	784.2		503.8		242.0	
60+	526.3		431.0		138.4	
Total		100.0		100.0		100.0

Chart 2



The Fleet Basin currently appears to have a fairly even spread of age class. Existing site types and elevation, constrained by the potential for windthrow, however necessitate that, despite efforts to retain mature crop for conservation benefits within the period of this plan, the area of crop over 40 years does in fact reduce across the Fleet Basin plan area. This trend notionally continues over the following 10 year period until a significant cohort of 21-40 years crop matures again providing a range of mixed age classes and favouring mature conifer woodland.

3.7 Road Operations and Quarries

Several planned new road constructions are scheduled (see table 9) and around 20km of upgrade and maintenance will also be required to facilitate forest operations over the 10yr plan period.

There is also a single active quarry to the south east of the Fleet Basin plan area (Culreoch quarry (2.4ha)).

Planned new roads, road realignments, road upgrades, quarries and timber haulage routes are all shown on the Road Operations and Timber Haulage map (**Map 7**).

Table 9

Forest Road Upgrades, Realignments, New Roads and New Quarrying				
Phase	Name / Number	Length (m)	Year	Operation
1	50147	720	23/24	New road
1	50102	480	23/24	New road
1	50027	800	24/25	New road
1	50018	1430	24/25	New road
2	50023	450	30/31	New road
2	50023	630	30/31	New road
2	50019	1180	30/31	New road
Total		5690		

3.8 Environmental Impact Assessment (EIA)

Any operations requiring an EIA determination are shown in the table below. If required, the screening opinion request form is presented in **Appendix II**.

Table 10

EIA projects in the plan area		
Type of project	Yes / No	Note
Afforestation	No	There is no proposed afforestation
Deforestation	Yes	Significant areas of priority soil types are proposed for peatland restoration. Where there has been an identified benefit to the wider environment or community, modest increases to permanent open space are also likely.
Forest roads	Yes	5690m of new forest road and around 20000m of upgrading and maintenance of the existing road network is 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 roads projects will exceed the threshold requirements. All road construction will adhere to best practice regarding protection of the water environment from contamination and maintaining natural water pathways.
Forestry quarries	Yes	Culreoch quarry (2.4ha) is active.

EIA projects in the plan area		
		Stone material for forest road upgrade and maintenance to service planned operations will be sourced from this quarry.

3.9 Tolerance table

Working tolerances agreed with Scottish Forestry are shown in **Appendix IV**.

4.0 Management Proposals – guidance and context

4.1 Silviculture

4.1.1 Clear felling

Coupes for clearfelling during the plan period are identified in **Map 4** and **table 3, section 3.2**. Generally coupes will have a minimum of 7yrs, often more, between proposed fell dates.

To achieve the UK Forestry Standard of separation between adjacent crops, adjoining coupes should not be felled before the restocking of the first area has reached an average height of at least two metres.

In South Region we normally expect this to be achieved in 5 years following planting however any unforeseen reduction in separation during the period of the plan will be formally agreed with Scottish Forestry by amendment.

4.1.2 Thinning

Although large areas of the Fleet Basin present as DAMS 16 or less, because of the range of unsuitable site types and crops that have passed their current thinning windows, the vast majority of the block is at present ostensibly a no thin area (refer to **Map 5**).

A series of potential thinning coupes, both first and second rotation crops, have however been identified as part of a potential future conservation network of thin areas that will benefit both Black Grouse habitat and provide long term raptor sites in the future.

Coupes with mature crops present will continue to provide potential raptor sites until the younger crops reach maturity and further opportunities for timeous thinning of all future second rotation crops will also be assessed as those crops near pole stage.

Thin coupes for raptor conservation		
Coupe	Area (ha)	Thin year
50501	38.0	2026/27
50504	53.0	2027/28
50509	36.7	2027/28
50555	47.5	2027/28
50573	38.6	2029/30
Total	213.8	

Some of the more mature thinning coupes identified also contain Pine Marten boxes and thinning treatments should hopefully prove beneficial, not just for the raptors, but for a range of other species such as Pine Marten, Red Squirrel and bat species.

In areas identified as BL/Open ground where undesirable conifer regeneration is an issue (e.g. where habitat or species enhancement is key for environmental benefits), as part of our

environmental remit, where practical and possible we will remove all non-native *regeneration* (including that over >10cm dbh) under a modified thinning operation across the forest block.

Thin coupes for open ground management		
Coupe	Area (ha)	Thin year
50007	8.5	2031/32
50502	17.9	2029/30
50505	68.3	2029/30
50506	60.7	2029/30
50575	26.7	2029/30
Total	182.1	

4.1.3 Low Impact Silviculture Systems (LISS) / Continuous Cover Forestry (CCF)

Refer to **Map 4**.

Future opportunities for Low Impact Silviculture Systems (LISS) to strive for a permanent, mainly woodland cover may be limited as referenced in 4.1.2 but will be considered in the future and where achievable, Group Shelterwood system will become the norm. Group Shelterwood should, through regular thinning and occasional small-scale clearfells of <2ha (perhaps centred on windthrow), provide spatial diversity and areas for either natural regeneration or targeted restock of small seeded native tree and shrub species.

Group Shelterwood 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 the FCS as per the Tolerance Table in Appendix II.

Survey work, prior to any operations, will be required to check for the presence / evidence of protected species like Red Squirrel, Otter and Badger.

All harvesting operations will conform to Forests and Water Guidelines (5th edition) and Water Environment (Diffuse Pollution) (Scotland) regulations 2008.

4.1.4 Long term retention (LTR) ^{1/} Minimum intervention (MI) ^{2/} Natural reserve (NR) ³

Some coupes containing both mixed conifer and or broadleaf have been earmarked for Long Term Retention (to provide long term nesting locations for raptors) whilst many others

¹ Long term retention areas are individual, stable stands and clumps of trees retained for environmental benefit significantly beyond the age or size generally adopted by the woodland enterprise

² Minimum Intervention is management with no systematic felling or planting of trees. Operations normally permitted are fencing, control of exotic plant species and vertebrate pests and maintenance of paths and rides and safety work

³ FLS Natural Reserves are predominantly wooded areas, usually mature and intended to reach biological maturity, managed in perpetuity by minimum intervention where conservation or biodiversity is the prime objective. They are permanently identified and in locations which are of high wildlife interest.

containing broadleaf have been identified in the short to medium term as Minimum Intervention coupes (essentially to provide connectivity corridors and areas appropriate for Black Grouse habitat).

Long Term Retention coupes		
LTR coupe	Area (ha)	Notional Fell year
50009	37.6	2037/38
50040	57.5	2042/43
50084	19.3	2032/33
50133	38.0	2037/38
Total	152.4	

Should biologically rich native woodland communities eventually develop here the coupes could potentially be later reclassified as a Natural Reserve.

There are no coupes currently identified as Natural Reserve within the plan area.

4.1.5 Tree species choice / Restocking

Following winter rainfall events, the Little Water of Fleet catchment is prone to pH values below 5, a level that may be life critical to salmon and may be a significant contributor to the current low spawning numbers in the catchment. As identified by Galloway Fisheries Trust, there are presently areas with suitable habitat that should support fish populations but, only sporadic numbers have been recorded.

Future restocking plans must take this along with potential long term carbon impacts of forestry on deep peat, into consideration.

Sitka spruce nevertheless remains the primary species for timber with predicted average YC ranging up to 20 where site conditions are suitable. Where soils have low nutrient regimes, SS may be planted with Lodgepole pine as a nurse crop. Where ground conditions are suitable, alternative conifer planting is proposed to meet management objectives for timber and woodland diversity, whilst also contributing to habitat provision and aesthetic value.

Alternative conifer species are primarily Norway spruce and Scots pine.

The ESC (Forest Research Ecological Site Classification tool) has been used to identify site suitability and appropriate species choice. With timely interventions, higher yielding areas should produce quality saw logs, with the remaining crop offering small round wood, pulp and biomass.

All proposed broadleaf planting will be native to the area and should complement and/or enrich existing naturally growing scrub and woodland to give the most ecological value.

As per **4.2.2**, broadleaf planting will be targeted to promote improvements in water quality and to assist with future-proofing aquatic habitats. This is particularly relevant within the Little Water and Big Water of Fleet catchments where the aim is to achieve dappled riparian shading through low density broadleaf establishment. Likewise, ecosystem resilience will be the focus of broadleaf planting on/around peats where maintenance of hydrological function and defence against non-native seed rain will be crucial. Proposed for planting are pioneering

species, primarily Downy/Silver Birch, Hawthorn, Rowan, Willow, and with Common Alder planting kept to a minimum in acidified catchments.

Areas of deep peat that have been assessed as not suitable for productive restock, but where peatland restoration is unlikely to succeed (due to site topography and the practicalities of current restoration methods) will be flat planted with peatland edge woodland (low density native broadleaves) or managed as open ground (where deep peats areas are <10 ha) to benefit biodiversity.

The Restocking Strategy for Scotland's National Forest Estate explains that we will minimise chemical usage in restocking (insecticides and herbicides). Site scale options such as delayed planting will contribute to achieving this objective (refer to Map 6).

Restock coupes	
Coupe	Restock intent
50018	Restock with SP matrix to include native BL species along Little Water of Fleet flood plain to marry with Ancient Semi Natural Woodland further south (Scrogs of Drumruck) and provide enhanced riparian buffer.
50026	Core production SS matrix.
50027	Significant area of mixed Native BL to northern edge (possible peatland edge woodland) merging into SS. Small SP area to south on better ground for species diversity.
50028	Core production SS matrix.
50034	Native BL and SP initially proposed however coupe has high potential for positive effect on the neighbouring SSSI if peat restoration takes place. Drain blocking will arrest current erosion and slow water flow to adjacent SSSI.
50036	Native BL and SP initially proposed however coupe has areas of restorable peat with significant drainage channels. Restoration would slow water flow into coupe 50038 and ultimately the adjacent SSSI.
50039	Native BL and SP initially proposed however coupe has potential for, if not presumption to restore peatland, then drain blocking with low density BL to slow water flow into the adjacent SSSI.
50041	SS matrix, additional SP for species diversity and significant open area along acidified Big Water of Fleet watercourse (presumption to restore to peatland).
50043	Core production SS matrix with extensive BL to west, adjacent to open ground, providing part of environment corridor onto other open hill top to east.
50054	Core production SS matrix with significant additional open ground to west adjacent to potential peatland restoration area.
50059	Core production SS matrix.
50078	Native BL and open ground (protected Fen/Marsh habitat) as buffer to open water body (L Grannoch)

50080	Native BL and SP providing part of environment corridor from open ground to west onto other open hill top to east.
50085	Native BL and open ground around SSSI and for BG habitat creation.
50091	Core production SS matrix.
50102	Core production SS matrix.
50131	Core production SS matrix with significant additional open ground to west adjacent to potential peatland restoration area.
50146	SS matrix with additional SP for species diversity.
50147	SS matrix with additional BL as enhanced riparian buffer and open ground to east.
50148	Core production SS matrix.
50153	Native BL as part of enhanced riparian buffer.
50606	Open ground peat bog area bounding acidified watercourse and utilities; presumption to restore

4.1.6 Natural regeneration

There are some productive sites where conifer natural regeneration is occurring. These sites will be monitored and recorded in the FLS sub-compartment database. Where the natural regeneration is the desired species in any future Clearfell area or Group Shelterwood areas, it will be recruited to establish the next rotation crop at the required stocking density. It will be important that thinning/Shelterwood interventions avoid damage to the young trees.

