

Environment and Rural Affairs Monitoring & Modelling Programme (ERAMMP)

ERAMMP Document-49 Field-Survey Handbook (Procedures) Vegetation Plots 2021

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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/en/glossary> (English) and <https://erammp.cymru/geirfa> (Welsh)

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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 1km 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.

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 veg plots

In the previous survey (GMEP), plots were placed and recorded for the first time in all 1km squares. Thus, most plots provided baseline data (the exception being a set of 21 squares completed in year 4 of GMEP, 2016, when 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 squares, or 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 *Collector*.

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 maybe 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

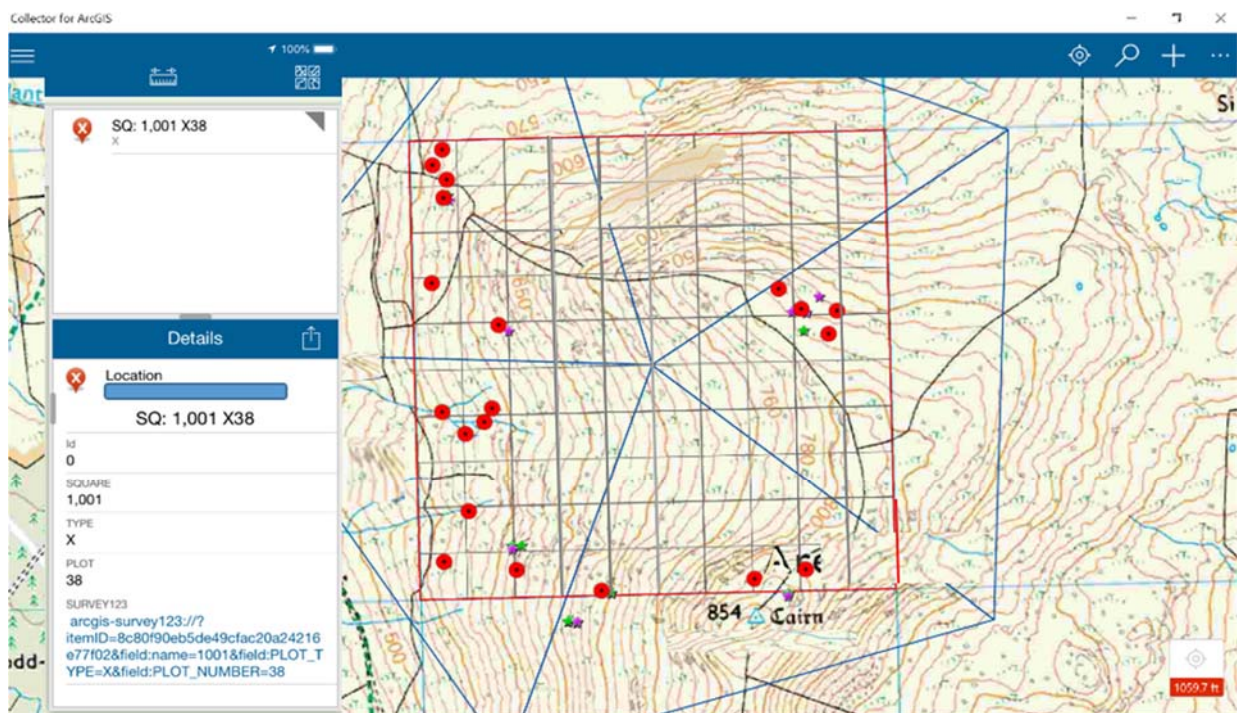
In order to begin plot data entry, you will open ESRI's Collector app. Open the map (name tbc in training), on which the plots will appear. You can then:



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 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 Plot 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,...
- **Plot 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.



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.



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 to 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.

Notes on 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

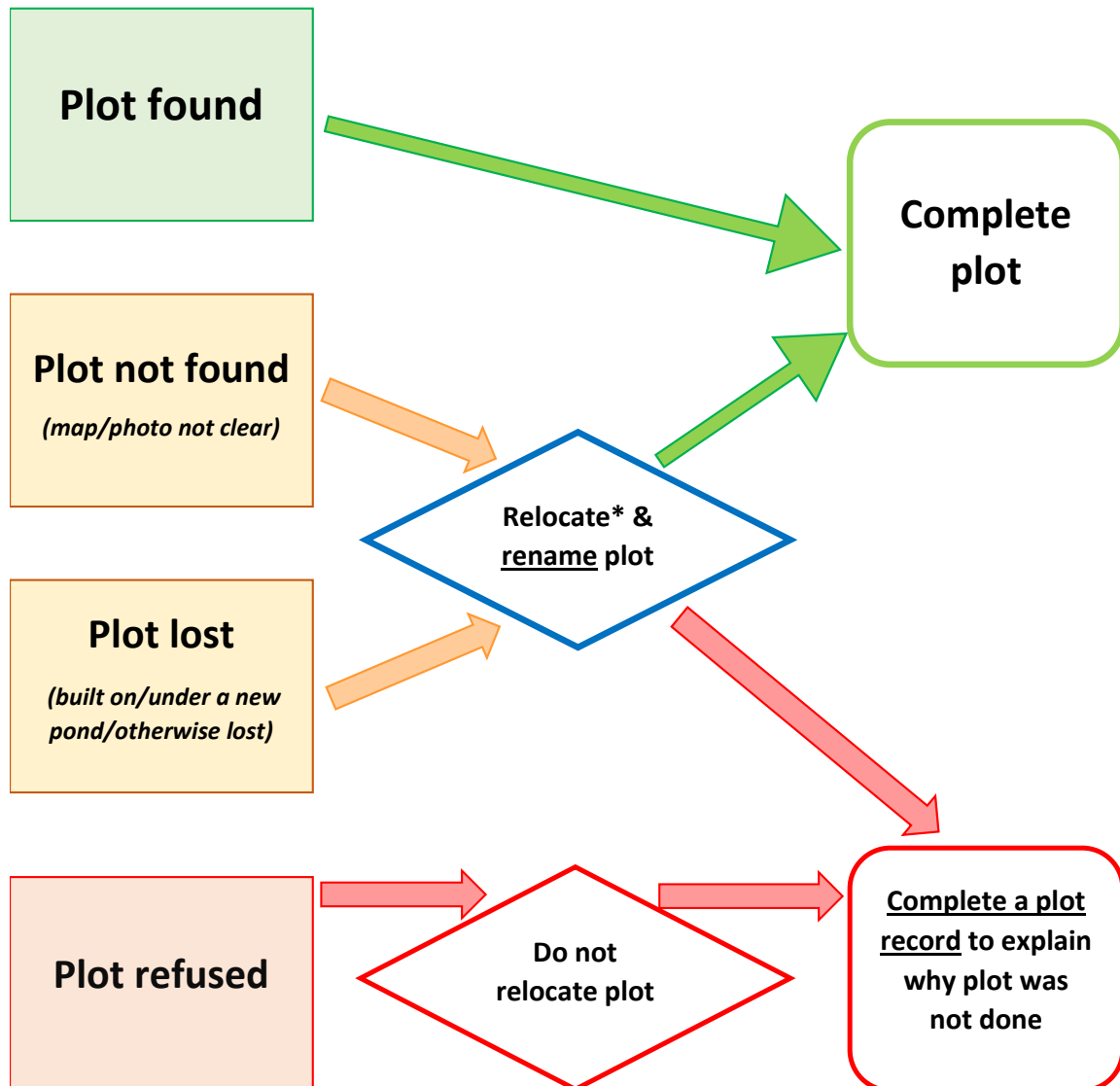
Do not relocate plot if:

- 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? Tick yes if you have found the metal plate. With minimum disturbance please dig down and make sure that it is the metal plate you have found and not rubbish. The knife in the soil coring kit is good for this purpose. **Metal plates were only buried in Countryside Survey squares** (and are sometimes hard to find).

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 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) *

Priority Habitat (plot) *

Broad Habitat (wider polygon) *

Priority Habitat (wider polygon) *

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

Trees present
 Yes

- **Broad habitat (at 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.
- **Broad habitat (wider polygon)** - The BH selected in this dropdown plots should reflect the assignment of the wider mapped polygon (or 'minimum mappable unit'¹). (UNLESS the polygon is a Mosaic. This will invariably be in Unenclosed habitats, for example Bog and heath or Bog and Fen, Marsh & 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 (at 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.
- **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.

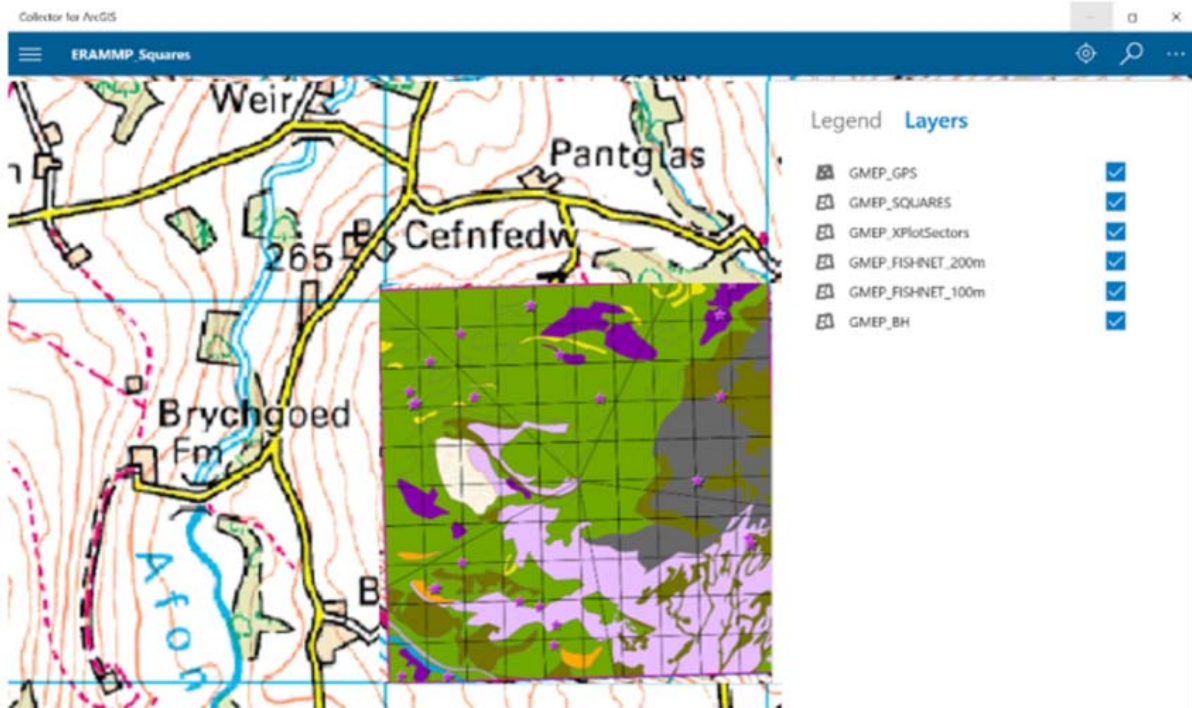
You should err on the conservative side so use the same allocation as previously unless it appears that real change has occurred (or unless you think that there was a major error in classification).

