

# Environment and Rural Affairs Monitoring & Modelling Programme (ERAMMP)

## ERAMMP Document-49 Field-Survey Handbook (Procedures) Vegetation Plots

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### Abbreviations Used in this Report

BH	Broad Habitat
CS	Countryside Survey
ERAMMP	Environment and Rural Affairs Monitoring & Modelling Programme
GMEP	Glastir Monitoring & Evaluation Programme
MHW	Mean High Water
PH	Priority Habitat
UKCEH	UK Centre for Ecology & Hydrology
WLF	Woody Linear Feature

*Abbreviations and some of the technical terms used in this document are expanded on in the programme glossaries: <https://erammp.wales/glossary> (Welsh & English)*

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# 1 INTRODUCTION TO VEGETATION PLOTS

The ERAMMP survey involves a repeat of the GMEP baseline of fixed vegetation plots located within a sample of 1-km x 1-km squares across Wales.

Surveyors will use a habitat key to classify the polygon within which each area plot is located or that is adjacent to each linear plot.

The survey involves recording plant species presence and abundance in different sizes and types of vegetation plot as described below. Being able to record plots by re-finding their exact location is a very important part of the survey. Accurate recording of the repeat plots from previous surveys will provide the data needed to quantify changes in the countryside with great precision, allowing vegetation change to be expressed by habitat type and landscape location and whether in or out of the Glastir agri-environment scheme.

In order to maintain this valuable dataset it is essential that the following information is collected for each plot:

- **General information** about the plot including plot number and type, vegetation height etc. (header information) as well as species presence and (usually) cover.
- **Plot photo** – for plot relocation (i.e. finding the position of the previously recorded plot) by surveyors in the next survey and to provide visual information about the plot.
- **Plot sketch map** – to enable surveyors to find the same plot location in subsequent surveys.

Note that because this is a repeat survey, photos and sketch maps will be available from the previous survey to enable plots to be recorded in the same location. But sketch maps can be updated if needed.

Most of this data will be collected in a digital format. To this end, apps based on ESRI's 'Survey123' and 'Collector' software will be used, named '**Vegplots**'.

For ease of use, plot maps will be provided to surveyors on paper although digital copies will be available on the tablet and newly drawn onto paper/tablet .



## 1.1 Location of vegetation plots

In the previous survey (GMEP), plots were placed and recorded for the first time in all 1-km x 1-km squares. Thus, most plots provided baseline data (the exception being a set of 21 Countryside Survey squares were revisited. These squares are part of a globally unique times series, first surveyed in 1978).

## 1.2 Plot locations - Repeated plots

In the previous survey, plots may have been located in any vegetation apart from within urban areas, land without access permission, inland water and sea or other dangerous and inaccessible land.

Plots may be placed in amenity grass such as playing fields or on golf courses where permission has been given.

Where new plots are being recorded for the first time, e.g. replacement plots (due to loss of land to development) specific instructions for locating particular plot types are given in the 'Plot types' section below.

It is important to record the location of the plot as accurately as possible with sketch maps, photos and GPS.

To access a map showing the locations of previously surveyed plots, the surveyor will need to open up the *Collector* App.

The precise locations of individual plots are described using:

- a GPS location
- a sketch map per plot
- a series of associated photographs to aid re-finding the plot

In most cases there will be one map per plot but some co-located plots may be described on a single map, for example A, B and X plots (i.e. random points in fields and nearby boundaries) or S/W and P plots (pertaining to watercourses).

Protocols for recording plots are described below. These protocols rely on BOTH, the sketched plot map and the map provided by the software.



## 2 DATA ENTRY

### 2.1 Repeated Plots

#### Collector

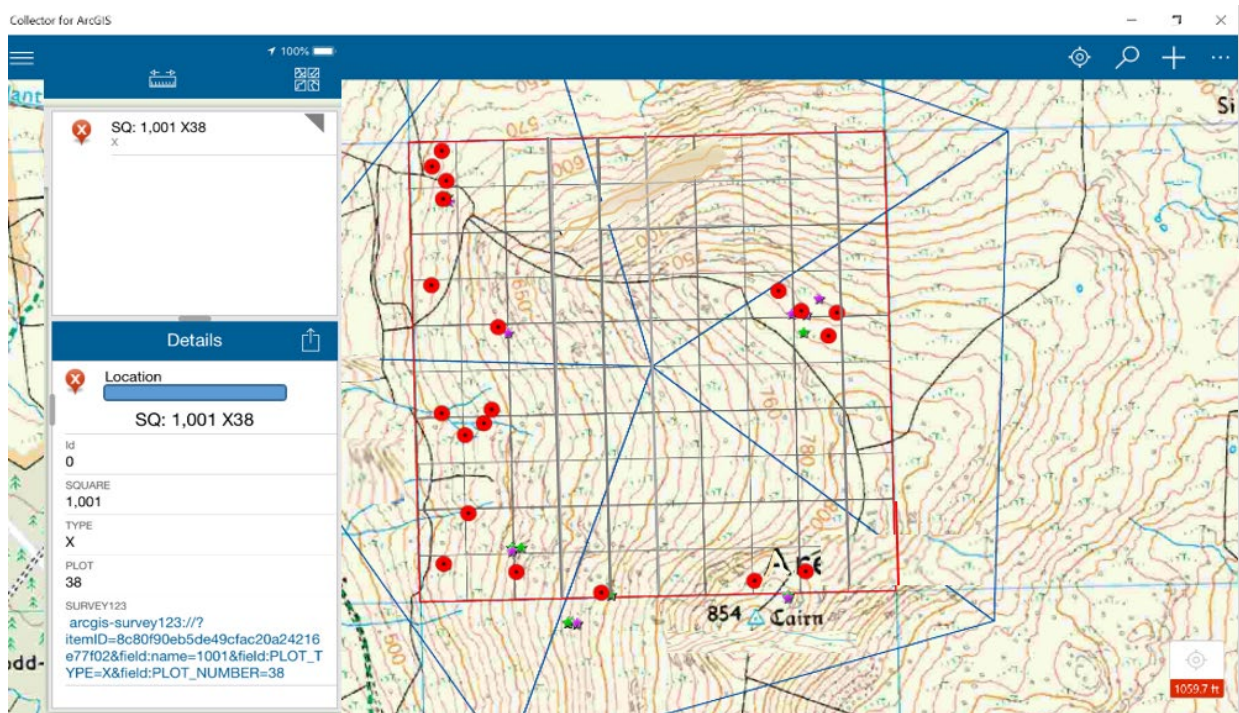
In order to begin plot data entry, you will open ESRI's Collector app. Open the map (name tbc in training), on which the plots will appear. You can then:



1. Navigate to the plot using this map
2. When you get to the plot, click the plot symbol. A window will open.
3. Click on the survey link in the window - this will open a new form to enter the plot data (it's a bit slow, so be patient)

**Note: If you have already started a form for a plot, do not do this. Instead, follow the instructions in section 2.2. for opening a plot in Survey123 below. Those instructions also apply if you cannot open the form from the Collector app, for some reason.**

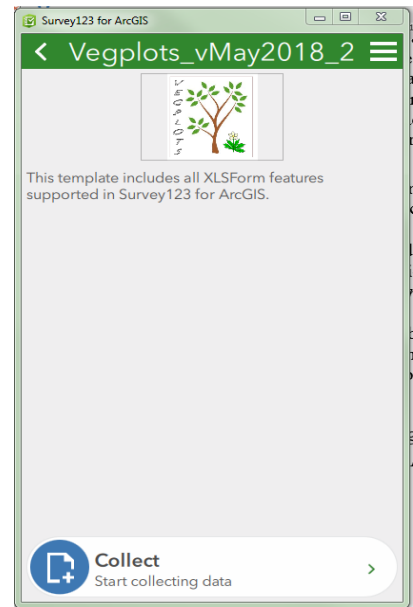
For further technical notes regarding *Collector*, see Appendix-1.



## 2.2 New plots (or editing a previously created plot)



In order to begin plot data entry for a plot not featured on a previous map (i.e. the plot was lost (see figure below) or not found; or editing a previously created plot), the recording forms are launched by selecting the relevant survey from 'My Surveys' within Survey123, then selecting 'Collect' as illustrated below.



This will launch the survey forms, starting with the general plot (header) information on [page 1](#) (this may take a few seconds – be patient!)

For further technical notes about *Survey123*, see Appendix-1.

## 2.3 Plot Recording in Veg Plots

**Take care to disturb the vegetation as little as possible - this applies particularly to fragile assemblages in flushes and other wetlands - but bear in mind that a full census of the vegetation species composition is required.**

### ***Plot level information***

There are three recording pages for the following categories.

- **PAGE 1: PLOT HEADER INFORMATION** – site name, recorders, slope, aspect, location, photos
- **PAGE 2: PLOT SPECIFIC HEADERS** – information that is specific to the current plot type
- **PAGE 3: VEGETATION PLOT** - Ground Flora - presence and absence in a range of plot types. Major common bryophytes should be recorded but a full list is not expected (see Section 6).

**Please ensure you record information for all plots in the square – this includes header information for those plots that are refused, inaccessible etc. It is important to know why a repeat plot has not been re-recorded.**

## PLOT HEADER INFORMATION (PAGE 1)

If the plot was launched from within the *Collector* map (or is being edited from a previously created plot), Square, Plot Type, Plot Number and Rep ID will be already entered at the top of the form consisting of the following:

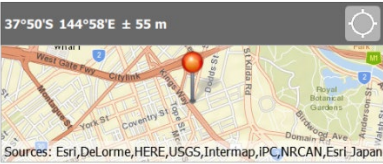
- **Square** – Survey square number
- **Plot Type** - A,B,D,H,M,S,U,W,P,X,Y
  - **Plot number** - 1, 2, 3,...
- **Rep ID** (filled automatically) = Square + Plot Type + Plot Number

*If the plot is new, these can be filled in manually – **take care to enter the correct details.***

- **Surveyors** – choose names
- **Plot recorded** (see below)
- **Location** (geopoint) will be captured automatically if your device has an (offline) GPS. If you are online (either mobile data or WiFi), a map will appear to make it easier to ascertain how accurate the location is. In some cases, you may also wish to use a handheld GPS and make a note of the reading in the 'notes' box lower down the page. **Make sure you are standing in the correct place in relation to the plot when you record this.** See *notes below*.


### **Note:** Geopoint questions

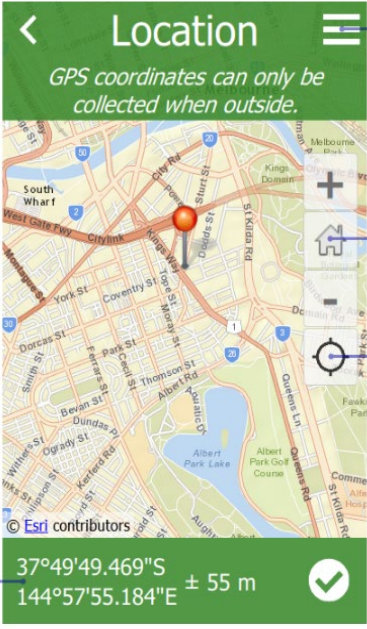
Geopoint questions have two forms of presentation. Initially, they are represented by a location panel on the form. When you press the location panel, it expands into a full-screen map with additional locating functions. You can capture a point on either the location panel or the full-screen map.



37°50'S 144°58'E ± 55 m

Sources: Esri,DeLorme,HERE,USGS,Intermap,IPC,NRCAN,Esri-Japan

The Location Averaging button  at the top right of the location panel captures an average of locations rather than a single result when it's pressed. This can also be used with an accuracy threshold to ensure only reliable results can be used. When you tap the location panel, it expands to a full-screen map.





Location


GPS coordinates can only be collected when outside.




37°49'49.469"S  
144°57'55.184"E ± 55 m

The latitude and longitude of your current location are listed here. Selecting the area converts them into editable fields, allowing you to define a different location.

The Menu button  provides a number of alternative basemaps to the default, for a range of different purposes.

Home  returns the map marker to where the survey creator has defined a home location. If no home location has been defined, it instead returns the marker of the user's location.

The Location icon  starts displayed in black, indicating the location sensor is disabled. Select

the button to switch to Navigation  mode, enabling Location and tracking the device's current location. Moving the map marker from here, either directly on the map or by changing the coordinates, still changes the location and coordinates of the answer, but the device's location remains visible as a pulsing blue dot while doing so. When this happens, the button switches to an Active Location icon  ; select it to return to Navigation .

**Plot relocation**

If the plot you are recording is a new plot for some reason, some of the options will not apply.

**Plot Recorded** [Found, Not Found, New Plot (Replacement for unfound plot), New Plot (New feature/Land cover), Not appropriate, Access Denied, Too Dangerous].

Plot Recorded \*

Plate detected? \*

Yes     
  No     
  No (new plate buried)

No plate to find

**IMPORTANT NOTE: If you go back to this field after recording and change to Not Found (or other unrecorded field) all your data will be deleted.**

*NB: Choosing ‘Found’ means you are telling us that you are happy that the location of the plot is close enough to the location in previous surveys that the data recorded can be considered as a snapshot of the vegetation in that same location but at the present time.*

*Choose ‘Not appropriate’ for example if you do not record the vegetation or attempt to record the vegetation but then abandon recording because the plot cannot be effectively censused. This would occur if the plot had just been mown, burnt or was under water. Please indicate the kind of disturbance responsible in the Notes box for the plot.*

**Note: Plot relocation**

**If a previous plot position cannot be found satisfactorily using previous maps and photos, the plot should be recorded as ‘Not found’**

*A degree of judgement is needed - for example, if the vegetation being sampled is reasonably homogenous e.g. improved grassland or upland heath, then a greater amount of error might be allowed i.e. you believe you are in roughly the right location but 10-20 metres either way might not bring the plot into a different habitat type or result in a significant change in species composition. On the other hand, the same uncertainty over the location of a Y plot could result in the plot being in a very different habitat type than that originally targeted (Y plots target uncommon, often small patches of vegetation). This might lead you to recommend that the data cannot be reliably analysed as if it were a repeat recording of the vegetation in the same position as last time. The decision is left to the surveyor as they are in the best position to decide.*

***Basically, if you feel the plot can be considered to be in the same location as previous then select ‘Found’ from Plot Recorded. This is a really important decision that you have to make, yet it is hard to give guidance for every circumstance - do the best you can. If you think there is high probability that the difference between the previous location and the location in this survey will lead to marked differences in species composition then select ‘Not found’ and create a replacement plot.***

**Relocate plot if:**

- The plot cannot be found satisfactorily from the information given
- The plot is lost due to building/major landscape changes

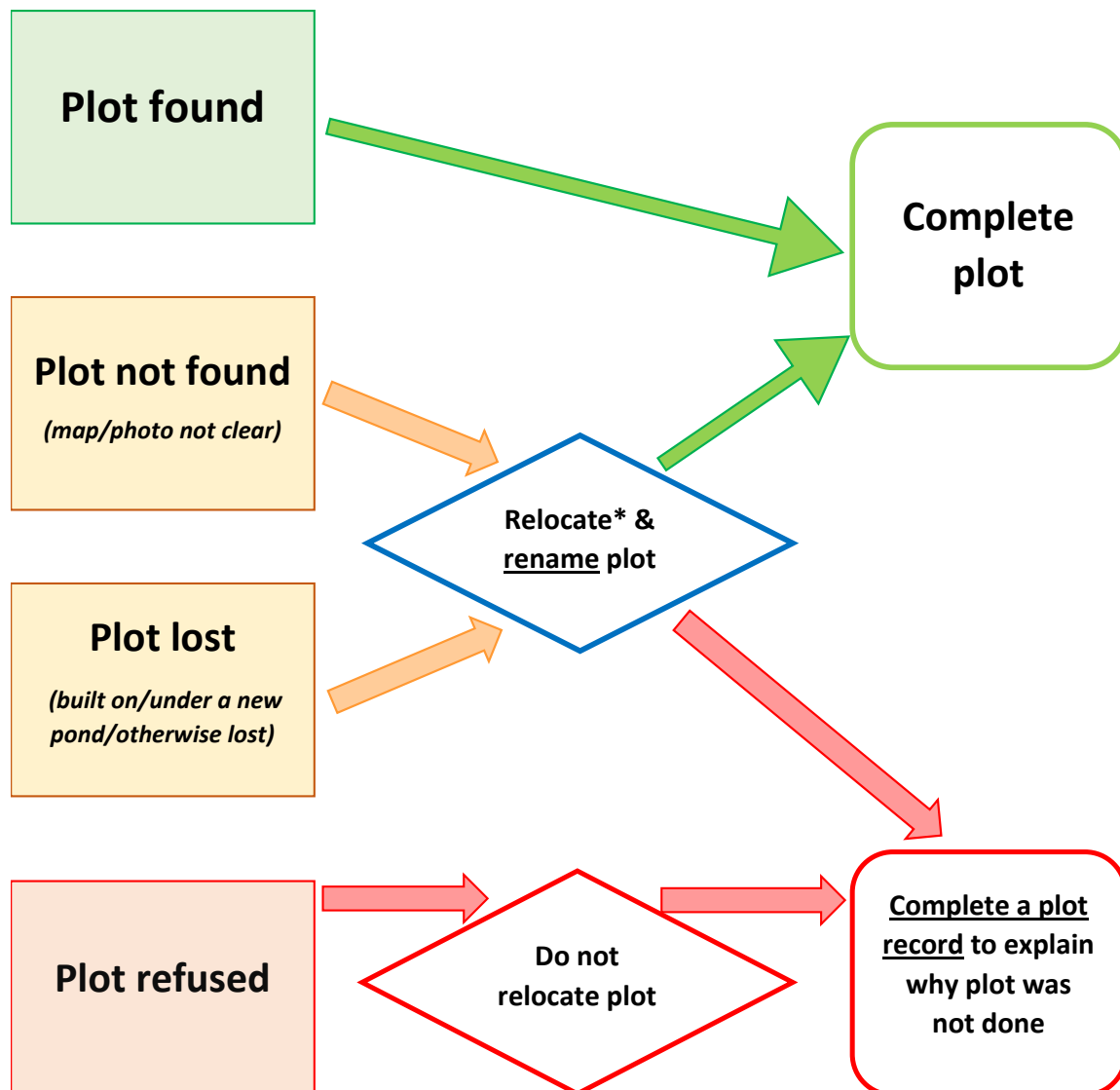
**Do not relocate plot if:**

- A plot has been refused access
- Plot is disturbed (record as best you can and note the disturbance)
- Plot is no longer appropriate (i.e. Arable margin plot – margin may no longer exist)

**Plot ID of unfound plot** – Rep ID of plot that has been replaced when plot not found.

**Plate found** - Metal plates were buried in Countryside Survey squares only and are no longer required to be located as part of the ERAMMP survey. However, there is an option to record whether or not the plate has been found which defaults to “NO”.

**Rules for plot relocation**



***\*Check which land has access permission***

## Broad and Priority Habitats

For each plot you need to record the Broad or Priority Habitat (BH and PH) for the plot and the wider polygon. If you click on a Broad Habitat that has Priority Habitat options, these will appear as additional options.

**▼ Plot description**

Broad Habitat (plot) \*

Broadleaved Mixed and Yew Woodland

Priority Habitat (plot) \*

Lowland Beech and Yew Woodland

Broad Habitat (wider polygon) \*

Broadleaved Mixed and Yew Woodland

Priority Habitat (wider polygon) \*

Lowland Beech and Yew Woodland  
 Upland Mixed Ashwood  
 Wet Woodland  
 Upland Oakwood  
 Lowland Mixed Deciduous

Trees present

Yes

- **Broad Habitat (plot)** - The BH selected in the dropdown for plots should reflect the habitat that makes up the majority of the plot, or for linear plots, the habitat type immediately adjacent to the plot.
- **Priority Habitat (plot):** List of PH options, or none. Surveyors are asked to record the specific Priority Habitat which the plot represents (or 'none' if the habitat is not a PH). Priority Habitat names or 'Not priority habitat' should be selected from the drop-down list.
- **Broad Habitat (wider polygon)** - The BH selected in this dropdown plots should reflect the assignment of the wider mapped polygon (or 'minimum mappable unit'<sup>1</sup>). (UNLESS the polygon is a Mosaic. This will invariably be in Unenclosed habitats, for example Bog and heath or Bog and Fen, Marsh and Swamp). For linear plots this could be a wide field margin or the field itself (where the margin is too narrow to constitute significant area).
- **Priority Habitat (wider polygon):** as above, but for wider polygon (or 'minimum mappable unit').

In order to classify the Broad (and Priority) Habitats, you will be provided with a vegetation key (Appendix-4) and also habitat data collected during the previous survey. This information can be used to guide your choice of habitat.

You should err on the conservative side so use the same allocation as previously unless it appears that real change has occurred (or unless you think that there was a major error in classification).

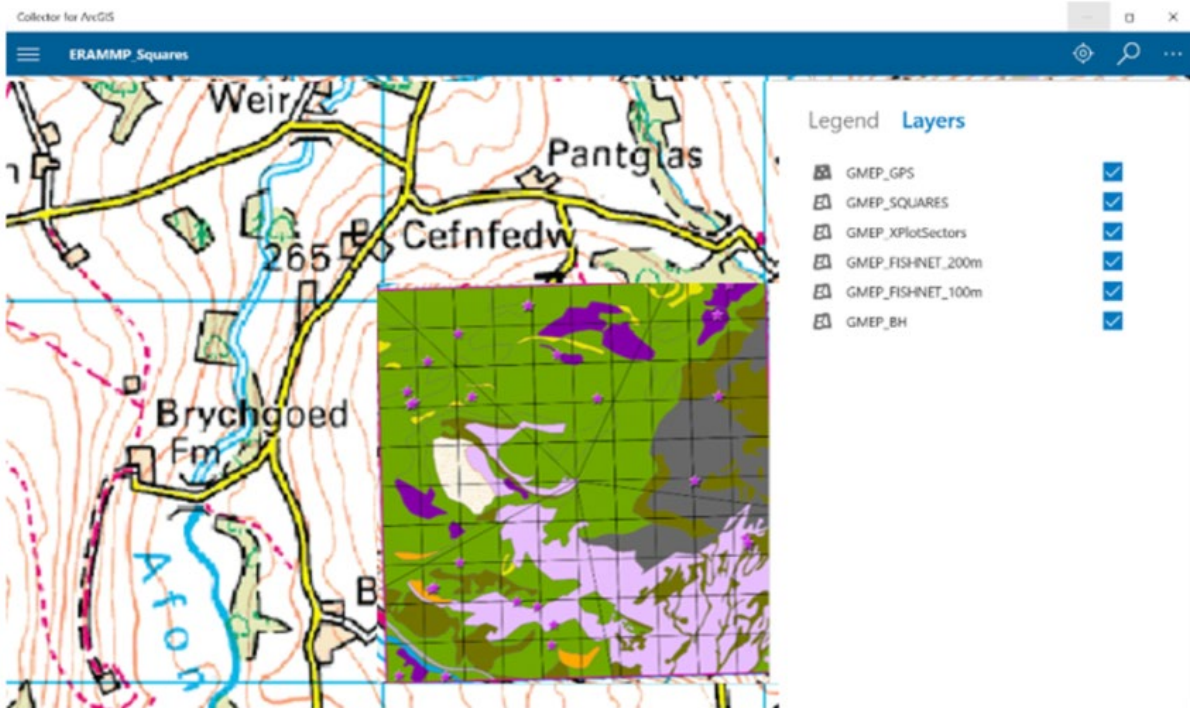
---

<sup>1</sup> The Minimum Mappable Unit is 1/25<sup>th</sup> of a hectare or equivalently 0.04 \* 10,000 m<sup>2</sup> or equivalently an area of 400 m<sup>2</sup> and therefore a square of side 20 m

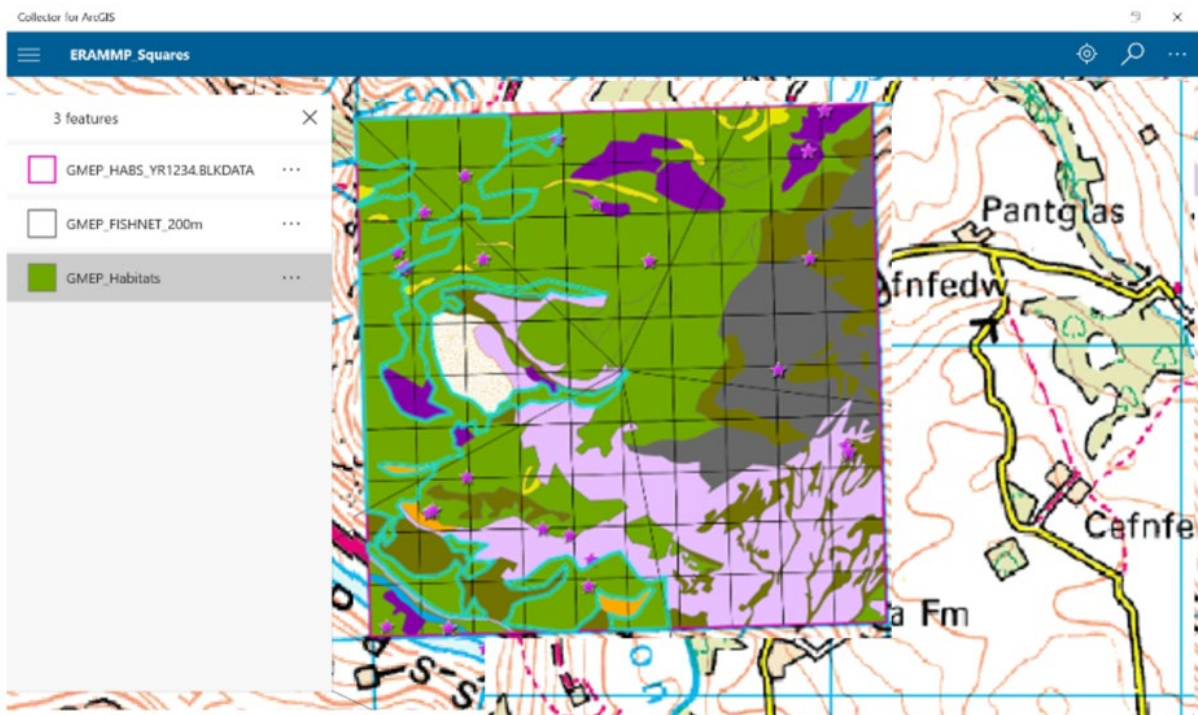
In order to view the Broad and Priority Habitat data you can turn on a layer in Collector (your map of Veg Plots).

- Click on the 3 dots (top right) and choose 'Map Contents'
- In the layers, make sure the layer containing 'BH' is turned on (ticked).

This gives you a coloured map of habitats in your square:

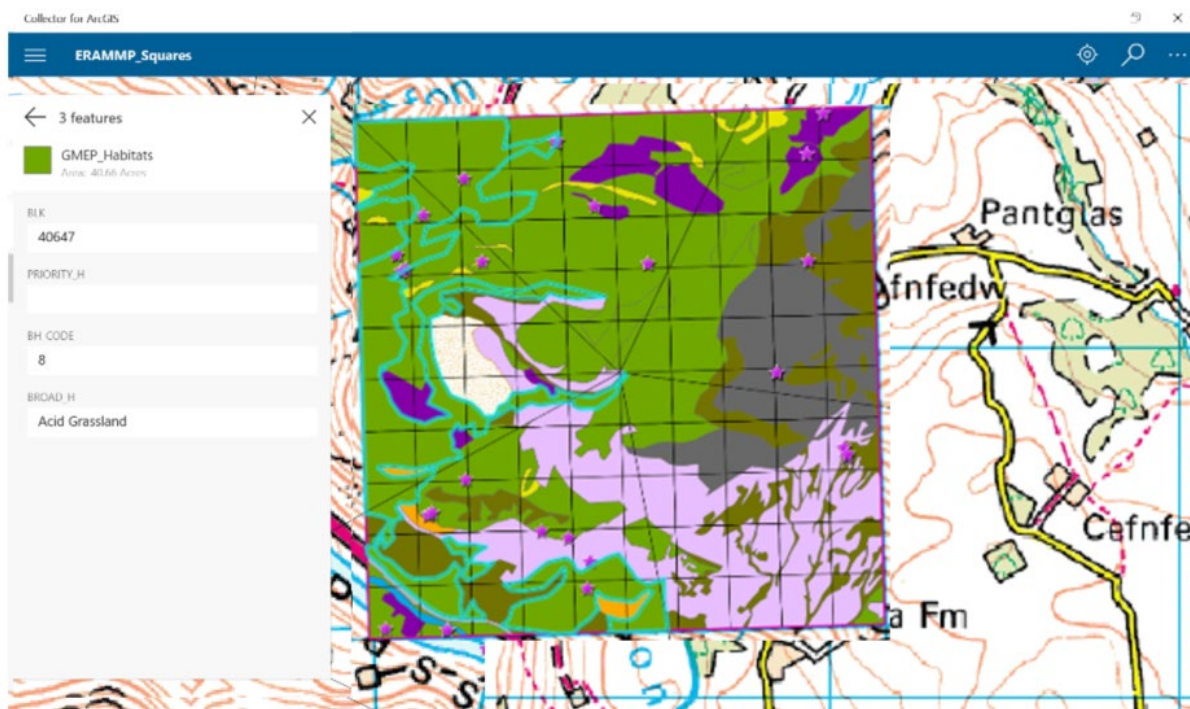


- To select information about a particular polygon, click on the polygon in question. On the left, several selected items may appear, as below:





- Click on the **habitat** choice to bring up the information about the recorded habitat in the selected polygon, as below:



- **Tree disease.** If the box 'Trees present' is checked then choose either 'Dead trees' or 'Signs of tree disease' as applicable.

**Plot description**

- **Slope** - Flat, Slight, Moderate, Steep
- **Aspect** - None, N, NE, E, SE, S, SW, W, NW
- **Shade** (as at 12 noon) - None, Partial (some direct sunlight is reaching the plot), Full
- **Plot Map drawn?** – Yes, No, Edited, Redrawn. Plot maps are essential data, we need both a record of what has been done with the maps and copies of the maps themselves. See Plot Sketch Map protocol.