If stocking density is too low it will be beaten up by year 5.

If the natural regeneration is too dense it may be necessary to clear and restock.

There should also be a preference for natural regeneration of broadleaf areas (to maintain provenance and improve the chances of establishment) but where this is unlikely or has not been successful then these areas should be planted/beaten up to the required stocking density and site requirements.

Where the natural regeneration is not the desired species or proposed land use (e.g. on managed open ground) it will be considered against the plan objectives and tolerance table and either accepted (with a plan amendment if necessary) or removed.

It is expected that some of the riparian zones, designed open ground and broadleaf areas will fill in with natural regeneration of both conifers and broadleaves. This will be managed in such a way as to ensure that, where practicable, it does not significantly impose a negative impact upon the objectives of the plan or create a negative impact upon the watercourse in terms of shading and acidification.

There is currently 32% of open ground in the plan area so there is scope for increased woodland cover without compromising UKFS requirements.

4.1.7 New planting

There is no new planting scheduled for the plan area.

4.1.8 Protection

Deer

There is a significant challenge in establishing species palatable to deer such as soft conifers and broadleaves. Generally, within South Region there is a presumption not to erect physical protections against deer with the current Regional Deer Management Strategy being to manage the deer population through shooting by either internal staff or through lease achieving set annual cull targets (determined using integrated data i.e. population counts, fecundity/mortality rates, and damage levels) to meet land management objectives (see appendix VII)

At the work planning stage, we will re-assess all restock areas to determine site specific deer management requirements. If the potential occurrence of deer browsing is high, and where protection through deer population control alone is likely to prove difficult, alternative protection measures such as biodegradable plastic tree shelters may be used.

Establishment will be assessed at year five upon completion of restock when, if tree shelters have been used, a plan for their removal and recycling will be put in place assuming the trees are satisfactorily established and less susceptible to continued browsing pressure.

Broadleaves present across the site are generally vulnerable to deer browsing, therefore more resilient broadleaved species such as Common Alder, Downy Birch and Hawthorn, may be planted where suitable and in line with UKFS best practice (e.g. limiting Alder planting within acidified catchments). Specific forest design aims to facilitate effective deer management, however, further consideration for lines of sight will be taken during the work planning process and amendments sought where necessary.

Tree pests and Diseases

See Appendix I Tree Health for detail

4.1.9 Road operations, Timber haulage and other infrastructure

Forest road access throughout the plan area is generally good with only a modest requirement for new road construction to access some proposed felling coupes.

The A712 Queens Way road to the north and the minor C13S road to the south are currently respectively categorised as Consultation and Agreed routes in the D&G Timber Transport Groupe Agreed Routes map for Timber Haulage)

The Area Engineer Roads and Transport Division will be consulted at least 5 weeks prior to start of operations.

To avoid the risk of using rock of an unsuitable chemical content and to reduce the impact of stone transportation on the county road network, stone material for forest road upgrade and construction will be sourced locally from Culreoch quarry.

Development quarry work over the period of the plan may be required and where this is undertaken all works shall be carried out in accordance with the Quarries Regulations (1999).

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

Additional quarry development outwith the agreed tolerances will be submitted to Scottish Forestry for approval prior to any work taking place (see Tolerance table appendix IV). Map 7 shows the existing forest road network, planned new roads. Main egress points and agreed Timber Transport routes.

4.2 Biodiversity

4.2.1 Designated sites

There are three designated sites associated with the Fleet Basin LMP. All of the sites have agreed management plans in place.

Designated Site	Site condition	Description	Objectives
Lea Larks SSSI	<ul style="list-style-type: none"> Rock outcrop; favourable, maintained 	Part of the Cairnsmore of Fleet granite mass, the exposed crags provide a good example of Caledonian igneous rock type (granite) representing the best example of this type of Southern Uplands geology.	<ul style="list-style-type: none"> Maintain integrity of unobscured rock structures Maintain unobscured long distance views of rock exposures
Cairnsmore of Fleet SSSI	<ul style="list-style-type: none"> Upland assemblage; favourable, maintained Blanket bog: unfavourable, recovering 	Large upland granite massif	<ul style="list-style-type: none"> Maintain extent of upland assemblages Maintain or increase extent and quality of blanket bogs (enhance diversity of rarer plant species) Support use of site for recreation
Laughenghie and Airie Hills SSSI	<ul style="list-style-type: none"> Hen Harrier (not breeding); favourable 	Large area of unplanted moorland (includes two oligatrophic lochs, Stroan and Skerrow) supporting a mosaic of acidic grassland and wet heathland	<ul style="list-style-type: none"> Maintain and enhance diversity of breeding birds especially rarer species and Black Grouse Maintain grassland and heathland communities

4.2.2 Native woodland

This plan seeks to protect and enhance existing areas of Native Woodlands and, where appropriate, expand the area to maximise habitat connectivity. Efforts to extend/establish

native woodland will focus on riparian zones across the plan area (specifically to the south on the Little Water of Fleet to link to the Native Woodland fragments) and also in other areas surrounding peatland restoration sites or on sites adjacent to the SSSI designated site. Where appropriate along watercourses, FLS intend to establish a light open-broadleaf woodland mosaic to improve overall water quality, assist with bank stabilisation, and to help protect aquatic habitats from the effects of climate change (e.g. through the provision of dappled shading and some woody debris/leaf litter). Planting should be focused where watercourses widen while aiming to avoid areas prone to localised flooding (to alleviate tree stress/death). Native broadleaves will be grouped and consideration will be given to forming thorny shrouds (e.g. Hawthorn) around more palatable species. Whilst the occurrence of naturally regenerating broadleaves in heavily browsed areas is not generally expected, it will be encouraged where present and appropriate for the site. Regeneration of non-native conifer species is expected due to the presence of neighbouring plantation. Monitoring will be carried out to ensure conifer regeneration does not compromise the establishment and growth of broadleaved species. Broadleaves present across the site are generally vulnerable to deer browsing, therefore more resilient species such as Common Alder, Downy Birch and Hawthorn, will be planted where suitable and in line with UKFS best practice (e.g. limiting Alder planting within acidified catchments). The forest design aims to facilitate effective deer management, however, further consideration for lines of sight will be taken during the work planning process and plan amendments sought where necessary.

4.2.3 Ancient woodland / Plantation on Ancient Woodland sites (PAWs)

There are no Ancient Semi Natural Woodland (ASNW) or Long Established of Plantation Origin broadleaf woodland sites within the block however externally to the south fragments of ASNW exist (Scrogs of Drumruck and Carstramon Wood).

Native broadleaf restock is planned for around here with an overall long term aim for connectivity to native woodland sites and to increase the area of native broadleaf species.

4.2.4 Protected and priority habitats and species

All forest management operations involve a planning process before work commences which includes checks for wildlife and important habitats. Work plans will be adjusted if necessary to avoid disturbance, and opportunities to further protect species or enhance habitats will be identified.

Following felling operations, planting will be re-designed around any priority habitats that are revealed. (This includes species rich Groundwater Dependent Terrestrial Ecosystems (GWDTE) which will be protected as per current best practice.) Deviations beyond tolerance will be referred to Scottish Forestry for consideration.

Blanket bog

As a UKBAP Priority Habitat, FLS has a duty to further the protection and enhancement of blanket bog under the Nature Conservation Scotland Act (2004).

FLS are committed to a long-term peatland restoration programme and have already restored similar sites both regionally and nationally. With the restoration potential for Blanket bog across the Fleet Basin being moderate to high, a key objective of this plan is to continue these efforts by initiating a phased restoration programme, utilising best practice techniques to achieve re-wetting of peat following tree removal.

Generally sites identified for some level of restoration potential are occupied by first rotation plantation however some second rotation opportunities also exist and require further soils investigation (see section 4.6.3)

Upland birchwood

FLS has a duty to protect this priority habitat and ensure the condition does not deteriorate. Efforts will be made to remove naturally regenerating conifers and invasive species from these areas.

Upland flush, fen and swamp

FLS has a duty to protect this priority habitat and ensure the condition does not deteriorate. Efforts will be made to remove naturally regenerating conifers and invasive species from these areas.

Upland Heathland

FLS has a duty to protect this priority habitat (extensive areas centred on the Fell of Fleet and Loch Skerrow surrounds) and ensure the condition does not deteriorate. Efforts will be made to remove naturally regenerating conifers and invasive species from these areas.

Oligotrophic or Dystrophic Loch

FLS has a duty to protect this priority habitat (Loch Grannoch and Loch Fleet) and ensure the condition does not deteriorate. Efforts will be made to remove naturally regenerating non-native conifers from the surrounding open ground.

Red squirrel

FLS holds a single licence to cover forest management activities on the national forest estate (NFE) that may impact Red Squirrels. This is consistent with the objective of the Scottish Biodiversity Strategy to address species management issues. All works within the Plan area will follow the assessment and mitigation actions stipulated by this licence.

The LMP unit is currently identified as priority woodland and one of a small suite of “Red Squirrel Stronghold Sites” designated by the Scottish Government where Red Squirrel can be helped to survive through positive management practices, as such is considered a core area for Red Squirrel (UKBAP).

One of our long term objectives through efforts to extend rotation length is to provide a mixed age class, but favouring mature conifer woodland, that guarantees a food supply and habitat that will remain advantageous towards Red squirrel. Recent surveys confirm the presence of Red Squirrel (UKBAP priority species) at healthy densities throughout the block; however, given the blocks connectivity to surrounding broadleaf woodland, it is highly

vulnerable to Grey Squirrel colonisation (in recent years populations of Greys have been confirmed and monitored through sightings across the plan area).

Organisations such as Saving Scotland's Red Squirrels (acting under Scotland Wildlife Trust) and local squirrel groups are subsequently notified and if seen as a significant threat, these groups may then initiate further monitoring and or control actions as required.

