



# Surveying a woodland for wild products



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## Acknowledgements

This protocol has been developed by Wild Resources Ltd on behalf of Llais y Goedwig in support of commercial harvesting of wild woodland products by community woodland groups in Wales. It is based on the outputs of an action research study undertaken by Llais y Goedwig in 2013-16 under the EU FP7 StarTree research project.



The woodland featured as an example in this document is Llyn Parc Mawr Community Woodland on Anglesey. Many thanks to the Llyn Parc Mawr volunteers for helping with the StarTree survey and for offering up their data as an example of a woodland survey.

## Why do a woodland product survey?

The aim is to assess both the variety and abundance of woodland products present in your woodland and provide you with sufficient information to consider what opportunities there may be to utilise them. In the much longer term, you may wish to alter the composition of species present and understanding the ecology and physical conditions present at your site will help you to make better decisions.

If carried out carefully the survey described will also be useful in monitoring changes in your woodland over time – the survey could be repeated in the future and the results compared.

## What does it involve?

A basic survey will involve walking to points in the woodland to mark out a 15m by 15m square and to record the vegetation (common herbs, shrubs and trees) and physical features found there. However, it can be very useful to include other taxa such as fungi or lichens in which case specialist advice might be required.

To ensure that the survey is statistically robust (and results can be meaningfully compared with surveys in the future), it needs to be carried out systematically and with care but can easily be done by amateurs provided they can identify common plant species and use a tape measure, compass and GPS.

Ideally, once the data has been collected it needs to be transferred to a computer database, and preferably also into a simple GIS to make analysis easier, though this is not essential.

**Commented [JW1]:** Might need to say a bit more about this??

Also doing a quick walk through to decide what to look for???

## Objectives of the survey

1. To provide an overview of the presence and abundance of a range of woodland products
2. To provide basic data on tree stocking density (basal area), their size classes (stand tables), and spatial distribution
3. To gather data suitable for input into the Forestry Commission Ecological Site Model to examine the future potential for woodland products on the site

## Planning

Before commencing any survey it is useful to gather as much information on the site as possible. This might include any previous management plans, any other surveys that have been carried out, historical background information, and maps, aerial photographs or satellite imagery both historical and current. If the woodland has previously been zoned either ecologically, or into separate management compartments, it is useful to be able to take these into account when planning the survey.

Although little disturbance to the vegetation is envisaged, it is important to be aware of site boundaries and ensure that all the relevant permissions have been obtained to carry out the work and for access. If the survey is to be carried out mostly by volunteers it is useful to know what skills are available – surveyors do not need to be ‘experts’ but if there are people available who are knowledgeable on plants, trees, wildlife, soils etc., then it makes good sense to use them if this is practical and they wish to help.

A list of equipment required to carry out the surveys is given on page 20.

The ideal time to record the vegetation is in early summer when there are signs showing for most plants – including remnants of any spring bulbs. Most trees can be identified at any time of year, though leaves do make identification easier. Some annual herbs may not be visible until the summer and identification is often easier when they are in flower. Lichens can be surveyed at any time of year, but for other taxa, such as fungi, several visits may be required and a different survey technique for these will be required.

## Sample design

1. The aim is to provide sufficient statistically robust data, which can be gathered using help from volunteers. Approximately 20 survey plots are planned at each site but if a site is both very large *and* varied then more plots may be needed, and in that case it will be useful to divide the woodland into blocks of similar type and place around 20 plots in each. However, accessing and surveying plots takes time and effort, so only consider adding more if you are sure your site needs them and you have the resources. For most small woodlands, 20 plots should suffice for a basic survey.
2. The survey plots are located at the intersections of a 100m grid based on the Ordnance Survey grid system, so the first task is to mark all the intersections onto a map of the woodland. Points falling on open water can be ignored! The survey points should aim to cover the area as evenly as possible without bias – so be careful if you have more than 20 intersections, not to select plots because they might be ‘interesting’ or easy to get to. If, on closer inspection, some plots are found to lie entirely or mostly outside the boundary of the woodland then they can be ignored. An example plot location layout is shown in Figure 1.
3. Once you have decided where your plots should go, they should be located on the ground using a GPS. Make a note of the easiest route to each point or sketch it on a map, this will be really useful if you need to return to the plots in the future. At each intersection a temporary marker post should be placed so that the sites can be relocated. It is possible that each plot will be revisited in more than one season, so the marker posts need to survive for at least 12 months. Figure 2 shows a marker made from a 60cm long 50mm x 25mm (2” x 1”) treated wooden stake, with a plastic number tag attached, but anything reasonably long-lasting and clearly visible will do.
4. A square plot 15m x 15m in size should be laid out to the north-east of the marker post using a tape measure, compass and improvised survey poles. Use a compass to indicate the north and east boundary lines. Try to be as accurate as possible when laying out the shape and direction of the square plot. A pair of surveyors using distinctive survey poles, coloured string/rope and two 20m tape measures works well. It is useful to mark the sides and corners of the plot with short bamboo canes and string/tape whilst you are working there. Figure 3 shows how the boundary of a plot can be marked out.
5. The survey uses a ‘nested plot’ design: Data is gathered over the entire 15m x 15m plot; from a smaller 5m x 5m within it; and a 2m x 2m plot within that, all using the same marker post at the SW corner (see Figure 4). All the information collected should be recorded onto data sheets, always including the name of the surveyor, date and plot number (see example below).
6. Data should be transferred from the data sheets into an appropriate database (preferably ACCESS) and a GIS, for analysis and mapping. It is useful if someone with basic knowledge of database / spreadsheets takes responsibility for this.

**Figure 1:** Plot origins on a 100 x 100 m grid



Overlaying the 100 x 100 m grid gives 23 points for this 24 ha woodland. Checks on the ground revealed that some of these locations were so close to the boundary that more than half the survey plot fell outside the designated area of interest, so were ignored.

**Figure 2:** Plot marker post.



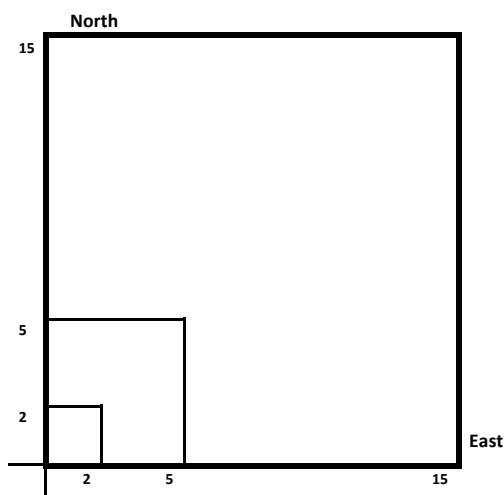
In this example, a 2" x 1" wooden stake was used, and numbered with a clearly visible number which was a repurposed livestock tag).