¹ The Minimum Mappable Unit is 1/25th of a hectare or equivalently 0.04 * 10,000m² or equivalently an area of 400m² and therefore a square of side 20m

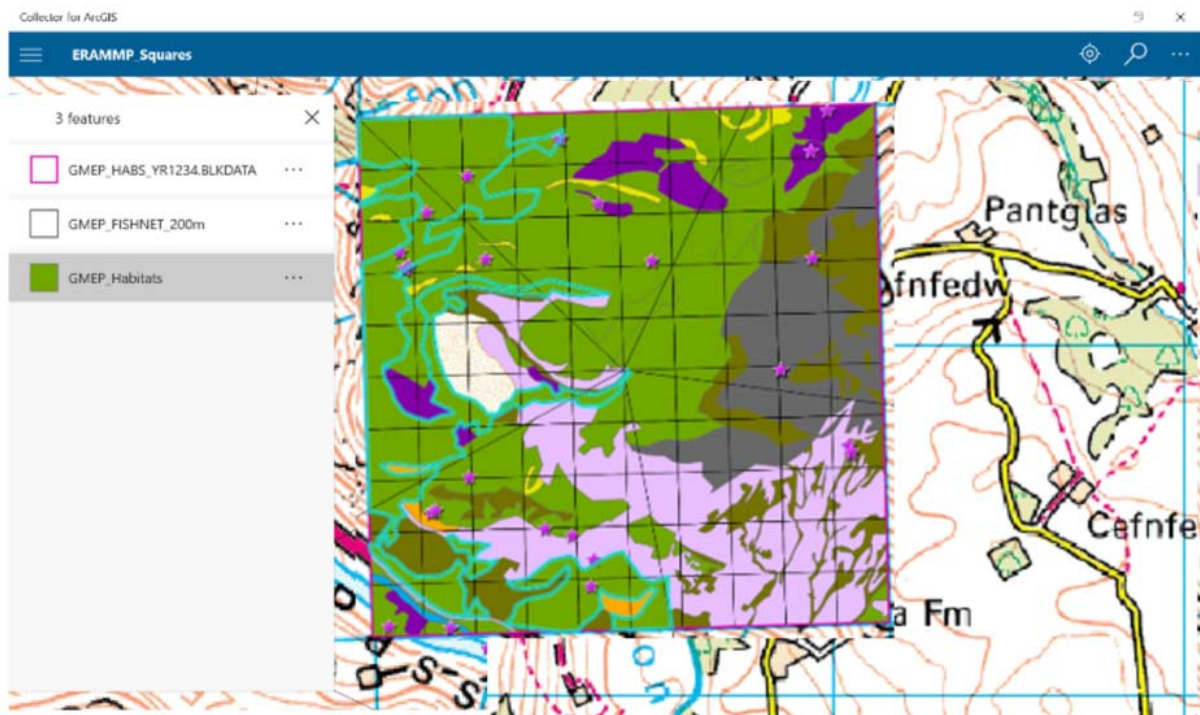
In order to view the Broad and Priority Habitat data you can turn on a layer in Collector (your map of Veg Plots).

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

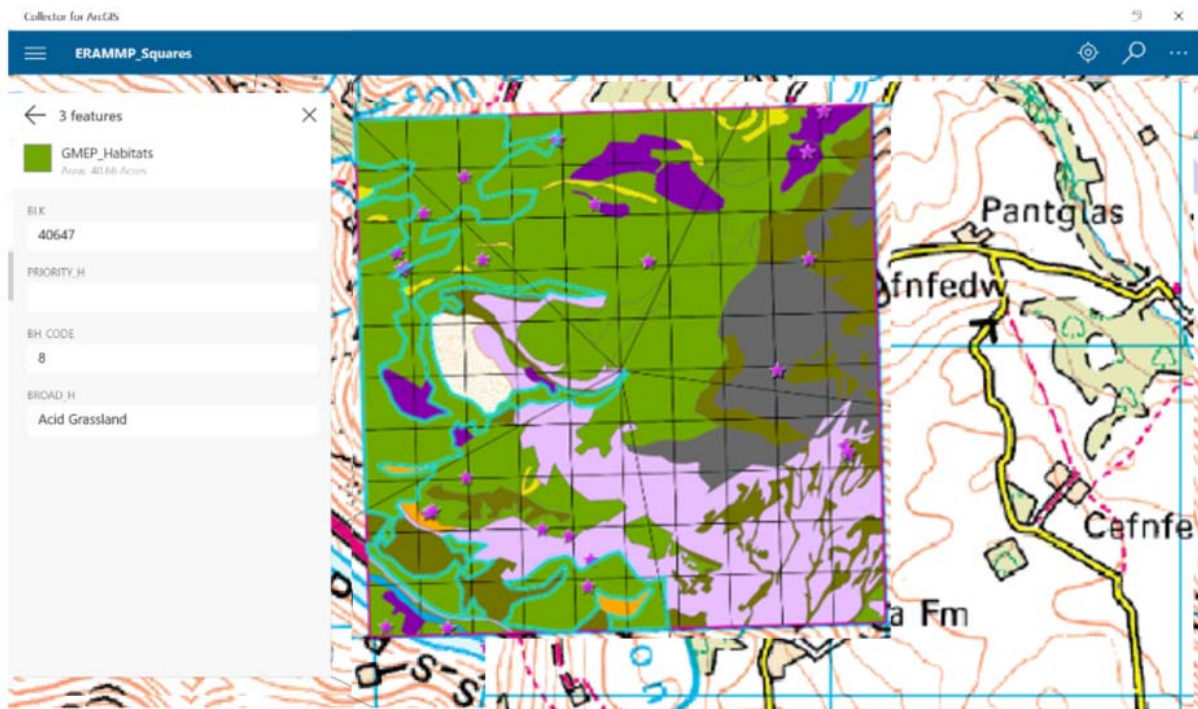
This gives you a coloured map of habitats in your square:



- 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

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

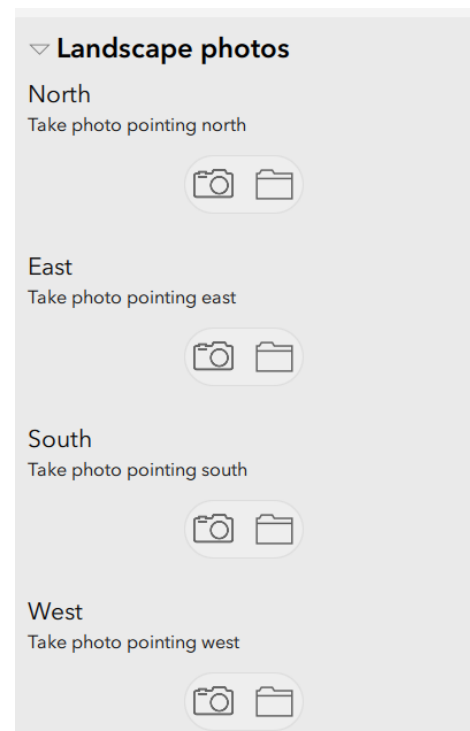
Vegetation Height

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 plot, 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.



Read Section 7 for more information.

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. It is essential that all plot photos feature information on plot number and type, **this should be automatically stamped on the photo if taken using the Survey123 app.** (As an alternative, surveyors are supplied with a set of letters and numbers on waterproof paper which can be attached to the back of a weatherwriter to indicate the number and type of plot featured in the photo as well as the square number. From the evidence of previous surveys, the most useful plot photos show the surveyor holding the weather writer vertically behind or to the side of a plot (at plot location marker) NOT facing the sun (which can cause glare and make it impossible to decipher the plot type and number) or including too much sky).

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).



Ensure that the following are clearly visible in each photo:

- Square number
- Clear plot type and number
- Distinguishing features where possible

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 locations. 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 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.

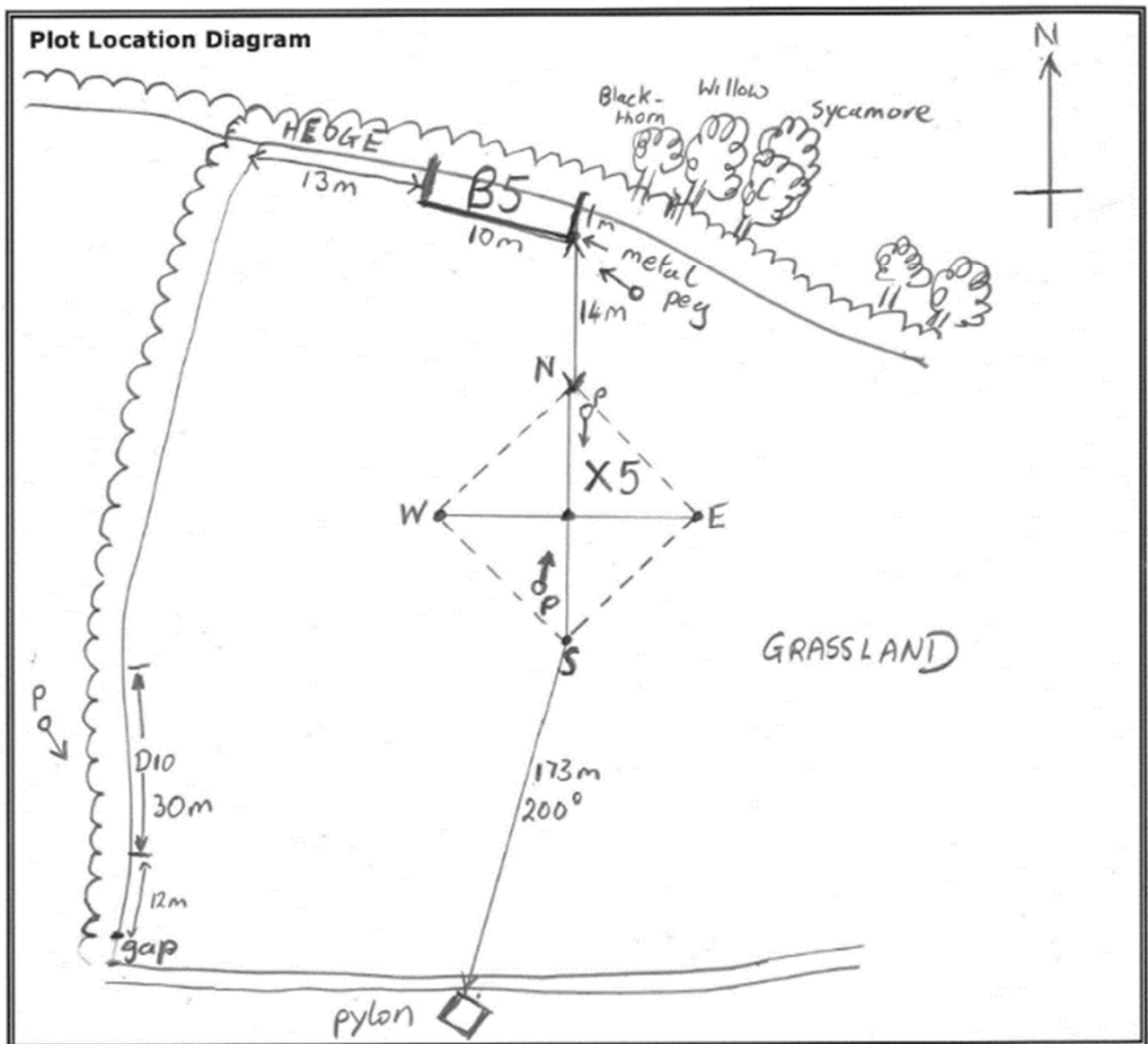
When editing/drawing new maps surveyors may include more than one plot on a map if the plots are co-located, e.g. X, B, A, M plots or H and D plots or S, W and P plots (see below for further details). Also note that if you have no rangefinder and you have to pace then translate your paces into metres.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

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 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.



