

April 2016 (2nd edition)

GLASTIR MONITORING & EVALUATION PROGRAMME VEGETATION AND SOIL FIELD HANDBOOK

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Version History

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2.	Simon Smart	02/04/2014	Additional edits implemented.
7.	Simon Smart	06/04/2014	Final edits implemented for the 2014 survey. Additional notes covering issues raised by surveyors. Bryophyte list added. Landscape photo protocol added as now located at 4 of the X plots. Random number table added. List of edits to Vegplots added. Picture of Y and U plot.
8.	Simon Smart	17/04/2014	Edited following surveyor training sessions
9.	Simon Smart	22/04/2014	Final edits following wash-up session with surveyors. Present were CLMW, SA, AG, SMS and all surveyors.
10.	Simon Smart	24/03/2015	Edits added to incorporate change in X plot size and allocation of plots to option land.
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Table of Contents

1 Introduction to Vegetation Plots	6
1.1 Location of veg plots	6
1.2 Adding New veg plots	7
1.3 Adding New veg plots in ArcMap.....	9
2 Plot Recording in Veg Plots	11
2.1 Logistics of recording on tablets	11
2.2 Data entry	11
3 Plot Photo Protocol	17
4 Plot Sketch Map Protocol	18
5 Plot Types	19
5.1 X Plots – (X1-X5)	20
5.1.1 Locating X plots	20
5.1.2 Laying out X plots	22
5.1.3 Recording X plots	23
5.2 Y Plots (Y1-Y5)	24
5.2.1 Locating Y plots	24
5.2.2 Laying out Y plots	24
5.2.3 Recording Y plots	25
5.3 U Plots – Unenclosed Plots (U1-U10)	26
5.3.1 Locating U plots	26
5.3.2 Locating new U plots.....	27
5.3.3.Laying out U plots	29
5.3.4 Recording U plots.....	29
5.4 Linear Plots.....	29
5.5 B Plots – Boundary Plots (B1-B5)	30
5.5.1 Locating B plots	30
5.5.2 Laying out B plots.....	31
5.5.3 Recording B plots	31
5.6 A Plots – Arable Field Margin Plots (A1-A5).....	32
5.6.1 Locating new A plots	32
5.6.2 Laying out A plots.....	33
5.6.3 Recording A plots	33
5.7 M Plots –Margin Plots (M1-Mx).....	33
5.7.1 Locating M plots.....	34

5.7.2 Laying out M plots	34
5.7.3 Recording M plots.....	35
5.8 H Plots –Hedgerow Plots (H1-H2)	35
5.8.1 Locating H plots.....	35
5.8.2 Laying out H plots	36
5.8.3 Recording H plots.....	36
5.9 D Plots – Hedgerow Diversity Plots (D1-10)	37
5.9.1 Locating new D plots.....	37
5.9.2 Laying out D plots	37
5.9.3 Recording D plots.....	37
5.9.4 D Plot: Invasive Species Presence/Cover	39
5.10 S/W Plots –Streamside Plots (S1-2, W1-3)	40
5.10.1 Locating S/W plots	40
5.10.2 Laying out S/W plots	41
5.10.3 Recording S/W plots	41
5.11 P Plots –Perpendicular Plots (P1-5)	42
5.11.1 Locating a P plot.....	43
5.11.2 Laying out P plots.....	43
6 Other Information.....	44
7 Guidelines on Species Identification.....	46
7.1 Aggregations/Combinations	46
7.2 Bryophytes and Lichens	46
7.2.1 List of mosses to be recorded in vegetation plots where possible.	47
8 Additional Note.....	50
9 Additional Note 1 – GPS log file setup	52
10 Additional Note 2 – Startup notes for Vegplots	56
11 Additional Note 3 - Landscape Photographs; field survey methodology ..	58
12 Additional note 4: Allocating plots to Glastir land	60
13 Additional Note 5 – Methods to be applied in Countryside Survey Squares	68
13.1 Finding vegetation plot locations from the previous surveys	68
13.2 Filling in Vegplots headers	68
13.3 Updating existing plot maps	69
13.4 Finding previous plot locations.....	70
14 Soil Sampling Procedure.....	74

14.1 Equipment.....	74
14.1.1 Soil plastic core samples	74
14.2 Taking the cores	75
14.2.1 X plot sample layout	75
14.2.2 Plastic Soil Cores and Auger Samples in Tin	77
14.3. Soil sample storage and dispatch	81
14.3.1 Posted to Bangor (Long black, Long white and tin sample in plot envelope)	81
14.3.2 Posted to Lancaster (5 small white cores for square)	81
14 Random numbers between 0 and 1.....	83

1 Introduction to Vegetation Plots

The survey involves recording plant species presence and abundance in different sizes and types 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 GMEP. It will provide the data needed to quantify changes in the Welsh countryside with great precision allowing vegetation change to be expressed by habitat type, landscape location and whether in or out of the Glastir scheme. In order to maintain this valuable dataset it is essential that the following information is collected for each plot.