**Figure 3:** Laying out the plot with tapes.



Red & white hazard marker tape has been used to define the edges of the 15m x 15m plot. Bamboo canes have been laid on the ground to define the smallest 2m x 2m subplot

**Figure 4:** Plot layout (bottom SW corner is the intersection of the 100 x 100 m grid)



## What to record

The survey is designed with volunteers in mind but with supervision by someone with knowledge of forestry or biodiversity surveys. Ideally one person in the Group should take responsibility for co-ordinating data collection and to keep the information secure. If volunteers are not confident in carrying out such a survey, then training and advice should be sought, at least at the initial stages.

Record all the information onto data sheets (completed examples are shown below, and blank Field sheets are provided on pages 20-24. It is good practice to always include the name of the surveyor, date and plot number at the top of every sheet.

For each plot location record:

**1. Site conditions**

- 1.1 Record aspect / slope angle / drainage / soil type. Describe conditions underfoot.
- 1.2 Take a photograph looking NE from marker post across the 15 x 15 m plot. Record the reference number of photo and any note this. Make sure to record the plot number for each photo (it can be useful to include the marker post number in the picture).
- 1.3 Record any other features of interest e.g. bare soil, boulders, drainage ditches, signs of human activity (e.g. litter, footpaths); dog fouling etc.
- 1.4 Draw a rough sketch map of the plot – include any streams, ditches, footpaths, fallen trees or other large features. This does not need to be too detailed!

**2. Tree survey (large 15m x 15m plot)**

- 2.1 In the large (15 x 15 m plot) measure and record all trees over 10 cm diameter at 1.3 m from the ground. Trees smaller than this will be dealt with in the medium (5 x 5 m) plots.
- 2.2 Data to record: Species; Form (single or multi-stemmed); Health (damage/decay / broken branches etc.); diameter at 1.3 m (measured in cm to nearest 0.5cm using a diameter tape – if this is not available measure circumference using a normal tape measure and divide by  $\pi$  (3.142)). If a clinometer is available, heights can also be measured, but this is not essential. Record all data onto 'Tree Survey' recording sheets.
- 2.3 Collect twigs, leaves, cones etc. for confirmation of ID if required – good photos can also be useful.
- 2.4 Additional notes: a variety of woodland products may be found growing on the trees, such as Lichens, Mistletoe or galls. You may need to familiarise yourself with some of these before doing the survey so you know what to look for and record.

**3. Understorey survey (medium plots: 5 x 5 m)**

- 3.1 Measure and count all trees over 1m tall and up to 10 cm diameter at 1.3 m: Record the species, and diameter of individual trees where possible, but this is not needed for shrubs or herbs.
- 3.2 Shrubs: all woody shrubs over 1m tall. Record the species, and, depending on the growth form, estimate the extent (% of area, if abundant) or number of individuals in the 5m x 5m plot.
- 3.3 Collect samples for confirmation of plant name if required

**4. Ground flora survey (small plots 2 x 2 m)**

- 4.1 Estimate the extent (% of area) of live vegetation, bare soil or other features in this sub-plot – make sure this adds up to 100% Images on page 25 may help
- 4.2 Record all vegetation below 1 m tall including tree seedlings, herbaceous plants, grasses and other monocots, and ferns. Make a complete species list if possible. A list of species of particular interest is given on page 27 and 30 - it helps if these can be identified easily. The presence of Fungi, Lichens and Bryophytes can be recorded but do not need to be identified down to species.
- 4.3 Estimate the extent (% of area) of each species, and count the number of individuals for tree seedlings. Where the vegetation is multi-layered, the total area for all species may end up more than 100%
- 4.4 Collect samples for confirmation of ID if required

**5. Animal signs (optional)**

- 5.1 Sightings / droppings / footprints / feeding signs, nests/drays etc.

5.2 Photograph / collect any signs for later confirmation if required for identification

If you are unsure about a plant species and want to check it later then collect samples and place them in bags (paper or plastic as appropriate) or tag them. Make sure they are clearly labelled with the plot number and a reference matching the record on your data sheet.

NB: To reduce damage from trampling, It is recommended that the 2 x2 m ground flora survey is carried out *first* followed by the understorey & tree surveys.

## Examples of completed data sheets

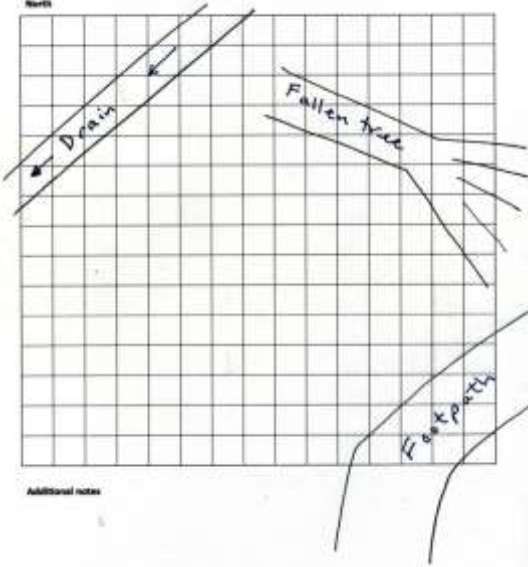
### General plot description

Plot #	Gridref	Date	Recorder
4	SH399675	29/2/2017	A Surveyor
Slope gradient (degrees or %)	1 in 10 (10%), uneven		
Aspect	NW		
Soil type	Heavy clay		
Drainage	Poor – waterlogged		
Photo taken?	Yes	Photo #004 290217, #005 290217	004 looking NE from marker post, 005 looking from SW NE corner
General notes / other features of interest  e.g signs of Human activity / litter / dog fouling etc.	Ditch in NE corner with flowing water  Large fallen tree to NE Footpath 5m to E Some litter		

Rough sketch of natural edges within the 15m x 15m tree plot

Plot 4 SH579675 29/2/2017 A. Sawyer

North



Additional notes

### Tree survey

2. Tree survey (15m x 15m plot)

Plot #	Gridref	Date	Recorder
2	413 620	14/8/15	DD

#	Species	DBH (cm)	Form	Health	Height	Notes
1	C.P.	48.5	single	Fair	26m	Cross-section cone samples
2	-	40.4	stem	-	-	-
3	-	41.3	-	-	-	veg on stem
4	-	44.5	-	-	-	-
5	-	28.5	-	-	-	veg on stem
6	-	44.5	-	-	-	-
7	-	38.1	-	-	-	-
8	-	47.4	-	-	-	-
9						
10						
11						
12						
13						
14						
15						

Add more trees below if necessary

All have very thin emerg - few branches + needles.