**Plot description**

Slope \*

Aspect \*

Shade \*

Plot map (re) drawn? \*  
 Yes     No     Edited  
 Redrawn

Notes

**Note:** Updating existing plot maps

Surveyors will have been provided with plot sketch maps for all squares which have previously been surveyed.

- Where surveyors are repeating a plot and the map provided is adequate, this should be recorded in the Vegplots software by answering **NO** to the Plot Map drawn entry and no further action taken.
- Where the surveyors considers a map to be inadequate (e.g. missing an essential feature) or where something has changed in the landscape since the previous map was drawn they may want to edit or redraw the map they have been provided with. If this is the case, it should be indicated in the Vegplots software by answering **Edited or Redrawn**.

***Training will be provided regarding the drawing of sketch maps.***

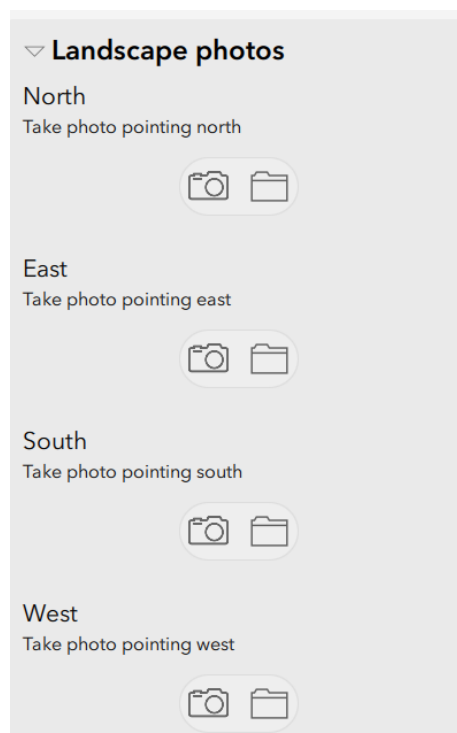
**Vegetation Height**

Surveyors are asked to provide an estimate or measure of **modal** (the most frequently encountered) vegetation height at three levels in the plot.

- **Canopy** subdivided into None, 3-5m, 5-10m and >10m
- **Shrub** subdivided into None, 0-5cm, 5-15cm, 15-40cm, 40cm -1m, 1-3m, 3-5m, and >5m
- **Ground** subdivided into None, 0-7cm, 7-15cm, 15-40cm, 40cm-1m, and >1m
- **Notes** Free text, mainly to describe why plot has been lost or other reasons why it was not appropriate to do, notes on soil samples or unidentified species. Indicate factors that may have compromised full species recording e.g. flooded, ploughed, burned, recently mown, other disturbance effects.
- **Photos** See Plot photo protocol (section 7). The camera icon will launch the device camera, from where you can take a photo. The folder icon can be used to attach previously taken photos stored in a folder on the tablet.

**Landscape Photos – See Section 7**

Take 4 photos, North, South, East and West from the southern post of the X plot prior to setting up the plot.



*Note: You can navigate between pages using the arrows at the bottom of each page.*

## 3 PLOT PHOTOS & SKETCH MAPS

### 3.1 Plot Photo Protocol

Surveyors are asked to take photos of each plot location. This can be done easily using the tablet camera accessible via the plot recording application. Two or three photos will usually suffice – please don't overdo it. These photos will primarily be used to help surveyors find the same plot locations in the next survey. However, the photos have also proved useful for illustrating vegetation change over time. Since the principal aim of the photos is to aid finding the plot, the most useful photos depict the plot in relation to a nearby feature that is unlikely to move in four years and is unique and obvious, for example, a prominent rock, tree or fence post. Information on plot number and type is automatically stamped on the photo if taken using the Survey123 app.

As surveyors will be using the tablet digital cameras it will be possible to check the quality of the photo and take another if the one taken is inadequate. Also indicate the direction of the photo taken on the plot sketch map (do not label these as 'P1', 'P2' as this could be confused with 'P' plots).



**Where possible, ensure that distinguishing features are clearly visible in each photo.**

## 3.2 Plot Sketch Map Protocol

Accurate and clear plot sketch maps will enable plots to be refound in subsequent surveys. The plot sketch maps are therefore vital and you will be relying on previous maps to help you locate the plot. When drawing new maps please make them as clear and precise as possible using the measuring tape, rangefinder and compass. **Ensure that the point at which the differential GPS reading was taken is also clearly marked.** The maps need not be works of art but they do need to be useable. You will know from your own experience of using plot sketch maps drawn by others what is and is not useful. Try to be as helpful as possible in upland situations where reference points may be scarce. In such situations, surveyors have often taken back bearings from reasonably distant features on the skyline. This is completely acceptable. The possibility of misty conditions next survey is no reason not to record them but also do not use distant features as a substitute for measuring to nearby reference points.

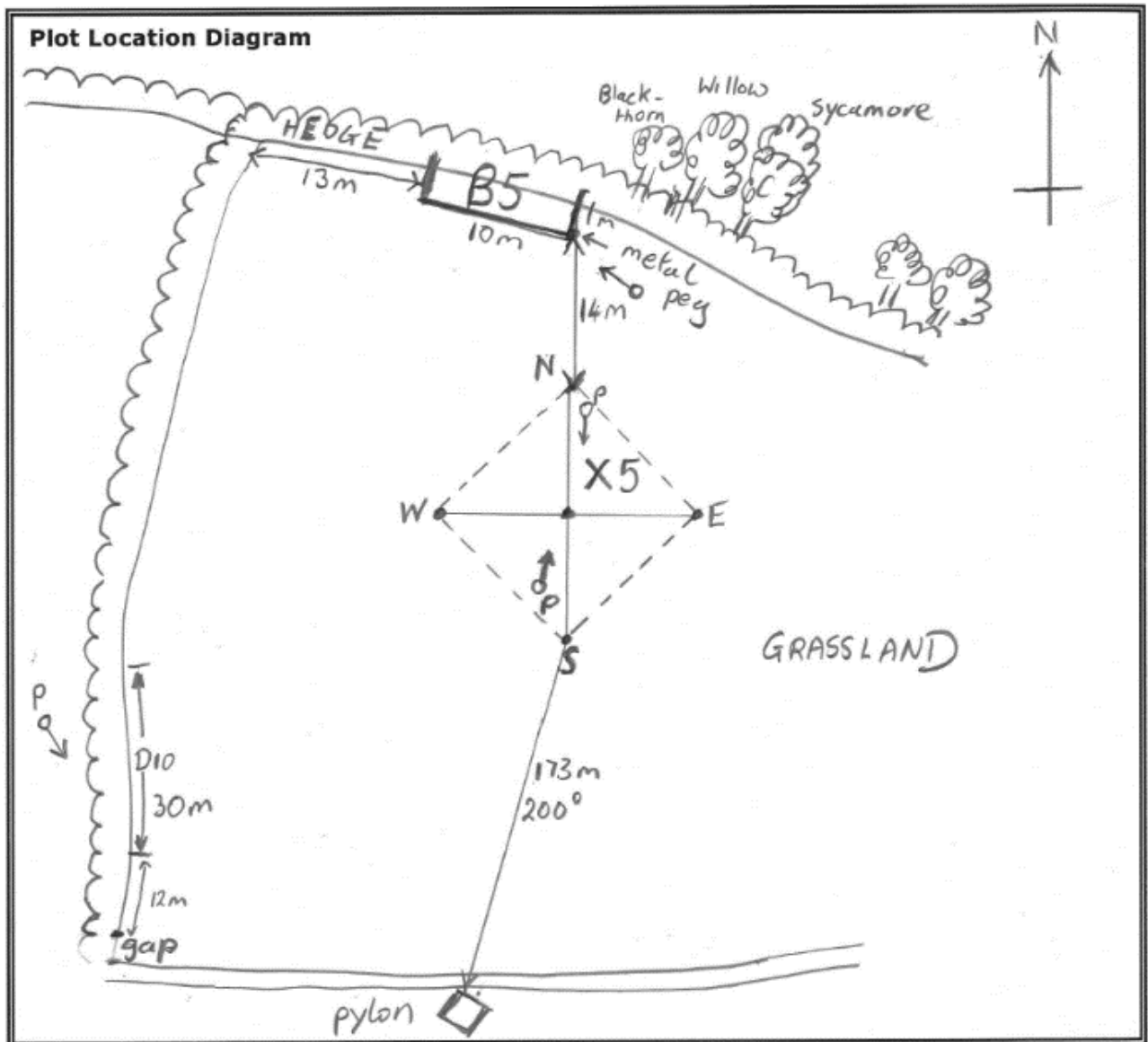
When editing/drawing new maps surveyors may include more than one plot on a map if the plots are co-located, e.g. X, B, A, M plots or H and D plots or S, W and P plots (see below for further details). Also note that if you have no rangefinder and you have to pace then translate your paces into metres. Measure your pace to determine whether one long stride really is 1 m or whether two ordinary paces combine to more accurately to a metre. Writing distances in metres is always to be preferred.

If necessary, a sketch of the plot location should be drawn on the tablet, a map on a pdf document can be edited, or can be drawn on waterproof A4 sheets provided (training will be given for this). The map should clearly define plot location using measured distances and compass bearings to nearby reference features.

### Ensure that maps include:

- Square number
- Plot type and number
- Date and surveyors initials
- North arrow

Having successfully refound a plot using sketch map and photos you may often find that it is in a different position to that indicated by the point on the plot map layer. This is because GPS may not have been used to stamp the plot in the previous survey and so the plot point is an approximation.



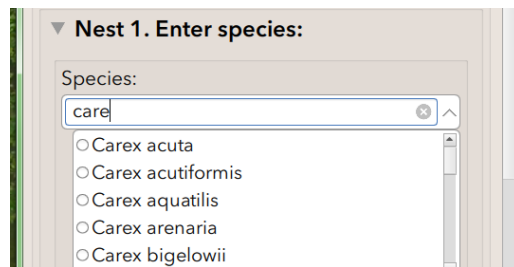
Example of a Plot Sketch Map

### PLOT SPECIFIC HEADER INFORMATION (PAGE 2)

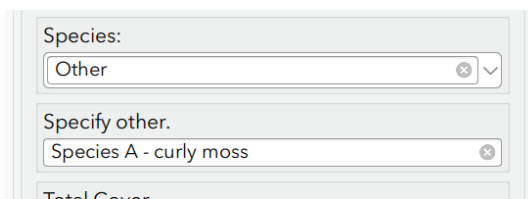
This page contains a range of information which is required for the different plot types. The surveyors will only be able to enter data relevant to the plot type being surveyed. *The header information relevant to the different plot types is detailed under each plot type, which is described later on in this plot manual.*



### ENTERING SPECIES (PAGE 3)

- For some plot types (see individual plot type protocols), species recording will be carried out in a series of nested plots.
- Comprehensive species lists are provided in each drop-down box – ‘auto-type’ is enabled in these boxes to allow for ease of data entry.



If the species is not listed, start typing ‘Other’, select ‘Other’ and a free-text box will appear in which you can type the species. This may also be used to enter unknown species, for example ‘Species A’, ‘Species B’ and so on (*once the species has been identified, this should be replaced with the correct species*). Plants which cannot be immediately identified, or for which a subsequent check, in a flora or herbarium, is required, can be placed in a labelled paper bag, or alternatively, an option is also provided to take a photo of unknown species at the bottom of the page for later identification.



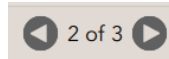
Additional species are entered by clicking the  (below ‘Total Cover’), or can be deleted using the dustbin icon .

If a species is selected, and subsequently needs to be changed, click the small x at the side of the species to delete, and the drop down options will reappear.



Having completed the record of presence of the plants in the relevant nest, an estimate of cover abundance for the nest should be made. This should include all vascular plants plus tree/shrub seedlings recorded as present, plus the six additional categories (**litter, wood, rock, bare ground, water and bryophytes**). **Estimates should be given to the nearest 5% only or 'present'**. The total cover should add up to ca. 100% (making due allowance for the 'presents'), **or can be much more if the ground flora is markedly layered**. For example a woodland plot with a tree canopy, a shrub layer, patchy Bracken and an understorey could exceed 300%.

Cover estimates can be entered as species are entered, or can be entered subsequently using the scroll forward and back buttons.



Unfortunately, it is currently not possible to view the species entered as a list. However, as a helpful guide, species are summarised at the bottom of the page, along with a sum of the covers entered.

**Note** *the software currently allows blank species or cover boxes, as well as duplicate species. PLEASE CHECK carefully that this does not occur in your plot by checking the summary at the bottom of the page.*

Estimates of cover should be constantly checked between partners to ensure that there is not a tendency to over or under estimate. **Cover may be over 100% if several layers are present e.g. Pteridium (100%) over Agrostis (25%). Trees and shrubs whose canopies project over the plot should also be listed as present and cover estimated in the normal way.** 'Bare ground' does not include leaf litter and rock. All vascular plants should be recorded, together with a restricted list of bryophytes and lichens (see Section 6). **Mosses and lichens growing on rocks and trees should be ignored.**

### Completing Plots

The software will check that certain fields are filled in. If something is missing, you will get a reminder before submitting, for example:



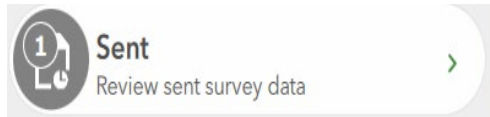


### 3.3 Submitting your data

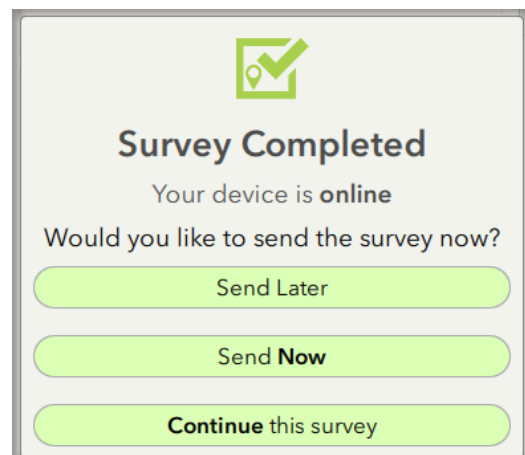
Once a survey form has been completed, you have a number of options on clicking the green tick button on the last page of your survey.



If you are online (either WiFi or mobile data) and you are happy your survey is fully complete, you can submit your data directly to the central database using the 'Send Now' option (*note: it is possible to resend a survey if you find you have missed something – you will find your sent surveys in the 'Sent' box. **You must choose the 'Copy to new survey' option** otherwise you will find you can't edit certain fields. If you are resending, **please make a note in the notes section** to say which the correct version is).*



If you are offline, return halfway through a survey or choose 'Send Later', your survey will automatically be saved in the 'Drafts' or 'Outbox' from where you can reopen your survey and continue editing.



*If your devices crashes at any point, Survey123 has auto save, so it is likely that if you are halfway through a survey, you should not have lost anything.*

## 4 PLOT TYPES

Plot types recorded in each square.

Code	Name	Other names	Where	Size	Max No. per square
<b>Area plots</b>					
X	Large	'Wally plot' Main	Random points not on linear features	200 m <sup>2</sup>	5
Y	Small	Targeted and Enclosed Habitat	Primarily allocated to 'Enclosed habitats' placed to record Priority Habitats (PH) not sampled by other plots.	4 m <sup>2</sup>	Up to 5 but more if >5 PH
U	Unenclosed		Unenclosed Broad Habitats	4 m <sup>2</sup>	10
<b>Linear plots</b>					
B	Boundary		Adjacent to field boundaries	10 x 1 m	5
A	Arable		Arable field edges centred on each B plot. Only one per arable field. Usually paired with X plots.	100 x 1 m	5
M	Margin		Field margins	2 x 2 m	15
H	Hedgerow		Alongside hedgerows (i.e. WLF with unnatural shape) and usually coincident with two of the D plots.	10 x 1 m	2
D	Hedgerow diversity		WLF with natural or unnatural shape.	30 x 1 m	10
S/W	Streamside		Four placed alongside water courses. <i>One W plot centred on the RHS stretch.</i>	10 x 1 m	5
P	Perpendicular streamside		Sampling the upslope habitats adjacent to and centred on the S/W plots.	10 x 1 m	5
				MAX	>=73

## 4.1 X Plots

### 4.1.1 Laying out X plots

#### 200 m<sup>2</sup> X plot layout

The vegetation plot is 200 m<sup>2</sup> (14.14 m x 14.14 m) and is set up by using the survey poles provided with the strings forming the diagonals of the square. The diagonals should be orientated carefully at right angles and the plot should be orientated with the strings on the North/South, East/West axes.

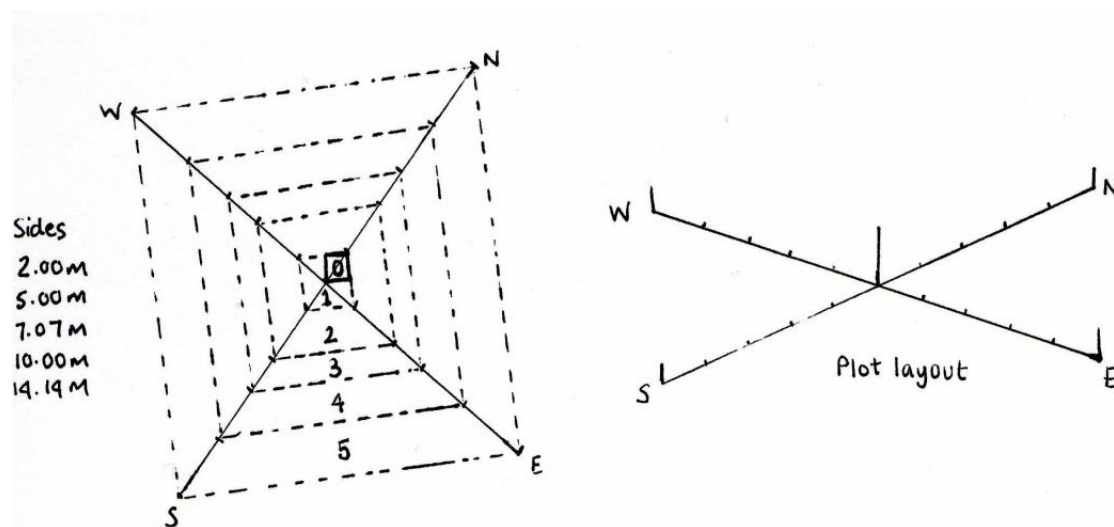
**Note:** In **arable fields** the plot should be taken as being a 14 m square (estimated, not measured), starting 3 m into the crop (to avoid any edge effect). Access should be made using drill lines where possible and causing minimum disturbance to the crop (or where the crop may be on a future visit). The species list should be compiled from what can be seen in the crop - accuracy is difficult to achieve but samples must be taken from arable crops however possible.

**Note:** There are X-plots which don't have the full extent, but were set-up and recorded only as the 4 m<sup>2</sup> nest. This was due to time constraints in the GMEP project. These small X-plots are marked on the sketch map and need to be extended to the full size in this survey. The originally surveyed small X-plot should be in the centre of nest 1 of the big X-plot. If for any reason this is not possible (e.g. obstacles), the small X-plot should be located as close as possible and note should be made on the plot software. Please amend the sketch map accordingly.

The different nested plots shown below are marked by different coloured strings on the appropriate position of the diagonal. The 1 m<sup>2</sup> nest is not marked and comprises the northernmost corner of the inner 4 m<sup>2</sup> nest.

An easy way to mark out nest 0 is as follows:

1. Locate the marker tag for nest 1 along the north-pointing 1/2 diagonal string. This tag should be positioned at 1.41 m
2. Run out 4 m of tape and place the 2 m position at the nest 1 marker tag then run the 0-2 m and 2-4 m lengths back to the centre post.
3. Now simply pull out the slack in the tape, placing pegs at 1 m and 3 m to derive the 1x1 m quadrat.



Design of an X-(Wally) Plot

Nest	Area (m <sup>2</sup> )	Sides(m)	Diagonal(m)	1/2 diagonal(m)
0	1	1	1.41	not needed
1	4	2.00	2.83	1.41
2	25	5.00	7.07	3.54
3	50	7.07	10.00	5.00
4	100	10.00	14.14	7.07
5	200	14.14	20.00	10.00

*X plot dimensions*

## 4.1.2 Recording X plots

### HEADER

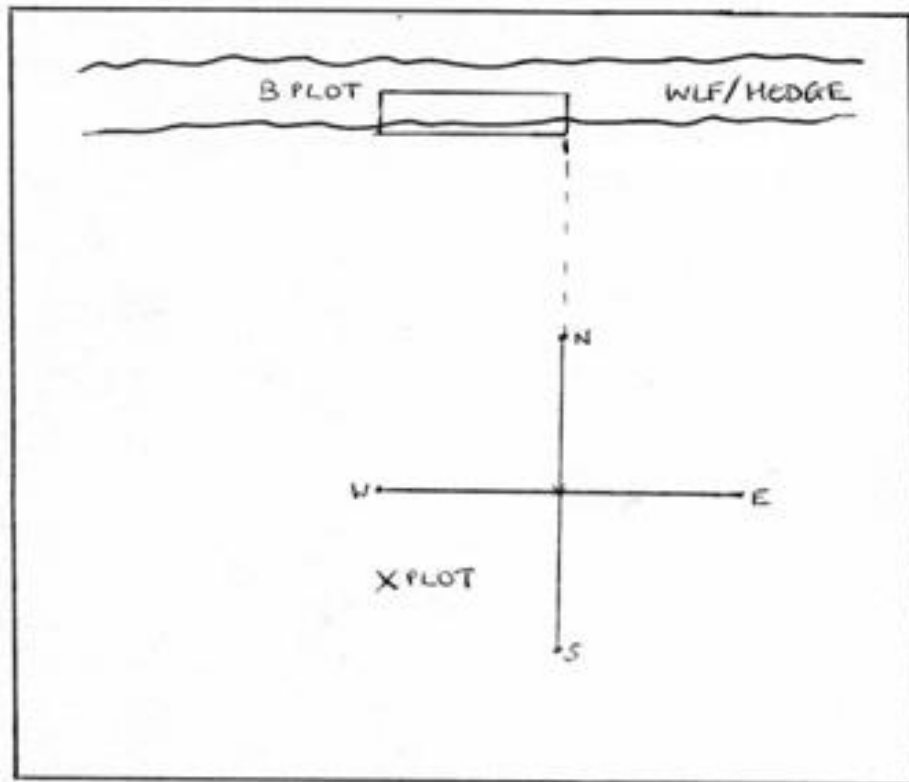
The only header information required specifically for X plots is:

- **Soil sample taken** : Yes, No
- **Date**: a calendar is provided which defaults to today's date
- **Scan barcode**: The barcode on each bag provided should be scanned. *Check the correct code type is set (code 39).*

*See soil sampling handbook for further guidance.*

### LISTED SPECIES

**200 m<sup>2</sup> X plot**: Species are recorded cumulatively starting in nest 0 and then censusing successively larger nests up to nest 5, which is the outermost nest. Any additional species are recorded in each successive nest.



*Marking X and B plots. Note that the differential GPS reading for the X plot should be taken at the south corner of the X plot and the reading for the B plot taken at the right hand corner of the B plot facing the boundary and nearest the X plot*

### **Nest 0**

A record of the presence of species in this innermost quadrat are made by selecting the name of the species on the recording form, under 'Nest 0'. A drop-down menu is provided, but it is often easier to start typing the name of species, and suggestions will appear. Additional

species are entered by clicking the  (below 'Total Cover'), or can be deleted using the  dustbin icon.

**Tip!** *If the species is not listed, start typing 'Other', select 'Other' and a free-text box will appear in which you can type the species. This may also be used to enter unknown species, for example 'Species A', 'Species B' and so on (once the species has been identified, this should be replaced with the correct species).*

*Plants which cannot be immediately identified, or for which a subsequent check, in a flora or herbarium, is required, can be placed in a labelled paper bag, or alternatively, an option is also provided to take a photo of unknown species at the bottom of the page for later identification (this is preferable in the first instance).*

Rep ID  
100X2

▼ **Vegetation Plot**

▼ **Nest 1 (include X plot 0). Enter species:**

Species:



care

- Carex acuta
- Carex acutiformis
- Carex aquatilis
- Carex arenaria
- Carex bigelowii

Cover: Nest 0

Cover: Nest 1

Total Cover

 1 of 1 

Species:

Other

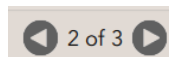
Specify other.

Species A - curly moss

Total Cover

Having completed the record of presence of the plants in nest (0), an estimate of cover abundance for the nest should be made. This should include all vascular plants plus tree/shrub seedlings recorded as present, plus the six additional categories (**litter, wood, rock, bare ground, water and bryophytes**). **Estimates should be given to the nearest 5% only or 'present'**. The total cover should add up to ca. 100% (making due allowance for the 'presents'), **or more if the ground flora is markedly layered**.

Covers should be entered into the 'Cover: Nest 0' box for each species. Covers can be entered as species are entered, or can be entered subsequently using the scroll forward and back buttons.



Unfortunately, it is currently not possible to view the species entered as a list. However, as a helpful guide, species are summarised at the bottom of the page, along with a sum of the covers entered.

**Note:** *the software currently allows blank species or cover boxes, as well as duplicate species. PLEASE CHECK carefully that this does not occur in your plot.*

### **Nest 1**

For Nest 1, the innermost 2 m x 2 m nest is searched. Species additional to those recorded in Nest 0 are added to the same nest section as Nest 0 '(Nest 1 (include X plot 0))'. However, for those species appearing in Nest 1 only (not nest 0), the option 'Not present in nest 0 (nest 1 only)' must be selected in the 'Cover: Nest 0' box.

Rep ID  
100X2

▼ Vegetation Plot

▼ Nest 1 (include X plot 0). Enter species:

Species:  
Carex acuta

Cover: Nest 0  
Not present in nest 0 (nest 1 only)

Cover: Nest 1  
5%

Total Cover

1 of 1

### **Subsequent Nests**

Having recorded all species in a given quadrat size, the new area enclosed by the next successive set of markers is searched for **additional species only**. This procedure is repeated until the full 14.14 m x 14.14 m (200 m<sup>2</sup>) has been recorded.

The most convenient method of search for the successive sizes of quadrat is for the two operators to spiral outwards moving in opposite directions so that both cover the whole area. Record successive quadrats under the relevant Nest section on the recording form. Do not record the Total Cover until you have censused Nest 5.

If there are no additional species on the particular nest, the 'No additional species in nest' box may be ticked.

Survey123 for ArcGIS

**Plot Information**

Page of Vegetation

▼ **Vegetation Plot**

▶ **Nest 1. Enter species:**

▼ **Nest 2. Enter species:**

Nest 2:

No additional species in nest

Species:

▼

Total Cover

▼

1 of 1

Because of identification difficulties, only a limited list of the more common bryophytes should be recorded (**do not record bryophytes growing on tree bases, logs, rocks or other specialised habitats. Admittedly this is sometimes a difficult distinction. What we want to avoid is recording bryophytes on substrates not typical of the ‘floor’ of the plot hence avoiding branches, tree trunks and boulders raised substantially above the ground surface).**

A list of allowable bryophytes is provided in Section 6.

### ***Total cover***

Having completed the record of presence of the plants in all five quadrat sizes, an estimate of cover abundance for the full plot (14.14 m x 14.14 m) should be made and inserted in the ‘Total Cover’ box below each species. **Note: it is necessary to enter these under each species in each of the 5 nests. Also do not forget to record total cover of bryophyte, litter, water and bare ground.**



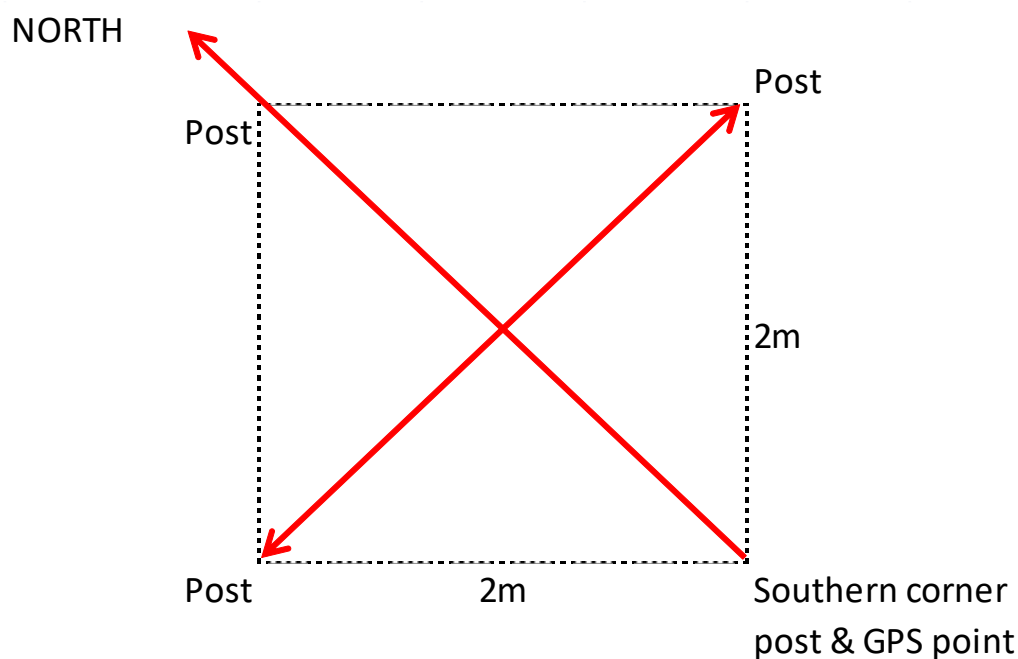
## 4.2 Y plots

Y plots are **2 x 2 m** in size and were targeted (for example to sample Priority Habitats (PH) or to sample 'enclosed' habitats in and out of an agri-environment scheme).