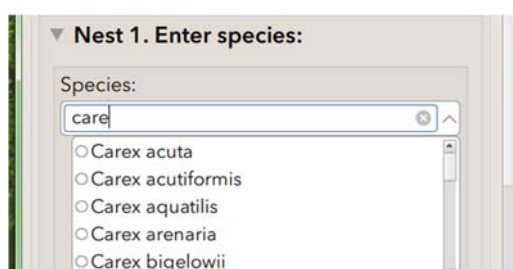
Example of a plot location diagram

PLOT SPECIFIC HEADER INFORMATION (PAGE 2)

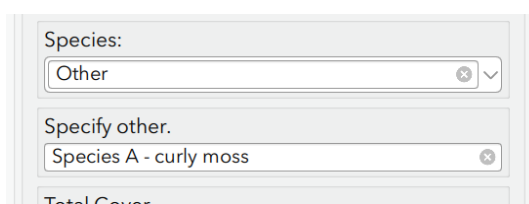
This page contains a range of information which is required for the different plot types. The surveyors will only be able to enter data relevant to the plot type being surveyed. *The header information relevant to the different plot types is detailed under each plot type, which is described later on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

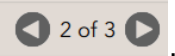


Additional species are entered by clicking the  (below ‘Total Cover’), or can be deleted using the dustbin icon. .

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:

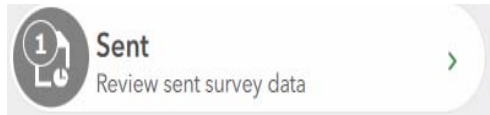


3.3 Submitting your data

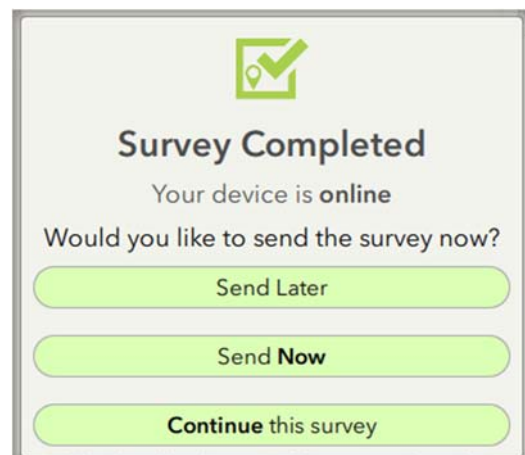
Once a survey form has been completed, you have a number of options on clicking the green tick button on the last page of your survey.



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
Area plots					
X	Large	'Wally plot' Main	Random points not on linear features	200m ²	Up to 5
Y	Small	Targeted and Enclosed Habitat	Primarily allocated to 'Enclosed habitats' placed to record Priority Habitats (PH) not sampled by other plots.	4m ²	Up to 5 but more if >5 PH
U	Unenclosed		Unenclosed Broad Habitats	4m ²	Up to 10
Linear plots					
B	Boundary		Adjacent to field boundaries	10 x 1m	5
A	Arable		Arable field edges centred on each B plot. Only one per arable field. Usually paired with X plots.	100 x 1m	Up to 5
M	Margin		Field margins.	2 x 2m	Up to 15
H	Hedgerow		Alongside hedgerows (i.e. WLF with unnatural shape) and usually coincident with two of the D plots.	10 x 1m	2
D	Hedgerow diversity		WLF with natural or unnatural shape.	30 x 1m	Up to 10
S/W	Streamside		Four placed alongside water courses. <i>One W plot centred on the RHS stretch.</i>	10 x 1m	Up to 5
P	Perpendicular streamside		Sampling the upslope habitats adjacent to and centred on the S/W plots.	10 x 1m	Up to 5 (limited number this year)
				MAX	>=73

4.1 X Plots

4.1.1 Laying out X plots

200 m² X plot layout

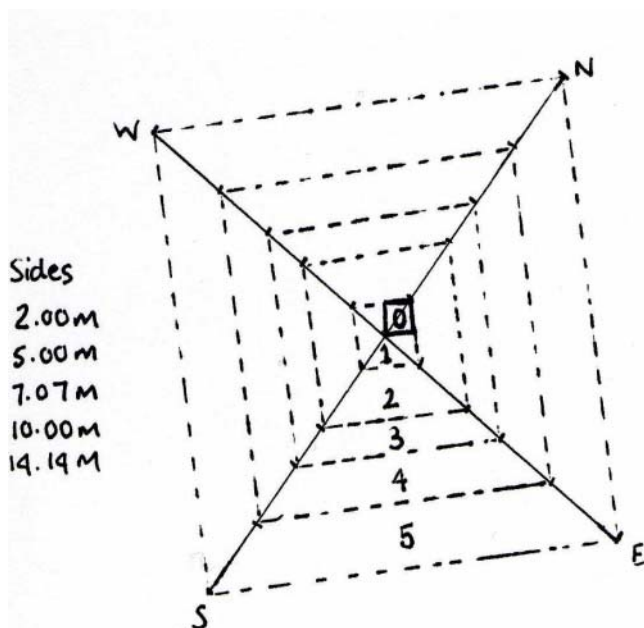
The vegetation plot is 200 m² (14.14 x 14.14m) and is set up by using the survey poles provided with the strings forming the diagonals of the square. The diagonals should be orientated carefully at right angles and the plot should be orientated with the strings on the North/South, East/West axes.

In arable fields the plot should be taken as being a 14m square (estimated, not measured), starting 3 metres 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.

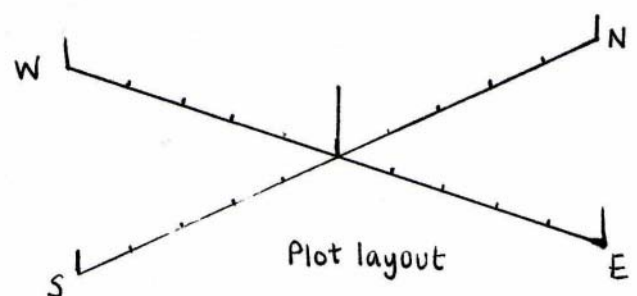
The different nested plots shown are marked by different coloured strings on the appropriate position of the diagonal. The 1m² nest is not marked and comprises the northernmost corner of the inner 4 m² nest.

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 1.41m
2. Run out 4m of tape and place the 2m position at the nest 1 marker tag then run the 0-2m and 2-4m lengths back to the centre post.
3. Now simply pull out the slack in the tape, placing pegs at 1m and 3m to derive the 1x1m quadrat.



Design of X (Wally) Plot



Nest	Area (m ²)	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

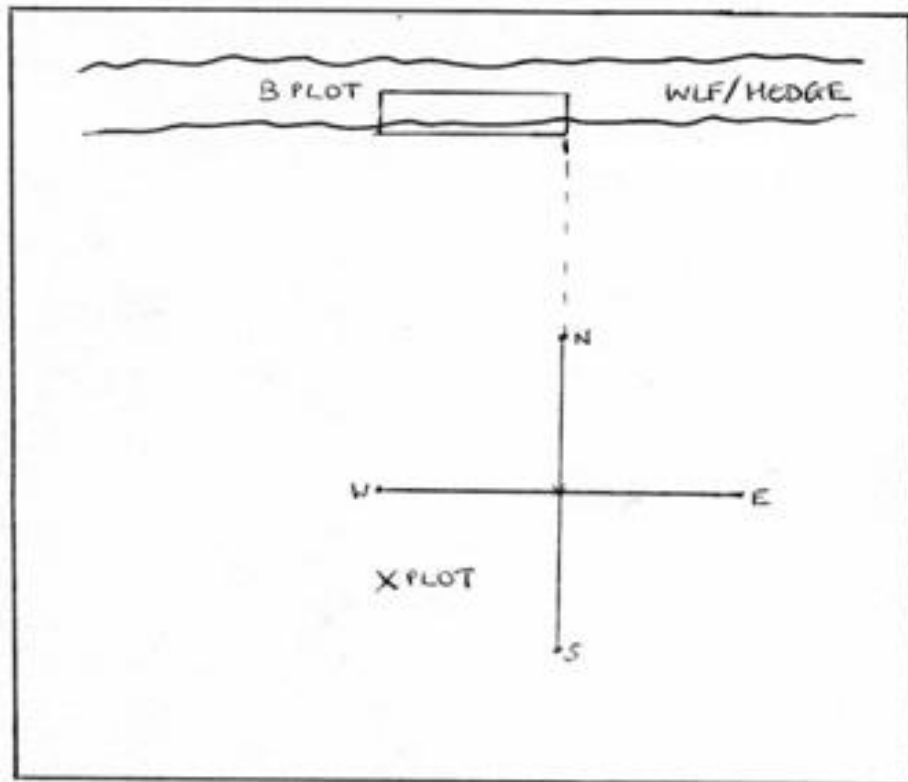
The only header information required specifically for X plots is:

- **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 notes for further guidance

LISTED SPECIES

200m² 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 in the

drop-down menu. 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 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 x 14.14 m (200 m²) 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

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▼ **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 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 **2x2m** 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).

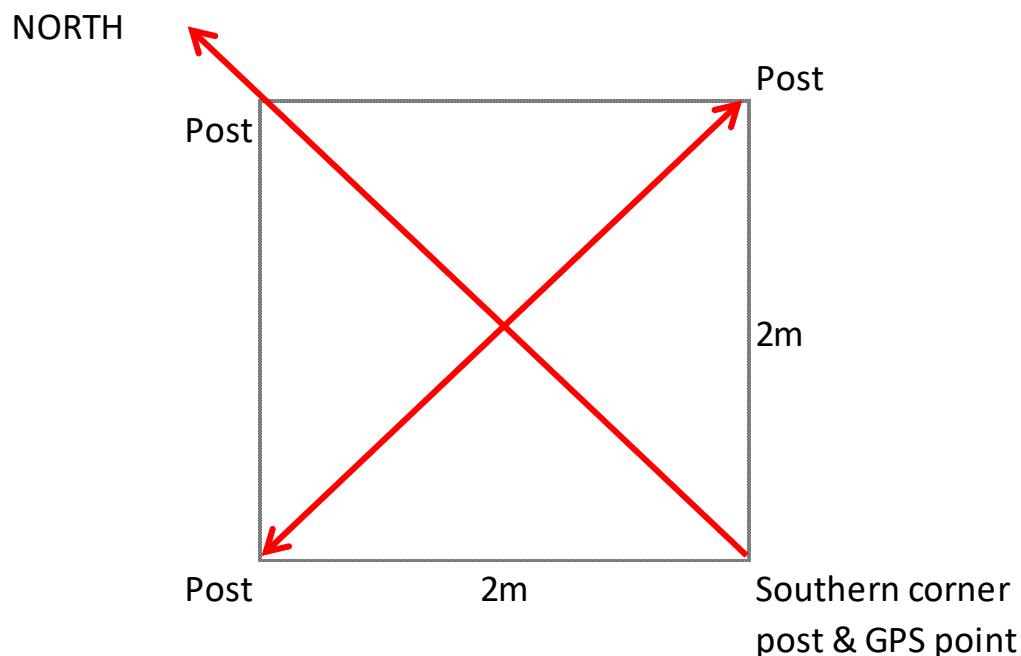
Enclosed habitats are Broadleaved and Conifer woodland, Arable, Improved and Neutral Grassland.

4.2.1 Locating Y plots

In general, the GPS point and metal plates (CS squares only) were placed immediately adjacent to the survey pole at the south point of the plot, but just outside (15cm) the plot boundary or somewhere else on the plot perimeter. Check sketch map and plot photos provided.

4.2.2 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 2.82m of tape (the diagonal length of the 2x2m plot) and orient this north to south and peg both ends. Then simply run out 8m of tape pegging out the north and south ends at 0 and 4m and pulling out the tape taught so that the 2m and 6m corners are pegged.



Layout of the X, U and Y plot showing the southern corner and direction of alignment. The plot is 4m² i.e. 2m x 2m along the sides.