Black Grouse

The Fleet Basin LMP is considered to be a key area in the Region's strategy for Black Grouse (red listed UKBAP species) to both support existing lekking groups and maintain general numbers, enhance nesting and brood rearing habitats and also to provide additional connectivity between key leks to the north and south. This plan presents an excellent opportunity to improve provision for the species through a mosaic of open and woodland habitats, additional native broadleaf establishment and increased areas of open ground. Lekking areas have been identified at Loch Grannoch and the Fell of Fleet with additional important lek sites areas at Loch Skerrow and the Clints of Dromore. The importance of the creation and enhancement of connectivity corridors of open space with low density broadleaf between the wetter valley floors, the woodland edge and up to open hill ground to provide foraging habitat between lekking sites and therefore encourage the dispersal of juvenile hens cannot be overstated.

Black Grouse sites		
Site	Issue	Concept
Loch Skerrow area Coupes 50111 & 50118	Conifer regeneration is negatively influencing our intention to create areas of open ground and broadleaf	Remove non-native conifer regeneration Maintain high and low density native broadleaf groups for optimal brood rearing habitat Reduce canopy cover and create more open structure Block drains and leave wet areas unplanted
Backhill of Orchars Coupe 50200	Improve grassland condition for brood rearing habitat	Consider targeted grazing to develop variety of grass sward structure and reduce dominance of Purple moorgrass
Fell of Fleet/Lea Larks and Craigwhinnie Coupe 50085	Shortfall in suitable moorland habitats	Early clearfell Maximise brash removal Establish high and low density native broadleaf groups for optimal brood rearing habitat Reduce canopy cover and create more open structure Block drains and leave wet areas unplanted

Raptors

A variety of raptors such as Common buzzard and Goshawk are present across the LMP area however recent harvesting has diminished the number of nesting site locations. Identifying coupes for Long Term Retention (LTR) until younger surrounding crops mature (challenging given the unthinned nature of crops on poor and exposed site types) or identifying coupes of younger crop for thinning to provide stands that may become more windfirm and be suitable for nesting is a potential solution to providing more permanent, longer term nesting areas that would avoid the need for bird relocation as a result of harvesting operations. Despite Fleet Basin's notionally large element of 16 DAM areas, both options present difficulties due to poorly exposed site types (sections 4.1.2 and 4.1.4 refer).

Accordingly several easily accessible and well roaded coupes of around 20.0ha in size, around 1km apart that were either notionally due for clearfell within phase 1 or are coming up to an age where they could potentially be thinned have been identified to kickstart this process and accommodate the birds (see tables in sections 4.1.2 and 4.1.4)

Any enhancement of the LMP area by providing a greater expanse of mature conifer crop would also provide serious food resource benefits for the resident Red Squirrel population.

Other

Pine Marten and Nightjar use the block.

Riparian zones support Otter. The plan design aims to positively contribute to aquatic habitat quality via the creation of riparian buffer zones and low density native planting (refer to section 4.7.2).

Badger are also present. Set locations will be identified and protected during forestry operations, with necessary licences sought as part of the work planning process.

In line with the Scottish Biodiversity Strategy's aim to resolve species management issues, all works within the plan area will follow standard assessment and mitigation actions as part of the work planning process.

4.2.5 Open ground

Open ground (including peatlands, rides and forest road corridors) has been incorporated into the design to ensure suitable habitat is available to support a range of invertebrate species. Road and ride management will be planned carefully to minimise disturbance to these species.

Peatland restoration is proposed for several coupes adjacent to the Cairnsmore of Fleet SSSI where similar work undertaken by NatureScot has already taken place (see also section 4.6).

Peatland restoration sites will typically be buffered using peatland edge woodland and/or open ground. Broadleaf establishment and ongoing low levels of disturbance will help maintain hydrological functioning of peatland units and offer protection from non-native seed rain. Broadleaves (typically pioneering Birch, Common Alder and Willow species) will form a natural component of the peatland ecosystem mosaic with woodland cover, improving the resilience of existing/restored peatlands to climate change by providing shading to ground flora, lowering exposure to wind, and reducing water level drawdown

during drought conditions. Planting will be concentrated on drier, mineral soils above the water table to avoid significantly negatively affecting hydrology.

Several areas of open ground, including sites at Craigherron (south of Loch Grannoch), Loch Skerrow and Loch Fleet, provide important areas for connectivity as a dispersal route between Black Grouse leks to the north and south of the Queens Way and for essential brood habitat. Conifer regeneration in these areas is an issue and ongoing removal may be required to maintain the low density BL corridors.

Planned open space tends to be a mixture of permanent open space centred on heritage sites, open areas along the main watercourses and of course peatland restoration areas. Post clearfelling, there will be no conifer restocking within 20m (and on occasion up to 50m) within either the main watercourse riparian zones or any Groundwater Dependent Terrestrial Ecosystems (GWDTEs) in particular springs/ flushes identified.

Advice and comments from the Galloway Fisheries Trust and SEPA will be taken into account when planning the management of natural regeneration and through the delivery of this Land Management Plan (LMP).

4.2.6 Dead wood

Opportunities for retaining or creating deadwood in this predominantly conifer woodland will be identified during the planning of all felling and thinning works, favouring areas with the highest deadwood ecological potential. Valuable deadwood and deadwood areas, some associated with wetland areas scattered throughout the block, will be marked on contract maps for retention and potential expansion. Areas of natural reserve will offer some of the best opportunities for the development of standing and fallen deadwood. Where it is safe to do so, standing mature dead trees will be retained as these offer excellent potential for a range of species.

4.2.7 Invasive species

Invasive Non Native species are present in the woodland.

Rhododendron ponticum, Yellow Archangel, Japanese Knotweed and Himalayan Balsam will be surveyed and wherever practically possible eradicated. Invasive non-native species (INNS) can impact directly on many environmental aspects of an area and are specifically recognised as a significant risk to water environments potentially causing problems for communities who rely on rivers and lochs for their livelihoods.

Control measure treatments for areas of Rhododendron ponticum have previously taken place. Monitoring is ongoing and persistent identified groups will continue to be treated as per the Region's INNS Policy.

4.3 Historic Environment

Refer to **Map 12**.

Our key priorities for archaeology and the historic environment are to undertake conservation management, condition monitoring and archaeological recording at significant historic assets;

and to seek opportunities to work in partnership to help to deliver Our Place in Time: the historic environment strategy for Scotland (2014) and Scotland's Archaeology Strategy (2015). Significant archaeological sites will be protected and managed following the UK Forestry Standard (2017) and the FCS policy document Scotland's Woodlands and the Historic Environment (2008).

Harvesting coupes, access roads and fence lines will be surveyed prior to any work being undertaken in order to ensure that upstanding historic environment features can be marked and avoided. At establishment and restocking, work prescriptions will remove relevant historic environment features from any ground disturbing operations and replanting. Where appropriate, significant historic assets are recorded by archaeological measured survey, see active conservation management and may be presented to the public with interpretation panels and access paths. Opportunities to enhance the setting of important sites and landscapes will be considered on a case-by-case basis (such as the views to and from a significant designated site).

The Regional Historic Asset Management Plan includes conservation management intentions for designated historic assets on the National Forest Estate. Details of all known historic environment features are held within the Forester Web Heritage Data and included within work plans for specific operations to ensure damage is avoided. Significant historic environment features will be depicted on all relevant operational maps and machine operators will be fully briefed on their responsibilities prior to all sites being worked. Areas of historic environment interest should be checked both on FLS's internal historic environment records and also with the Council's HER prior to the commencement of forestry activities. Any upstanding features should be clearly marked, both on the ground and on operational maps. Care should be taken to avoid any damage to surviving structural elements (see Appendix V).

4.3.1 Designated sites

There are no Scheduled Monuments or Category A-listed buildings or Inventory gardens or designed landscapes present within the boundaries of the Fleet Basin LMP.

4.3.2 Other features

See Appendix V.

4.4 Landscape

4.4.1 Designated areas

There are no landscape designations for the Plan area.

4.4.2 Other landscape considerations

With other FLS plantation to the north, the Fleet basin is the southern edge of an extensive conifer plantation massif and is surrounded on three sides by extensive areas of open ground and agricultural pasture. Despite its extensive geographical spread, the plantation is typically

viewed only intermittently from a distance. However, from within the plantation its sheer size and the many dominant features that arise become much more apparent.

Internally landscaping will focus on the increased open space along watercourses and expansion of existing open ground at elevation.

The NatureScot Landscape Character Assessment classifies the plan area as a mix of “Rugged Uplands with Forest”, large granite outcrops in a grand landscape scale with spruce dominated forests below, “Foothills with Forest” with typically a dark green blanket of conifer forest covering undulating foothills, “Foothills”, undulating land between 170 and 250m dissected by valleys and “Narrow Wooded Valley”, smaller scale landscapes of narrow incised valleys with wooded slopes enclosing pasture floors.

Issues in these areas include:

- Forestry expansion obscuring topographic interest and loss of open ground (particularly hill farm land)
- Threats to cultural features and wildland scenic areas through forestry planting
- Potential wind power development
- Modifications to existing forests and landscape character through forest design

In developing this plan the following have been addressed:

- There are areas of conifer plantation on blanket bog where a targeted reduction in plantation and the establishment of peatland edge woodland may be appropriate.
- A variety of habitat networks will be created linking lower valleys to slopes and hill summits often using scattered semi-natural woodland.
- Large scale landscapes may well allow for larger scale felling coupes at the open hill interfaces
- Heritage features will be buffered in open space and any area under agricultural use will not be diminished.
- Alternative species will be used where appropriate.
- Currently there are no specific renewable developments planned for the Fleet Basin LMP

4.5 People

4.5.1 Neighbours and local community

Several neighbours have taken an active interest in the development of the plan and their aspirations have been incorporated where they do not conflict with the objectives of the plan and are consistent with FLS’s approach to land management.

4.5.2 Public access

There is little in the way of formal recreation facilities within the plan area however Sustrans route 7 runs north-south through the plan with other Core paths running east-west and north-south. Forest roads are also used by foot traffic as a means to access some areas of open hill ground.

Visitors are welcome to explore FLS land, and will only be asked to avoid routes while certain work is going on that will create serious or less obvious hazards for a period (e.g. tree felling).

Scotland's outdoors provides great opportunities for open-air recreation and education, with great benefits for people's enjoyment, and their health and well-being. The Land Reform (Scotland) Act 2003 ensures everyone has statutory access rights to most of Scotland's outdoors, if these rights are exercised responsibly, with respect for people's privacy, safety and livelihoods, and for Scotland's environment. Equally, land managers have to manage their land and water responsibly in relation to access rights and FLS will only restrict public access where it is absolutely necessary, and will keep disruption to a minimum.

