



UK Centre for  
Ecology & Hydrology

# *UKCEH Countryside Survey:* **VEGETATION PLOTS FIELD HANDBOOK 2019-2023**

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1.3	Lindsay Maskell	28/02/2020	Added material on habitat classification
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## Table of Contents

	<i>page</i>
<b>1. Introduction to Vegetation Plots</b>	4
1.1 Location of veg plots	5
1.2 Adding new veg plots	5
<b>2. Data entry</b>	6
2.1 Repeated plots	6
2.2 New plots	7
2.3 Plot Recording in Veg Plots	7
2.3.1 Plot header information	8
2.3.1.1 <i>Plot Photo Protocol</i>	13
2.3.1.1 <i>Plot Sketch Map Protocol</i>	14
2.3.2 Plot Specific headers	16
2.3.3 Editing species	17
2.4 Completing plots	17
2.4.1 Submitting data	17
<b>3. Plot Types</b>	18
3.1 X Plots	18
3.1.1 Locating X plots	18
3.1.2 Laying out X plots	19
3.1.3 Recording X plots	21
3.1.3.1 <i>200m<sup>2</sup> VEGETATION plot</i>	21
3.1.3.2 <i>2x2m SOIL plot</i>	24
<b>4. Guidelines on Species Identification</b>	27
4.1 Aggregations/Combinations	27
4.2 Bryophytes and Lichens	27
4.3 List of mosses to be recorded in vegetation plots where possible	28
<i>Appendix I: Survey 123 and Collector – generic reference guide</i>	30
<i>Appendix II: Random number table</i>	40
<i>Appendix III: Plot types recorded in each square in previous surveys</i>	41
<i>Appendix IV: Additional notes on habitat classification</i>	

## 1. Introduction to Vegetation Plots

The survey involves recording plant species presence and abundance in two different sizes of vegetation plot as described below. Being able to position and record plots (and then repeat them by re-finding their exact location) is a very important part of the survey. It 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. 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 photos – 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 and the ways it may have changed over time.
- Paper sketch map – for plot relocation by surveyors in the next survey.

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



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

## 1.1 Location of veg plots

### *Repeated plots*

In many cases, surveyed plots will have been visited before, in some cases on several occasions since 1978.

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 GPS, a sketch map per plot and a series of associated photographs to aid re-finding the plot. In most cases there will be one map per plot. Protocols for recording plots are described below. These protocols rely on BOTH the plot map and the map provided by the software.

### *Plot markers*

In most cases, plots were additionally marked using either a 20 x 20cm aluminium metal plate or a wooden stake (particularly in upland areas) as indicated on the plot maps. Finding the metal plate or stake is the proof of relocation. Metal detectors are provided to enable surveyors to detect the plates. Note however, that many plates will now have been buried for several years and may have been covered by layers of soil or may have moved. This will be especially true in damp areas or alongside streams. In waterlogged soil we also know that metal detectors do not work very well. Also be aware that metal junk including buried fence wire can make you think you have found the plate when you haven't; for this reason the metal plate was always buried 1m out from the base of any adjacent vertical feature. To ensure you've found the marker, dig down with minimum disturbance and experience a frisson of well-earned delight as the aluminium plate winks back at you after years underground. If the plate cannot be detected within 5-10 minutes of searching (less if surveyors have other evidence of being in the correct location or more if time allows and other location aids are poor (e.g. plots on open moorland), then the plot should be located as well as possible using the sketch map and photograph. If surveyors are not confident that the plot will be a valid repeat then this can be indicated on a drop-down in the software by choosing 'not found' This indicates that the plot was positioned using the available information but should not be considered as being re-recorded as in the same exact location as in previous surveys.

## 1.2 Adding new veg. plots

If a square has never been surveyed before, X plots will always have been randomly allocated in the square beforehand. In some cases, these may need to be moved. Additionally, plots may need to be relocated if a plot is lost (photo/map not clear, built-on etc.). New plots can be located in any vegetation apart from within urban areas, land without access permission, inland water and sea or other dangerous and inaccessible land. Plots can be placed in amenity grass such as playing fields or on golf courses where permission has been given. It is important to record the location of the plot as accurately as possible with sketch maps, photos and GPS systems.

## 2. Data entry

### 2.1 Repeated Plots

#### Collector

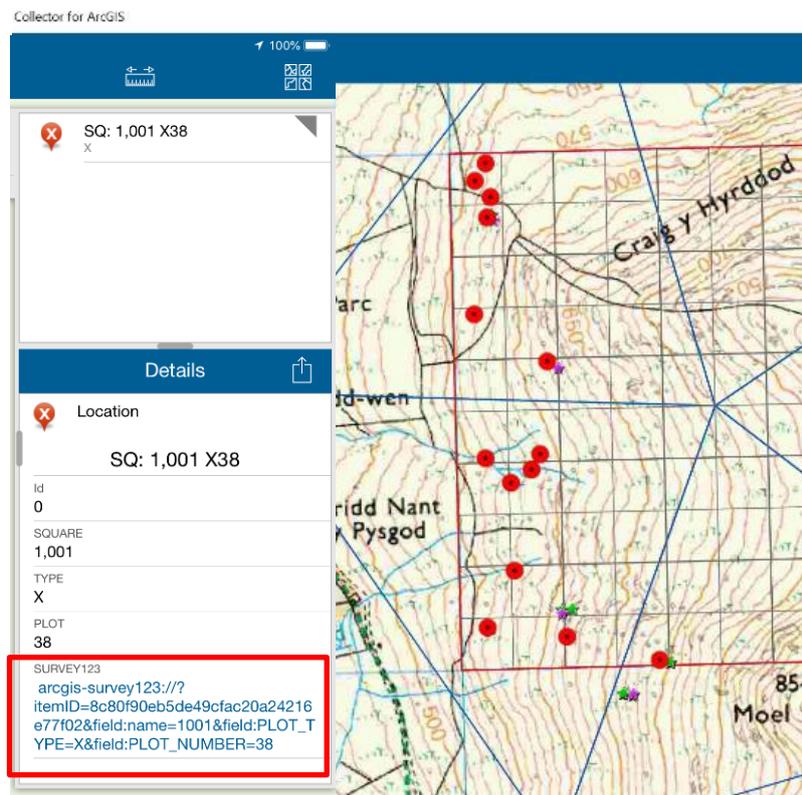


In order to navigate to a plot and begin plot data entry, you will open ESRI's Collector app. Open the map (*name tbc in training*), on which the plots will appear. You can then:

1. Navigate to plot using this map
2. When you get to your plot, click the plot symbol. A window will open on the right.
3. Click on the link in the window - this will open a new form (in Survey123) to enter the plot data (it's a bit slow, so be patient)

**Note:** If you are returning to edit plot data you have already created, do not do this. Follow the instructions for opening a plot in Survey123 below.

**For further technical notes regarding Collector, see Appendix I.**



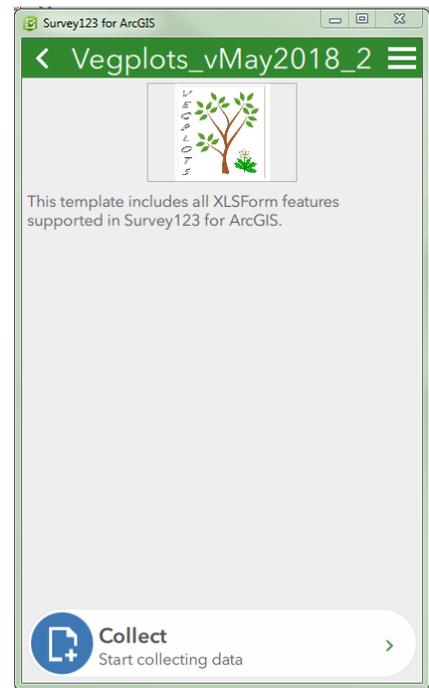
## 2.2 New plots (or editing a previously created plot)



In order to begin plot data entry for a plot not featured on a previous map (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!)