4.2.3 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 x 2m) 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)

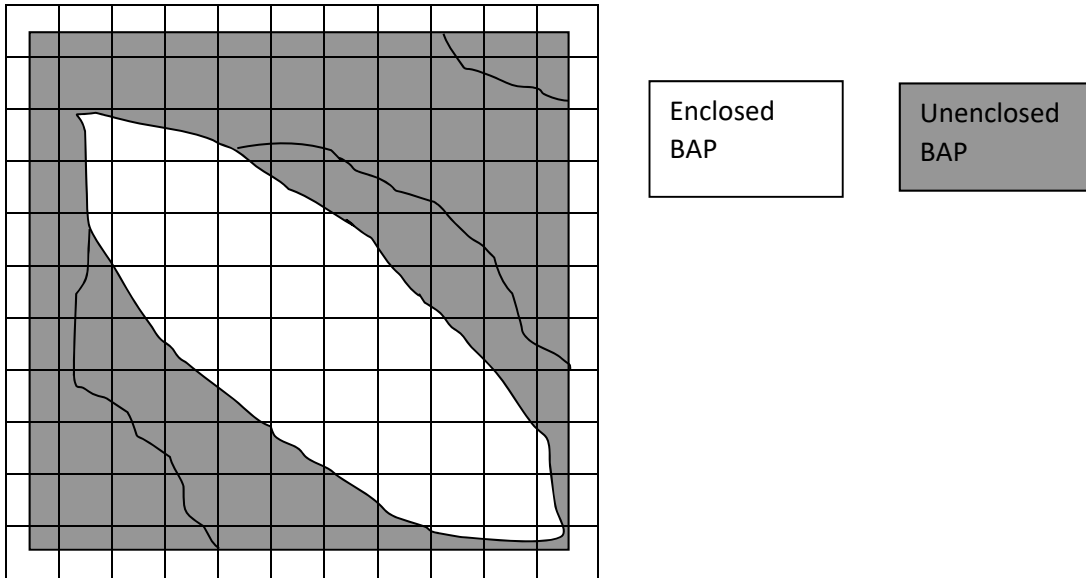
Note that you will not be required to lay out new plots unless replacing previous plots that have not been Found

Up to 10 plots may be placed in any unenclosed Broad Habitat types that occur within the square. The plots are 2 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.

N.B. 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.



100m 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.**

Previous U plots were often marked with either a metal plate or a wooden stake immediately adjacent to the south corner of the plot but just outside (15cm) the plot boundary (CS squares). A pilot survey in CS2006 revealed that U plots were particularly difficult to re-find.

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 metres 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 4m²- 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 metre 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 metre.

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 x 1m**).

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 200m² 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 Boundary plot will take precedence over other types of linear plot. If two plots would otherwise end up in the same location, then the Boundary plot would be laid out and the other linear feature moved to the nearest permissible length of boundary which was at least 10m away. The exception is where a linear plot has previously/already been located in the same position as a Boundary plot would fall. In this case the Boundary plot would be moved to the next nearest length of boundary on a different cardinal bearing.

The marker plate (CS squares only) for the 200m² 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. The metal plate should be to the right of the plot when viewed from the field, and located 1m away from any vertical feature such as the base of a wall or fence.

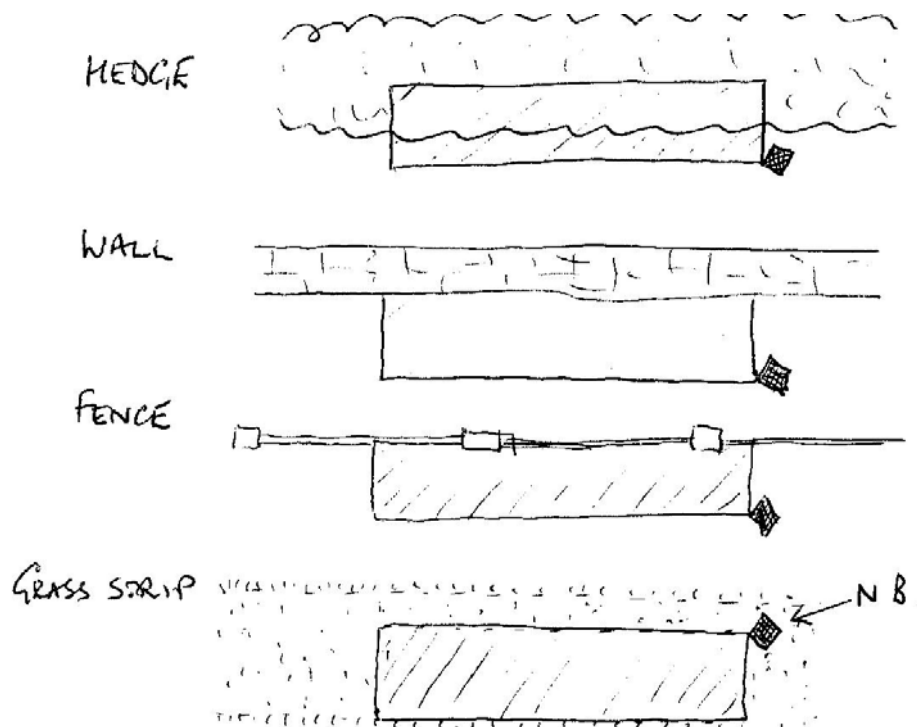
4.5.2 Laying out B plots

The linear plot should be laid out so that the differential GPS recording position is at the right-hand corner of the plot at 1m 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 1m 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 1m 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 1m strip, irrespective of whether it includes part of another linear feature. (N.B. different rules apply in the case of H and S/W plots - see below).

Boundary 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. (**N.B.** 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 boundary plot should run from the curtilage into the field.



Laying out a boundary 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 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 100m long by 1m wide.**

The plots are not marked with metal plates or photographed due to their relationship with B plots. Thus, the B plot photos may prove helpful. N.B. Note that 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.

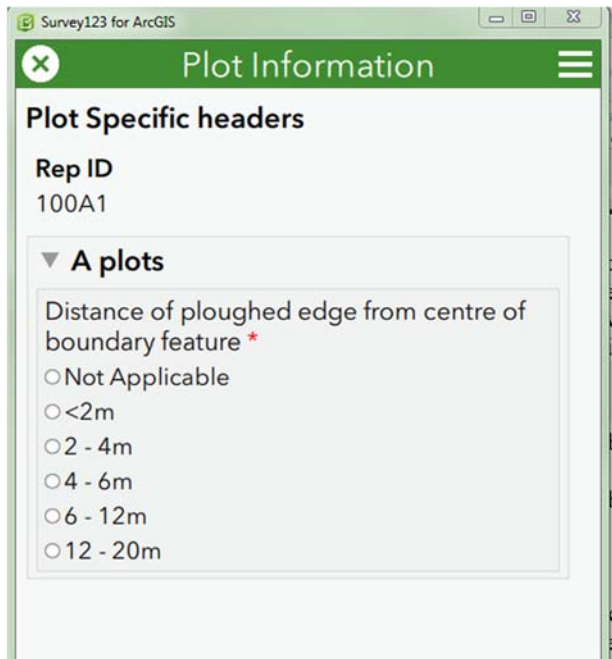
4.6.1 Locating new A plots

'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 Boundary 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 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 50m 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

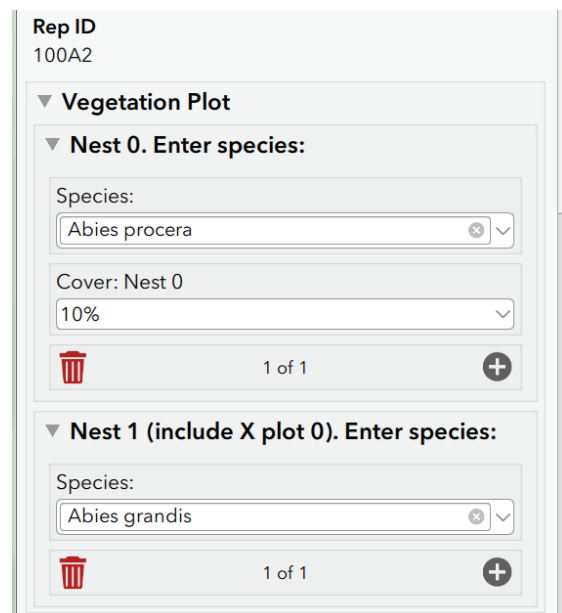


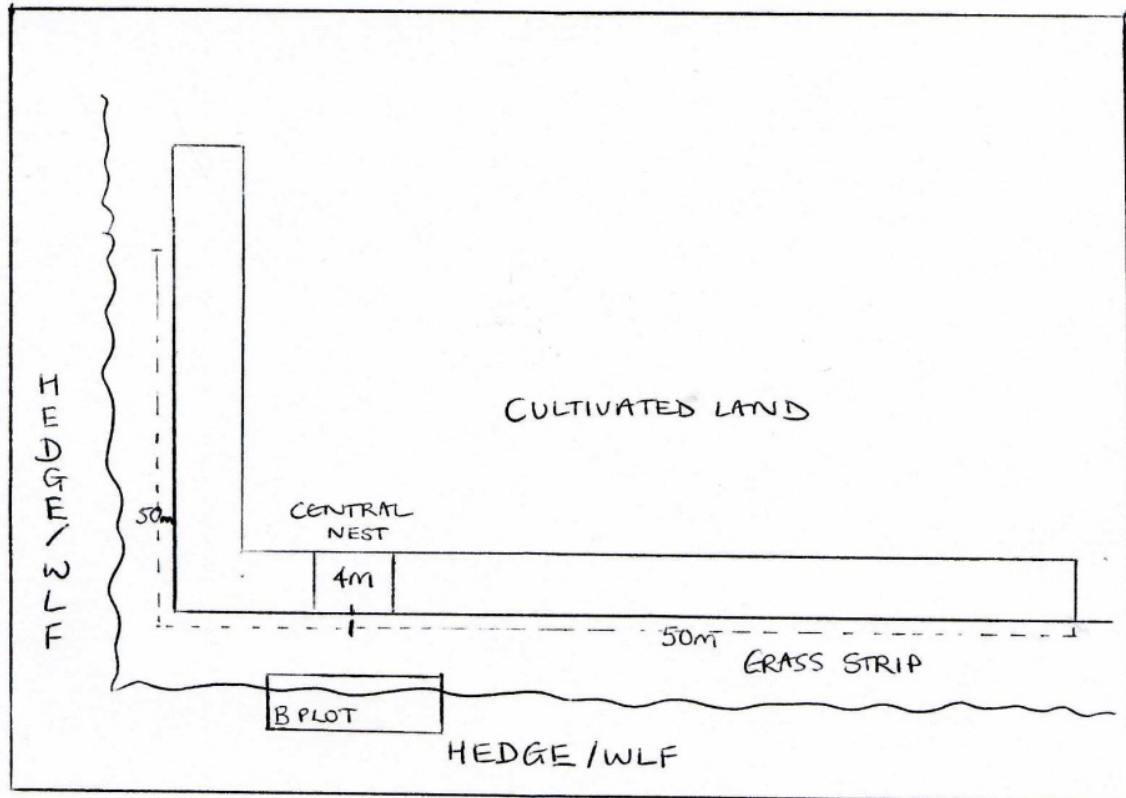
HEADER

- **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 4x1m section (nest 0). In the rest of the plot (nest 1) only species presence should be recorded.





