Scottish Natural Heritage
Research Report No. 1138

Birks of Aberfeldy SSSI: Herbivore Impact Assessment

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
nature.scot

RESEARCH REPORT

Research Report No. 1138

Birks of Aberfeldy SSSI: Herbivore Impact Assessment

For further information on this report please contact:

Peter McPhail
Scottish Natural Heritage
Battleby
Redgorton
PERTH
PH1 3EW
Telephone: 01738 444177
E-mail: peter.mcphail@nature.scot

This report should be quoted as:

Armstrong, H. & Chalmers, F. 2020. Birks of Aberfeldy SSSI: Herbivore Impact Assessment. *Scottish Natural Heritage Research Report No. 1138.*

RESEARCH REPORT

Summary

Birks of Aberfeldy SSSI: Herbivore Impact Assessment

Research Report No. 1138
Project No: 113848
Contractor: Helen Armstrong Broomhill Ecology, Fiona Chalmers Associates
Year of publication: 2020

Keywords

Birks; Aberfeldy SSSI; herbivore impact assessment; grazing, deer.

Background

The Birks of Aberfeldy SSSI is notified for its upland mixed ash wood and its lichen assemblage. When last assessed, the woodland was found to be in unfavourable declining condition due to a lack of tree regeneration in birch-dominated areas and the lichen assemblage was found to be in favourable condition but declining due to extensive beech regeneration. In October 2017 a Herbivore Impact Assessment was carried out at the Birks of Aberfeldy SSSI to determine the current impact of large herbivores on the woodland. The results were used to recommend management actions that would enable both notifiable features to attain favourable condition.

Main findings

- Large areas of the woodland are dominated by single age class birch. Many of the mature birch trees are old and are likely to start to senesce in the coming decades.
- There are very few saplings or young trees, of any species, present within the woodland apart from on the steep sides of the gorge. Elsewhere, beech saplings occur occasionally and saplings of other species rarely, often immediately adjacent to the main path through the gorge.
- Seedlings of ash, beech, hazel and rowan are abundant and fairly widespread. Seedlings of other tree species are rare.
- Birch seedlings may be rare due to shade from the extensive cover of bracken or, in some places, from the canopy. The reason for the rarity of seedlings of other tree species is not known but browsing may be a contributory factor.
- In areas of the SSSI that are not adjacent to the main path through the gorge, the current impact of deer is high. At this level of impact, very few palatable tree and shrub species, or preferentially browsed or grazed plant species, will be able to successfully regenerate. Flowering and seeding of the latter is also likely to be significantly lower than they would be if impact levels were lower.
- Beech seedlings are subject to lower browsing levels than are those of more palatable tree species and beech is therefore more likely to successfully regenerate. Browsing is, however, likely to be keeping many beech seedlings in check.
- Sheep may be crossing the eastern boundary of the SSSI.
- Rabbits appear to be abundant in the north east corner of the SSSI.

- If browsing pressure is not reduced, the extensive areas of birch dominated woodland are likely to become more open and the area of woodland will decline over the next few decades.
- Biodiversity overall is likely to be below its potential due to heavy browsing pressure.
- A reduction in browsing pressure is needed to bring the woodland into favourable condition. However, reducing browsing pressure is likely to result in the expansion of beech, possibly more than that of other tree species. This would lead to a decline in the condition of the SSSI. Consequently, deer control will need to be accompanied by the control of beech regeneration.

For further information on this project contact:
Peter McPhail, Scottish Natural Heritage, Battleby, Redgorton, Perth, PH1 3EW.
Tel: 01738 444177 or peter.mcphail@nature.scot
For further information on the SNH Research & Technical Support Programme contact:
Research Coordinator, Scottish Natural Heritage, Great Glen House, Leachkin Road, Inverness, IV3 8NW.
Tel: 01463 725000 or research@nature.scot

Table of Contents **Page**

1. INTRODUCTION

The Birks of Aberfeldy SSSI is situated to the south of the village of Aberfeldy in Perthshire. The SSSI covers 45.18 ha. Most of it is owned by Perth and Kinross Council with small areas on the periphery owned by three private landowners (Figure 1). The SSSI is designated for its upland mixed ash woodland and its lichen assemblage. Site condition monitoring of the woodland feature in 2012, and of the lichen feature in 2013, indicated that they were in unfavourable declining and favourable declining condition respectively. One of the reasons for the woodland feature being in unfavourable condition was the lack of young trees and shrubs in the birch woodlands flanking the main gorge. A key reason for this appeared to be that browsing by deer was preventing seedling trees from growing to sapling or pole stage. Although the woods may have been used several decades ago as pasture woodland, and sheep are grazed in adjacent stock-fenced fields, there are currently thought to be no domestic livestock present in the woodlands. Deer are, however, able to move relatively freely into and out of the SSSI from adjacent woodlands, farmland and residential areas. The aim of the current Herbivore Impact Assessment was to determine the impact of roe deer, and other herbivores, on the SSSI and, from that, recommend appropriate herbivore management to improve woodland condition.

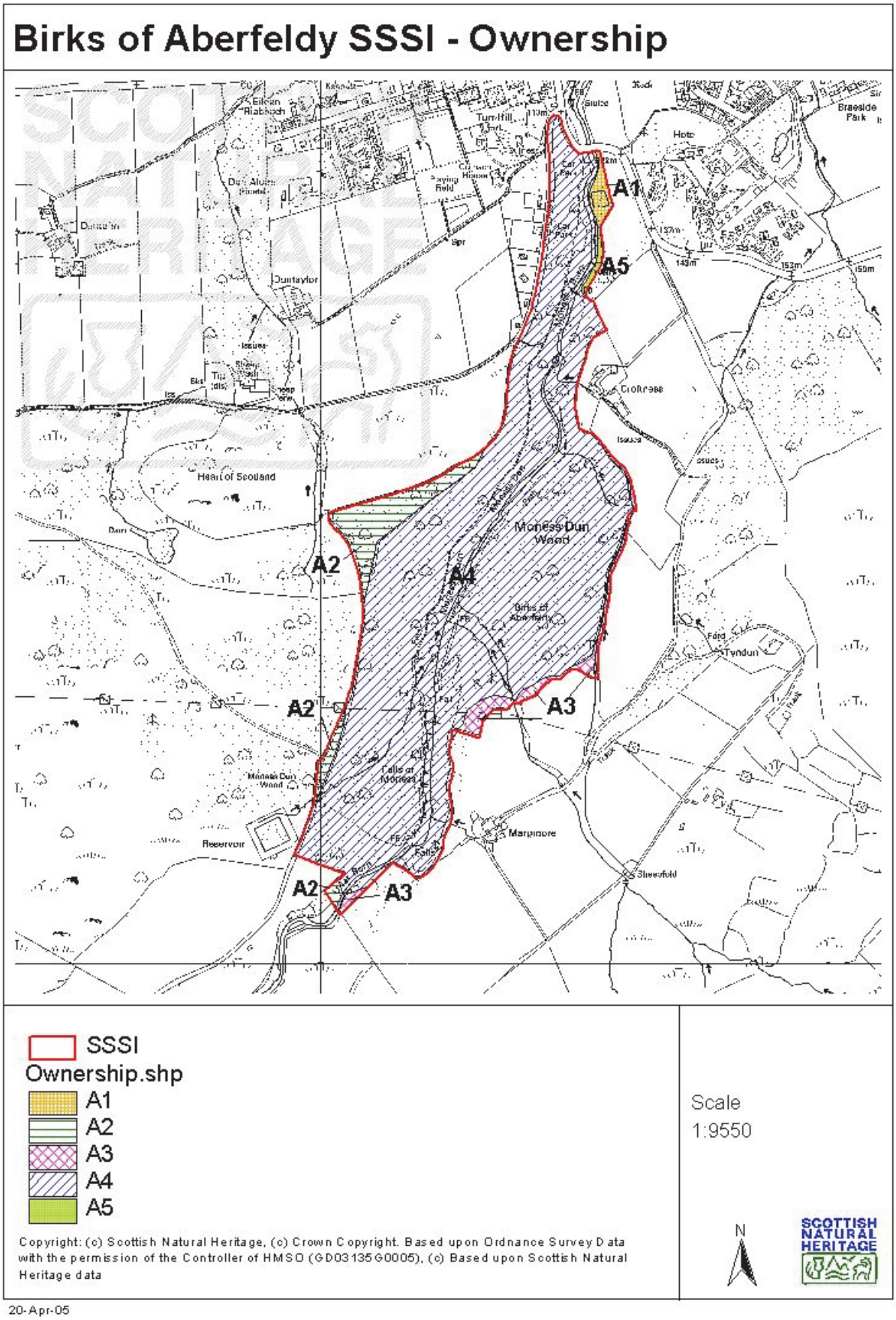


Figure 1. Map of the Birks of Aberfeldy SSSI showing ownership boundaries. Area A4 is owned by Perth and Kinross Council. The other areas are privately owned.

2. METHODS

2.1 Sampling strategy

The SSSI boundary was taken as the limit of the sampling area. A systematic grid of twelve potential stop /plot locations was determined using GIS mapping. Two additional stops /plots were added where the grid intersections were just outside the SSSI boundary. Where stops /plots were found, in the field, to be in inaccessible or unsafe locations, they were moved to the nearest safely accessible location and a new grid-reference recorded. Fourteen stops /plots were assessed (Table 1; Figure 2). This resulted in seedling /sapling density being sampled in 1.1 % of the area of the SSSI (using 12.6 m radius circular plots). The plots were assessed between the 26 and 28 October 2017 (Figure 2).

Table 1. Plot information

Plot	Grid reference	Post tag number	Date surveyed	Photo numbers
1	NN85455 48395	0552	26/10/17	1-4
2	NN85414 48138	0555	28/10/17	84-87
3	NN85333 47998	0556	26/10/17	7-10
4	NN85594 48010	0551	27/10/17	26-29
5	NN85203 47870	0557	26/10/17	11-14
6	NN85470 47864	0549	27/10/17	90-83
7	NN85347 47742	0553	27/10/17	76-79
8	NN85195 47683	0548	28/10/17	92-95
9	NN85461 47610	0545	27/10/17	57-60
10	NN85069 47486	0554	26/10/17	16-19
11	NN85282 47551	0542	27/10/17	72-75
12	NN85070 47227	0558	26/10/17	20-23
13	NN85577 47735	0543	27/10/17	44-47
14	NN85105 47739	0550	28/10/17	88-91

2.2 Plot size and marking

The centre of each plot was marked using a numbered (with an aluminium tree tag) wooden peg. The peg was hammered in such that only c. 10 cm was visible above the ground. The grid reference of each plot centre was recorded using a GPS. All plots used for tree seedling /sapling monitoring were of 12.6 m radius. In one case (plot 4) where there was a large number of ash seedlings, these were assessed in half the plot and the number of seedlings recorded was doubled to give an estimate of the number in the whole plot. Seedlings /saplings of other tree species were assessed in the whole plot. All plots were assessed by Helen Armstrong and Fiona Chalmers.

2.3 Stop /plot assessments

Within a notional area of 25 m around each plot centre (stop), Woodland Structure Class and current herbivore impact were recorded using the version of the Woodland Grazing Toolbox method (Armstrong, Black , Holl & Thompson, 2014) current at the time (version of 17 October 2017). The guidance used for these assessments is given in Annex 1, Tables 1 – 4. Within each 12.6 m radius plot average ground vegetation height was estimated and notes were made on woodland tree species composition and structure, NVC type, ground layer vegetation, signs of herbivores and factors potentially limiting regeneration. Within each plot the species and number of seedlings and saplings in four categories (Annex 1, Table 5) was recorded, together with the number of each that showed evidence of the leading shoot having been browsed in the last 12 months. Four photos were taken from the centre of each plot facing north, south, west and east. Photos were also taken of browsing indicators of particular interest.

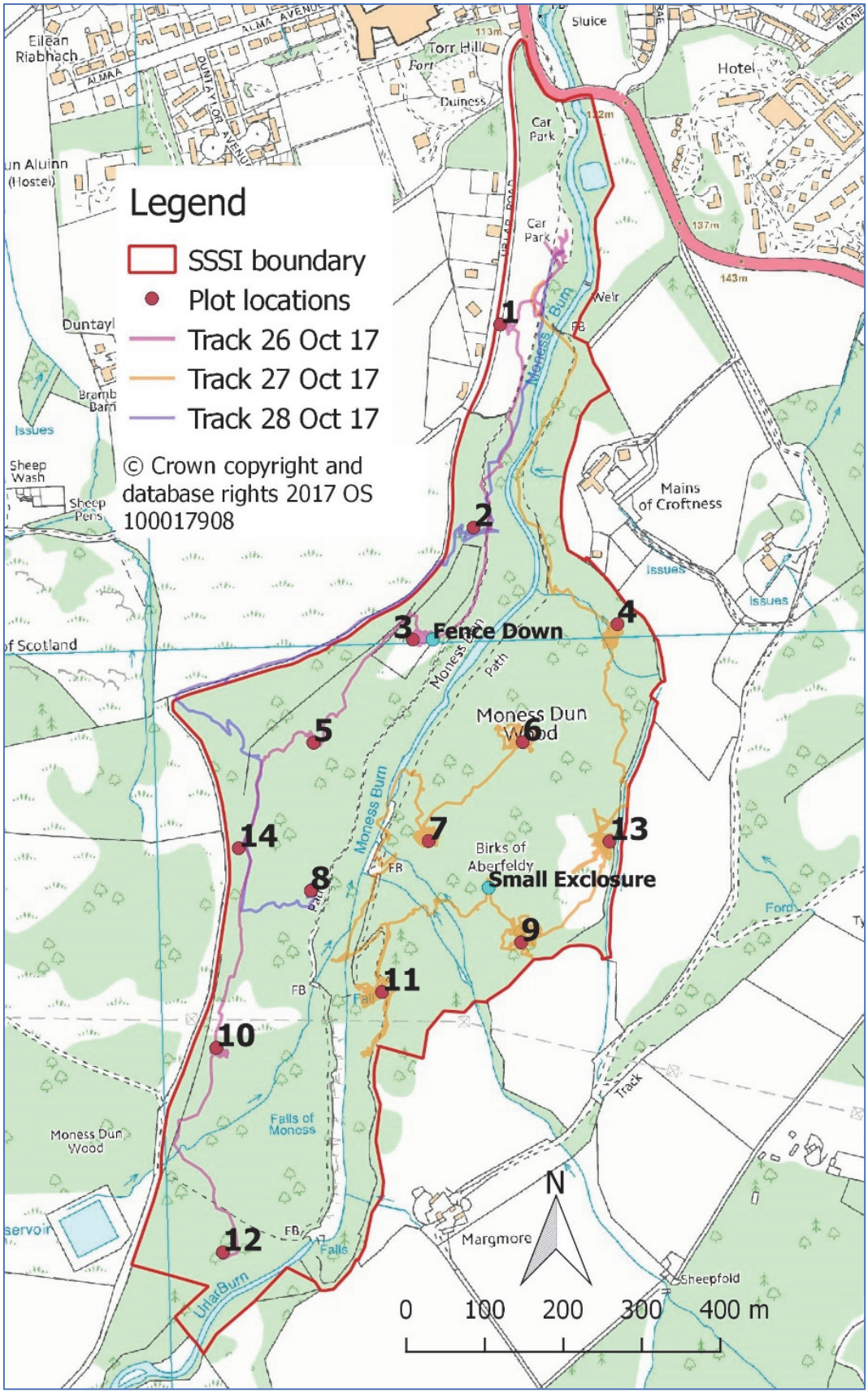


Figure 2. Map of the Birks of Aberfeldy SSSI showing the SSSI boundary as well as the location, and number, of each stop /plot and the route taken between stops on each day of field work. Also shown is the location of a small exclosure and the location of a break in the fence around a large exclosure.

3. RESULTS

Details of the results for each stop /plot are provided in Annex 2.

3.1 Woodland structure

At nine of the fourteen stops, the woodland was in structure class 6 (Table 2; Annex 1, Table 1.1). In this structure class the woodland has a canopy of mature trees but there is an absence of saplings, young trees and climbing plant species. At one of these stops (9) part of the area was in structure class 1 (open but with no evidence of successful tree recruitment). At a further three of these stops (8, 10 and 14) the woodland was progressing towards structure class 8 where the woodland is starting to decline due to senescence and death of mature trees but there is still an absence of saplings, young trees and climbing plant species. At a further two stops (5 and 7) the structure class had already reached 8. These results suggest that at 11 of the 14 stops there has been a period of several decades during which there has been no, or very little, new tree or shrub recruitment. At three stops (1, 3 and 11) the woodland was in structure class 5 i.e. with a mature canopy and also an understorey of saplings and young trees (Table 2; Annex 1, Table 1.1). At these stops, successful tree regeneration has taken place at some point during the last few decades. Stop 1 is close to the car park and the main track and also has a power line running next to it where vegetation has been swiped in the past, stop 3 is within a deer and rabbit exclosure erected in 1999 (bracken may have been swiped at some point within the exclosure) and stop 11 is on a steep slope above the gorge and is also next to the main track. The regular presence of people and dogs near to stop 1, the exclusion of deer at stop 3, at least for a while after the fence was erected, and the steep slope and regular presence of people near to stop 11 may all have deterred deer and therefore allowed successful tree recruitment at these locations.