### Understorey survey

11.3 Understorey survey (5 m x 5 m plot)

Plot #	Gridref	Date	Recorder
9			

#	Species list	Diameter (cm) at 1.3m if a tree % cover or # of individuals if not	Notes
	Cotoneaster	10/1	
	D. Purple	2/1	
	Nettle	2/1	
	Brake	25/1	
	Ash	1	

Ground vegetation

11.2 Ground flora survey (2 m x 2 m plot)

Plot #	Gridref	Date	Recorder
5		19.9.15	JGR

#	Species list	% cover	Notes
	blackthorn	70	with Janit on top (2:50)
	vegetation	100	
	broom	<del>20</del>	
	bramble	10	with some mouse fruit
	Male fern	10	
	hearts tongue		
	King's cress		
	(sample 5-1)		
	Herb robert		
	Small dock		
	Broad buckler		
	Red campion		no flowers on
	ivy		
	Mosses		
	willow herb		

## Logistics

How long your survey might take will depend on many factors. Probably, the first few plots will be the slowest, but things quickly speed up once a team of surveyors has learned what they need to do, know what equipment is needed and can recognise the common species. A small team of two people is usually sufficient, but more can sometimes be of help. Working efficiently, a plot might be marked out and surveyed in as little as an hour, but additional time should be allowed to locate them. If the understorey vegetation very is dense or there are many fallen trees this will also slow things down considerably. In previous surveys using volunteers, it has been possible to complete up to four plots in day, but the average was just two, however, every woodland is different!

If many different volunteers are used to carry out the surveys it is important that someone takes overall responsibility for coordinating the work. It is important that some training of volunteers is provided to ensure that everyone follows the methodology in the same way.

## Additional surveys

A complete inventory of woodland products should include all higher plants (flowering plants, grasses, sedges & rushes) as well as lower plants (e.g bryophytes – mosses and liverworts), other taxa such as Fungi and Lichens and as well as the fauna. Even for very common species, specialist advice may be needed for some of these. For Fungi, where there distribution can be very patchy, and the identifiable parts (fruiting bodies) may be abundant one year, and scarce the next, a single visit to the plots will not give a complete picture. A different survey strategy is required for these – possibly using taxa specialists to run ‘fungi forays’ or similar events may be one solution.

## Summaries and analysis of your data

There are many different database programs available to help you store, analyse and present your results, but you can prepare basic results using pivot tables in Google Sheets or Excel. If a GIS (Geographical Information System) is available then this can be used to provide a variety of maps to help you visualise and manage your site.

It is worth setting up your database and begin entering your results as soon as you have completed one or two plots. This should identify any data collection / data entry issues at an early stage!

One of the first things you may need to do is to check the names of all the species recorded - different surveyors may have used different local names to identify the same plants. This is fine, but you will need to ensure that naming is consistent to be able to summarise your results easily.

Once completed, your survey will provide a list of most of the higher plants present at your site and also an indication of their abundance and distribution. This survey method is not designed to find all the rarest species, but it will give you an idea of the most likely woodland products available. There are numerous publications and online resources listing the possible uses for different species (see Section 13) and by comparing these with what you have found (and taking into account their abundance), potential opportunities can be identified.

It is possible to estimate the abundance of different species (expressed in hectares or numbers of individuals) though these figures are for guidance only and are subject to error (which could also be calculated as percentage error if you wished). Remember to take care when scaling up from your observations as the subplots are of different sizes (e.g. each ground flora plot is just 4m<sup>2</sup> whilst the larger ‘tree’ plot is 225m<sup>2</sup>)

There are numerous ways of analysing and present your results, some examples are shown below:

Results presented in tables:

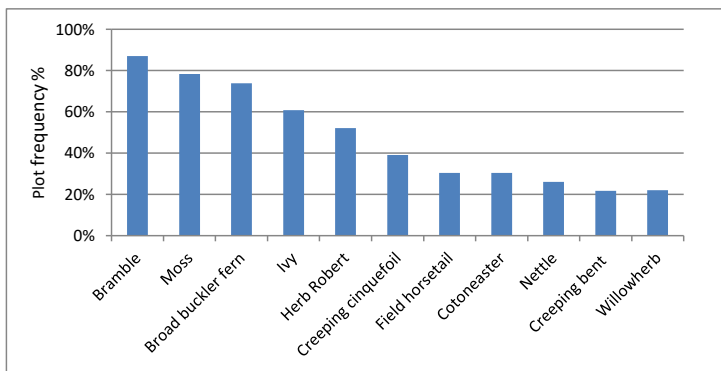
Table 1: A list of species present and how frequently they were encountered

Scientific name	English name	Welsh name	Frequency (number of plots in which species was recorded)			
			Ground flora	Understorey	Trees	All plots
<i>Abies amabilis</i>	Silver fir				1	1
<i>Abies grandis</i>	Grand fir	Ffynidwydden fawr		1	2	3
<i>Abies sp.</i>	Fir	Ffynidwydden			1	1
<i>Acer campestre</i>	Field maple	Masarn bach	1	1	1	1
<i>Acer platanoides</i>	Norway maple	Masarn Norwy	1	1	6	6
<i>Acer pseudoplatanus</i>	Sycamore	Masarn	1		6	6
<i>Aegopodium podagraria</i>	Ground elder	Llysiau'r gymalwst	2			2
<i>Agrostis stolonifera</i>	Creeping bent		5			5
<i>Alnus glutinosa</i>	Alder	Gwernen			1	1
<i>Angelica sylvestris</i>	Wild angelica	Llysiau'r angel	3	1		3
<i>Asplenium adiantum-nigrum</i>	Black spleenwort fern		1			1
<i>Asplenium scolopendrium</i>	Hart's tongue fern	Tafod yr Hydd	1			1
<i>Betula pendula</i>	Silver birch	Bedw arian		3	4	5
<i>Betula pubescens</i>	Downy birch	Bedw llwyd		2	8	8
<i>Betula sp. (mainly B.pubescens)</i>	Downy birch	Bedw llwyd	5	4	6	10

This is a rough indication of the commonest species, produced by simply adding up the number of *different* plots that each species was recorded in.