Note: For further technical notes regarding *Survey123*, see Appendix I.



## 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 must be carried out.

### *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**
- **Page 3: Vegetation plot.**
  - **VEGETATION SQUARES:** Ground Flora - presence and absence in five successively increasing quadrat sizes up to the full 14.14 x 14.14 m, with % cover/abundance estimates for the largest of these (plus an additional nest, nest 0 - see below).
  - **OR SOILS SQUARES:** Ground Flora - presence and absence in a 2x2m plot.
- Major common bryophytes should be recorded but a full list is not expected (see below).

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

## 2.3.1 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** – ‘X’ (200m<sup>2</sup>) or ‘XX’ (2x2m)
- **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 name / free text initials

### **Plot relocation**

If the plot you are recording is a new plot for some reason, some of the options will not apply - only being relevant for squares revisited from a previous survey.

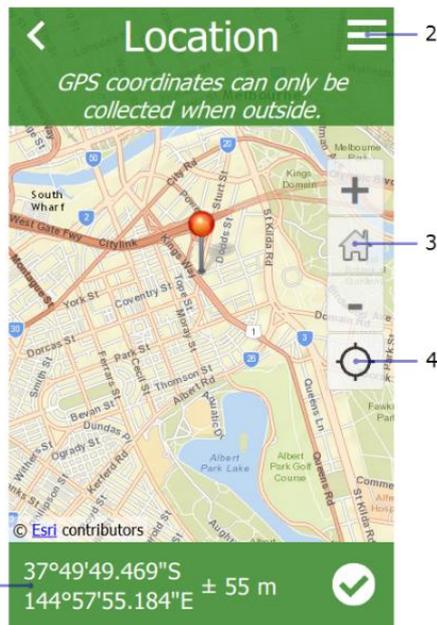
- **Plot Recorded** [Found, Not Found, New Plot (Replacement for unfound plot), New Plot (New feature/Land cover), Not appropriate, Access Denied, Too Dangerous]. NB: Choosing ‘Found’ means you are telling us that you are happy that the location of the plot is close enough to the location in previous surveys that the data recorded can be considered as a snapshot of the vegetation in that same location but at the present time. Please do not be overly strict about this decision. Some small amount of relocation error is acceptable; more so if the vegetation is reasonably homogenous. 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.
- **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. **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 (if online).

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 .

### **Notes on plot relocation**

*If a previous plot position cannot be relocated satisfactorily using previous maps and photos the plot should be recorded as 'Not found' and a new plot created. A degree of judgement is needed. If for example, the vegetation being sampled is reasonably homogenous fertile grassland or upland heath then a greater amount of relocation 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, in more heterogenous vegetation, the same uncertainty over the location of a plot could result in the plot being in a very different habitat type than that originally targeted. 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.*

*Note that a plot may also not need to be recorded if it is no longer appropriate due to changes in land use. For example, a new housing estate built on a grass field would no longer have an X plot. In both these cases you would select 'Not appropriate' from the list.*

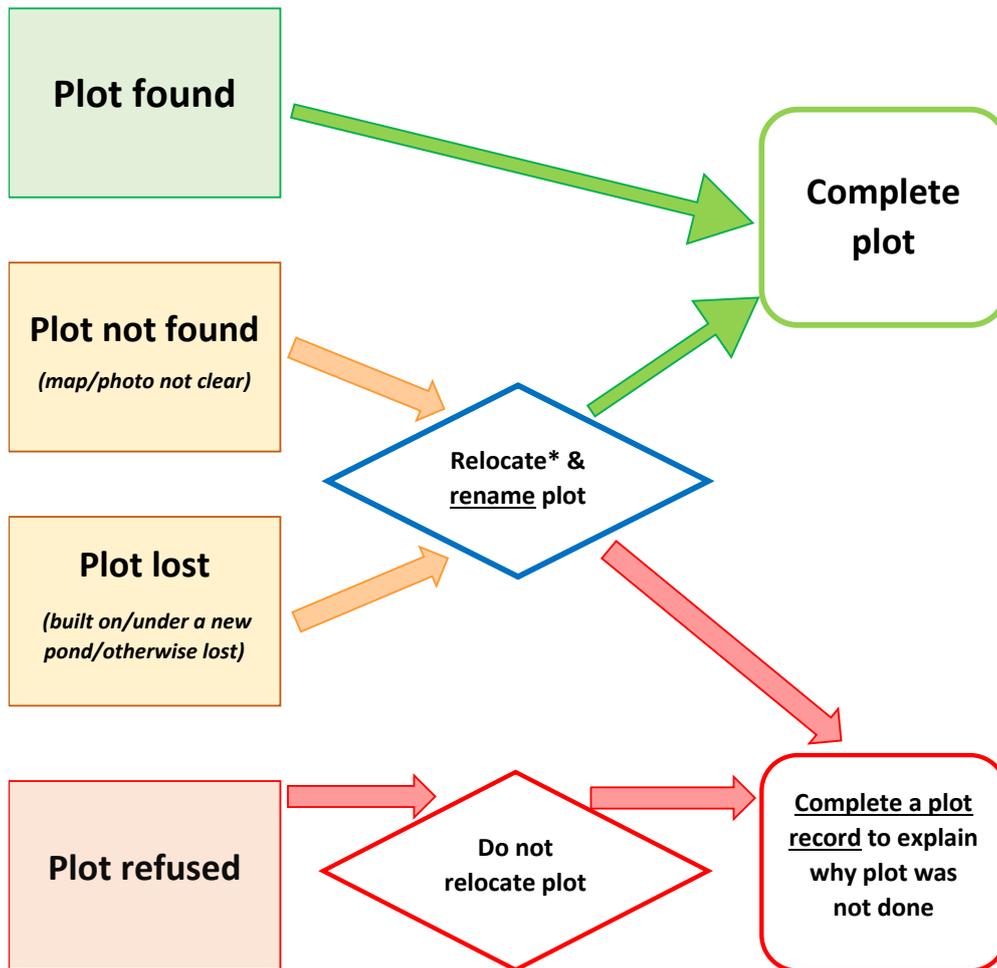
**Surveyors may encounter the following scenario:** *In the previous survey an area of land was refused access and so a number of plots were moved from this area to parts of the square that could be visited. On revisiting the square, the area of land previously refused access now can be visited. This may mean that you have a greatly increased number of possible plots to do because as well as repeating the previous plots you can put in new plots in the newly accessible area. In this situation prioritise repeating the previous plots and only put in new plots if you have time.*

**Another scenario** *is where the plot was recorded in 1990 in one place say, and in 1998 in a different place, because the surveyors failed to correctly find the repeat plot location in 1998. However if on return, you can find the oldest plot position then repeat the plot in that position. This maximises the length of the interval between plot recording and so maximises the chances of picking up vegetation change.*

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

**Plate found?** In repeat plots, a metal plate or stake may be present to mark the location. Have these been re-found? *(Tick yes if you have definitely found the plate. If you are confident you have refound the plot using plot maps and photos, click 'Found' in the Plot Relocation question even if you do not find the metal plate or stake.)*

### Rules for plot relocation



*\*Check which land has access permission*

▼ **Plot description**

Broad Habitat (plot) \*  
 Broadleaved Mixed and Yew Woodland

Priority Habitat (plot) \*  
 Lowland Beech and Yew Woodland

Broad Habitat (wider polygon) \*  
 Broadleaved Mixed and Yew Woodland

Priority Habitat (wider polygon) \*  
 Lowland Beech and Yew Woodland  
 Upland Mixed Ashwood  
 Wet Woodland  
 Upland Oakwood  
 Lowland Mixed Deciduous

Trees present  
 Yes

- **Broad habitat (at plot)** - The BH selected in the dropdown for X plots should reflect the habitat that makes up the majority of the X plot. If in a 'soil' square, then for consistency, you should still assign the full 14.14 x 14.14m area containing the 2x2m plot. Just estimate the size of this area rather than setting up the full X plot. You will be able to view the habitat map from CS2007 as an aid to determining the shape and extent of the wider polygon and the possible identity of the broad or priority habitat.