Table 2. Woodland structure class (WSC) at each stop. A number in brackets indicates that the woodland is progressing towards this structure class. Two numbers separated by a '/' indicates that two structure types occurred at the stop.

Stop	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**Most common WSC**
WSC	5	6	5	6	8	6	8	6 (8)	1/6	6 (8)	5	6	6	6 (8)	6

3.2 Woodland species composition

3.2.1 Senescent trees

Overall, very few senescent trees were noted. Senescent Birch was rare at four stops (2, 7, 10 and 12) and occasional at two stops (5 and 14; Tables 3 and 4). Willow was rare at one stop (7; Tables 3 and 4).

3.2.2 Mature trees

The dominant mature tree species was birch at nine stops, beech at three (stops 1, 3 and 11), oak at one (stop 4) and alder at one (stop 13; Figure 2; Tables 3, 4). Mature birch occurred at all fourteen stops, ash at seven, hazel at five and beech at three (Tables 3 and 4). Oak, rowan, willow, lime and sycamore occurred at one or two stops each (Tables 3 and 4).

3.2.3 Young trees

There were very few young trees (taller than saplings but not yet in the canopy) at any of the stops. Young beech were frequent at 3 stops and young birch were frequent at 1 stop (Tables

3 and 4). Young trees of another five species occurred occasionally or rarely at a small number of stops (Tables 3 and 4).

3.2.4 Saplings

Saplings occurred only occasionally or rarely and in a small number of plots (Tables 3 and 4). Beech was the most commonly encountered species of sapling but even this species occurred in only 4 plots where it was occasional or rare.

3.2.5 Seedlings

Seedling abundance varied considerably between plots. Seedlings were abundant or frequent in eight plots and occasional or rare in five (Table 3). No seedlings were found in plot 13. Beech and ash were the most abundant seedling species with beech seedlings abundant or frequent in six plots and ash in four (Tables 3, 4). Hazel and rowan were the only other species that were found to be either abundant or frequent (in two plots each; Tables 3 and 4). Beech and rowan seedlings were widespread, occurring in nine plots each (Table 3). Hazel and ash seedlings were found at seven and six stops respectively (Table 3). Oak, holly, birch, sycamore, cherry and elder seedlings were found in 5, or fewer, plots (Table 3). Very few seedlings were found that had germinated during summer 2017.

Table 3. Number of stops at which trees of each species and age class were found in each abundance class. Seedling and sapling abundance is based on total number of seedlings and saplings found in the plots, where Abundant i= >50, Frequent = 20-49, Occasional = 5-19 and Rare = 1-4.

Age class	Tree species	Abundant	Frequent	Occasional	Rare	Total
Senescent	Birch			2	4	6
	Willow				1	1
Mature	Birch	6	3	4	1	14
	Ash	1		1	5	7
	Hazel			4	1	5
	Beech	1	1	1		3
	Oak	1		1		2
	Rowan				2	2
	Willow				2	2
	Lime				1	1
	Sycamore				1	1
Young	Birch		1		5	6
	Beech		3		1	4
	Hazel			1	3	4
	Rowan				4	4
	Ash			1		1
	Aspen				1	1
	Alder				1	1
Sapling	Beech			2	2	4
	Ash				2	2
	Hazel			1	1	2
	Elder				1	1
	Elm				1	1
	Oak				1	1
Seedling	Beech	5	1		3	9
	Rowan	1	1	1	6	9
	Hazel	1	1	2	3	7
	Ash	4			2	6
	Oak			2	3	5
	Holly			1	3	4
	Birch				3	3
	Sycamore			1	2	3
	Cherry			1		1
	Elder				1	1

Table 4. Frequency of senescent (S), mature (M), young (Y), sapling (Sa) and seedling (Se) trees of different species at each stop. Seedling and sapling abundance is based on total number of seedlings and saplings in plots where Abundant is >50, Frequent is 20-49, Occasoinal is 5-19 and Rare is 1-4.

Stop	Age class	Abundant	Frequent	Occasional	Rare
1	S				
	M		Beech	Birch, Oak	
	Y		Beech		Hazel
	Sa			Beech	
	Se	Beech		Hazel, Holly	Elder, Oak, Rowan, Sycamore
2	S				Birch
	M	Birch			Lime, Sycamore
	Y			Hazel	Rowan
	Sa				
	Se	Beech	Hazel, Rowan	Cherry, Oak, Sycamore	Ash, Holly
3	S				
	M			Beech	Birch, Willow
	Y				Beech, Rowan
	Sa				Beech
	Se	Beech		Hazel, Oak	Holly, Rowan, Sycamore
4	S				
	M	Oak		Birch, Hazel	Ash
	Y				Aspen
	Sa				
	Se	Ash			Beech, Birch, Hazel, Oak
5	S			Birch	
	M		Birch		
	Y				Birch
	Sa				Elder
	Se				Beech
6	S				
	M	Birch		Hazel	Ash
	Y				Birch
	Sa				
	Se	Ash, Beech			
7	S				Birch, Willow
	M	Birch			Hazel, Willow
	Y		Beech		Birch, Rowan
	Sa				
	Se		Beech	Rowan	Holly, Oak
8	S				
	M	Birch			Ash
	Y				Hazel
	Sa				Beech, Hazel
	Se	Ash, Beech, Hazel			Rowan
9	S				
	M		Birch	Hazel	Ash
	Y				Hazel
	Sa				Ash
	Se	Ash			Beech, Birch, Hazel, Rowan
10	S				Birch
	M	Birch			Rowan
	Y				Birch
	Sa				
	Se				Rowan
11	S				
	M	Beech		Ash, Birch, Hazel	
	Y		Beech	Ash	
	Sa			Beech, Hazel	Ash, Elm, Rowan
	Se			Ash, Beech	Hazel, Rowan

12	S				Birch
	M		Birch		
	Y		Birch		
	Sa				
	Se	Rowan			Ash, Birch, Hazel
13	S				
	M	Alder		Birch	Ash, Rowan
	Y				Alder, Birch
	Sa				
	Se				
14	S			Birch	
	M	Birch			
	Y				Rowan
	Sa				
	Se				Rowan

3.3 Ground flora

The ground flora varied considerably between plots however bracken was a significant component of the ground flora in eight of the fourteen plots (Table 5). Under beech canopies there was very little, if any, ground vegetation (Table 5). Vegetation height also varied considerably between plots (Table 5).

Table 5. Dominant ground flora and vegetation height at each stop.

Stop /NVC	**Dominant Ground flora**	**Average vegetation height (cm)**
1 W11	Mostly bare ground under beech with some wood rush, cocksfoot and grasses plus garden escapes.	10
2 W11/17	Grass, moss, some bracken, some ferns, wood sage.	Ferns: 100 Grass: 15
3 W11	Bracken (40% cover), grasses, ferns, bare ground under beeches.	Bracken: 100 Under beech: 0 Elsewhere: 10
4 W11d /W9?	Grasses, moss, some bluebells, ferns by stream, violets.	4
5 W11	100% cover of bracken. Occasional ferns.	120
6 W11	Enchanter's nightshade, bluebell, wood sorrel, wood sage,	40
7 W17	Tall Bracken over 70% of plot.	Bracken: 100 Rest: 10
8 W11b	Bracken covers >90% of W11b area. Bracken, tufted hair grass, Ferns.	Bracken: 120 Elsewhere: 8
9 W11	Enchanters' nightshade, Yorkshire fog, wood sorrel.	25
10 W17	100% bracken /grass.	120
11 W9	Deep shade from Beech so not much ground vegetation.	5
12 W11	High bracken cover (40% of plot) plus Yorkshire fog, tufted hair grass and occasional raspberry	Bracken: 100 Elsewhere: 20
13 W7c	Wet, with streams running through the stop. Some wet grassland. Grasses, ferns, bracken, butterbur, thistles (on edge of flushed, open area)	70
14 W11b	100% bracken dominated with litter layer in parts and with grasses and raspberry below.	120

3.4 Possible factors limiting tree regeneration

Shade under beech (3 stops), oak (1 stop), alder (1 stop) and birch (1 stop) may have been limiting tree regeneration (Table 6). Tree regeneration may have been limited by shade and competition from bracken at 5 stops and by a dense sward at 2 stops (Table 6). Areas of wet soil at 1 stop may also have limited tree regeneration (Table 6).

Table 6. Possible factors limiting tree regeneration at each stop.

Stop	Possible factors affecting regeneration
1	Shade from beech in most of the plot.
2	None (Very light so shade is not a factor limiting regeneration)
3	Shade under beech trees. Bracken is tall but fairly open so may not be limiting regeneration.
4	Shade under oak (>90% canopy cover).
5	Bracken is extensive but there is a ground flora below the bracken so it may not be limiting seedling germination but may be limiting growth.
6	60% of plot consists of a grassy sward which may hinder regeneration. Shade probably not a limitation since the birch lets a lot of light through.
7	Shade and competition from Bracken.
8	Shade and competition from Bracken.
9	Dense sward. Poor drainage in < 10% of plot. Shade under birch in wooded part of plot.
10	Shade and competition from bracken.
11	Dense shade under multi-age beech.
12	Shade and competition from bracken in part of plot.
13	Shade under alder. Wet soils (but there are no seedlings even in open, dry areas)
14	Shade and competition from bracken in 100% of plot. Bracken with deep litter layer in 20% of plot.

3.5 Signs of herbivores

Possible deer tracks were found at four stops and deer lying up sites at three stops (table 6). There was evidence of rabbits at stop 4 and roe deer dung was found at stops 4 and 13 (although the former may have been rabbit dung; Table 7). At stops 4 and 13 clumped dung pellets were found which may have come from sheep (Table 7). Since both these stops are on the eastern edge of the SSSI and sheep graze in the fields adjacent to the eastern edge, it is possible that the clumped dung was produced by sheep getting through the stock fence.

Table 7. Signs of herbivores at each stop.

Stop	Signs of herbivores
1	None
2	None
3	Possible deer lying up site
4	3 fresh rabbit burrows and droppings. Fresh pellets (most likely roe deer but might be rabbit; photo 43), 4 fresh clumped pellet groups (most likely sheep; photo 42)
5	None
6	Deer lying up site.
7	Human track through plot that narrows to what could be a deer track.
8	None
9	Deer track
10	Deer lying up site.
11	None
12	None (possible deer track through plot).
13	2 deer pellet groups (photo 48), 2 fresh clumped pellet groups (sheep?; photo 49.). Deer track.
14	Deer track (vegetated) through edge of plot.

3.6 Human disturbance

Human paths were noted within, or adjacent to, stops 1, 2, 6, 11, 12 and 14 (Table 8).

Table 8. Additional notes on each stop.

Stop	Notes
1	Power line through stop. Very close to road, path and bike track. Part of stop has had waste tipped on it in the past.
2	Two vegetated tracks through the stop most likely human as connecting upper and lower paths. Three young beech trees have been cut in the past and are now re-sprouting from the base.
8	Main path at eastern edge of plot.
11	Adjacent to main path.
12	There is a path through the stop.
14	Human path through the centre of the plot. Tarmac road close to the plot.

3.7 Current herbivore impact

The assessment of current herbivore impact showed a much higher impact on tree shoots and preferentially grazed or browsed plant species than on bark, ground disturbance and the sward (Table 9). Over the whole site, the current herbivore impact on bark, ground disturbance and the sward was assessed as 'no impact' although a low impact was found at stop 9 and an impact between 'no impact' and low was found at stop 14 (Table 9). The overall current herbivore impact on tree shoots and preferentially browsed and grazed plant species was assessed as high; however there was a high level of variation between stops (Table 9, Figure 3), with impacts tending to be between 'no impact' and medium near to the main path through the glen and either high or very high elsewhere (Figure 3). The exception to this is stop 3 which had low impacts but is not next to the main path. Stop 3 is within a 0.68 ha deer and rabbit exclosure that was erected in 1999. It is no longer deer proof since the chicken wire has been pulled down allowing deer access just to the west of plot 3 and there is a break in the eastern side of the fence where a tree has fallen onto it (marked on Figure 2) however the fence may deter deer entry and therefore result in reduced deer impacts. Impact levels on the basal shoots, epicormic and lower shoots and preferentially browsed and grazed plants individually tended to show a similar pattern (Figures 4-7). By contrast, impacts on seedlings and saplings were low only at stop 1, medium at three stops (11, 12 and 13) and high or very high at the remaining ten stops (Figure 6). A high or very high impact is sufficient to prevent the successful establishment of all but the least palatable tree species and will prevent the flowering, seeding and spread of preferentially browsed and grazed plant species.

The lack of an obvious impact on bark, ground disturbance and the sward despite the high impact on tree shoots and preferentially browsed and grazed plant species is consistent with the major herbivore being roe deer and with the time of the assessment. Roe deer do not bark strip however they do fray saplings and old fraying was recorded at eight stops (Annex 2). It is likely that the amount of fraying in any year is relatively low but that, over the years, the evidence builds up. Roe deer are small, territorial deer that do not generally produce much ground disturbance. Unlike red deer they do not make wallows and do not occur in large herds. More impact on the sward might have been seen if the assessment had been carried out at the end of winter after a period of low plant growth and reduced forage availability.

Table 9. Current Herbivore Impact Assessment: summary of results. Stop numbers are entered under the appropriate impact level for each indicator. Where a stop number is entered under more than one impact level (shown in blue), this indicates that different elements of the indicator showed different impacts or that it was not possible to distinguish between the impact levels given the species of seedling /sapling present. More information on the results for each indicator at each stop is provided in Annex 2.

Current herbivore Impact							
Impact Indicator	**Not applicable**	**Very high**	**High**	**Medium**	**Low**	**No Impact**	**Overall impact**
Bark stripping and stem breakage	5,6,8,14				3,10	1,2,4,7,9,11, 12,13	**No impact**
Ground disturbance					9,12,13,14	1,2,3,4,5.6,7,8, 10,11	**No impact**
Basal shoots	3,5,8,14	4,6,7,9,13	7	2	10,11	1,12	**Very High**
Epicormic and lower shoots	5	4,9	2,6,7,10,11,13	14		1,3,8,12	**High**
Seedlings and saplings		4,7,10,12,14	2,3[1],5[1],6,8[2],9, 13[3]	11,12,13[3]	1	8[2]	**High**
Preferentially browsed or grazed plants		4,9,10,	5,7,13,14	6	2,12	1,3,8,11	**High**
Sward					4,9	1,2,3,5,6,7,8, 10,11,12,13,14	**No impact**
Overall impact	Tree shoots and preferred plants	4,9	5,6,7,10,13,14	2,11[4]	3,8,11[4],12	1	**High**
	Bark, ground and sward				9,14[4]	1,2,3,4,5,6,7,8, 10,11,12,13, 14[4]	**No Impact**
Comments	Very variable impacts both within, and between, stops.						

[1] Ambiguous results (see Annex 2). [2] No impact next to the main path but high impact away from the path. [3] Based only on one birch seedling. [4] Impact falls between two levels.

