Wild Ennerdale

United Utilities

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Forestry Commission England

Forest Development Monitoring

Initial Plot Survey Report

January 2007

Gareth Browning
On behalf of The Wild Ennerdale Partnership

Funded and Supported By Natural England

NATURAL ENGLAND

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Introduction

The Wild Ennerdale partnership is committed to allowing the Ennerdale Valley to develop as a wilder valley allow natural processes greater say in how the ecology of the valley develops. Clearly this is a radical departure from how the valley has been managed over the last 100 years and is important for scientific research and to support management decisions that information is gathered about the valley as it changes. Key to monitoring these changes is setting up base line surveys which can be repeated in the future. This report describes the setting up of permanent sample plots in 2006 with the aim of monitoring the development of the forest into the future. The survey work has been fully funded by Natural England to whom the Wild Ennerdale Partnership is very grateful.

Methodology

Desk based

Using Arcview 3.2 a 300m grid was created across the wooded areas of the valley. This generated over 100 points. For reasons of funding and unnecessary duplication this was reduced to around 100 plots. A final figure of 104 plots (see Appendix 1) was agreed which included additional plots on the boundary of forested areas. Each of the plots was given a unique plot id and its gps reference calculated using GIS.

Field based

The Forestry Commission let a contract to Phil Taylor of Eden Woodlands to complete the field work. Eden Woodlands had completed 3 similar surveys to a high standard. The field survey was based on the methodology described in FCIN45 (see pdf document from Forest Research). At each survey point the following information was recorded about the crop using a 0.02ha plot (8m radius):-

- The number of trees by species including recording the dbh (diameter at 1.3m) of every tree and the top height of the largest dbh tree.
- The number of saplings by species
- The number of seedlings by species.
- The number of seedlings and saplings that have been damaged by grazing animals
- The percentage ground cover of different vegetation types
- Any other relevant comments
- A photograph of the plot.
- A coil of wire was buried at each plot centre to aid replicating the survey in the future.

The survey took approximately 22.5 days and cost £2655.00 which equates to £35.52 per plot.

Results

The survey produced 104 detailed field survey forms which have been summarised a spread sheet which is presented in Appendix 3. A total area of just over 2ha was surveyed. A full copy of the field data sheet is held by The Forestry Commission, Natural England, The National Trust and Eden Woodlands.

The data was then examined as graphs, tables and by importing back into a new GIS package ARC 9.2. The latter enabled the data to be overlaid with other layers such as current woodland and soils. In addition the GIS package was used to explore the distribution of the results across the whole valley.

The table below provides a snapshot of what the data reveals

	Oak	Birch	Larch	Spruce
Percentage of plots including trees	4%	10%	19%	16%
Percentage of plots including saplings	3%	16%	15%	38%
Percentage of plots including seedlings	6%	22%	18%	43%
Percentage of plots with trees of any species	44%			
Percentage of plots with saplings of any species	60%			
Percentage of plots with seedlings of any species	67%			
Percentage of plots with no trees, saplings or seedlings recorded	16%			

The graphs produced are provided as Appendix 4 whilst the GIS maps are provided in Appendix 5.

Interpretation

Whilst the value of this data will become clearer when the survey is repeated in the future it is still possible to draw some conclusion about the current structure of the forest from this dataset as summarised below:

From the Graphs

- On the face of it seedling regeneration is equally split between broadleaf (48%) and conifer (52%). Unfortunately this does reflect the east west split with spruce dominating the western valley.

- Browsing damage is very low with only 12% of seedlings and 6% of saplings recorded with browsing damage. This should bode well for future seedling establishment into woodland. Equally it could be seen as an opportunity to reduce the level of culling and allow more browsing to control regeneration. This topic needs further debate.

- The number of small category spruce trees per hectare is over twice the number of birch or larch small trees per hectare. Thinning of areas of spruce must be a priority to ensure that spruce does dominate the future forest.

- Spruce dominates the saplings category, a situation that needs to be controlled else spruce will have the potential to dominate the valley again.

From the Maps

- The forest is becoming more species diverse. From looking at the three maps which show the distribution of trees, saplings and seedlings it can be seen that the species diversity of the seedlings is greater that that of the saplings which is greater than that of the trees.

- The eastern valley has significantly fewer trees and as such is less structurally diverse than the western and central valley. This reflects harvesting of the remaining mature spruce which was completed during 2002 to 2005 with the aim of reducing future spruce regeneration.

- Whilst spruce regeneration (seedlings) is apparent in the eastern valley recent clear fells only exhibit low levels of regeneration compared to older clear fells. Again reflecting the removal of the mature seed bearing trees.

- Birch and larch regeneration dominates the seedlings recorded in the western valley.

- Spruce does dominate the saplings and seedlings in the middle and eastern valleys.

- Seedlings and saplings densities and diversity is higher on the south facing side of the valley, possibly reflecting improved growing conditions.

- The plots in Side Wood have not picked up many oak trees. Neither were many seedlings or saplings recorded. Additional plots may be advisable in Side Wood to adequately monitor this important ancient woodland.

- Browsing damage across the plots was low and restricted to three areas, Silver Cove, Bowness Knott and Broadmoor.

Summary and Recommendations

The work carried out has achieved the aim of providing a base line dataset that can be replicated in future years.

It would be beneficial to install four extra plots in Side Wood to ensure that this ancient woodland is adequately monitored.