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

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

**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.
- **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 should also be entered. For example if you have recorded Species A and then subsequently identified it, go back and enter a note to say Species A= *Carex diandra* (for a gorgeous example).

▼ **Plot description**

Slope \*

Aspect \*

Shade \*

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

Notes

## 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
- **Photos** See Plot photo protocol. The camera icon will launch the device camera, from where you can take a photo. The folder icon can be used to attach a previously taken photos stored in a folder on the tablet.

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

### 2.3.1.1 Plot Photo Protocol

Surveyors are asked to take photos of each plot location - two or three will usually suffice. 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 trends in vegetation change. Since the principal aim of the photos is to aid re-finding the plot, the most useful photos depict the plot in relation to a nearby feature that is unlikely to have moved since the last survey 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. 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 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 can be confused with other codings. Use 'Po' instead.



### 2.3.1.1 Plot Sketch Map Protocol

Accurate and clear plot sketch maps will enable plots to be re-found in subsequent surveys. The plot sketch maps are therefore vital. 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 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 although admittedly has high error. 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.

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.

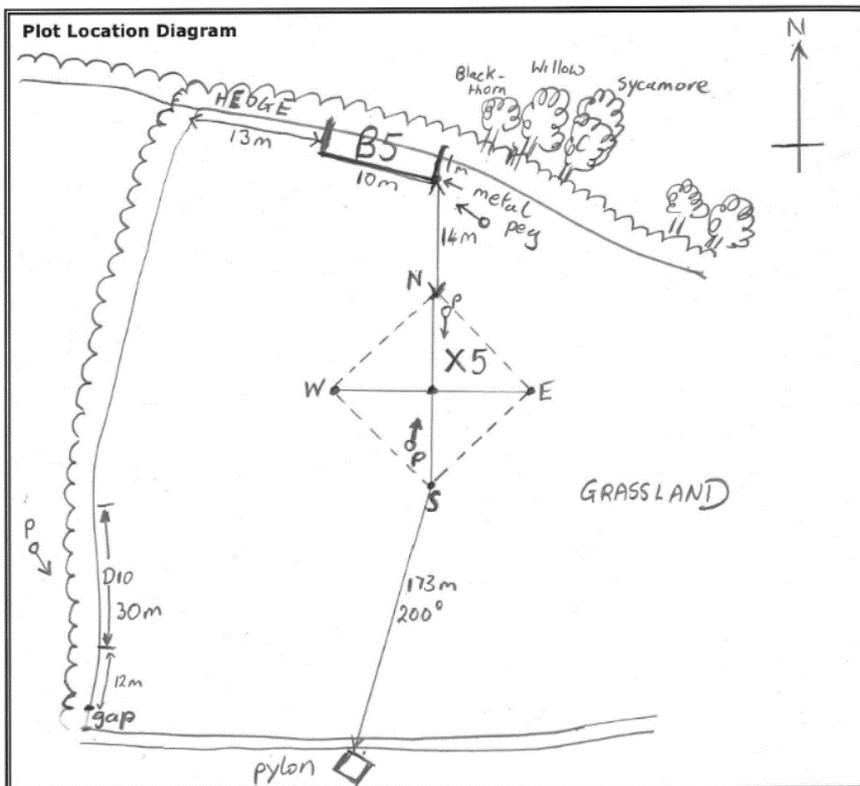
A sketch of the plot location should be drawn on one of the waterproof A4 sheets provided. The map should clearly define plot location using measured distances and compass bearings to nearby reference features. Always draw a north arrow on the map. These sketches should be clearly labelled with square and plot number. If surveyors run out of map recording sheets they should record maps on blank sheets and ensure that maps include Square number, Plot type and number, date and surveyors initials.

If a map is drawn/redrawn, take a photo of the map using the tools provided in Survey123. It is also possible to draw/annotate the map on the tablet.

Surveyors 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 surveyor 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. An edited map should feature edits made in pencil (make sure the map is clear enough to appear on a photocopy), the word 'edited' with surveyors initials and date. Similarly for maps redrawn, plot location should be drawn on a map recording sheet provided, clearly showing plot position with relevant measurements and angles to nearby reference features. Surveyors should indicate that the plot map has been 'redrawn' on the recording sheet.

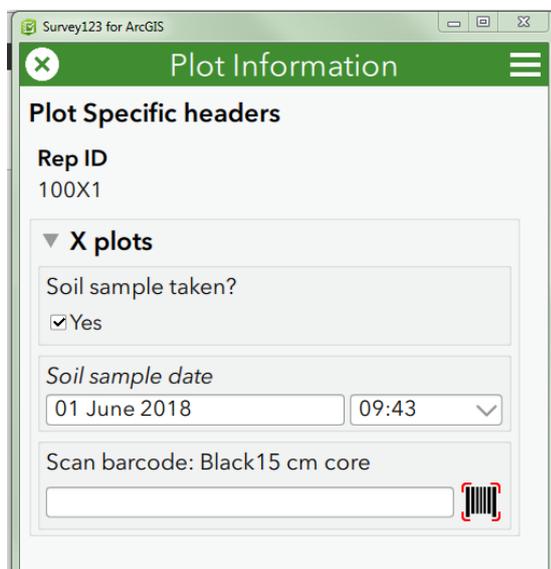
Having successfully re-found a plot using sketch map and photos, you may often find that it is in a different position to that indicated by the point on the plot map layer. This is because GPS may not have been used to stamp the plot in the previous survey and so the plot point is an approximation.



**Example of a plot location diagram** (the 'B' plot on the map is not relevant for this survey although it may be necessary to use its location to find the X plot)

### 2.3.2 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 'X' plots pertains to soil sampling and is detailed in the soils manual.*



#### HEADER

The only header information required specifically for X plots is:

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

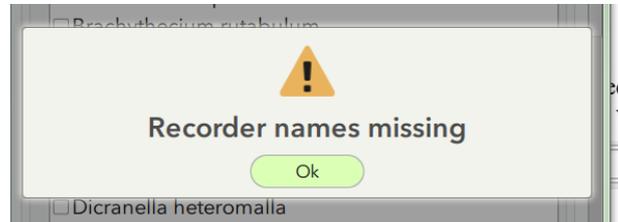
*See soil sampling handbook for further guidance on core depth recording and peat depth recording.*

### 2.3.3 Entering Species (Page 3)

- For the soil + vegetation squares plant 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.
- Enter species as described in the section 'Recording X plots'

## 2.4 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:



### 2.4.1. Submitting your data

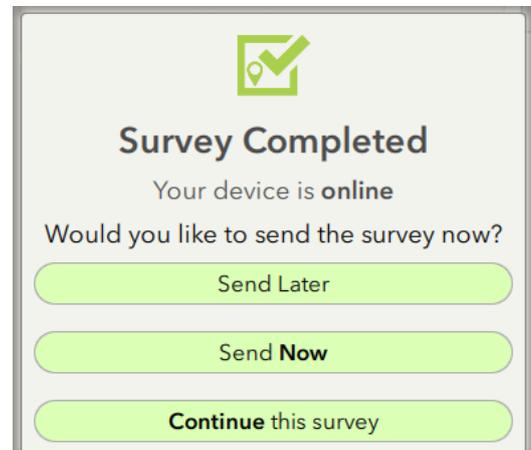
Once a survey form has been completed, you have a number of options on clicking the green tick button on the last page of your survey. If you are online (either Wifi or mobile data, and you are happy your survey is fully complete, you can submit



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.*



### 3. Plot types

Plot types to be recorded in each square. *Note that if any plot protrudes outside the square move it so that it is wholly inside the 1km square that is unless this means you are not recording the plot in the same location as in previous surveys.*

Code	Name	Other names	Where	Size	No. per square
<i>Areal plots</i>					
X	<b>VEGETATION SQ Large</b> (occasionally small in some circumstances)	'Wally plot' Main	Random points not on linear features	200m <sup>2</sup>	Up to 5
XX	<b>SOIL SQ Small X</b>		Random points not on linear features	4m <sup>2</sup>	Up to 5

#### 3.1 X Plots (X1-X5)

X plots are placed at five predetermined random positions.