Enclosed habitats are Broadleaved and Conifer woodland, Arable, Improved and Neutral Grassland.

### 4.2.1 Laying out Y plots

Y plots should be orientated along north/south, east/west axes. However, in a linear feature, this may not be possible and the main axis of the plot should be measured and recorded. The best way to set out the plot is to run out 2.82 m of tape (the diagonal length of the 2 m x 2 m plot) and orient this north to south and peg both ends. Then simply run out 8 m of tape pegging out the north and south ends at 0 m and 4m and pulling out the tape taught so that the 2 m and 6 m corners are pegged.



*Layout of the X, U and Y plot showing the southern corner and direction of alignment. The plot is 4 m<sup>2</sup> i.e. 2 m x 2 m along the sides*

## 4.2.2 Recording Y plots

### HEADER

*No specific plot header.*

### LISTED SPECIES

The species present in the square should be recorded in the same way as for nest 1 of the X plots (i.e. 2 m x 2 m) and a cover estimate made.

Rep ID  
100Y2

▼ Vegetation Plot

▼ Nest 1 (include X plot 0). Enter species:

Species:  
Viola riviniana

Total Cover

1 of 1

## 4.3 U Plots – Unenclosed Plots (U1-U10)

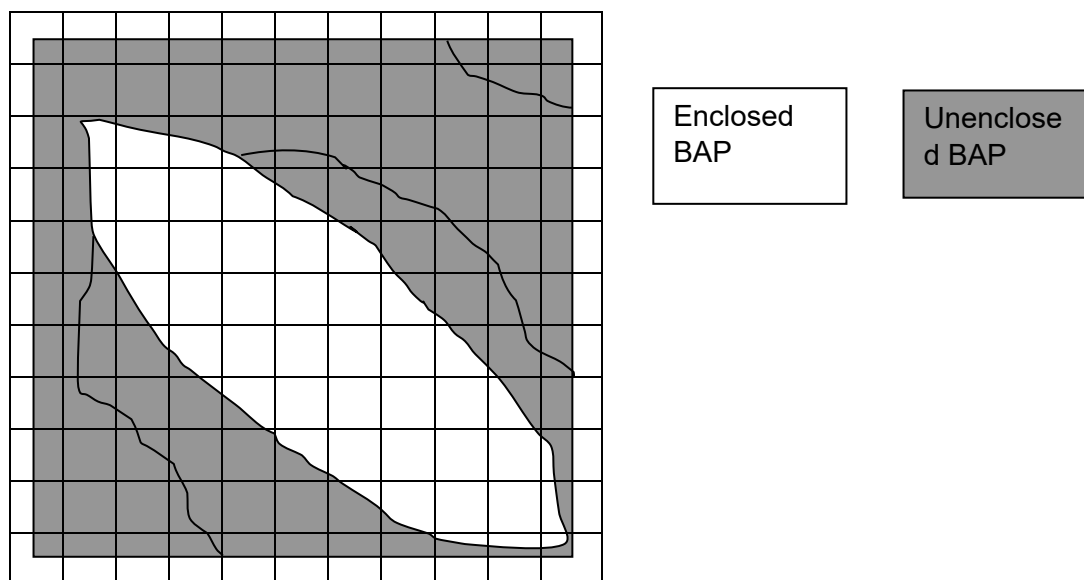
**Note that you will not be required to lay out new plots unless replacing previous plots that have not been Found**

Up to 10 plots may be placed in any unenclosed Broad Habitat types that occur within the square. The plots are 2 m x 2 m in all instances. Two rules apply in determining the number of U plots required. Firstly, 1 obligatory U plot is needed per unenclosed BH. Secondly, having allocated these obligatory plots, the remaining U plots are allocated according to the proportion of the total amount of unenclosed BH in the square.

**Note:** *all mosaics are treated as one single Broad Habitat category, irrespective of their component parts.*

### 4.3.1 Locating U plots

The number of U plots to be recorded depends on the proportion of the square that is occupied by unenclosed Broad Habitats. If recording replacement square where the whole square comprises unenclosed Broad Habitats then 10 U plots should be deployed. If half the square is made up of these habitats then 5 U plots are needed. A grid is provided to allow estimation of the proportion of the square which is made up of unenclosed habitat types.



*100 m fishnet grid used to help estimate the allocation of new U plots*

**Note** that the Broad Habitat types that should be sampled with U plots are defined in the table below and *not* by their occurrence in unenclosed landscapes. **Hence, small areas of lowland heath, bog or calcareous grassland should all be U plot sampled despite being embedded in an enclosed landscape.**

A degree of judgement is needed. If for example, the vegetation being sampled is reasonably homogenous bog or upland heath then a greater amount of error might be allowed i.e. you believe you are in roughly the right location but 10-20 m either way might not bring the plot into a different habitat type then the plot may be considered as a valid replicate.

In cases like this, it is not worth spending much more than 10 minutes searching for the specific plot location. In all cases check plot map and photos provided for any further detailed info.

*List of unenclosed Broad Habitat types eligible for U plot sampling.  
See key for definition of constituent Priority Habitats*

Code number	Name
7	Calcareous grassland
8	Acid grassland
9	Bracken
10	Dwarf shrub heath
11	Fen, marsh & swamp
12	Bog
15	Montane
18	Supralittoral rock
19	Supralittoral sediment
16	Inland rock

### 4.3.2 Laying out U plots

Plots should have been orientated along north/south, east/west axes as for X and Y plots. However, in a linear feature, narrower plots extended along the main axis may be placed and measured to ensure that they cover 4 m<sup>2</sup>- this should be clearly depicted with measurements in the sketch map and photos provided, and you should be sure to do the same if locating a new plot in such a location.

### 4.3.3 Recording U plots

#### HEADER

*No specific header information*

#### LISTED SPECIES

The species present in the square should be recorded in the same way as for Y plots and a cover estimate made.

Rep ID  
100U2

▼ Vegetation Plot

▼ Nest 1 (include X plot 0). Enter species:

Species:  
Aegopodium podagraria

Total Cover

1 of 1

## 4.4 Linear Plots

General rules for linear plots:

- The two H, two S, five A and five B plots can all be projected from the X plots.
- No two linear plots of the same type should be placed within 10 m of each other on the same linear feature.
- No two linear plots of different types should overlap, except H and D plots.
- The 1 m width should be measured across the surface of the terrain so that, on a bank, the true horizontal width, as viewed from above, would be less than 1 m.

## 4.5 B Plots – Boundary Plots (B1-B5)

Boundary linear plots are recorded at the boundary marker of each of the X plots in enclosed land (**10 m x 1 m**).

### 4.5.1 Locating B plots

B plots should be located at a position on the boundary closest to the X plot and on a cardinal bearing from it (i.e. N, S, E or W). For example, if you have to put in a replacement B plot, then choose another cardinal bearing from the X plot location. A boundary is taken to be any physical feature that has a length and which is an interface between the parcel containing the 200 m<sup>2</sup> plot and any other land cover type. This might include a hedge, wall, fence, ditch, embankment etc. It will not include land cover which is associated with the management practice of the field e.g. headlands.

**In general, the B plot will take precedence over other types of linear plot.** If two plots would otherwise end up in the same location, then the B plot would be laid out and the other linear feature moved to the nearest permissible length of boundary which was at least 10 m away. The exception is where a linear plot has previously/already been located in the same position as a B plot would fall. In this case the B plot would be moved to the next nearest length of boundary on a different cardinal bearing.

The marker plate (CS squares only) for the 200 m<sup>2</sup> plot may have been positioned at the boundary nearest to the plot and should be lying on one of the cardinal points of the compass, as measured from the centre of the X plot.

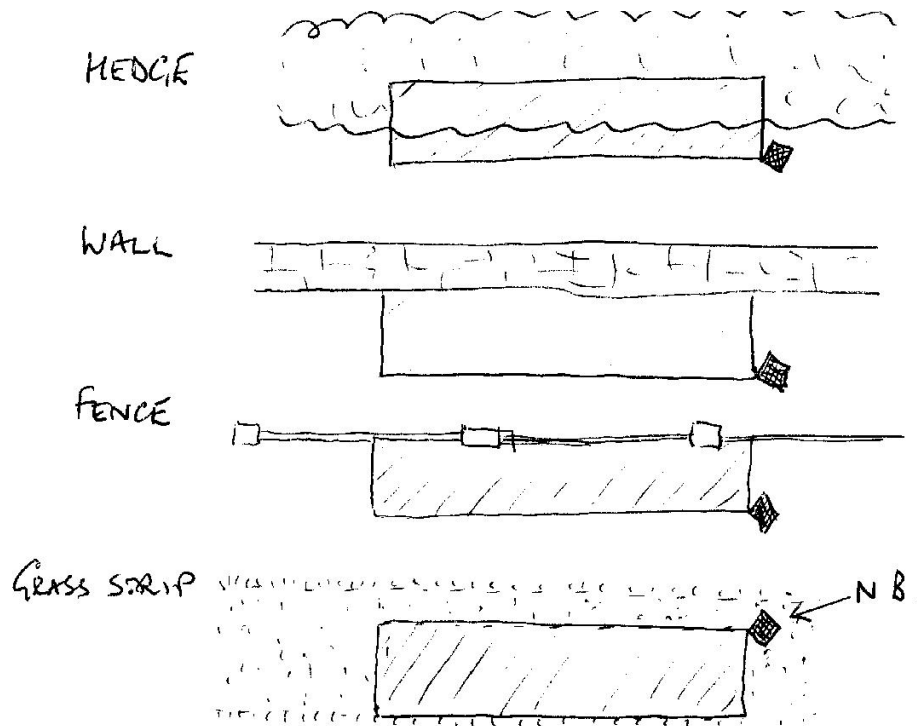
### 4.5.2 Laying out B plots

The linear plot should be laid out so that the differential GPS recording position is at the right-hand corner of the plot at 1 m away from the boundary feature. In most cases the feature recorded will be vertical, i.e. a hedge, wall or fence - in the case of a hedge, the plot should occupy the 1 m strip running outwards from the centre of the feature. Yes, you may indeed have to get on your hands and knees and peer under the hedge. Make a note if you think the difficulty of re-recording from the centre of the hedge may have reduced the number of species spotted. In other cases, the 1 m width will run out from the base of the feature (e.g. wall or fence).

Where the boundary is composed of several different elements e.g. hedge with ditch, then the laying out procedure should be decided by reference to the dominant vertical feature e.g. hedges/walls/fences are dominant to ditches which are dominant to grass strips. Once the dominant feature has been identified and the plot laid out accordingly, then recording takes

place in the 1 m strip, irrespective of whether it includes part of another linear feature. (**Note:** *different rules apply in the case of H and S/W plots - see below*).

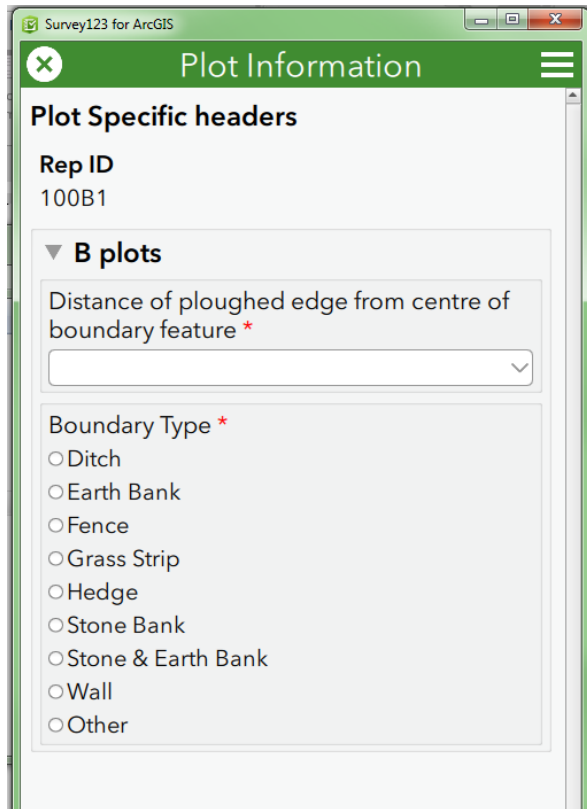
B plots which are adjacent to large ditches or dykes should be located at the water's edge, and not at the top of the bank. (**Note:** *no plots should be located below the Mean High Water (MHW) mark*). Where a field is immediately adjacent to curtilage (land intimately associated with buildings), then the B plot should run from the curtilage into the field.



*Laying out a B plot in different circumstances. The black square indicates where the differential GPS location should be made*

### 4.5.3 Recording B plots

#### HEADER

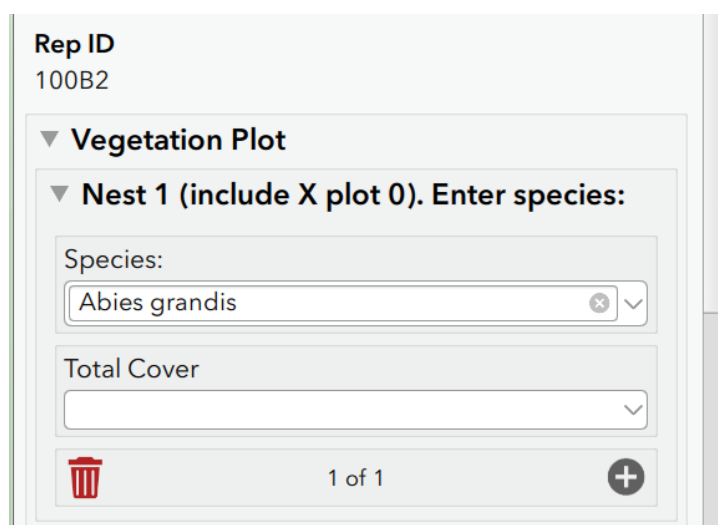


**Distance of ploughed edge from centre of boundary feature:** Not Applicable, <2m, 2-4m, 4-6m, 6-12m, 12-20m

**Boundary type:** Fence, Hedge, Wall, Ditch, Grass Strip, Earth Bank, Stone Bank, Earth & Stone Bank, Other (should be noted on plot map)

#### LISTED SPECIES

All species within the B plot are recorded using the recording tablet and cover estimates made.



## 4.6 A Plots – Arable Field Margin Plots (A1-A5)

Arable field margin plots were recorded for the first time in the 1998 Countryside Survey. The purpose of establishing the plots was to record changes in the arable weed population at the edge of cultivated fields. Non-crop plant diversity increases towards the edge of a field and the field edge contributes an important source of biodiversity. The uptake of conservation headland options for arable field management under agri-environment schemes may further enhance species diversity in A plots. **The plots are 100 m long by 1 m wide.**

The plots are photographed due to their relationship with B plots. Thus, the B plot photos may prove helpful. **Note:** *it is possible that the position of the A plot may have changed because of the adoption of agri-environment scheme margin options.* This would result in a change in the distance to the start of cultivated land from the boundary. In such a case the **A plot would need to be recorded as a new plot.**

### 4.6.1 Locating new A plots

A plots are either projected from X plots or located at random along arable field margins that were in relevant Glastir options in GMEP. If projected from X plots then they are located only adjacent to those B plots (*see above*) which border arable fields, up to a maximum of 5 A plots per square. Thus, A plots should be numbered A1, A2...A5 linked to the corresponding B1, B2... B5. The A plots are 100 m x 1 m where the 1 m is the outermost cultivated metre of the field and the 100 m is centred on the B plot. The plot should always extend 50 m outwards from the B plot even if this means continuing along a second side of the field.

### 4.6.2 Laying out A plots

It is impractical to mark out the exact dimensions of A plots. Instead, the rangefinder should be used to measure 50 m in each direction from the centre of the B plot. A plot pole or cane, with a 1 metre mark, should then be used to check the width of the plot as it is walked and recorded.

### 4.6.3 Recording A plots

#### HEADER

- **Distance of ploughed edge from centre of boundary feature:** Not Applicable, <2m, 2-4m, 4-6m, 6-12m, 12-20m



### LISTED SPECIES

Species cover and presence should be recorded in the central 4 m x 1 m section (nest 0). In the rest of the plot (nest 1) only species presence should be recorded.

Rep ID  
100A2

▼ **Vegetation Plot**

▼ **Nest 0. Enter species:**

Species:  
Abies procera

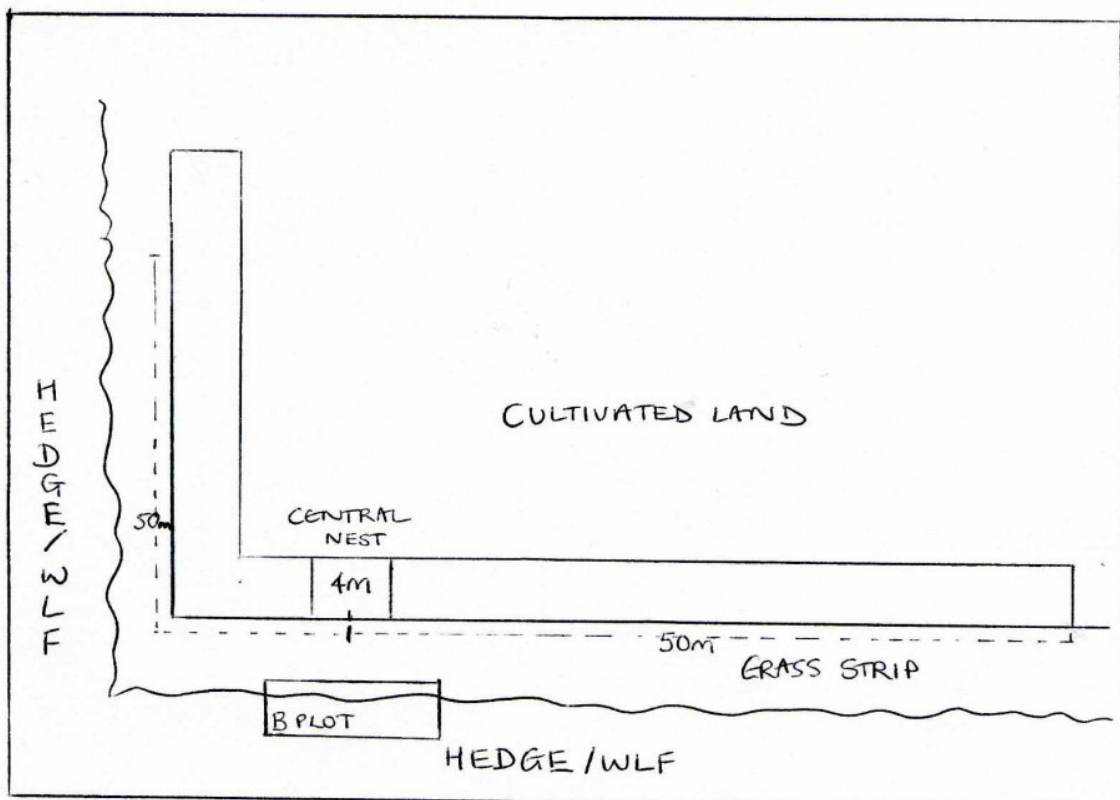
Cover: Nest 0  
10%

1 of 1

▼ **Nest 1 (include X plot 0). Enter species:**

Species:  
Abies grandis

1 of 1



Laying out an arable field margin plot

## 4.7 M Plots –Margin Plots (M1-Mx)

M plots are **2 m x 2 m** in size and are designed to record the quality of new arable field margins that form part of the agri-environment agreement and other margins put in without agri-environment support. Types of margin include:

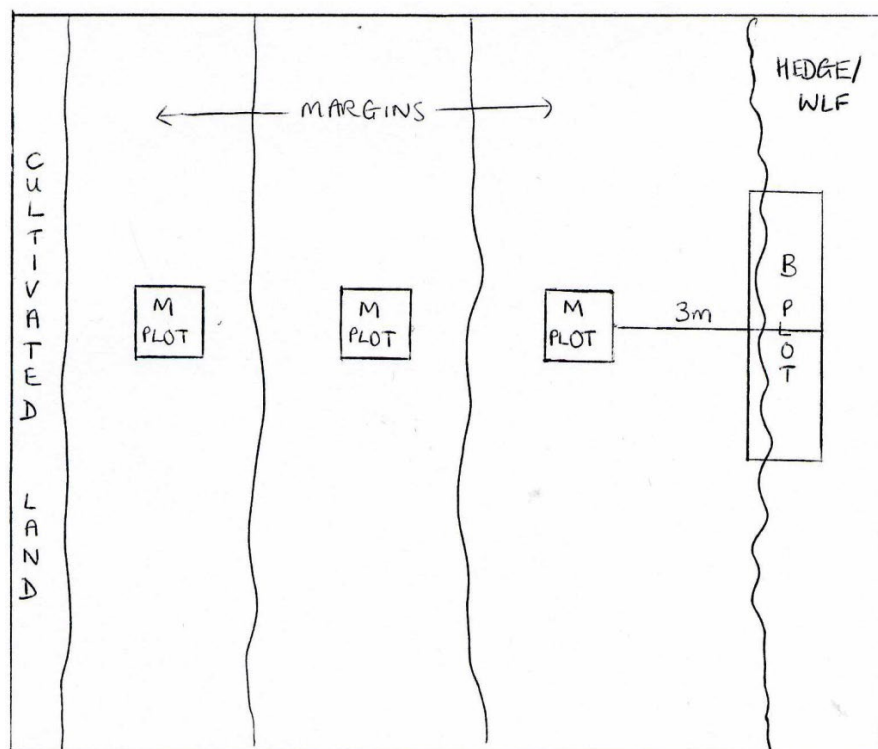
- Fixed and rotational rough grass margins
- Fallow crop margin
- Unsprayed spring sown cereals or legumes
- Wildlife cover crop
- Unharvested cereal margin
- Unfertilised and unsprayed cereal margin

### 4.7.1 Locating M plots

M plots are associated with A plots, i.e. in an arable field, which is bounded by margins. The number of M plots per square will depend on the widths of margins present, with up to 3 per field. If an A plot samples in-option cultivated margins then M plots are coupled to this A plot but a B plot may not be present because the A plot was not projected from an X plot.

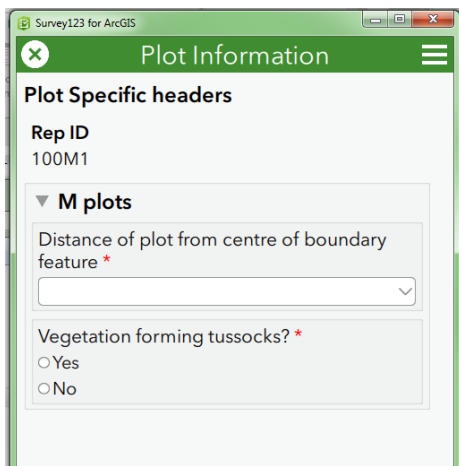
### 4.7.2 Laying out M plots

Where a margin or margins are present at the edge of the field, the first M plot will be placed at 3 m from the centre of the hedge (where a hedge is the boundary feature). Where the boundary feature is a wall or fence, the M plot will be placed at 2 m from the boundary in order to avoid overlap with the B plot and to avoid recording at the edge of the margin. If margins extend beyond 6 m into the cropped area, further quadrats will be recorded at intervals of 6 m. Thus if the first M plot is at 3 m from the hedge centre, the 2<sup>nd</sup> is at 9m, the 3<sup>rd</sup> at 15 m etc.



*Laying out a margin plot*

### 4.7.3 Recording M plots

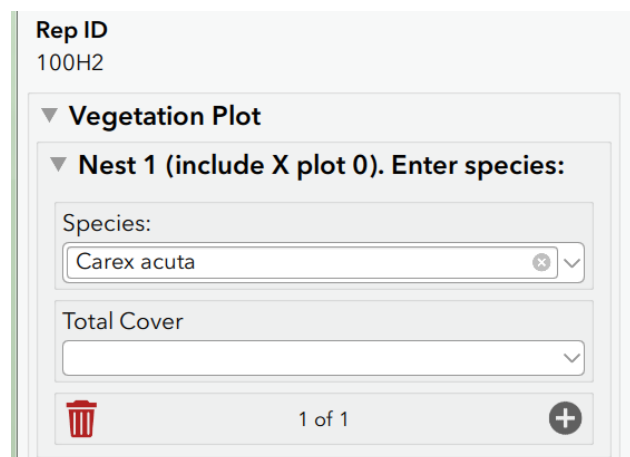


#### HEADER

- **Distance of plot from centre of boundary feature:** Not Applicable, <2m, 2-4m, 4-6m, 6-12m, 12-20m
- **Vegetation forming tussocks? :** Yes, No

#### LISTED SPECIES

Species presence and cover will be recorded.



## 4.8 H Plots – Hedgerow Plots (H1-H2)

### 4.8.1 Locating H plots

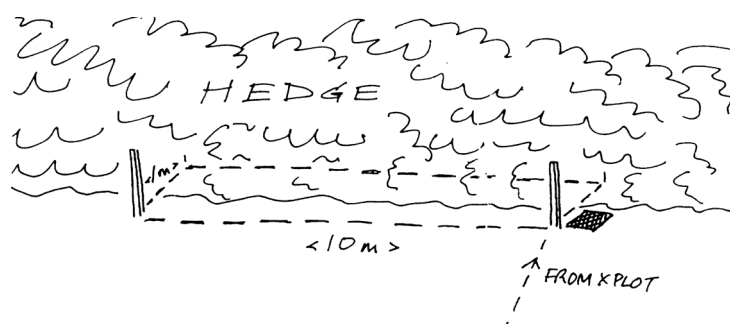
H plots are linear **10 m x 1m** plots. H plots are placed on the hedge<sup>2</sup> nearest to each of the two X plot locations that are farthest apart in the square. The 10 m H plot is laid out to the left and the 1 m width extends out towards the field from the centre of the hedge. **The H and B plots should not be nearer than 10 m to each other, so if there is not more than 30 m of continuous hedge in the square, only one plot (the B) should be recorded.** Where the nearest feature is ineligible (because it is not wide enough, or is confused by the presence of a different type of linear within its width – see *below*) then a new location should be chosen at the nearest permissible position. The position of a new plot will be marked on the GIS tablet and clearly marked on a sketch map. Each H plot should be associated with a D plot (see *below*).

Check the plot map and photographs provided. If a fence has been installed since the plot was recorded last, then repeat the plot in its original position. This means that the long axis of the plot follows the centre of the hedge and projects into adjacent land by 1 m rather than following the base of the new fence.

### 4.8.2 Laying out H plots

H plots are each **10 x 1 m**. The position of the plots should be temporarily marked with a survey pole at each end, one metre out from the centre of the hedge. A measuring tape can be used to mark the outer edge of the plot.

If there is not a clear metre between the centre of the hedge and another linear feature, e.g. a ditch, then the hedge plot should be relocated at the nearest permissible location.



*Laying out an H plot. The black square indicates the corner of the plot where the differential GPS location should be measured*

<sup>2</sup> H plots should be placed on hedgerows only i.e. WLF where the woody species have an unnatural shape due to their present or past management.

### 4.8.3 Recording H plots

#### HEADER

- **Distance of crop from centre of hedge:** Not Applicable, <2m, 2-4m, 4-6m, 6-12m, 12-20m. Note that this refers to cultivated land not to established grassland. The idea is to capture ploughing too close to the hedge base. Distance is from the mid-line of the hedge.
- **Tree disease:** Dead trees. Disease present (need to click trees present to get these options).

#### LISTED SPECIES

Species presence and cover will be recorded.

## 4.9 D Plots – Hedgerow Diversity Plots (D1-10)

### 4.9.1 Locating D plots

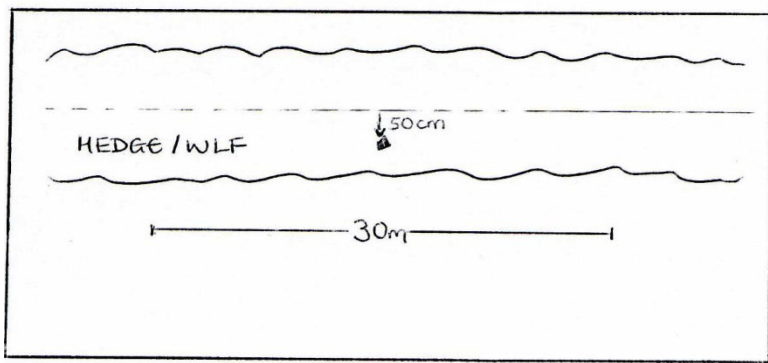
New D plots should only be placed on **Woody Linear Feature's** (WLF) with a length >20 m (which can include gaps). If the randomly located segment of the WLF coincides with gaps that exceed 20 m of the length of the D plot then move the plot so that gaps are <20 m.

Except for plots co-located with H plots which are marked as for H plots, D plots were marked at the centre point along the 30 m length. The plate (CS) was supposed to be buried 50 cm out from the centre line of the WLF. However, please check the plot map as, in some cases, it may have been placed in a different position; most typically at the end of the plot length. Where associated with an H plot, this H plot should have been recorded in the central 10 m of the D

plot. Check the plot sketch map though and make sure that you do it in the same place as the previous survey.

### 4.9.2 Laying out D plots

Each plot is **30 m long** and includes the full width of the **WLF**. The plot does not need to be fully marked out but, rather, the rangefinder should be used to check the length of the plot (15 m in each direction from the centre point).



Laying out a hedgerow diversity (D) plot

### 4.9.3 Recording D plots

D plots may be placed on hedgerows or lines of trees or on linear features which comprise both.

#### HEADER

Trees are defined as species that can persist as constituents of a woodland canopy. So, for example, woody species that can be ultimately overtopped by another species when growing in woodland or those that rarely grow in woodland, are considered shrubs. Hazel is an exception and is considered a tree for the purposes of D plot recording. Willows are considered trees because they can be the dominant in wet woodland. Shrubs therefore comprise; *Prunus* spp., Hawthorn, *Viburnum* spp., Juniper, *Ulex* spp., *Rhamnus catharticus*, and all other woody species which are ultimately successional replaced as scrub becomes woodland. Hence the maximum height of a shrub will be shorter than that of the tree species that can replace it.