Laying out an arable field margin plot

4.7 M Plots –Margin Plots (M1-Mx)

M plots are **2m x 2m** 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

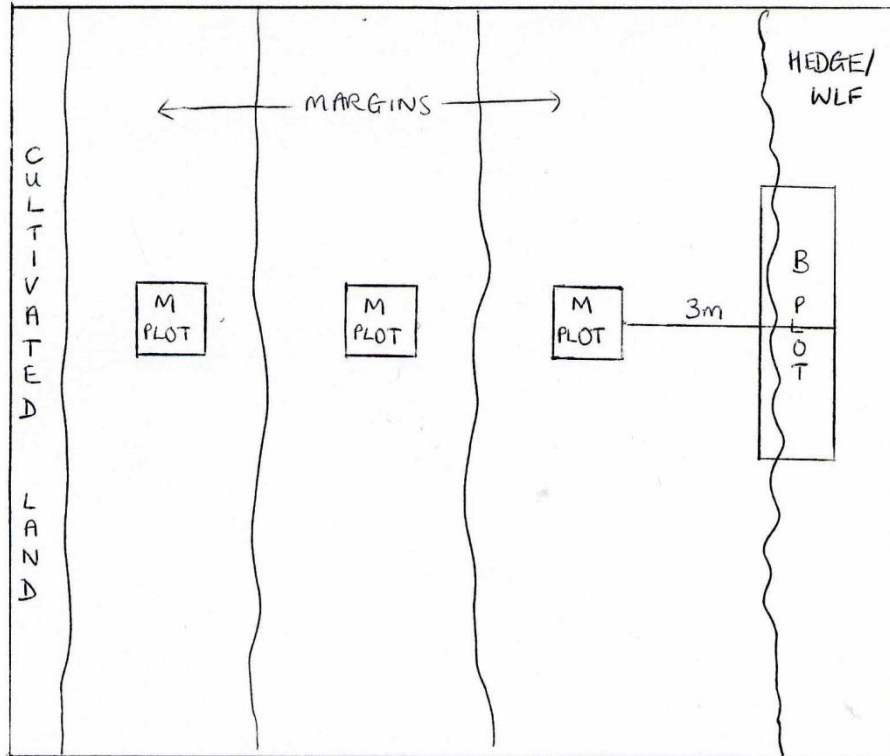
4.7.1 Locating M plots

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

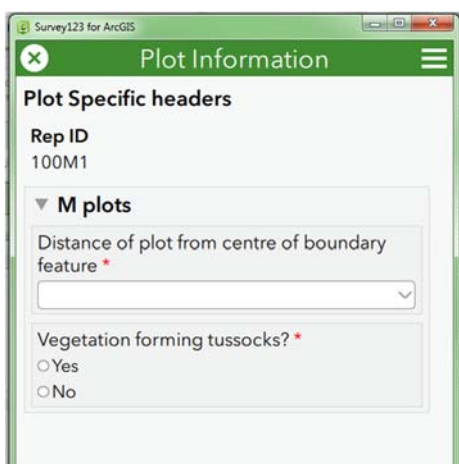
Where a margin or margins are present at the edge of the field the first M plot will be placed at 3m from the centre of the hedge (where a hedge is the boundary feature). Where the

boundary feature is a wall or fence the M plot will be placed at 2m 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 6m into the cropped area further quadrats will be recorded at intervals of 6m. Thus if the first M plot is at 3m from the hedge centre, the 2nd is at 9m, the 3rd at 15m 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.

Rep ID
100H2

▼ Vegetation Plot

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

Species:
Carex acuta

Total Cover

1 of 1

4.8 H Plots – Hedgerow Plots (H1-H2)

4.8.1 Locating H plots

H plots are linear **10 x 1m** plots. H plots are placed on the hedge ² nearest to each of the two X plot locations that are farthest apart in the square. The 10m x 1m H plot is laid out to the left and the 1m width extends out towards the field from the centre of the hedge. **The H and B plots should not be nearer than 10m to each other, so if there is not more than 30m 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).

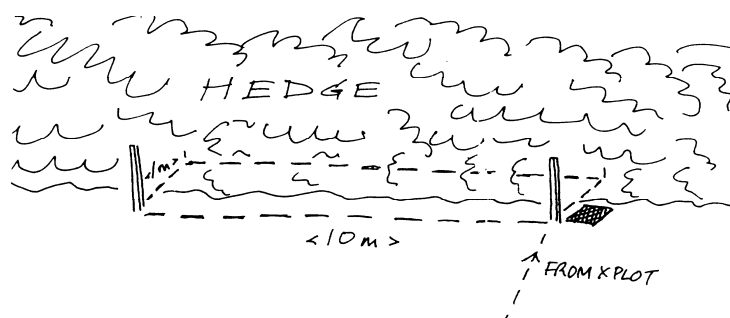
If in a Countryside Survey square then each repeat plot should have been marked with a metal plate at the right-hand end of the plot when you are facing it from the field. Check the plot map and photographs provided. If a fence has been installed since the plot was recorded last then repeat the plot 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 1m rather than following the base of the new fence.

² H plots should be placed on hedgerows only ie WLF where the woody species have an unnatural shape due to their present or past management.

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.

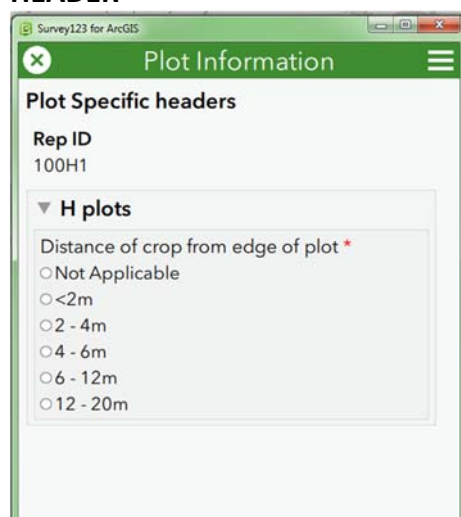
If there is not a clear metre between the centre of the hedge and another linear feature, e.g. a ditch, then the hedge plot should be relocated at the nearest permissible location.



Laying out a hedgerow plot. The black square indicates the corner of the plot where the differential GPS location should be measured.

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)

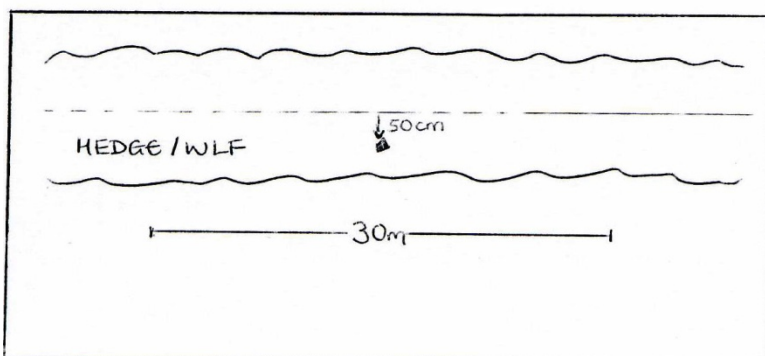
4.9.1 Locating D plots

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

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 the H plot should have been recorded in the central 10m 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 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:

The screenshot shows a mobile application interface for 'Survey123 for ArcGIS'. The main title is 'Plot Information'. Under 'Plot Specific headers', the 'Rep ID' is '100D1'. A section titled 'D plots' contains several dropdown menus for data entry: '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? *', and 'Are trees and shrubs: *'. Each dropdown menu is currently empty.

- **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 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%
- **Crocoshmia 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%

Survey123 for ArcGIS

Plot Information

Width perennial vegetation *

Are the trees or shrub canopies touching? *

Height of base of canopy *

Are there signs of historic management? *

Yes

No

▼ Invasive Species *

Crocoshmia aurea hybrid *

<10% >10%

Fallopia japonica *

<10% >10%

Fallopia sachalinensis *

<10% >10%

Fallopia x bohemica *

<10% >10%

Fallopia baldschuanica *

<10% >10%

Heracleum mantegazzianum *

<10% >10%

Impatiens glandulifera *

<10% >10%

Leylandii *

<10% >10%

Petasites albus *

<10% >10%

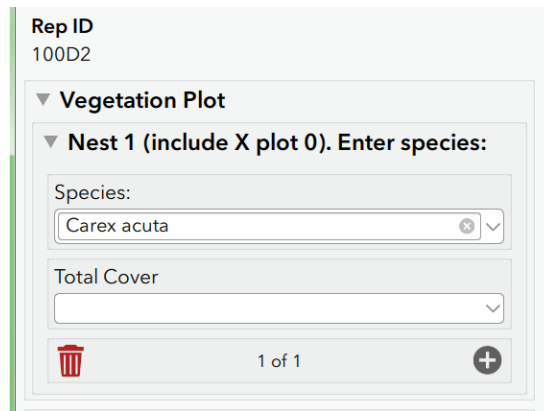
Petasites fragrans *

<10% >10%

LISTED SPECIES

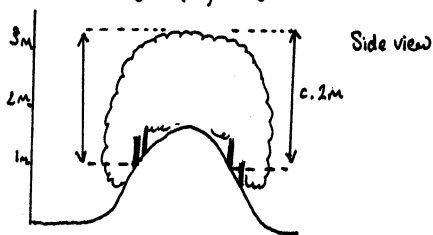
Woody species presence and cover only (not including gaps) are recorded. This includes woody climbing species such as *Rosa spp.*, *Rubus fruticosus* and *Clematis vitalba*. Also

include trees that maybe vertically shading the plot. List these and include a cover value. Note that 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.

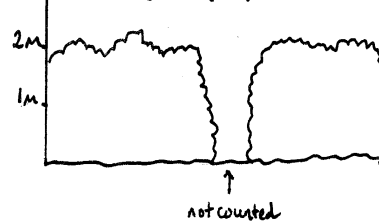


Note that in Wales surveyors will encounter stone and earth banks topped with Gorse. These are perfectly valid WLF and are eligible for D plot sampling.

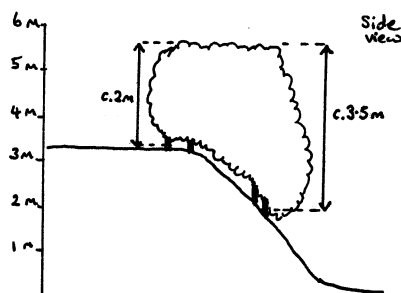
A Average height (2m) Hedgerow on bank



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 N.B 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 plot The two Streamside plots are projected to the nearest watercourses to the two X plot locations that are farthest apart in the 1km square. This gives two random samples of the watercourses in the square. **10 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 Waterside plot is then placed at the centre of the RHS sampling stretch. **10 x 1m**

Repeat plots were marked with a metal plate at the right hand end of the plot when looking at the water feature from the field. Use the plot sketch map and photographs provided.

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 (200m²) which are furthest apart. Once reached, the 10m plot is laid out to the left and the 1m 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

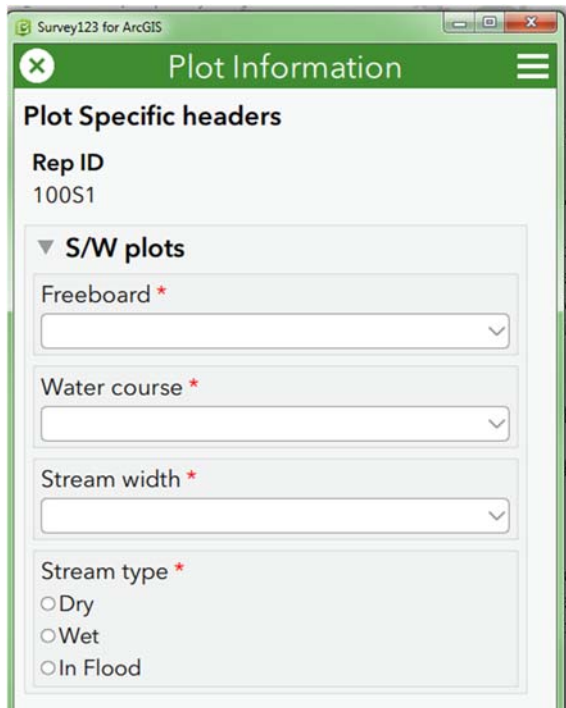
The remaining two W plots should be placed at random to sample types of water course not already sampled by the S plots.

Plots should not be nearer than 10m to each other, so if there is not more than 30m of stream/ditch/river in the square, only one plot should be recorded. If the plot coincides with a Boundary 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 Boundary plot.