Managing and controlling spruce saplings and thinning spruce trees in the eastern and middle valley along with restocking native broadleaves in the eastern valley is important in ensuring that spruce does not dominate the future forest.

The survey should be repeated between 2011 and 2016. It may be best to consider repeating the survey nearer to 2011 to be able to adequately monitor the effectiveness of spruce control and restocking. However once spruce is considered unlikely to dominate the future forest a standard resurvey period of 10 years should suffice.

Gareth Browning
January 2007

Appendix 1-- Plot Layout Maps

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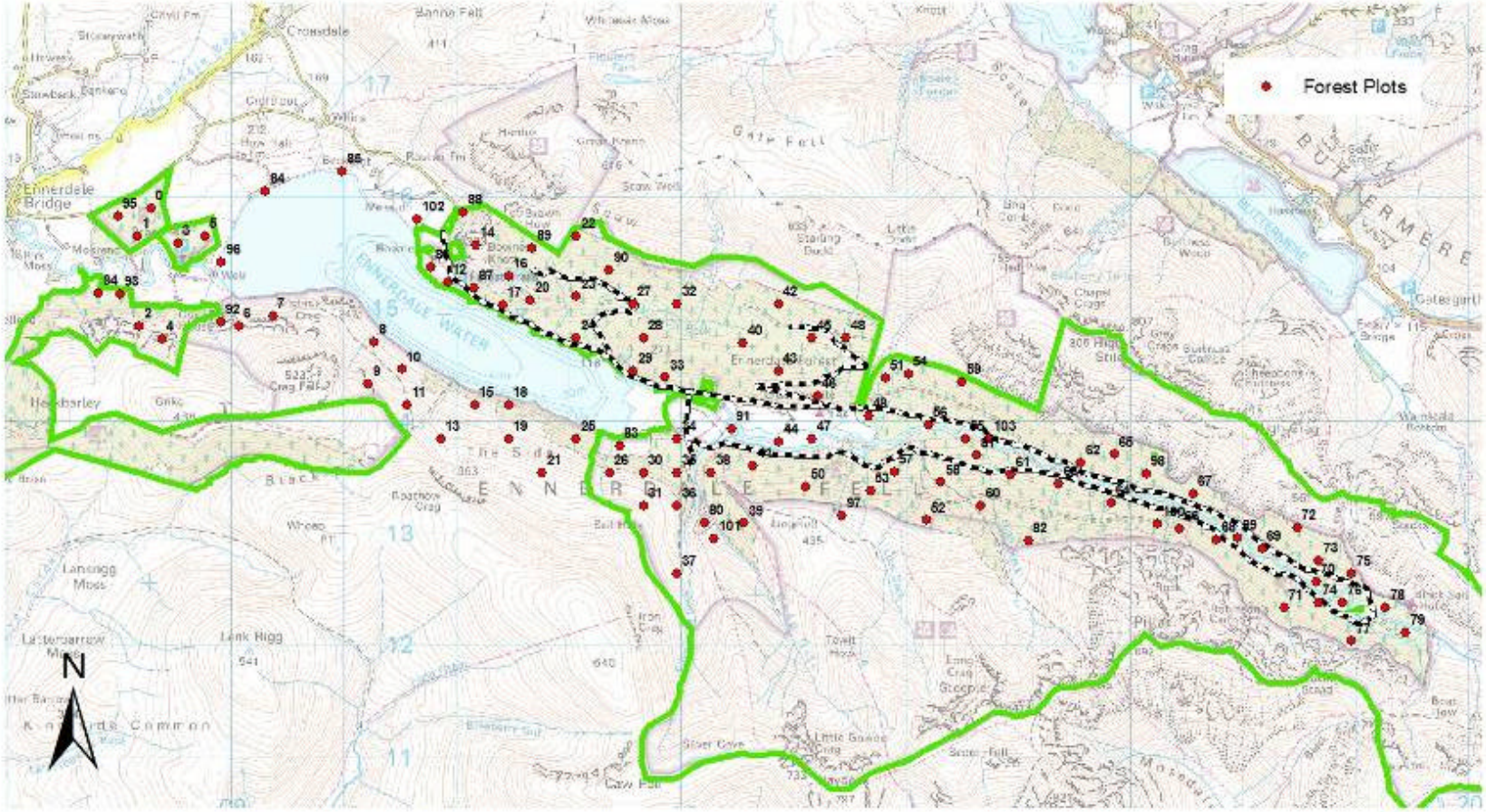
Monitoring Forest Development

Scale: 1:35,000



Appendix 2 -- Summary Data

Site name	Ennerdale		Date Surveyed	Dec-06	Plot Area	0.02	No of Plots	##

DBH Trees
(Small= 7-24.9, Medium=25-39.9, Large=40-54.9, V Large=55+)