- VEGETATION SQUARES contain standard X plots, which is nested and covers an area of 200m<sup>2</sup>.
- SOIL SQUARES contain small X plots, which cover an area of 2x2m i.e. the 2x2m nest of the larger X plot that would have been fully recorded in previous surveys.

##### 3.1.1 Locating X plots

Surveyors will be provided with a map of random points indicating previous X plot locations. However if the plot is a new one, surveyors should locate these as close as possible to those points marked on the plot map. Where the random point indicates that the X plot would cross a linear feature, the plot should be located in vegetated land so that the linear feature is at least 12m from the edge of the X plot. A position on the boundary closest to the X plot and on a cardinal axis from it (i.e. N, S E or W) will be the location of a previously recorded boundary (B) plot. **Although this will not be surveyed in this survey, sometimes you may have to locate your X plot based on the location of this 10x1m plot, based on the information given in the sketch map.**

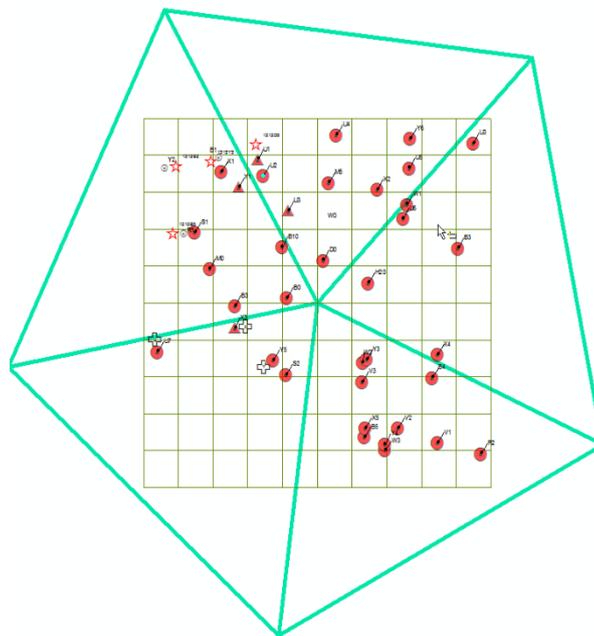
Metal plates for repeated X plots (200m<sup>2</sup>) were placed at the south-most corner of the plot (or in the field boundary). Check the plot map and photographs provided. **(NOTE: For 2x2m SOIL plots, the plate will be buried as if for a 200m<sup>2</sup> plot, as recorded in the last survey).**

The plot location (GPS) reading should be taken at the south corner of the plot. In the small

4m<sup>2</sup> plots, there will be no X plot centre post and so the most reliable position from which to project all measurements and associated plots is the south corner of the plot *Ensure this is clearly indicated on plot sketch maps.*

If the plot falls in the sea, inland water, built land, unsafe or inaccessible land, then choose a new location at random from land within the same sector. If there is no plot-able land then the plot cannot be recorded and no Vegplots entry is necessary. This rule is applied because simply positioning these plots on the nearest land will oversample coastal or waterside habitats.

*Note that if, as a result of land-use change, plot-able vegetated land is very scarce in a square, it may not be possible to find and record locations for all new plots. To determine whether a new X plot position can be feasibly recorded, the surveyors should use the five sector overlay on the plot location map.*



**The five sector stratification for X plots**

The five sector stratification is a layer (XPlotSectors) available in *Collector*. If there is eligible land available in that sector then apply the rule above for finding a new X plot location.

If the X plot lands in an arable field then the plot will need to be moved to **12m** away from the edge of the crop to avoid excessive trampling damage. Then access the vegetation via tram lines in the crop and do not attempt to layout the X plot string and poles if this will cause crop damage. In hay meadows, if there is high risk of irreparably flattening the hay close to harvest time then move the X plot to the field edge.

### **3.1.2 Laying out X plots**

**4m<sup>2</sup> X plot layout** The small vegetation X plot is 4m<sup>2</sup>. It should be orientated along north/south, east/west axes. 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.

In arable fields the plot should be taken as being a 2x2m square (estimated, not measured), starting 12 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.

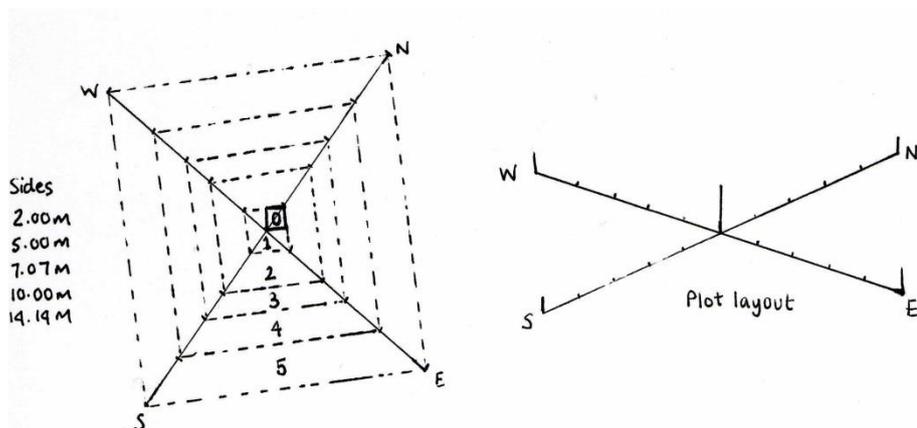
**200 m<sup>2</sup> X plot layout (standard)**

The vegetation plot is 200 m<sup>2</sup> (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.

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

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

1. Locate the marker tag for nest 1 along the north-pointing 1/2 diagonal string. This tag should be positioned at 1.41m
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 <sup>2</sup> )	Sides(m)	Diagonal(m)	1/2 diagonal(m)
0	1	1	1.41	not needed
1	4	2.00	2.83	1.41
2	25	5.00	7.07	3.54
3	50	7.07	10.00	5.00
4	100	10.00	14.14	7.07
5	200	14.14	20.00	10.00

### X plot dimensions

### 3.1.3 Recording X plots

#### LISTED SPECIES

**4m<sup>2</sup> X plot:** All species are recorded from the 4m<sup>2</sup> nest

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

#### 3.1.3.1 200m<sup>2</sup> X plot ('VEGETATION')

Note that the GPS reading for the X plot should be taken at the south corner of the X plot.

##### **Nest 0**

A record of the presence of species in this innermost quadrat are made by inserting the name of the species on the recording form, under 'Nest 1 (include X plot 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 vascular plants in the 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' (=1)), **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.  2 of 3 .