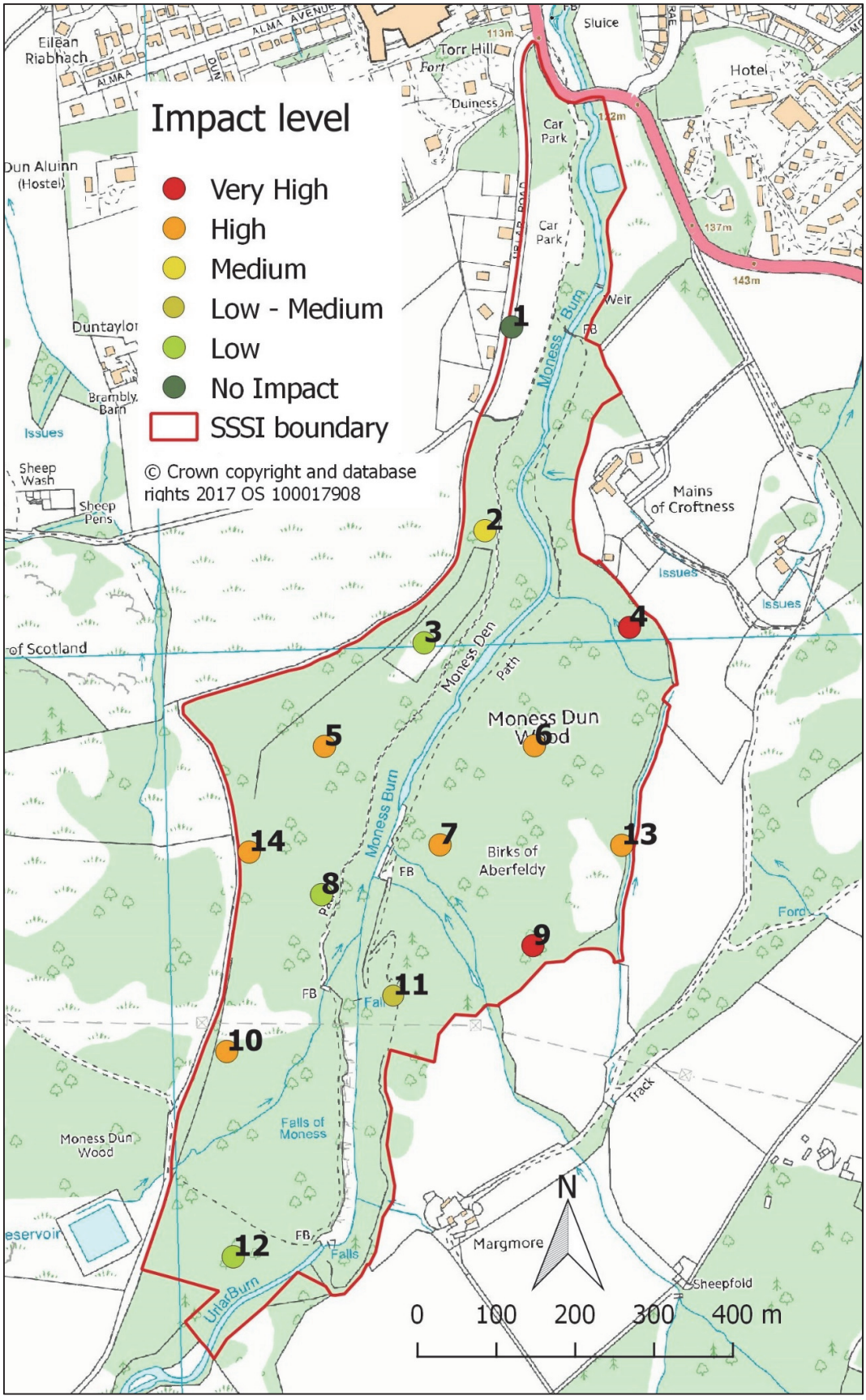


Figure 3. Overall current herbivore impact level at each stop on ***tree shoots and preferentially browsed plant species****.*

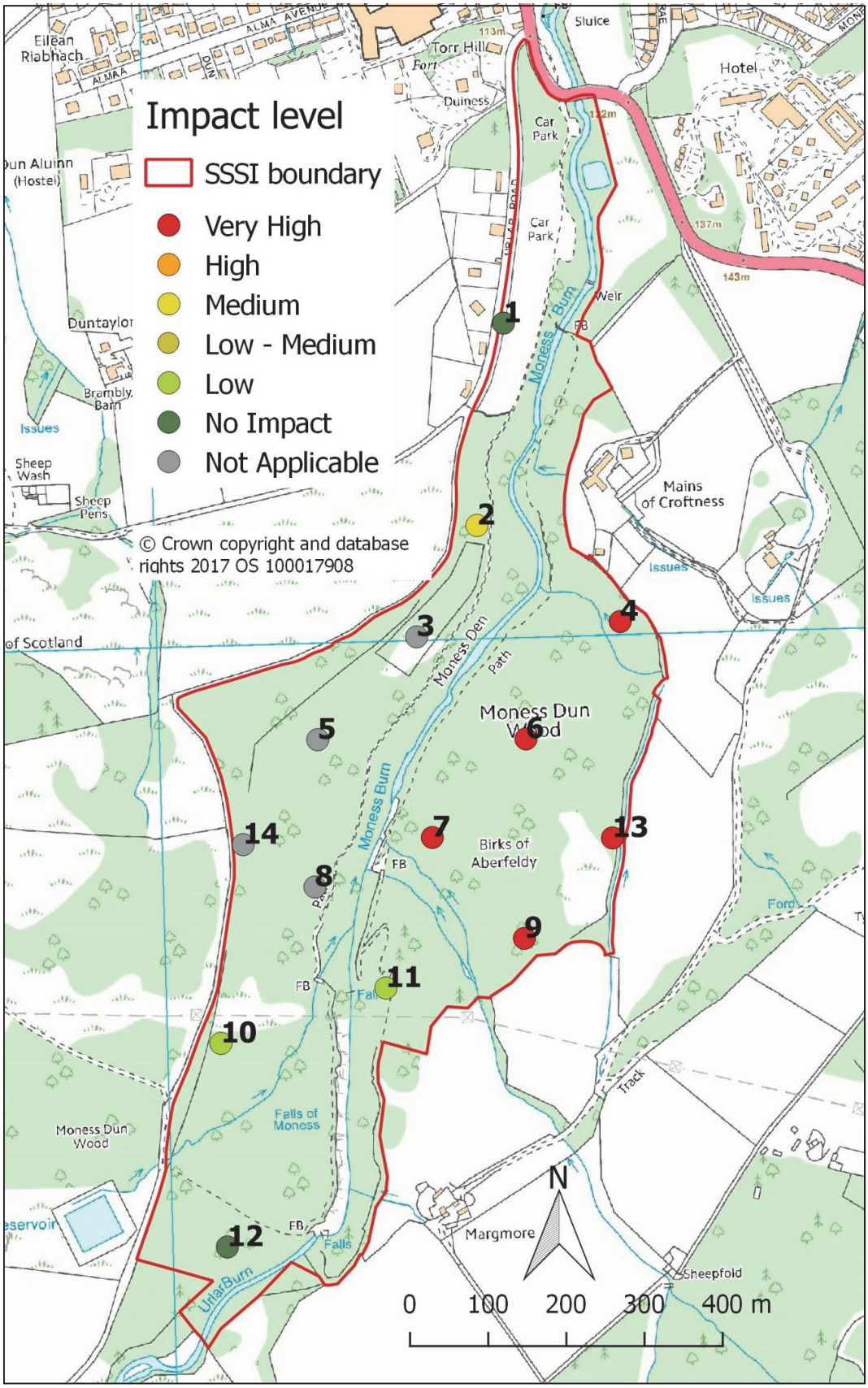


*Figure 4. Level of impact on **basal shoots** at each stop.*

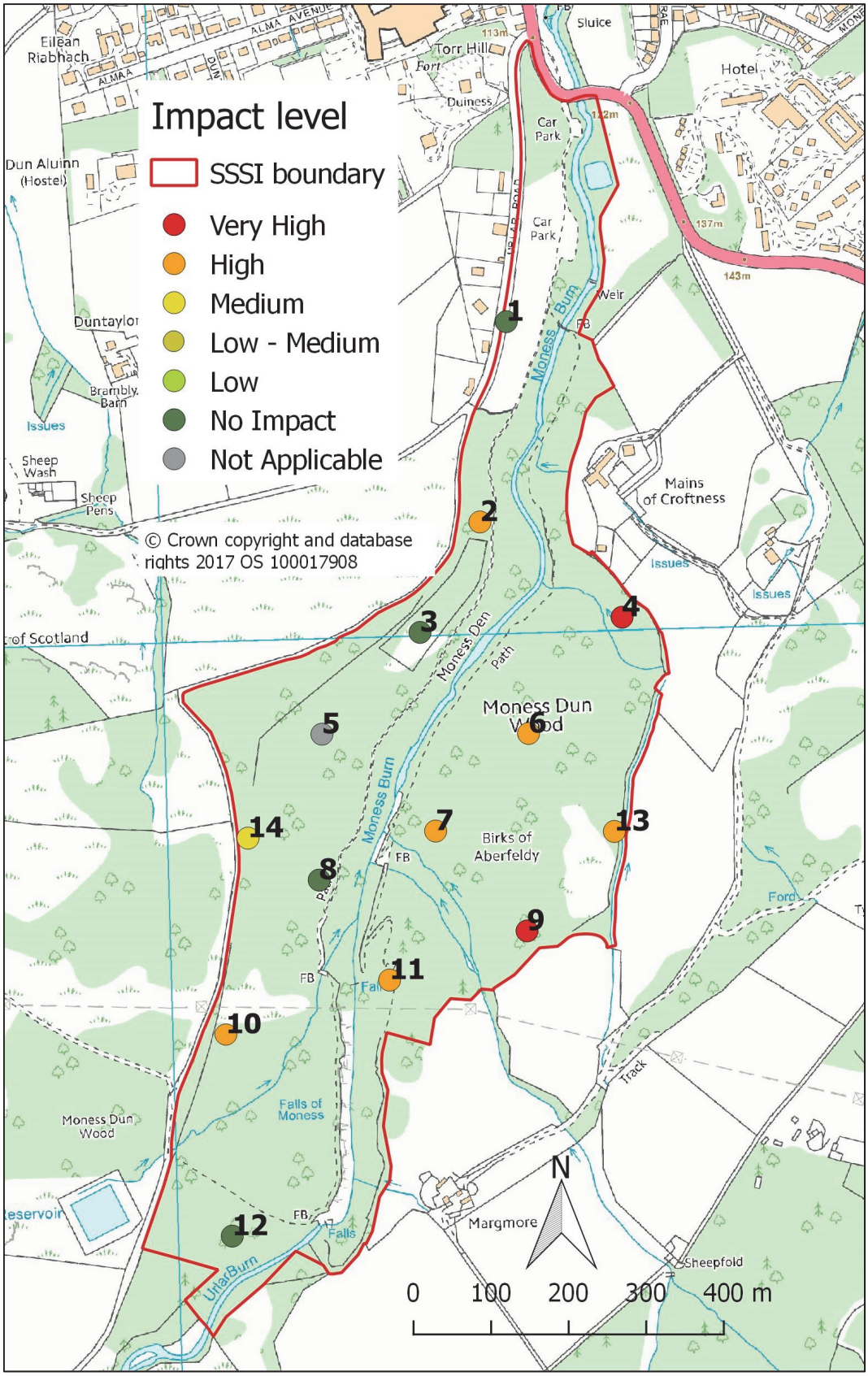


*Figure 5. Level of impact on **epicormic and lower shoots** at each stop.*

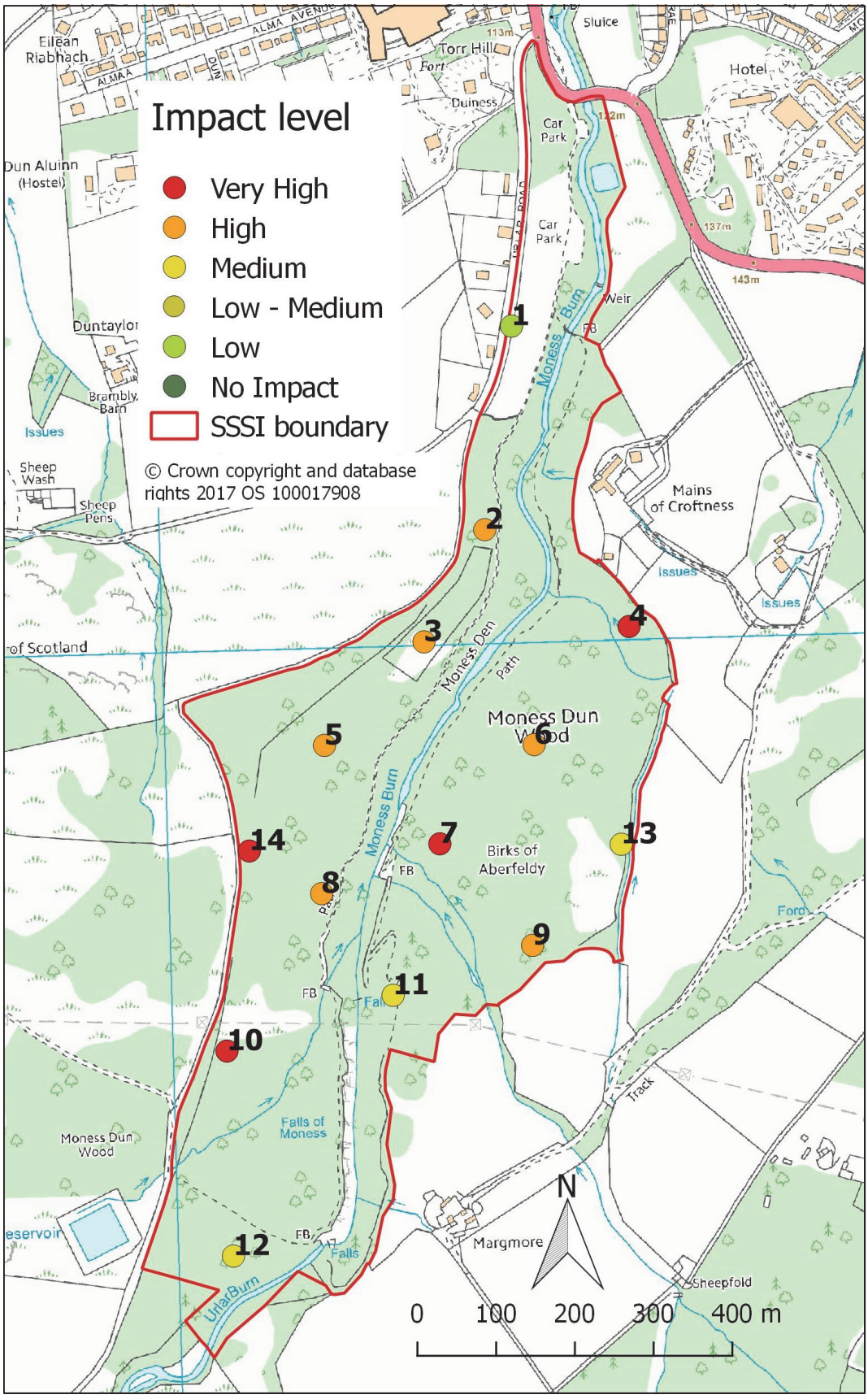


*Figure 6. Level of impact on **seedlings and saplings** at each stop.*

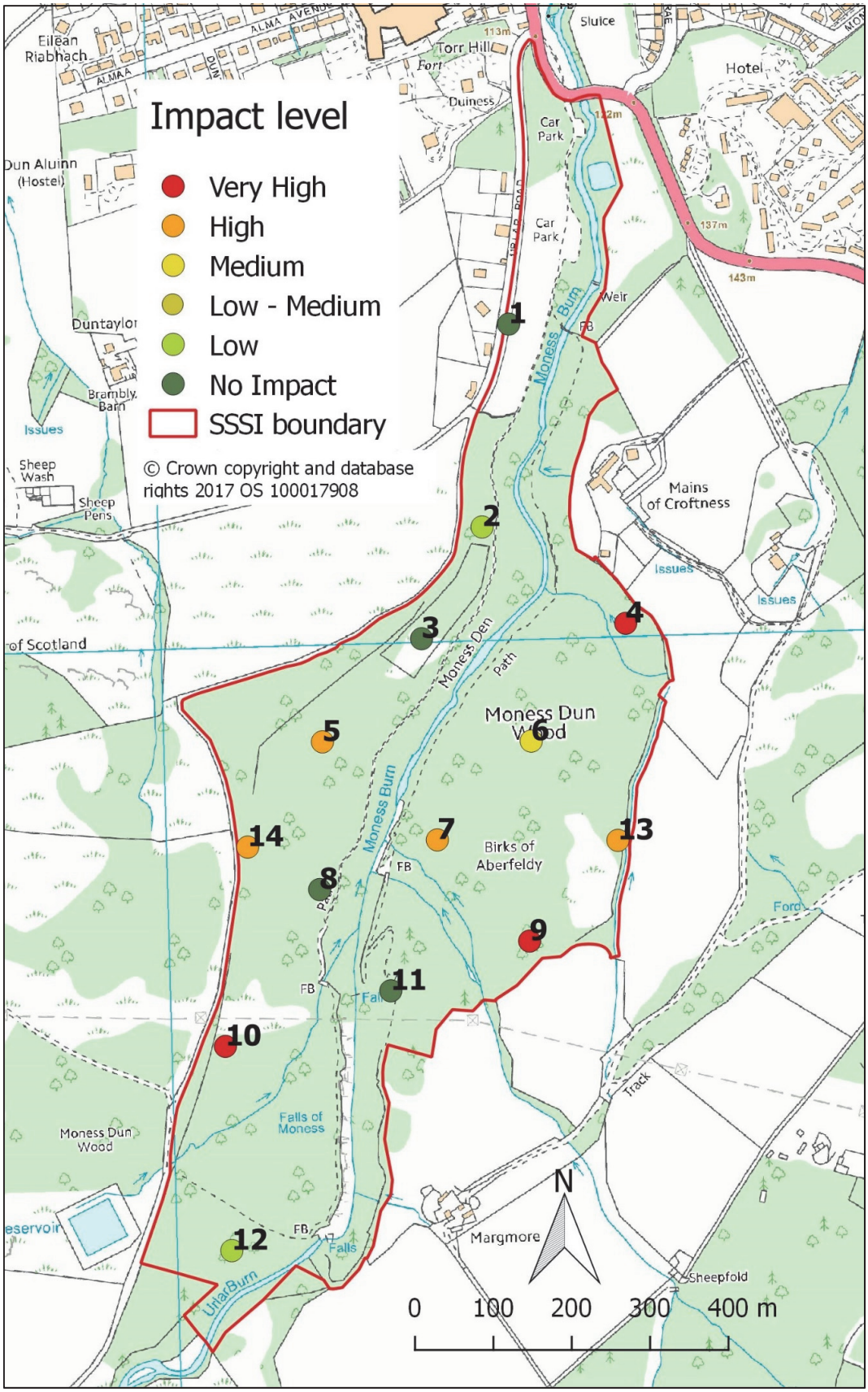


Figure 7. Level of impact on ***preferentially browsed or grazed plants*** *at each stop.*

3.8 Density of seedlings and saplings in plots

Seedlings of only four species (ash, beech, hazel and rowan) were found both in relatively high numbers and in at least half the plots (Table 10). More ash seedlings were recorded than any other species, however the majority of these were found in one plot (plot 4; Table 10). Beech and rowan seedlings were found in most plots (10 and 9 plots respectively) and hazel was found in 8 plots. Seedlings of all other species were found in small numbers and in few plots (Table 10). Plot 13 contained no seedlings at all. These results suggest that only ash, beech, hazel and rowan have the potential to regenerate in significant numbers over a wide area. Very few seedlings were found that had germinated during summer 2017. It is not possible to tell whether this is because they were never there or because they have already been removed by pests, disease, desiccation or browsing.