There is a LOT of D plot information. These plots provide a lot of information on which condition of **WLF**'s is assessed:

Survey123 for ArcGIS

**Plot Information**

**Plot Specific headers**

Rep ID  
100D1

▼ **D plots**

Modal Feature Height \*

Modal Feature Width \*

Vertical gappiness \*

Are there gaps >5m? \*

Distance of adjacent managed or ploughed land from end of WLF?

Are there trees that take their natural shape? \*

Are trees and shrubs: \*

- **Tree disease.** Dead trees. Disease present.
- **Modal Feature height** (excluding earth banks, see illustrations for measuring asymmetric **WLF** heights) (modal height is the average for most of the length of the feature rather than an average between the tallest and shortest part of a feature): <1m, 1-1.5m, 1.5-2m, 2-2.5, 2.5-3m, 3-4m, 4-6m, 6-15m, >15m
- **Feature width:** <1m, 1-1.5m, 1.5-2m, 2-2.5, 2.5-3m, 3-4m, 4-5m, 5-10m, >10m
- **Vertical Gappiness** % gappiness: none, <10%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%
- **Are there gaps >5m:** Yes, No
- **Distance of adjacent managed or ploughed land from midline of the WLF:** Not Applicable, <2m, 2-4m, 4-6m, 6-12m, 12-20m
- **Are there trees that take their natural shape?**
  - Yes (forming a separate layer above a shrubby WLF),
  - Yes (but there is no separate shrubby layer),
  - No. Note that natural shape means devoid of any apparent trimming or pruning anywhere from the base to the crown.
- **Are trees and shrubs?** - Uniform in height, Different heights. If the trees and shrubs form two or more obvious strata then they are of 'different heights'. If all intermixed and variable but forming a single mixed canopy then answer 'uniform in height'.
- **Width perennial vegetation:** <1m, >1m, Not Applicable. This question refers to the width of any herbaceous strip of vegetation next to the WLF. Hence, if it is just an adjacent grassland then it would probably be >2m. If next to cultivated ground it may well be less.
- **If trees present are the tree or shrub canopies touching?** : Not at all, Partially, Mostly, Completely, Not applicable. This question refers to the extent to which the tree layer is gappy or whether it is continuous; either as a largely uninterrupted tree canopy or tree and shrub canopy.

- **Height of base of canopy** : <0.5m, 0.5-1m, 1-2m, >2m
- **Are there any signs of historic management? (e.g. layered base, old coppice stools, slanting main stems with large vertical branches. Yes, No.** Historic management really refers to impacts that happened >10 years ago. However, this will be difficult to determine with certainty so apply your best judgement.

#### 4.9.4 D Plot: Invasive Species Presence/Cover

- **Leylandii**: <10%, >10%
- **Fallopia japonica**: <10%, >10%
- **Crocasmia aurea hybrid (Montbretia)**: <10%, >10%
- **Fallopia sachalinensis**: <10%, >10%
- **Fallopia x bohemica**: <10%, >10%
- **Fallopia baldschuanica**: <10%, >10%
- **Heracleum mantegazzianum**: <10%, >10%
- **Impatiens glandulifera**: <10%, >10%
- **Petasites albus**: <10%, >10%
- **Petasites fragrans**: <10%, >10%

#### LISTED SPECIES

Woody species presence and cover only (not including gaps) are recorded. This includes woody climbing species such as *Rosa* spp., *Rubus fruticosus* and *Clematis vitalba*. Also include trees that may be vertically shading the plot. List these and include a cover value. **Note:** when considering shade categories for D plots it is the main components of the WLF that would be subject to shade from a separate layer of overtopping trees. Hence if the WLF is not separable into an obvious shrub and tree layer then the WLF will **not** be shaded.



**Rep ID**  
100D2

▼ **Vegetation Plot**

▼ **Nest 1 (include X plot 0). Enter species:**

Species:  

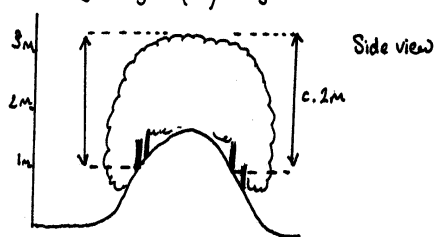
✕ ▼

Total Cover

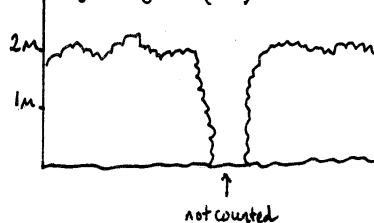
🗑
1 of 1
+

**Note:** in Wales, surveyors will encounter stone and earth banks topped with Gorse. These are perfectly valid WLF and are eligible for D plot sampling.

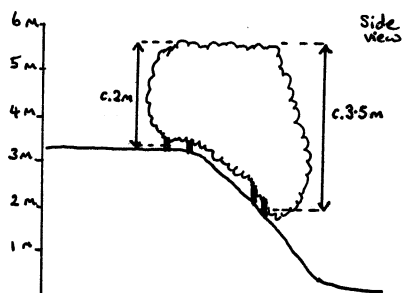
A Average height (2m) Hedgerow on bank



A Average height (2m) Front view



A Average height (c. 2m) Hedgerow on asymmetric bank



Illustrations to help in the assessment of modal height in different circumstances. **Note:** Modal differs from average as described above (i.e. it is NOT the heights of different features added together and then divided by the number of features)

## 4.10 S/W Plots –Streamside Plots (S1-2, W1-3)

“Streamside plots” is a convenient name given to those linear plots which lie alongside watercourses (rivers, streams, canals and ditches). The S and W prefixes refer to the different sampling methods applied:

**S plots** The two Streamside plots are projected to the nearest watercourses to the two X plot locations that are farthest apart in the 1 km x 1 km square. This gives two random samples of the watercourses in the square. **10 m x 1m**

**W plots** Three further Waterside plots are used to sample additional watercourses. Two plots are located in a stratified random fashion to sample types of watercourse not sampled by the S plots. One W plot is then placed at the centre of the RHS sampling stretch. **10 m x 1 m**

Use the plot sketch map and photographs provided to locate Streamside plots.

### 4.10.1 Locating S/W plots

**S plots:** The two linear S plots should be located on watercourses such that they are as close as possible to the two X plots (200 m<sup>2</sup>) which are furthest apart. Once reached, the 10 m plot is laid out to the left and the 1 m width extends landwards from the point where it appears that water reaches when the watercourse is full. Only permanent watercourses should be included; ditches may be included if they appear to be normally wet.

**W plots:** The remaining two W plots should be placed at random to sample types of watercourse not already sampled by the S plots.

Plots should not be nearer than 10 m to each other, so if there is not more than 30 m of stream/ditch/river in the square, only one plot should be recorded. If the W plot coincides with a B plot, then it should be moved to the nearest permissible length of stream/river/ditch so that no part of the plot is within 10 metres of the B plot.

### 4.10.2 Laying out S/W plots

S and W plots are each **10 m x 1 m**. The waterside edge of the plot should be along what appears to be the normal highest point that water reaches (i.e. excepting flood situations). So if the watercourse is not in flood, then the 1 m width should extend upslope from the water surface. In dry grip drains or ditches the lower edge of the plot should run along the base of the drain. **Pay particular attention to the position of the plot in relation to the water's edge when drawing the sketch map and taking photos. A shift up or down the bank of only 10 cm or so could appreciably change the chances of recording species where these occupy narrow zones.** The most important thing is that your GPS point, sketch map and photos allow the plot to be positioned in exactly the same place when visited again.

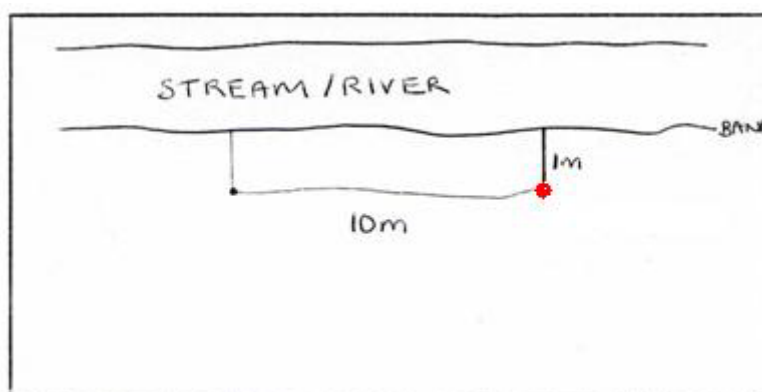
### 4.10.3 Recording S/W plots

#### HEADER

- **Freeboard:** Distance between current water level and level at which waters will overtop the bank or break of slope. <0.5m, 0.5-1m, 1-2m, >2m
- **Water course:** River, Canal, Stream, Ditch, Road ditch
- **Stream Width :** <1m, 1-2.5m, >2.5m
- **Stream type:** Dry, Wet, In flood

#### LISTED SPECIES

Species should be recorded on the recording tablet and cover estimates made.



*Laying out a streamside (S/W) plot. The red dot marks the corner where the differential GPS reading should be made*

### 4.11P Plots – Perpendicular Plots (P1-5)

A wide range of Glastir measures are designed to impact habitat diversity, structure and species composition along watercourses. P plots are designed to detect impacts resulting from the creation of buffer zones and other kinds of managed change that might take place up the bank and into the riparian buffer zone and adjacent habitats. **P plots are aligned perpendicular to, and centred on, each S and W plot to form a T shape.** Because they extend upslope they are likely to traverse different kinds of vegetation type and be internally very varied in their species composition. For example, a single P plot could record wetland herbs associated with the downslope end of the plot, through a scrub or woodland strip and then traverse a path, multiple boundary features and into an arable crop. These plots are therefore likely to be relatively species rich.



*Layout of P a plot. The red blob shows the location of the differential GPS point for the S or W plot. **The nest lengths here are an example only.** In reality the number of nests and their sizes will vary at the surveyor’s discretion up to a total of 6 nests i.e. from 0 to 5 as for the X plots*

### 4.11.1 Locating a P plot

There are a maximum of 5 P plots per square. They will be projected from the centre of each S and W plot. Each P plot will run directly upslope taking the shortest route toward the break of slope from the channel edge. This should mean that the direction upslope is approximately perpendicular to the direction of the S or W plot. **A compass bearing showing the direction upslope from the water’s edge must be carefully taken and recorded on each sketch map.** Particular care needs to be taken in recording the position of the P plot at its upslope limit. This is because any error in the angle at the bottom of the slope will translate into a larger shift in the plot position at the top of the slope. **If possible add distances to upslope features to help locate the upslope end of the P plot.** Note that the P plot starts 1 m up from the edge of the water course so that it does not overlap the middle of its associated S or W plot).

### 4.11.2 Laying out P plots

First, draft a plot location sketch map (if necessary) and take photographs marking the position of these on the sketch map. P plots should then be recorded in the same way as an S or W plot. However, the plot should be subdivided into a number of nests at the surveyor’s discretion and species recorded next to their nest number. The nesting is designed to help the surveyor with recording and to provide potentially useful information on the number of distinct vegetation types sampled within each P plot. In the *figure above*, the P plot is divided into three nests that coincide with three vegetation zones. The surveyor should decide how many nests to divide the plot into. A maximum of 5 nests is possible, numbered from 1 to 5, max. 10 m. **The critical job is to measure the length of each nest, number each nest and mark these clearly on the sketch map.** Having done this, each species is recorded starting at the bottom of the slope. Species are recorded against their nest number but once recorded, a species is not recorded again even if it occurs in another nest. **So, as you move upslope record species only once.** Once all species have been recorded as present in the plot then estimate total % cover values for each. Do not try and record cover values for each nest. The main aim is to effectively census the whole P plot. It is hoped that nesting will make for a more efficient search pattern just as it does in the X plots. The size and number of nests can also be turned into a diversity index indicating how the buffer strip changes in its habitat structure over time in parallel with its species composition.

▾ P plots  
 ▾ Enter max. length of nests (up to 5)  
 Max. length of P nest (m)  
 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ 10  
 [trash] 1 of 1 [plus]

**HEADER**

*There are no headers specific to P plots.*

**LISTED SPECIES**

Species should be recorded on the recording tablet for each nest identified (up to 5) and cover estimates made.

**Nest 1 (include X plot 0).  
Enter species:**

Species:

Total Cover  
Enter cover

1 of 1

▷ **Nest 2. Enter species:**

▷ **Nest 3. Enter species:**

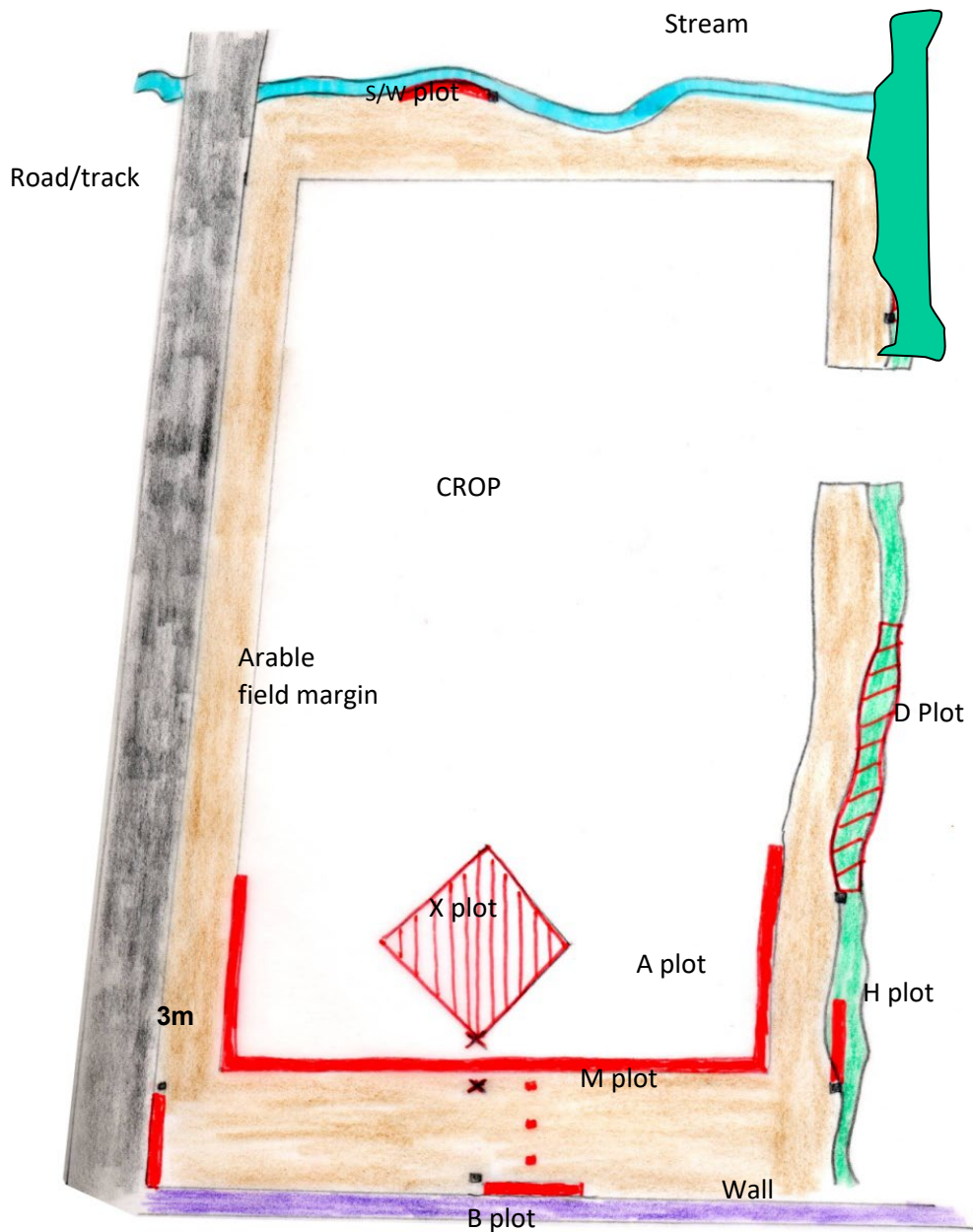
▷ **Nest 4. Enter species:**

▷ **Nest 5. Enter species:**

## 5 OTHER INFORMATION

The layout of plots in an arable field is summarised below. This figure demonstrates how the different plots relate to one another.

**The relationship between different plots in an arable field. *What are the deliberate mistakes in this diagram and what is missing?* See Appendix-2 for answers.**



## 6 GUIDELINES ON SPECIES IDENTIFICATION

### 6.1 Aggregations/Combinations

Surveyors are expected to record to the species level. However, there are certain species which are notoriously difficult to separate. In order to remain consistent with previous surveys, certain amalgamated taxa should be recorded.

The combinations were determined on the basis of experience, where it is considered that unless good specimens are available, it is not possible to identify the species accurately. A number of the species combinations have similar ecological amplitudes e.g. *Cardamine hirsuta/flexuosa*. Where the separate species name is known unequivocally, then it should be used; otherwise, the combination name should be used, as provided in the species list available on the tablet.

**Please DO NOT ATTEMPT TO UPROOT invasive species. If they are removed we cannot detect an increase in abundance and gather evidence that there may be a problem. Moreover trying to uproot these species may encourage them to spread further.**

*Also be aware that if you uproot a plant in a plot in order to identify it and it is the only individual present you are potentially changing the species richness and may also be causing a discrepancy to occur with the subsequent QA visit.*

### 6.2 Bryophytes and Lichens

Only the bryophytes and lichens listed (mosses only) on the Vegplots list (lichens, liverworts and mosses), should be recorded (with their individual cover values). **No other bryophytes or lichens should be recorded.**

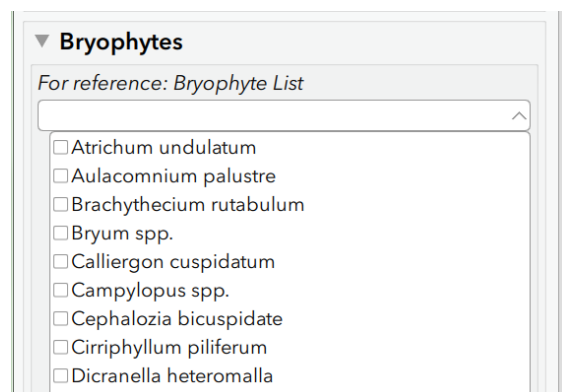
#### Sphagnum groups

*Sphagnum* (green/fat)\*

*Sphagnum* (green/thin)\*

*Sphagnum* (red/fat)\*

*Sphagnum* (red/thin)\*





The simple classification above includes the following species (following AJE Smith, *The moss flora of Britain and Ireland*, 1978).

**Green/Fat***S. compactum**S. molle**S. palustre**S. papillosum**S. squarrosum**S. strictum**S. subsecundum* (Sect.)*S. teres***Red/Fat***S. medium***Green/Thin***S. angustifolium**S. fimbriatum**S. fuscum**S. girgensohnii**S. fallax* (note this species can be confused with *S. angustifolium* and *S. flexuosum*)*S. russowii* (green form)*S. quinquefarium**S. cuspidatum***Red/Thin***S. subnitens**S. capillifolium**S. russowii* (red form)*S. warnstorffii*

### 6.2.1 List of mosses to be recorded in vegetation plots where possible

Note that **surveyors should put maximum effort into recording vascular plants - especially sedges and grasses - accurately and completely rather than spend effort on identifying bryophytes.**

Even if you record those listed below, this will often only represent part of the total. Hence attach the highest priority to recording 'Total bryophyte' and cover of the coarse *Sphagnum* categories.

No	Species	Compare with
1	<i>Atrichum undulatum</i>	<i>Plagiomnium undulatum</i>
2	<i>Aulacomnium palustre</i>	6,7
3	<i>Brachythecium albicans</i>	4, 5, 20
4	<i>Brachythecium rivulare</i>	3, 5, 20, <i>Sciuro-hypnum plumosum</i>
5	<i>Brachythecium rutabulum</i>	3, 4, 20
6	<i>Breutelia chryoscoma</i>	2,7
7	<i>Bryum pseudotriquetrum</i>	2,6
8	<i>Calliergonella cuspidatum</i>	9
9	<i>Calliergon giganteum</i>	8, <i>Calliergon cordifolium</i>
10	<i>Campyllum stellatum</i>	-
11	<i>Campylopus introflexus</i>	<i>Campylopus atrovirens</i> , <i>Grimmia</i> sp.
12	<i>Campylopus</i> sp.	16, 18
13	<i>Climacium dendroides</i>	52
14	<i>Palustriella commutatum</i>	<i>Cratoneuron filicinum</i>
15	<i>Ctenidium molluscum</i>	-
16	<i>Dicranella heteromalla</i>	12, 19
17	<i>Dicranum majus</i>	19
18	<i>Dicranum scoparium</i>	12, 16, 17
19	<i>Drepanocladus aduncus</i> Only in swamps, not flushes	47, <i>Scorpidium revolvens</i> , <i>S. cossonii</i> , <i>Warnstorfia fluitans</i> , <i>Sarmentypnum exannulatum</i>
20	<i>Eurhynchium</i> spp.	3, 4, 5
21	<i>Fissidens</i> sp.	37
22	<i>Fontinalis antipyretica</i>	<i>Fontinalis squamosa</i>
23	<i>Hedwigia stellata</i>	42
24	<i>Homalothecium lutescens</i>	25
25	<i>Homalothecium sericeum</i>	24
26	<i>Hookeria lucens</i>	-
27	<i>Hylocomium splendens</i>	53
28	<i>Hypnum cupressiforme</i>	29, 47
29	<i>Hypnum jutlandicum</i>	28
30	<i>Leucobryum glaucum</i>	<i>Sphagnum</i> spp.
31	<i>Mnium hornum</i>	7
32	<i>Neckera crispa</i>	-
33	<i>Pellia</i> spp.	<i>Riccardia</i> spp.
34	<i>Philonotis fontana</i>	-
35	<i>Plagiothecium</i> sp.	22
36	<i>Plagiothecium undulatum</i>	-
37	<i>Pleurozium schreberi</i>	40
38	<i>Polytrichum commune</i>	<i>Polytrichum formosum</i>
39	<i>Polytrichum juniperinum</i>	<i>Polytrichum piliferum</i>
40	<i>Pseudoscleropodium purum</i>	37
41	<i>Ptilidium ciliare</i>	-
42	<i>Racomitrium lanuginosum</i>	23
43	<i>Rhizomnium punctatum/pseudopunctatum</i>	31, <i>Plagiomnium</i> spp.
44	<i>Rhytidiadelphus loreus</i>	45, 46
45	<i>Rhytidiadelphus squarrosus</i>	44, 46
46	<i>Hylocomiadelphus triquetrus</i>	44, 45
47	<i>Scorpidium scorpioides</i>	19
48	<i>Sphagnum green/fat</i>	-
49	<i>Sphagnum green/thin</i>	-
50	<i>Sphagnum red/fat</i>	-
51	<i>Sphagnum red/thin</i>	-
52	<i>Thamnobryum alopecurum</i>	13
53	<i>Thuidium tamariscinum</i>	27

## 7 LANDSCAPE PHOTOGRAPHS: FIELD SURVEY METHODOLOGY

### PURPOSE

- To support the work to be undertaken in quantifying the landscape quality of the Welsh countryside.
- To provide repeatable, fixed-point photographs to monitor landscape change over time.
- To provide an objective photographic record of the 1 km x 1 km field survey sites, capturing the typical rather than just the prettiest view. The landscape analysis will attempt to quantify aspects of enclosure / openness / variety / texture as well as determining what can be seen from public rights of way. These landscape photographs will be an important tool in undertaking this work and will help to validate some of the spatial analysis methods being undertaken.

### METHOD

1. Photographs should be taken from the four X plot locations nearest to the centre point of each square. These have been preselected and are indicated on the map with a camera symbol.
2. Standing at the southern post of the X plot use a compass to orientate yourself due North. **To avoid cluttering the north facing photo with X plot paraphernalia make sure you take the photos before setting out the plot.**
3. Using the tablet camera with the horizon (if there is one) situated approximately  $\frac{2}{3}$  from the bottom of the photograph take the first photograph NORTH. Try to hold at a height which captures the view in front of you. This will be approximately between shoulder and eye height on most adults. Sometimes, due to the location, your horizon may be very short (blocked by a building, vegetation etc.) Default to eye height if in doubt. Check the photograph is in focus and is representative of your view. If not, delete and re-shoot. **Please photograph what you see, do not be tempted to move around to find a better view as this will make repeating the photography difficult in future years.**
4. Turn through 90 degrees clockwise to face due EAST, check your direction with a compass. Repeat the photograph.
5. Turn through 90 degrees clockwise to face due SOUTH, check your direction with a compass. Repeat the photograph.
6. Finish by turning through 90 degrees clockwise to face due WEST, check your direction with a compass. Repeat the photograph.
7. Check the focus and quality of your photographs at each stage.
8. If the camera has the option of taking a panorama photograph, then a 360 degree panorama from each of the four quadrant centres should also be attempted.
9. Repeat 3-8 for each of the 4 X plot locations.

## FIELD PRACTICALITIES

If conditions are poor (thick fog / poor visibility) then please make a note on the plot software to explain why photographs are missing.

EXAMPLES of a series of landscape photographs taken for random 1 km x 1 km squares, winter 2013.



South East quadrant



## 8 TREE DISEASES

There is much concern about the spread and impact of particular tree diseases (e.g. Ash Dieback, *Hymenoscyphus fraxineus*) and existing monitoring may be a good way of capturing this information. We have added a field to the recording of individual tree point features and there are also fields in the vegplot database. We would ask surveyors to think carefully about how accurately tree diseases can be recorded and how much time it would take. Information sheets on how to identify particular tree diseases are in *Appendix 6*.

## 9 APPENDIX-1: COLLECTOR & SURVEY123 APPS

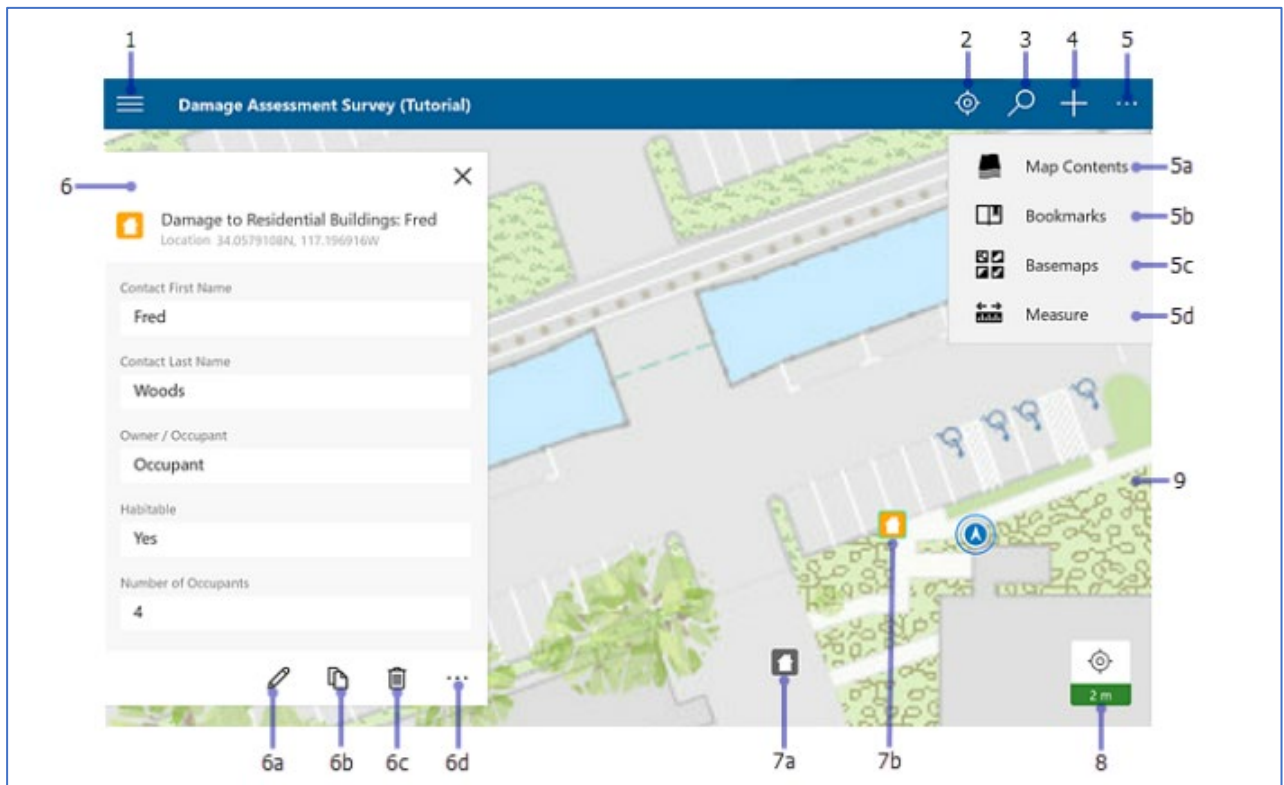
### Collector – Generic Notes

The main parts of the app are as follows:




- [Map](#)
- [Collect screen](#)
- [Map Gallery](#)
- [Menu](#)

### Map

The majority of your time in the app is spent interacting with the map, where a basemap and features display. This is the active open map used in your data collection. When viewing the map, you can collect data, begin measuring, and initiate all the other capabilities of the app. Use the Map Gallery to open a map.




The following features are numbered in this image of the map:

1. **Menu**—Expands the menu to display collections of maps and provides access to accounts and app settings.
2. **My Location** tool—Uses GPS to show your location on the map. To enable **My Location**, turn on location services in your device's settings. The icon changes to show the state of the GPS. The icon  indicates your location does not display on the map. Once your location is turned on, the icon  indicates your location displays on the map and is kept centred. As you move, the map moves on the screen to keep your location centred on the screen. Once you pan the map while your location displays, the icon  indicates your

location displays on the map but isn't kept centred. As you move, your location displayed on the map moves on the screen and can even move outside of the visible part of the map.