Woodland Management in Visitor Zones

Visitor Zones have been identified in areas where FLS encourage and manage access or where the woodland managed by FLS interacts with popular visitor sites or access routes. Visitor Zones are mapped on **Map 13**, *and this map specifies management interventions identified to be carried out in the next ten years (italicised text is optional – only include if specific interventions have been identified and mapped)*

In these areas, single trees or small groups of trees will be removed when necessary to protect facilities, infrastructure and trails, or to enhance the setting of features, or to maintain existing views.

Woodland in these zones will also be thinned, or trees re-spaced, for safety reasons (including to increase visibility to ensure that sites are welcoming and feel safe) and where it is necessary to enhance the experience of the forest setting, through the development of large trees, or preferential removal of trees to favour a particular species.

4.5.3 Renewables, utilities and other developments

Currently there are no specific renewable developments planned for the Fleet Basin LMP unit however the possibility remains that the area could be subject to future windfarm and/or mineral extractions applications.

Forestry and Land Scotland (FLS) 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 FLS objectives

4.5.4 Support for the rural economy

FLS supports a sustainable rural economy by managing the national forests and land in a way that encourages sustainable business growth, development opportunities, jobs and investment.

4.6 Soils

4.6.1 Protection and Fertility

There will be minimal soil disturbance and machine movement on sites with clayey soils to reduce the risk of compaction or damage to the soil structure. Brash mats (or alternative measures) will be used to protect sensitive soils. Except for sites targeted for peatland restoration and coupes located within acidified catchments, felling residue will usually be left on site to allow nutrient recycling, with consideration for the practicalities of restocking.

4.6.2 Cultivation

Where required, the choice of ground cultivation technique will consider the short-term benefits for establishment against any long-term side effects on tree stability, access for future forest operations and the environment. There will be a preference for the least intensive technique, with no cultivation (straight planting) being employed in wet woodland and riparian areas.

4.6.3 Deep peats

A combination of detailed soil data (1:10,000) and site investigation have identified areas of deep peat as a component of the Fleet Basin plan.

Some peat types (8a, 8d, 9a, 10a, 10b, 14, 14h, 14w) are classed as 'Scenario A' soils: edaphically unsuited to woodland. Additionally, 10a and 10b peat types are associated with raised bog habitats. Lowland raised bog and blanket bog are UK BAP priority habitats and therefore a presumption to restore.

In the LMP process because of the potential negative impacts on water quality, biodiversity and habitat provision by restocking of deep peats, by default we will not commercially restock areas where Scenario A peat types dominate, and will include such areas for further assessment for either peatland restoration, or manage as native broadleaf or peatland edge woodland (PEW).

Areas where peatland restoration is unlikely to succeed (due to site topography and the practicalities of current restoration methods) but should not be commercially restocked due to soil type, will be flat planted with low density native woodland (PEW) or managed as open ground (where deep peats areas are <10 ha) to benefit biodiversity. FLS is preparing a Peatland Restoration Strategy which will be published in due course (incorporating the 'FES Lowland Raised Bog and Intermediate Bog Strategy', 2013).

In the interim, we will take a precautionary approach to restocking on deep peat soils, following the principles laid out in the FCS practice guide 'Deciding future management options for afforested deep peatland', in particular where there is a 'presumption to restore'. Sites for which there is a 'Presumption to restore' are defined as:

- Habitats designated as qualifying features in the UK Biodiversity Action Plan, or on Natura sites, Ramsar sites, Sites of Special Scientific Interest (SSSI) or National Nature Reserves (NNRs);
- Sites or parts of sites where restocking is likely to adversely affect the functional connectivity (hydrology) of an adjacent Annex 1 peatland habitat (as defined in the EU habitats Directive) or a habitat associated with one;

- Sites where deforestation would prevent the significant net release of greenhouse gases

After areas for which there is a presumption to restore are identified, the remaining afforested peatlands will be investigated, looking for evidence to support replanting, as per the FCS Practice Guide. If evidence is found that they will clearly support good growth of Yield Class 8 or more, then they will be restocked. If no evidence is found, they will either be restored, if this is considered to be achievable, or if not, e.g. on slopes of greater than 5%, have a low density native woodland established (PEW).

4.7 Water

4.7.1 Drinking water

There are no Scottish Water drinking water catchments or water abstraction sources designated as Drinking Water Protected Areas under the Water Framework Directive or Scottish Water Assets (including water supply and sewage pipes, water and waste water treatment works or reservoirs) in the area in the block.

A single private water supply for Meikle Cullendoch is present (Appendix VIII refers)

All private drinking water supply points (and pipes) are recorded as a layer in our Forester Web GIS (included in Map 2).

This is consulted during the work plan process for all forest operations to ensure their protection. Affected neighbours will be consulted prior to any works commencing. Features will be clearly marked on all contract maps, as well as on the ground. The design of the future forest has incorporated an open space or broadleaf buffer of at least 50m around these supply points to minimise future disturbance.

4.7.2 Watercourse condition

SEPA's water classification hub gives the upper Water of Fleet poor water quality status, further downgraded by poor fish ecology and macroinvertebrates, essentially due to surface water acidification.

Issue	Resultant Problem	Remedial Action
Lack of dappled shade	Exposed waters may become warmer due to climate change potentially causing heat stress to aquatic species.	Low density broadleaf restock within enhanced riparian corridors should provide shade and reduced water temperature.
Conifer plantation/regen within 20m of watercourse	Watercourse overshadowing by mature conifers and conifer regen causes loss of understorey vegetation leaving	Planned control of undesirable conifer regeneration through budgeted thinning and/or Environment specific plans

	bank structures more susceptible to erosion. Mature conifers adjacent to watercourses can contribute to lower water pH which may be fatal to fish, fish eggs and other aquatic life.	(possibly in partnership with other agencies).
Forest drainage	Potential to introduce poor quality water directly into burns.	Follow (exceed) Water guidelines to create buffers and stop drains before reaching watercourse.
Peatland restoration	Potential low water pH due to damaged peatland.	Targeted peatland restoration (including drain blocking).
Erosion	Watercourse siltation may lead to the covering of instream habitats and increased water turbidity.	Follow Water guidelines to create buffers and stop drains before reaching watercourse.
Lack of large instream woody debris	Large woody debris (LWD) can maintain a variety of habitats within a watercourse as well as helping to stabilise watercourse banks and beds by deflecting and slowing water flows and helping to trap sediments like gravels that are beneficial spawning habitat for salmon.	LWD left in targeted appropriate sites.

Management of waterbodies and catchment areas is a key environmental issue and FLS aim to comply with best practice in minimising sediment release and preventing further deterioration in their current/potential quality. In many instances FLS will, based on data and understanding from key stakeholders (Galloway Fisheries Trust in particular), provide enhanced riparian buffer zones that exceed minimum guideline recommendations. All forestry operations will meet the requirements of the UKFS Guidelines on Forests and Water, Forestry and Water Scotland Know the Rules (2nd Ed.) handbook, and Managing Forests in Acid Sensitive Water Catchments best practice.

Operations will also comply with FLS South Region's Pollution Control Plan and additional mitigations detailed within site specific risk assessments undertaken as part of the work planning process.

Four acid sensitive catchments either "at risk" or "failing" interact with the plan area, these are the Big Water of Fleet, the Little Water of Fleet the Pullaugh Burn and the Airie Burn. The proposed scale and timing of felling in the forest, along with increases in open ground and broadleaf cover in their riparian zones, seeks to reduce significant negative impact within

these catchments as per the Managing Forests in Acid Sensitive Water Catchments guidance. Refer to **Appendix VII** Acid Sensitive Catchments.

From the Critical Load assessment carried out in 2022, eleven stream catchments show waters to be sufficiently protected from acidification to allow normal restocking practice without the need for checking or mitigation. Four of the sampled stream catchments are at risk of further acidification if restocking were to exceed 30% catchment cover of closed canopy forest (>15 years age), another four stream catchments have a very low level of critical load protection and resampling is recommended.

Refer to **Appendix VIIb** Report on Critical Loads for the Fleet Basin.

The proposed increase in open ground and restocking with permanent broadleaf woodland should result in a greatly reduced operational impact and overall enhancement of riparian areas. Furthermore the potential for (phased) peatland restoration operations should ultimately improve both the holding capacity and quality of water leaving the block.

4.7.3 Flooding

Whilst there is no part of the plan area that lies within or immediately adjacent to a Potentially Vulnerable Area (PVA), lying as it does within the rural Water of Fleet catchment (comprising rough grazing, moorland and forestry) and directly feeding the Water of Fleet a watercourse that rises and falls very quickly, the Fleet Basin plan area may nevertheless still have a significant downstream influence on flooding impact on areas in and around the Gatehouse of Fleet Potentially Vulnerable Area (PVA 14/18).

The majority of floods recorded in and upstream from Gatehouse of Fleet are river floods primarily attributed to the Water of Fleet. The Water of Fleet is subject to a significant tidal effect and flooding, recorded as recently as 2008 in Gatehouse, is anecdotally happening at increased frequencies upstream of the town.

Forestry can have a range of effects on flood flows depending on the type and scale of forest operations. Forest establishment and growth have the potential to decrease peak flows whilst clearfelling can have an opposite effect until crops are replanted and re-grow.

FLS has considered flood risk of peak flows at the exit of the site and also further downstream and has built in the following flood prevention considerations within the plan area to have a beneficial impact on downstream flood risk and contribute towards flood alleviation:

- a reduced scale of and enhanced timing of proposed felling through extended rotation lengths
- the creation of an increasingly diverse age structure to include well designed significant riparian and wet woodland buffer habitats
- the restoration of flood plain woodland and
- potential peatland restoration

Additionally a series of actions to manage flooding in the PVA, generally focusing on non-forest activities have been set by SEPA and agreed with flood risk management authorities and are identified in below.

Selected Actions

Strategic mapping and modelling

Maintain flood warning

Flood forecasting
Awareness raising
Self help
Maintenance
Emergency plans/response
Planning policies

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 coupe scale), however with no additional areas of new planting proposed for this LMP, a planned optimal clearfell programme, well designed and significant riparian buffers that include peatland restoration and where appropriate forest wetland creation to minimise this effect, no increase to the existing flooding risk is anticipated.

4.8 Wildfires

4.8.1 Wildfire

FLS continues to work closely with the Scottish Fire and Rescue Service (SFRS) to prevent and tackle wildfires that threaten Scotland's natural Forests and Land. FLS support SFRS in their lead role for fire prevention and suppression through creating annual fire plans, maintaining a fire duty rota and providing additional logistic support.

Whilst the Wildfire risk for this LMP is currently low to moderate, the primary objective for FLS is always to protect people's health, safety and wellbeing including our neighbours.

Climate Change guidance for the south west of Scotland suggests that whilst significant change to this rating over the period of the plan is unlikely there are elements of the plan such as long external boundary links to the west and east onto the open moorland areas of both the Cairnsmore of Fleet and Laghengahie and Airie Hills SSSIs that require to be continually considered and monitored for Wildfire resilience.