Table 10. Number of all (small and large) seedlings in each plot and in total, together with the number of species per plot and in total and the number of plots in which each species, and any species, was found.

Plot	Ash	Beech	Birch	Cherry	Elder	Hazel	Holly	Oak	Rowan	Sycamore	Total no.	Total spp.
1	0	58	0	0	1	7	15	1	1	4	87	7
2	3	125	0	9	0	29	1	7	25	9	208	8
3	0	135	0	0	0	9	1	7	1	1	154	6
4	847	2	1	0	0	2	0	1	0	0	853	5
5	0	4	0	0	0	0	0	0	0	0	4	1
6	3	2	0	0	0	0	0	0	0	0	5	2
7	0	28	0	0	0	0	1	1	17	0	47	4
8	8	15	0	0	0	9	0	0	1	0	33	4
9	15	1	3	0	0	1	0	0	2	0	22	5
10	0	0	0	0	0	0	0	0	1	0	1	1
11	12	8	0	0	0	4	0	0	2	0	26	4
12	1	0	1	0	0	2	0	0	61	0	65	4
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	6	0	6	1
Total no.	889	378	5	9	1	63	18	17	117	14	1,511	10
Total plots	7	10	3	1	1	8	4	5	9	3	13	

Saplings occurred in only half the plots (Table 11). Of these, there were five or fewer saplings in all but plot 11. Plot 11 is next to the gorge path and is on steep ground falling away towards the gorge so may for some time have been subject to lower browsing rates than are other plots. Despite the presence in plot 11 of a closed canopy of mature beech, with some mature ash, birch and hazel (Table 4), a relatively large number of saplings was present. Disturbance by people and dogs, and the relative inaccessibility of the area to deer, may have allowed these saplings to establish.

Table 11. Number of all (small plus large) saplings in each plot and in total, together with the number of species per plot and in total and the number of plots in which each species, and any species, was found.

Plot	Ash	Beech	Elder	Elm	Hazel	Rowan	Total no.	Total spp.
1	0	5	0	0	0	0	5	1
2	0	0	0	0	0	0	0	0
3	0	3	0	0	0	0	3	1
4	0	0	0	0	0	0	0	0
5	0	0	1	0	0	0	1	1
6	0	0	0	0	0	0	0	0
7	0	2	0	0	0	0	2	1
8	0	1	0	0	1	0	2	2
9	1	0	0	0	0	0	1	1
10	0	0	0	0	0	0	0	0
11	4	16	0	4	7	3	34	5
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
Total no.	5	27	1	4	8	3	48	6
Total plots	1	5	1	1	2	1	7	

3.9 Leader browsing on seedlings in plots

Browsing on seedlings and saplings was defined as browsing of the leading shoot within the last twelve months. Since saplings were taller than the maximum browsing height of roe deer (Annex 1, Table 1.5) it is only possible for seedlings to be browsed.

Unpalatable seedlings (beech and birch) had a lower percentage of their leading shoots browsed (33%) than did palatable seedlings (87%; Table 12). Small seedlings were less likely to be browsed than were large seedlings (Table 12). Only 5% of large seedlings of palatable species had not been browsed in the previous twelve months whereas nearly 70% of large seedlings of unpalatable species had not been browsed (Table 12). Browsing pressure is therefore likely to be severely restricting the regeneration of palatable tree species and severely reducing, but not preventing, the regeneration of unpalatable tree species (largely beech).

Table 12. Overall browsing rates on unpalatable (Beech and Birch) and palatable (all other species) seedlings in all plots.

	Unpalatable species			Palatable species		
	Number	No. browsed	% browsed	Number	No. browsed	% browsed
Small seedlings	122	26	21	140	49	35
Large seedlings	261	99	31	988	934	95
All seedlings	383	125	33	1,128	983	87

Of the four most common species, browsing rates on beech were the lowest (26%), followed by hazel (34%), rowan (75%) and ash (95%; Table 13). This suggests that, although quite widespread (Table 10), it is unlikely that ash seedlings will be able to establish anywhere in the SSSI under current browsing pressures. Even in plot 11, where there were four ash saplings (Table 11), the leading shoots of eleven out of twelve ash seedlings had been browsed. Rowan seedlings would appear to have a very small chance of escaping browsing, but hazel seedlings have a higher chance (Table 13).

Table 13. Browsing rates (%) on all seedlings (small plus large) of the most common tree species.

	Small seedlings	Large seedlings	Total
Ash	22	100	96
Beech	21	29	26
Hazel	30	38	34
Rowan	61	81	75

Browsing rates on palatable seedlings tended to be lower in plots 1, 2 and 3 than in the other six plots where there were sufficient palatable seedlings to calculate reliable browsing rates (plots 4, 7, 8, 9, 11 and 12; Table 14). This suggests that palatable tree species may have slightly more chance of escaping browsing in plots 1-3 than in the other plots. This may be due to the location of these stops close to the car park and therefore higher disturbance from walkers and dogs. There are insufficient data to compare browsing rates between plots for unpalatable species.

Table 14. Browsing rates on all (small plus large) unpalatable (Beech and Birch) and palatable (all other species) seedlings in each plot.

	Unpalatable species			Palatable species		
Plot	Total no.	No. browsed	% browsed	Total no.	No. browsed	% browsed
1	58	10	17	29	7	24
2	125	25	20	83	29	35
3	135	57	42	19	7	37
4	3	2	67	850	816	96
5	4	0	0	0	0	
6	2	1	50	3	3	100
7	28	25	89	19	16	84
8	15	1	7	18	15	83
9	4	2	50	18	15	83
10	0	0		1	1	100
11	8	1	13	18	13	72
12	1	1	100	64	57	89
13	0	0		0	0	
14	0	0		6	4	67
Total	383	125	33	1128	983	87

3.10 Exclosures and areas inaccessible to deer

As well as the 0.64 ha exclosure on the west side of the SSSI in which stop /plot 3 was located there is also a small exclosure on the east side of the SSSI close to stop 9 (Figure 2). The fence surrounding the large exclosure is no longer deer or rabbit proof and it is unknown how long this has been the case, so it cannot be used as an example of unbrowsed /ungrazed woodland. Inside the small exclosure on the east side of the SSSI, however, there were abundant ash, rowan and birch saplings. This was in marked contrast to the lack of saplings outwith the exclosure (photos 68-71). The upper wires of the exclosure are loose so it is not clear whether the exclosure is currently deer proof, but even it if is not, it is likely that it has been in the past and that this has allowed the saplings to 'get away'. At two stops (6 and 9) there were saplings of ash and beech growing on upturned tree root plates where they were inaccessible to deer. This suggests that browsing pressure is a significant factor limiting the ability of seedlings to reach sapling stage.

3.11 Summary of findings

Our results indicate that herbivore impacts are high in areas away from the main path through the gorge and adjacent to the eastern edge of the SSSI, where sheep may be getting through the stock fence. Rabbits may be contributing to the high browsing impact on seedlings in the oak woodland in the north-eastern section of the SSSI. In areas near to the main path through the gorge, where disturbance from people and dogs is likely to be high, herbivore impacts are low. In contrast to this pattern, browsing on seedlings is medium to very high everywhere, except near the car park, hence it is unlikely that many seedlings, particularly those of the more palatable species, will be able to escape browsing and establish. There is evidence from inaccessible micro-sites at stops/plots 6 and 9, as well as from a small exclosure, that seedlings /saplings can get away if protected from deer (although it is unknown whether bracken swiping was carried out inside the small exclosures). The lack of young trees and saplings, and the complete lack of climbing plant speces, such as ivy and honeysuckle, suggests long term heavy browsing pressure. Heavy grazing on preferred plant species will be reducing the amount of flowering and seed setting thereby reducing the food supply for invertebrates, birds and small mammals.

4. PROGNOSIS FOR THE FUTURE AND EFFECTS OF REDUCING HERBIVORE IMPACT

Ash, hazel and rowan seedlings occur throughout much of the SSSI but currently browsing is preventing many of them from establishing, especially away from the main gorge path. There is potential for these tree species to spread if herbivore impacts are reduced. We saw no evidence of Chalara infection of ash (ash dieback) whilst in the field, however we were not carrying out a systematic survey and, were one to be done, it would be better done when the ash was in full leaf. If Chalara does reach, or is already within, the ash population in the SSSI, then ash may not spread even if herbvivore impacts are reduced. There are very few seedlings of other palatable tree species. This may be due to browsing on, and death of, seedlings early in their life or it may be due to other factors e.g insect attack or shading or competition with ground layer vegetation (especially bracken). Lack of a seed source may also be a factor for those species that are rarely found in the canopy although seeds of many species can be transported long distances by wind, birds and mammals. A reduction in browsing will assist the spread of these other tree species if browsing is a significant factor in their rarity. Despite being relatively unpalatable to deer, we found very few birch seedlings. The dense bracken cover in many parts of the SSSI, and the closed canopy in others, may be contributing to the lack of seedlings of this light-demanding species. Beech seedlings, by contrast, are widespread. Reducing deer browsing may therefore lead to prolific regeneration of beech, especially since beech is relatively unpalatable so will benefit more than some other tree species from a reduction in overall browsing pressure. This could have serious consequences for the biodiversity value of the SSSI given that the shade under a mature beech woodland results in a sparse, or non-existent, ground flora. It will also, eventually, affect the condition of the lichen assemblage notified feature which was found to be in favourable declining condition in 2013 due to the widespread regeneration of beech.

If the herbivore impact remains at its current level for the next few decades, we would expect to see continuing successful regeneration of a range of tree species adjacent to the main path through the gorge and on the sides of the gorge that are too steep to be accessible to deer. Elsewhere, some young beech trees are likely to establish but heavy browsing on all other tree species is likely to prevent, or severely limit, their establishment. Since much of the mature birch trees are now old and, in some places, the woodland is heading towards structure class 8 (with a component of dead and senescent trees), the extensive birch woodland present within the SSSI is likely to open up over the next few decades and to decline in extent. Extensive bracken cover may prevent new birch seedlings from establishing even if browsing pressure is reduced. Other tree species that have larger seeds and are more shade tolerant, may be able to establish within the bracken, especially in areas where the bracken is relatively open, as it is in may parts of the SSSI, if browsing pressure is reduced. Other tree species cast more shade than does birch so, if these species can successfully regenerate, they may eventually shade out the bracken allowing a more diverse woodland ground flora to establish.

A reduction in browsing pressure is also likely to result in the spread of the more palatable ground layer plant species such as raspberry and blaeberry. We did not find any bramble, ivy or honeysuckle. All of these species, and possibly others, may come into the SSSI if browsing pressure is reduced. There would also be a general increase in the amount of flowering and seed setting, leading to a potential increase in invertebrate, small mammal and bird diversity.

A reduction in browsing pressure, along with control of beech regeneration, would appear to be necessary for the notified features of the woodland to attain, and remain in, favourable condition. A herbivore impact of ‘low’ or ‘no impact’ on seedlings and saplings throughout the SSSI is likely to be needed to achieve this aim.

5. MANAGEMENT RECOMMENDATIONS

We suggest the following management actions:

1. Cull deer heavily throughout the SSSI but, in particular, away from the main path through the gorge. Roe deer, and possibly also red deer, are likely to come in from surrounding areas so culling would, ideally, be done over a wider area in collaboration with the owners of the surrounding land.
2. Regularly monitor herbivore impacts so that the effects of deer control can be assessed. Ideally, monitoring should be carried out every year at the start of spring when there is some new growth to help with spotting and identifying young trees, but the new growth is not yet sufficient to obscure browsing impact on the previous year's growth. Additionally, at this time of year, the full impact of over-winter browsing can be seen. If cost is an issue, omit the counts of seedlings and saplings and browsing impact within plots but include an estimate of seedling and sapling density using the method listed under 'optional extras' in Armstrong *et al.* 2014. Alternatively, monitor seedling and sapling density only every few years. Much of the other information that was collected as part of this assessment e.g. NVC type, ground vegetation, vegetation height, woodland structure type and woodland species composition, also does not need to be collected every year since these attributes would not be expected to change rapidly and it is the current herbivore impact indicators that will provide regular, and rapid, feedback on the effectiveness of any culling.
3. If culling of sufficient deer to achieve the target impact level is not possible, consider the possibility of deer fencing the whole woodland. This should only be considered, however, once a concerted attempt has been made to control deer over several years since deer fencing is very expensive both to erect and maintain, reduces the ease of access to the woodland by visitors and, unless the whole fence is checked, and maintained, regularly, will be ineffective. Even with a deer fence, deer control will be necessary within the fence initially and, very likely, on an on-going basis since it is likely that a fence of the necessary length will become porous at some time in its life.
4. Ensure that the stock fence on the eastern side of the SSSI is stock proof.
5. If deer browsing had been successfully reduced, and sheep have been excluded, but browsing impacts persist at levels that are too high in the north east of the SSSI, consider controlling rabbits in this area or protect a number of ash seedlings from rabbit browsing (as well as from deer and sheep browsing if necessary) to ensure their establishment.
6. Control beech regeneration by pulling out seedlings and cutting saplings on a regular basis. This could perhaps be done by volunteers.

6. REFERENCES

Armstrong, H., Black, B., Holl, K. & Thompson, R. 2014. Assessing herbivore impact in woodlands – a subjective method. https://forestry.gov.scot/images/corporate/pdf/herbivore-impact-assessment-method.doc

ANNEX 1: DETAILS OF THE METHODOLOGY

Table 1.1. Woodland Structure Classes

	Description
Class 1: Open ground, simple	Any open ground vegetation with a simple structure. May be open because of high herbivore impacts, because seed trees are absent or because the ground is very wet, very poor or rocky. Can include a deep field /shrub layer of unpalatable species e.g. bracken or rhododendron.
Class 2: Open ground, complex	Any open ground vegetation progressing towards woodland. Includes sparse tree regeneration and /or a low shrub layer that includes very palatable species, e.g. bramble. This suggests a period of low herbivore impacts within the last decade.
Class 3: Dense regeneration on previously open ground	Clumped patches of tree and /or shrub regeneration up to 3 m in height. This suggests that herbivore impacts have been low or absent for several years.
Class 4: Young, dense woodland in the thicket, stem exclusion, or early maturity stage	Young woodland with a closed canopy >3 m in height and too dense to allow new saplings to grow into it. Contains dead, suppressed stems and may contain small seedlings but normally these die due to a lack of light. This suggests that impacts over the last decade or more have been low or absent. Current herbivore impacts may vary.
Class 5: Mature woodland, understorey regeneration	Older woodland with small canopy gaps or where competition between canopy trees is minimal. The field layer is likely to be tall and dense. A woody shrub layer, a well-established understorey and /or frequent well-established tree seedlings and saplings will be present. This suggests a period of low herbivore impacts within the last decade.
Class 6: Mature woodland, no understorey regeneration	Older woodland with small canopy gaps or where competition between canopy trees is minimal. A single storey of mature trees with a sparse or absent understorey and a short field layer or a tall and dense field layer of unpalatable species such as bracken or purple moor-grass. Few or no woody species. This suggests medium to very high herbivore impacts over the last decade or more.
Class 7: Post-mature woodland, dead canopy trees, complex	Open canopy with senescent and dead canopy trees. A woody shrub layer and understorey are present, including frequent, well established saplings. This suggests a period of low herbivore impacts within the last decade.
Class 8: Post-mature woodland, dead canopy trees, simple	Open woodland with senescent and dead canopy trees, no understorey and little, if any, woody growth in the field layer. This suggests high, or very high, herbivore impacts over the last decade or more and a declining woodland cover.
Class 9: Open canopy, open-grown trees, complex	Wood pasture. Scattered, open-grown trees that are mature or post-mature, with tree regeneration and a tall, dense field layer that includes palatable species. This suggests a period of low herbivore impacts within the last decade.
Class 10: Open canopy, open-grown trees, simple	Wood pasture. Scattered, open-grown trees that are mature or post-mature, with a short field layer or a tall, dense field layer of unpalatable species such as bracken or purple moor-grass. Little or no tree regeneration. This suggests several decades of high or very high herbivore impacts and the potential for long-term decline in the woodland component.

