Stocking Density Survey Protocol Supporting FGS Tree Planting

All tree planting operations supported through the Forestry Grant Scheme (FGS), i.e. Woodland Creation – Initial Planting; Woodland Improvement Grant - Restructuring Regeneration; or Agroforestry options, require that a stocking density return is completed and submitted to Scottish Forestry at some point in the first five years after planting.

Scotland has a dedicated and professional forestry industry and managers across the country will make assessments of their planted areas to ensure stocking densities are maintained for the purposes of good silvicultural practices already. This document, however, intends to give a standardised approach and guidance on the level of detail required by the stocking density return and to outline the generally accepted methodology of undertaking the survey.

There are three stages of the survey:
- Assessment Planning
- Data collection
- Reporting

Assessment Planning

To effectively undertake the survey you will need to plan how you will collect data on the site. You will need to determine how many sample plots are required, where they are going and how you will collect the information.

Determining the number of plots

You should determine the number of plots based on the total stratified areas for each species composition (component) associated with the option(s) you are surveying. For example, the WC – 'Conifer' option has 3 different species compositions i.e.: 'Sitka spruce'; 'Other conifer' and 'Native broadleaves or shrubs'.

Each species composition area should be stratified and allocated the corresponding number of plots, as per the table below.

Number of plots required

Number of plots for each stratified species composition area					
Up to 2.00ha	2.01ha – 10.00ha	10.01ha - 20.00ha	20.01ha – 30.00ha	30.01ha – 100.00ha	Over 100ha
4 plots	6 plots	20 plots	30 plots	1 plot per hectare	1 plot per hectare to a maximum of 200 plots

When you have calculated the number of plots required for the survey you will need to plot them onto the site. In order to reduce the possibility of introducing bias to the plot locations you should ideally decide on their locations and mark them on the map before you visit the site.

Data collection

For the purposes of the return, the information that you need from each plot is basic in that you should record the number of trees that have been planted (dead or live). You may, however, want to record additional information such as weevil or deer browsing damage or the level of weed control required for each area as part of collating information to inform future management decisions.

When you have found the plot centre, you will need to count the trees within a circle 5.64m in radius from the plot centre. This will give you a number of trees in a 0.01ha area. Trees that are difficult to assess as either in or out of the plot circle should be counted as a half of a tree.

A 5.64m Radius plot with 25.5 live trees counted and 2 dead. An average of 2750 planted trees per hectare.

Scottish Rural Development Programme

Scottish Forestry
Coilltearachd na h-Alba

Scottish Government
Riaghaltas na h-Alba
gov.scot
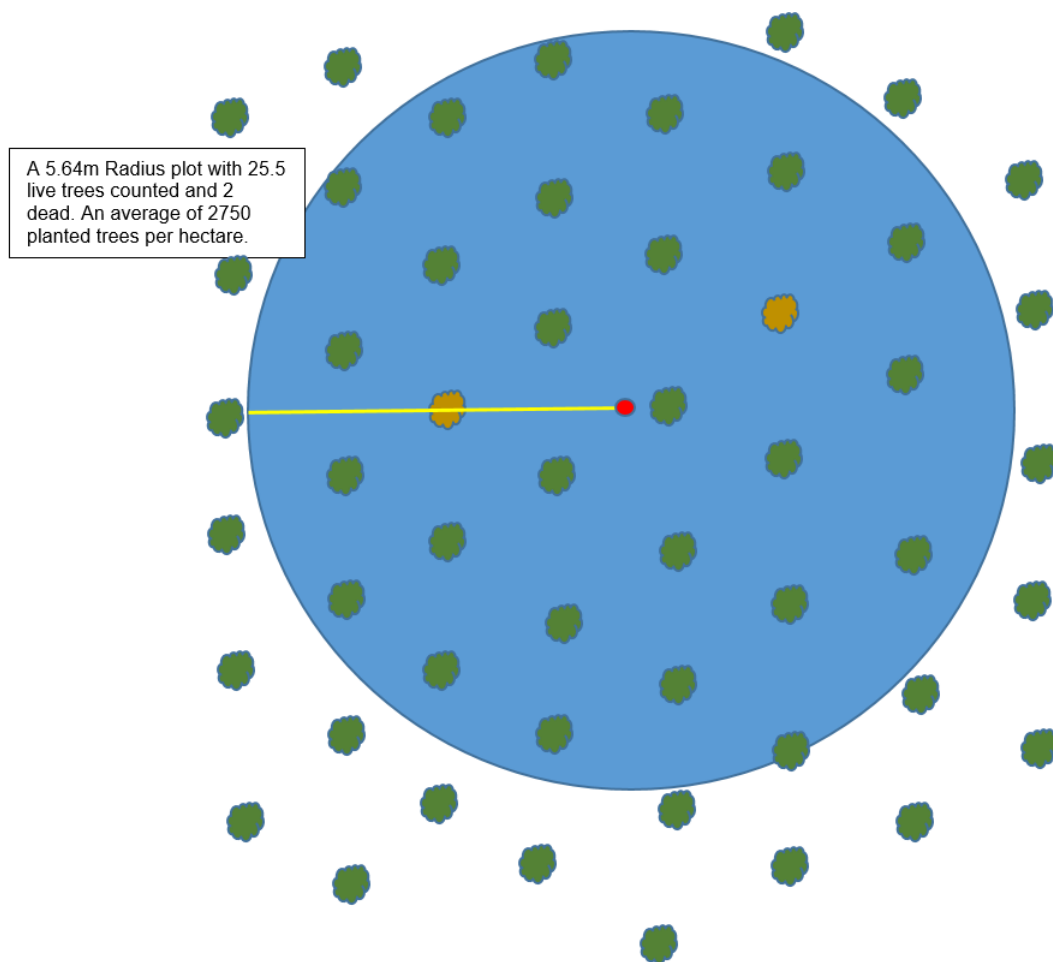
Recording data and marking plots