4.10.2 Laying out S/W plots

S and W plots are each **10 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 1m 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 10cm 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



Survey123 for ArcGIS

Plot Information

Plot Specific headers

Rep ID
100S1

▼ S/W plots

Freeboard *

Water course *

Stream width *

Stream type *

Dry

Wet

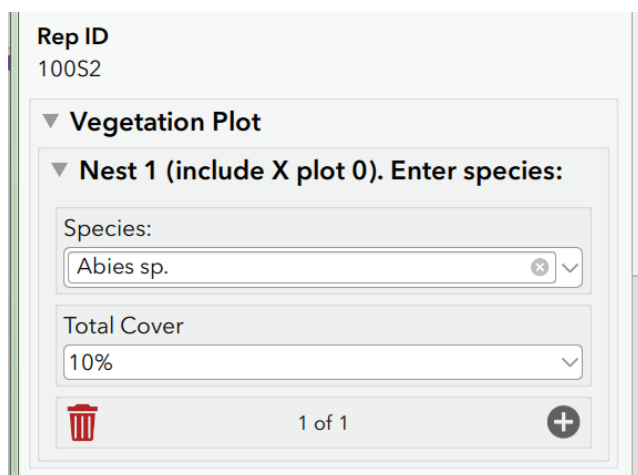
In Flood

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.



Rep ID
100S2

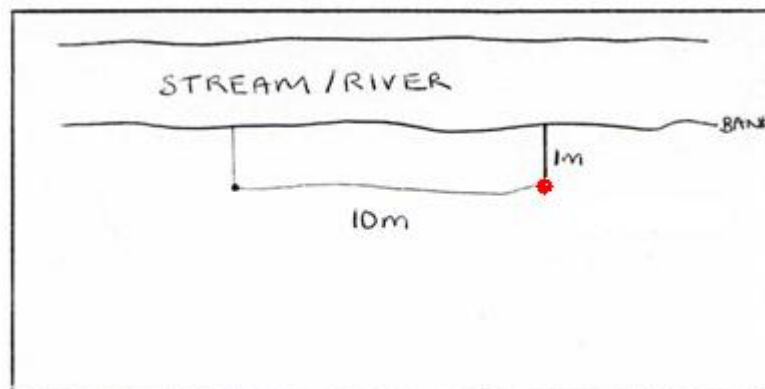
▼ Vegetation Plot

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

Species:
Abies sp.

Total Cover
10%

1 of 1



Laying out a streamside 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 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 1m 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, 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. 10m. **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

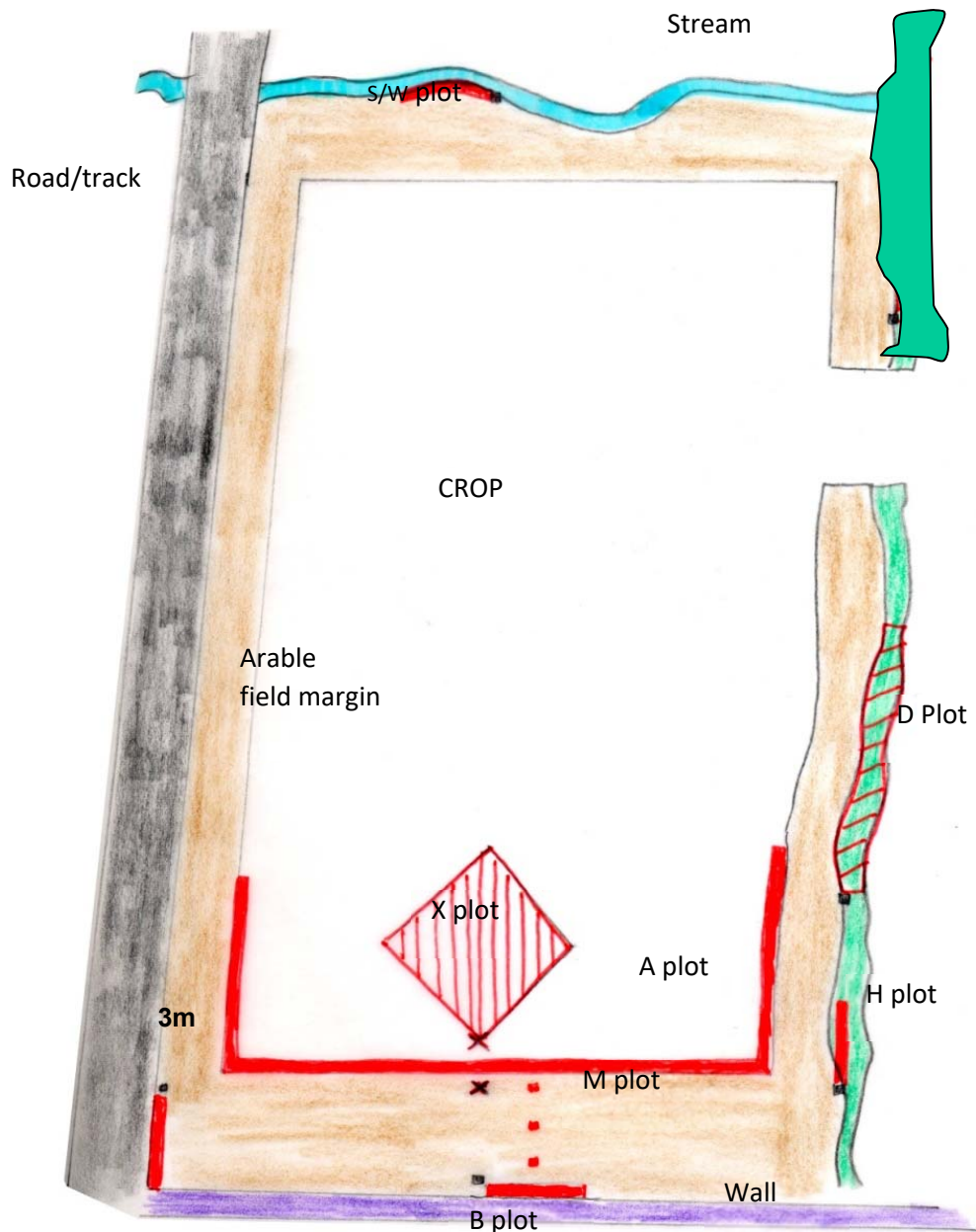
Species should be recorded on the recording tablet for each nest identified (up to 5) and cover estimates made.

The screenshot shows a mobile application interface for recording data. At the top, there is a section for 'Nest 1 (include X plot 0). Enter species:'. Below this, there is a 'Species:' label followed by a white input field with a downward arrow on the right. Below that is a 'Total Cover' label followed by a white input field containing the text 'Enter cover' and a downward arrow. At the bottom of this section is a grey bar with a trash can icon on the left, the text '1 of 1' in the center, and a plus sign icon on the right. Below this bar are four more sections, each starting with a right-pointing triangle icon followed by the text 'Nest 2. Enter species:', 'Nest 3. Enter species:', 'Nest 4. Enter species:', and 'Nest 5. Enter species:' respectively.

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) and 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)*

▼ Bryophytes

For reference: Bryophyte List

- Atrichum undulatum
- Aulacomnium palustre
- Brachythecium rutabulum
- Bryum spp.
- Calliergon cuspidatum
- Campylopus spp.
- Cephalozia bicuspidate
- Cirriphyllum piliferum
- Dicranella heteromalla

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

The nomenclature below is out of date and will be updated in the next version of the handbook.

Green/Fat	Green/Thin
<i>S. compactum</i>	sect. <i>Cuspidata</i> *
<i>S. molle</i>	<i>S. fimbriatum</i>
<i>S. palustre</i>	<i>S. fuscum</i>
<i>S. papillosum</i>	<i>S. girgensohnii</i>
<i>S. squarrosum</i>	<i>S. recurvum</i> (note this species is now part of <i>S. fallax</i>)
<i>S. strictum</i>	<i>S. russowii</i> (green form)
<i>S. subsecundum</i> (Sect.)	<i>S. quinquefarium</i>
<i>S. teres</i>	(* includes <i>S. recurvum</i> and <i>S. cuspidatum</i>)
Red/Fat	Red/Thin
<i>S. magellanicum</i>	<i>S. subnitens</i>
	<i>S. capillifolium</i>
	<i>S. russowii</i> (red form)
	<i>S. warnstorffii</i>

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.

Note that the nomenclature below will be updated in the next version of the handbook. Older surveyors will recognize the names!

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>Brachythecium plumosum</i>
5	<i>Brachythecium rutabulum</i>	3, 4, 20
6	<i>Breutelia chrysocoma</i>	2,7
7	<i>Bryum pseudotriquetrum</i>	2,6
8	<i>Calliergon (Calliergonella) cuspidatum</i>	9
9	<i>Calliergon giganteum</i>	8, <i>Calliergon cordifolium</i>
10	<i>Campylium 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>Cratoneuron (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>Drepanocladus revolvens</i> , <i>D. cossonii</i> , <i>Warnstorfia fluitans</i> , <i>W. exannulata</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 (Scleropodium) 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>Rhytidiadelphus 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 1km 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 in a text document to explain why photographs are missing (see Read.me file above).

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



South East quadrant



APPENDIX-1: COLLECTOR & SURVEY123

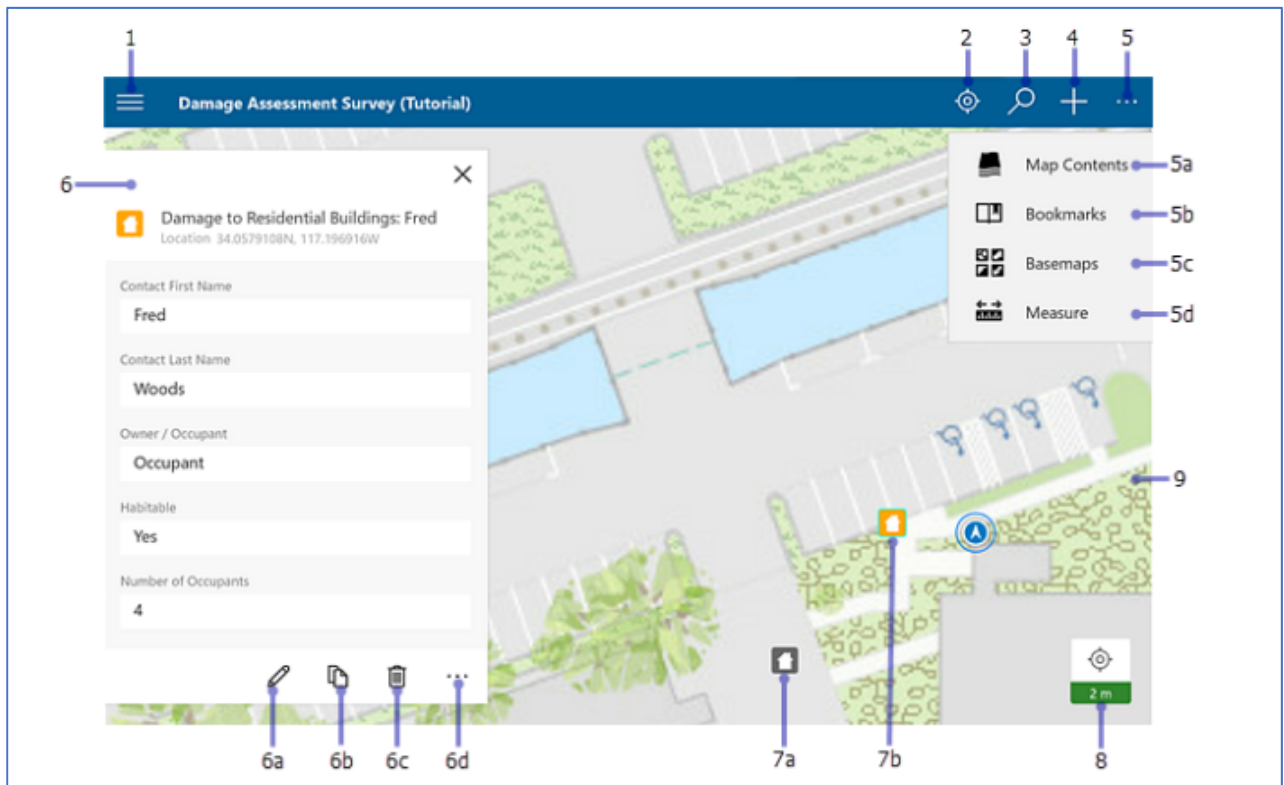
Collector – Generic Notes

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, synchronize 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.