The same data can also be expressed as a graph, either for all species, or if you wish, just looking at similar groups of species:

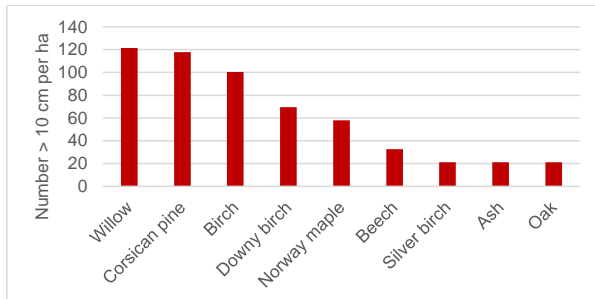
The most frequently encountered ground level and understorey plants



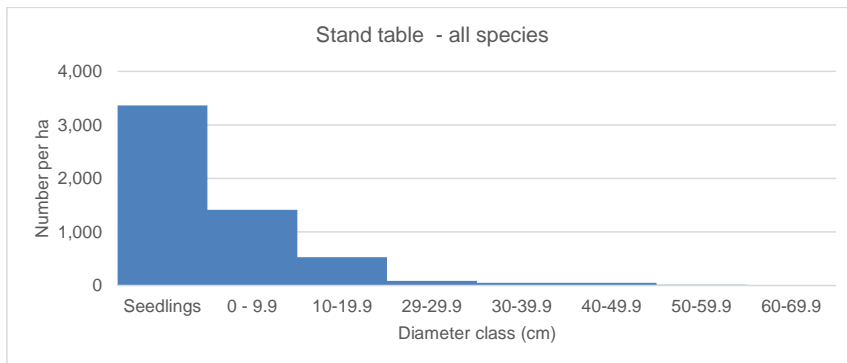
In this example the understorey was comprised of large dense areas of brambles and ferns with many mosses and ivy growing on the forest floor.

An estimate of the total number of trees can be made, and expressed as number per hectare, or scaled up to give an approximate number for the whole woodland. Simple bar charts can be used to illustrate significant features of your data.

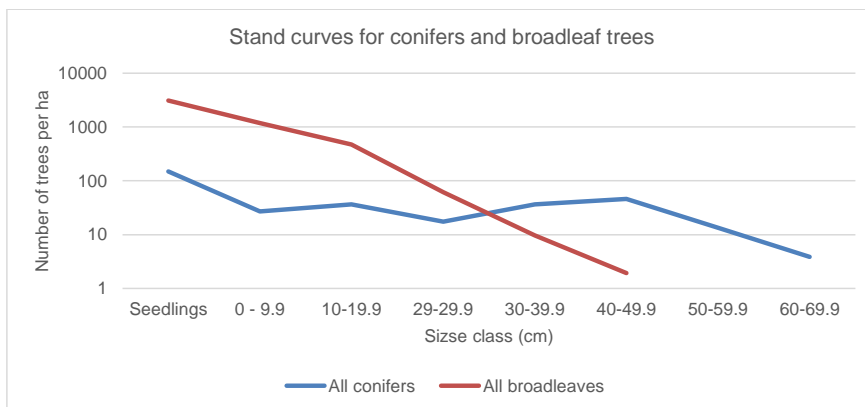
For example: to highlight the commonest species:



Or the structure of the woodland in terms of number of trees of differing sizes. Note that in a naturally regenerating woodland we would expect to see a much higher density of small trees and the shape of the curves reflects the recent history of the woodland.



The drop off in numbers of trees can make it difficult to see differences – displaying the numbers as  $\log_{10}$  makes it easier to see differences but take care reading the numbers off the vertical axis as its not linear!



These curves illustrate the difference between planted conifers and naturally regenerating broadleaves.

Table 2: Conventional tree stand table

Scientific name	Tree diameter class (cm)								Total
	Seedlings	0 - 9.9	10-19.9	29-29.9	30-39.9	40-49.9	50-59.9	60-69.9	
<i>Abies amabilis</i>					1.93				1.93
<i>Abies grandis</i>	19.32		1.93	3.86					25.11
<i>Abies sp.</i>	1.93	3.86	1.93						7.72
<i>Acer campestre</i>	108.7	38.64	7.72						155.06
<i>Acer platanoides</i>	108.7	65.67	54.05	3.86					232.28
<i>Acer pseudoplatanus</i>	108.7	15.44	7.72	7.72	1.93				141.51
<i>Alnus glutinosa</i>		3.86	11.58	1.93					17.37
<i>Betula pendula</i>	34.78	77.29	13.51	1.93	3.86			1.93	133.3
<i>Betula pubescens</i>	17.39	102.33	63.7	5.79					189.22
<i>Betula sp.</i>	599.51	168.07	86.87	11.58	1.93				867.97
<i>Chamaecyparis lawsoniana</i>						1.93			1.93
<i>Corylus avellana</i>	17.39								17.39
<i>Crataegus monogyna</i>	269.57	54.1	5.79	3.86					333.32
<i>Cryptomeria japonica</i>	108.7	1.93	3.86	3.86					118.35
<i>Fagus sylvatica</i>	108.7	77.27	17.37	13.51	1.93				218.78
<i>Fraxinus excelsior</i>	595.65	104.31	17.37	1.93	1.93				721.2
<i>Larix decidua</i>					1.93				1.93
<i>Picea abies</i>				1.93	1.93				3.86
<i>Picea sitchensis</i>	17.39	19.32				1.93			38.64
<i>Pinus contorta</i>					1.93				1.93
<i>Pinus nigra</i>	1.93		25.1	5.79	27.03	42.47	13.51	3.86	119.69
<i>Prunus avium</i>	17.39	71.48	9.65						98.52
<i>Prunus serotina</i>	34.78								34.78
<i>Prunus sp.</i>	52.17			1.93					54.1

Scientific name	Tree diameter class (cm)								Total
	Seedlings	0 - 9.9	10-19.9	29-29.9	30-39.9	40-49.9	50-59.9	60-69.9	
<i>Prunus sp.?</i>	108.7								108.7
<i>Prunus spinosa</i>	252.17								252.17
<i>Quercus robur</i>		34.77	19.3			1.93			56
<i>Quercus sp.</i>	126.09	7.72	11.58						145.39
<i>Salix caprea</i>		1.93	1.93						3.86
<i>Salix cinerea</i>	108.7	17.37	13.51	1.93					141.51
<i>Salix sp.</i>	273.43	264.61	113.9	7.72					659.65
<i>Sorbus aria</i>	52.17	52.17							104.35
<i>Sorbus aucuparia</i>		17.39							17.39
<i>Sorbus intermedia</i>		11.58	17.37						28.96
<i>Sorbus sp.</i>	108.7								108.7
<i>Tsuga heterophylla</i>		1.93	3.86						5.79
Unidentified	108.7	202.89	17.37	7.72	3.86				340.54
<b>Grand Total</b>	<b>3,361.34</b>	<b>1,415.95</b>	<b>527.01</b>	<b>86.87</b>	<b>50.19</b>	<b>48.26</b>	<b>13.51</b>	<b>5.79</b>	<b>5,508.92</b>

In this example the most abundant trees by far are Birch, mainly due to very active natural regeneration under open areas of a plantation of mainly Corsican pine.

One of the objectives of the survey is to provide an overview of the occurrence woodland products, possibly with a view to harvesting them.

Once your checklist of species is complete, possible uses for the most interesting or abundant species can be researched. In the table below, the most abundant species have been classified by their potential uses (see Section 13 for sources of information). However alternative uses are continually being developed and historic uses being rediscovered, so when considering any income opportunities it pays to think creatively!