You should fill in a survey sheet like the one below for each stratified species composition area with the count for each plot. The survey sheet should be supported with a map of the planted area with the corresponding number of the plot marked on the map within each option area

So that the exercise is repeatable and auditable, you will need to mark each plot at the plot centre as below

For sites smaller than 20 hectares in area, you will need to mark the plots at the centre point with a cane and unique number for each plot centre. You can evenly space the plots across the site as you prefer. You should not 'choose' plot locations in a way that could introduce bias. Try to randomly select the plot location so that you get an accurate idea of the stocking on the site.

For sites that are larger than 20 hectares in area, you will need to mark the plots with a cane and identification tag as well as recording the grid reference of the plot centre of each plot. To avoid the introduction of operator bias, it is recommended that you evenly space the plot locations on a map before visiting the site.

Reporting

To work out the average stocking density for each species composition you will need to add the number of 'Live Trees' and divide it by the number of plots. This will give you a plot average.

> 'Live Trees'
(Plot1+Plot2+Plot3+Plot4...) / No of plots = Plot Average

You should then multiply the plot average by 100 to get the average stocking density per hectare (Ha).

When you have completed the 'Summary' and 'Survey' sheets, you should send them to your local Conservancy office. A sample of these returns will be selected for verification by Scottish Forestry staff.

Remedial Action

Should your stocking density fall below the minimum requirements of the contract, and you need further assistance, you can contact your local Conservancy office who will be able to give you advice on a remedial action plan to bring the area up to the required standards. However as guide the sort of detail that we would expect to see in any plan would be information such as:
- where (i.e. on a map) the trees are beneath the minimum specification.
- why the trees have failed.
- what action, if any, is proposed to minimise any potential future losses
- when failed/missing trees are planned to be replaced.

It is worth remembering that stocking densities that fall below the contracted minimum may result in reduced payment of claims or, in some circumstances, the reclaiming of grants that have previously been paid. Low stocking density, because of deer damage or plant deaths, is considered a breach at inspection even though it is evident that the work has been done. To ensure quick payment of claims for tree planting operations, you should carry out survey work and replant any dead trees prior to submitting claims.