Plot Number	Grid Ref		Oak					Birch					Other Bls					Beech/Sycamore					Larch					Spruce					Other Conifer					Total Trees					Saplings									Seedlings									Plot Number
	X coord	Y coord	Small	Medium	Large	V Large	Total	Small	Medium	Large	V Large	Total	Small	Medium	Large	V Large	Total	Small	Medium	Large	V Large	Total	Small	Medium	Large	V Large	Total	Small	Medium	Large	V Large	Total	Small	Medium	Large	V Large	Total	Small	Medium	Large	V Large	Total	Oak	Birch	O Bls	Be/Syc	Larch	Spruce	O Con	Total	Deer Damage	Oak	Birch	O Bls	Be/Syc	Larch	Spruce	O Con	Total	Deer damage	
0	308286	515897						6				6											1				1	24				24						31				31						5		5	4		4						4	4	0
1	308166	515644																										1				1						1				1		##	2			40		142	17		25				10		35		1
2	308181	514851											2				2																					2				2			1					1				2					2	2	2
3	308524	515583																																																			25			1	75		101		3
4	380381	515734																																																											4
5	308766	515644						20				20																1				1						21				21		75	10			12		97			20				2		22	22	5
6	309066	514844																																																											6
7	309369	514938																																											1					1											7
8	310273	514708											3				3																					3				3												4					4	4	8
9	310219	514335																																																											9
10	310516	516461											4				4																					4				4			3					3											10
11	310566	514144																																																											11
12	310927	515239						2				2																										2				2			1					1			1						1		12
13	310866	513844																																																											13
14	311174	515564																																											2					2				3					3	3	14
15	311166	514144																																																											15
16	311466	515289																																																											16
17	311413	515032																						4	1		5												4	1		5	1	15	3	1	3	1		24		25	25	31					81		17
18	311466	514144				1	1	1	3	1		5																										1	3	1	1	6																			18
19	311466	513844																																																											19
20	311658	515080	30	5			35						1				1																					31	5			36	1							1		12		32					44	10	20
21	311766	513544																																																											21
22	312066	515644																																										1				18		19	9		4				5		9		22
23	312069	515110																					1				1	2				2						3				3		40	2		15	54	5	116	52		5	2		5	5		17		23
24	312066	514744						2				2												1	1		2											2	1	1		4		25	10		2	2		39			5	50					55	37	24
25	312066	513844						7	4			11																										7	4			11																			25
26	312366	513544																																											1					1											26
27	312571	515044																																																			1						1		27
28	312666	514744																					1				1	3				3	1				1	5				5		1			8			9			1			15	10	1	27		28
29	312573	514451	4	2	1		7	2	1			3	1				1																					7	3	1		11										10	##	35		3	8		171	8	29
30	312319	513559																																											6					6	2										30
31	312666	513244																																																				8			1		9	4	31
32	312966	515044																										44	4			48						44	4			48																			32
33	312860	514390	15	1			16	7		1		8	5				5																					27	1	1		29		3	4					7				50					50	14	33
34	312966	513844																						3	1		4												3	1		4											2	26		10	15	4	57	17	34