Table 3: Recorded uses of species present

Taxon	Scientific name	English name	Number of plots	Potential uses*						
				Food	Craft	Medicinal	Wood	Cosmetics	Garden	Other
Shrub	<i>Rubus fruticosus</i>	Bramble	20	Y	Y	Y				
Tree	<i>Pinus nigra</i>	Corsican Pine	18		Y		Y			Y
Fern	<i>Dryopteris dilatata</i>	Broad buckler Fern	17	Y		Y		Y		
Climber	<i>Hedera helix</i>	Ivy	14		Y	Y			Y	
Tree	<i>Salix spp.</i>	Willow	14	Y	Y		Y		Y	
Herb	<i>Geranium robertianum</i>	Herb Robert	12							Y
Herb	<i>Potentilla reptans</i>	Creeping Cinquefoil	9			Y				
Tree	<i>Betula pubescens</i>	Downy Birch	8	Y	Y	Y	Y			
Tree	<i>Crataegus monogyna</i>	Hawthorn	8	Y		Y	Y			Y
Tree	<i>Fraxinus excelsior</i>	Ash	8	Y	Y	Y	Y			Y
Herb	<i>Equisetum arvense</i>	Field Horsetail	7	Y		Y				Y
Shrub	<i>Cotoneaster simonsii</i>	Himalayan cotoneaster	7		Y					
Herb	<i>Urtica dioica</i>	Nettle	6	Y	Y	Y		Y		Y
Tree	<i>Acer platanoides</i>	Norway Maple	6		Y	Y	Y			
Tree	<i>Acer pseudoplatanus</i>	Sycamore	6	Y	Y	Y	Y			

\*Potential use categories

**Food:** Used as or for foodstuffs including beverages

**Craft:** Used as a craft material or for decorative use

**Medicinal:** Used as an ingredient in traditional or modern herbal medicines

**Wood:** Used for construction or fuel, including charcoal

**Cosmetics:** Used as an ingredient for cosmetics or toiletries including aromatics

**Garden:** Used for horticultural purposes, including green fencing, bark chips, growth media (e.g. moss for hanging baskets) and outdoor decorative items

**Other:** Other miscellaneous uses, including 'experiential uses' such as species frequently used in craft / bushcraft / foraging courses

With the information collected on stem diameters you will also be able to estimate the stocking density of trees and be able to create simple 'stand curves' to help you plan the future of your site.

Stand curves are standard charts in forestry and are used to present an impression of the population structure and hence dynamics for each species.

Table 4: Stand curves abundance maps (number of trees per hectare) for two tree species

Tree	Stand curve	Number of stems in sample plots																
<i>Betula</i> spp. (Birches)	<table border="1"> <thead> <tr> <th>Diameter size class (cm)</th> <th>Estimated stems/ha</th> </tr> </thead> <tbody> <tr><td>&lt;10</td><td>1982</td></tr> <tr><td>10-19</td><td>164</td></tr> <tr><td>20-29</td><td>19</td></tr> <tr><td>30-39</td><td>6</td></tr> <tr><td>40-49</td><td>2</td></tr> <tr><td>50-59</td><td>0</td></tr> <tr><td>&gt;60</td><td>2</td></tr> </tbody> </table>	Diameter size class (cm)	Estimated stems/ha	<10	1982	10-19	164	20-29	19	30-39	6	40-49	2	50-59	0	>60	2	
Diameter size class (cm)	Estimated stems/ha																	
<10	1982																	
10-19	164																	
20-29	19																	
30-39	6																	
40-49	2																	
50-59	0																	
>60	2																	
<i>Pinus nigra</i> (Corsican pine)	<table border="1"> <thead> <tr> <th>Diameter size class (cm)</th> <th>Estimated stems/ha</th> </tr> </thead> <tbody> <tr><td>&lt;10</td><td>0</td></tr> <tr><td>10-19</td><td>6</td></tr> <tr><td>20-29</td><td>3</td></tr> <tr><td>30-39</td><td>13</td></tr> <tr><td>40-49</td><td>20</td></tr> <tr><td>50-59</td><td>7</td></tr> <tr><td>&gt;60</td><td>2</td></tr> </tbody> </table>	Diameter size class (cm)	Estimated stems/ha	<10	0	10-19	6	20-29	3	30-39	13	40-49	20	50-59	7	>60	2	
Diameter size class (cm)	Estimated stems/ha																	
<10	0																	
10-19	6																	
20-29	3																	
30-39	13																	
40-49	20																	
50-59	7																	
>60	2																	

In the above examples it is easy to see the large ‘excess’ of small Birch trees representing natural regeneration. The humped-backed chart for Corsican Pine is typical for an even-aged mature plantation where there are few small-sized trees.

Maps showing the distribution and relative abundance of different species can indicate where there are most stems, but other features such as fallen trees, drainage features, invasive species etc. can also be mapped using the data collected.

### Further assistance

If you are considering felling and/or re-planting areas of your woodland to develop new woodland products it is very important to consider which tree species are most likely to thrive. Forest Research (Pyatt *et al* 2001) have developed an online decision support system called the ‘Ecological site classification’ (ESC) which can assist in this: Using a basic description of the location and physical features of your site, combined with information on the presence of ‘indicator’ plant species, the ESC will provide information on the most likely natural woodland type and the most suitable species to plant. To access the ESC go to <http://www.forestry.gov.uk/esc>

Additional online tools and resources for woodland management can be found through 'myForest' (<http://sylva.org.uk/myforest>). There are useful downloads for tree identification and woodland inventory notes and also some basic mapping tools.

## Equipment required

For health & safety, a risk assessment (and suitable insurance cover) may be required and it is important that everyone is aware of potential dangers and are appropriately dressed. Leaders will need some means of communication e.g. a mobile phone and a first aid kit and know how to use them. Make sure that other people at the base know where the party is intending to go and inform them of any changes to plan.