Annexe 1 - Stocking Density Survey Recording Table *(please fill in the blank boxes)*

Summary Sheet

Contract Summary

FGS Case Ref No:		FGS Application Name:		Total Contract Area [including designed open ground] (Ha)	
Survey Date		Surveyor		Total Planted Area [excluding designed open ground] (Ha)	

Option Summary & Survey Results

FGS Option (eg WC - Diverse Conifer)			
Species Composition (e.g. 'Other Conifer Species; 'Native broadleaves or shrubs')	**Area** (ha)	**Minimum Contractual Stocking Density** (per ha)	**Average Stocking Density Recorded** (per ha)

Option Planted Area (Ha) – excl DOG:	
Number of discrete areas:	
Number of plots:	

FGS Option (eg WC - Diverse Conifer)			
Species Composition (e.g. 'Other Conifer Species; 'Native broadleaves or shrubs')	**Area** (ha)	**Minimum Contractual Stocking Density** (per ha)	**Average Stocking Density Recorded** (per ha)

Option Planted Area (Ha) – excl DOG:	
Number of discrete areas:	
Number of plots:	

FGS Option (eg WC - Diverse Conifer)			
Species Composition (e.g. 'Other Conifer Species; 'Native broadleaves or shrubs')	**Area** (ha)	**Minimum Contractual Stocking Density** (per ha)	**Average Stocking Density Recorded** (per ha)

Option Planted Area (Ha) – excl DOG:	
Number of discrete areas:	
Number of plots:	

Survey Sheet (Page 1 of ...)
Please include a map marking the location of each numbered plot

Option							
Plot No	**Grid Ref**	**Species Composition**		**Species Composition**		**Species Composition**	**Notes**
		Live Trees	Dead Trees	Live Trees	Dead Trees	Live Trees	Dead Trees	

							TOTAL

By species composition the:
total number of Live Trees / total number of plots X 100 = Average Stocking Density /ha

Annexe 2 – Example of Stocking Density Survey Recording Table

Summary Sheet

Contract Summary

FGS Case Ref No:	16FGS12345	FGS Application Name:	Leckie Hill Woods	Total Contract Area [including designed open ground] (Ha)	31.52
Survey Date	19/09/2020	Surveyor	J Smith	Total Planted Area [excluding designed open ground] (Ha)	29.38

Option Summary & Survey Results

FGS Option (eg WC - Diverse Conifer)	Conifer		
Species Composition (e.g. 'Other Conifers')	**Planted Area (ha)**	**Minimum Contractual Stocking Density (per ha)**	**Average Stocking Density Recorded (per ha)**
Main Conifer or Broadleaved Species	15.09	2,500	2,345
Other Conifers	2.74	2,500	2,516
Native broadleaves or shrubs	1.81	1,100	1,100

Option Planted Area (Ha) – excl DOG:	19.64
Number of discrete areas:	3
Number of plots:	30

FGS Option (eg 'Agroforestry'400 trees/hectare)	Diverse Conifer		
Species Composition (eg '400 trees/hectare')	**Planted Area (ha)**	**Minimum Contractual Stocking Density (per ha)**	**Average Stocking Density Recorded (per ha)**
Main Conifer	3.90	2,500	2,116
Other Conifers	3.08	2,500	1,950
Native broadleaves or shrubs	0.42	1,100	1,100

Option Planted Area (Ha) – excl DOG:	7.40
Number of discrete areas:	3
Number of plots:	16

FGS Option (eg WIG – Restructure Regeneration)	Native Upland Birch		
Species Composition (e.g. 'Delivering UKFS'))	**Planted Area (ha)**	**Minimum Contractual Stocking Density (per ha)**	**Average Stocking Density Recorded (per ha)**
Native Upland Birch (NVC W4)	2.34	1,600 at Initial Planting 1,100 at Establishment	1,216

Option Planted Area (Ha) – excl DOG:	2.34
Number of discrete areas:	1
Number of plots:	6

Survey Sheet (Page 1 of 3)
Please include a map marking the location of each numbered plot