35	312966	513544																																																			12	25			2		39	35	35
36	312966	513244																																																											36
37	312966	512644																																																											37
38	313266	513544																							2		2													2		2						10		10							50		50		38
39	313560	513092																																													4			4											39
40	313551	514693																					1				1											1				1					15	50		65						5	10		15		40
41	313640	513607																					2	4			6											2	4			6					3	4		7				25			1		26	18	41
42	313866	515044																						5	2		7												5	2		7															10		10	1	42
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49	314668	514051																																											10			2		12			10	2			6		18		49
50	314112	513417																					10				10	19				19						29				29					4	5		9											50
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52	315182	513119																										9				9						9				9			25			8		33				25					25		52
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54	315024	514423																1				1																1				1											1	2	2	3	5		13		54
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58	315313	513457											2				2																					2				2		5	2			20		27				2			30		32		58
59	315499	514353																1				1	1				1											2				2						1		1				1			1		2	1	59
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64																																																													64
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69																																																													69
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72	318481	513050																																														2		2											72
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75	318966	512644																																																										75
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82	316090	512935																																														1		1							1		1		82
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85	309987	516226																																																											85
86	310775	515369																																									2							2											86
87	311160	515182						1				1												2	1	1	4											1	2	1	1	5			3					3		5		7					12	2	87
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92	308907	514880																																											6					6											92
93	308011	515131																																														32		32							10		10		93
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95	307995	515825																																														15	10	25			10	2	1		5	10	28	6	95
96	308913	515416																																											6					6											96
97	314431	513161																																														4		4							1		1		97
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99	317953	512964																																										3						3				23			18	3	44		99
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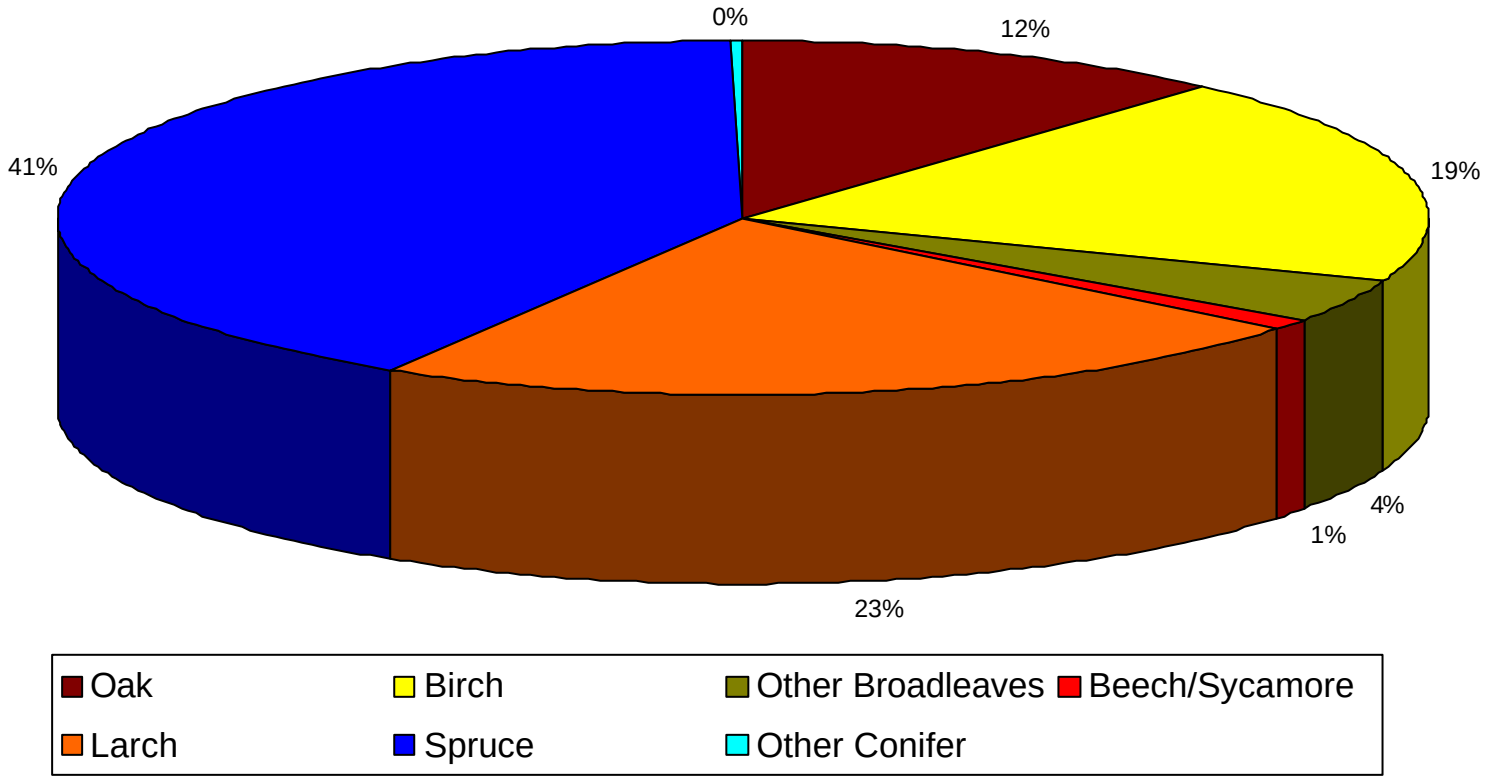
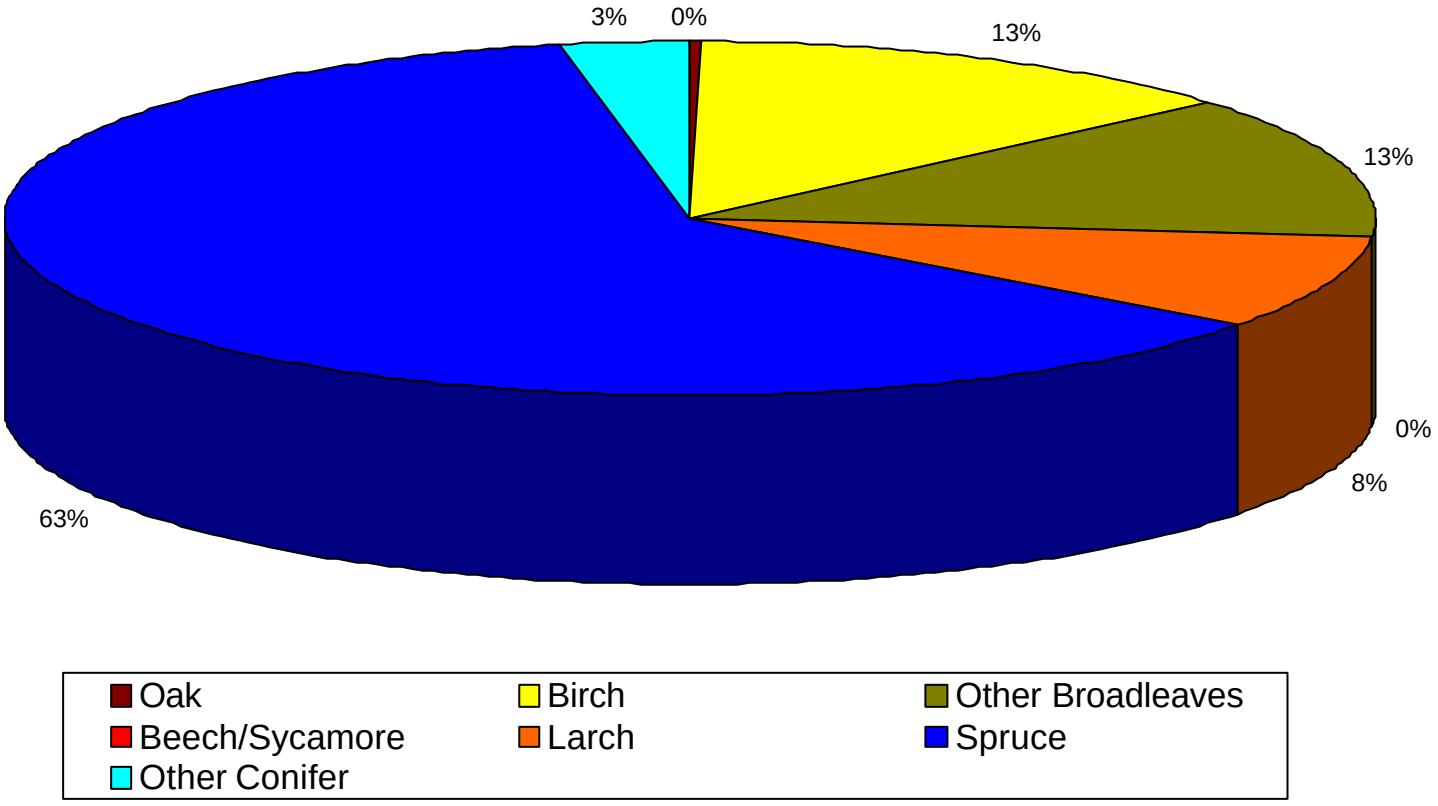
103	315732	513843																					1				1											1				1		40			6			46			10		2	5	25		42		103
104	316645	513478																										3				3						3				3		1				46		47											104
Totals			49	8	1	2	60	89	8	2		99	20				20	3		1	1	5	80	27	10	1	118	197	9	5		211	2				2	##	52	19	4	##	4	##	##	1	##	##	38	1412	86	78	##	422	10	84	##	32	1738	222	
Per ha			24	4	0	1	30	44	4	1		49	10				10	1		0	0	2	40	13	5	0	58	98	4	2		104	1				1	##	26	9	2	##	2	##	81	0	52	##	19	699	42.57	38.6	##	209	5	42	##	16	860	110	