**Tip:**

When you don't need to see your location on the map, turn off **My Location** . This saves the battery by turning off not only the display of your location but also the GPS. If the map [tracks your location](#), it continues to do so when location is not displayed on the map, turning on the GPS when needed. If you're collecting data, the GPS turns back on as needed to get collection locations.

3. **Search** tool—Searches for a place-name, address, coordinate location, or feature. The map author configures the search and the hint text, which provides information about what you can search.
4. **Collect New** tool—Adds a feature.
5. **More**—Shows a menu of the additional tools available. The screen capture shows the menu.
  - 5a. **Map Contents** tool—Shows the legend and layers. If you turn layers on and off on the **Layers** tab, these changes are reflected in the legend. While this changes which features display on the map, it doesn't change the saved map or how the map appears to others.
  - 5b. **Bookmarks** tool—Goes to previously defined areas of interest. These include **Bookmarks** defined on the map and **My Places** that you've stored in your device.
  - 5c. **Basemaps** tool—Changes the basemap to another one that is either online or on your device. The basemap, also known as a reference or background map, provides the information displayed under the interactive features.

**Note:**

The map author can disable the ability to switch basemaps.

- 5d. **Measure** tool—Draws lines and shapes on the map, and calculates their lengths and areas in a variety of measurement units.

Note: The map author can disable the ability to measure. This is done with the map in measure mode, presenting a different set of tools and different behaviour. While viewing an open map, interacting with the map highlights features and presents information about them. In measure mode, interacting with the map adds vertices and updates the measurement.

6. **Panel**—Displays contextual information based on the tools being used and the interactions with the map. The possible contents include types for data collection, searches and search results, feature lists and feature details, and editable feature details. When displaying a list of search results or features, the selected item is highlighted on the map. Select a result or use **More** ... to interact with the result.

The screen capture shows the panel with the details of a feature. While feature details are displayed, the following tools are available:

- 6a. **Edit**—Starts editing the feature.
- 6b. **Copy**—Copies the feature to create a new feature.

Note: A feature can only be copied if it's editable. Copying is disabled on features that are the children in a relationship.

- 6c. **Delete**—Deletes the feature.


- 6d. **More**—Provides access to the **Zoom to** and **Add to my places** actions if applicable to the selected feature.
- 7. (a and b) **Features**—Each feature (in this example, a house) is an interactive piece of data on the map. As you work, you add, update, and delete features. When selected, the feature is highlighted on the map, as in the case of the feature marked b. They have additional information—including, in some cases, attachments—that can be viewed by selecting the feature to display its details in the **panel**.
 

*Note: In this help system, the word “feature” refers to an item of interest on the map with which you can interact. The traditional meaning of a feature on a map refers to any item of interest. However, in this app, some of the traditional features are part of the basemap (background) and are not interactive. For example, in the Damage Assessment Survey (Tutorial) sample map, the cities and lakes are a part of the basemap and do not have additional information or interactivity. Any houses are items on top of the basemap, and they have additional information with which you can interact. You can view information about and edit the houses, so the houses in that map are features.*
- 8. **Location Accuracy**—Indicates current horizontal GPS accuracy as well as whether it is below the location accuracy threshold. For details, see [How do I know the accuracy of the GPS positions I'm getting?](#) in the Collect Data [Troubleshooting](#) topic. To display more information about your current GPS location, such as vertical accuracy and fix type, select the badge.
- 9. **Map**—The map appears here, including a basemap and features. You can pan, zoom in, and zoom out to see other areas.

***My GPS locations are not being updated on the map, and after I select the location accuracy badge, it shows that it's taking increasingly longer to calculate a fix time. Why is this happening and how do I fix it?***

*The time on your Windows 10 device might be ahead. Collector calculates fix time by determining the difference between the time on your GPS receiver and the time on your Windows device. If the time on your Windows 10 device is ahead, Collector assumes that your GPS positions are invalid and discards them. To fix this, synchronise the time on your device with the time on the Internet.*

***How do I know the accuracy of the GPS positions I'm getting?***

When you have a map open and **My Location**  is on, displaying your location on the map, the **Location Accuracy** badge displays in the lower right corner of the map.



This indicates current horizontal accuracy as well as whether the current accuracy is below the location accuracy threshold required to use the GPS to collect data. If the horizontal accuracy is valid for data collection, the badge is green; if the accuracy is not good enough to use the GPS for data collection, the badge is red. If no positions have been received, dashes appear in the badge where the accuracy is supposed to display. If you are not receiving any position information and are using an external GPS receiver, first verify that your receiver is turned on and connected to Collector.

***How can I get more information about my current GPS location?***

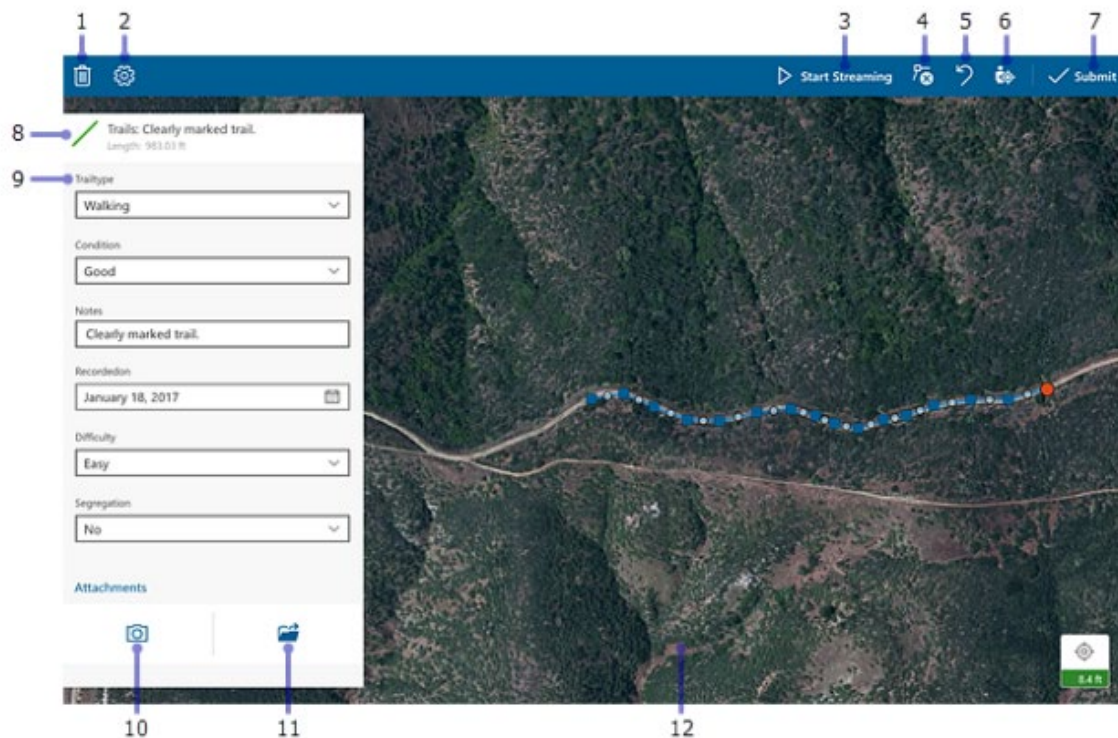
If you have a GPS location and want to see the details of that position, select the **Location Accuracy** badge in the lower right corner of the map to display information such as the time that the position was received, vertical accuracy, and fix type.





## Collect screen

This screen displays when you are collecting a new feature or editing the attributes of an existing feature. Use it to enter and save information about a feature, including attributes and attachments, as well as to set the feature's location. The collect screen also provides access to the location accuracy, streaming interval, and collection mode settings.



The following items are numbered on this image of the **Collect** screen:

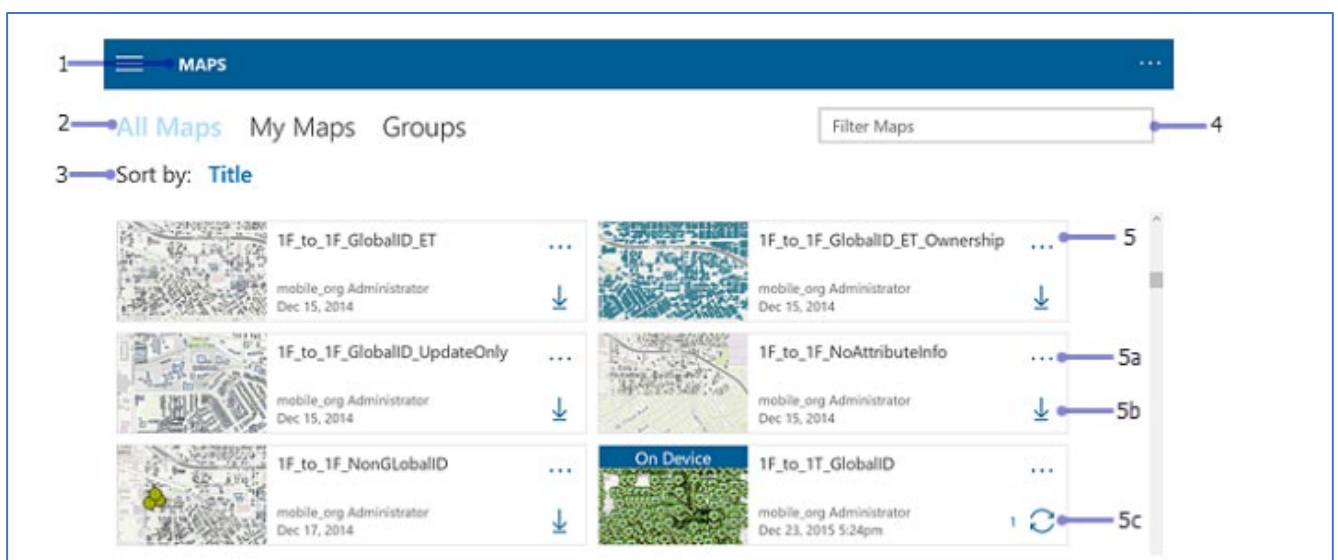
1. **Delete**—Provides options to discard the feature if you are collecting a new feature, discard your edits if you are editing an existing feature, or discard the shape of the feature if you are working with a line or polygon.
2. **Collect Settings**—Provides access to view and update location accuracy, streaming interval, and collection mode.
3. **Start Streaming**—Automatically collects a shape using your device's GPS, allowing you to walk or drive along a feature and capture its shape without manually placing points. When selected, it changes to Pause Streaming Pause Streaming, and you can't manually edit the shape. To make manual edits, pause streaming, make your updates, and restart streaming. You can only stream when collecting or editing a polygon or line.
4. **Delete Vertex**—Deletes the currently active vertex of your polygon or line feature. It only displays when you are collecting or editing a polygon or line feature.
5. **Undo**—Reverts the last change you made to the shape of a feature. For example, if you update the location of a feature or add a point to a shape you're drawing, selecting Undo discards these changes. However, if you edit a field in the Attributes list and select Undo, your field edits are unaffected and the last change made to the feature's shape is undone.
6. **Use My Location**—Updates the feature's location or adds a new vertex using the GPS.
7. **Submit**—Saves the feature and the data you collected about it.
8. **Feature type**—Indicates the type of feature you are collecting.
9. **Fields**—Enter information about the feature in each of the fields shown.

10. **Camera**—Take and add a new photo or video to a feature collection using the device's camera if attachments are enabled in the map.
11. **Browse**—Attach to a feature collection an existing item from the device, such as a photo, video, PDF file, or text document if attachments are enabled in the map.
12. **Map**—Allows you to create and edit the feature's shape. For details on working with the shape of features, see Draw a shape.

## Map Gallery

Use the Map Gallery to open, find, or manage maps. It displays lists of maps including both the collections from the menu and the maps of a group.

To go to the Map Gallery when viewing a map, select Menu and select a collection of maps. To change the collection of maps displayed, use the menu or select a group. To return to the open map, select the map's thumbnail at the top of the menu.







The following items are numbered on this image of the Map Gallery:


1. **Gallery title** - Describes the list of maps.
2. **Tabs** - Displays the selected category of maps. When viewing **Maps**, it has the following options:
  - **All Maps** (as shown in the image) - Shows all available maps, including those you authored and those available to groups of which you are a member.
  - **My Maps** - Shows all the maps you authored. They are shown as a flat list, ignoring any folders that you have set up.
  - **Groups** - Shows the groups of which you are a member. Choose a group to show the maps shared with that group.

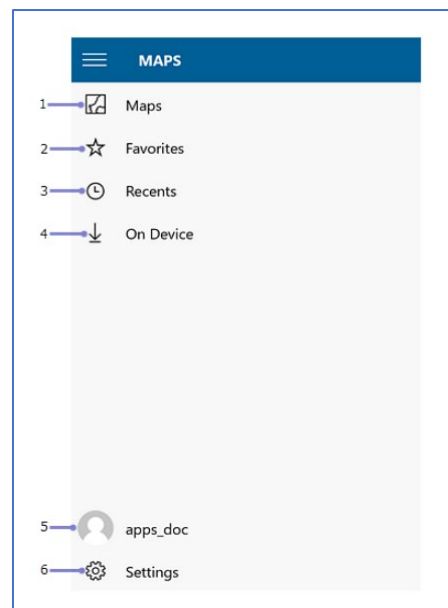
When viewing the On Device collection, **Maps** shows maps downloaded to your device, and **Basemaps** allows you to manage your basemaps.

3. **Sort by** - Allows you to sort maps by title, date, or owner.
4. **Filter Maps** - Filters the available maps to only display those maps with matching title, summary, or tags.
5. **Map Card** - An available map. Select the map card to open a map.

- 5a. **More** - Provides access to additional actions you can take with the map. These depend on the chosen map and can include **Details**, **Download**, **Sync**, and **Remove**. In the map's details, you can open the map , add the map to your favourites by choosing the star , and download the map  if that option is available.
- 5b. **Download** - Starts downloading your map. **Download** is only visible if the map can be taken offline.
- 5c. **Sync** - Syncs the data with the server. This only displays on downloaded maps. A count of unsynced edits displays beside **Sync** .

The following items are numbered on the image of the menu here:

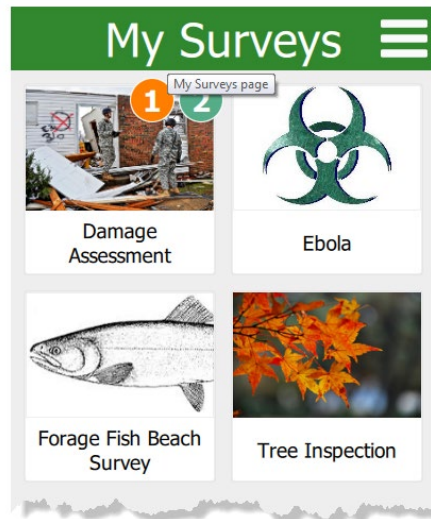
- 1. **Maps** - Displays **All Maps**, **My Maps**, and **Groups**.
- 2. **Favourites** - Displays your favourite maps. To make a map a favourite, select **More** **•••** on the map's card, select **Details**, and select **Favourite** .
- 3. **Recents** - Displays the maps recently used by the current account and on this device.
- 4. **On Device** - Displays the maps and basemaps you've downloaded to your device.
- 5. **Account** - Provides access to add, remove, or switch user accounts.
- 6. **Settings** - Provides access to view and update the app settings, such as location accuracy, streaming interval, collection mode, and measurement units. It also provides access to information about the licensing of the app.




## Survey123 - Generic Notes

### My Surveys

When starting the Survey123 field app and signing in with your ArcGIS organizational account, the app opens to the My Surveys page. This is the table of contents for all of your currently installed surveys, although it will be empty on first launching the app. Note that, once there is a survey downloaded onto your device, you will no longer need to sign in at launch.





To access the menu for a particular form, select its icon. Numbers in the corner of a survey's icon indicate unfinished or unsent results. If one has unfinished draft entries, the number of them will be listed in an orange circle, while the surveys queued to be sent later are numbered in a green circle. If a survey has inbox editing enabled, the amount of downloaded surveys in the inbox are numbered in a blue circle.

Use the Menu  at the upper-right to access the Download Surveys page, sign in with your ArcGIS organizational account, or view settings.

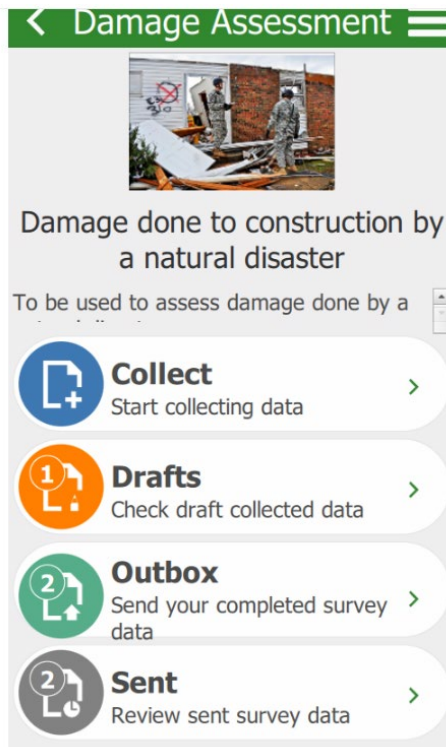
### Download Surveys

On the Download Surveys page, all surveys currently available to your account are listed alphabetically. In the following screen shot, the bottom survey has been downloaded,

evidenced by Download  being replaced by Refresh .


### Survey contents

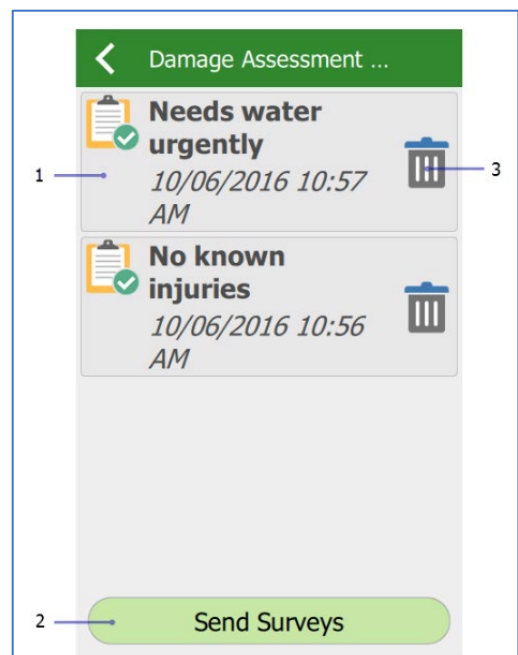
The survey contents page can be accessed by selecting a survey from My Surveys. Here, you can start collecting new data or access previously collected surveys.



The options on this page are as follows:

- Collect**—Opens a new, blank survey page for inputting data.
- Drafts**—Opens to a form currently left uncompleted by closing the survey before sending it.
- Outbox**—Opens to a listing of all forms finished but unsent, either by choice or due to the device being offline when submitting.
- Sent**—Contains the records of all forms submitted to the survey's creator.


The Menu  at the upper right contains the options to delete the survey from your device and to download an associated basemap (if this choice is not available, the survey has no basemap associated with it). The Drafts, Outbox, and Sent pages have similar layouts, with standardized buttons and functions. The following screen shot is of the Outbox page, but be aware that all three pages look and behave similarly:



The options on these pages are as follows:

Press the field for the form to reopen it. On the Sent page, this instead opens a copy of the form and its answers. The text in this field defaults to the raw data of the survey. To replace it with something else, see instance names.

The Send Surveys button on the Outbox page submits all forms currently listed within it. This button does not exist on the Sent page; however, the Sent page instead has an Empty Sent Surveys button, which clears the listing of all sent forms. It does not delete the surveys from their destination. There is no equivalent button on the Drafts page.


Delete  deletes the form from the device. This button is not present on the Sent page.

**Survey**

On the individual survey page, you can fill in the data requested by the survey's creator. Surveys are modular and designed for specific purposes, so the actual layout and presentation will vary from survey to survey. However, the Menu button and its contents remain the same throughout.

**Favourites**

To create a set of favourite answers that you can reuse, first complete a survey with your preferred answers, then open the


Menu  and select Set as favourite answers (1a) before submitting it. This saved survey will now be marked with a star icon in the Sent list, and the Paste answers from favourite option (1b) will become visible. This menu option will apply your favourite answers to the current survey automatically.



**Note:**

*Favourite answers are saved as a marker on the sent survey, signified by a gold star on their entry on the Sent page. If this survey is deleted from your device, the favourite answers will also be deleted.*


**Settings**

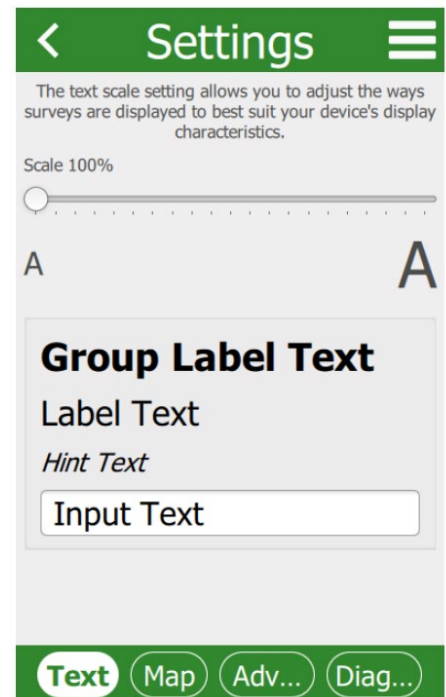
Accessed from the Menu  on the app's initial page, Settings contains a number of options and choices to customize the Survey123 field app to your preference.

**Text settings**

The slider on the Text tab allows you to alter the scale of text within the app, up to 200 percent of the default. The text preview updates in real time to display the currently selected scale.

**Map settings**

Designate the Map Library Folder, from which the app will pull offline basemaps. The Map Library can be accessed within the app through the Menu button  in the Settings pages.



## Advanced Settings

Reinitialize Database returns the device's survey database to the default; all surveys, complete or incomplete, are deleted, and the submitted surveys list is cleared.

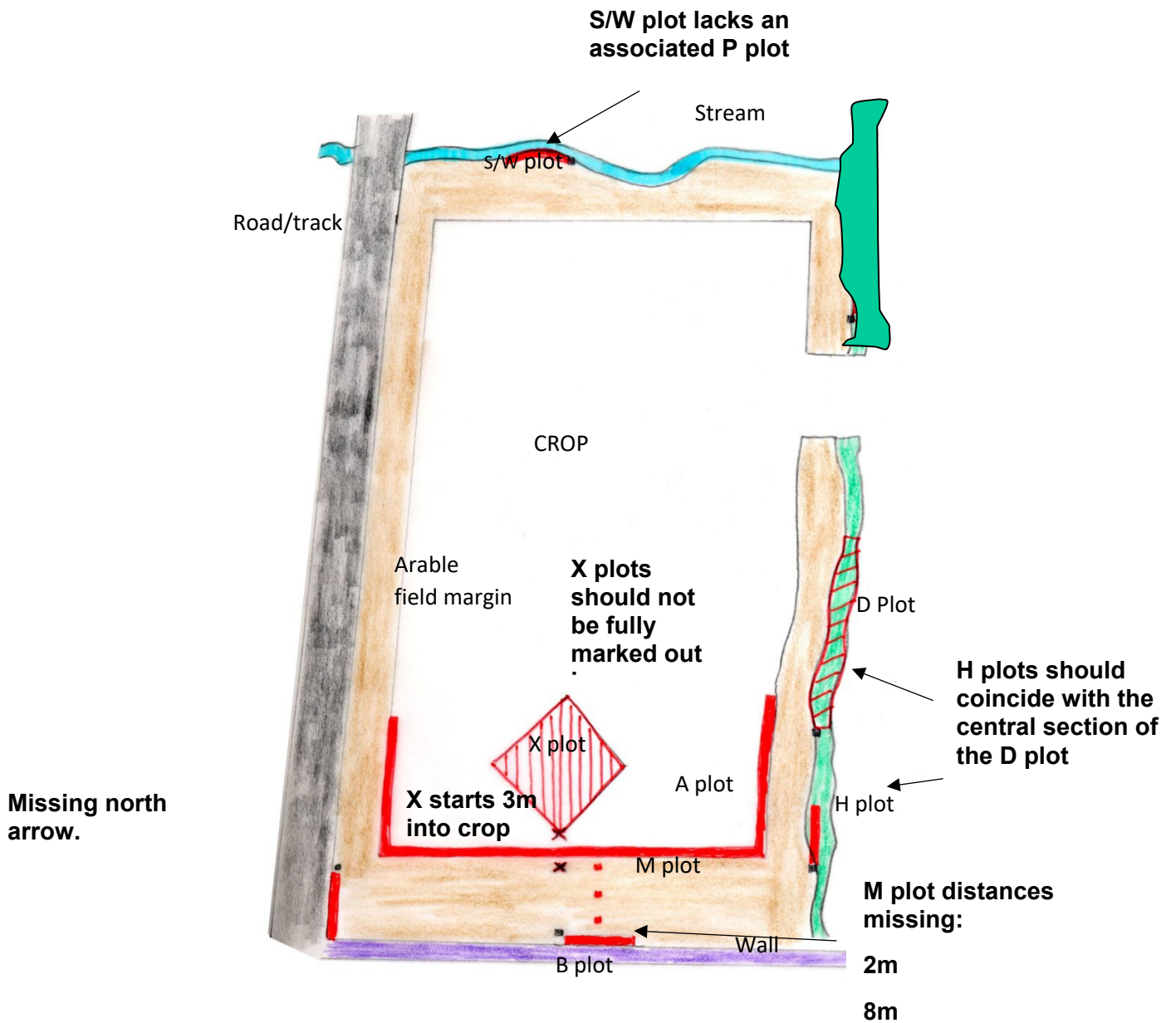
Fix Database fixes the existing entries in the survey database on your device when the folder path for the database has changed. This is required when you update the version of the Survey123 field app on iOS from the App Store. When the app is updated, its location on the device changes. Fixing the database ensures the new folder path is used for existing records. This tool is also useful if you want to copy a database from one device to another to send records. After copying the .sqlite database from one device to another, click Fix Database on the destination device to fix the data paths.

For additional details, see Recover data from a mobile device.

Delete Submitted Surveys clears the submitted surveys list for all surveys saved onto the device.