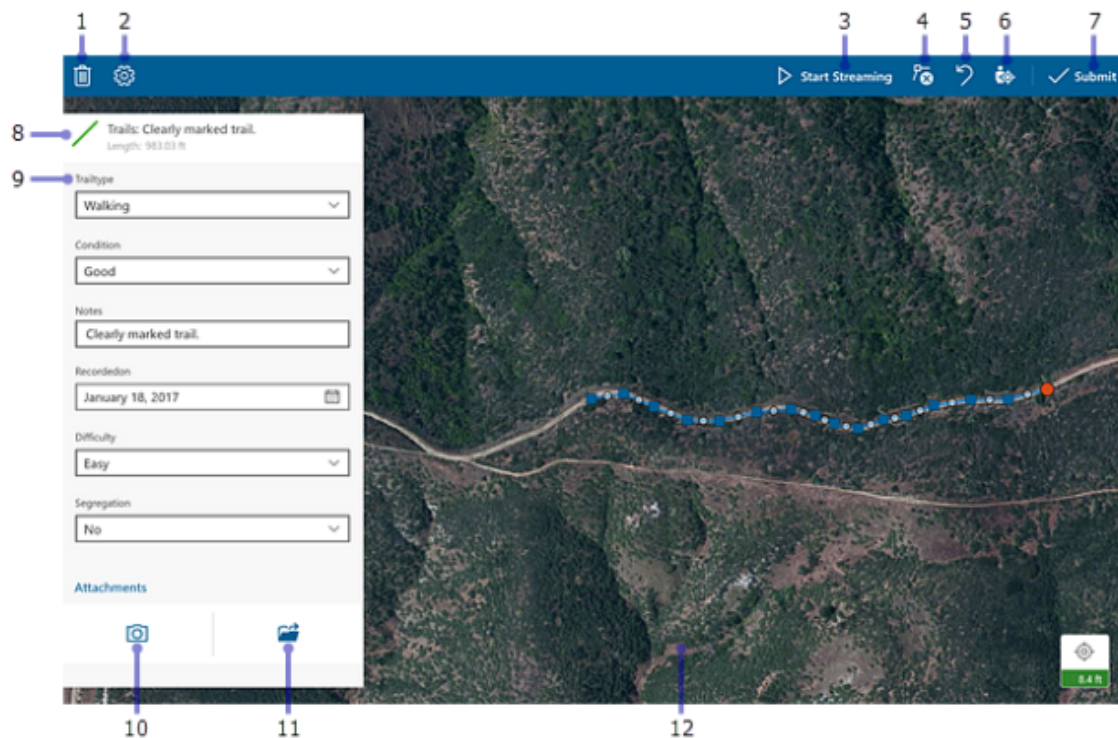
How can I get more information about my current GPS location?

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:

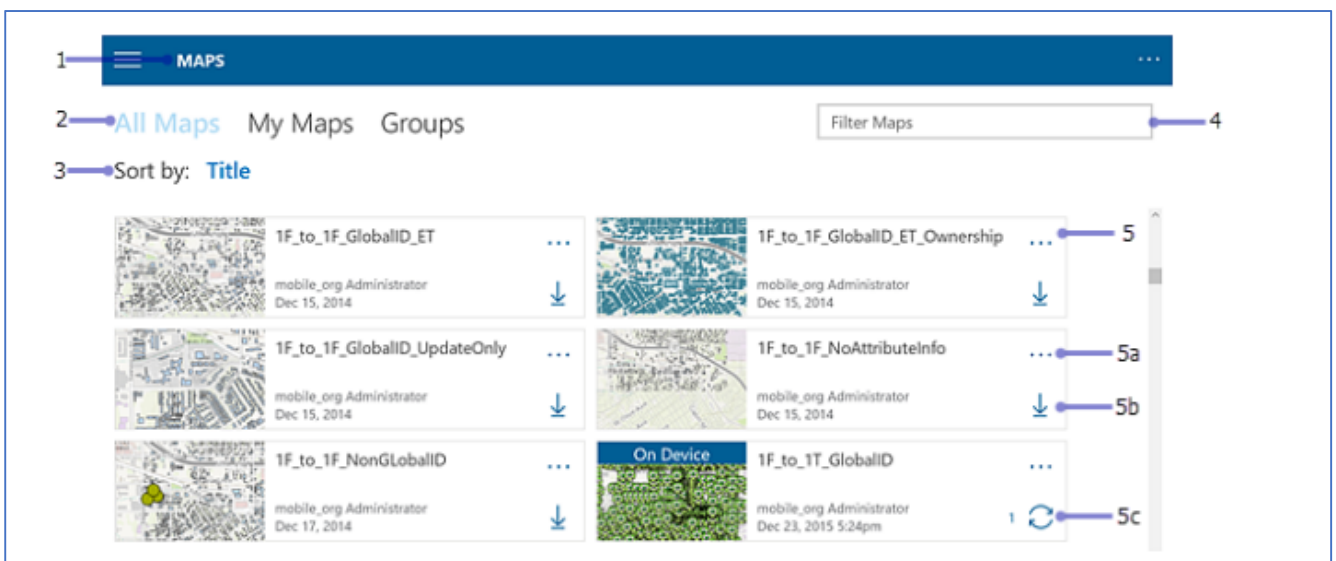
1. **Delete**—Provides options to discard the feature if you are collecting a new feature, discard your edits if you are editing an existing feature, or discard the shape of the feature if you are working with a line or polygon.
2. **Collect Settings**—Provides access to view and update location accuracy, 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.

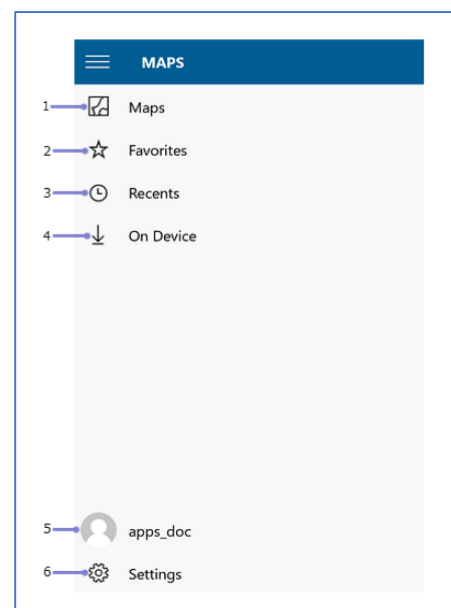
When viewing the On Device collection, **Maps** shows maps downloaded to your device, and **Basemaps** allows you to manage your basemaps.

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:

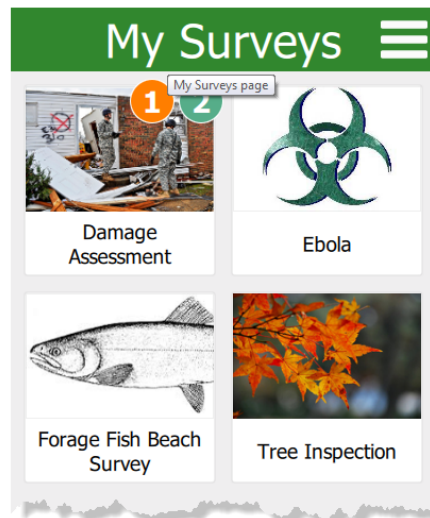
1. **Maps** - Displays **All Maps**, **My Maps**, and **Groups**.
2. **Favourites** - Displays your favourite maps. To make a map a favourite, select **More**  on the map's card, select **Details**, and select **Favorite** .
3. **Recents** - Displays the maps recently used by the current account and 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.

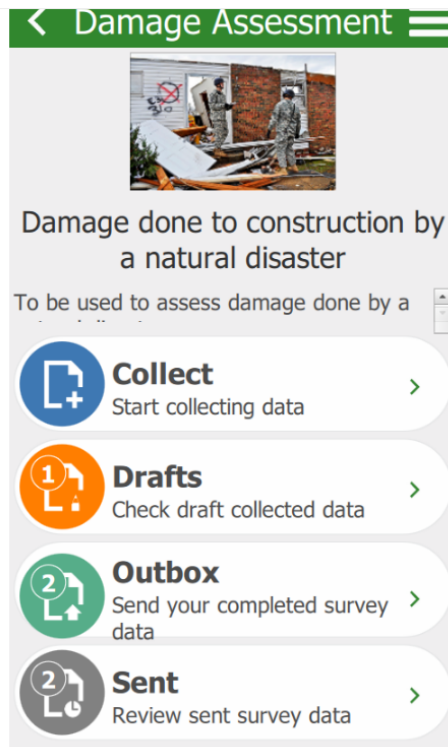
Download Surveys

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

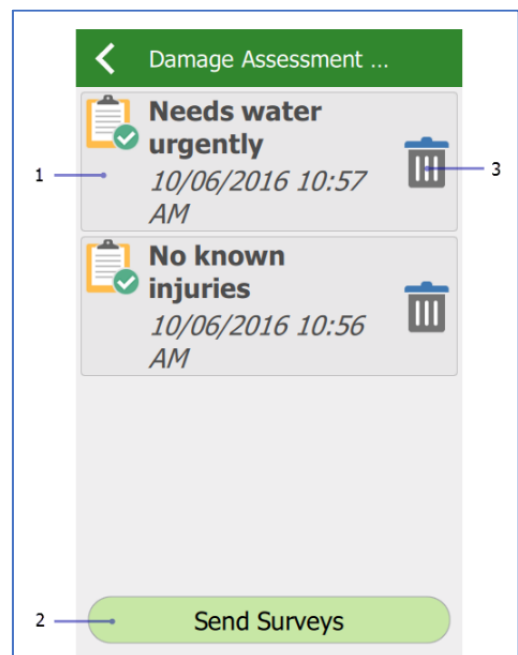
The survey contents page can be accessed by selecting a survey from My Surveys. Here, you can start collecting new data or access previously collected surveys.



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

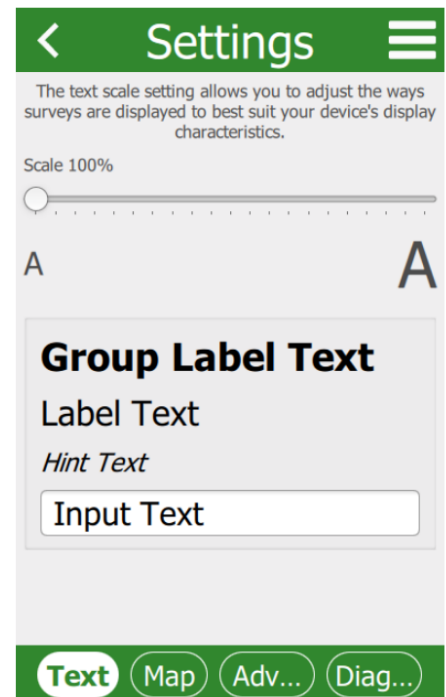
Accessed from the Menu  on the app's initial page, Settings contains a number of options and choices to customize the Survey123 field app to your preference.

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.