1. Map of sample plot locations
2. GPS
3. Camera
4. Field recording sheets, clipboards Pens & spare pens /pencils
5. 20m tape measure
6. Compass
7. Marker posts and hammer
8. At least 3 x Bamboo canes 2m long
9. String or boundary marker tape 50-60m
10. Tree diameter tape or standard measuring tape (cloth)
11. Clinometer
12. Field guides
13. Sealable plastic bags for samples. Paper bags or plastic containers might also be useful for fungi / herbs
14. Gloves and long-handled secateurs or a billhook may be useful for easing access (cutting back nettles or brambles) on the access path to the plot

## Useful reference texts for species identification

### **Trees:**

Trees in Britain, Europe and North America. Roger Philips (1980)

Broadleaves. FC Booklet no. 20 (1985)

Conifers: FC Booklet no. 15 (1985)

Collins Field Guide: Trees of Britain & Northern Europe (1994)

### **Flowering plants:**

The New Concise British Flora. Keble Martin (1969)

The Wild Flowers of Britain and Northern Europe. Fitter, Fitter & Blamey (1985)

New Flora of the British Isles 3<sup>rd</sup> edition (2010) Clive Stace

### **Ferns:**

Grasses, Ferns, Mosses & Lichens of Great Britain & Ireland. Roger Philips (1980)

### **Fungi:**

Mushrooms and other fungi of Great Britain & Europe. Roger Philips (1981)

**Animal signs:**

Hamlyn Guide: Animals Tracks, Trails & Signs. Brown, Lawrence & Pope (1984)

Mammals of Britain Their Tracks, Trails and Signs. Lawrence & Brown (1973)

**Other references**

FC Ecological Site Classification. FC (Pyatt *et al* 2001): <https://www.forestry.gov.uk/esc>

MyForest online woodland management portal: <https://sylva.org.uk/myforest/>

Mantau, U.; Saal, U.; Mayr, M. (2016) Marketing insights for Wild Forest Products and Forest Services (STAR TREE publication, Hamburg 2016)

## Field sheets

### General Plot description Recording sheet

Plot #	Gridref	Date	Recorder
Slope gradient (degrees or %)			
Aspect			
Soil type			
Drainage			
Photo taken?		Photo #	Photo note
General notes / other features of interest  e.g signs of Human activity / litter / dog fouling etc.			

Add additional notes / sketch overleaf if needed







**Rough sketch of vegetation within the 15 m x 15 m tree plot**

**North**

The form consists of a large 15m x 15m grid. The grid is divided into three horizontal sections of 5m each by two thick solid lines. Each section contains a 5m x 5m grid of smaller squares. Within each of these smaller squares, there is a 5m x 5m grid of even smaller squares, with the inner grid lines being dashed. This structure allows for a detailed sketch of vegetation within the tree plot.

**Additional notes**

Animal signs survey (15 m x 15m plot)

Plot #	Gridref	Date	Recorder

General notes on any animal signs recorded

A rough sketch of where the signs are located can also be included

## Useful information

### Images to assist in estimation of % vegetation cover

Each quarter of any one square has the same amount of black.

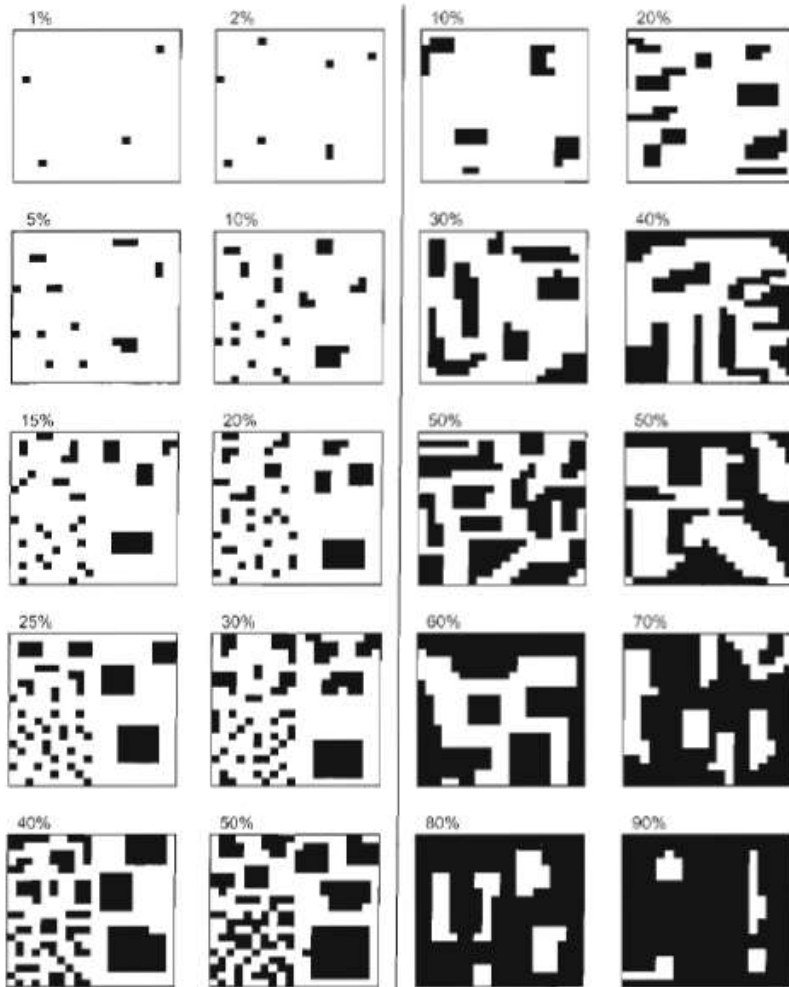


Figure 36 Abundance charts (after Ontario Institute of Pedology, 1985).

Standard tree species abbreviations as used by NRW

Common name	Genus	species	Abbreviation
Scots Pine	<i>Pinus</i>	<i>sylvestris</i>	SS
Corsican Pine	<i>Pinus</i>	<i>nigra</i>	CP
Lodgepole Pine	<i>Pinus</i>	<i>contorta</i>	LP
Sitka Spruce	<i>Picea</i>	<i>sitchensis</i>	SS
Norway Spruce	<i>Picea</i>	<i>abies</i>	NS
European Larch	<i>Larix</i>	<i>decidua</i>	EL
Japanese Larch	<i>Larix</i>	<i>kaempferi</i>	JL
Douglas Fir	<i>Pseudotsuga</i>	<i>menziesii</i>	DF
Grand Fir	<i>Abies</i>	<i>grandis</i>	GF
Noble Fir	<i>Abies</i>	<i>procera</i>	NF
Pacific Sliver Fir	<i>Abies</i>	<i>amabilis</i>	PSF
Western Hemlock	<i>Tsuga</i>	<i>heterophylla</i>	WH
Western Red Cedar	<i>Thuja</i>	<i>plicata</i>	RC
Coast Redwood	<i>Sequoia</i>	<i>sempervirens</i>	RSQ
Sessile Oak	<i>Quercus</i>	<i>petraea</i>	SOK
Pedunculate Oak	<i>Quercus</i>	<i>robur</i>	POK
Beech	<i>Fagus</i>	<i>sylvaticus</i>	BE
Ash	<i>Fraxinus</i>	<i>excelsior</i>	AH
Sycamore	<i>Acer</i>	<i>pseudoplatanus</i>	SY
Wych Elm	<i>Ulmus</i>	<i>glabra</i>	WEM
Sweet Chestnut	<i>Castanea</i>	<i>sativa</i>	SC
Silver Birch	<i>Betula</i>	<i>pendula</i>	SBI
Downy Birch	<i>Betula</i>	<i>pubescens</i>	SBI
Aspen	<i>Populus</i>	<i>tremens</i>	ASP
Poplar cultivars	<i>Populus</i>	<i>deltoides</i>	POD
Common Alder	<i>Alnus</i>	<i>glutinosa</i>	CAR
Hornbeam	<i>Carpinus</i>	<i>betulus</i>	HBM
Small-leaved Lime	<i>Tilia</i>	<i>cordata</i>	SLI
Wild Cherry, Gean	<i>Prunus</i>	<i>avium</i>	WCH
Mixed Broadleaves			MB
Mixed Conifers			MC