Table 1.2. Current Herbivore Impact (current = within all, or part, of the preceding twelve months, depending on the time period of interest[1])

Note: if palatable and unpalatable species are present and the impacts on both do not match the descriptions below, use the higher impact, whether on the palatable or unpalatable species. This situation should rarely occur.

Indicator	Very High	High	Medium	Low	No impact
Bark stripping & stem breakage dbh = diameter at breast height (1.3 m above ground). Score as "Not applicable" if there are no trees susceptible to bark stripping or stem damage or if all damage occurred prior to the time period of interest.	>50% of live stems, and recently fallen branches, showing recent bark stripping that may be severe. One tree species, e.g. rowan, can have all accessible live stems stripped by deer. And /or >50% of live stems of saplings <5 cm dbh snapped by cattle and /or red deer.	20-50% of live stems, and recently fallen branches, showing recent bark stripping. One tree species, e.g. rowan, can have all accessible live stems stripped by deer. And /or 20-50% of live stems of saplings <5cm dbh snapped by cattle and /or red deer.	<20% of live stems, and recently fallen branches, showing signs of recent bark stripping. Sometimes one individual tree is badly bark stripped. And /or <20% live stems of saplings <5 cm dbh snapped by cattle and /or red deer. One tree species (e.g. rowan) may be heavily targeted.	Recent bark stripping generally hard to find. There may be one stripped or frayed tree. And /or Occasional stem snapping by cattle and /or red deer.	No recent bark stripping or stems snapped by large herbivores.
Ground disturbance **Animal disturbance** = trampling, pathways or wallows created within the assessment period. Score as "Not applicable" if the ground is composed of boulders or scree. N.B. plant litter is very quickly mineralised in moist, very rich woodlands and soil may be bare in spring. The lack of vegetation in these cases is not	>30% of ground disturbed by large herbivores. Deer and /or livestock: frequent wide, heavily used, and wholly un-vegetated, pathways and /or, on wet, open ground, there may be kicked out clods of turf and *Sphagnum* as well as well-defined deer wallows. Livestock: there may also be substantial areas of bare ground	15-30% of ground disturbed by large herbivores. Deer and /or livestock: pathways frequent and partially, or mostly, un-vegetated. Livestock: disturbance may be more widely distributed with some poached and /or un-vegetated ground especially if the ground is wet. There may be heavier disturbance	5-15% of ground disturbed by large herbivores. Deer and /or livestock: pathways not hard to find but largely vegetated or pathways rare but un-vegetated. Livestock: There may be heavier disturbance around feeding areas and pig shelters.	<5% of ground disturbed by large herbivores Deer and /or livestock: pathways rare and almost completely vegetated.	No areas of ground devoid of vegetation due to disturbance by large herbivores. No recognisable pathways.

due to animal disturbance.	caused by poaching especially if the ground is wet. There may be heavier disturbance around feeding areas and pig shelters.	around feeding areas and pig shelters			
Basal shoots Includes all accessible shoots sprouting from tree bases. Score as 'Not applicable' if there are no trees with basal shoots or if it is unclear whether shoots have been browsed or have died, and broken off, for other reasons e.g. frost, drought or lack of light. This may be an issue especially for Birch.	***Palatable*** species very heavily browsed, ***Unpalatable*** species heavily to very heavily browsed NB. Where large herbivores have been rare or absent in previous years there may be basal shoots that are now of too large a diameter to be browsed.	***Palatable*** species generally heavily browsed; a few may be very heavily browsed. ***Unpalatable*** species moderately browsed.	***Palatable*** species generally moderately browsed; a few may be heavily browsed. ***Unpalatable*** species generally lightly browsed; a few may be moderately browsed.	***Palatable*** species generally lightly browsed; a few may be moderately browsed. ***Unpalatable*** species generally un-browsed; a few may be lightly browsed.	***Palatable*** species un-browsed ***Unpalatable*** species un-browsed.
	Browsing rates Very heavy Heavy: Moderate: Light:	**Estimate % of current year's shoot growth removed based on the ratio of shoot diameter to length.** > 90% of the current year's growth removed. Short stubby stems, difficult to see on some species. Most older, woody shoots browsed. 50%-90% of the current year's growth removed. Some older, woody shoots browsed. 10% -50% of the current year's growth removed. No older, woody shoots browsed. <10% of the current year's growth (only shoot tips) removed.				

Indicator	Very High	High	Medium	Low	No impact
Epicormic & lower shoots Includes all shoots on tree trunks (epicormic), lower branches or fallen trees that are within reach of herbivores. Score as 'Not applicable' if there are no trees with epicormic or lower shoots	A very obvious and well maintained browse-line on all trees, with plenty of evidence of recent browsing to shoot tips. ***Palatable*** species: shoots difficult to find because they are browsed close to the trunk or well into old woody growth. Any remaining shoots very heavily browsed. ***Unpalatable*** species moderately to very heavily browsed, even if shoots are woody.	An obvious browse-line on all trees that have live lower branches with most, or all, shoot tips browsed. ***Palatable*** species heavily browsed ***Unpalatable*** species**:** all but the most unpalatable shoots e.g. old woody birch shoots, moderately or heavily browsed.	An established browse-line is being maintained or a new browse-line is starting to develop i.e. there is evidence of some recent browsing to shoot tips, on most, or all, tree species. The presence of some un-browsed lower branches may interrupt the horizontal browse-line. ***Palatable*** species moderately browsed. ***Unpalatable*** species un-browsed or lightly browsed.	***Palatable*** species lightly browsed ***Unpalatable*** species un-browsed.	No sign of *recent* browsing on any live shoots within reach of large herbivores.
Seedlings & saplings **Seedlings** = <50 cm tall (includes 'old seedlings'). **Saplings** = 50-200 cm tall. **'Old seedlings'** = trees < 50 cm tall that may be many years, or even decades, old but adverse conditions, usually browsing pressure, prevent them from growing upwards They often have a woody stem but rarely exceed 30 cm in height.	**Seedlings** ***Palatable*** species, if present, will be very heavily browsed. If the survey is taking place during the growing season, un-browsed seedlings in their first year may be present. ***Unpalatable*** species moderately to very heavily browsed. **Saplings** ***Palatable*** species battered by very heavy browsing, with many woody side shoots browsed back or snapped. Leading	**Seedlings** ***Palatable*** species, if present, will be heavily browsed. If the survey is taking place during the growing season, un-browsed seedlings in their first year may be present. ***Unpalatable*** species lightly or moderately browsed. **Saplings** ***Palatable*** species heavily browsed. Leaders undamaged only if they cannot be reached by herbivores.	**Seedlings** ***Palatable*** species generally moderately browsed; a few may be heavily browsed. ***Unpalatable*** species un-browsed or lightly browsed. **Saplings** ***Palatable*** species generally moderately browsed; a few may be heavily browsed. Leaders undamaged only if they cannot be reached by herbivores. U***npalatable*** species generally lightly browsed; a few may be	**Seedlings** P***alatable*** species generally lightly browsed; a few may be moderately browsed. ***Unpalatable*** species un-browsed. **Saplings** ***Palatable*** species lightly browsed. ***Unpalatable*** species un-browsed.	**Seedlings** If present, all species un-browsed. **Saplings** If present, all species un-browsed.

Score as 'Not applicable' if seedlings and saplings are absent since a lack of seedlings and saplings may be due to a cause other than browsing pressure.	shoots un-browsed only if they cannot be reached by herbivores. ***Unpalatable*** species heavily or very heavily browsed.	***Unpalatable*** species lightly or moderately browsed.	un-browsed or moderately browsed.		
	Browsing rates Very heavy Heavy: Moderate: Light:	All outer shoots removed (including many old, woody shoots) and remaining growth old and woody. >80% of the current year's growth removed. Older, woody growth removed from some shoots. 30-80% of the current year's growth removed. Older, woody growth removed from some shoots. <30% of the current year's growth removed.			

Indicator	Very High	High	Medium	Low	No impact
Preferentially browsed or grazed plants Vegetation other than trees; primarily species listed as "very palatable" in Table 3. Score as "Not applicable" if there no accessible preferentially browsed or grazed plants can be found.	All accessible shoots very heavily browsed /grazed. No un-browsed accessible runners of palatable species e.g. honeysuckle, bramble. There may be some growth of the current year's shoots in the growing season.	Accessible shoots generally heavily browsed /grazed but some of the most preferred species may be very heavily browsed /grazed. No un-browsed accessible runners of palatable species e.g. honeysuckle, bramble.	Accessible shoots generally moderately browsed /grazed. Some, more preferred, species may be heavily browsed while others are un-browsed e.g. bramble browsed but blaeberry un-browsed. No un-browsed accessible runners of palatable species e.g. honeysuckle, bramble.	Accessible shoots generally lightly browsed /grazed but there may be some shoots or individual species moderately browsed /grazed or un-browsed /un-grazed. There may be some un-browsed runners of palatable species e.g. honeysuckle, bramble.	No browsing /grazing on accessible shoots. Depending on the time since large herbivores have been present, there may be long un-browsed runners /climbers or a dense tangled field layer obscuring views through the wood.
Sward Ground cover vegetation. This may include preferentially grazed species Rank = tall, dense vegetation, sometimes with a well-developed understorey of mosses or herbs. Score as 'Not applicable' if the ground cover is < 5%.	***Palatable*** species very heavily grazed. Flowering herbs of palatable species hug the ground, flower stalks difficult to find. In the growing season, spring flowering herbs may be un-grazed even where winter impacts were very high. ***Unpalatable*** species, such as rushes and tussock-forming grasses (e.g. tufted hair-grass, purple moor-grass,) heavily grazed. If grazing limited to autumn /winter, unpalatable species may be only lightly grazed.	***Palatable*** species heavily grazed. Flowering herbs of palatable species hug the ground, flower stalks difficult to find. In the growing season, spring flowering herbs may be un-grazed even where winter impacts were high. ***Unpalatable*** species moderately grazed. If grazing limited to autumn /winter, unpalatable species may be only lightly grazed.	***Palatable*** species moderately grazed. If palatable species are abundant, ***unpalatable*** species will be un-grazed. If palatable species are rare or absent, unpalatable species will be lightly grazed, except where livestock have been put into the wood at the start of the spring, At this time many unpalatable species are relatively palatable and they may be heavily grazed.	***Palatable*** species lightly grazed. ***Unpalatable*** species un-grazed. They may form a rank field layer more than 10 cm tall that shades the ground layer vegetation beneath.	**All sward species** un-grazed. There may be a rank and tussocky sward with abundant leaf litter, and /or a high proportion of woody herbs (e.g. bramble) or heathy species in the sward, depending on site characteristics such as soil, exposure and light availability.

	Browsing /grazing rates	
	Very heavy	All of leading shoots browsed or leaves grazed.
	Heavy:	>75% of leading shoots browsed or leaves grazed.
	Moderate:	25-75% of leading shoots browsed or leaves grazed.
	Light:	<25% of leading shoots browsed or leaves grazed.

*Table 1.3. Relative palatability of non-tree plant species**

Season	Very palatable	Moderately palatable	Unpalatable
All year	Bramble, Honeysuckle, dog rose, Ivy, Blaeberry, **Great woodrush,** Common Bent, Red Fescue, Yorkshire fog, Broom	*Hard fern,* Bog myrtle, Heather (Ling), Bell heather, Sheep's fescue	Hard fern, Great woodrush, Purple moor-grass, Mat grass, Tufted hair-grass, Soft and Sharp-flowered rush, Cross-leaved heath
Spring - Summer	As above. In addition: Valerian, Meadowsweet, Angelica, Raspberry, *Buckler ferns*	Devil's-bit scabious, **Purple moor-grass, Soft and Sharp-flowered rush,** *Lemon-scented fern, Lady fern, Great woodrush (especially flower shoots)*	Buckler ferns, Lemon-scented fern, Lady fern, Primrose

***** Normal font = all large herbivore species, except where also listed in bold or italics. **Bold = cattle only**, *italics = deer only*.

Table 1.4. Relative palatability and resilience of different tree species[1]

Palatability[1] (Innate attraction of the species to being browsed)		**Resilience** (ability to survive being browsed & continue to grow)	
1 – Most palatable	Aspen, Willow, Ash, Elder[2]	1 – Most resilient	Eared Willow, Birch, Alder, Bird cherry, Hawthorn
2	Holly, Rowan, Hazel, Oak, Elm	2	Holly, Juniper, Blackthorn
3	Douglas Fir, Larches, Sycamore, Hawthorn, Gean, Blackthorn	3	Hazel, Oak, Rowan, Ash, Elm, Sycamore
4	Birch, Scots Pine, Lodgepole Pine, Beech	4 – Least resilient	Scots pine and non-native conifers
5	Juniper, Bird cherry, Norway Spruce, Western Hemlock		
6 – Least palatable	Alder, Rhododendron, Sitka Spruce		

[1] Assume that palatability classes 1-3 are 'palatable' and classes 4-6 are 'unpalatable'. [2] Elder is unpalatable to rabbits.

Table 1.5 Classes used to record seedlings and saplings in plots.

1.1 Small seedling	All seedlings **at or below the predominant field layer vegetation height.** Includes newly germinated seedlings of the previous year
1.2 Large seedling	Seedlings above the field layer vegetation height, **but still < 1.3m tall**
2.1 Small sapling	Small saplings **1.3m - 3m height, and < 7 cm dbh;** not yet producing **significant** quantities of seed
3.1 Large sapling	Large saplings **3m - 5m in height but DBH < 7 cm.**

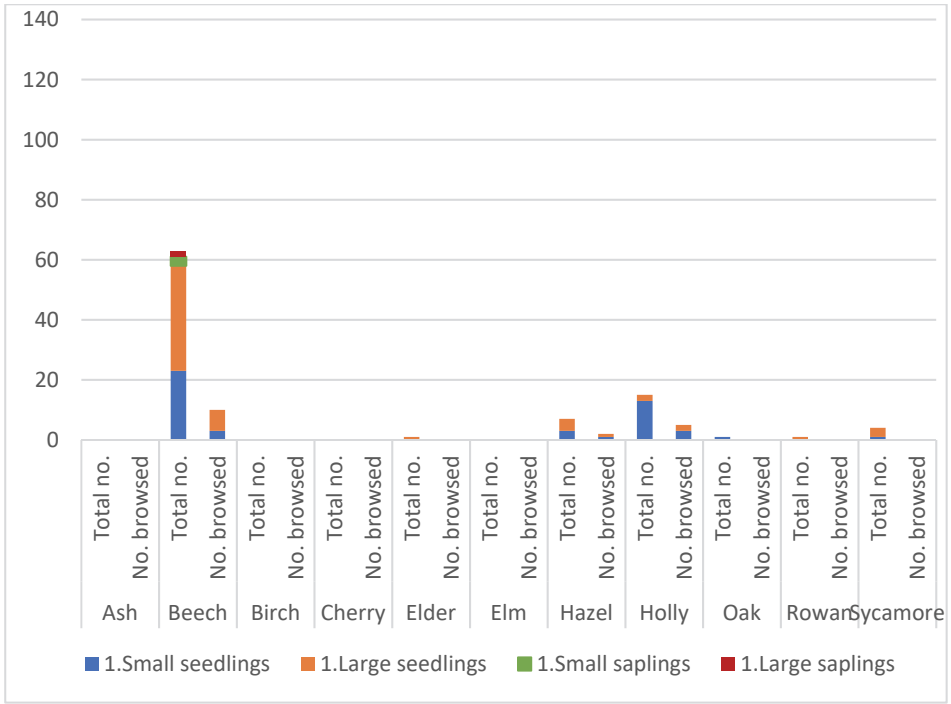
ANNEX 2: RESULTS FOR EACH STOP /PLOT

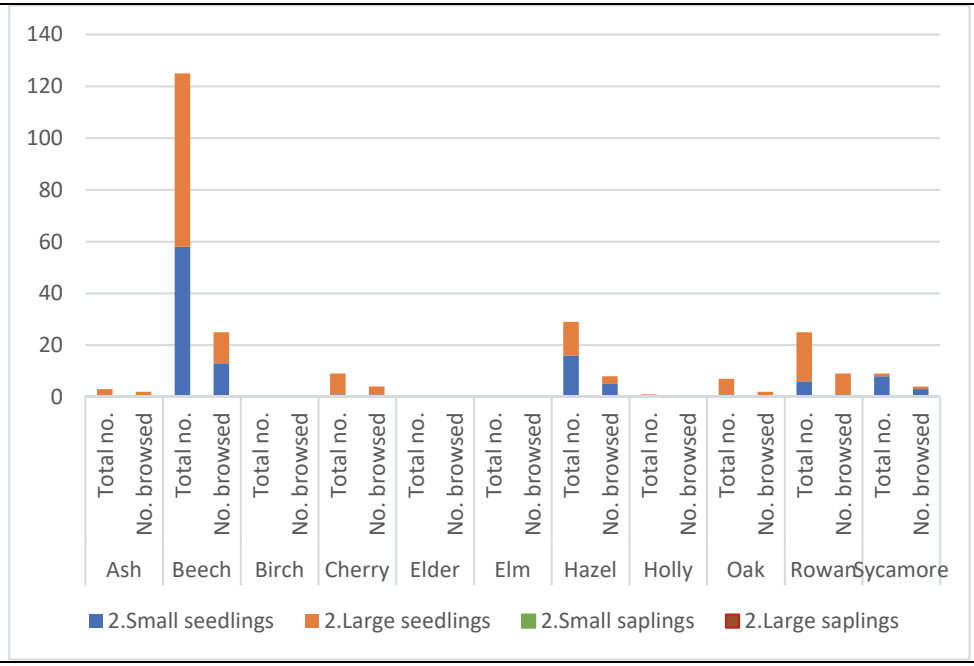
Abbreviations used in the tables below:

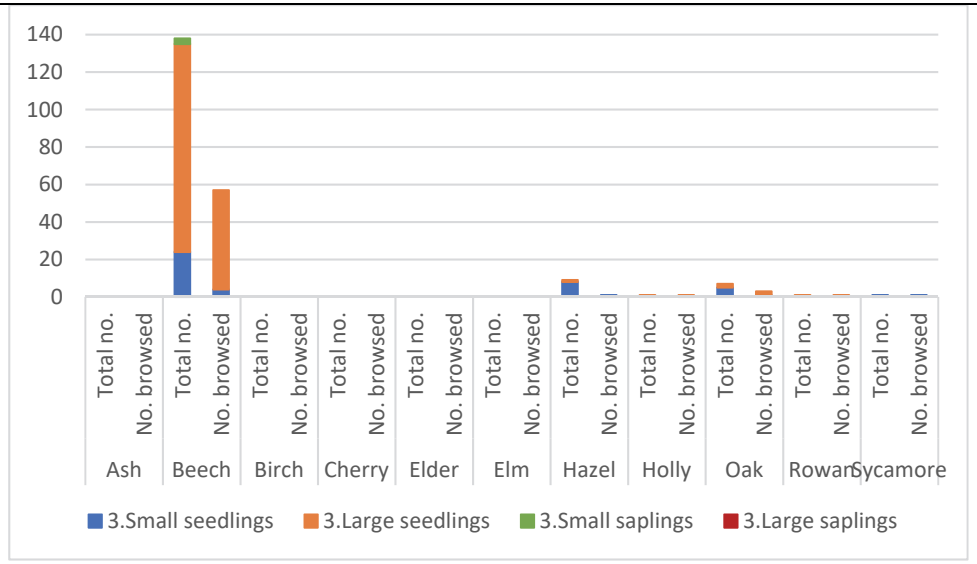
WSC: Woodland Structure Class (see Annex 1, Table 1)

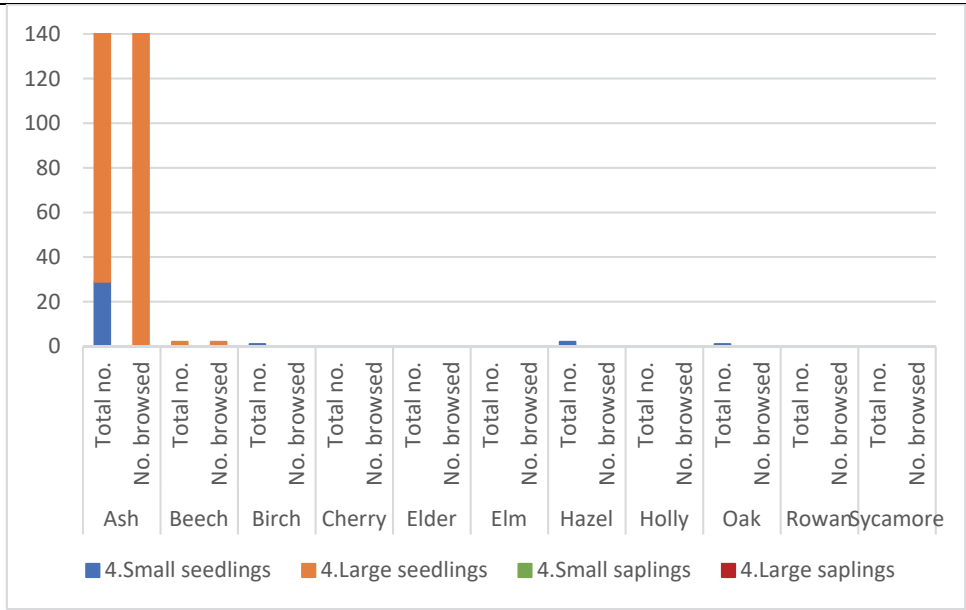
A: Abundant
F: Frequent
O: Occasional
R: Rare

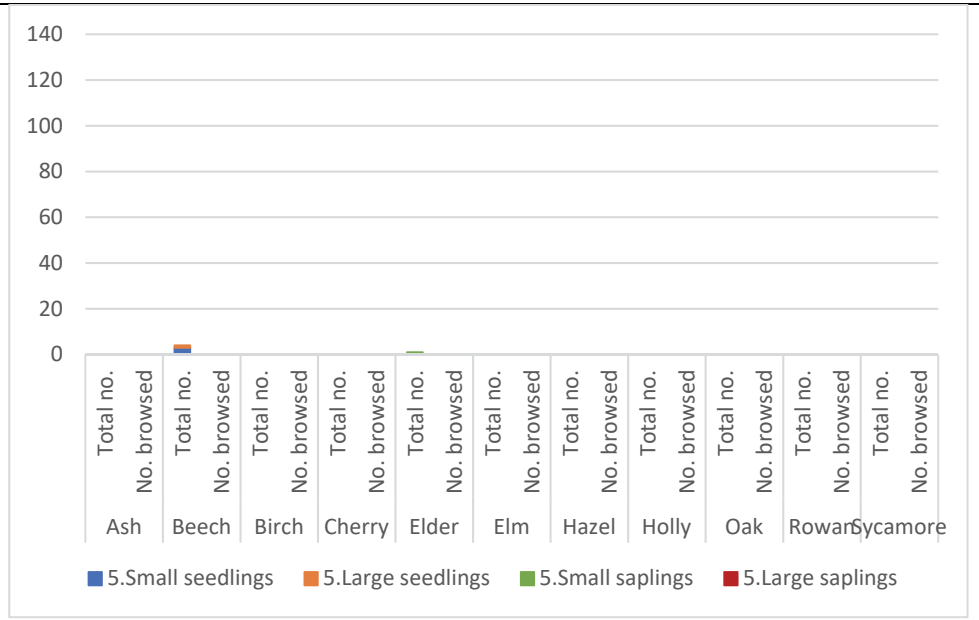
NI: No impact
L: Low impact
M: Medium impact
H: High impact
VH: Very high impact
N/A: Impact not applicable

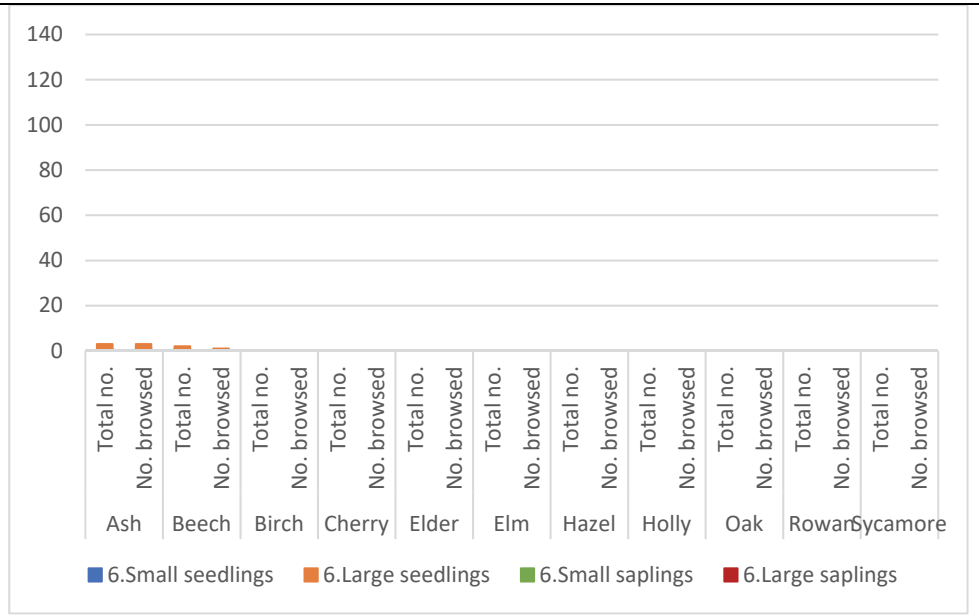
Stop /plot 1	Grid ref: *NN85455 48395*	Post tag no: *0552*	Date surveyed: *26/10/17*	Surveyor: *HA /FC*	Photo nos.: *1-4*
General notes	*Power line through stop. Very close to road, path and bike track. Part of stop has had waste tipped on it in the past. Disturbance by people may be the cause of low impacts.*				
Woodland structure	*WSC 5. Senescent: None. Mature: Beech (F), Birch (O), Oak (O). Young: Beech (F), Hazel (R).*				
NVC /Ground flora	*W11. Mostly bare ground under beech with some Wood Rush, Cocksfoot and grasses plus garden escapes.*				Av. veg. height (cm): *10*
Factors limiting regen.	*Shade from beech in most of the plot may be affecting tree regeneration.*				
Signs of herbivores	*None*				
Bark stripping, fraying & stem breakage	*NI*				
Ground disturbance	*NI*	*Human(?) path through stop.*			
Basal shoots	*NI*	*Beech: un-browsed*			
Epicormic and lower shoots	*NI*	*Beech: un-browsed, Oak: un-browsed*			
Seedlings & saplings	*L*	*Beech seedlings: light browsing, rowan seedling: un-browsed, sycamore seedling: un-browsed, holly seedlings: heavy browsing on some but not others.*			
Preferentially browsed or grazed plants	*NI*	*Blaeberry: un-browsed, Bramble: un-browsed, Broom: un-browsed*			
Sward	*NI*	*No signs of grazing*			
Seedlings /saplings in plot: total numbers and numbers browsed of each tree species.					

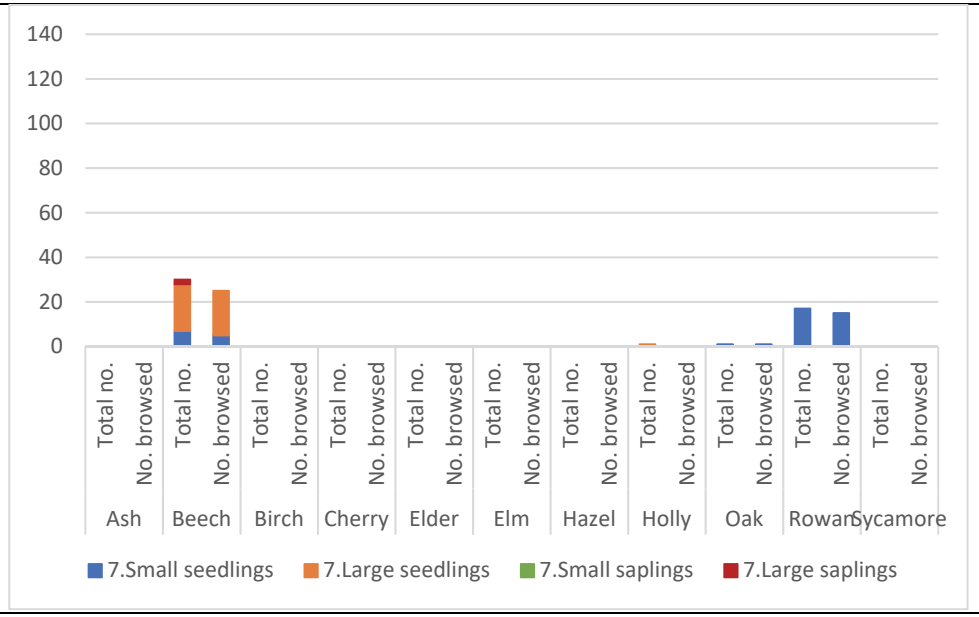
Stop /plot 2	Grid ref.: NN85414 48138	Post tag no: *0555*	Date surveyed: *28/10/17*	Surveyor: *FC (HIA), HA (Plot)*	Photo nos.: *84-87*
General notes	*Two vegetated tracks across the HIA stop area but most likely human as connecting upper and lower paths. Three young beech trees have been cut in the past and are now re-sprouting from the base.*				
Woodland structure	*WSC 6. Senescent: Birch (R). Mature: Birch (A), Lime (R), Sycamore (R). Young: Hazel (O), Rowan (R). Area is predominantly birch with 1 mature lime and seedlings of rowan, holly and beech.*				
NVC /Ground flora	*W11 /W17 Grass, Moss, some Bracken, some Ferns, Wood sage.*			Av. veg. height (cm): *Ferns: 100, Grass: 15*	
Factors limiting regen.	*Very light so shade is not a factor limiting regen.*				
Signs of herbivores	*None*				
Bark stripping, fraying & stem breakage	NI	*Old fraying on hazel stems.*			
Ground disturbance	NI				
Basal shoots	M	*Birch (beside track): moderate browsing. Hazel: moderate browsing.*			
Epicormic and lower shoots	H	*Birch: moderate browsing on epicormic shoots. Hazel: lower shoots un-browsed (next to path). Lime: lower shoots heavily browsed. Beech: shoots on recently cut tree (next to path) unbrowsed.*			
Seedlings & saplings	H	*Rowan: 1 seedling and 1 sapling very heavily browsed, 1 seedling heavily browsed. Holly: 1 seedling un-browsed. Oak: 1 seedling heavily browsed, 1 sapling (in Bracken stand) un-browsed (but browsed 2 years ago). Beech: 1 seedling heavily browsed. Hazel: 1 sapling heavily browsed, 2 saplings, next to path, moderately browsed. Ash: 1 seedling in bracken stand un-browsed (but browsed 2 years ago).*			
Preferentially browsed or grazed plants	L	*Blaeberry: very heavily grazed (growing either side of the track). Raspberry: un-browsed.*			
Sward	NI				
Seedlings /saplings in plot: total numbers and numbers browsed of each tree species.					