Appendix 3 -- Graphs

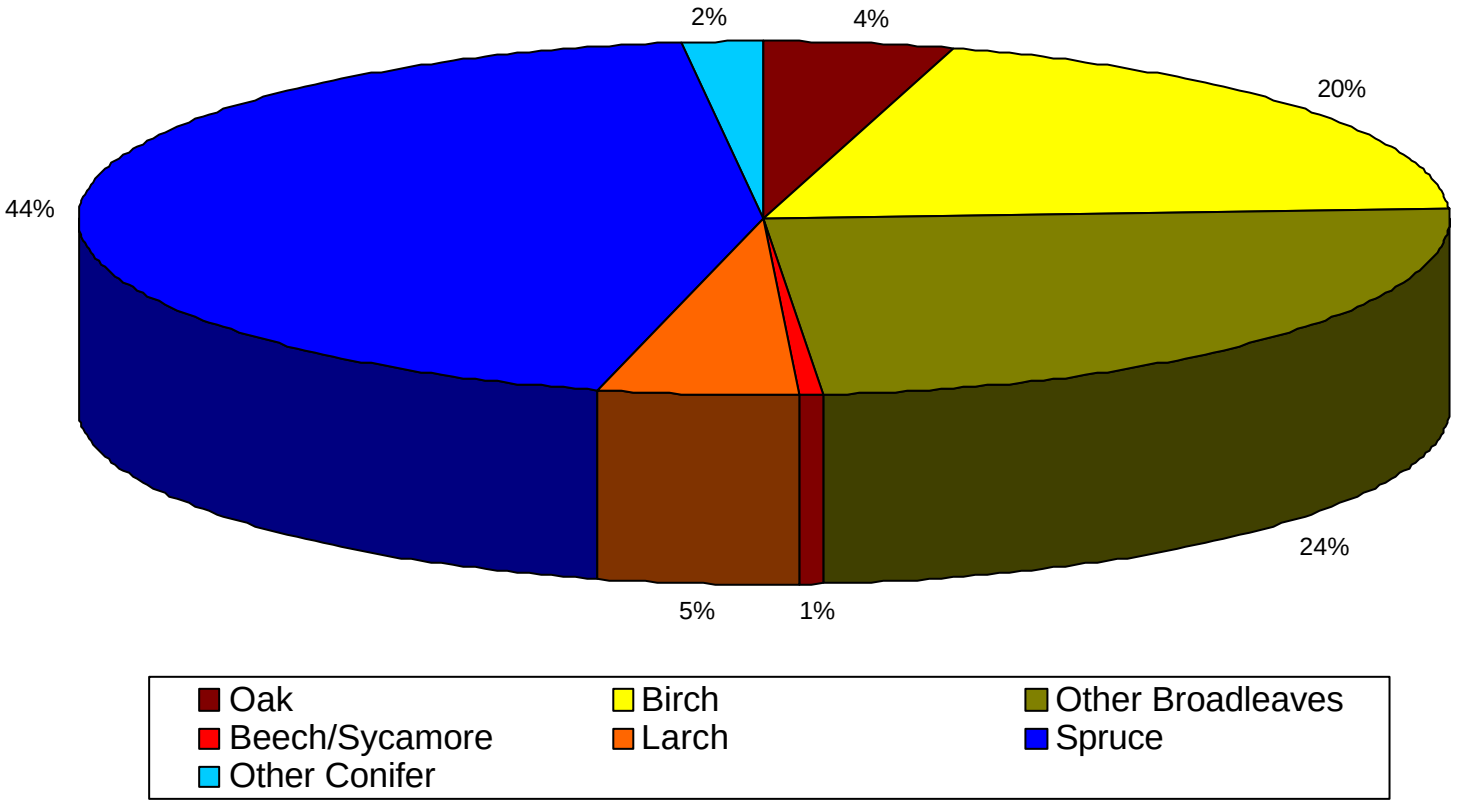
Total Trees Recorded by Species



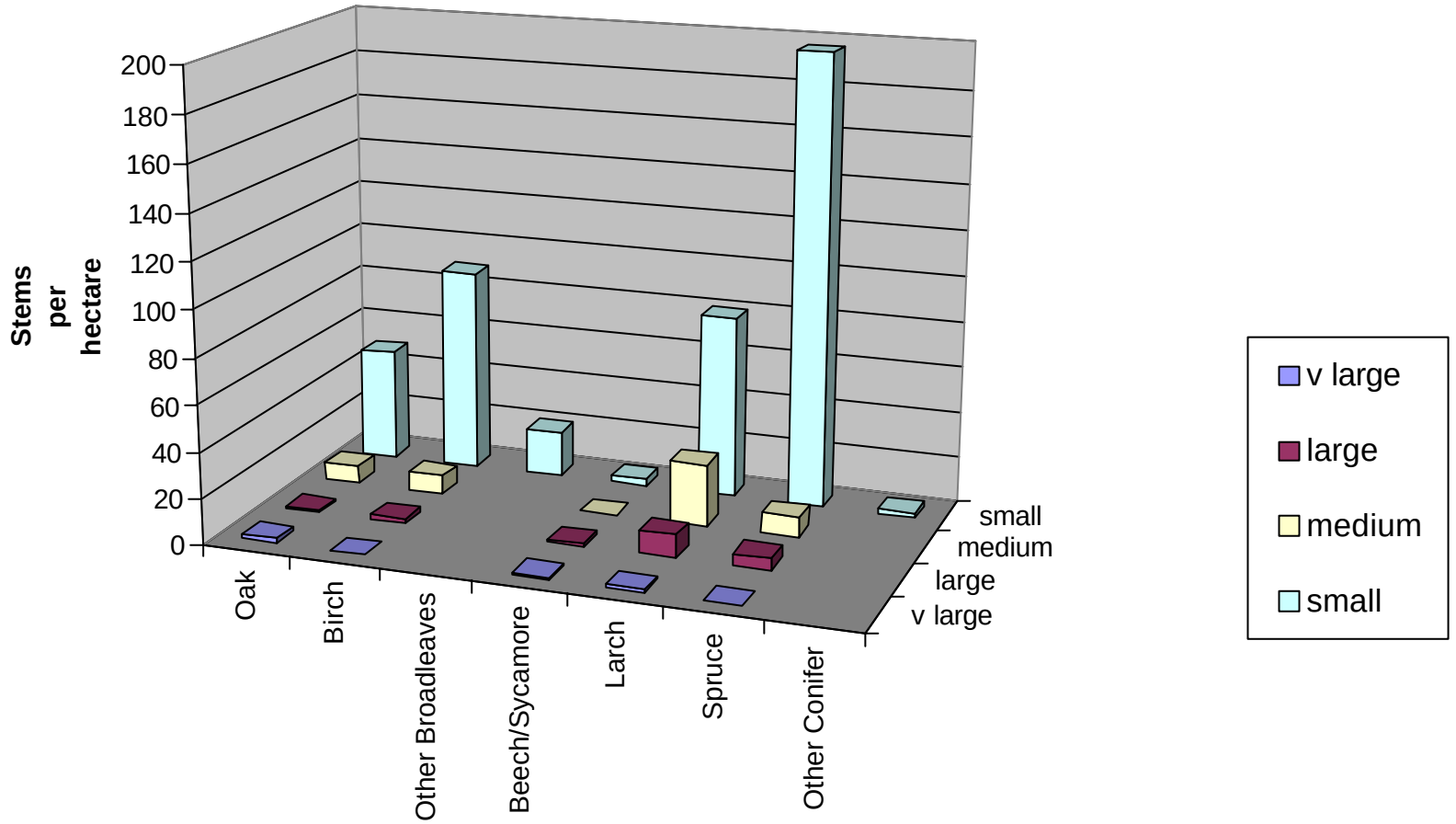
Total Saplings Recorded By Species