Unfortunately, it is currently not possible to view the species entered as a column-based 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%

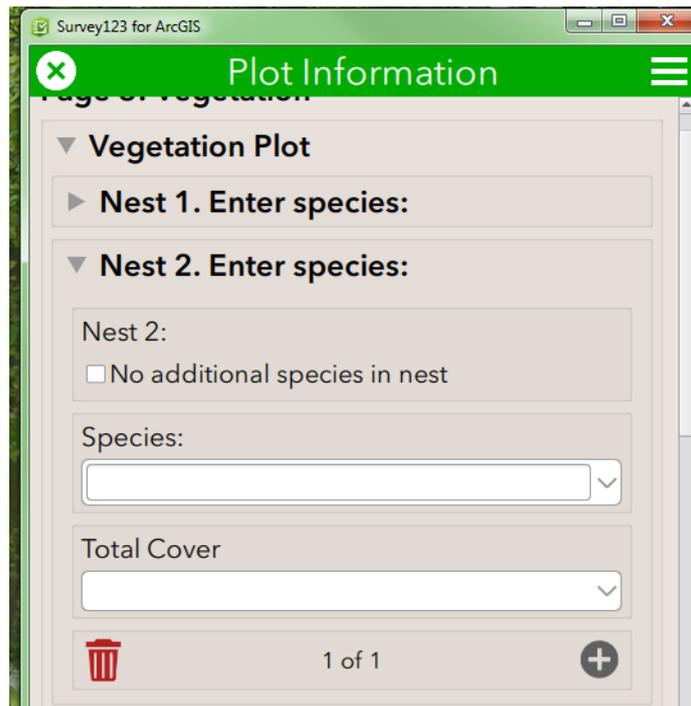
Total Cover

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 m<sup>2</sup>) has been recorded. The most convenient method of search for the successive sizes of quadrat is for the two operators to spiral outwards moving in opposite directions so that both cover the whole area. Record successive quadrats under the relevant Nest section on the recording form.

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



Because of identification difficulties, only the common major bryophytes growing on the soil should be recorded (**not on tree bases, logs, rocks or other specialised habitats**). A list of these is given in Appendix I.

Having completed the record of presence of the vascular 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 'total covers' under each species in each of the 5 nests.**

### **3.1.3.2 4m<sup>2</sup> X plot ('SOIL')**

A record of the presence of species in the quadrat are made by inserting the name of the species on the recording form, under 'Nest 1 (include X plot 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 vascular plants in the quadrat, an estimate of cover abundance for the plot 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 at least 100% (making due allowance for the

'presents' (=1)), **or more if the ground flora is markedly layered**. For example in woodland or % cover could be as much as 300%. Covers should be entered into the 'Total cover' 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.*

## 4. Guidelines on Species Identification

### 4.1 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.

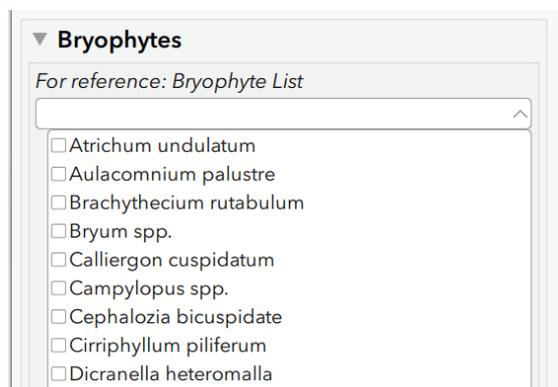
The combinations were determined on the basis of experience, where it is considered that unless good specimens are available it is not possible to identify the species accurately. A number of the species combinations have similar ecological amplitudes e.g. *Cardamine hirsuta/flexuosa*. Where the separate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

### 4.2 Bryophytes and Lichens

Only the bryophytes and lichens listed in section 7.2.1 (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.**



#### **Sphagna**

*Sphagnum* (green/fat)\*

*Sphagnum* (green/thin)\*

*Sphagnum* (red/fat)\*

*Sphagnum* (red/thin)\*

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

**Green/Fat**

*S. compactum*  
*S. molle*  
*S. palustre*  
*S. papillosum*  
*S. squarrosum*

*S. strictum*  
*S. subsecundum* (Sect.)  
*S. teres*

**Red/Fat**

*S. magellanicum*

**Green/Thin**

sect. *Cuspidata*\*  
*S. fimbriatum*  
*S. fuscum*  
*S. girgensohnii*  
*S. recurvum* (note this species is now part of *S. fallax*)  
*S. russowii* (green form)  
*S. quinquefarium*  
 (\* includes *S. recurvum* and *S. cuspidatum*)

**Red/Thin**

*S. subnitens*  
*S. capillifolium*  
*S. russowii* (red form)  
*S. warnstorffii*

*Note: The specific species may be recorded if desired, however do not waste time on this as it is likely the species will be aggregated for analysis*

**4.2.1 List of mosses to be recorded in vegetation plots where possible.**

Note that surveyors should put effort into recording vascular plants, especially sedges and grasses, accurately and completely rather than spend effort on identifying bryophytes. Even if you record those listed below, this will often only represent part of the total. Hence attach the highest priority to recording 'Total bryophyte' and cover of the coarse *Sphagnum* categories.

No	Species	Compare with
1	<i>Atrichum undulatum</i>	<i>Plagiomnium undulatum</i>
2	<i>Aulacomnium palustre</i>	-
3	<i>Brachythecium albicans</i>	4, 5, 21
4	<i>Brachythecium rivulare</i>	3, 5, 21, <i>Brachythecium plumosum</i>
5	<i>Brachythecium rutabulum</i>	3, 4, 21
6	<i>Breutelia chryoscoma</i>	-
7	<i>Bryum pseudotriquetrum</i>	32
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 spp.</i>	3, 4, 5
21	<i>Fissidens sp.</i>	37
22	<i>Fontinalis antipyretica</i>	<i>Fontinalis squamosal</i>
23	<i>Hedwigia stellate</i>	42
24	<i>Homalothecium lutescens</i>	26
25	<i>Homalothecium sericeum</i>	25
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 spp.</i>
31	<i>Mnium hornum</i>	7
32	<i>Neckera crispa</i>	-
33	<i>Pellia spp.</i>	<i>Riccardia spp.</i>
34	<i>Philonotis fontana</i>	-
35	<i>Plagiothecium sp.</i>	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 spp.</i>
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

#####

## APPENDIX I. COLLECTOR & SURVEY123

### *Generic reference guides*

#### Installing Collector



1. Find and install 'Collector' (for ArcGIS, ESRI) from your App Store (this will depend on your type of phone or device) (*note: free to download*).

#### Installing Survey123

1. Find and install 'Survey123' (for ArcGIS, ESRI) from your App Store (this will depend on your type of phone or device) (*note: free to download*).

The Windows version can be downloaded here:

<https://doc.arcgis.com/en/survey123/download/>



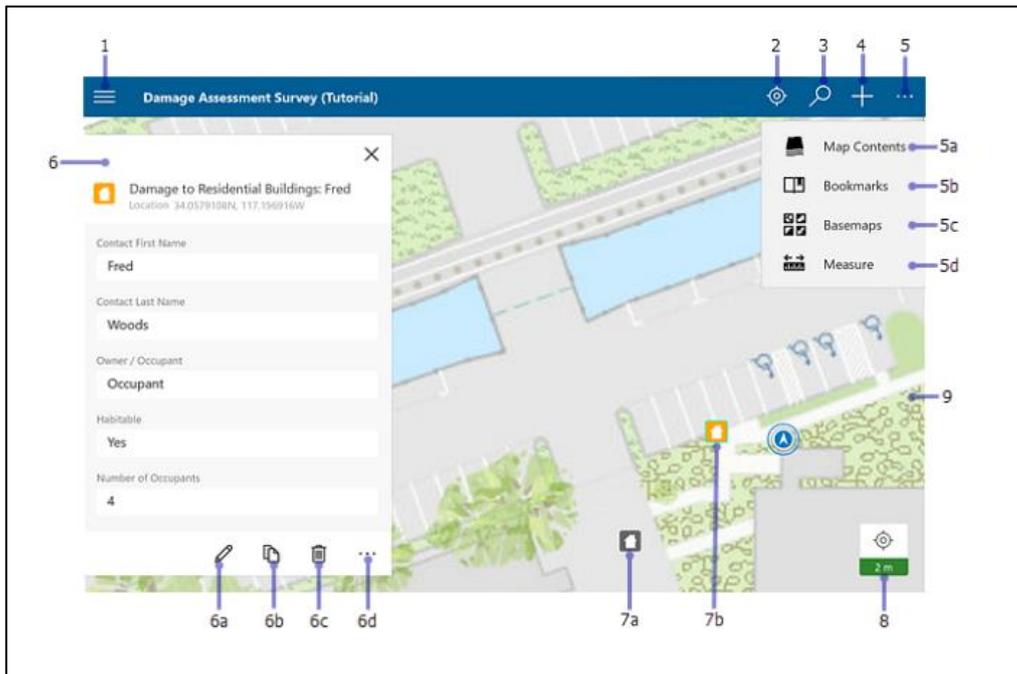
#### **Collector – Generic Notes**

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.