Clear Map Cache deletes the cache of map tiles that surveys have loaded. The button also lists the current size of the cache on the device

# 10 APPENDIX-2: DELIBERATE MISTAKES AND OMISSIONS ANSWERS





## 11 APPENDIX-3: RANDOM NUMBERS BETWEEN 0 AND 1

0.155	0.209	0.487	0.595	0.561	0.558	0.194	0.687	0.307	0.409
0.779	0.215	0.509	0.000	0.869	0.309	0.891	0.194	0.005	0.633
0.171	0.198	0.250	0.442	0.059	0.991	0.158	0.276	0.425	0.275
0.250	0.703	0.995	0.534	0.883	0.677	0.988	0.454	0.134	0.087
0.138	0.225	0.544	0.869	0.586	0.315	0.795	0.094	0.727	0.604
0.488	0.177	0.995	0.098	0.888	0.840	0.769	0.758	0.854	0.894
0.733	0.131	0.203	0.195	0.976	0.244	0.340	0.143	0.662	0.556
0.864	0.059	0.507	0.460	0.002	0.811	0.731	0.104	0.935	0.130
0.016	0.999	0.734	0.142	0.978	0.014	0.376	0.025	0.141	0.212
0.512	0.844	0.965	0.270	0.550	0.772	0.127	0.470	0.810	0.855
0.523	0.534	0.173	0.640	0.117	0.653	0.156	0.765	0.838	0.815
0.046	0.296	0.654	0.627	0.674	0.990	0.822	0.663	0.585	0.574
0.464	0.666	0.094	0.851	0.115	0.439	0.234	0.799	0.583	0.347
0.046	0.590	0.935	0.373	0.205	0.991	0.658	0.811	0.443	0.204
0.734	0.862	0.755	0.298	0.262	0.702	0.534	0.408	0.573	0.794
0.461	0.925	0.486	0.588	0.725	0.513	0.371	0.566	0.295	0.644
0.112	0.091	0.123	0.452	0.016	0.948	0.060	0.294	0.591	0.868
0.560	0.953	0.872	0.851	0.695	0.414	0.478	0.016	0.405	0.114
0.961	0.249	0.888	0.487	0.787	0.618	0.179	0.551	0.357	0.483
0.907	0.704	0.374	0.368	0.488	0.986	0.153	0.920	0.696	0.291
0.148	0.064	0.627	0.417	0.144	0.496	0.620	0.018	0.317	0.982
0.059	0.101	0.227	0.311	0.628	0.674	0.271	0.517	0.693	0.735
0.720	0.083	0.070	0.576	0.904	0.508	0.118	0.036	0.933	0.321
0.637	0.288	0.257	0.037	0.757	0.006	0.303	0.145	0.960	0.236
0.418	0.776	0.970	0.710	0.856	0.392	0.416	0.409	0.841	0.537
0.348	0.950	0.318	0.431	0.709	0.766	0.097	0.004	0.511	0.650
0.966	0.540	0.731	0.384	0.376	0.079	0.900	0.778	0.312	0.978

## 12 APPENDIX-4: HABITAT KEY AND ALLOCATION RULES TO BROAD AND NON-COASTAL PRIORITY HABITATS

(Adapted for GMEP)

*Simon Smart, Bob Bunce, Rob Large, Pete Carey, Dave Howard, Keith Kirby, Lindsay Maskell and incorporating Suggestions from Stuart Smith, Jim Latham, Clare Burrows, Mark Crick, Ian Strachan, Keith Kirby, Alex Turner and Heather Robertson.*

		Numbered links plus Broad & Priority Habitats	Primary attributes	NVC units (indicative list only)
<b>1a</b>	Total vegetation cover may be variable but where present consists of over 75% herbaceous species.	<b>2</b>		
<b>1b</b>	Vegetation cover consisting of over 25% canopy cover of trees or shrubs over 1m high.	<b>16</b>		
<b>1c</b>	Vegetation with over 25% cover of dwarf shrubs, less than 1m. Includes dwarf <i>Ulex europaeus</i> , <i>Ulex galii</i> and <i>U. minor</i> , <i>Calluna</i> , <i>Erica</i> spp., <i>Vaccinium</i> spp. <i>Empetrum</i> and <i>Arctostaphylos</i> . Does not include <i>Salix repens</i> in dune slacks.	<b>20</b>		
<b>1d</b>	Saxicolous (on rock) and chasmophytic (in crevices), non-coastal vegetation cover less than 50% with residual cover being <u>rock</u> . Includes species such as <i>Cryptogamma crispa</i> , <i>Cystopteris fragilis</i> , <i>Gymnocarpium robertianum</i> and <i>Asplenium trichomanes</i> . Includes scree, mine spoil and other unvegetated rock surfaces that may be sparsely vegetated- see attribute descriptions.	Inland Rock (BH 16). Go to 25 for breakdown to PH.	<i>Rock vegetation</i>	OV38-40, U16, U17, U21
<b>1e</b>	Unvegetated e.g. sea/other water bodies, bare rock or peat, artificial surfaces/built land. See 2c for ploughed land. See guidance notes for post-clearfell vegetation	Exit key -not vegetation, see note on bare ground		
<b>2a</b>	Vegetation consisting of Bracken at ≥95% cover with or without a sparse herbaceous understorey. Stands that have not yet peaked in seasonal biomass should still be recorded as dense Bracken if you believe peak cover is likely to be at least 95%. Note that bracken can occur in amongst boulders and scree. Consideration should be made to map as mosaic with inland rock habitats in this situation.	Dense Bracken (BH 9)	<i>Bracken at 95-100% cover</i>	U20, W25
<b>2b</b>	Bracken <95% cover or absent – the species code for Bracken plus cover intervals should be used in conjunction with any other primary and secondary attributes and relevant BH e.g. Acid grassland. Hence, the underlying species assemblage requires further keying.	<b>3</b>		U20, W25, other grasslands and heaths
<b>2c</b>	Vegetation consisting of crops (including grass leys in arable rotation). Note that ploughed land should be indicated as such but a primary attribute used to reflect the previous crop where this can be identified. If not possible, use 'ploughed land' as a primary attribute (also see guidance notes for Orchards).	Arable and Horticultural (BH 4)	<i>Theme: Agricultural crop. crops listed in drop-down box</i>	
<b>3a</b>	Vegetation containing halophytic species	4		
<b>3b</b>	Vegetation not as above.	5		

		<b>Numbered links plus Broad &amp; Priority Habitats</b>	<b>Primary attributes</b>	<b>NVC units (indicative list only)</b>
<b>4a</b>	Vegetation consisting of frequent to dominant halophytes, usually on mud often much bare ground.	26		
<b>4b</b>	Vegetation with halophytes prominent. On sea cliffs.	Maritime cliffs and slopes vegetation Priority Habitat PH (BH Supra-littoral Rock)	<i>Maritime vegetation</i>	
<b>4c</b>	Vegetation growing on sand dunes including yellow dunes, grey dunes and slacks.	Sand dune Priority Habitat (BH 19 Supra-littoral sediment)	<i>Sand dune vegetated</i>	
<b>4d</b>	Generally linear vegetation, just above the high-tide mark, consisting of halophytes such as <i>Cakile maritima</i> , <i>Agropyron junceiforme</i> and <i>Honkenya peploides</i> . Sometimes with generalist ruderals such as <i>Stellaria media</i> and <i>Rumex obtusifolius</i> .	Strandline/Coastal vegetated shingle Priority Habitat (BH 19 Supra-littoral sediment)	<i>Strandline vegetation</i>	
<b>4e</b>	Sparsely vegetated shingle with halophytes such as <i>Rumex crispus</i> , <i>Crambe maritima</i> , <i>Glaucium flavum</i> , <i>Silene uniflora</i> , <i>Beta vulgaris maritima</i> , <i>Lathyrus japonicus</i> , <i>Picris echioides</i>	Strandline/Coastal vegetated shingle Priority Habitat (BH 19)	<i>Strandline vegetation</i>	
<b>4f</b>	<i>Phragmites australis</i> is dominant but with halophytic species in underlayer	Reedbeds Priority Habitat (BH 11 Fen, Marsh, Swamp)		
<b>5a</b>	<b>Pulse-disturbance vegetation.</b> Includes assemblages whose <b>species composition</b> suggests disturbance in the past but with no evidence of being subject to recent sustained management cycles that involve grazing with or without mowing. Two specific groups of plant assemblage are included here. Firstly, <b>wetland tall-herb</b> including reedbeds, sedge swamps and tall-herb dominated gaps in wet woodland plus emergent aquatic vegetation that is often zoned and on the fringes of waterbodies. The second group includes very diverse <b>communities of drier soils</b> assembling in response to previous unpredictable disturbance. Often found in urban situations, in woodland gaps and clearfell or on linear features but including setaside – see guidance notes for further details.	<b>6</b>		
<b>5b</b>	<b>Press-disturbance vegetation.</b> Includes all grazed <b>upland and lowland grasslands along with meadows and silage fields</b> . Also included are those <b>amenity grasslands</b> which maybe rabbit grazed but are generally managed by frequent repeated mowing. Also included are areas of <b>monocot rather than dwarf shrub dominated bogs and heaths</b> – see guidance notes for further details. Plant assemblages may reflect wet to dry, acid to calc conditions but the common feature is that they experience a relatively stable, cyclic disturbance regime where biomass is removed by annual cutting or/and continuous grazing at <b>varying</b> intensities.	<b>8</b>		
<b>6a</b>	Wetland tall herbs or sedges frequent to dominant.	<b>6c-g</b>		

		Numbered links plus Broad & Priority Habitats	Primary attributes	NVC units (indicative list only)
<b>6b</b>	Wetland tall herbs occasional to absent.	<b>7a-c</b>		
<b>6c</b>	Terrestrial vegetation growing on lowland peat soils often with or without scattered Alder or Willow. Species include <i>Carex paniculata</i> , <i>C. acutiformis</i> , <i>C. rostrata</i> , <i>C. elata</i> , <i>C. riparia</i> , <i>Iris pseudacorus</i> , <i>Filipendula ulmaria</i> , <i>Phragmites australis</i> (but not virtually pure stands), <i>Equisetum fluviatile</i> , <i>Eupatorium cannabinum</i> , <i>Lythrum salicaria</i> . See guidance notes.	Fen Priority Habitat (BH 11 Fen, Marsh, Swamp)	<i>Fen</i>	S1-S28 (but not S4) M27, M28, OV26
<b>6d</b>	Aquatic vegetation where macrophytes persist as emergents within standing water. Species include <i>Typha</i> spp., <i>Schoenoplectus</i> , <i>Ranunculus fluitans</i> , <i>Sparganium</i> spp, <i>Sagittaria</i> , <i>Hippuris</i> and others. Does not include beds of floating and submerged aquatics eg. <i>Chara</i> spp., <i>Potamogeton</i> spp., <i>Ceratophyllum</i> spp.	Aquatic macrophytes (BH Rivers and streams)	<i>Aquatic macrophytes</i>	
<b>6e</b>	Stands dominated by <i>Phragmites australis</i> in standing saline or freshwater.	Reedbeds Priority Habitat (BH 11 Fen, Marsh, Swamp)	<i>Reedbed</i>	S4, S24, S25, S26
<b>6f</b>	Vegetation fringing open water often developed as a narrow (<0.5m wide or <0.25ha in extent) part of a hydrosere between standing water and upslope vegetation. Species include <i>Valeriana officinalis</i> , <i>Epilobium hirsutum</i> , <i>Filipendula ulmaria</i> , <i>Oenanthe crocata</i> , <i>Stachys palustris</i> and <i>Lythrum salicaria</i> .	Aquatic marginal vegetation (BH 11 Fen, Marsh, Swamp)	<i>Aquatic marginal vegetation</i>	
<b>6g</b>	Fertile, wetland tall-herb vegetation with less than 50% grass cover. Dominated by characteristic species such as <i>Epilobium hirsutum</i> , <i>Urtica dioica</i> , <i>Filipendula ulmaria</i> , <i>Phragmites</i> , <i>Arrhenatherum</i> .	Fen Priority Habitat (BH 11 Fen, Marsh, Swamp)	<i>Tall herb wetland vegetation</i>	OV26
<b>7a</b>	Mid to late-successional pulse-disturbance vegetation consisting entirely of long-lived perennials with little or no open ground. Vegetation with over 50% grass cover. <i>Arrhenatherum</i> , <i>Dactylis</i> and <i>Elymus repens</i> usually dominate but scattered shrubs and tall herbs maybe present particularly along linear features such as road verges, field boundaries, tracksides and ditch banks.	Neutral Grassland (BH 6)	<i>Tall unmanaged neutral grass</i>	OV23, OV25, OV27, MG1
<b>7b</b>	Early-successional pulse-disturbance vegetation dominated by annual weeds as well as perennial species usually with some open ground present. Open ground usually conspicuously present. Actual species composition dependent upon starting point. <b>Unsovn setaside</b> will usually key out here. Indicators include <i>Poa annua</i> , <i>Plantago major</i> , <i>Agrostis stolonifera</i> , <i>Polygonum aviculare</i> , <i>Persicaria maculosa</i> , <i>Anisantha sterilis</i> , <i>Stellaria medi</i> and a diverse range of arable weeds. Excludes weed assemblages with managed crops present. These key out at <b>2c</b> .	Arable and Horticultural BH (BH 4) or Urban (BH 17)	<i>Annual /early successional with open ground</i>	OV21-23
<b>7c</b>	Vegetation containing some annual weeds but consisting mainly of long lived perennials including some grasses but <50% cover. Some shrubby species may be present as infrequent juveniles. Species include <i>Urtica dioica</i> , <i>Galium aparine</i> , <i>Chamaerion angustifolium</i> , <i>Cirsium arvense</i> , <i>Arrhenatherum elatius</i> and <i>Poa trivialis</i> . Includes stands dominated by invasive aliens such as	Neutral Grassland (BH 6)	<i>Perennial vegetation, tall herb/grass</i>	OV24

		Numbered links plus Broad & Priority Habitats	Primary attributes	NVC units (indicative list only)
	<i>Reynoutria japonica</i> , <i>Impatiens glandulifera</i> and <i>Heracleum mantegazzanum</i>			
<b>7d</b>	50-80% cover of grasses (notably <i>Holcus lanatus</i> ) on old mine spoil or serpentine soils, with metalophyte species occurring e.g. <i>Minuartia verna</i> , <i>Thlapsi arvense</i> , <i>Armeria maritima</i> , <i>Silene maritima</i> , <i>Thlapsi caerulescens</i> , <i>Lychnis alpina</i> , <i>Cerastium nigrescens</i> .	Calaminarian Grassland Priority Habitat (Inland Rock BH16)-		
<b>8a</b>	Grassland of many types with Mature and/or Ancient trees present (much lower than 25% cover), often in a parkland setting. Record this habitat and continue key for overlapping habitats.	Wood-pasture and Parkland Priority Habitat (not currently on PH/BH list)	<i>Record as grassland with parkland as Primary qualifier</i>	
<b>8b</b>	Vegetation usually dominated by palatable grasses with a rich or poor suite of accompanying herbs that indicate neutral, dry or damp soils. <b>Calcareous or acid indicator species infrequent, rare or absent.</b> Neutral indicators include <i>Trifolium repens</i> , <i>Lolium perenne</i> , <i>Stellaria media</i> , <i>Cynosurus cristatus</i> , <i>Trifolium pratense</i> , <i>Centurea nigra</i> , <i>Lotus corniculatus</i> , <i>Cerastium fontanum</i> , <i>Rumex acetosa</i> , <i>Ranunculus repens</i> , <i>Juncus inflexus</i> , <i>Juncus effusus</i> , <i>Montia fontana</i> , <i>Glyceria fluitans</i> , <i>Poa trivialis</i> , <i>Agrostis stolonifera</i> , <i>Juncus bufonius</i> and <i>Alopecurus geniculatus</i> .	<b>9</b>		
<b>8c</b>	Calcareous indicators of wet or dry ground present eg. <i>Galium verum</i> , <i>Briza media</i> , <i>Carlina vulgaris</i> , <i>Cirsium acuale</i> , <i>Sanguisorba minor</i> , <i>Sesleria albicans</i> , <i>Helianthemum nummularia</i> , <i>Cirsium dissectum</i> , <i>Carex pulicaris</i> , <i>C. flacca</i> , <i>C. panicea</i> , <i>Eriophorum latifolium</i> , <i>Gymnadenia conopsea</i> .	<b>10</b>		
<b>8d</b>	Acid indicators present (includes a large range of acid grassland, moorland, heath and peatland species).	<b>11</b>		
<b>9a</b>	Productive grasses and <i>Trifolium repens</i> usually (see below) dominate mainly <i>Lolium</i> , <i>Phleum pratense</i> , <i>Dactylis</i> , <i>Cynosurus</i> , <i>Holcus lanatus</i> and the larger <i>Festuca spp.</i> <i>Agrostis capillaris</i> , <i>Cynosurus cristatus</i> and <i>Anthoxanthum odoratum</i> may be present at the less fertile end of the gradient. In wet grasslands <i>Juncus effusus</i> , <i>Deschampsia cespitosa</i> , <i>Glyceria fluitans</i> , <i>Alopecurus geniculatus</i> and <i>Festuca arundinacea</i> may be abundant. Varies from pure grass to moderately species rich grassland but hay meadow Priority Habitat indicators are always rare or absent. Some fields may be dominated by <i>Ranunculus</i> and/or <i>Trifolium repens</i> .	<b>17</b>		

		<b>Numbered links plus Broad &amp; Priority Habitats</b>	<b>Primary attributes</b>	<b>NVC units (indicative list only)</b>
<b>9b</b>	Cover of grass species <i>Trifolium repens</i> and sown <i>T. pratense</i> usually less than 50%. Typically rich in forb species with frequent Priority Habitat <b>lowland</b> meadow indicators including <i>Lathyrus pratensis</i> , <i>Lotus corniculatus</i> , <i>Leucanthemum vulgare</i> , <i>Galium verum</i> , <i>Primula veris</i> , <i>Centaurea nigra</i> , <i>Leontodon hispidus</i> , <i>Ranunculus bulbosus</i> or on flood meadows some of <i>Caltha palustris</i> , <i>Sanguisorba officinalis</i> , <i>Filipendula ulmaria</i> and <i>Alopecurus pratensis</i> . Note that vegetation dominated by <i>F. ulmaria</i> keys out at <b>6g</b> .	Lowland hay meadows Priority Habitat (BH 6 Neutral Grassland)	<i>Herb-rich grassland</i>	MG4, MG5, MG8
<b>9c</b>	Cover of grass species and clover usually less than 50% with a high proportion of Priority Habitat <b>upland</b> meadow indicators such as <i>Geranium sylvaticum</i> , <i>Alchemilla</i> spp., <i>Trisetum flavescens</i> , <i>Conopodium majus</i> and <i>Anthoxanthum odoratum</i> .	Upland hay meadows Priority Habitat (BH 6 Neutral Grassland)	<i>Herb-rich grassland</i>	MG3
<b>9d</b>	Neutral flushes typically picking out enriched springlines and water seepage zones in lowland or upland situations. <b>Acidic and calcareous indicators are absent or rare</b> . Characteristic species include <i>Agrostis stolonifera</i> , <i>Calliergon cuspidatum</i> , <i>Lotus uliginosus</i> , <i>Montia fontana</i> , <i>Alopecurus geniculatus</i> , <i>Juncus articulatus</i> , <i>Caltha palustris</i> , <i>Brachythecium rivulare</i> , <i>J. bufonius</i> , <i>Glyceria fluitans</i> , <i>Ranunculus acris</i> , <i>Veronica beccabunga</i> , <i>Chrysosplenium oppositifolium</i> .	Fen, Marsh, Swamp Broad Habitat (BH 11)	<i>Flush</i>	
<b>9e</b>	Not as above.	<b>10</b>		
<b>10a</b>	Vegetation on dry ground with scattered sedges and many calcicoles present. Can be relatively species poor but often species rich with >50% forb cover. On calcareous soils, usually rendzinas on chalk or limestone in lowland Britain. Indicators include <i>Bromus erectus</i> , <i>Brachypodium pinnatum</i> , <i>Linum catharticum</i> , <i>Sanguisorba minor</i> , <i>Carlina vulgaris</i> , <i>Cirsium acaule</i> , <i>Hippocrepis comosa</i> and <i>Asperula cynanchica</i> , <i>Filipendula vulgaris</i> , <i>Galium verum</i> , <i>Briza media</i> , <i>Koeleria macrantha</i> and <i>Helianthemum nummularia</i> .	Lowland Calcareous Grassland Priority Habitat (BH 7 Calcareous Grassland)	<i>Lowland Calcareous grassland</i>	CG1-CG9, CG10,
<b>10b</b>	As <b>10a</b> but often low in species richness. Often dominated by <i>Sesleria albicans</i> with <i>Festuca ovina</i> , <i>Thymus praecox</i> , <i>Galium sternerii</i> and <i>Agrostis capillaris</i> characteristic. Stands may comprise a confusing mix of calcicoles and acidophiles. Montane forms sometimes contain Arctic-Alpine plants, such as <i>Alchemilla alpina</i> , <i>Polygonum viviparum</i> and <i>Silene acaulis</i> . <i>Dryas octopetala</i> is also locally indicative.	Upland Calcareous Grassland Priority Habitat (BH 7 Calcareous Grassland)	<i>Upland Calcareous grassland</i>	CG10-CG14, U5c
<b>10c</b>	Rush or/and <i>Molinia</i> dominated vegetation usually on peat or peaty-gley soils with <i>Juncus acutiflorus</i> and/or <i>subnodulosus</i> abundant. Usually on level ground in lowland or marginal uplands. Acid indicators may be present but especially notable are uncommon assemblages of rich fen species such as <i>Juncus subnodulosus</i> , <i>Carex pulicaris</i> , <i>C. hostiana</i> , <i>Cirsium dissectum</i> , <i>Epipactis palustris</i> , <i>Crepis paludosa</i> , <i>Geum rivale</i> , <i>Briza media</i> , <i>Gymnadenia conopsea</i> and <i>Serratula tinctoria</i>	Purple Moor Grass and Rush Pastures Priority Habitat (BH 11 Fen, Marsh, Swamp)	<i>Purple moor grass rush pasture</i>	M22, M24, M26

		Numbered links plus Broad & Priority Habitats	Primary attributes	NVC units (indicative list only)
10d	Localised areas of vegetation, often visibly associated with seepage zones where water movement is vertical (topogenous mires) or lateral (soligenous mires). Usually with several sedge species and species of wet soils. Includes <i>Briza media</i> , <i>Schoenus nigricans</i> , <i>Pinguicula vulgaris</i> , <i>Parnassia palustris</i> , <i>Carex hostiana</i> , <i>Carex dioica</i> , <i>Drosera anglica</i> , <i>Eriophorum latifolium</i> , <i>Primula farinosa</i> . Often with abundant <i>Molinia</i> .	Fen Priority Habitat (BH 11 Fen, Marsh, Swamp)	Flush	M9-14
10e	Not as above	11		
11a	Rush or/and <i>Molinia</i> dominated vegetation usually on peaty-gley soils with <i>Juncus acutiflorus</i> or <i>Juncus effusus</i> abundant to dominant. Indicators of rich fen are absent. Instead typical species include <i>Galium palustre</i> , <i>Cirsium palustre</i> , <i>Ranunculus flammula</i> , <i>Agrostis canina</i> , <i>Mentha aquatica</i> , <i>Achillea ptarmica</i> , <i>Equisetum palustre</i> , <i>Cardamine pratensis</i> , <i>Epilobium palustre</i> and <i>Angelica sylvestris</i> <sup>3</sup> .	Purple Moor Grass and Rush Pastures Priority Habitat (BH 11 Fen, Marsh, Swamp)	Purple moor grass rush pasture	M23, M25
11b	Not as above.	12		
12a	Localised narrow wet areas of vegetation or obvious flushing. Vegetation usually dominated by acidiphilous species eg. <i>Sphagnum</i> spp, <i>Juncus effusus/articulatus/acutiflorus</i> , <i>Carex echinata</i> , <i>Ranunculus flammula</i> , <i>Stellaria alsine</i> , <i>Carex rostrata</i> , <i>Carex nigra</i> . Often bryophyte rich.	Fen Priority Habitat (BH 11 Fen, Marsh, Swamp)	Flush	M4-8
12b	Vegetation with many acid indicators. Not associated with clearly defined flushes and depressions but characterising larger, more extensive drier or wetter ground. Hence, all bogs with low cover of dwarf shrub heaths plus upland and lowland acid grasslands key out here.	13		
13a	Sub-arctic indicators present, for example prostrate <i>Salix herbacea</i> and <i>Calluna</i> , , <i>Carex bigelowii</i> , <i>Juniperus communis ssp. nana</i> , <i>Empetrum nigrum ssp hermaphroditum</i> and <i>Racomitrium lanuginosum</i> . Includes montane, snowbed and sub-arctic sedge and rush communities on raw thin podzols, rankers and semi-skeletal soils.	Montane (BH 15)	Sub-arctic (Montane)	U7-12, U14-15, H13-15, H17, H19, H20, H22, W20
13b	Sub-arctic indicators not present, Peatland species under 25% on variable soil types. <i>Juncus effusus</i> , <i>J. conglomeratus</i> and <i>J. acutiflorus</i> can be abundant.	14		
13c	Sub-arctic indicators not present , Cover of peatland species over 25%. Indicators include <i>Tricophorum</i> , <i>Molinia</i> , <i>Sphagnum</i> , <i>Eriophorum</i> spp., <i>Juncus squarrosus</i> and <i>Myrica</i> . Usually on deep-peats or wet peaty rankers. <i>Juncus effusus</i> and <i>J. acutiflorus</i> scarce or absent	15		

<sup>3</sup> Species-poor *Molinia* stands when associated with upland bog systems and flushes will key out as Moorland grass or be included pragmatically in a wider blanket bog unit. Similarly, grazed Fertile and Acid grasslands in the uplands and west of Britain can have a frequent to dominant overstorey of *Juncus effusus* and should be placed in those BH rather than in Purple Moor grass and Rush Pastures. Hence, to qualify as Purple Moor-grass and Rush pasture PH the stand must have a reasonable representation of the listed indicator species.

		Numbered links plus Broad & Priority Habitats	Primary attributes	NVC units (indicative list only)
14a	Fine grasses predominate in generally dry situations eg. <i>Agrostis curtisii</i> , <i>Festuca ovina</i> and <i>Anthoxanthum odoratum</i> usually on brown podzolic soils or rankers. Acid indicators present eg. <i>Galium saxatile</i> , <i>Potentilla erecta</i> , <i>Pleurozium schreberi</i> and <i>Rumex acetosella</i> .	Acid Grassland (BH 8)	<i>Acid grassland</i>	U2, U4
14b	Grassland that can include a high proportion of bare ground or with a high proportion of <i>Cladonia</i> spp and small annuals such as <i>Erophila verna</i> , <i>Aphanes arvensis</i> and <i>Myosotis ramosissima</i> . Found on nutrient poor sandy soils or shingle in the lowlands below 300m. Typical species are <i>Festuca ovina</i> , <i>Galium saxatile</i> , <i>Sedum acre</i> , <i>Rumex acetosella</i> , <i>A. capillaris</i> and <i>Potentilla erecta</i> . Also includes lowland stands dominated by <i>Agrostis curtisii</i> and <i>Deschampsia flexuosa</i> . <i>Carex arenaria</i> locally present but only on inland stands.	Lowland Dry Acid grassland Priority Habitat (BH 8 Acid grassland)	<i>Acid grassland</i>	U1-U3, U4c, SD10b, SD11b
14c	Not as above	15		
15a	Coarse grasses predominate generally in <b>upland wet</b> situations eg. <i>Nardus</i> , <i>Molinia</i> , <i>Deschampsia flexuosa</i> and <i>Juncus squarrosus</i> usually on peaty-gley soils. Includes species poor <i>Molinia</i> dominated upland bog slopes and flushes.	Moorland grass (BH 8 Acid Grassland)	<i>Moorland-grass</i>	U5, U6, U7, U13
15b	Peat largely >0.5m deep (use peat rod). Scattered to dominant <i>Eriophorum vaginatum</i> often with <i>Sphagnum</i> spp. and/or <i>Rubus chamaemorus</i> .	Blanket bog PH <sup>4</sup> (BH 12Bog)	<i>Blanket Bog</i>	M1-M3, M17-M20, (on deep peat H9, H12, M15-16, M25)
15c	Species of wet peat soils predominate. Indicators include <i>Tricophorum</i> , <i>Molinia</i> , <i>Sphagnum</i> , <i>Eriophorum</i> spp. ( <i>E. Vaginatum</i> absent), <i>Narthecium ossifragum</i> , <i>Juncus squarrosus</i> and <i>Myrica gale</i> . Usually on deep-peats or wet peaty rankers. Valley bogs and other peat-based topogenous and soligenous mires key out here if with <=25% cover of Dwarf Shrubs. See guidance notes.	Bog Broad Habitat (BH 12)	<i>Other Bog</i>	M21, M25
15d	Peatland species predominate eg. <i>Tricophorum</i> , <i>Eriophorum angustifolium</i> , <i>Sphagnum</i> spp, <i>Vaccinium oxycoccus</i> and <i>Andromeda polifolia</i> . Often in lowland areas in unimproved/unafforested areas of flood plains. All lowland bog elements that appear to have a groundwater or riverine source to their water table should, depending on their species composition, key out as flushes (12a or 10d) or at 16c. Purely rainfed bog systems should key out here. This separation may be difficult. A good indicator is the location of the bog on level ground with a gently domed structure and an absence of calcicolous and	Lowland raised bog Priority Habitat (BH 12 Bog)	<i>Other Bog</i>	M1-M4, M17-M20

<sup>4</sup> Blanket Bog, Raised Bog and Other Bog are keyed out on floristic grounds but national estimates of extent further reflect the spatial restriction of the range of each habitat by application of GIS masks.



		Numbered links plus Broad & Priority Habitats	Primary attributes	NVC units (indicative list only)
	mesotrophic wetland species. The lags around lowland raised bogs also key out here.			
<b>15e</b>	<b>Dominated by dwarf shrubs</b> e.g. <i>Calluna</i> , <i>Erica</i> , usually on podzolic soils but also on brown podzolics, shallow peats (<0.5m), rankers and gleys.	<b>21</b>		
<b>15f</b>	Not as above	<b>16</b>		
<b>16a</b>	Less than 80% conifers in canopy (excluding yew but includes juniper).	<b>19</b>		
<b>16b</b>	More than 80% coniferous in canopy (excluding yew but includes juniper)	Coniferous Woodland (BH 2)	<i>Belt or Clump of trees or Woodland/ Forest</i>	All planted stands of conifers
<b>17a</b>	Palatable grasses dominate mainly <i>Lolium</i> , <i>Dactylis</i> , <i>Cynosurus</i> , <i>Holcus</i> . Grass cover usually over 75%. Broadleaved species restricted to <i>Trifolium repens</i> , <i>Ranunculus repens</i> , <i>Plantago major</i> , <i>Taraxacum</i> , <i>Rumex obtusifolius</i> and <i>Stellaria media</i> . Fertile but wetter situations may support occasional <i>Juncus effusus</i> or <i>J. inflexus</i> , but accompanying species will always indicate high fertility.	Improved Grassland (BH 5)	<i>Fertile Grass</i>	MG6, MG7
<b>17b</b>	Palatable grasses predominate, usually <i>Lolium</i> and <i>Phleum pratense</i> 25% or below and other grasses more prominent such as <i>Cynosurus</i> , <i>Agrostis capillaris</i> , <i>Trisetum</i> , <i>Bromus hordeaceus</i> and <i>Anthoxanthum</i> . Semi-improved but wetter situations may support abundant <i>Juncus effusus</i> or <i>J. inflexus</i> , <i>Glyceria fluitans</i> , <i>Agrostis stolonifera</i> and <i>Poa trivialis</i> . Total grass cover usually between 50 and 75%. Forbs up to 50% cover and associated with less fertile soil eg. <i>Plantago lanceolata</i> , <i>Rumex acetosa</i> , <i>Ranunculus acris</i> , <i>R. repens</i> , <i>Prunella vulgaris</i> , <i>Achillea millefolium</i> , <i>Potentilla anserina</i> , <i>Cirsium palustre</i> and <i>Cardamine pratensis</i> . However, indicators of the two hay meadow Priority Habitats will be rare or absent.	<b>18</b>		
<b>18a</b>	Recently sown mixtures of light grasses for agri-environment schemes or habitat creation/restoration such as <i>Anthoxanthum</i> , <i>Poa pratensis</i> , <i>Festuca rubra</i> , <i>Cynosurus</i> and <i>Trisetum</i> . 50-100% grass cover. Herb species rare or absent. Often on sown field margins.	Neutral Grassland (BH 6)	<i>Recently sown neutral grass</i>	
<b>18b</b>	As above but with high cover of sown mixtures of legumes such as <i>Trifolium pratense</i> , <i>T. hybridum</i> and <i>Lotus corniculatus</i> . Often on sown field margins.	Neutral Grassland (BH 6)	<i>Recently sown neutral grass</i>	

		<b>Numbered links plus Broad &amp; Priority Habitats</b>	<b>Primary attributes</b>	<b>NVC units (indicative list only)</b>
<b>18c</b>	Not as above.	Neutral Grassland (BH 6)	<i>Semi-improved neutral grass</i>	
<b>19a</b>	Scrub on sand dunes and shingle or <i>Salix repens</i> in dune slacks.	Supralittoral sediment (BH19)	<i>Sand dune</i>	
<b>19b</b>	All other broadleaved woodland (see guidance notes for Orchards).	<b>22</b>		
<b>20a</b>	<i>Ulex europaeus</i> > 25%.	Broadleaved woodland (BH 1)	<i>Belt of trees or Woodland/ Forest</i>	W23
<b>20b</b>	Any of <i>Erica</i> spp., <i>Calluna</i> , <i>Empetrum</i> , <i>Vaccinium</i> or <i>Ulex minor/gallii</i> (co-) dominate but not in coastal situations. Species of wet/deeper peats absent eg. <i>Myrica</i> , <i>Narthecium</i> , <i>Eriophorum</i> spp. and <i>Sphagnum</i> spp absent. Soils generally thin peaty podzols or rankers.	Dry Heath <sup>5</sup> (BH 10 Dwarf Shrub Heath)	<i>Dwarf Shrub heath</i>	
<b>20c</b>	As above but heathland on sand dunes and shingle.	Supralittoral sediment (BH19)	<i>Sand dune</i>	
<b>20d</b>	As above but heathland on maritime cliffs.	Maritime cliff and slope Priority Habitat (BH18)	<i>Maritime vegetation</i>	
<b>20e</b>	Not as above.	<b>21</b>		
<b>21a</b>	Dwarf Shrub Heath with occasional to frequent indicators of wet conditions such as <i>Erica tetralix</i> , <i>Molinia</i> and/or <i>Narthecium</i> but lacking high cover of <i>Sphagnum</i> , <i>Eriophorum</i> spp and <i>Rubus chamaemorus</i> . Peat largely <0.5m in depth where this can be established using peat rod. This is a difficult separation to make particularly regarding degraded ombrogenous mires where low abundance of bog indicators may reflect overgrazing, burning and drainage rather than thinner, drier peats.	Wet heath (BH 10 Dwarf Shrub Heath)	<i>Dwarf Shrub heath</i>	M15, M16
<b>21b</b>	Peat largely >0.5m, where this is possible to establish using the peat rod. Scattered to dominant <i>Eriophorum vaginatum</i> often with <i>Sphagnum</i> spp and/or <i>Rubus chamaemorus</i> .	Blanket Bog Priority Habitat <sup>6</sup> (BH 12 Bog)	<i>Blanket Bog</i>	M1-M3, M17-M20, (on deep peat H9, H12, M15-M16, M25)

<sup>5</sup> Discrimination between Upland and Lowland heath PH rests on application of altitude-based GIS masks applied post-survey.