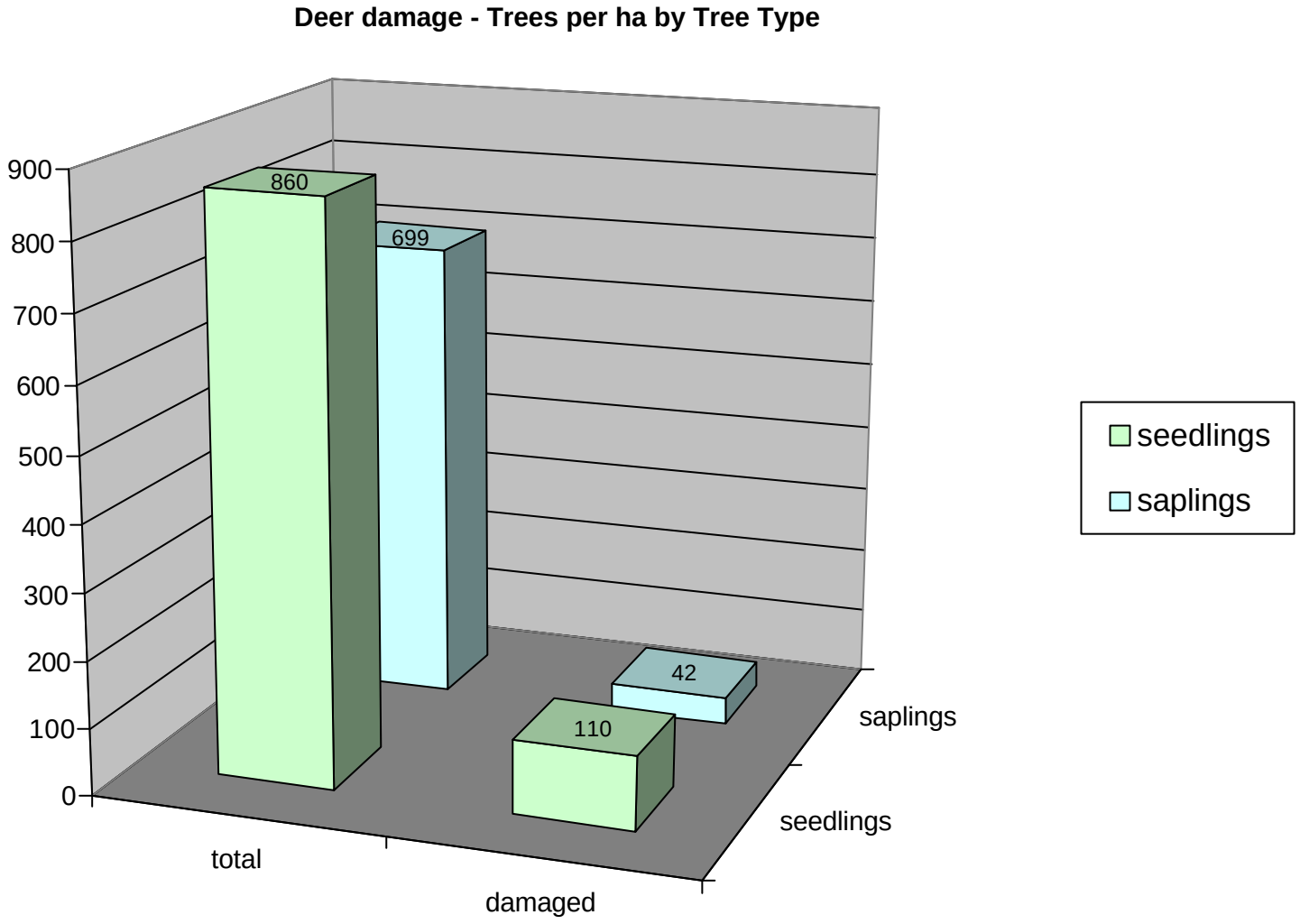


Total Seedlings Recorded by Species



Total Trees recorded by size and species




Deer damage - Trees per ha by Tree Type
900
800
700
600
500
400
300
200
100
0
860
699