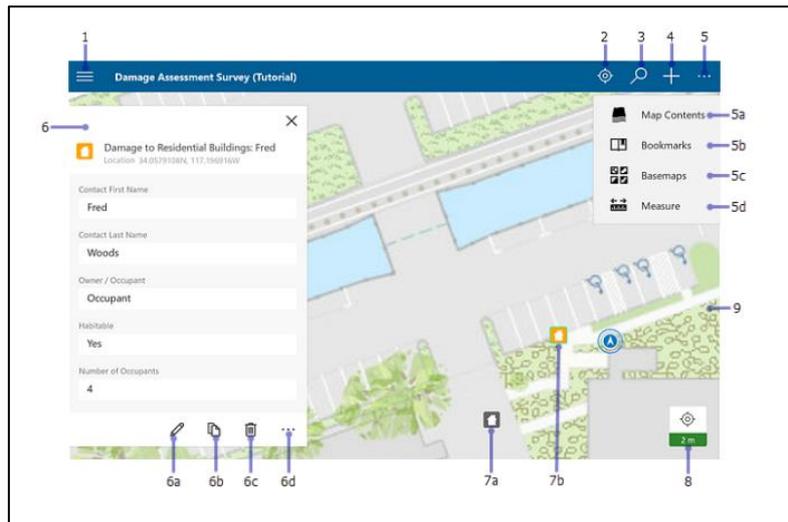
The following are highlighted in the image of the map:

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.



- a) **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.
  - b) **Bookmarks** tool—Goes to previously defined areas of interest. These include **Bookmarks** defined on the map and **My Places** that you may have stored in your device.
  - c) **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.
  - d) **Measure** tool—Draws lines and shapes on the map, and calculates their lengths and areas in a variety of measurement units.
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 (these are not relevant for this survey):

- a) **Edit**—Starts editing the feature.
  - b) **Copy**—Copies the feature to create a new feature.
  - c) **Delete**—Deletes the feature.
  - d) **More**—Provides access to the **Zoom to** and **Add to my places** actions if applicable to the selected feature.
- 7. **Map**—The map appears here, including a basemap and features. You can pan, zoom in, and zoom out to see other areas.
  - 8. **Location Accuracy**—Indicates current horizontal GPS accuracy as well as whether it is below the location accuracy threshold. To display more information about your current GPS location, such as vertical accuracy and fix type, select the badge.

## FAQ – GPS in Collector

**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 type.

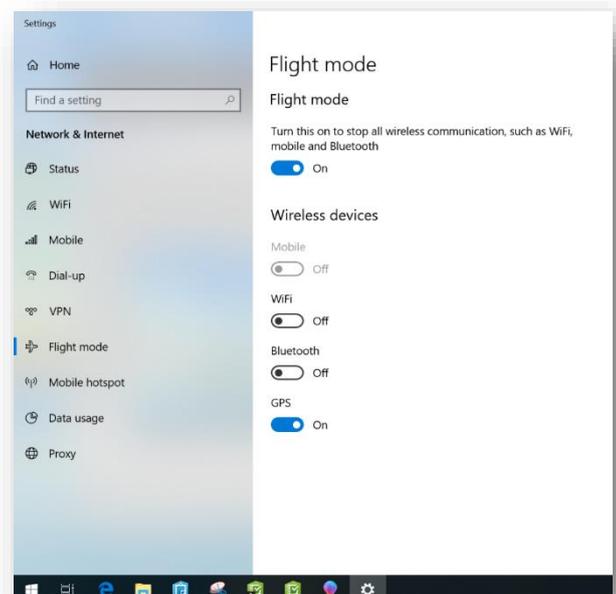
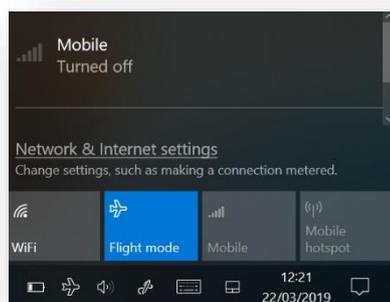


fix

## **Note: GPS – make sure it is turned on**

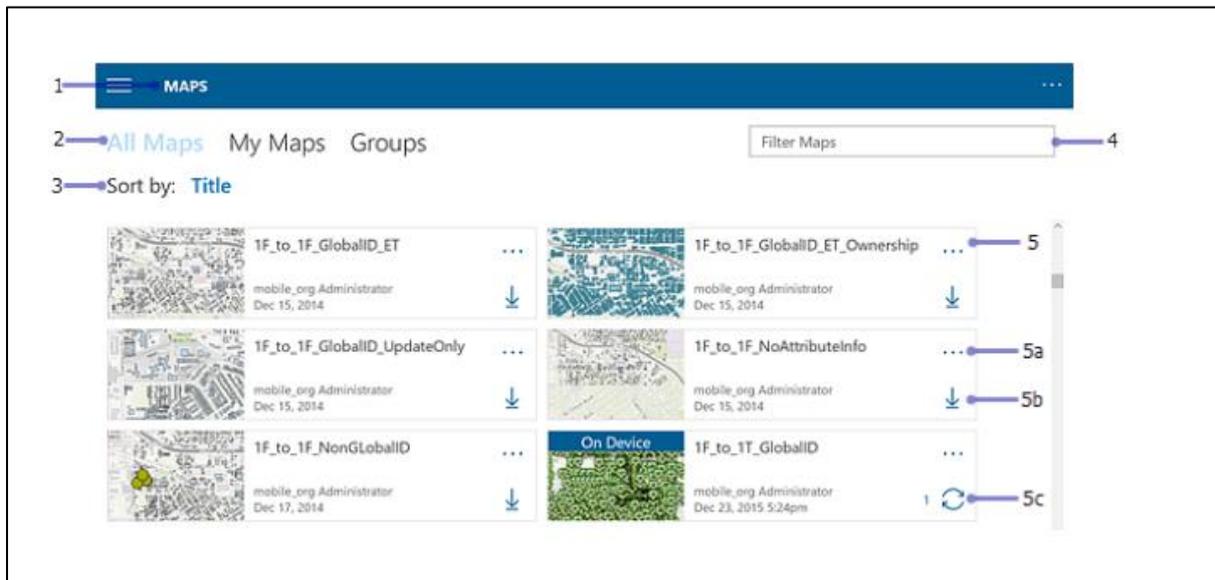
In order to conserve battery power, it is best to keep your tablet in flight mode.

However, you need to make sure your GPS is on, when in flight mode (Click on the Network and Internet settings link)



## Map Gallery

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.