Our long term aims within this LMP to increase the use of LISS and to reduce the overall area of conifer plantation through an increase in the area of broadleaf woodland and open space across the plan area coupled with the creation of riparian corridors (wider and exceeding the minimum guidelines) should constrain the overall Wildfire risk to the current levels.

For enquiries about this plan please contact:

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Appendix I: Description of Woodlands

Description of woodlands
<p>Topography and Landscape</p> <p>There are no landscape designations for the Plan area.</p> <p>Map 11 shows the SNH Landscape Character Types relevant to Fleet Basin:</p> <ul style="list-style-type: none"> • Rugged Uplands with Forest LCT 181 • Foothills with Forest LCT 176 • Foothills LCT 175 • Narrow Wooded River Valley LCT 160
<p>Geology and Soils</p> <p>Map 9 shows Soils types within the Fleet Basin</p>
<p>Climate</p> <p><u>Accumulated temperature (day-degrees above 5°C)</u> Min: 1436, Max: 1687, Mean: 1551</p> <p><u>Moisture Deficit (mm)</u> Min: 74, Max: 95, Mean: 85</p> <p>The climate of the LMP area is highlighted pink on the table below</p>
<p>Hydrology</p> <p>Map 2 Key Features shows all watercourses, open water, and recorded water supplies.</p> <p>Water catchments The block sits across the River Fleet waterbody catchments (as defined by SEPA). Four acid sensitive catchments (all either at risk or failing) overlap the plan area (see Appendix VII for full details). Names: Little Water of Fleet, Big Water of Fleet, Airie Burn & Pullaugh Burn</p> <p>Water quality SEPA's water classification hub gives the upper Water of Fleet poor water quality status (see 4.7.2)</p> <p>Flooding The Water of Fleet is subject to a significant tidal effect and flooding (see 4.7.3).</p> <p>Water supplies A single private water supply for Meikle Cullendoch lies within the block (see 4.7.1 and Appendix VIII).</p>
<p>Windthrow</p> <p>Map 10 illustrates the DAMS measurements for the Plan area.</p>

Description of woodlands
Adjacent land use
With FLS plantation to the north, the Fleet basin forms the southern edge of an extensive conifer plantation massif and is surrounded on three sides by extensive areas of open ground and agricultural pasture.
Public access
Maps 2 and 13 show the location of promoted trails and visitor zones.
Historic environment
Historic environment records for the forest are shown in Appendix V and on Map 12 .
Biodiversity
<p>Designated Sites: There are three designated sites associated with the Fleet Basin LMP. All of the sites have agreed management plans in place.</p> <p>Priority Habitats: Blanket bog, Upland Heathland, Upland Birchwoods, Upland Fen and swamp and Oligatrophic and Dystrophic lochs are all present (see 4.2.4)</p> <p>Priority Species: Red Squirrel and Black Grouse are present (see 4.2.4)</p> <p>Ancient Woodland / PAWS (see 4.2.3)</p> <p>Natural Reserves (see 4.1.4)</p> <p>Deadwood potential: Small scattered areas of standing deadwood are present across the block (see 4.2.6).</p> <p>Open ground (see 4.2.5)</p>
Invasive species
Invasive Non Native species are present in the woodland (see 4.2.7).
Woodland composition
<p>The current species composition of the forest is illustrated on Map 8.</p> <p>YC varies across the block up to YC 20.</p> <p>Clearfell/restocking has taken place over the years to provide second rotation crop in addition to the remnant first rotation crops.</p> <p>Clearfell is the main management type across the plan area however opportunities to provide alternative areas of LISS may present.</p>
Plant health
<p>With relatively low levels of species diversity across the plan area modern day resilience and widespread tree health issues remain.</p> <p>Hylobius, the Pine weevil, can cause extensive damage to young conifer crop (and at times young broadleaves) and is found throughout the region. As part of the region's chemical minimisation strategy, the Hylobius Management Support System (HMSS) is used to measure Hylobius numbers on clearfell sites. Using billet traps conifer restock areas are assessed, weevil numbers are recorded and along with other site data the optimum time for site restocking is determined. This more flexible fallow period between felling and re-</p>

Description of woodlands

stocking may result in restocking not taking place within two years of felling (see Tolerance table as agreed with SF).

Phytophthora ramorum infection has been confirmed on Larch across the region. Several infected areas in the plan area have already been felled to comply with the requirements of a Statutory Plant Health Notice (SPHN) but are now generally being treated under a “Management zone / Risk Reduction Zone” agreement (removal to be carried out as soon as practical within the period of the plan). Areas of infected larch have been identified for removal in both phase 1 and phase 2 of the plan.

Heterobasidion annosum is not endemic in the block. Stump treatment with urea post felling may however be required in the areas of poorer site types.

Infrastructure

The A712 Queens Way road to the north and the minor C13S road to the south are currently respectively categorised as Consultation and Agreed routes in the D&G Timber Transport Groupe Agreed Routes map for Timber Haulage).

Forest road access throughout the plan area is generally good with only a modest requirement for new road construction to access some proposed felling coupes and a single quarry (Culreoch) is present (see 4.1.9).

Core paths and the Sustrans cycle route are also present.

Appendix II: LMP Consultation record

Consultee	Date contacted	Date of response	Issues raised	FLS response
Historic Environment Scotland	07 March 2022	15 March 2022	No scheduled monuments, category A-listed buildings or Inventory gardens and designed landscapes present	Noted (section 4.3)
Ed Tooth RSPB	07 March 2022	10 April 2022	<p>Galloway Glens Black Grouse project referenced with identifying appropriate measures for leks across the plan area specifically referencing Fell of Fleet and Craigherron Leks</p> <ul style="list-style-type: none"> • enhance brood rearing habitats through increased area and variable density BL restock, • manage conifer regeneration to increase area of scrub moorland / interface zones • limit operations to October to February to minimise lek disturbance • address shortfall of boggy moorland habitat adjacent to lek areas • improve available acid grassland areas potentially through grazing • advance felling of identified coupes 	Noted (section 4.2.4)
Ed Forrest G&SA Biosphere	15 March 2022	19 April 2022	<p>Overall we generally welcome the Plan with primary management objectives relating to timber production, larch removal, Red squirrel habitat, water management and water quality and peatland restoration.</p> <p>Black Grouse is a high focus species in the Biosphere Natural Heritage Management Plan and the Fleet Basin area is critical in terms of</p>	<p>Noted (sections 4.1.3, 4.2.4, 4.2.5, 4.5.3 & 4.6.3)</p> <ul style="list-style-type: none"> • Black Grouse management included as objective • Local plan peatland restoration areas included in Region's National targets • Continuous Cover management to be considered where appropriate

Consultee	Date contacted	Date of response	Issues raised	FLS response
			<p>the wider Black Grouse project being prepared for Southern Scotland; we recommend that management for the species is included as a primary plan objective</p> <p>Red squirrel is also a high focus species; we are pleased to see that the species is included as one of the key management objectives and that under 'outcome 1' reference is made to providing suitable elements of mature woodland as a seed/food source for the species.</p> <p>We welcome the intention to restore peatland to enhance priority bog habitats but would urge that the degree of restoration is significant in scale and believe commitment towards a specific target for peatland restoration is necessary</p> <p>With Climate Change impacting on the frequency of storms, droughts, fire risk, increased disease susceptibility and flooding and waterlogging of ground there is a need for a more robust, diverse and resilient woodland; we would urge and welcome any moves towards Continuous Cover type management from both a sustainable production and a biodiversity and landscape perspective.</p> <p>On outcome 2 'Looking after Scotland's National Forests and Land' we welcome many of the actions and prescriptions, particularly those around open land and the intention to raise the condition of Lea Larks and</p>	<ul style="list-style-type: none"> • Permanent open areas to be kept free from natural regeneration • No current plans for windfarm development

Consultee	Date contacted	Date of response	Issues raised	FLS response
			<p>Cairnsmore of Fleet NNR and SSSI's to favourable condition and also the intention to create additional permanent open habitat at elevation across the plan area; we look forward to seeing the prescriptions identified to keep these areas open and free from natural regeneration and the greater use native BL species around the edges to both facilitate these connected areas and providing additional habitat for Black Grouse and Nightjar and other invertebrate species.</p> <p>We note under outcome '3: National forests and land for visitors and communities' that reference is made to incentivising renewables companies to provide community ownership opportunities and to facilitate renewable energy where it offers community benefits. While it may be the case that the statements relate to small scale renewables or hydro, as the site lies within the buffer zone of the Biosphere and has a relative proximity to the Fleet Valley National Scenic Area; we do not think that the area is suitable for commercial windfarms.</p>	
Suzanne McIntyre Nature Scot	07 March 2022	21 March 2022	<p>NatureScot await a report from Galloway Fisheries Trust, summarising catchment surveys over recent years and would welcome information on critical load assessments for plantation areas in the catchment of these failing and at risk water bodies.</p>	<p>Noted (sections 4.1.6, 4.2.4, 4.2.5 & 4.6.3)</p> <ul style="list-style-type: none"> • Appendix VII refers for critical load assessments • Permanent open areas to be kept free from natural regeneration

Consultee	Date contacted	Date of response	Issues raised	FLS response
			<p>Regarding conifer regeneration along riparian corridors NatureScot would like to see the extent of any reduction in proposed restocking across the plan area and see the prescriptions identified to keep these areas open and free from natural regeneration.</p> <p>Regarding NatureScot peatland restoration work being carried out on the Cairnsmore of Fleet NNR, it would be ideal to not only consider replacement of sitka with scots pine or broadleaf but to also address water loss via the existing drainage systems which are connected to areas of peat depth greater than 50cm on the FLS estate but also to peatland restoration areas on the reserve (see peat depth map). NatureScot would like to see ditch blocking to reduce water run-off as part of any FLS peatland restoration programme.</p>	<ul style="list-style-type: none"> • Ditch blocking to reduce water run-off is an integral part of any peatland restoration programme Appendix V refers
Jamie Ribbens Galloway Fisheries Trust	07 March 2022		No reply received	
Jamie Farquhar CONFOR	07 March 2022		No reply received	
Emily Taylor Crichton Carbon Centre	07 March 2022	Consultation page	CCC welcomes FLS engagement with key stakeholders and the opportunity here for FLS to continue working with stakeholders to design and implement a sensitive commercial forestry plan that strives to go beyond the minimum guidelines set out in the UKFS and UKWAS and make a genuine and much	<p>Comments noted (sections 4.1.6, 4.6.3 & 4.7.2)</p> <ul style="list-style-type: none"> • Targeted enhanced riparian buffers (as guided by stakeholders) • Minimise restock of deep peat • Permanent open areas to be kept free from non-native conifer natural regeneration