42
110
total
damaged
saplings
seedlings
seedlings
saplings

Appendix 4 -- Maps

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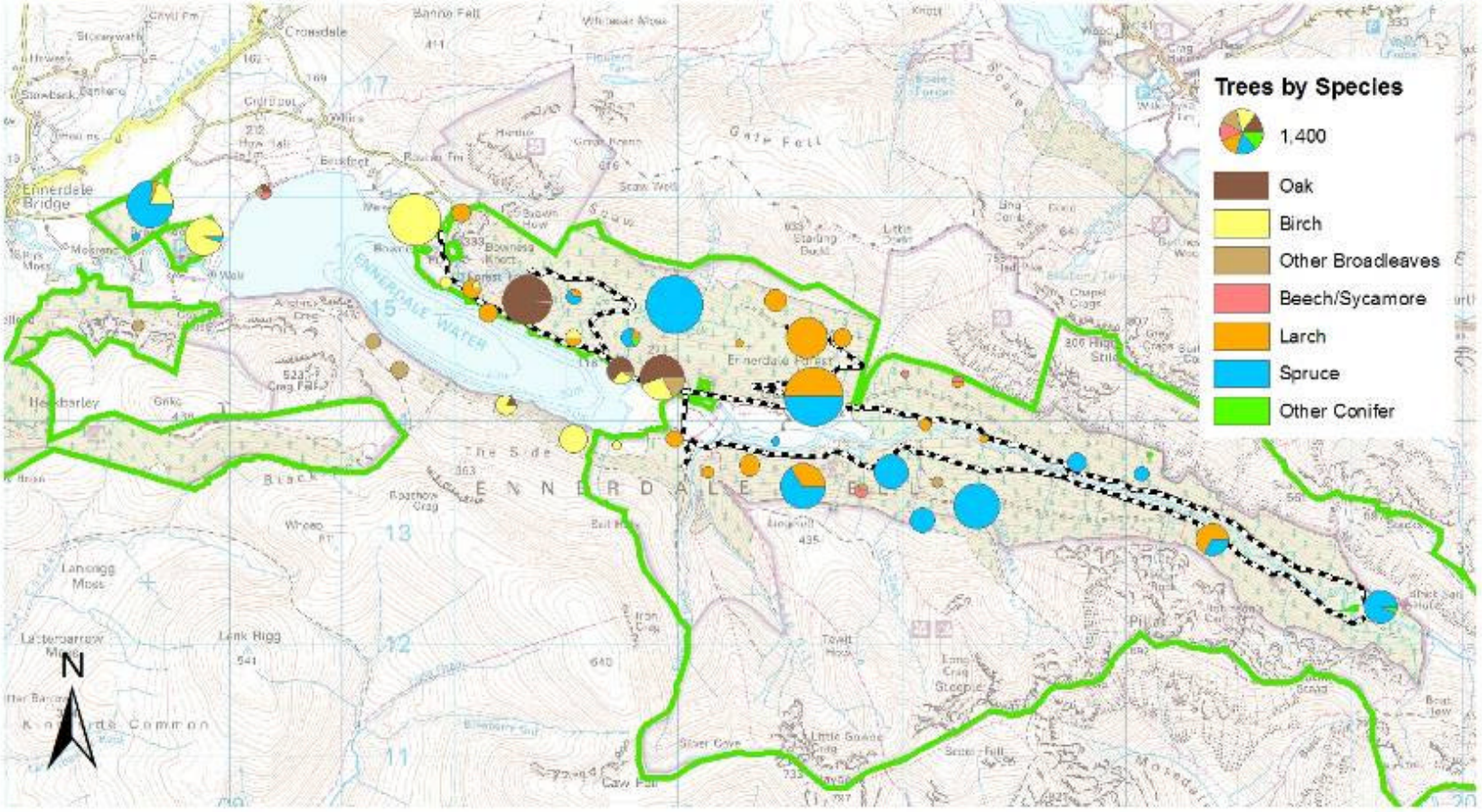
Scale: 1:35,000