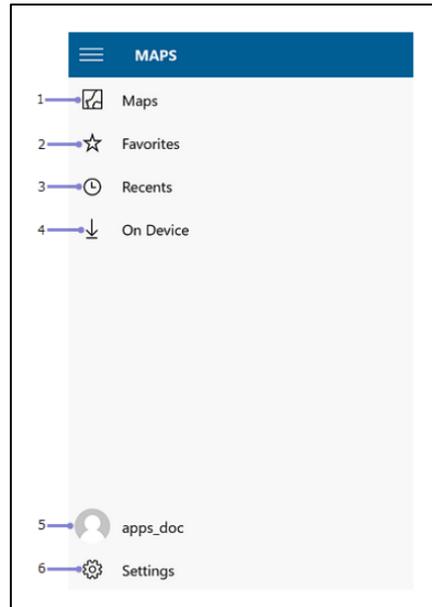
The following items are highlighted on the image of the Map Gallery:

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.

... **More**—Provides access to additional actions you can take with the map. These depend on the chosen map and can include **Details (5a)**, **Download (5b)**, **Sync (5c)**, 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.



The following items are highlighted on the image of the menu:

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.

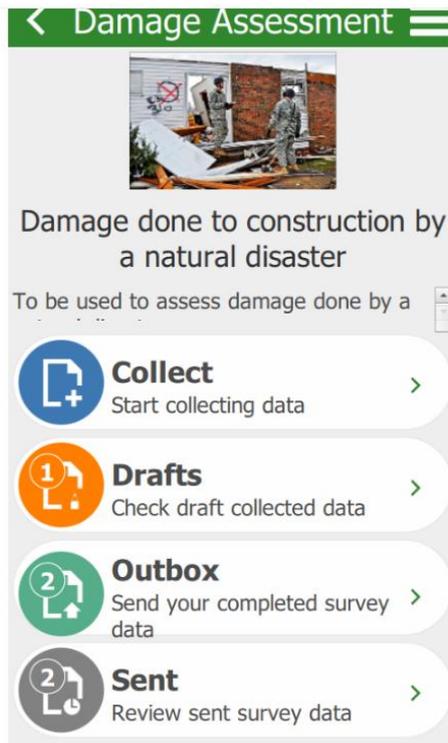
### *Download Surveys*

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.

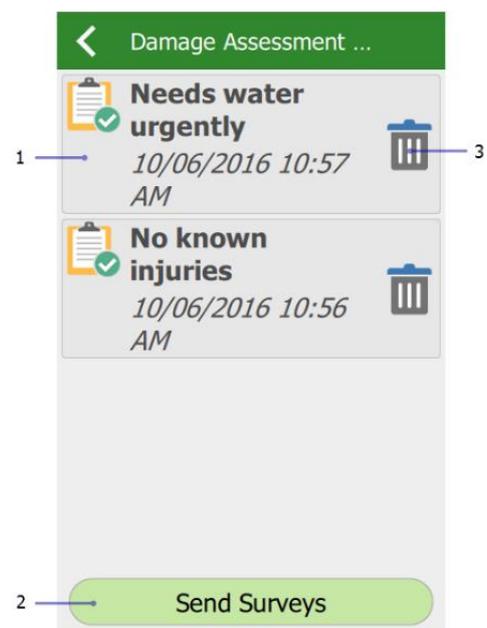
**Drafts**—Opens to a form currently left uncompleted by closing the survey before sending it.

**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 Menu 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.

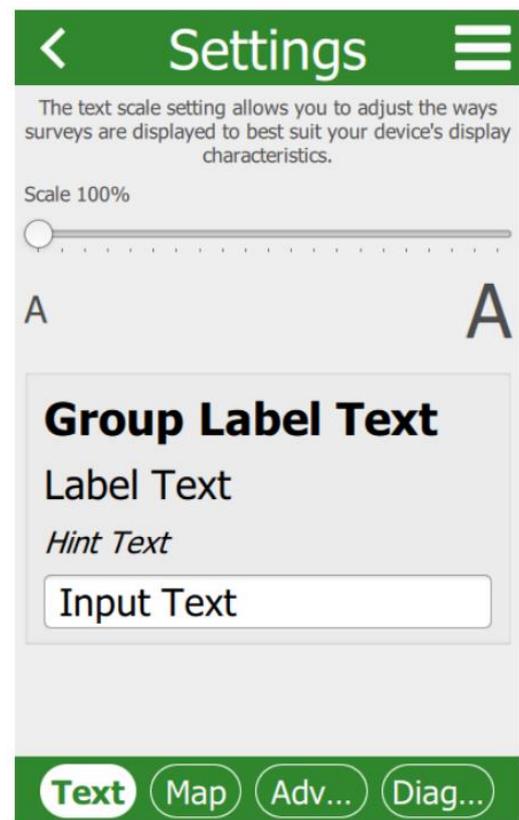
### Advanced Settings

**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 II 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 III**  
**Plot types recorded in each square in previous surveys**

Code	Name	Other names	Where	Size	No. per square
<i>Areal plots</i>					
X <sup>1</sup>	Large	‘Wally plot’ Main	Random points in open polygons	200 m <sup>2</sup>	5
X <sup>6</sup>	‘Soil’	Small X	Random points in open polygons	4 m <sup>2</sup>	5
Y <sup>2+4</sup>	Small	Targeted Habitat	Uncommon vegetation types and in 2007, Priority Habitats	4 m <sup>2</sup>	Up to 5
U <sup>3</sup>	Unenclosed		Unenclosed Broad Habitats	4 m <sup>2</sup>	Up to 10
<i>Linear plots</i>					
B <sup>2</sup>	Boundary		Adjacent to field boundaries and paired with X plots	10 x 1 m	5
A <sup>3</sup>	Arable		Arable field edges centred on each B plot	100 x 1 m	Up to 5
M <sup>4+5</sup>	Margin		Field margins	2 x 2 m	Up to 15
H <sup>1</sup>	Hedgerow		Alongside hedgerows	10 x 1 m	2
D <sup>3</sup>	Hedgerow diversity		Hedgerows	30 x 1 m	Up to 10
S <sup>1</sup> /W <sub>2</sub>	Streamside		Alongside water courses	10 x 1 m	5
R <sup>1</sup> /V <sub>2</sub>	Roadside		Alongside roads and tracks	10 x 1 m	5
<b>MAX</b>					<b>67</b>

<sup>1</sup> first recorded in 1978, <sup>2</sup> first recorded in 1990, <sup>3</sup> first recorded in 1998, <sup>4</sup> new in 2007, <sup>5</sup> if there are 5 A plots in a square and wide margins <sup>6</sup>New in 2019-23. *Either 5 x large X (‘Vegetation’) or 5 x small X (‘soil’)*

## Appendix IV: Habitat descriptions

1. Broadleaved mixed and yew woodland BH
2. Coniferous woodland
3. Boundary and linear features
4. Arable & Horticulture
5. Improved grassland
6. Neutral grassland
7. Calcareous grassland
8. Acid grassland
9. Bracken
10. Dwarf Shrub Heath
11. Fen. Marsh, Swamp
12. Bog
- 13/14. Rivers and standing water
15. Montane
16. Inland rock
17. Urban
18. Supra-Littoral Rock Broad Habitat (e.g. Maritime cliffs)
19. Supra-Littoral Sediment (e.g. sand dunes and strandline)
21. Littoral sediment( e.g. salt marsh)