	Option	Conifer					
Plot No	**Grid Ref**	**Species Composition**		**Species Composition**		**Species Composition**	**Notes**
		Main Conifer or Broadleaved Species		Other conifer		Native broadleaves & shrubs	
		Live Trees	Dead Trees	Live Trees	Dead Trees	Live Trees	Dead Trees	
1	NN/666/036	25	3					
2	NN/666/039	26	0					
3	NN/666/042	27	0					
4	NN/666/045	27	0					
5	NN/666/048	25	0					
6	NN/666/051	16	12					Evidence of deer damage. Highlighted to wildlife ranger who will increase monitoring within the plantation. Additional trees ordered and programmed to be planted in the next planting season
7	NN/666/053	18	8					As per note above
8	NN/666/057	17	3					As per note above
9	NN/666/060	19	6					As per note above
10	NN/666/063	20	6					As per note above
11	NN/668/066	22	3					As per note above
12	NN/668/069	22	3					As per note above
13	NN/668/071	25	0					
14	NN/668/074	25	0					
15	NN/668/077	26	0					
16	NN/668/080	26	0					
17	NN/668/083	24	2					
18	NN/668/086	25	0					
19	NN/668/092	26	0					
20	NN/668/095	28	0					
21	NN/670/098			20	6			Evidence of hinge planting, but not extensive
22	NN/670/101			26	0			
23	NN/670/104			27	0			
24	NN/670/107			27	0			
25	NN/670/110			25	0			
26	NN/670/113			26	0			
27	NN/670/116					12	0	
28	NN/670/119					11	1	
29	NN/670/122					10	3	
30	NN/670/125					11	0	
30		469	46	151	6	44	4	**TOTAL**

By species composition the:
total number of Live Trees / total number of plots X 100 = Average Stocking Density /ha
Main Conifer or Broadleaved Species = 469/20 x 100 = **2,345** stems/ha
Other conifer = 151/6 x 100 = **2,516** stems/ha
Native broadleaves & shrubs = 44/4 x 100 = **1,100** stems/ha

Option	Diverse Conifer						

Plot No	Grid Ref	Species Composition		Species Composition		Species Composition	Notes
		Main conifer		Other conifer		Native broadleaves & shrubs	
		Live Trees	Dead Trees	Live Trees	Dead Trees	Live Trees	Dead Trees	
1	NN/669/077	20	5					
2	NN/669/080	22	3					
3	NN/669/083	21	0					
4	NN/669/086	19	6					
5	NN/669/092	22	1					
6	NN/669/095	23	3					Evidence of rabbit damage. Checked fence and identified rabbit netting in south west corner had become detached from fence. Netting now re-attached and replacement trees ordered and programmed planting next March
7	NN/671/098			20	6			As per note above
8	NN/671/101			19	0			As per note above
9	NN/671/104			17	0			As per note above
10	NN/671/107			21	0			As per note above
11	NN/671/110			20	0			As per note above
12	NN/671/113			20	0			As per note above
13	NN/671/116					12		Trees in tubes looking good, however, noted significant weeds encroaching onto site that will require maintenance works. Programmed for next Spring
14	NN/671/119					11		
15	NN/671/122					10		
16	NN/671/125					11		

| 16		127	18	117	6	44		TOTAL

By species composition the:
total number of Live Trees / total number of plots X 100 = Average Stocking Density/ha

Main Conifer = 127/6 x 100 = **2,116** stems/ha
Other conifer = 117/6 x 100 = **1,950** stems/ha
Native broadleaves & shrubs = 44/4 x 100 = **1,100** stems/ha

Survey Sheet (Page 3 of 3)
Please include a map marking the location of each numbered plot

Plot No	Grid Ref	Option						Notes
		Native Upland Birch						
		Species Composition		Species Composition		Species Composition		
		Native upland birch (NVC W4)						
		Live Trees	Dead Trees	Live Trees	Dead Trees	Live Trees	Dead Trees	
1	NN/673/198	13	0					
2	NN/673/201	12	0					
3	NN/673/204	12	0					
4	NN/673/207	12	0					
5	NN/673/210	11	0					
6	NN/673/213	13	0					
6		73	0					TOTAL

By species composition the:
total number of Live Trees / total number of plots X 100 = Average Stocking Density/ha