Consultee	Date contacted	Date of response	Issues raised	FLS response
			<p>needed improvement to natural capital. The area benefits from having the support of the Fleet Catchment Steering Group, a group comprising Galloway Fisheries Trust, the Crichton Carbon Centre, NatureScot, SEPA and private landowners that over recent years has gathered information on peat condition and extent, water quality and peatland restoration opportunities, to help support land managers across the Fleet for catchment scale improvements. The plan is key to restoring the Fleet Catchment and could showcase partnership working and stakeholder engagement for FLS and provide a nationally significant example of catchment-based management to improve natural capital within the context of environmentally sensitive commercial forestry operations.</p> <p>CCC recognises that the Fleet catchment is acid sensitive (as demonstrated from water analysis carried out by Galloway Fisheries Trust with support from NatureScot, Crichton Carbon Centre and Peatland Action over recent years) and that FLS management seeks to improve water quality for wild fisheries and that the management of peatland restoration is specifically identified as an Outcome 2 in the draft design.</p> <p>CCC agrees that key priorities for the plan should be to Improve water quality within</p>	

Consultee	Date contacted	Date of response	Issues raised	FLS response
			<p>Fleet Basin catchment(s), maintain and enhance plan area for priority species (Red squirrel and Black Grouse), and Contribute to the Scottish Government's Climate Change Plan (Carbon sequestration) recognizing that action is required to improve the condition of the catchment. This plan offers an opportunity to halt biodiversity decline and tackle climate change by improving ecological function and quality of peatlands and freshwater.</p> <p>CCC feels that enhanced riparian buffer zones that exceed minimum guideline recommendations need to be carefully considered and targeted based on data and understanding from key stakeholders (Galloway Fisheries Trust in particular)</p> <p>Artificial drainage across the catchment (including forestry drains) has an extensive and cumulative impact across the catchment and contributes to frequent low pH events into watercourses particularly during winter months (a sensitive time for fish). Natural watercourses and actions by NatureScot to block open hills drains and improve peatland condition will only have a limited impact due to the extent and severity of existing forestry drains (some areas of severe drain erosion have worsened following the winter of 2021/2022).</p>	

Consultee	Date contacted	Date of response	Issues raised	FLS response
			<p>CCC see key to restoring a natural hydrology in riparian areas is reducing the frequency and severity of acid flush events so recommend that all artificial drainage networks cutting through peat should be blocked in riparian zones as a minimum to disconnect these sources of acidic waters (often below pH4) reaching natural watercourses (wet woodland creation should be considered if planting is to take place in these areas).</p> <p>The Little Water of Fleet catchment is prone to pH's below 5 following winter rainfall events, a figure below which may be life critical to salmon and may well be a major contributing factor for the low numbers now spawning in the catchment and general decline in salmon. As identified by Galloway Fisheries Trust, there are areas which should be supporting populations of fish (trout and salmon) where habitat is good but only sporadic numbers have been recorded. Future restocking plans must take this, and potential long term carbon impacts of forestry on deep peat, into consideration based on current and future understanding as data and evidence presents itself.</p> <p>All areas of restocking on deep peat should not only meet the minimum criteria for restocking they should also be assessed for</p>	

Consultee	Date contacted	Date of response	Issues raised	FLS response
			<p>potential negative impacts on water quality, biodiversity and habitat provision.</p> <p>CCC have concerns on the reliance on natural regeneration to provide more diverse woodland and the creation/establishment of peatland edge woodland.</p> <p>More detail is required on how these areas would be managed to suppress extensive regeneration of non-native conifers and FLS require well-resourced and long-term plan to address naturally regenerating areas of dense conifers that provide little biodiversity, timber production or even carbon benefits.</p>	
Chris Rollie Galloway Raptor Group	07 March 2022		No reply received	
Pip Tabor Southern Uplands Partnership	07 March 2022		No reply received	
Alasdair Hendry Scottish Forestry	07 March 2022		No reply received	
Kat Fingland Saving Scotland's Red Squirrels	07 March 2022		We are keen to minimise the impact of any forestry work on the local red squirrel population whilst acknowledging that commercial conifers will be subject to cycles of felling and restocking, and that other factors also need to be considered such as	Noted (see section 4.2.4)

Consultee	Date contacted	Date of response	Issues raised	FLS response
			<p>windthrow. As red squirrels are known to be present in the area, we would expect that, with regard to planning felling works, all the relevant surveys are carried out in advance and the work is planned to factor in the breeding season. We would appreciate if you could take into consideration ways of improving/maintaining the habitat for red squirrels – such as providing continuous cover, long-term retention, small-coupe felling and, when planning felling, take into account the movement of squirrels and habitat connectivity. Other aspects to consider include planting regimes, which include a mix of species and age class to allow for a continuity of food supply. We would suggest that, alongside the felling permission, landowners and contractors are made aware of the risk and responsibility they have to resident red squirrels, and are made aware of surveys to be conducted in advance of felling activities (https://forestry.gov.scot/publications/24-forest-operations-and-red-squirrels-in-scottish-forests). Many thanks.</p>	
Simon Watt SEPA	15 March 2022		No reply received	
Sharon Fishwick	15 March 2022		No reply received	

Consultee	Date contacted	Date of response	Issues raised	FLS response
New Galloway Community Council				
Simon Fieldhouse D&G Council	15 March 2022		No reply received	
R Goodman Meikle Cullendoch Neighbour	16 March 2022		No reply received	
Iain Wilson Tracy Cook Jean & Ken Clarkson Nila Hempstock Neighbours	20 April 2022	20 April 2022	Downstream flooding of access road to properties by Water of Fleet (usually at high tide)	Comments noted and mitigation measures identified (see section 4.7.3)
Ken Clarkson Drumruck Neighbour	23 May 2022	23 May 2022	Flooding of property owing to obstructed drainage on FLS estate Potential danger to property from wildfires Species diversity and planned restock around property locus	Comments noted and mitigation measures identified (see section 4.8.1)

Appendix III: Tolerance table

	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	<ul style="list-style-type: none"> Fell date can be moved within 5 year period where separation or other constraints are met. 	<ul style="list-style-type: none"> Up to 10% of coupe area. 	<ul style="list-style-type: none"> Up to 3 planting seasons after felling. 	<ul style="list-style-type: none"> Change within species group e.g. evergreen conifers or broadleaves. 		<ul style="list-style-type: none"> Increase by up to 5% of coupe area 	
Approval by exchange of letters and map	Y	<ul style="list-style-type: none"> Advance felling of Phase 2 coupe into Phase 1 	<ul style="list-style-type: none"> Up to 15% of coupe area 	<ul style="list-style-type: none"> Between 3 and 5 planting seasons after felling, subject to the wider forest and habitat structure not being significantly compromised. 		<ul style="list-style-type: none"> Additional felling of trees not agreed in plan. Departures of > 60m in either direction from centre line of road 	<ul style="list-style-type: none"> Increase by up to 10% of coupe area Any reduction in open space of coupe area by planting. 	<ul style="list-style-type: none"> Up to 5ha
Approval by formal plan amendment may be required	Y	<ul style="list-style-type: none"> Felling delayed into second or later 5 year period. Advance felling (phase 3 or beyond) into current or 2nd 5 year period. 	<ul style="list-style-type: none"> More than 15% of coupe area. 	<ul style="list-style-type: none"> More than 5 planting seasons after felling, subject to the wider forest and habitat structure not being significantly compromised. 	<ul style="list-style-type: none"> Change from specified native species. Change Between species group. 	<ul style="list-style-type: none"> As above, depending on sensitivity. 	<ul style="list-style-type: none"> In excess of 10% of coupe area. Colonisation of open space agreed as critical. 	<ul style="list-style-type: none"> More than 5ha.

NOTES:

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

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

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

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

Table of Working Tolerances Specific to Larch

	Adjustment to felling period	Adjustment to felling coupe boundaries	Timing of restocking	Changes to species	Changes to road lines
FC Approval not normally required	Fell date for all larch can be moved and also directly associated other species	Larch areas can be treated as approved coupes. Other conifers directly associated with larch being felled, may also be removed up to an equivalent of 20% of the area occupied by the larch or 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 road lines or tracks directly necessary to allow the extraction of larch material.

Appendix IV: Historic Environment records

Refer to **Map 12**

Historic Environment Records				
Designation	Name	Feature Description	Grid Reference	Importance
No	Auchencloy	Enclosure, structure - ruins	NX604695	Low
No	Auchencloy	Farmstead, field system - ruins	NX608696	Low
No	Auchencloy Hill	Enclosures	NX601703	Low
No	Benmeal	Sheepfold – unroofed structure	NX574693	Low
No	Benmeal Mote	Natural feature - natural morainic mound	NX575689	Low
No	Big Water of Fleet viaduct	Railway viaduct -granite with brick support	NX559642	High
No	Boggrie Moss	Sheepfold - small circular enclosure	NX579657	Low
No	Boggrie Moss	Sheepfold	NX581655	Low
No	Burnfoot Burn	Shieling Hut – not visible	NX601646	Low
No	Cairn	Cairn	NX583689	Low
No	Cairn	Cairn	NX600633	Low
No	Chain bridge	Bridge	NX545625	Low
No	Cleugh of Eglon	Cairn - Memorial cairn for pilot	NX541678	Moderate
No	Cloven Stone	Stone – named large boulder	NX598655	Low
No	Corse Burn	Sheepfold – oval structure	NX581662	Low

Historic Environment Records

Designation	Name	Feature Description	Grid Reference	Importance
No	Corse Burn, Dunharberry	Sheepfold(s)	NX571664	Low
No	Craigbrack	Sheepfold(s)	NX559633	Low
No	Craiglowrie	Sheepfold(s), wall	NX547670	Low
No	Craiglowrie	Sheepfold	NX550676	Low
No	Darow Faulds	Field system, sheepfold	NX557662	Low
No	Domins	Sheepfold(s)	NX549666	Low
No	Domins	Field boundary, pound	NX547665	Low
No	Domins	Sheepfold	NX550668	Low
No	Domins	Sheepfold	NX548668	Low
No	Domins	Structure	NX539666	Low
No	Domins	Enclosure(s) – large enclosure with smaller internal enclosure	NX551667	Low
No	Domins	Field boundary, structure	NX546666	Low
No	Dromore	Field system	NX549633	Low
No	Dunharberry	Sheepfold	NX564674	Low
No	Dunharberry	Sheepfold(s)	NX567671	Low
No	Fell of Fleet	Sheepfold(s)	NX578702	Low
No	Fell of Fleet	Sheepfold - circular structure	NX575698	Low
No	Glengainoch Burn	Sheepfold(s)	NX586703	Low