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

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

#### **1. Broadleaved Mixed and Yew woodland Broad Habitat**

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

#### **Broadleaved Mixed and Yew woodland Priority Habitats**

##### Lowland beech and yew woodland

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

### Lowland wood-pasture and parkland

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

### Northern Birchwood

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

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

### Upland mixed ashwoods

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

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

### Upland oakwood

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

### Wet woodland

Wet woodland occurs on poorly drained or seasonally wet soils, usually with alder, birch and willows as the predominant tree species, but sometimes including ash, oak, pine and beech on the drier riparian areas. They occur on floodplains, lake edges, as successional habitats on fens, mires and bogs, and in peaty hollows and hill-side flushes within other woodland types. Wet woods frequently occur in mosaic with other woodland key habitat types and with open key habitats such as fens. In terms of National Vegetation Classification (NVC) plant communities this habitat is characterised by W1 *Salix cinerea - Galium palustre* woodland, W2 *Salix cinerea - Betula pubescens - Phragmites australis*

woodland, W3 *Salix pentandra* - *Carex rostrata* woodland, W4c *Betula pubescens* - *Molinia caerulea* woodland: *Sphagnum* sub-community, W5 *Alnus glutinosa* - *Carex paniculata* woodland, W6 *Alnus glutinosa* - *Urtica dioica* woodland, and W7 *Alnus glutinosa* - *Fraxinus excelsior* - *Lysimachia nemorum* woodland. Some birch stands classified as W4 are relatively dry and in management terms better treated alongside other extensive birch stands. The ground flora is diverse, and within different types the dominant species include *Phragmites*, *Molinia*, *Sphagnum*, *Urtica* and large sedges. Wet woodlands frequently intergrade with other woodland types, notably upland oakwoods and mixed ashwoods. Habitats with canopies composed of *Salix* spp. should be classed as wet woodland even if the trees are low and 'scrubby' in appearance (these will usually be stands of W1 *Salix cinerea* - *Galium palustre* woodland, or W2 *Salix cinerea* - *Betula pubescens* - *Phragmites australis* woodland).

#### Lowland mixed deciduous

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

There is great variety in the species composition of the canopy layer and the ground flora, and this is reflected in the range of associated NVC and Stand Types. *Quercus robur* is generally the commoner oak (although *Quercus petraea* may be abundant locally) and may occur with virtually all combinations of other locally native tree species.

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

#### Orchards

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

## **2. Coniferous Woodland Broad Habitat**

The Broad Habitat includes all coniferous woodland that is not native pine woodland PH.

Conifer cover needs to exceed 80% for a woodland polygon to be allocated to Coniferous rather than

Broadleaved. Mixed and Yew Woodland.

### How to record Clearfell

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

### Coniferous Woodland Priority Habitat

#### Native pine woodland

Native pine woodlands are relict indigenous forests dominated by self-sown Scots *Pinus sylvestris* which occur throughout the central and north-eastern Grampians and in the northern and western Highlands of Scotland. Native pinewoods do not support a large diversity of plants and animals compared with some more fertile habitats. However, there is a characteristic plant and animal community which includes many rare and uncommon species. The main tree species is Scots pine although birches *Betula* spp., rowan *Sorbus aucuparia*, alder *Alnus glutinosa*, willows *Salix* spp., bird cherry *Prunus padus* are also found. Sessile oak *Quercus petraea* also occurs infrequently, mainly in the north-east of Scotland. A shrub understorey, where browsing levels are low, includes common juniper *Juniperus communis*, aspen *Populus tremula*, holly *Ilex aquifolium* and hazel *Corylus avellana*. Old or dead trees and rotting wood supports significant beetle and bryophyte communities. The field layer is characterised by acid-tolerant plants like bell heather *Erica cinerea*, bilberry *Vaccinium myrtillus* and crowberry *Empetrum nigrum*.

#### 4. Arable and Horticultural

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

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

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

And would be recorded as arable and horticultural.

#### 5. Improved Grassland

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

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

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

This broad habitat includes:

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

## 6: Neutral Grassland Broad Habitat

This Broad Habitat includes;

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

### **Neutral grassland Priority Habitats**

#### Lowland hay meadow

This habitat consists of traditionally managed hay-meadows and pastures in which grasses such as *Cynosurus cristatus*, *Festuca rubra*, *Agrostis capillaris* and *Anthoxanthum odoratum* typically occur in a species-rich sward with a high cover of associated herbs. Cover of grass species and clover are usually

less than 50%. Typically rich in forb species with frequent PH **lowland** meadow indicators including *Lathyrus pratensis*, *Lotus corniculatus*, *Leucanthemum vulgare*, *Galium verum*, *Primula veris*, *Centaurea nigra*, *Leontodon hispidus*, *Ranunculus bulbosus* or on flood meadows some of *Caltha palustris*, *Sanguisorba officinalis*, *Filipendula ulmaria* and *Alopecurus pratensis*. NVC communities include MG4, MG5 and MG8.

#### Upland hay meadow

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

### **7. Calcareous Grassland Broad Habitat**

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

#### **Priority Habitats**

##### Lowland calcareous grassland

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

##### Upland calcareous grassland

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

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

### **8. Acid Grassland Broad Habitat**

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

#### **Acid grassland Priority Habitat**

##### Lowland acid grassland

It is defined as both enclosed and unenclosed acid grassland throughout the UK lowlands (normally below c. 300m). Includes the *Festuca ovina* - *Agrostis capillaris* - *Rumex acetosella* (U1), *Deschampsia flexuosa* (U2), *Agrostis curtisii* (U3) and *Festuca ovina* - *Agrostis capillaris* - *Galium saxatile* (U4) NVC grassland plant communities but really only U4c *Lathyrus montanus*-*Stachys betonica* sub-community.

Inland vegetation, but not coastal dunes. It is characterised by a range of plant species such as *Galium saxatile*, *Festuca ovina*, *Agrostis capillaris*, *Rumex acetosella*, *Carex arenaria*, *Deschampsia flexuosa*, *Agrostis curtisii* and *Potentilla erecta*, with presence and abundance depending on community type and locality.

#### **9. Bracken Broad Habitat**

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

#### **10. Dwarf Shrub Heath**

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

#### **11. Fen/Marsh/Swamp Broad Habitat**

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

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

##### Fen priority habitat

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

##### Flush priority Habitat

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

#### Purple moor grass rush pasture priority habitat

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

#### Reedbed priority habitat

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

### **12. Bog Broad Habitat**

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

#### ***Priority Habitats***

##### Blanket bog

The term blanket 'bog' strictly applies only to that portion of a blanket 'mire' which is exclusively rain-fed. Peat depth is very variable, with an average of 0.5-3 m being fairly typical but depths in excess of 5 m not unusual. The principal vegetation (NVC) types covered are M1, M2, M3, M15, M17, M18, M19, M20 and M25, together with their intermediates. Other communities, such as flush, fen and swamp types, also form an integral part of the blanket bog landscape but should be mapped separately if areas are greater than the MMU (20x20m) Dominant species include *Calluna vulgaris*, *Erica tetralix*, *Trichophorum cespitosum*, *Eriophorum vaginatum* and *Sphagnum* species. For allocation purposes, the most important defining feature is dominant to occasional *E.vaginatum*.

##### Lowland raised bog

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

### **13. Rivers and Streams**

### **14. Standing Water**

Unlikely to be X plot habitats

## 15. Montane Broad Habitat

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

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

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

## 16. Inland Rock Broad Habitat

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

### Priority Habitats

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

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

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

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

*Silene maritima*. Notable species include *Epipactis youngiana*, *Asplenium septentrionale*, *Ditrichum cornubicum*, *Marsupella profunda*, *Cephaloziella nicholsonii* and *Ditrichum plumbicola*.

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

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

## 17. Urban Broad Habitat

This Broad habitat includes;

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

## 18. Supra-Littoral Rock Broad Habitat

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

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

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

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

## **19. Supra-Littoral Sediment**

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

#### Sand dune (vegetated)

Sand dune vegetation should be recorded where the area is vegetated at 25% or greater, otherwise the physiography attribute sandy shore (36) should be used. Typical species include *Ammophila arenaria*, *Leymus arenarius*, *Elymus farctus*, *Viola tricolor*, and *Euphorbia portlandica*. Dune slacks should also be included with typical species such as *Salix repens*.

#### Strandline vegetation

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

## **20. Littoral rock Broad Habitat**

NA

## **21. Littoral Sediment**

### ***Priority Habitats***

#### Saltmarsh

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

#### Mudflats

Unlikely to be an X plot habitat