- General information about the plot including plot number and type, vegetation height etc (header information) as well as species presence and (usually) cover.
- Plot photo – for plot relocation (i.e. finding the position of the previously recorded plot) by surveyors in the next survey and to provide visual information about the plot.
- 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 a forms-based software tool called Vegplots will be used for the plot data capture. A digital camera will be used for plot photos and surveyors will use the “Copy square photos from camera for upload” button on the dashboard to download photos automatically into a folder labelled ‘New_Photos’ within the **C:\CEH\square number\field_data** directory on the tablet. Surveyors should then manually move plot photos into the “VegPlots” sub directory. For ease of use, plot maps will continue to be provided on paper and newly drawn onto paper although digital copies will be available on the tablet.

1.1 Location of veg plots

In the first four years of GMEP plots will be located and recorded for the first time in all 1km squares. Therefore the only information that will be provided regarding plot locations are five random points marking the position of the five X or ‘main’ plots in each square (**Figure 1.1.1**). **The exception is in the final year of the roll – currently this year, 2016 – when Countryside Survey squares will be revisited. These squares are part of a globally unique times series. They were first mapped and plots positioned and recorded in 1978. Where possible they were then revisited in 1990, 1998 and 2007 and so you have the honour and responsibility of extending this globally unique time series by another 9 years. It will be exciting science when we come to analyse these additional data! Further details on how to tackle these repeat 1km squares is provided in Additional Note 5.**



To access the X plot layer the surveyor will need to open up ArcMap. Click this icon  Select File > Open and navigate to **C:\CEH\square number\field_data** and select VegPlotsWelsh.mxd. All plots and their locations will be marked on this map by the survey team. In future surveys this map will provide surveyors with information as to where plots are located in relation to one another and to prominent features in the landscape such as linear features. N.B. Plot locations are also visible in Surveyor.

The precise locations of individual plots are then described using GPS, a sketch map per plot and a series of associated using photographs to aid re-finding the plot. In most cases there will be one map per plot but some co-located plots maybe described on a single map, for

example A, B and X plots or S/W and P plots. Protocols for recording plots are described below. These protocols rely on BOTH the ArcMap plot map and the Vegplots software, which are integrally linked.

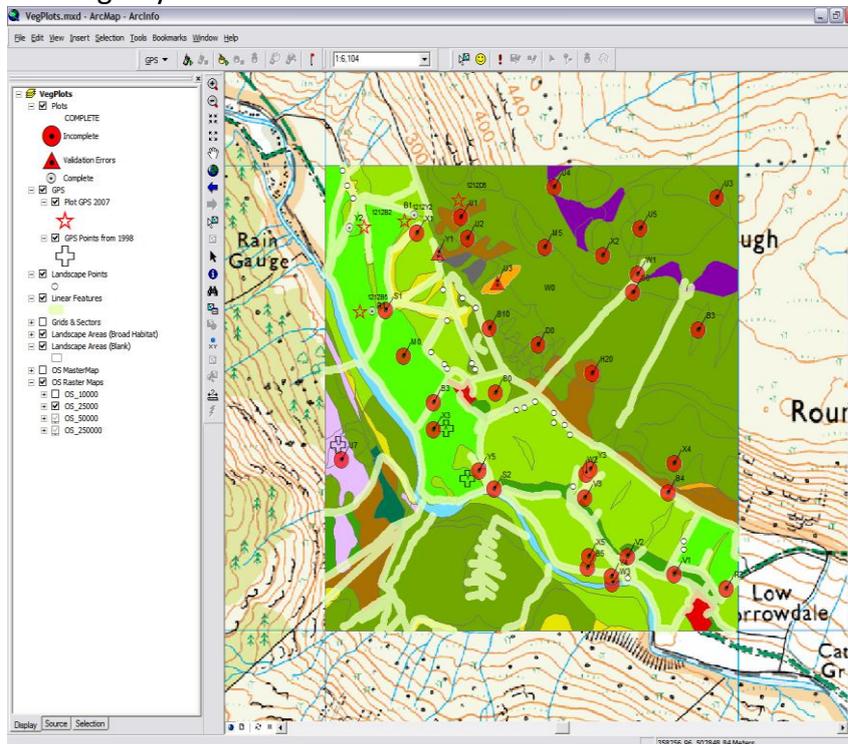


Figure 1.1.1 a and b. A view of a Summary Plot Location Map having completed the field survey and positioned and recorded all necessary plots.