The larger the pie the more stems were recorded in that plot

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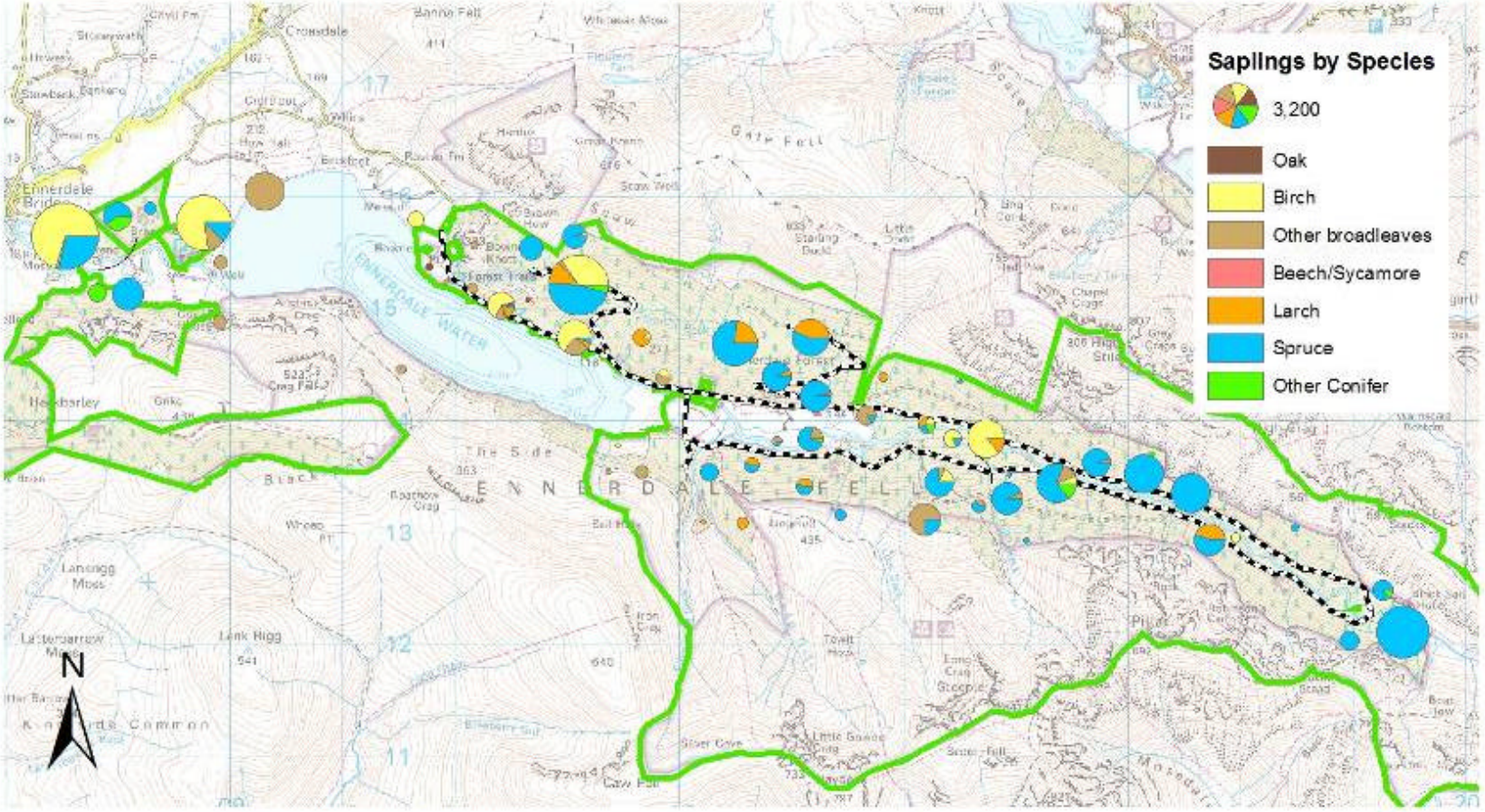
Scale: 1:35,000



The larger the pie the more stems were recorded in that plot

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