Native Upland Birch = 73/6 x 100 = **1,216** stems/ha

66 | 67

Inglis Forestry Group

N
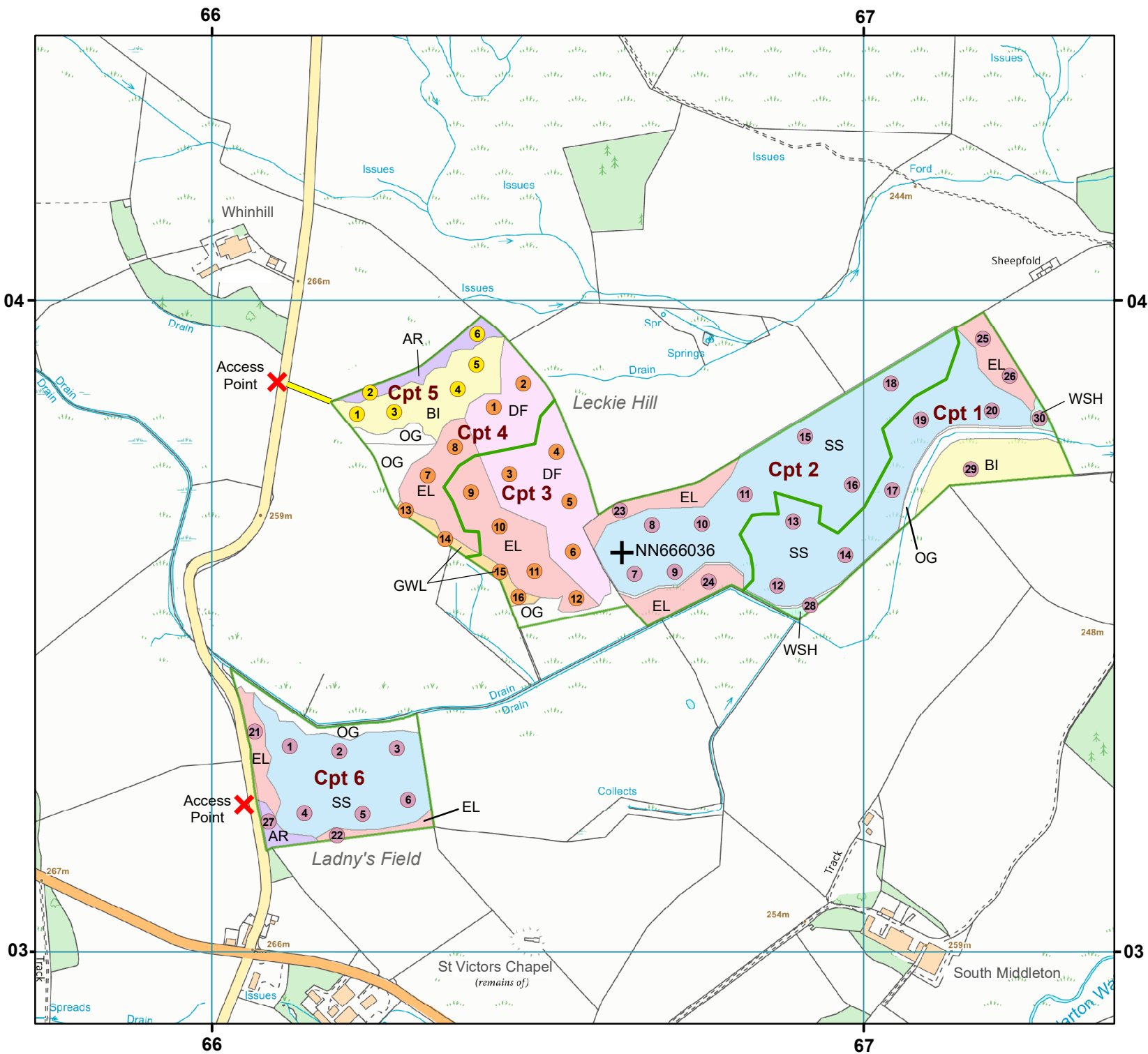
| Business Reference Number | 123456 |
| Location Code | 067/6271 |

Leckie Hill Woods

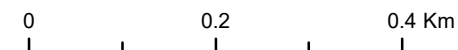## Stocking Density Survey Map

Legend

- Alder (AR)
- Birch (BI)
- Douglas Fir (DF)
- European Larch (EL)
- Goat Willow (GWL)
- Open Ground (OG)
- Sitka Spruce (SS)
- Woody Shrubs (WSH)

Option Stocking Density Plots

- CON
- DCON
- NUB

✕ Access Point

0   0.2   0.4 Km

© Crown copyright and database rights 2021.
Ordnance Survey Licence number 100043970.

This Map was produced on 29/09/2021

Whinhill

Leckie Hill

Access Point

Cpt 5
Cpt 4
Cpt 3
Cpt 1
Cpt 2
Cpt 6

NN666036

Sheepfold

WSH

St Victors Chapel
(remains of)

Ladny's Field

South Middleton