<sup>6</sup> Blanket Bog, Raised Bog and Other Bog are keyed out on floristic grounds but national estimates of extent further reflect the spatial restriction of the range of each habitat by application of GIS masks.

		<b>Numbered links plus Broad &amp; Priority Habitats</b>	<b>Primary attributes</b>	<b>NVC units (indicative list only)</b>
<b>21c</b>	Species of acid peat soils predominate eg. <i>Tricophorum</i> , <i>Eriophorum angustifolium</i> , <i>Sphagnum</i> spp, <i>Vaccinium oxycoccus</i> and <i>Andromeda polifolia</i> . Often in lowland areas in unimproved/unafforested areas of flood plains. All lowland bog elements that appear to have a groundwater or riverine source to their water table should, depending on their species composition, key out as flushes ( <b>12a</b> or <b>10d</b> ) or at <b>16b</b> . Purely rainfed bog systems should key out here. This separation may be difficult. A good indicator is the location of the bog on level ground with a gently domed structure and an absence of calcicolous and mesotrophic wetland species.	Lowland raised bog Priority Habitat (BH12 Bog)	<i>Lowland raised bog</i>	M1-M3, M17-M20
<b>21d</b>	Species of acid peat soils predominate eg. <i>Tricophorum</i> , <i>Molinia</i> , <i>Narthecium ossifragum</i> , <i>Sphagnum</i> and <i>Myrica</i> usually on deep-peat soils or wet peaty rankers. Valley bogs and other topogenous and soligenous mires key out here. See guidance notes.	Bog (BH 12)	<i>Other bog</i>	M21
<b>22a</b>	>=50% canopy cover of <i>Alnus glutinosa</i> or >=50% cover of <i>Salix</i> spp. Willow.	Wet woodland Priority Habitat (BH 1 Broadleaved Woodland)	<i>Belt of trees or woodland / Forest (plus secondary attributes see guidance)</i>	W1-W7
<b>22b</b>	>=25% canopy cover of <i>Fagus sylvatica</i> (Beech) or >=25% canopy cover of <i>Taxus baccata</i> (Yew)	Lowland beech Priority Habitat <sup>7</sup> (BH 1 Broadleaved Woodland)	<i>Belt of trees or woodland /Forest (plus secondary attributes see guidance)</i>	W12-W15
<b>22c</b>	>=25% canopy cover <i>Fraxinus excelsior</i> or >=25% canopy cover of <i>Ulmus</i> spp	<b>24</b>	<i>Belt of trees or woodland /Forest (plus secondary attributes see guidance)</i>	(W7a-c, W8a-g, W9a, W12, W13a-b, W14)
<b>22d</b>	>=75% canopy cover of native <i>Quercus</i> spp or >=75% canopy cover of native <i>Betula</i> spp.	<b>23</b>		W8-W9, W13

<sup>7</sup> GIS masks delimiting the accepted native range for Beech will be used to constrain the range of the Priority Habitat.

		<b>Numbered links plus Broad &amp; Priority Habitats</b>	<b>Primary attributes</b>	<b>NVC units (indicative list only)</b>
<b>22e</b>	>=25% canopy cover of Hornbeam ( <i>Carpinus betulus</i> ), Stands of <i>Quercus</i> sp. with <i>Carpinus betulus</i> with Bluebell ( <i>Hyacinthoides non-scripta</i> )	Lowland Mixed Deciduous Woodland Priority Habitat (BH1 Broadleaved Woodland)	<i>Belt of trees or woodland /Forest (plus secondary attributes see guidance)</i>	W10
<b>22f</b>	Not as above.	Broadleaved Woodland (BH 1)	<i>Belt of trees or woodland /Forest (plus secondary attributes see guidance)</i>	
<b>23a</b>	>=95% canopy cover of native <i>Betula</i> spp in Scotland only.	Northern Birchwood Priority Habitat (BH 1)	<i>Belt of trees or woodland /Forest (plus secondary attributes see guidance)</i>	W10e, W11, W17
<b>23b</b>	Not as above.	Upland Oak Woodland Priority Habitat or Lowland Mixed Deciduous Priority Habitat <sup>9</sup> (Broadleaved woodland BH 1)	<i>Belt of trees or woodland /Forest (plus secondary attributes see guidance)</i>	
<b>24a</b>	Upland or hyperoceanic woods with frequent <i>Fraxinus excelsior</i> and/or <i>Ulmus glabra</i> often distinguished by a lush lichen flora.	Upland Mixed Ash priority habitat (Broadleaved Woodland BH)		
<b>24b</b>	Lowland woods with frequent <i>Fraxinus excelsior</i> and/or a suite of other species. Lichen flora not obvious	Lowland Mixed Deciduous Priority Habitat (BH 1 Broadleaved Woodland)		
<b>25a</b>	Limestone, with clints and grikes	Limestone Pavement Priority Habitat (Inland Rock BH16)		
<b>25b</b>	Mine spoil or metalliferous river gravels or serpentine rocks, species include <i>Minuartia verna</i> , <i>Thlapsi arvense</i> , <i>Armeria maritima</i> , <i>Silene maritima</i> , <i>Thlapsi caerulea</i> , <i>Lychnis alpina</i> , <i>Cerastium nigrescens</i> .	Calaminarian Grassland Priority Habitat (Inland Rock BH16)		OV37

		<b>Numbered links plus Broad &amp; Priority Habitats</b>	<b>Primary attributes</b>	<b>NVC units (indicative list only)</b>
<b>25c</b>	Not limestone with clints and grikes nor metalliferous rocks. Solid rock outcrops or screes. Includes species such as <i>Cryptogamma crispera</i> , <i>Cystopteris fragilis</i> , <i>Gymnocarpium robertianum</i> and <i>Asplenium trichomanes</i>	Inland rock outcrop and scree (PH) (Inland rock BH)		
<b>25d</b>	Rocky ungrazed ledges at high altitude with one or more of downy willow <i>Salix lapponum</i> , whortle-leaved willow <i>S. myrsinites</i> , mountain willow <i>S. arbuscula</i> and woolly willow <i>S. lanata</i> . Associated arctic-alpine and northern willows include net-leaved willow <i>S. reticulata</i> , dark-leaved willow <i>S. myrsinifolia</i> and tea-leaved willow <i>S. phyllicifolia</i> .	Mountain heaths and Willow scrub PH record as Montane BH		
<b>26a</b>	Coastal saltmarsh	<b>27</b>		
<b>26b</b>	Inland saltmarsh vegetation around natural springs or old mine workings	Saltmarsh Priority Habitat		SM16, SM23
<b>26c</b>	Saltmarsh vegetation alongside roads	Linear Features BH3 or Urban BH17		
<b>27a</b>	Pioneer vegetation of lower saltmarshes made up of open stands of perennial glasswort <i>Sarcocornia perennis</i> , glasswort <i>Salicornia</i> spp., or annual sea-blite <i>Suaeda maritima</i> .	Saltmarsh Priority Habitat (Littoral sediment BH 21)	<i>Saltmarsh</i>	SM7-9, SM27
<b>27b</b>	Cord-grass <i>Spartina</i> spp. on a wide range of substrates, from very soft muds to shingle, in areas sheltered from strong wave action. It can be on the seaward fringes of saltmarshes and creek-sides and may occur on old pans in the upper saltmarsh.	Saltmarsh Priority Habitat (Littoral Sediment BH21)	<i>Saltmarsh</i>	SM4-6
<b>27c</b>	Vegetation forming the middle and upper reaches of saltmarshes, where tidal inundation still occurs but with decreasing frequency and duration. A wide range of community types is represented and the saltmarshes can cover large areas, especially where there has been little or no enclosure on the landward side	Saltmarsh Priority Habitat (Littoral Sediment BH21)	<i>Saltmarsh</i>	SM10-20
<b>27d</b>	Halophytic shrubs growing at the base of sea-defences or at the landward slope of salt-marshes or where there is a transition to dunes or shingle. Typically bushes of shrubby sea-blite <i>Suaeda vera</i> and sea purslane <i>Atriplex portulacoides</i> comprise the majority of vegetation.	Saltmarsh Priority Habitat (Littoral Sediment BH21)		SM25

### Further guidance notes

**Pulse-disturbance vegetation:** This will often be a difficult separation to make but refers to early to mid-successional vegetation that may still be undergoing species compositional turnover and either assembling in response to a single infrequent disturbance episode e.g. flooding, felling and natural gap formation in woodlands, or the cessation of disturbance e.g. urban derelict land and fallow arable. Also included here are the annual to less frequently mown communities of boundaries and linear features including hydroseres around waterbodies and 'rough' areas of amenity grassland on school playing fields, golf courses and churchyards. Their Assemblages here may often be variable in height but usually typified by tall grasses and herbs not tolerant of grazing or agricultural mowing regimes. Hence, the vegetation is usually more than 25 cm in average height. Variation in species composition may be large and unpredictable given the dynamic and spontaneous nature of the colonisation and establishment phases. Nitrophiles will often be very well represented given the association with fertile lowland soils, gardens, arable land and urban environments.

**Press-disturbance vegetation:** There is no naturally sharp distinction between these communities and pulse-disturbance types. Plant assemblages may reflect wet to dry, acid to calcareous conditions but the common feature is that they experience a relatively stable annual disturbance regime where biomass is removed by annual cutting or/and continuous grazing at varying intensities. Hence, all grazed upland and lowland grasslands are included here along with meadows and silage fields. Also included are those amenity grasslands which may be rabbit grazed but are generally managed by very frequent mowing. Also included here are areas of monocot rather than dwarf shrub dominated bogs and heaths that may typically be managed less intensively than agricultural lowland grasslands but may nevertheless experience frequent, predictable biomass removal by grazing. Surveyors will often find it difficult to effect the separation between **5a** and **5b**. This simply reflects real difficulties in establishing mapped boundaries when species vary individualistically and the environment varies continuously.

## 13 APPENDIX-5: HABITAT DESCRIPTION

### Habitat descriptions

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#### ***Key to Broad and Priority Habitats (Vegetation Key)***

Based on plant species composition, patches of discrete vegetation (polygons) and vegetation plots are assigned by the surveyor to Broad and Priority Habitats (used for BAP reporting), priority habitats nest within Broad habitats. The vegetation key allows all vegetation stands to be keyed to a Broad and Priority Habitat. The information below (taken from JNCC priority habitat descriptions and other sources) can be used to guide your habitat allocation.

## 13.1 Broadleaved Mixed and Yew woodland Broad Habitat

This Broad Habitat is used for broadleaf woodland which does not fall into PH. The Broadleaved Mixed and Yew Woodland BH includes *Ulex europaeus* scrub but not *U. gallii* or *U. minor* scrub, also woodlands dominated by *Acer pseudoplatanus* where the cover of native broadleaf is too low to qualify for PH status. Since the Broad Habitat can have up to 80% conifer cover it also includes mixed woodland that may appear largely coniferous.

### Broadleaved Mixed and Yew woodland Priority Habitats

#### Lowland beech and yew woodland

Beech can grow on both acidic and calcareous soils, although its association with yew tends to be most abundant on the calcareous sites. In the UK beech is considered native only in southern England and southern Wales. Beech is dominant in the canopy (greater than 30%), but the canopy can include mixtures of beech, ash, sycamore (non-native), oak, yew and whitebeam. In some areas, this woodland type occurs as intricate mosaics with lowland mixed deciduous woods. Bramble (*Rubus fruticosus*) forms a characteristic ground layer on neutral-slightly acidic soils. Holly is the main understorey species, less often yew, on acidic soils. The main corresponding National Vegetation Classification (NVC) plant communities associated with this habitat type are W12 *Fagus sylvatica* - *Mercurialis perennis* woodland (base-rich soils), W14 *Fagus sylvatica* - *Rubus fruticosus* woodland (mesotrophic soils), W15 *Fagus sylvatica* - *Deschampsia flexuosa* woodland (acidic soils). Yew stands fall into W13 *Taxus baccata* woodland.

#### Lowland wood-pasture and parkland

Mature trees scattered across typically grazed grasslands in an extensive managed estate setting.

#### Northern Birchwood

This Habitat is only found in Scotland, it is dominated by a series of stands of downy and/or silver birch with constituents such as rowan, willow, juniper and aspen. Boundaries are often diffuse and liable to change as woodlands expand and contract in response to fires and changes in grazing pressure. On more acidic soils, rowan is a prominent component, and juniper can form the underwood in the eastern highlands. Aspen grows on a variety of site types where mineral soil is present, occurring frequently within upland birchwoods as small groups and rarely as extensive stands. Only 12 stands greater than 5 ha are known to exist within Scotland.

Upland (northern) birchwoods are composed of the following main communities from the National Vegetation Classification: W11 *Quercus petraea*-*Betula pubescens*-*Oxalis acetosella* woodland, a, b, c, d, W17 *Quercus petraea*-*Betula pubescens*-*Dicranum majus* woodland, a, c, d, W4 *Betula pubescens*-*Molinia caerulea* a, b.

#### Upland mixed ashwoods

The term upland mixed ashwoods is used for woods on base-rich soils, in most of which ash is a major species, although locally oak, birch, elm, small-leaved lime and even hazel may be the most abundant species. Yew may form small groves in intimate mosaics with the other major tree species and alder may occur where there are transitions to wet woodland. Upland in the name reflects the abundance of this type of woodland on base-rich soils in upland Britain rather than to the altitude at which individual sites occur indeed some are only just above sea



level. The ground flora is rich, and characteristic species include *Mercurialis perennis*, *Phyllitis scolopendrium*, *Rubus*, *Geranium robertianum* and *Allium ursinum*.

In terms of National Vegetation Classification (NVC) plant communities this habitat is characterised by W8 *Fraxinus excelsior* - *Acer campestre* - *Mercurialis perennis* woodland, sub communities d. *Hedera helix*, e. *Geranium robertianum*, f. *Allium ursinum* and g. *Teucrium scorodonia*, and W9 *Fraxinus excelsior* - *Sorbus aucuparia* - *Mercurialis perennis* woodland, together with W13 *Taxus baccata* woodland for the yew groves on the Carboniferous and Magnesian limestones.

### Upland oakwood

Upland oakwoods occur on acidic soils in areas of high rainfall and are typically found on steep valley sides. The word 'upland' is used from a UK perspective, and they occur almost down to sea level in the west of the British Isles. Upland oakwoods are characterised by a predominance of oak (most commonly sessile, but locally pedunculate) and birch in the canopy, with varying amounts of holly, rowan and hazel as the main understorey species. Most oakwoods also contain areas of more alkaline soils, often along streams or towards the base of slopes where much richer communities occur, with ash and elm in the canopy. Classically, upland oakwoods have a ground flora of *Calluna vulgaris* and *Vaccinium myrtillus* with few flowering plants, but with abundant and luxuriant mosses, liverworts and epiphytic ferns.

### Wet woodland

Wet woodland occurs on poorly drained or seasonally wet soils, usually with alder, birch and willows as the predominant tree species, but sometimes including ash, oak, pine and beech on the drier riparian areas. They occur on floodplains, lake edges, as successional habitats on fens, mires and bogs, and in peaty hollows and hill-side flushes within other woodland types. Wet woods frequently occur in mosaic with other woodland key habitat types and with open key habitats such as fens. In terms of National Vegetation Classification (NVC) plant communities this habitat is characterised by W1 *Salix cinerea* - *Galium palustre* woodland, W2 *Salix cinerea* - *Betula pubescens* - *Phragmites australis* woodland, W3 *Salix pentandra* - *Carex rostrata* woodland, W4c *Betula pubescens* - *Molinia caerulea* woodland: *Sphagnum* sub-community, W5 *Alnus glutinosa* - *Carex paniculata* woodland, W6 *Alnus glutinosa* - *Urtica dioica* woodland, and W7 *Alnus glutinosa* - *Fraxinus excelsior* - *Lysimachia nemorum* woodland. Some birch stands classified as W4 are relatively dry and in management terms better treated alongside other extensive birch stands. The ground flora is diverse, and within different types the dominant species include *Phragmites*, *Molinia*, *Sphagnum*, *Urtica* and large sedges. Wet woodlands frequently intergrade with other woodland types, notably upland oakwoods and mixed ashwoods. Habitats with canopies composed of *Salix* spp. should be classed as wet woodland even if the trees are low and 'scrubby' in appearance (these will usually be stands of W1 *Salix cinerea* - *Galium palustre* woodland, or W2 *Salix cinerea* - *Betula pubescens* - *Phragmites australis* woodland).

### Lowland mixed deciduous

Lowland mixed deciduous woodland includes woodland growing on the full range of soil conditions, from very acidic to base-rich, and takes in most semi-natural woodland in southern and eastern England, and in parts of lowland Wales and Scotland. It thus complements the ranges of upland oak and upland ash types. It occurs largely within enclosed landscapes, usually on sites with well-defined boundaries, at relatively low altitudes, although altitude is not a defining feature. Many are ancient woods. The woods tend to be small, less than 20 ha. Often there is evidence of past coppicing, particularly on moderately acid to base-rich soils; on very acid sands the type may be represented by former wood-pastures of oak and birch.

There is great variety in the species composition of the canopy layer and the ground flora, and this is reflected in the range of associated NVC and Stand Types. *Quercus robur* is generally

the commoner oak (although *Quercus petraea* may be abundant locally) and may occur with virtually all combinations of other locally native tree species.

In terms of the National Vegetation Classification the bulk of this type falls into W8 (*Fraxinus excelsior* - *Acer campestre* - *Mercurialis perennis* woodland, mainly sub-communities a - c in ancient or recent woods; in the lowlands W8d mostly occurs in secondary woodland) and W10 (sub-communities a to d) with lesser amounts of W16 (mainly W16a). Locally, it may form a mosaic with other types, including patches of beech woodland, small wet areas, and types more commonly found in western Britain. Rides and edges may grade into grassland and scrub types.

### Orchards

Traditional orchards are defined, for priority habitat purposes, as groups of fruit and nut trees planted on vigorous rootstocks at low densities in permanent grassland and managed in a low intensity way. There are many regional variations on this theme, including apple, pear, cherry, plum, damson, and walnut orchards. They are a composite habitat (similar to wood-pasture and parkland), defined by their structure rather than vegetation type, which can include trees, scrub, grassland, ponds, walls, hedgerows and hedgerow trees. Prime traditional orchard habitat consists of grazed grassland with fruit trees of varying age structure, with an abundance of standing and fallen dead and decaying wood. Young trees and newly planted orchards that are managed in a low intensity way are also included in the definition. Low intensity management refers to orchards that are managed extensively, with little or no use of chemicals such as pesticides, herbicides and inorganic fertilisers, with relatively long-lived trees that are allowed to reach the veteran stage, and with a permanent grass sward that is usually grazed by cattle or sheep or cut for hay. In intensive orchards where bare herbicide-cleared soil is present between trees, the BH should be Arable and Horticulture.

## 13.2 Coniferous Woodland Broad Habitat

The Broad Habitat includes all coniferous woodland that is not native pine woodland PH. Conifer cover needs to exceed 80% for a woodland polygon to be allocated to Coniferous rather than Broadleaved. Mixed and Yew Woodland.

### **How to record Clearfell**

We want surveyors to record the habitats they find when they survey rather than trying to describe what might be there in the future or the way that land is used e.g., part of a forestry cycle. This means that in areas of felled conifer plantations the surveyor should describe the habitats that they see. For example, heathland vegetation may have developed/survived under the canopy and now that the trees have been felled has sufficient continuous cover for the area to be described as Broad Habitat Heathland, alternatively the area may have been recently felled and there is no continuous cover of vegetation in which case record the Broad Habitat as coniferous woodland and make a note about the felling and disturbance.

### **Coniferous Woodland Priority Habitat**

#### Native pine woodland

Native pine woodlands are relict indigenous forests dominated by self-sown Scots pine *Pinus sylvestris* which occur throughout the central and north-eastern Grampians and in the northern and western Highlands of Scotland. Native pinewoods do not support a large diversity of plants and animals compared with some more fertile habitats. However, there is a characteristic plant and animal community which includes many rare and uncommon species. The main tree species is Scots pine although birches *Betula* spp., Rowan *Sorbus aucuparia*, alder *Alnus*

*glutinosa*, willows *Salix* spp., bird cherry *Prunus padus* are also found. Sessile oak *Quercus petraea* also occurs infrequently, mainly in the north-east of Scotland. A shrub understorey, where browsing levels are low, includes common juniper *Juniperus communis*, aspen *Populus tremula*, holly *Ilex aquifolium* and hazel *Corylus avellana*. Old or dead trees and rotting wood supports significant beetle and bryophyte communities. The field layer is characterised by acid-tolerant plants like bell heather *Erica cinerea*, bilberry *Vaccinium myrtillus* and crowberry *Empetrum nigrum*.

### 13.3 Boundary and Linear features

Where a combination of linear features is wide enough to form an area e.g., ditch, line of trees, fence, wall, then these should be mapped as areas and assigned to this Broad Habitat.

### 13.4 Arable and Horticultural

Should be fairly self-evident, includes ploughed land, land planted with crops and also annual/early successional with open ground habitats which is apparently fallow land dominated by annual weed species often with much open ground present. Perennials may be present but if they are a significant component of the vegetation cover it implies greater time since last disturbed and a Neutral Grassland category would likely be more appropriate.

You may also encounter margins, the most common types of margin are perennial grass margins, with or without supplementary wildflowers. If > MMU these margins will be recorded as areas of Neutral and or Improved grassland. Other rarer types include:

- Uncropped strips, usually cultivated each year;
- Wild bird seed cover e.g., kale, quinoa
- Pollen and nectar mixes, usually with a high proportion of legumes;

And would be recorded as arable and horticultural.

### 13.5 Improved Grassland

This is an extensive Broad Habitat comprising low botanical quality grassland with high grazing value. The Broad Habitat is selected at the polygon level. Intensively managed agricultural grasslands include impoverished swards usually dominated by *Lolium perenne*, often with varying amounts of *Cynosurus cristatus*, *Holcus lanatus* and *Poa trivialis*. The coarse grass *Dactylis glomerata* may be frequent in some stands. Forb diversity is characteristically low, the commoner species being *Trifolium repens*, *P. major*, *Taraxacum officinale* agg., *Stellaria media* and *Ranunculus repens*. Patches of coarse weeds (*Rumex obtusifolius*, *Urtica dioica*, *Cirsium vulgare* and *C. arvense*) are often present.

Separation of improved from semi-improved grassland relies mainly on the abundance of agricultural species on the one hand and the diversity of forbs on the other. Stands with greater than 25% cover of *Lolium perenne* can be safely regarded as improved, unless any of the characteristic marker species of unimproved grassland are present at high frequency. In addition, impoverished grasslands dominated by *Cynosurus cristatus*, *Holcus lanatus* or *Poa* spp. should be classified as improved, even if *Lolium* is rare or absent, unless any of the characteristic marker species of unimproved grassland are present at high frequency.

Improved grasslands are ubiquitous on heavily fertilised soils throughout the lowlands. They are typically managed as pasture, or for silage or occasionally hay. Two NVC communities are included (MG6 and MG7).

This broad habitat includes:

- Species-poor, grass dominated swards, often sown for agricultural or recreational use, or created by modification of unimproved grasslands by fertilisers and selective herbicides. They are particularly characterised by the abundance of rye grass *Lolium spp.* and white clover *Trifolium repens*.
- Ley: a short-term grassland, re-seeded less than five years previously. Characterised by evidence of ploughing, bare soil between grass plants, scarcity of broadleaf species and often dominated by a single grass species e.g., *Lolium*.
- Amenity grass: This is non-agricultural grass which is clearly being used for amenity purposes (not recreation) e.g., parks, large lawns, may be component of golf course.

## 13.6 Neutral Grassland Broad Habitat

This Broad Habitat includes;

- Vegetation containing some annual weeds but consisting mainly of long-lived perennials with grass cover less than <50% cover. Species include *Urtica dioica*, *Galium aparine*, *Chamaerion angustifolium*, *Cirsium arvense*, *Bromus sterilis* and *Poa trivialis*. Includes stands dominated by invasive aliens such as *Reynoutria japonica*, *Impatiens glandulifera* and *Heracleum mantegazzanum*.
- Recently sown neutral grass: Recently sown mixtures of fine-leaved grasses such as *Anthoxanthum*, *Poa pratensis*, *Festuca rubra*, *Cynosurus* and *Trisetum*. 50-100% grass cover. Herb species rare or absent. Often on sown field margins.
- Semi-improved Neutral grassland: This includes all semi-improved and unimproved grassland occurring on circum-neutral soils. It includes enclosed and managed grassland such as pastures, a range of grasslands which are inundated with water periodically, permanently moist or even waterlogged grassland, where the vegetation is dominated by grasses, and tall and unmanaged grassland.
- Tall unmanaged neutral grass: Long-lived perennials with little or no open ground. Vegetation with over 50% grass cover. *Arrhenatherum*, *Dactylis* and *Elymus repens* usually dominate but scattered shrubs and tall herbs may be present (e.g., *Artemisia vulgaris*, *Cirsium arvensis*, *Cirsium vulgare*, *Digitalis purpurea*, *Heracleum sphondylium*, *Chamaerion angustifolium* N.B. does not include wetland indicators e.g., *Filipendula ulmaria*, *Epilobium hirsutum*, *Urtica dioica*, *Filipendula ulmaria*, *Phragmites*). Associated with linear features such as road verges, field boundaries, tracksides and ditch banks but in these situations will only be mapped if >MMU.

### **Neutral grassland Priority Habitats**

#### Lowland hay meadow

This habitat consists of traditionally managed hay-meadows and pastures in which grasses such as *Cynosurus cristatus*, *Festuca rubra*, *Agrostis capillaris* and *Anthoxanthum odoratum* typically occur in a species-rich sward with a high cover of associated herbs. Cover of grass species and clover are usually less than 50%. Typically rich in forb species with frequent PH lowland meadow indicators including *Lathyrus pratensis*, *Lotus corniculatus*, *Leucanthemum vulgare*, *Galium verum*, *Primula veris*, *Centaurea nigra*, *Leontodon hispidus*, *Ranunculus*

*bulbosus* or on flood meadows some of *Caltha palustris*, *Sanguisorba officinalis*, *Filipendula ulmaria* and *Alopecurus pratensis*. NVC communities include MG4, MG5 and MG8.

#### Upland hay meadow

The habitat comprises the single NVC community MG3, *Anthoxanthum odoratum* - *Geranium sylvaticum* grassland and is characterised by a dense growth of grasses and herbaceous dicotyledons up to 60 - 80 cm high.

## 13.7 Calcareous Grassland Broad Habitat

This Broad Habitat is uncommon. It comprises vegetation with scattered sedges, many calcicoles present in often species rich turf on calcareous soils usually rendzinas on chalk or limestone. Indicators include *Bromopsis erecta*, *Lotus corniculatus*, *Linum catharticum*, *Sanguisorba minor*, *Carlina vulgaris*, *Sesleria albicans*, *Helianthemum nummularium*, *Cirsium acaule*. These vary from mostly coastal grasslands through to upland and mountain grasslands rich in arctic alpine. The habitat divides into:

### **Priority Habitats**

#### Lowland calcareous grassland

NVC communities include CG1 (*Festuca ovina* - *Carlina vulgaris* grassland (excludes CG1f)), CG2 *Festuca ovina* - *Avenula pratensis* is the most common form of grazed calcareous grassland in the lowlands. Note that the more improved examples of the *Holcus lanatus* - *Trifolium repens* sub-community (CG2c) are included under semi-improved grassland. *Bromus erectus* grassland (CG3) and *Avenula pubescens* grassland (CG6) are also included.

#### Upland calcareous grassland

Most examples occur above 250-300 m altitude, but the habitat is also found within unenclosed moorland at lower elevations. *Festuca ovina* - *Agrostis capillaris* - *Thymus praecox* grassland (CG10) is the most prevalent form of calcareous grassland in the uplands and occurs occasionally in the lowlands.