Historic Environment Records				
Designation	Name	Feature Description	Grid Reference	Importance
No	Glengainoch Burn	Sheepfold	NX591704	Low
No	Glengainoch Burn	Enclosure(s), structure	NX592703	Low
No	Herd Hill	Enclosure, structure	NX565627	Low
No	Hill Faults	Field system	NX558668	Low
No	Lea Larks	Sheepfold	NX568692	Low
No	Little Cullendoch	Enclosures. Head dyke	NX551652	Low
No	Little Cullendoch	Enclosure, sheepfold	NX554645	Low
No	Little Cullendoch	Structure	NX555651	Low
No	Little Cullendoch	Enclosure, structure	NX556648	Low
No	Little Water of Fleet viaduct	Railway viaduct, granite remains	NX586670	Low
No	Loch Skerrow	Structure - circular	NX602677	Low
No	Maggie Ireland's Was	Possible farmstead named after eponymous resident	NX553661	Low
No	Maggie's Stone	Animal memorial	NX541679	Low
No	Meikle Cullendoch moss	Structure	NX562655	Low
No	Memorial cairn	Memorial cairn for WWII pilot	NX582669	Low
No	Walled enclosure(s)	Enclosure(s)	NX550665	Low
No	Nick of Dead Man's bones	Possible human remains	NX562686	Low

Historic Environment Records				
Designation	Name	Feature Description	Grid Reference	Importance
No	Penwhaile	Ring Cairn (possible)	NX559636	Low
No	Penwhaile	Enclosure	NX559637	Low
No	Pool Ness	Possible lead ore mine	NX565623	Low
No	Rig of Burnfoot	Sheepfold	NX589665	Low
No	Rig of Burnfoot	Sheepfolds	NX586653	Low
No	Rig of Craigbrack	Sheepfold	NX560640	Low
No	Rig of Drumruck	Enclosure(s)	NX567641	Low
No	Sheepfold	Sheepfold	NX550685	Low
No	Sheepfold	Sheepfold	NX553649	Low
No	Sheepfold	Sheepfold	NX567646	Low
No	Sheepfold	Sheepfold	NX541680	Low
No	Sheepfold	Sheepfold	NX588669	Low
No	Shiel Rig	Sheepfold	NX596646	Low
No	Shiel Rig	Corn drying kiln and sheepfold	NX598641	Low
No	Souter's Stone	Stone	NX542675	Low
No	Stone Head	Structure	NX562660	Low
No	Trig point	Ordnance Survey Control pillar	NX574675	Low
No	White Brae	Sheepfold - two compartment	NX580648	Low

Appendix V: EIA screening supporting information (deforestation)

This document provides supplementary information to support the EIA screening application for deforestation in the Fleet Basin LMP submission for peatland restoration in the plan area. It includes:

- 1.0 Context
- 2.0 Operational methodology
- 3.0 Fleet Basin site appraisal
- 4.0 Assessment of potential impact

The document demonstrates alignment with the following key Scottish Government and Scottish Forestry policies and practice:

- The Scottish Government Control of Woodland Removal Policy – in particular guidance on woodland removal without a requirement for compensatory planting
- FCS Practice Guide - Deciding future management options for afforested deep peatland
- Forestry on Peatland Habitats (FCS, 2000)
- UK Forestry Standard.

1.0 Context

The Scottish Government has set a target of net zero carbon emissions by 2045. In order to help meet this target, Forestry and Land Scotland (FLS) are currently in the process of preparing a Peatland Strategy. The strategy will set out the best way to manage its peatlands and to determine which afforested peatlands will be restored or restocked on Scotland's national estate.

Peatlands will play an important role in achieving this net zero target due to their natural ability to store and sequester carbon: it is estimated that UK peatlands store 2,300 Mt of carbon (Billett et al. 2010). Peatlands in the UK are naturally treeless due to the wet oceanic climate (Sloan et al. 2018). This differs from European continental peatlands which naturally support tree cover due to the drier, and generally warmer, summer climate. In their natural state, UK peatlands are too wet and nutrient poor to sustain tree cover, except in exceptional circumstances such as pine or oak bog woodland. In general, in the UK afforestation of unmodified peatlands is unnatural.

The purpose of the 'Deciding future management options for afforested deep peatland' practice guide is to ensure that principles of sustainable forest management are applied specifically in the context of managing the peatland asset. This is a shared objective of both FLS and SF, taking account of the valuable ecosystem services provided by peatlands.

Specifically:

- The importance of peatlands in relation to climate change. Afforested peatlands have the potential to act as significant sources of carbon, depending on the levels of modification imposed at establishment and the impact these have had on peatland condition since. Evans et al. (2017) estimated an average carbon emission rate of 9.9 tCO₂e/ha/yr, therefore the growth rate of trees on a particular peatland must capture enough carbon to compensate for such carbon loss if a net carbon capture outcome is to be realised.
- The contribution towards enhancing biodiversity. Article 8(f) of the Convention of Biological Diversity, signed by the UK Government on 12th June 1992, encourages the repair of damaged ecosystems. Restoration of priority habitats is therefore a key component of the Scottish Biodiversity Strategy.

- The potential ability of peatlands to grow trees to capture carbon, although there are unknown risks to the security of the carbon store, and the ability of restoring peatlands after the end of subsequent rotations.

1.1 FLS approach to peatland management

Restoration of blanket bogs and lowland raised bogs is a key action from the Scottish Biodiversity Strategy (both habitats are included on the Scottish Biodiversity List). Beyond their value as a carbon store, peatlands host a huge diversity of organisms and planting trees on peat leads to a fundamental change in the ecosystem (Payne et al. 2018).

As a Scottish Government agency, FLS's objectives and legislative framework has an added 'Biodiversity Duty' as stated in the Nature Conservation Scotland Act (2004). Protection of conservation values is mentioned in UKWAS and the principles of sustainability are outlined in the UKFS. What this means is that for afforested peatlands, restoration is considered ahead of replanting.

This is set out in 'Deciding future management options for afforested deep peatland' practice guidance. It deals with afforested peatlands that are not going to be restored for biodiversity reasons and states that replanting must be justified by considering if the crop will achieve YC 8 or more for Sitka spruce. The default is not to restock, unless there is evidence trees will achieve a good growth rate for harvestable timber. If it does not, the option to restock is unsustainable as the three legs (economic, environmental, and social) of the sustainability stool are not present. A slow growing crop would not result in profit, it would act as a carbon source and contribute to climate change, and society would be disadvantaged/threatened (based on current scientific information).

Since 2014 FLS has undertaken peatland restoration on a number of peatland types, including the restoration of unproductive plantations on peatlands. FLS restored 2,786 ha of 'forest to bog' peatland sites across 60 project areas between 2014-2020. In the same period, FLS restored 3,786 ha of existing open peatland habitat across 29 project areas. FLS anticipates the need to restore 35,000-60,000 ha of afforested peatlands before 2035.

2.0 Operational methodology

In many areas of the UK large expanses of deep peat blanket bog have been historically drained and replaced with trees for commercial forestry. This afforestation has resulted in the degradation and loss of large areas of peat bog. However, with a greater interest in soil carbon and the realisation that many of the trees on deep peat are vulnerable to growth check and wind-blow, there is a shift to restore these low return forests back to open bog.

Afforested peatland restoration, known more commonly as 'forest-to-bog' restoration, is thought to take a least 10 years (following re-wetting) to change from acting as a carbon source to a carbon sink. Therefore, there is an inherent urgency to begin restoration as soon as possible after felling with respect to the Scottish Government target of net zero carbon emissions by 2045.

Restoration is achieved using a number of re-wetting techniques, the more common of which are detailed below. Methods are usually employed together in a sequence, beginning at the upper areas and working downslope towards main water courses or where water leaves the site, to achieve best results. Methods are under constant development and improved techniques result in much better surface re-wetting in previously forested peatlands.

These methods will be applied across Fleet Basin restoration sites. Note that detailed restoration plans cannot be confirmed until after tree felling and windblow clearance has taken place. Access across the site, giving a clear view of the lie of the land, localised undulations, and where the flushed areas are, is needed to determine the exact location of drains and to determine their status in terms of peak and base flows. This then allows decisions to be made on the positioning of any peat dams and spotting if the underlying

peat is cracked or not. Some indication of the positions and intensity of drainage may be apparent from studying aerial photographs and mapped topography, however, this may not give a true picture of the site. In addition, a thorough survey of drains and their loading, peak flows, and depth of peat below the base of the drain can only be undertaken safely and efficiently after clear felling has taken place.

Drain blocking and peat dams

Where appropriate, peat dams are an effective way of blocking drains and furrows to encourage water dispersal across a peatland (whether on open peat or a forest-to-bog project). Drain re-profiling is carried out at the same time as installing peat dams only if they do not have high peak or base flows (indicated by the absence of vegetation in and on the sides of the drain).

Such 'traditional' methods of achieving hydrological restoration can help on damaged open bog habitat, however, on previously afforested sites intensive intervention is often required. The vast majority of these sites retain a legacy 'ridge' and 'furrow' pattern, with either single or double ploughed furrows varying from ~30 cm up to 1 m depth in extreme cases. These furrows act as drainage conduits, thereby lowering the natural water table and drying out the peatland. If left in situ, the water table and peatland vegetation are suppressed, while negative indicator species such as *Calluna* or tree regeneration are promoted.

Ground smoothing and stump flipping

FLS have been a key organisation in developing 'ground smoothing and stump flipping' methods, which aim to re-profile the uneven surface on previously afforested sites and restore the natural surface topography. This can be achieved by flattening any plough ridges and/or infilling furrows, allowing a greater proportion of the planar surface to be closer to the water table, thereby promoting the development of key peat-forming species (i.e. *Sphagnum* mosses) and reducing the opportunity for tree regeneration that typically occurs on uneven/drained sites.

The notable advantage of ground smoothing and stump flipping is that the vegetated surface of the peat is left upper-most rather than inverted, which helps to minimise the cover of bare, exposed peat. Where there are bigger and more solid wood stumps, the machine will invert the root plate into the furrow. Intact vegetation between the areas of the two plough ridges will assist with re-colonisation of bare peat where ridges have been removed. Once the 'mining' aspect of the work has been completed, the machine then cross-tracks across the furrows to further flatten out any topography or brash that is still standing proud. Some afforested peatlands have suffered from surface cracking due to water deprivation which, alongside root structures, can lead to underground 'pipes' forming. These pipes act as a conduit to dissolved and particulate organic carbon loss, hampering the rewetting process by acting as 'hidden drains'. Forest Research have developed a method to tackle this problem which greatly improves restoration efforts (method trialed at the Lochar Mosses Longbridge Muir site near Dumfries). Barriers to prevent water flowing away through cracks are formed by digging trenches deeper than the cracks and repacking them with peat with or without a plastic membrane lining one side of the trench, leading to a rise in the water table (i.e. the level the water is at underground).