### Target ESC species to record in ground vegetation survey

From FC Ecological Site Classification

List 1: Basic and extended lists of species identified by Wilson (1998) which can reliably estimate soil nutrient regime (SNR) if average cover proportion is >70% of site

Nomenclature follows Stace (1997)

Common name	Genus	species	Taxon
<b>Basic list:</b>			
Bluebell	<i>Hyacinthoides</i>	<i>non-scripta</i>	Bulb
Lady-fern	<i>Athyrium</i>	<i>filix-femina</i>	Fern
Hard-fern	<i>Blechnum</i>	<i>spicant</i>	Fern
Scaly male-fern	<i>Dryopteris</i>	<i>affinis</i>	Fern
Broad buckler-fern	<i>Dryopteris</i>	<i>dilatata</i>	Fern
Male-fern	<i>Dryopteris</i>	<i>filix-mas</i>	Fern
Bracken	<i>Pteridium</i>	<i>aquilinum</i>	Fern
Common Bent	<i>Agrostis</i>	<i>capillaris</i>	Grass
Sweet Vernal-grass	<i>Anthoxanthum</i>	<i>odoratum</i>	Grass
False-brome	<i>Brachypodium</i>	<i>sylvaticum</i>	Grass
Cocksfoot	<i>Dactylis</i>	<i>glomerata</i>	Grass
Tufted hair-grass	<i>Deschampsia</i>	<i>cespitosa</i>	Grass
Wavy hair-grass	<i>Deschampsia</i>	<i>flexuosa</i>	Grass
Yorkshire fog	<i>Holcus</i>	<i>lanatus</i>	Grass
Creeping soft-grass	<i>Holcus</i>	<i>mollis</i>	Grass
Bugle	<i>Ajuga</i>	<i>reptans</i>	Herb
Wood Anemone	<i>Anemone</i>	<i>nemorosa</i>	Herb
Rosebay willowherb	<i>Chamerion</i>	<i>angustifolium</i>	Herb
Enchanters nightshade	<i>Circaea</i>	<i>lutetiani</i>	Herb
Foxglove	<i>Digitalis</i>	<i>purpurea</i>	Herb
Cleavers, Goosegrass	<i>Galium</i>	<i>aparine</i>	Herb
Heath bedstraw	<i>Galium</i>	<i>saxatile</i>	Herb
Herb Robert	<i>Geranium</i>	<i>robertianum</i>	Herb
Wood avens	<i>Geum</i>	<i>urbanum</i>	Herb
Ground ivy	<i>Glechoma</i>	<i>hederacea</i>	Herb
Ivy	<i>Hedera</i>	<i>helix</i>	Herb
Common cow-wheat	<i>Luzula</i>	<i>sylvatica</i>	Herb
Dog's mercury	<i>Mercurialis</i>	<i>perennis</i>	Herb
Wood sorrel	<i>Oxalis</i>	<i>acetosella</i>	Herb
Tormentil	<i>Potentilla</i>	<i>erecta</i>	Herb
Creeping buttercup	<i>Ranunculus</i>	<i>repens</i>	Herb
Hedge woundwort	<i>Stachys</i>	<i>sylvatica</i>	Herb
Greater stitchwort	<i>Stellaria</i>	<i>holostea</i>	Herb
Chickweed	<i>Stellaria</i>	<i>media</i>	Herb
Wood sage	<i>Teucrium</i>	<i>scorodonia</i>	Herb
Stinging nettle	<i>Urtica</i>	<i>dioica</i>	Herb
Germander speedwell	<i>Veronica</i>	<i>chamaedrys</i>	Herb
Common violet	<i>Viola</i>	<i>riviniana</i>	Herb

Common name	Genus	species	Taxon
Soft rush	<i>Juncus</i>	<i>effusus</i>	Rush
Green-ribbed sedge	<i>Carex</i>	<i>binervis</i>	Sedge
Heather	<i>Calluna</i>	<i>vulgaris</i>	Shrub
Hazel	<i>Corlus</i>	<i>avellana</i>	Shrub
Hawthorn	<i>Crataegus</i>	<i>monogyna</i>	Shrub
Bell heather	<i>Erica</i>	<i>cinerea</i>	Shrub
Honeysuckle	<i>Lonicera</i>	<i>periclymenum</i>	Shrub
Holly	<i>Olex</i>	<i>aquifolium</i>	Shrub
Bramble	<i>Rubus</i>	<i>fruticosus</i>	Shrub
Raspberry	<i>Rubus</i>	<i>idaeus</i>	Shrub
Elder	<i>Sambucus</i>	<i>nigra</i>	Shrub
Bilberry	<i>Vaccinium</i>	<i>myrtillus</i>	Shrub
<b>Extended list</b>			
Ramson, Wild garlic	<i>Allium</i>	<i>ursinum</i>	Bulb
False oat-grass	<i>Arrhenatherum</i>	<i>elatius</i>	Grass
Common cotton-grass	<i>Eriophorum</i>	<i>angustifolium</i>	Grass
Cotton grass, Hare's-tail	<i>Eriophorum</i>	<i>vaginatum</i>	Grass
Sheep's fescue	<i>Festuca</i>	<i>ovina</i>	Grass
Red fescue	<i>Festuca</i>	<i>rubra</i>	Grass
Mat-grass	<i>Nardus</i>	<i>stricta</i>	Grass
Rough meadow-grass	<i>Poa</i>	<i>trivialis</i>	Grass
Yarrow	<i>Achillea</i>	<i>millefolium</i>	Herb
Wild Angelica	<i>Angelica</i>	<i>sylvestris</i>	Herb
Burdock	<i>Arctium</i>	<i>minus</i>	Herb
Marsh marigold	<i>Caltha</i>	<i>palustris</i>	Herb
Common mouse-ear	<i>Cerastium</i>	<i>fontanum</i>	Herb
Golden saxifrage	<i>Chrysosplenium</i>	<i>oppositifolium</i>	Herb
Creeping thistle	<i>Cirsium</i>	<i>arvense</i>	Herb
Marsh thistle	<i>Cirsium</i>	<i>palustris</i>	Herb
Spear thistle	<i>Cirsium</i>	<i>vulgare</i>	Herb
Pignut	<i>Conopodium</i>	<i>majus</i>	Herb
Common horsetail	<i>Equisetum</i>	<i>arvense</i>	Herb
Wood horsetail	<i>Equisetum</i>	<i>sylvaticum</i>	Herb
Wood spurge	<i>Euphorbia</i>	<i>amygdaloides</i>	Herb
Meadow-sweet	<i>Filipendula</i>	<i>ulmaria</i>	Herb
Common hemp nettle	<i>Galeopsis</i>	<i>terahit</i>	Herb
Hogweed	<i>Heracleum</i>	<i>sphondylium</i>	Herb
Slender St. John's wort	<i>Hypericum</i>	<i>pulchrum</i>	Herb
Yellow archangel	<i>Lamiastrum</i>	<i>galeobdolon</i>	Herb
Yellow pimpernel	<i>Lysimachia</i>	<i>nemorum</i>	Herb
Lousewort	<i>Pedicularis</i>	<i>sylvatica</i>	Herb
Primrose	<i>Primula</i>	<i>vulgaris</i>	Herb
Lesser celandine	<i>Ranunculus</i>	<i>ficaria</i>	Herb
Sheep's sorrel	<i>Rumex</i>	<i>acetosella</i>	Herb