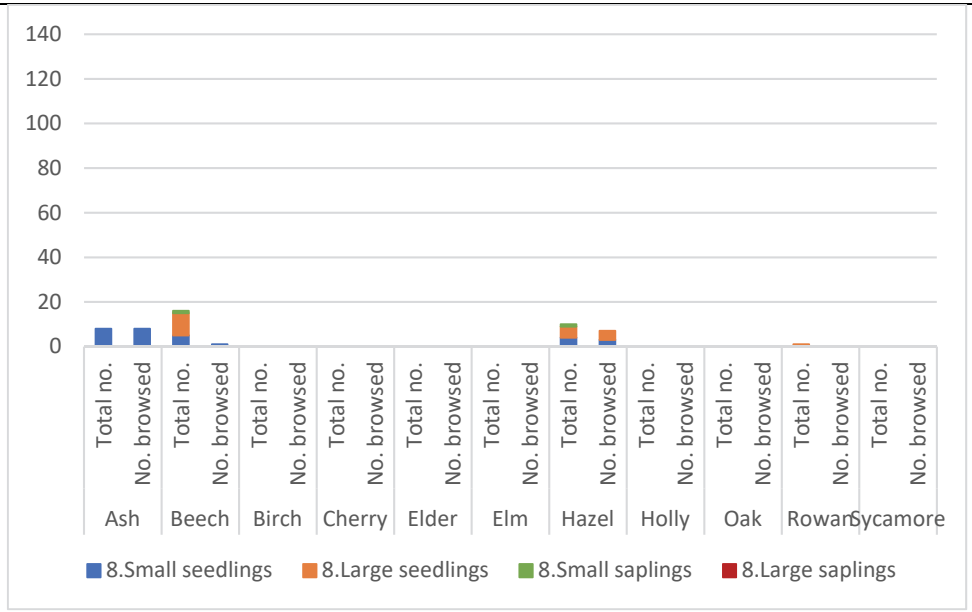
Stop /plot 3	Grid ref.: NN85333 47998	Post tag no: *0556*	Date surveyed: *26/10/17*	Surveyor: *HA /FC*	Photo nos.: 7-10
General notes	*Inside deer /rabbit fenced area. The chicken wire on the lower part of the deer fence just above the plot had been pulled down allowing deer access. A tree had also come down on the east side of the fence allowing access to deer*				
Woodland structure	*WSC 5. Senescent: None. Mature: Beech (O), Willow (R), Birch (R). Young: Beech (R), patch of Hazel (O), one Rowan (R)*				
NVC /Ground flora	*W11. Bracken (40% cover), grasses, ferns, bare ground under beeches.*			Av. veg. height (cm): *100 in bracken (40%), 0 under Beech (30%), 10 elsewhere.*	
Factors limiting regen.	*Shade under beech trees. Bracken is tall but fairly open so may not be limiting regen*				
Signs of herbivores	*Possible deer lying up area*				
Bark stripping, fraying & stem breakage	*L*	*Old fraying on beech and hazel saplings. New fraying on one ash sapling.*			
Ground disturbance	*Nl*				
Basal shoots	*N/A*	*Some Hazel basal shoots got away about 5-10 years ago. None recent. Heavy browsing on one oak shoot. Overall, not enough shoots on which to make an assessment.*			
Epicormic and lower shoots	*Nl*	*Hazel: no current browsing.*			
Seedlings & saplings	*H*	*Hazel: very small seedling browsed, larger seedling un-browsed, sapling lightly browsed. Beech: seedling heavily browsed. Holly: seedling very heavily browsed. Ash: seedling very heavily browsed. Oak: seedlings: 2 very heavily browsed, 5 heavily browsed, 2 moderately browsed, 1 un-browsed in last 12 months but heavily browsed previously. Overall: very variable impacts. According to the rule noted in Table 1.2, the overall impact should be that recorded on either the palatable or unpalatable species whichever is the highest. Since beech is unpalatable (Table 1.3), this would result in an overall impact of VH, however, given variation in the other impacts, the overall impact has been scored as H.*			
Preferentially browsed or grazed plants	*Nl*	*Angelica not grazed. Raspberry very lightly browsed.*			
Sward	*Nl*				
Seedlings /saplings in plot: total numbers and numbers browsed of each tree species.					

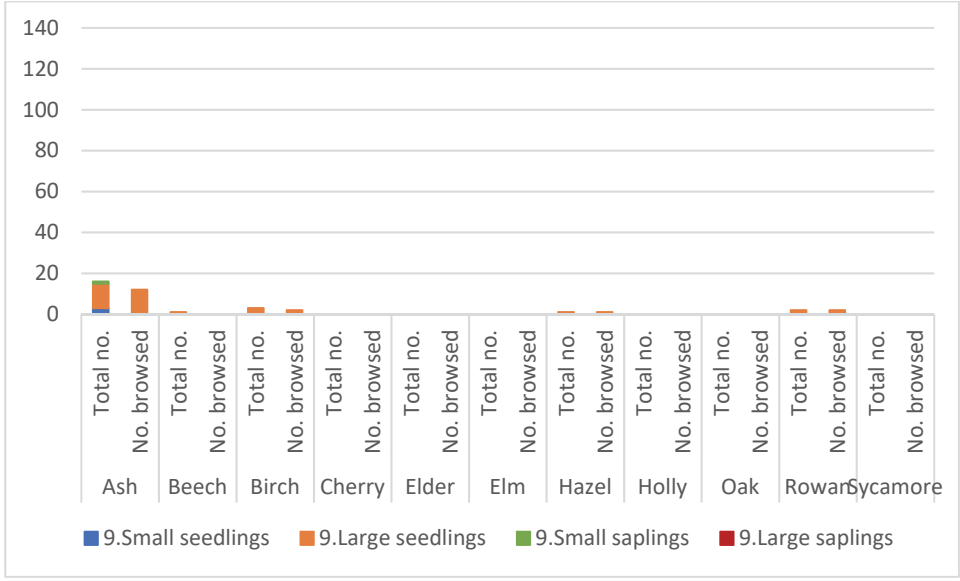
Stop /plot 4	Grid ref.: NN85594 48010	Post tag no: *0551*	Date surveyed: *27/10/17*	Surveyor: *HA (HIA), FC (Plot)*	Photo nos.: *26-29*
General notes	Strange mix of very heavy browsing on ash, guelder rose and birch with some hazel un-browsed and aspen almost completely un-browsed.				
Woodland composition	*WSC 6. Senescent: None. Mature: Oak(A), Birch (O), Hazel (O), Ash (R). Young: Aspen (R) and patch of aspen saplings.*				
NVC /Ground flora	*W11d (W9)? Grasses, moss, some Bluebells, ferns by stream, Violets,*			Av. veg. height (cm): *4*	
Factors limiting regen.	*Shade (>90% canopy cover).*				
Signs of herbivores	*3 fresh rabbit burrows and droppings. Fresh roe (or rabbit) pellets (photo 43), 4 fresh clumped dung (sheep?; photo 42)*				
Bark stripping, fraying & stem breakage	NI	*Old fraying on aspen saplings (photo 36) and on blackthorn sapling.*			
Ground disturbance	NI	*3 rabbit burrows.*			
Basal shoots	VH	*Hazel: basal shoots on two trees very heavily browsed but occasional shoot getting away (photos 39-41). Birch: very heavily browsed. Blackthorn: heavily browsed.*			
Epicormic and lower shoots	VH	*Birch: epicormic shoots very heavily browsed (photos 30-32) and with a definite browse-line at about 50 cm from the ground (rabbits?)*			
Seedlings & saplings	VH	*Ash: lots of very heavily browsed seedlings. Beech: 2 very heavily browsed seedlings. Guelder rose: very heavily browsed. Aspen: clump of saplings heavily browsed in the past but largely un-browsed now (photos 33-35,37-38)*			
Preferentially browsed or grazed plants	VH	*Ferns: most lightly grazed, one very heavily grazed. Raspberry: heavily browsed.*			
Sward	L	*Very light grazing on grass.*			
Seedlings /saplings in plot: total numbers and numbers browsed of each tree species.	N.B. For consistency with other graphs the y-axis goes up to 140 however, in plot 4, there were 818 large Ash seedlings of which 4 were unbrowsed.				

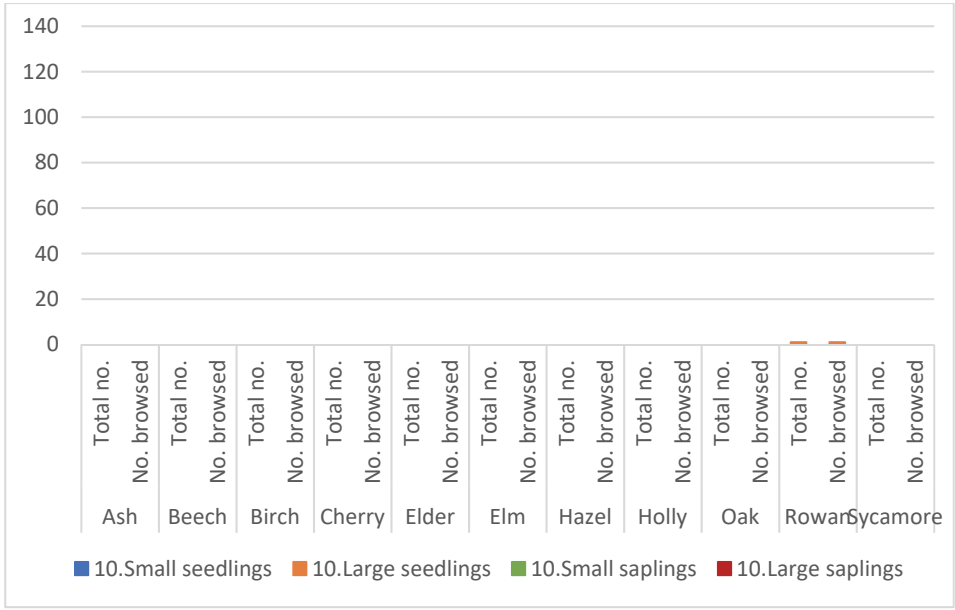
Stop /plot 5	Grid ref.: NN8520347870	Post tag no: *0557*	Date surveyed: *26/10/17*	Surveyor: *HA (HIA), FC (Plot)*	Photo nos.: 11-14
General notes	*Heavy grazing on ferns this early in autumn /winter indicates very heavy browsing pressure on these plants. No newly germinated seedlings of any tree species present under the bracken.*				
Woodland structure	*WSC 8. Senescent: Birch (O). Mature: Birch (F). Young: Birch (R). Open canopy.*				
NVC /Ground flora	*W11. 100% cover of bracken. Occasional ferns.*			Av. veg. height (cm): 120	
Factors limiting regen.	*Extensive bracken but there is a ground flora below the bracken.*				
Signs of herbivores	*None*				
Bark stripping, fraying & stem breakage	*N/A*	*No birch saplings suitable for fraying.*			
Ground disturbance	*NI*				
Basal shoots	*N/A*				
Epicormic and lower shoots	*N/A*				
Seedlings & saplings	*H*	*Beech: seedlings: 4 un-browsed, 1 lightly browsed, 6 heavily browsed and 1 very heavily browsed seedling. Overall: given the variation in browsing on unpalatable beech, the result is ambiguous but, since the majority of seedlings were heavily, or very heavily, browsed, overall the browsing rate can be classed as moderate hence the overall impact has been scored as H.*			
Preferentially browsed or grazed plants	*H*	*Raspberry heavily browsed. Ferns: some un-browsed, some lightly browsed, some heavily browed.*			
Sward	*NI*				
Seedlings /saplings in plot: total numbers and numbers browsed of each tree species.					

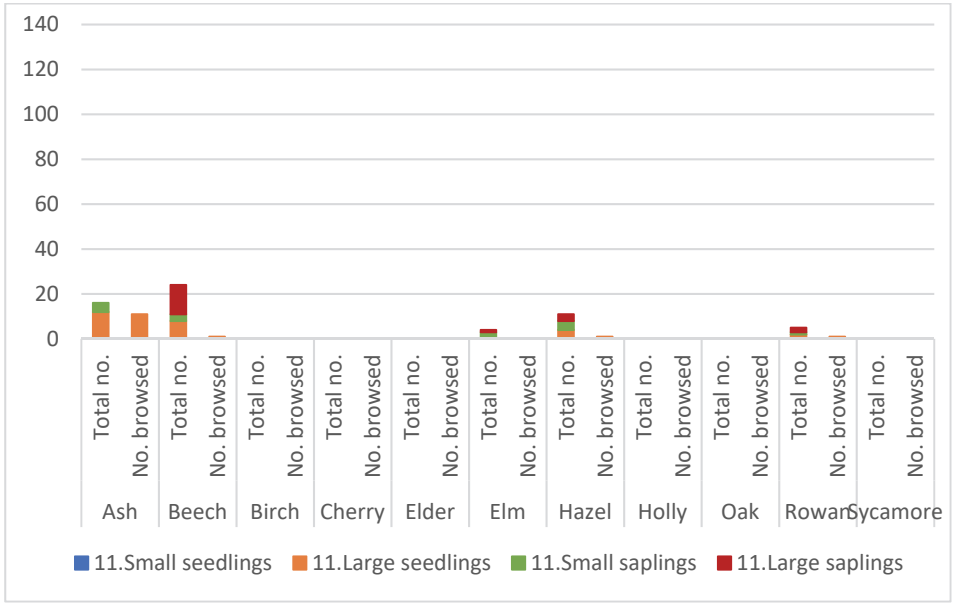
Stop /plot 6	Grid ref.: NN8547047864	Post tag no: *0549*	Date surveyed: *27/10/17*	Surveyor: *HA (HIA), FC (Plot)*	Photo nos.: *80-83*
General notes	*Ash and Beech saplings found growing on a tree stump that is inaccessible to deer. No other saplings present.*				
Woodland structure	*WSC 6. Senescent: None. Mature: Birch (A), Hazel (O), Ash (R). Young: Birch (R).*				
NVC /Ground flora	*W11. Enchanter's nightshade, Bluebell, Wood sorrel, Wood sage, Wild strawberry, Tufted hair grass, Violet, Tormentil, Yellow pimpernel, Bugle, Cow wheat.*			Av. veg. height (cm): *40*	
Factors limiting regen.	*60% of plot consists of a grassy sward which may hinder regeneration. Shade probably not a limitation since the birch let a lot of light through.*				
Signs of herbivores	*Deer lying up area.*				
Bark stripping, fraying & stem breakage	N/A				
Ground disturbance	NI				
Basal shoots	VH	*Hazel: heavily browsed. Birch: heavily browsed. Ash: very heavily browsed.*			
Epicormic and lower shoots	H	*Birch: epicormic shoots moderately browsed. Ash: 1 epicormic shoot heavily browsed.*			
Seedlings & saplings	H	*Beech: 1 seedling un-browsed, 1 very heavily browsed. Ash: 1 seedling (~ 2 years old) un-browsed, 3 heavily browsed. Rowan: 1 seedling heavily browsed, 1 seedling (~ 2 years old) un-browsed.*			
Preferentially browsed or grazed plants	M	*Ferns: lightly grazed. Enchanter's nightshade: moderately grazed. [Note: we don't know how palatable Enchanter's nightshade is but it would appear to be very palatable from our observations here].*			
Sward	NI				
Seedlings /saplings in plot: total numbers and numbers browsed of each tree species.					

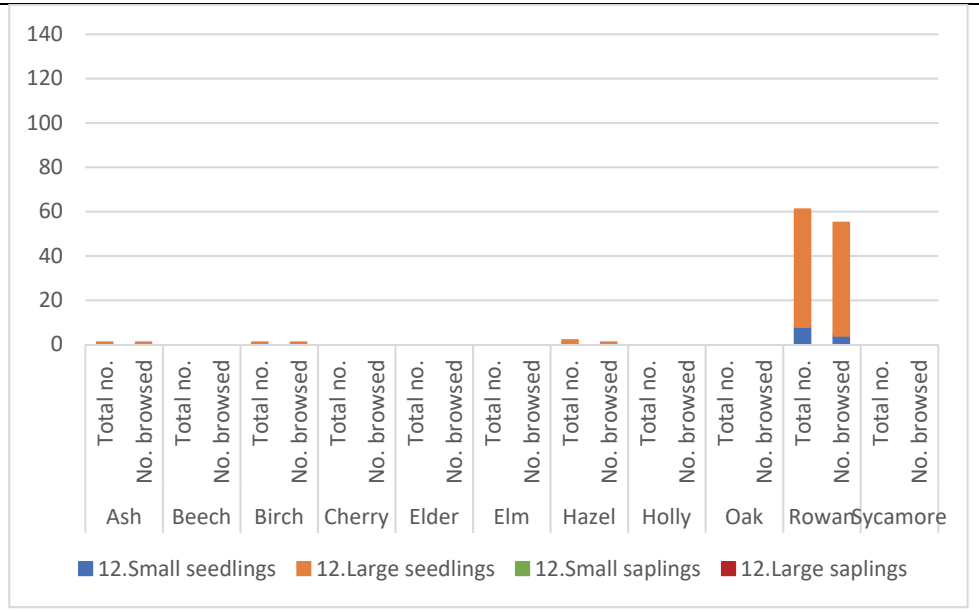
Stop /plot 7	Grid ref.: NN85347 47742	Post tag no: *0553*	Date surveyed: 27/10/17	Surveyor: FC (HIA), HA (Plot)	Photo nos.: *76-79*
General notes					
Woodland structure	*WSC 8. Senescent: Birch (R), Willow (R). Mature: Birch (A), Willow (R), Hazel (R). Young: Beech (F), Birch (R), Rowan (R). Open stand of tall, thin, even-aged Birches. <60% canopy cover, some dead canopy trees.*				
NVC /Ground flora	*W17. Tall bracken over 70% of plot.*			Av. veg. height (cm): *Bracken: 100. Rest: 10*	
Factors limiting regen.	*Shade from bracken.*				
Signs of herbivores	Human track through plot that narrows to what could be a deer track. No other signs.				
Bark stripping, fraying & stem breakage	*NI*	*Very old fraying on rowan and hazel.*			
Ground disturbance	*NI*				
Basal shoots	*H-VH*	*Birch: moderate to heavy browsing.*			
Epicormic and lower shoots	*H*	*Birch: moderate browsing.*			
Seedlings & saplings	*VH*	*Beech: seedlings and saplings heavily browsed. Hazel: 1 seedling un-browsed. Rowan: 1 seedling very heavily browsed and 2 seedlings in the field layer un-browsed. Holly: 1 sapling lightly browsed. Also see plot results: 15 out of 17 Rowans browsed, 25 out of 28 Beeches browsed, 1 Oak browsed but 1 Holly un-browsed.*			
Preferentially browsed or grazed plants	*H*	*Ferns: occasionally grazed. Blaeberry: heavily browsed.*			
Sward	*NI*				
Seedlings /saplings in plot: total numbers and numbers browsed of each tree species.					