2.1 Machinery specification

Ground smoothing techniques require the use of suitably equipped, low ground pressure (LGP) tracked excavators to allow safe working practice on wet and unstable terrain. FLS specify 360° LGP excavators on 1100 mm to 1400+ mm track pads, using wide toothed digging buckets, to achieve an average ground pressure of ≤ 3 psi.

2.2 Environmental protection

Surface management techniques, such as stump-flipping and cross-tracking, can potentially create areas of bare peat prior to vegetation establishing, and thus pose a risk to the downstream water environment via runoff and erosion of bare peat surfaces.

Stringent Pollution Prevention Control (PPC) are integral to any ground-smoothing project, including intensive management of on-site drainage, and protection of watercourses within proximity to restoration sites. This includes robust sediment management measures, particularly in areas where stump-flipping is carried out, and the appropriate design and siting of silt traps at these sites.

Generally, a cascade of silt traps made from plastic piling will be required on clear-felled sites, in addition to fabric dams to trap any sediment run-off. These may already be in place on recently felled sites, along with lengths of drain that have been dammed as part of pre-felling mitigation. If drains are not blocked or silt traps installed in preparation for harvesting operations, then this will be addressed prior to ground-smoothing works commencing.

Buffer zones of at least 20 m (often more) will be employed to mitigate against elevated levels of dissolved organic carbon, suspended solids, phosphates or nitrates from entering any river, burn, ditch, or wetland, towards which the land drains.

2.3 Monitoring

Sites are monitored on a regular programme to assess the change in surface vegetation (also a proxy indicator of water table level) and for non-native conifer regen. Where natural tree regeneration is considered to be problematic to the restoration trajectory, regenerating stems will be removed in years 5-10. However, the restoration techniques FLS now use minimise tree establishment potential and it is unlikely that more than a single intervention would be required, if at all.

FLS continue to work with Forest Research on the effects of restoration on water quality, FR having monitored Flanders Moss for over 10 years, and currently have a monitoring programme in place for upcoming peatland restoration elsewhere in South Region. Best practice recommendations made in the recent publication by Shah and Nisbet (based on 10 years data from Flanders Moss) will be followed.

3.0 Fleet Basin site appraisal

The restoration potential of UKBAP priority habitats (i.e. blanket bog and lowland raised bog) within Fleet Basin is considered to be high due to the very wet ground conditions and abundant remnant bog vegetation that persists in rides and other isolated areas, especially where planted conifers are in check. Based on Pyatt's 'FC Soil Classification' (1982), terrain, and FLS expert experience, site soils (i.e. 10b and 9) typically have a peat depth upwards of 0.5 m and are typically associated with National Vegetation Classification types M17 (*Scirpus cespitosus* – *Eriophorum vaginatum* blanket mire) and M18 (*Erica tetralix* – *Sphagnum papillosum* raised and blanket mire). FLS are committed to the long term restoration programme of these priority habitats.

Objectives within the LMP unit are to:

- Apply restoration treatments that encourage travel in the desired direction towards priority habitat, restoring these to function as near-natural peatland within 30 years
- Protect the storage of carbon in the soils
- Maximise the sequestration of carbon by peatlands in the future
- Improve water quality of the local area and help regulate flow.

3.1 Site description

The Fleet Basin plantation is a mix of afforested intermediate lowland raised bog (10b), blanket bog (9) and extensive areas of gleys and ironpans which has been historically ploughed and drained to establish a productive conifer crop. Due to the almost level nature of the terrain, there is a continuous link of coplanar

peat soils within the local landscape which connect hydrologically within the same watershed. The hydrological connectivity between the Scenario A peat type and surrounding blanket bog renders these areas as having a 'Presumption to Restore' (as defined in the 'Deciding future management options for afforested deep peatland' practice guidance). These are edaphically unsuited to woodland and restoration would therefore prevent the significant net release of greenhouse gases (GHG). Re-wetting the site will benefit the peat soils as it will stop oxidation and further degradation and erosion, ultimately improving the water quality of the local area by reducing run-off from the peatland. Overall, the goal at Fleet Basin is to create a series of hydrologically functioning intermediate raised-blanket bog complexes.

3.2 Previous crop

To establish a productive crop on an intermediate-blanket bog, the site was cultivated by means of deeply ploughed ridges and furrows and ploughed drains, and was likely to have been heavily fertilised. The afforested peatlands have soft ground conditions with a consistently high water table. Taking this into account along with the historical input for crop establishment, it is considered difficult to achieve sufficient crop performance over the second rotation in line with UKFS, without causing significant soil disturbance and the subsequent release of greenhouse gases.

3.3 Flooding

A significant element of the Fleet Basin LMP falls within the Upper Fleet SEPA waterbody catchment and flood risk management zone and a modest area of peatland restoration within the catchment is planned within this LMP period (see 4.7.3 for mitigation).

3.4 Private water supplies

A small proportion of the Fleet Basin block has the potential to interact with private water supplies. This will be addressed within the LMP proper (see 4.7.1).

3.5 Restoration proposal

Felling and re-wetting of the proposed peatland restoration areas will be undertaken using low impact techniques. The area is currently retaining water despite forestry drainage with key bog indicator vegetation present across the site. Re-wetting is essential to return the peatlands to a functional bog habitat which will allow the hydrology, and eventually the vegetation, to be restored to an intermediate-blanket bog habitat. There is sufficient existing seed source for *Sphagnum* and other bog species on site to make this successful.

Preliminary walkovers across site have been conducted by the local Planning team to establish the condition of the peatlands, water table level, presence and abundance of vegetation indicator species, in addition to the connectivity and extent of the bog. The walkovers identified the main afforestation modifications and feasibility of restoration, confirming that full restoration may be possible.

The main findings of the walkover were as follows:

- Fleet Basin potentially contains multiple hydrologically connected peatland units, consisting of predominantly deep intermediate bogs with flushed blanket bog and shallow peaty gleys.
- In places the water table is at the surface across the peatland, which is a positive indicator for restoration given the level of forestry modifications and there appears to be abundant *Sphagnum* cover with cotton grasses present throughout, indicating sufficient remnant species from which to reseed some sites.

- The existing forest road network may impact on some peatland areas, bisecting hydrological units across some management coupes. There will have been some compaction of the bog as a result of these roads where historically it would have formed one hydrological unit. As the road has existed in the landscape for sufficient time, any compromising factors for restoration of the bog would have become evident since. Therefore, for management purposes restoration can be phased with the aid of the forest road as an artificial boundary.

After clear-felling the mainly first rotation crops, the next stage of the restoration will be to re-wet the site. A combination of standard re-wetting techniques will be used to re-instate the natural water table across the site to ensure it is optimal for appropriate bog vegetation recovery. A combination of drain blocking, ground smoothing, and potentially backfill trenches, will be used following standard techniques as developed by NatureScot (Peatland Action Fund) and FLS. FLS have a long-term commitment to the Scottish Government to reduce GHGs across the National Estate and re-wetting will be funded through the Scottish Government Climate Crisis Fund.

The following restoration methods will be used:

- Block all drains and, where necessary, plough furrows using peat dams or composite dams to disperse water across the peatland.
- Undertake stump flipping and ground smoothing across the previously afforested area to un-modify the pattern of ploughed ridges and furrows. If left in situ, the plough/furrow pattern will suppress the water table and development of peatland vegetation, and will promote regeneration of native or non-native tree species (negative indicators).
- Where there is suspected peat cracking, install backfill trenches to retain water on site. Backfill trenches counteract the excessive lateral flow of water within the peat, which can result from the ploughing and draining carried out during afforestation, and the subsequent drying and suppressing effect of the mature trees on the peat and water table.
- Re-profile hags to repair excessive erosion of peatlands and stop the development of artificial drains caused by surface water run-off.
- Monitoring and removal of tree regeneration (a negative indicator) and undesirable vegetation on the bog.

Re-wetting operations will be delivered within the LMP period and in line with the UKFS and UKWAS.

Monitoring of the site will take place at year five following re-wetting with an evaluation of any completed restoration works will be submitted to Scottish Forestry as part of the LMP mid-term review.

References

Billett et al. (2010) Carbon balance of UK peatlands: Current state of knowledge and future research challenges. *Climate Research*, 45, 13–29.

Payne et al. (2018) The future of peatland forestry in Scotland: balancing economics, carbon and biodiversity. *Scottish Forestry*. pp. 34-40.

Shah, N. & Nisbet, T. (2019) The effects of forest clearance for peatland restoration on water quality, *Science of The Total Environment*, Volume 693.

Sloan, et al. (2018) Peatland afforestation in the UK and consequences for carbon storage. *Mires and Peat*, 23(01), 1-17.

4.0 Assessment of potential impact

Assessment of potential impact	Impact assessment
Key risk	Impact assessment
Population and human health	Low impact. Operations could impact on the headwater of the Private Water collection. Water quality within the water supply catchment will be protected by adopting low impact operational techniques and strict adherence to the latest UKFS Forests and Water guidance, Forestry and Water Scotland: Know the Rules 2 nd ed., and the FLS South Region Pollution Control Plan. Removal of forest cover could increase water availability in the local area. Ground-truthed drains connected to water supplies will not be blocked to avoid compromising the supply (see appendix VIII).
Biodiversity	Positive. Restoration of a degraded peatland will restore a priority open habitat, benefitting both habitat and associated species. Pre-operational surveys will identify any protected or breeding species to ensure suitable mitigation is in place to avoid disturbance.
Land	No known impact. Where the restoration project is adjacent to agricultural land, boundary drains will not be blocked to ensure neighbouring land is not compromised by re-wetting and increased potential to flooding.
Soil, geology and geomorphology	Positive. Re-wetting the site will benefit the peat soils as forestry modifications will be reversed to stop oxidisation and further degradation/erosion of the peat.
Water	Positive. Re-wetting techniques have shown to cause no significant adverse effect on water quality. Ultimately, water quality of the local area should improve with a reduction in run-off from exposed peat and degraded peatland.
Air	No known impact.
Climate	Positive. Afforested peatlands have the potential to emit more greenhouse gas emissions than can be absorbed by a growing woodland. Restoration of afforested peatlands, especially 'presumption to restore' peatlands, will prevent the significant net release of greenhouse gases, ultimately benefitting the local climate.
Material assets	No known impact.
Historic environment	No known impact. Pre-operational surveys will identify any cultural heritage features to ensure suitable mitigation is in place to avoid disturbance.

Assessment of potential impact	Impact assessment
Landscape	Positive. Peatland restoration will create more open space within the LMP forest blocks and their local area. This will add more diversity to the forest structure by creating open and associated native woodland habitats.

Control of Woodland Removal Policy: Peatland restoration projects meet the requirements of the Scottish Government's Control of Woodland Removal Policy as the deforestation and subsequent restoration will enhance a priority habitat and its hydrological connectivity.