*Festuca ovina* - *Alchemilla alpina* - *Silene acaulis* dwarf-herb community (CG12) and *Dryas octopetala* - *Silene acaulis* ledge vegetation (CG14) are often restricted to fragmentary stands.

## 13.8 Acid Grassland Broad Habitat

Fine grasses predominate generally in dry situations e.g. *Agrostis curtisii*, *Festuca ovina* and *Anthoxanthum odoratum* usually on brown podzolic soils or rankers. Acid indicators present e.g. *Galium saxatile*, *Potentilla erecta*, *Pleurozium schreberi* and *Rumex acetosella*. Also includes Moorland grass; which is dominated by coarser grass species, usually occurring in a moorland setting but is also present within lowland heath landscapes in southern Britain and in the Scottish lowlands. Usually dominated by *Nardus* or *Molinia* but often with significant amounts of *Deschampsia flexuosa* and *Juncus squarrosus*. *Sphagnum* species may be present but if so, associated with *Anthoxanthum odoratum* and/or *Juncus* species. Dwarf shrubs and peatland species may be frequent but are usually less than 25% cover and are never dominant. Usually on peaty gley soils but also on some peats.

### **Acid grassland Priority Habitat**

### Lowland acid grassland

It is defined as both enclosed and unenclosed acid grassland throughout the UK lowlands (normally below c. 300m). Includes the *Festuca ovina* - *Agrostis capillaris* - *Rumex acetosella* (U1), *Deschampsia flexuosa* (U2), *Agrostis curtisii* (U3) and *Festuca ovina* - *Agrostis capillaris* - *Galium saxatile* (U4) NVC grassland plant communities but really only U4c *Lathyrus montanus*-*Stachys betonica* sub-community. Inland vegetation, but not coastal dunes. It is characterised by a range of plant species such as *Galium saxatile* *Festuca ovina*, *Agrostis capillaris*, *Rumex acetosella*, *Carex arenaria*, *Deschampsia flexuosa*, *Agrostis curtisii* and *Potentilla erecta*, with presence and abundance depending on community type and locality.

## 13.9 Bracken Broad Habitat

This should only be used where vegetation consists of Bracken at  $\geq 95\%$  cover with or without a sparse herbaceous understorey. Stands that have not yet peaked in seasonal biomass should still be recorded as dense Bracken if you believe peak cover is likely to be at least 95%. If cover of bracken is less than this, then it should be recorded as the underlying vegetation (probably acid grassland).

## 13.10 Dwarf Shrub Heath

Includes vegetation dominated by species from the heath family or dwarf gorse species. It does not include vegetation from high mountain summits  $< 750$  m which may be included in the "Montane habitats" BH type. Heathland is characterised by presence of *Erica* spp., *Calluna*, *Empetrum*, *Vaccinium* or *Ulex minor/gallii*. Dry and wet heath are included in this category so there may be occasional to frequent indicators of wet conditions such as *Erica tetralix*, *Sphagnum*, *Molinia* and/or *Narthecium* but wet heath is differentiated from blanket bog by peat being on average  $< 0.5$  m deep without *Eriophorum vaginatum*. Vegetation dominated by *Ulex gallii* is included within the definition of heath, but vegetation in which *U. europaeus* predominates should be classified as scrub within the Broadleaved, Mixed & Yew Woodland Broad Habitat.

## 13.11 Fen/Marsh/Swamp Broad Habitat

This BH includes vegetation that is ground water fed; and permanently, seasonally or periodically waterlogged on peat, peaty or mineral soils where grasses do not predominate. It also includes emergent vegetation or frequently inundated vegetation occurring over peat or mineral soils. It does not include fertile grassland, with *Juncus effusus* and no wetland indicators. It also includes vegetation fringing open water often developed as a narrow part of a hydrosere between standing water and upslope vegetation. Species include *Valeriana officinalis*, *Epilobium hirsutum*, *Filipendula ulmaria*, *Oenanthe croccata* and Tall-herb wetland vegetation consisting of only wetland tall herb species e.g. *Epilobium hirsutum*, *Urtica dioica*, *Filipendula ulmaria*, *Phragmites*, (not including non-wetland tall herb species such as *Artemisia vulgaris*, *Brassica* sp., *Chenopodium album*, *Cirsium arvensis*, *Cirsium vulgare*, *Digitaria purpurea*, *Heracleum sphondylium*, *Triplospermum maritimum*, *Chamaerion angustifolium*).

### **Fen, marsh, Swamp Priority Habitats**

#### Fen priority habitat

Fens are minerotrophic peatlands that receive water and nutrients from the soil, rock and ground water. Species include *Carex 91chinate91e*, *C. acutiformis*, *C. rostrata*, *C. elata*, *C. riparia*, *Iris pseudacorus*, *Filipendula ulmaria*, *Phragmites australis* (but not virtually pure stands), *Equisetum fluviatile*, *Eupatorium cannabinum*, *Lythrum salicaria* and *Epilobium hirsutum*.

#### Flush priority Habitat

Localised, usually narrow areas (which may coalesce where adjacent) influenced by lateral water movement. Calcareous flushes are dominated by species such as *Linum catharticum*, *Carex hostiana* and *C. dioica*, *Campyllum stellatum* and *Parnassia palustris*. Non-calcareous flushes are usually dominated by *Juncus effusus*, *J. 91chinate91es/acutiflorus* and *Carex echinata*, often with *Sphagnum*. Usually found on peaty gley soils.

#### Purple moor grass rush pasture priority habitat

Purple moor grass and rush pastures occur on poorly drained, usually acidic soils in lowland areas of high rainfall in western Europe. Purple moor grass *Molinia caerulea*, and rushes, especially sharp-flowered rush *Juncus acutiflorus*, are usually abundant. Key species associated with purple moor grass and rush pastures include: *Hypericum undulatum*, *Carum verticillatum*, *Cirsium dissectum*, *Crepis paludosa*, *Platanthera chlorantha*, *Galium palustre*, *Cirsium palustre*, *Ranunculus flammula*, *Agrostis canina*, *Mentha aquatica*, *Achillea ptarmica*, *Equisetum palustre*, *Cardamine pratensis*, *Epilobium palustre*, *Juncus subnodulosus*, *Carex pulicaris*, *C. hostiana*, *Epipactis palustris*, *Geum rivale*, *Gymnadenia conopsea*, *Serratula tinctoria* and *Angelica sylvestris*.

#### Reedbed priority habitat

Reedbeds are wetlands dominated by stands of the common reed *Phragmites australis*, wherein the water table is at or above ground level for most of the year. They tend to incorporate areas of open water and ditches, and small areas of wet grassland and carr woodland may be associated with them.

## 13.12 Bog Broad Habitat

This broad category includes all vegetation (other than blanket bog) that is dominated by peatland species and should be identified by the plants present and not by topographic position since across the whole of Britain there is no consistency in the position of bogs within the landscape. The category therefore includes raised bogs and valley bogs but note that the soligenous mires dominated purely by *Molinia* and *Juncus* species would be included under moorland grass as no other peatland species are present. *Calluna* may be up to 50% cover but usually less. *Molinia* and *Sphagnum* species are usually present, often over 25%. *Tricophorum* is also often present as a significant cover species. Other species which may be locally dominant include *Myrica gale*, *Eriophorum angustifolium* and *Nardus stricta*. Indicative species include *Narthecium ossifragum*, *Drosera* spp., and *Pedicularis* ssp.

### **Priority Habitats**

#### Blanket bog

The term blanket 'bog' strictly applies only to that portion of a blanket 'mire' which is exclusively rain-fed. Peat depth is very variable, with an average of 0.5-3 m being fairly typical but depths in excess of 5 m not unusual. The principal vegetation (NVC) types covered are M1, M2, M3, M15, M17, M18, M19, M20 and M25, together with their intermediates. Other communities, such as flush, fen and swamp types, also form an integral part of the blanket bog landscape but should be mapped separately if areas are greater than the MMU (20 m x 20 m). Dominant species include *Calluna vulgaris*, *Erica tetralix*, *Trichophorum cespitosum*, *Eriophorum vaginatum* and *Sphagnum* species. For allocation purposes, the most important defining feature is dominant to occasional *E. vaginatum*.

#### Lowland raised bog

In the UK lowland raised bogs are a particular feature of cool, rather humid regions. Plant communities that are typical of natural raised bogs include the bog pool communities M1 to M3 and M18 *Erica tetralix* - *Sphagnum papillosum* raised and blanket mire. In addition, a number of communities, including M15 *Scirpus cespitosus* - *Erica tetralix* wet heath, M19 *Calluna vulgaris* - *Eriophorum vaginatum* blanket mire, M20 *Eriophorum vaginatum* blanket and raised mire, M25 *Molinia caerulea* - *Potentilla erecta* mire. Peatland species predominate e.g., *Trichophorum*, *Eriophorum angustifolium*, *Sphagnum* spp, *Vaccinium oxycoccus* and *Andromeda polifolia*. Often in lowland areas in unimproved/unafforested areas of flood plains. A good indicator is the location of the bog on level ground with a gently domed structure and an absence of calcicolous and mesotrophic wetland species.

## 13.13 Rivers and Streams

## 13.14 Standing Water

Unlikely to be X plot habitats.

## 13.15 Montane Broad Habitat

This Broad Habitat has now been classified as a Priority Habitat 'Mountain heaths and Willow scrub'. This habitat encompasses a range of natural or near-natural vegetation occurring in the montane zone, lying above or beyond the natural tree-line.

Surveyors will need to select the Broad Habitat montane from the drop down.

This habitat includes montane heath (dominated by *Calluna vulgaris* and *Vaccinium myrtillus* typically with abundant bryophytes e.g., *Racomitrium lanuginosum*) and/or lichens e.g., *Cladonia* species) and snow bed communities which are dominated by prostrate *Salix* spp., *J. trifidus*, *C. bigelowii*, *Racomitrium*, and dwarf forb communities of *Alchemilla alpina*, and *Saxifrage* species. It also includes moss and lichen dominated heaths of mountain summits. It does not include montane dwarf shrub heaths, flushes, grasslands, and rock and scree communities that straddle the notional boundary of the former treeline with little change in floristics and these should be treated as components of other BH types.

## 13.16 Inland Rock Broad Habitat

This BH includes both natural and artificial exposed rock surfaces where these are almost entirely lacking in vegetation, as well as various forms of excavations and waste tips. It includes inland cliffs, ledges and caves, screes, quarries and quarry waste.



## Priority Habitats

Limestone pavement: are of both geological and biological importance. The vegetation is rich in vascular plants, bryophytes and lichens and varies according to geographical location, altitude, rock type and the presence or absence of grazing animals. Limestone pavement vegetation may also contain unusual combinations of plants, with woodland and wood-edge species well-represented in the sheltered grikes. The clints (limestone slabs) support plants of rocky habitats or are often unvegetated. In the absence of grazing, scrub may develop.

Inland rock outcrop and scree habitats: This habitat covers a wide range of rock types, varying from acidic to highly calcareous and includes five Habitats Directive Annex 1 habitat types. The habitat occurs throughout the uplands and is particularly characteristic of high altitudes. Coastal cliff and ledge habitats are excluded as they form part of the maritime cliffs and slopes priority habitat.

Screes are typically dominated by *Cryptogramma crispera* and other ferns, lichens and bryophytes. On cliff ledges, tall herbs such as *Sedum rosea* and *Angelica sylvestris* are generally abundant. Chasmophytic vegetation (in rock crevices) is usually dominated by ferns such as *Asplenium viride* and small herbs such as *Thymus polytrichus* and *Saxifraga* spp. Bryophytes and lichens also occur in crevices but are able to flourish on the open rock surfaces where there is a lack of competition from vascular plants. NVC: U16-U18, U21, OV38-OV40. Tall-herb and fern vegetation of cliff ledges and ungrazed upland hillsides is represented by three NVC types. The *Luzula sylvatica* - *Vaccinium myrtillus* community (U16) is widespread but highly localised on acidic substrates. *Luzula sylvatica* - *Geum rivale* vegetation (U17) occurs on outcrops of base-rich rock in upland areas. Rock crevice vegetation includes the *Asplenium trichomanes* - *Asplenium ruta-muraria* (OV39) and *Asplenium viride* - *Cystopteris fragilis* communities (OV40). The *Festuca ovina* - *Minuartia verna* community (OV37) is confined to heavy metal-rich mine spoil.

Calaminarian grassland: includes a range of semi-natural and anthropogenic sparsely vegetated habitats on substrates characterised by high levels of heavy metals such as lead, chromium and copper, or other unusual minerals. These are associated with outcrops of serpentine and river gravels rich in heavy metals, as well as with artificial mine workings and spoil heaps. Seral succession is slowed or arrested by the toxicity of the substrate. Open-structured plant communities, sometimes known as 'Calaminarian grasslands', typically occur, composed of ruderal/metallophyte species of lichens, bryophytes and vascular plants, such as spring sandwort *Minuartia verna*, alpine pennycress *Thlaspi arvense*, and genetically adapted races of species such as thrift *Armeria maritima* and bladder campion *Silene maritima*. Notable species include *Epipactis youngiana*, *Asplenium septentrionale*, *Ditrichum cornubicum*, *Marsipella profunda*, *Cephalozia nicholsonii* and *Ditrichum plumbicola*.

Vegetation on metalliferous substrates is found in three distinct settings in the UK:

- Near-natural substrates;
- Mine spoil, in situations where naturally occurring metalliferous outcrops have been quarried away;
- Metalliferous river gravels, sometimes derived from washed-out mine workings. In many localities the metalliferous outcrops which would have been the natural habitat for the species referred to above have been quarried away but the mine spoil still provides suitable habitat.

## 13.17 Urban Broad Habitat

This Broad habitat includes;

- Curtilage is an area of ground that is associated with a building, and which has a use linked with that building e.g. gardens, 'grounds', forecourts etc.

- Allotments community gardens, usually used for growing vegetables.
- Buildings - residential and public
- Car parks
- Garden Centre/Nursery
- Glasshouses: refers to commercial, large-scale enterprises, not greenhouses at the bottom of gardens.
- Gravel pits
- Hard standing/concreted/gravel area
- Public open space: includes Parks, Ornamental Gardens and Accessible Common Land, especially near large conurbations.
- Quarry/mine
- School playing fields
- Tennis courts
- Touring caravan park
- Railway track/land: to include tracks, yards, sidings and their associated curtilages (e.g. banks and 'verges').
- Road (tarmac): includes any road, whether private or not, which is totally tarmac across its width.
- Annual/early successional vegetation with open ground in urban setting. Early-successional pulse-disturbance vegetation containing annual weeds as well as perennial species usually with some open ground present. Open ground usually conspicuously present. Actual species composition dependent upon starting point. Indicators include *Poa annua*, *Plantago major*, *Agrostis stolonifera*, *Polygonum aviculare*, *Dactylis glomerata*, *Taraxacum* agg. *Stellaria media*.

## 13.18 Supra-Littoral Rock Broad Habitat

Supralittoral rock occurs above high water mark, in areas influenced by wave splash and sea-spray. Features that may be present include vertical rock, boulders, gullies, ledges and pools, depending on the wave exposure of the site and its geology. Salt-tolerant species are the characteristic colonisers. Typical plants in such areas include *Cochlearia officinalis*, *Plantago maritima*, *Tripleurospermum maritimum*, *Sedum rosea*, *Ligusticum scoticum*, *Silene maritima*, *Armeria maritima*, *Crithmum maritimum*, *Plantago coronopus* and, in some rich areas, Arctic species such as purple saxifrage *Saxifraga oppositifolia* and *Silene acaulis*. The Broad Habitat is selected at the polygon level.

### ***Supra-littoral rock Priority Habitats***

#### *Maritime (cliffs and slopes) vegetation*

This habitat type is found on sea cliffs or other coastal situations and usually herb-rich due to salt spray. Halophytes always present e.g. *Plantago maritima*, *Plantago coronopus*, *Armeria maritima* and *Tripleurospermum maritimum*.

## 13.19 Supra-Littoral Sediment

### ***Supra-littoral sediment Priority Habitats***

#### *Sand dune (vegetated)*

Sand dune vegetation should be recorded where the area is vegetated at 25% or greater, otherwise the physiography attribute sandy shore (36) should be used. Typical species include

*Ammophila arenaria*, *Leymus arenarius*, *Elymus farctus*, *Viola tricolor*, and *Euphorbia portlandica*. Dune slacks should also be included with typical species such as *Salix repens*.

#### Strandline vegetation

Vegetation will establish on shingle beaches when there is a matrix of finer material such as sand or silt, and where the structure is stable. Herb-rich open pioneer stages colonise the seaward edge with species such as *Crambe maritima*, *Lathyrus japonicus*, *Armeria maritima*, *Glaucium flavum* and *Eryngium maritimum*.

## 13.20 Littoral rock Broad Habitat

### 13.21 Littoral Sediment

#### **Priority Habitats**

##### Saltmarsh

This PH should only be recorded where the area is vegetated, otherwise bare mud (Physiography section) is appropriate. Typical species include *Salicornia*, *Puccinellia*, *Triglochin maritima* and *Aster tripolium*. In complex situations which cannot be mapped, the polygon should be assigned to a mosaic and proportions of 'bare mud' and vegetated ground in a polygon indicated.

##### Mudflats

Unlikely to be an X plot habitat.

## 14 APPENDIX-6: TREE DISEASES



# Chalara dieback of ash

Symptoms associated with **Chalara dieback** of ash (1–7)



1 Diseased saplings typically display dead tops and/or side shoots.



2 At the base of dead side shoots, lesions can often be found on the subtending branch or stem.



3 Lesions which girdle the branch or stem can cause wilting of the foliage above.



4 Mature trees affected by the disease initially display dieback of the shoots and twigs at the periphery of their crowns. Dense clumps of foliage may be seen further back on branches where recovery shoots are produced.



6 In late summer and early autumn (July to October), small white fruiting bodies can be found on blackened rachises (leaf stalks) of ash in damp areas of leaf litter beneath trees. These do not necessarily belong to the pathogen but can be tested to determine their identity.

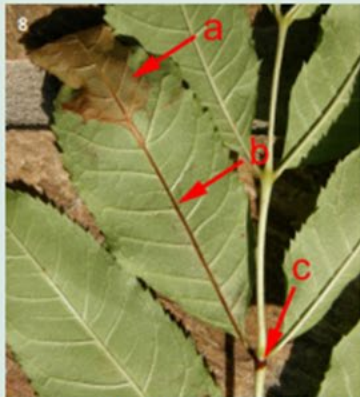


7 If the disease is well established, some trees may have tongues of bark killed by *C. fraxinea* at the base of their stems.

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[plant.health@forestry.gsi.gov.uk](mailto:plant.health@forestry.gsi.gov.uk)

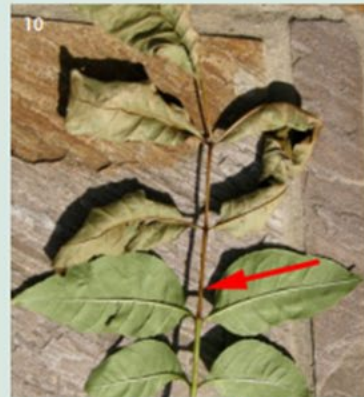
## Symptoms associated with **Chalara dieback** of ash (8-16)



8 Leaf necrosis (a) extending into leaflet vein (b) and leaf stalk (c).



9 Lesion on leaf stalk (ends arrowed) without leaflet symptoms.



10 Necrosis of leaf stalk (arrowed) and associated desiccation of leaflets.



11 Developing lesions associated with former insertion points of leaf stalks.



12 Older lesion associated with former insertion point of leaf stalk.



13 Developing lesion centred on a dead side shoot.



14 Older lesion centred on a dead side shoot.



15 Old lesion centred on a dead side shoot.



16 The wood and pith underlying bark lesions is usually strongly stained.

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[plant.health@forestry.gsi.gov.uk](mailto:plant.health@forestry.gsi.gov.uk)

# Chestnut Blight

*(Cryphonectria parasitica)*



Stem girdling causing branch wilting. Late summer or autumn is the best time to see fresh wilting. Typically the leaves on branches killed by the blight have not dropped and can still be seen even after the fall of leaves.



Canker symptoms on a young stem. Cankers can be seen throughout the whole year but they may be easier to see during the winter when the trees have lost their leaves.



Epicormic shooting below canker are a visible sign that the stem has been completely girdled by chestnut blight.



Removal of the outer bark at the edge of cankers can reveal fans of mycelium produced by the blight fungus.



Orange sporulation in bark cracks. In larger trees with decline symptoms, the bark of the trunk should be checked for fruiting bodies.



Orange tendrils of spores protruding from bark. Fruiting bodies are typically formed in bark cracks on the trunk and branches.

All photos on this page plus two overleaf courtesy of Dr. Daniel Rigling, Eidg. Forschungsanstalt für Wald, Schnee und Landschaft (WSL), Switzerland. [www.wsl.ch](http://www.wsl.ch)

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# Chestnut Blight

*(Cryphonectria parasitica)*



Courtesy of D. Rigling

Active lesion on a young chestnut stem, visible due to the altered colour of the bark.



Basal lesion with outer bark removed showing dying inner bark. Death of the main stem may occur in the growing season followed by regrowth from the grafted rootstock.



Cankering and bark splitting at the base of a young tree symptomatic of bark death.



Courtesy of D. Rigling

Canker resulting from infection via the graft wound. Wounds caused by grafting or other physical damage are entry points for the pathogen.



Smaller plants in new plantings can be surveyed for cankers throughout the year and cankers can often be seen before wilting symptoms occur.



Heavily cankered stem below the graft point. Orange pin-head sized fruiting bodies can be seen below the graft wound.

[www.forestry.gov.uk/planthealth](http://www.forestry.gov.uk/planthealth)

[plant.health@forestry.gsi.gov.uk](mailto:plant.health@forestry.gsi.gov.uk)

The current epidemic of Dutch Elm disease is caused by the fungus *Ophiostoma novo-ulmi*. It is disseminated by various elm bark beetles within the genus *Scolytus*. The fungus blocks the water conduction system of trees resulting in wilting and death of the foliage.

Symptoms of the disease first appear in early summer as clusters of wilting or yellowing leaves which then turn brown and fall (Figures 1 and 2). Affected shoots die back from the tip and the twigs sometimes turn down to form 'shepherd's crooks' (Figure 3). Because the disease is progressive an affected tree may have a mixture of healthy foliage, yellow or brown foliage and defoliated shoots, showing infection in different branch systems.



Figure 1. Yellowing and wilting of leaves.



Figure 2. Wilted and withered leaves.



Figure 3. Shepherd's crooks.

Confirmation of the disease can be obtained by peeling the bark from symptomatic live twigs which show dark brown or purple longitudinal streaks in the outer wood (Figure 4). Although the streaking may not be as pronounced as in the photograph. Cutting across the twig should reveal a ring of dark brown staining in the outer wood (Figure 5). This twig also has a ring of staining in a previous growth ring. Note that the brown streaking may not be present in all affected branches, especially in lower branches of large trees.



Figure 4. Diseased twig with bark removed to show staining in the wood. Healthy twig on the left.



Figure 5. Diseased twig with staining in the wood. This photograph shows evidence of an earlier infection as well as an infection in the outermost wood.

Further information on the disease can be found on the Forest Research website [www.forestresearch.gov.uk](http://www.forestresearch.gov.uk) and in Research Information Note 252 'Dutch Elm Disease in Britain' by John Gibbs, Clive Brasier and Joan Webber.



# EXOTIC PEST ALERT

## *Phytophthora ramorum*

### Sudden Oak Death



*Phytophthora ramorum* is a new species of *Phytophthora*. It was first identified in California in 2000 and then later in Oregon, USA: in both these states it causes a highly damaging tree disease known as Sudden Oak Death. The same *Phytophthora* has also been found to cause a new disease of rhododendrons and viburnums, which was first reported in Europe from the Netherlands and Germany. However, the form of *P. ramorum* in North America is of a different sexual mating type to the fungus in Europe.

*P. ramorum* has since been found on nursery stock in a number of other European countries including Belgium, the Czech Republic, Denmark, France, Ireland, Italy, Spain (including the Balearics), Slovenia, Sweden and the UK. The main hosts are rhododendron and viburnum, but other genera can be hosts, including *Camellia*, *Kalmia*, *Pieris*, *Hamamelis* and *Syringa*. It has also been recorded once on small pot-grown yew plants (*Taxus baccata*) growing close to infected viburnums in a UK nursery. The first record of *P. ramorum* on a mature tree outside the USA occurred in the UK in November 2003. The affected tree was a 100-year-old *Quercus falcata* (southern red oak). Also in November 2003, an infected *Q. rubra* (northern red oak) was reported in the Netherlands. Subsequently, infected examples of *Fagus sylvatica* (beech), *Castanea sativa* (sweet chestnut), *Q. cerris* (Turkey oak), *Q. ilex* (holm oak) and a single *Aesculus hippocastaneum* (horse chestnut) have been found in southeast England. This alert is to raise awareness of the disease and describe the symptoms on potentially susceptible hosts in the UK.

#### Known hosts

Disease symptoms caused by *P. ramorum* can vary markedly depending on the host. On some trees the infection is a lethal stem canker, but on other hosts only foliage and shoots are affected. In the USA infected plants have been found in both forests (Fig. 1) and urban plantings. They include:

- Stems of oak species such as
  - tanoak (*Lithocarpus densiflorus*)<sup>1</sup>
  - coast live oak (*Q. agrifolia*)<sup>1</sup>
  - black oak (*Q. kelloggii*)<sup>1</sup>
  - interior live oak (*Q. parvula* var. *shrevei*)<sup>1</sup>
- Leaves of
  - bay laurel (*Umbellularia* sp.)<sup>1</sup>
- Needles and shoots of
  - Douglas fir (*Pseudotsuga menziesii*)
  - coastal redwood (*Sequoia sempervirens*)



Fig. 1 Dying coast live oak in California

Apart from forest trees, numerous understorey shrubs can be hosts although often only foliage is affected. In all, around 40 plant species have been found to be susceptible to infection.

Details of these host plants can be found at [www.suddenoakdeath.org](http://www.suddenoakdeath.org)

In Europe known hosts include the trees and ornamentals described above. Beech and red oak are the most susceptible tree species so far; infection on these takes the form of extensive bleeding cankers on the trunk. Infected individuals of holm oak (Fig. 2) and sweet chestnut have also been reported, but only the foliage is colonised by *P. ramorum*.

With some ornamental species, particularly *Rhododendron* and *Pieris*, leaves and shoots are affected, whereas with *Viburnum* the stem bases are affected. *Vaccinium vitis-idaea* (cowberry) has also been reported as a host in Poland - interceptions only.



Fig. 2 Infected foliage of holm oak

<sup>1</sup>Virtually unknown in Europe.

### Symptoms on trees

Lethal infection of trees by *P. ramorum* is rare, but the symptoms can be very similar to those caused by other tree diseases.

#### Trunk

Infection by *P. ramorum* is usually characterised by the presence of dark red to black sap oozing from the trunk: 'bleeding cankers' or 'tarry spots' (Fig.3). This is often on the lower portion of the trunk but may also occur several metres up the stem. When the outer bark is removed from the bleeding canker, mottled areas of necrotic, dead and discoloured inner-bark tissue can be seen (Fig. 4). Black 'zone lines' are often present within and around the edges of the necrotic region.



Fig.3 Bark bleeding or tarry spots



Fig.4 Mottled necrotic inner-bark

#### Foliage

The necrosis caused by bleeding cankers may girdle the tree and result in rapid death. As a result, foliage may change colour rapidly and uniformly throughout the crown, with the withered leaves remaining on branches after death.

Where *P. ramorum* infects the foliage of sweet chestnut and holm oak, the symptoms are scattered throughout the crown but mostly at the lower levels.

Young foliage or epicormic shoots are the most commonly affected. In sweet chestnut dark necrotic lesions begin along the leaf margins or at the leaf tip (Fig.5) and in holm oak the necrosis extends down the petiole and kills the current year's shoot.



Fig.5 Infected leaf of sweet chestnut

### Spread and distribution

Spread is aerial, probably in rainsplash, mist-laden winds or via watercourses. In the UK, infected trees have been found in close proximity to heavily infected rhododendrons, which probably act as the main source of spores of *P. ramorum*.

### Similar symptoms

British oaks are already subject to a widespread but local mortality and dieback of complex cause known as 'oak decline'. In some cases this is associated with infection by other root infecting Phytophthoras. It also involves recurrent drought, root disease fungi such as *Collybia*, episodes of insect defoliation (e.g. by *Tortrix* species) and scale insect attacks. Oak decline symptoms have some similarities with those caused by *P. ramorum*. However, tests have shown that our native white oak species, *Q. robur* and *Q. petraea*, are not very susceptible to *P. ramorum*, and when these species suffer from oak decline they do not exhibit bleeding cankers on the main stem. Occasionally, declining trees have dark, watery fluxes from bark cracks which tend to run freely down the tree. On mature oaks with decline, foliar symptoms develop over many years and affected trees become 'stagheaded'.

Horse chestnut can also suffer from a disease known as 'bleeding canker'. The symptoms are very similar to those caused by *P. ramorum*, although the causal agent is another well-known species of *Phytophthora*; details at [www.forestresearch.gov.uk/pdf/bleedingcanker.pdf](http://www.forestresearch.gov.uk/pdf/bleedingcanker.pdf)

### Contacts

*P. ramorum* is a quarantine pathogen and infected plants are subject to eradication. If the disease is suspected on trees please contact:

FC Pathology Disease Diagnosis Service  
Tel: 01420 23000 Fax: 01420 23653  
FC Plant Health Service  
Tel: 0131 3146414 Fax: 0131 3146148  
Or visit these websites for more information:  
[www.forestry.gov.uk/pramorun](http://www.forestry.gov.uk/pramorun)  
[www.defra.gov.uk/plant/pramorun.htm](http://www.defra.gov.uk/plant/pramorun.htm)

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