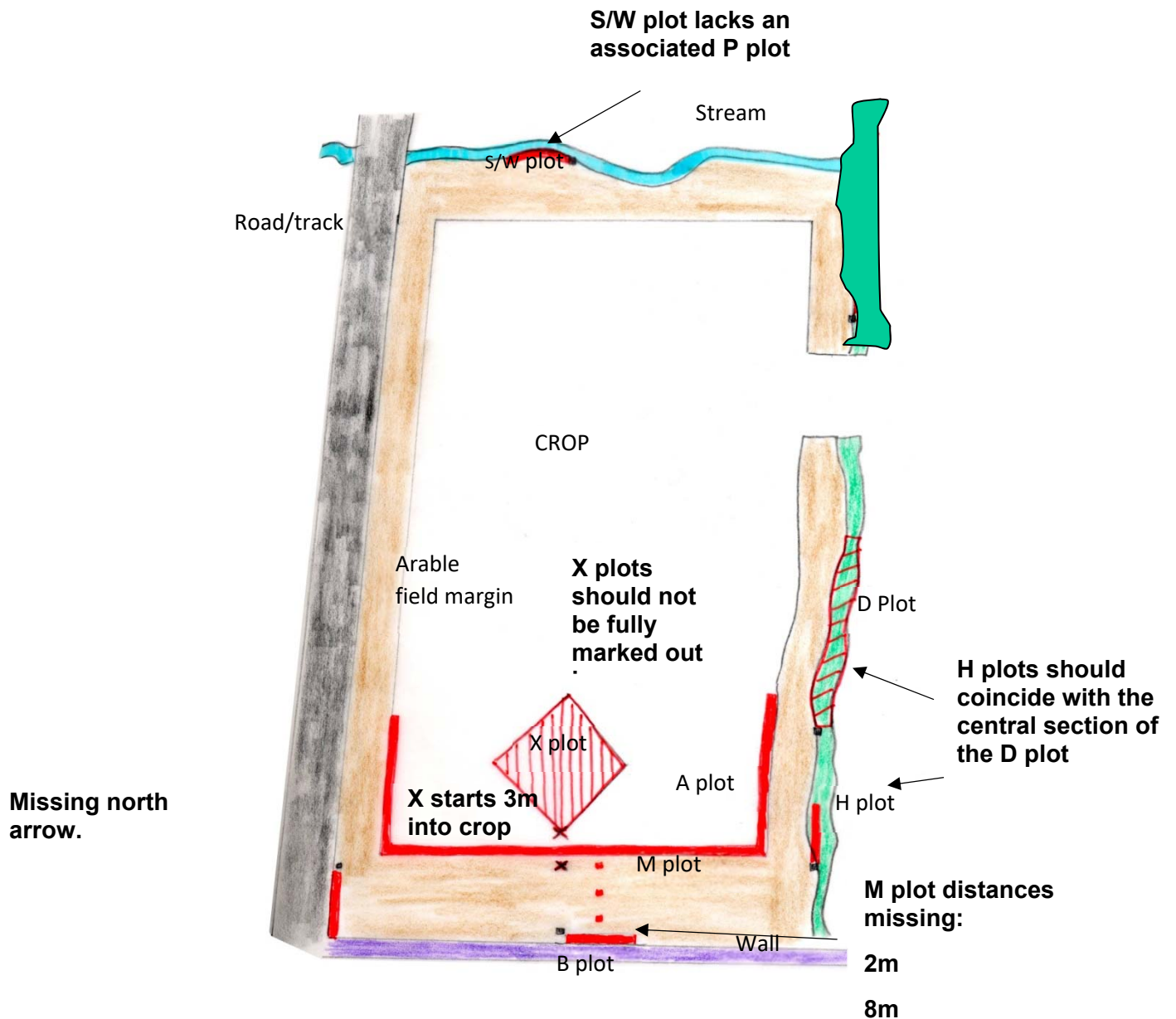
Fix Database fixes the existing entries in the survey database on your device when the folder path for the database has changed. This is required when you update the version of the Survey123 field app on iOS from the App Store. When the app is updated, its location on the device changes. Fixing the database 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

APPENDIX-2: DELIBERATE MISTAKES AND OMISSIONS ANSWERS



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

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)
1a	Total vegetation cover may be variable but where present consists of over 75% herbaceous species.	2		
1b	Vegetation cover consisting of over 25% canopy cover of trees or shrubs over 1m high.	16		
1c	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.	20		
1d	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)	<i>Rock vegetation</i>	OV38-40, U16, U17, U21
1e	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		
2a	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
2b	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.	3		U20, W25, other grasslands and heaths
2c	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>	
3a	Vegetation containing halophytic species	4		
3b	Vegetation not as above.	5		

		Numbered links plus Broad & Priority Habitats	Primary attributes	NVC units (indicative list only)
4a	Vegetation consisting of frequent to dominant halophytes, usually on mud often much bare ground.	26		
4b	Vegetation with halophytes prominent. On sea cliffs.	Maritime cliffs and slopes vegetation Priority Habitat PH (BH Supra-littoral Rock)	<i>Maritime vegetation</i>	
4c	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>	
4d	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>	
4e	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>	
4f	<i>Phragmites australis</i> is dominant but with halophytic species in underlayer	Reedbeds Priority Habitat (BH 11 Fen, Marsh, Swamp)		
5a	Pulse-disturbance vegetation. Includes assemblages whose species composition 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, wetland tall-herb 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 communities of drier soils 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.	6		
5b	Press-disturbance vegetation. Includes all grazed upland and lowland grasslands along with meadows and silage fields . Also included are those amenity grasslands which maybe rabbit grazed but are generally managed by frequent repeated mowing. Also included are areas of monocot rather than dwarf shrub dominated bogs and heaths – 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 varying intensities.	8		
6a	Wetland tall herbs or sedges frequent to dominant.	6c-g		

		Numbered links plus Broad & Priority Habitats	Primary attributes	NVC units (indicative list only)
6b	Wetland tall herbs occasional to absent.	7a-c		
6c	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
6d	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>	
6e	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
6f	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>	
6g	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
7a	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 ditchbanks.	Neutral Grassland (BH 6)	<i>Tall unmanaged neutral grass</i>	OV23, OV25, OV27, MG1
7b	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. Unsovn setaside 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 2c .	Arable and Horticultural BH (BH 4) or Urban (BH 17)	<i>Annual /early successional with open ground</i>	OV21-23
7c	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>			
7d	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 arvensis</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)-		
8a	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)	Record as grassland with parkland as Primary qualifier	
8b	Vegetation usually dominated by palatable grasses with a rich or poor suite of accompanying herbs that indicate neutral, dry or damp soils. Calcareous or acid indicator species infrequent, rare or absent. 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> .	9		
8c	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> .	10		
8d	Acid indicators present (includes a large range of acid grassland, moorland, heath and peatland species).	11		
9a	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> .	17		

		Numbered links plus Broad & Priority Habitats	Primary attributes	NVC units (indicative list only)
9b	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 lowland 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 6g .	Lowland hay meadows Priority Habitat (BH 6 Neutral Grassland)	<i>Herb-rich grassland</i>	MG4, MG5, MG8
9c	Cover of grass species and clover usually less than 50% with a high proportion of Priority Habitat upland 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
9d	Neutral flushes typically picking out enriched springlines and water seepage zones in lowland or upland situations. Acidic and calcareous indicators are absent or rare . 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.bufoinus</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>	
9e	Not as above.	10		
10a	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,
10b	As 10a 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
10c	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>Craex 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> ³ .	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		

³ 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 upland wet 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 ⁴ (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

⁴ 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.			
15e	Dominated by dwarf shrubs e.g. <i>Calluna</i> , <i>Erica</i> , usually on podzolic soils but also on brown podzolics, shallow peats (<0.5m), rankers and gleys.	21		
15f	Not as above	16		
16a	Less than 80% conifers in canopy (excluding yew but includes juniper).	19		
16b	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
17a	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
17b	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.	18		
18a	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>	
18b	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>	

		Numbered links plus Broad & Priority Habitats	Primary attributes	NVC units (indicative list only)
18c	Not as above.	Neutral Grassland (BH 6)	<i>Semi-improved neutral grass</i>	
19a	Scrub on sand dunes and shingle or <i>Salix repens</i> in dune slacks.	Supralittoral sediment (BH19)	<i>Sand dune</i>	
19b	All other broadleaved woodland (see guidance notes for Orchards).	22		
20a	<i>Ulex europaeus</i> > 25%.	Broadleaved woodland (BH 1)	<i>Belt of trees or Woodland/ Forest</i>	W23
20b	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 ⁵ (BH 10 Dwarf Shrub Heath)	<i>Dwarf Shrub heath</i>	
20c	As above but heathland on sand dunes and shingle.	Supralittoral sediment (BH19)	<i>Sand dune</i>	
20d	As above but heathland on maritime cliffs.	Maritime cliff and slope Priority Habitat (BH18)	<i>Maritime vegetation</i>	
20e	Not as above.	21		
21a	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
21b	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 ⁶ (BH 12 Bog)	<i>Blanket Bog</i>	M1-M3, M17-M20, (on deep peat H9, H12, M15-M16, M25)

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

⁶ 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)
21c	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 (12a or 10d) or at 16b . 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
21d	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
22a	>=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
22b	>=25% canopy cover of <i>Fagus sylvatica</i> (Beech) or >=25% canopy cover of <i>Taxus baccata</i> (Yew)	Lowland beech Priority Habitat ⁷ (BH 1 Broadleaved Woodland)	<i>Belt of trees or woodland /Forest (plus secondary attributes see guidance)</i>	W12-W15
22c	>=25% canopy cover <i>Fraxinus excelsior</i> or >=25% canopy cover of <i>Ulmus</i> spp	24	<i>Belt of trees or woodland /Forest (plus secondary attributes see guidance)</i>	(W7a-c, W8a-g, W9a, W12, W13a-b, W14)
22d	>=75% canopy cover of native <i>Quercus</i> spp or >=75% canopy cover of native <i>Betula</i> spp.	23		W8-W9, W13

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

		Numbered links plus Broad & Priority Habitats	Primary attributes	NVC units (indicative list only)
22e	>=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
22f	Not as above.	Broadleaved Woodland (BH 1)	<i>Belt of trees or woodland /Forest (plus secondary attributes see guidance)</i>	
23a	>=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
23b	Not as above.	Upland Oak Woodland Priority Habitat or Lowland Mixed Deciduous Priority Habitat ⁹ (Broadleaved woodland BH 1)	<i>Belt of trees or woodland /Forest (plus secondary attributes see guidance)</i>	
24a	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)		
24b	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)		
25a	Limestone, with clints and grikes	Limestone Pavement Priority Habitat (Inland Rock BH16)		
25b	Mine spoil or metalliferous river gravels or serpentine rocks, species include <i>Minuartia verna</i> , <i>Thlapsi arvensis</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

		Numbered links plus Broad & Priority Habitats	Primary attributes	NVC units (indicative list only)
25c	Not limestone with clints and grikes nor metalliferous rocks, solid rock outcrops or screes. Includes species such as <i>Cryptogamma crista</i> , <i>Cystopteris fragilis</i> , <i>Gymnocarpium robertianum</i> and <i>Asplenium trichomanes</i>			
25d	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. phylicifolia</i> .			
26a	Coastal saltmarsh	27		
26b	Inland saltmarsh vegetation around natural springs or old mine workings	Saltmarsh Priority Habitat		SM16, SM23
26c	Saltmarsh vegetation alongside roads	Linear Features BH3 or Urban BH17		
27a	Pioneer vegetation of lower saltmarshes made up of open stands of perennial glasswort <i>Sarcocornia perennis</i> , glasswort <i>Salicornia</i> spp., or annual seablite <i>Suaeda maritima</i> .	Saltmarsh Priority Habitat (Littoral sediment BH 21)	Saltmarsh	SM7-9, SM27
27b	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)	Saltmarsh	SM4-6
27c	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)	Saltmarsh	SM10-20
27d	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 hydrosere 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 25cm 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 calc 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.

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