Stop /plot 8	Grid ref.: NN85195 47683	Post tag no: *0548*	Date surveyed: *28/10/17*	Surveyor: *FC (HIA), HA (Plot)*	Photo nos.: *92-95*
General notes	*Predominantly open. Main path at eastern edge of plot.*				
Woodland structure	*WSC 6(-8). Senescent: None. Mature: Birch (A), Ash (R). Young Hazel (R).*				
NVC /Ground flora	*W11b (>90% canopy cover) and W9 (<20% canopy cover) in small area by main track. Bracken covers >90% of W11b area. Bracken, Tufted hair grass, Ferns.*			Av. veg. height (cm): *Bracken: 120 Otherwise: 15*	
Factors limiting regen.	*Shading from dense bracken may hinder regeneration.*				
Signs of herbivores	*None*				
Bark stripping, fraying & stem breakage	*N/A*				
Ground disturbance	*NI*				
Basal shoots	*N/A*				
Epicormic and lower shoots	*NI (only present next to path)*	*Hazel: lower shoots un-browsed. Birch: epicormic shoots un-browsed. Alder: epicormic shoots un-browsed. Hazel: basal shoots snapped but not browsed. Alder: epicormic shoot un-browsed.*			
Seedlings & saplings	*H (away from path) NI (near to path)*	*Hazel: 1 sapling un-browsed. Beech: 2 saplings un-browed and 1 seedling un-browsed. Ash: 1 sapling un-browsed, frequent seedlings near path either un-browsed or lightly browsed. Seedlings away from path very heavily browsed. Rowan: 1 seedling heavily browsed.*			
Preferentially browsed or grazed plants	*NI*	*Raspberry: un-browsed. Dryopteris fern: un-browsed.*			
Sward	*NI*				
Seedlings /saplings in plot: total numbers and numbers browsed of each tree species.					

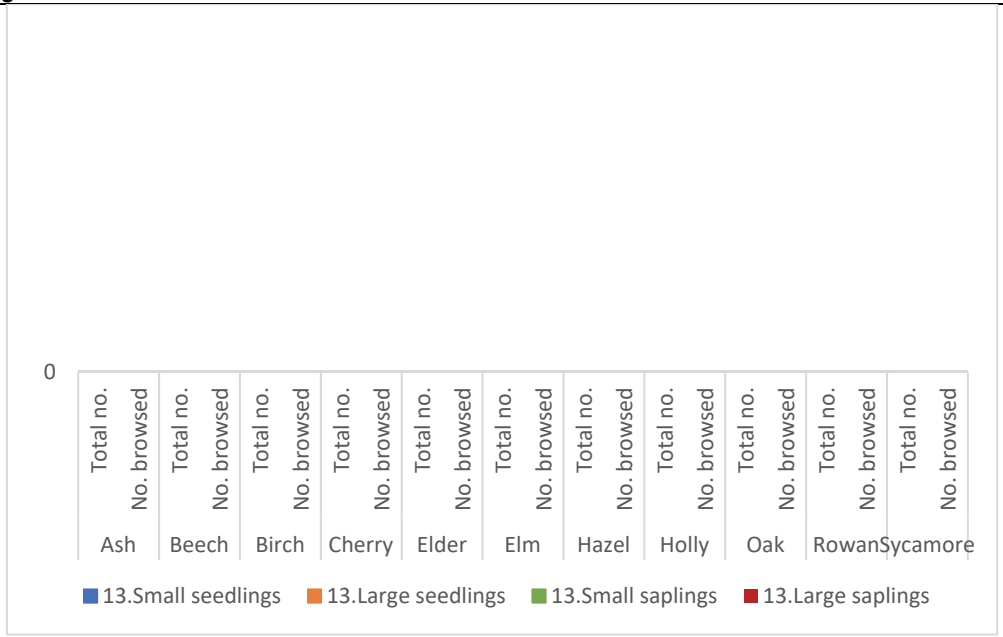
Stop /plot 9	*Grid ref.: NN*85461 47610	Post tag no: *0545*	Date surveyed: *27/10/17*	Surveyor: *HA (HIA), FC (Plot)*	Photo nos.*: 57-60*
General notes	*On slope. 50% open, 50% wooded. Open area is wet in some parts (rushes). Ash sapling growing on inaccessible rock (photos 63-64. Ash seedlings in fork of Rowan trunk (photos 65-67).*				
Woodland structure	*WSC 1/6. Senescent: None. Mature: Birch (F), Hazel (O), Ash (R). Young: Hazel (R)*				
NVC /Ground flora	*W11. Enchanters' nightshade, Yorkshire fog, Wood sorrel, Yellow pimpernel, Angelica, Violet, Bluebell, Raspberry, Dryopteris, Wood avens, False brome, Herb Robert, Opposite-leaved golden saxifrage, Cow-wheat, Bugle, Cuckoo flower*				Av. veg. height (cm): *25*
Factors limiting regen.	*Dense sward, poor drainage in < 10% of plot, shade in wooded part of plot*				
Signs of herbivores	*Deer track*				
Bark stripping, fraying & stem breakage	*NI*	*Old fraying on Alder sapling.*			
Ground disturbance	*L*	*Deer track*			
Basal shoots	*VH*	*Birch: very heavily browsed. Hazel: very heavily browsed. Alder: heavily browsed.*			
Epicormic and lower shoots	*VH*	*Birch: lower and epicormic shoots very heavily browsed. Hazel: lower shoots very heavily browsed. Birch: lower shoots very heavily browsed. Alder: epicormic shoots moderately browsed.*			
Seedlings & saplings	*H*	*Ash: seedlings moderately or very heavily browsed and 3 two-year-old seedlings (~25 cm tall) un-browsed. Alder: 2 saplings un-browsed. No accessible saplings.*			
Preferentially browsed or grazed plants	*VH*	*Enchanter's nightshade: moderate grazing. Ferns: lightly grazed (photo 61). Herb Robert: heavily grazed (photo 62). Raspberry: very heavily browsed.*			
Sward	*L*	*A few tufts of broad-leaved grass grazed.*			
Seedlings /saplings in plot: total numbers and numbers browsed of each tree species.					

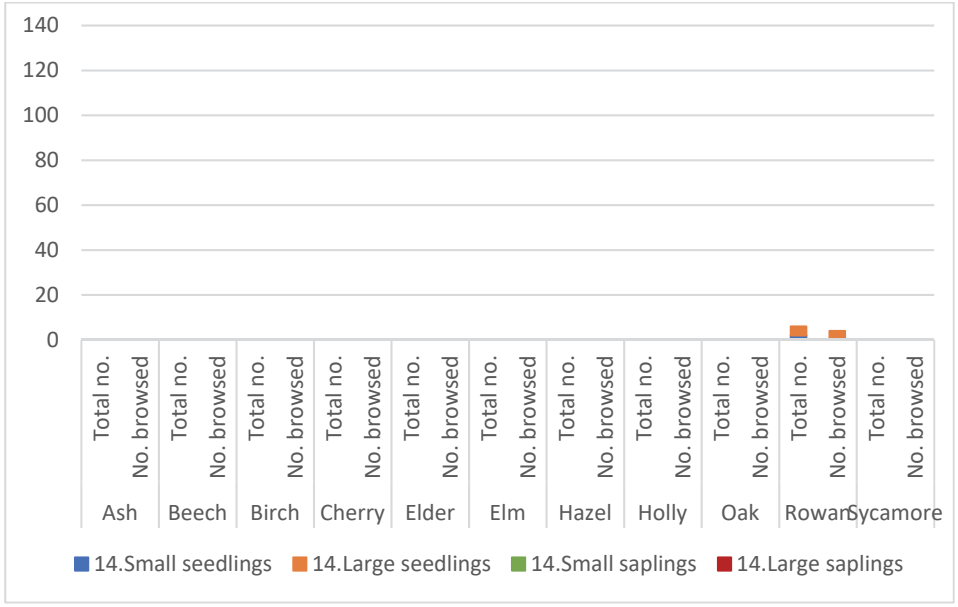
Stop /plot 10	Grid ref.: *NN85069 47486*	Post tag no: *0554*	Date surveyed:*26/10/17*	Surveyor: FC *(HIA), HA (Plot)*	Photo nos.: *16-19*
General notes					
Woodland structure	*WSC 6(-8). Senescent: Birch (R). Mature: Birch (A), Rowan (R). Young: Birch (R). Even-aged Birch*				
NVC /Ground flora	*W17. 100% bracken /grass. Path near to plot.*				Av. veg. height (cm): 120
Factors limiting regen.	*Shade from bracken.*				
Signs of herbivores	*Deer lying up area.*				
Bark stripping, fraying & stem breakage	*L*	*Rowan: very small amount of bark damage to sapling due to fraying.*			
Ground disturbance	*NI*				
Basal shoots	*L*	*Birch: very few basal shoots but those present lightly browsed.*			
Epicormic and lower shoots	*H*	*Birch: some epicormics moderately browsed but no established or maintained browse-line.*			
Seedlings & saplings	*VH*	*Rowan: 2 large seedlings very heavily browsed, 1 large sapling very heavily browsed*			
Preferentially browsed or grazed plants	*VH*	*Raspberry: very heavily grazed. Blaeberry: very heavily grazed. Ferns: un-browsed.*			
Sward	*NI*				
Seedlings /saplings in plot: total numbers and numbers browsed of each tree species.					

Stop /plot 11	Grid ref.: *NN85282 47551*	Post tag no: *0542*	Date surveyed: *27/10/17*	Surveyor: HA (HIA), FC (Plot)	Photo nos.: *72-75*
General notes	*Very steep ground above near vertical rock face. Adjacent to main path.*				
Woodland structure	*WSC 5. Senescent: None. Mature: Beech (A), Hazel (O), Birch (O), Ash (O). Young: Beech from 3 m tall to young trees (F), Ash (O).*				
NVC /Ground flora	*W9. Deep shade from beech so not much ground vegetation. Primrose, Wood sorrel, Violet, Bugle, Sweet-scented bedstraw*			Av. veg. height (cm): *5*	
Factors limiting regen.	*Dense shade cast by multi-age beech.*				
Signs of herbivores	*None*				
Bark stripping, fraying & stem breakage	*NI*	*Old fraying on ash sapling.*			
Ground disturbance	*NI*				
Basal shoots	*L*	*Hazel: lightly browsed.*			
Epicormic and lower shoots	*H*	*Elm: lower shoots heavily browsed. Ash: epicormic shoots heavily browsed. Birch: lower shoots un-browsed.*			
Seedlings & saplings	*M*	*Ash: seedling heavily browsed, some un-browsed. Beech: sapling un-browsed. Tend to be browsed nearer to path and un-browsed in in accessible areas.*			
Preferentially browsed or grazed plants	*NI*	*Ferns un-browsed. No other preferentially browsed species.*			
Sward	*NI*	*Not much of a sward.*			
Seedlings /saplings in plot: total numbers and numbers browsed of each tree species.					

Stop /plot 12	Grid ref.: *NN85070 47227*	Post tag no: *0558*	Date surveyed: *26/10/17*	Surveyor: *HA (HIA), FC (Plot)*	Photo nos.: *20-23*
General notes	*There is a path through the stop. There seems to be heavier browsing in the middle of the stop i.e. in the plot.*				
Woodland structure	*WSC 6. Senescent: Birch (R). Mature: Birch (F). Young: Birch (F)*				
NVC /Ground flora	*W11. High Bracken cover (40% of plot) plus Yorkshire fog, Tufted hair grass and occasional Raspberry, Wood sorrel, Violet, Wood avens.*			Av. veg. height (cm): *Bracken: 100. Other: 20*	
Factors limiting regen.	*Shade from bracken in part of plot.*				
Signs of herbivores	*None (possible deer track through plot).*				
Bark stripping, fraying & stem breakage	*NI*	*Old fraying on 5 Rowan saplings.*			
Ground disturbance	*L*	*Probable deer tracks.*			
Basal shoots	*NI*	*Birch: un-browsed. Rowan: un-browsed.*			
Epicormic and lower shoots	*NI*	*Hazel: un-browsed lower shoots. Birch: un-browsed epicormic shoots.*			
Seedlings & saplings	*M*	*Rowan: 4 seedlings very heavily browsed (photos 24 and 25), 1 seedling heavily browsed, 3 seedlings un-browsed, 1 sapling heavily browsed, 1 sapling un-browsed. Hazel: 1 seedling lightly browsed, 1 seedling un-browsed. Overall: Ambiguous results on both Rowan and Hazel (both palatable). Assume moderate browsing overall hence impact is M.*			
Preferentially browsed or grazed plants	*L*	*Raspberry: very light browsing. Ferns: un-browsed.*			
Sward	*NI*				
Seedlings /saplings in plot: total numbers and numbers browsed of each tree species.					

Stop /plot 13	Grid ref.: *NN85577 47735*	Post tag no: *0543*	Date surveyed: *27/10/17*	Surveyor: *FC (HIA), HA (Plot)*	Photo nos.: *44-47*
General notes	*Browse-line on alder, blackthorn and birch too high to be rabbits. Topiaried hawthorn in open, grassy area adjacent to stop (photo 55-56).*				
Woodland structure	*WSC 6. Most trees following watercourse with gaps in canopy elsewhere. Senescent: None. Mature: Alder (A), Birch (O), Ash (R), Rowan (R). Young: Alder (R), Birch (R).*				
NVC /Ground flora	*W7c. Wet, with streams running through stop. Dominated by large, mature alder. Some wet grassland. Grasses, Ferns, Bracken, Butterbur, Thistles (on edge of flushed, open area)*				Av. veg. height (cm): 70
Factors limiting regen.	*Shade, wetness (but no seedlings even in open, dry areas)*				
Signs of herbivores	*2 deer pellet groups (photo 48), 2 clumped pellet groups (sheep?; photo 49.). Deer track.*				
Bark stripping, fraying & stem breakage	*NI*				
Ground disturbance	*L*	*Visible track but vegetation not broken.*			
Basal shoots	*VH*	*Alder: moderately browsed. Birch: heavily browsed.*			
Epicormic and lower shoots	*H*	*Alder: epicormic shoots lightly browsed. Birch: epicormic shoots lightly browsed, lower shoots on fallen tree moderately browsed. Ash: lower shoots, where branches hanging low, heavily browsed. Blackthorn: lower shoots heavily browsed.*			
Seedlings & saplings	*M-H*	*Birch: 1 seedling lightly browsed. No other seedlings or saplings.*			
Preferentially browsed or grazed plants	*H*	*Enchanter's nightshade heavily grazed. Dryopteris fern: heavily grazed. Dog rose: heavily browsed. Raspberry: heavily browsed.*			
Sward	*NI*	*No obviously grazed grasses.*			
Seedlings /saplings in plot: total numbers and numbers browsed of each tree species.	No seedlings or saplings were found in this plot.				



Stop /plot 14	Grid ref.: *NN85105 47739*	Post tag no: *0550*	Date surveyed: *28/10/17*	Surveyor: *HA (HIA), FC (Plot)*	Photo nos.: *88-91*
General notes	*Human path through the centre of the plot. Tarmac road close to the plot.*				
Woodland structure	*WSC 6. Senescent: Birch (O). Mature: Birch (A). Young: Rowan (R). Dominated by tall, straight, old Birch trees (Canopy cover <40%)*				
NVC /Ground flora	*W11b. 100% Bracken dominated with litter layer in parts and with grasses and raspberry below. Wood sorrel, Raspberry, Wood rush, Bluebell, Violet, Dryopteris fern.*			Av. veg. height (cm): *Bracken: 120*	
Factors limiting regen.	*Bracken litter layer in 20% of plot. Bracken shading in 100% of plot.*				
Signs of herbivores	*Deer track (vegetated) through edge of plot.*				
Bark stripping, fraying & stem breakage	*N/A*	*Old fraying on Rowan saplings.*			
Ground disturbance	*L*	*Vegetated deer tracks through bracken.*			
Basal shoots	*N/A*				
Epicormic and lower shoots	*M*	*Birch: epicormic shoots lightly browsed.*			
Seedlings & saplings	*VH*	*Rowan: 2 large seedlings very heavily browsed. Cherry: 1 seedling very heavily browsed. Birch: 1 seedling (next to path) un-browsed. Beech: 1 seedling (next to deer track) heavily browsed and 1 sapling moderately browsed.*			
Preferentially browsed or grazed plants	*H*	*Raspberry: heavily browsed along deer track and elsewhere but some un-browsed. Ferns: most un-browsed but light grazing on Lady fern.*			
Sward	*NI*				
Seedlings /saplings in plot: total numbers and numbers browsed of each tree species.					

www.nature.scot

ISBN: 978-1-78391-783-9

Great Glen House, Leachkin Road, Inverness, IV3 8NW
T: 01463 725000

You can download a copy of this publication from the SNH website.

recycle

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
nature.scot