<b>Common name</b>	<b>Genus</b>	<b>species</b>	<b>Taxon</b>
Red campion	<i>Silene</i>	<i>dioica</i>	Herb
Devil's-bit scabious	<i>Succisa</i>	<i>pratensis</i>	Herb
White clover	<i>Trifolium</i>	<i>repens</i>	Herb
Common valerian	<i>Valeriana</i>	<i>officinalis</i>	Herb
Wood speedwell	<i>Veronica</i>	<i>montana</i>	Herb
Sharp-flowered rush	<i>Juncus</i>	<i>acutiflorus</i>	Rush
Compact rush	<i>Juncus</i>	<i>conglomeratus</i>	Rush
Heath rush	<i>Juncus</i>	<i>squarrosus</i>	Rush
Heath woodrush	<i>Luzula</i>	<i>multiflora</i>	Rush
Wood sedge	<i>Carex</i>	<i>sylvatica</i>	Sedge
Deer-grass	<i>Trichophorum</i>	<i>cespitosum</i>	Sedge
Broom	<i>Cytisus</i>	<i>scoparius</i>	Shrub
Crowberry	<i>Empetrum</i>	<i>nigrum</i>	Shrub
Cross-leaved heath	<i>Erica</i>	<i>tetralix</i>	Shrub
Bog myrtle	<i>Myrica</i>	<i>gale</i>	Shrub
Gorse	<i>Ulex</i>	<i>europaeus</i>	Shrub
Cowberry	<i>Vaccinium</i>	<i>vitis-idaea</i>	Shrub

### Additional NWFP species

Species listed by 'Reforestation Scotland Non Timber Forest Product Inventory Method' Anon., undated

Common name	Genus	species	Taxon
Reindeer Moss	<i>Cladonia</i>	<i>rangifera / alpestris</i>	Bryophyte
Mosses			Bryophyte
Broad buckler Fern	<i>Dryopteris</i>	<i>austiaca</i>	Fern
Lemon scented Fern	<i>Oreopteris</i>	<i>limbosperma</i>	Fern
Cep	<i>Boletus</i>	<i>edulis</i>	Fungi
Chanterelle	<i>Cantharellus</i>	<i>cibarius</i>	Fungi
Hedgehog Mushroom	<i>Hydnum</i>	<i>repandum</i>	Fungi
Saffron milk Cap	<i>Lactarius</i>	<i>deliciosus</i>	Fungi
Morel	<i>Morchella</i>	<i>wsculenta</i>	Fungi
Oyster Mushroom	<i>Plerotus</i>	<i>ostreatus</i>	Fungi
Slippery Jack	<i>Sullius</i>	<i>luteus</i>	Fungi
Summer truffle	<i>Tuber</i>	<i>aestivum</i>	Fungi
Garlic Mustard	<i>Alliaria</i>	<i>petiolata</i>	Herb
Mugwort	<i>Artemisia</i>	<i>vulgaris</i>	Herb
Basil	<i>Clinopodium</i>	<i>vulgare</i>	Herb
Coneflower	<i>Echinacea</i>	<i>sp.</i>	Herb
Eyebright	<i>Euphrasia</i>	<i>nemorosa</i>	Herb
Corn Mint	<i>Mentha</i>	<i>arvensis</i>	Herb
Sweet cicely	<i>Myrrhis</i>	<i>odorata</i>	Herb
Marjoram	<i>Origanum</i>	<i>vulgare</i>	Herb
Hard Shield Fern	<i>Polystichum</i>	<i>sp.</i>	Herb
Common Sorrel	<i>Rumex</i>	<i>acetosella</i>	Herb
Dandelion	<i>Taraxacum</i>	<i>officinale</i>	Herb
Mullein	<i>Verbascus</i>	<i>thapsus</i>	Herb
Mistletoe	<i>Viscum</i>	<i>album</i>	Herb
Bearberry	<i>Arctostaphylos</i>	<i>uva-ursi</i>	Shrub
Crowberry	<i>Empetrum</i>	<i>nigrum</i>	Shrub
Sea buckthorn	<i>Hippophae</i>	<i>ramnoides</i>	Shrub
Blackthorn	<i>Prunus</i>	<i>spinosa</i>	Shrub
Dog Rose	<i>Rosa</i>	<i>canina</i>	Shrub
Cloudberry	<i>Rubus</i>	<i>chamaemorus</i>	Shrub
Elder	<i>Sambucus</i>	<i>nigra</i>	Shrub
Cranberry	<i>Vaccinium</i>	<i>oxycoccus</i>	Shrub
Alder	<i>Alnus</i>	<i>glutinosa</i>	Tree
Birch	<i>Betula</i>	<i>pubescens &amp; pendula</i>	Tree
Beech	<i>Fagus</i>	<i>sylvatica</i>	Tree
Ash	<i>Fraxinus</i>	<i>exelsior</i>	Tree
Holly	<i>Ilex</i>	<i>aquifolium</i>	Tree
Juniper	<i>Juniper</i>	<i>communis</i>	Tree
Norway Spruce	<i>Picea</i>	<i>abies</i>	Tree
Scots Pine	<i>Pinus</i>	<i>sylvestris</i>	Tree
Aspen	<i>Populus</i>	<i>tremula</i>	Tree
Oak	<i>Quercus</i>	<i>robur &amp; petraea</i>	Tree
Rowan	<i>Sorbus</i>	<i>aucuparia</i>	Tree