1.2 Adding New veg plots

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. Specific instructions for locating particular plot types are given in the Plot types section below. It is important to record the location of the plot as accurately as possible and so surveyors will use GPS systems with sub-meter resolution.

The locations, type and numbers of certain kinds of plot will be determined based on the findings from the mapping exercise (see below and Additional Note 4) and therefore surveyors carrying out the mapping will need to communicate with those doing the vegetation plots in order to alert them to areas requiring new plots and where necessary note details down on paper. In addition one of the W plots and an associated P plot will be located in the centre of the River Habitat Survey stretch. In 2015 the in-stream surveys will be carried out by a separate team after the main field survey. It is therefore critical that the GMPE field survey team communicate the location of the W and P plot at the centre of the RHS reach, to the CEH river survey team.

From 2015 onwards surveyors will also need to allocate a proportion of plots to areas of habitat and lengths of linear features that are subject to Glastir management options. The

allocation process for habitat areas is achieved using the completed habitat map of the square. For lengths of linear features, adequate estimates can be derived using the aerial photo and OS Mastermap layers. Percentages of habitat areas or lengths of linear features are then divided up into those in or out of different Glastir option groups using a GIS layer showing the grouped options. The required percentage areas or estimates of linear length are then entered into a simple spreadsheet to calculate the numbers of plots required for in-option and out-of-option land (see Additional Note 4 and below).

1.3 Adding New veg plots in ArcMap

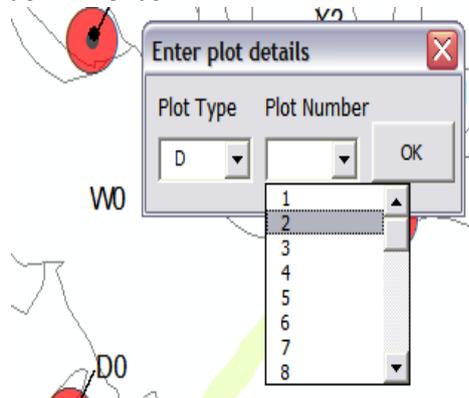
Vegplots Toolbar



A new plot is added in the ArcMap file as a point.

Add a new point by clicking the pencil  to start an Edit session and selecting the Add plot button (pin) .

Upon clicking on the map the surveyor will be asked to enter Plot type and Plot number from drop down menus.



Now **Save** the new plot by clicking on the Save button  and **Stop editing** by pressing the Stop

editing button . If you have added a plot by mistake do not press the Save button, press Stop editing and in the Save dialog box press 'No'. Only once a plot has been added in ArcMap will it be available for data entry in VegPlots as described above.

1.4 Logging GPS locations for plots

The inbuilt tablet GPS system can be used to navigate around each square and in future surveys to re-find the exact position of a plot if necessary. However re-finding plots will be dependent on the use of differential GPS and these will be used in the baseline surveys to determine plot positions with the highest possible accuracy. **Therefore the more accurate data from the differential Trimble GPS is critical and MUST be recorded for each plot in addition to use of the tablet GPS where practically possible.**

1.4.1 Stamping GPS Location

To stamp a plot location, ensure you have your GPS set up correctly. If you have connected the Trimble to your tablet correctly, the tablet knows to override the internal GPS with the Trimble. **See the Technical Handbook and Additional Note 1 for detailed setting up of the GPS.**

Note: A dialogue box regarding the GPS log will appear on starting Vegplots (you can also get this

by going to the GPS Toolbar and Clicking 'Log setup...'). Refer to Additional Note 1 on page 50 of the Veg Plots handbook.

GPS Toolbar

To enable your GPS, Click the GPS dropdown menu on the GPS toolbar as shown below:



- Go to GPS Connection Setup.
- Click the 'Detect GPS port' button, and wait while ArcMap searches for your GPS. Once it has found the correct port, click on the 'Test Connection' button. If testing is successful, click OK.

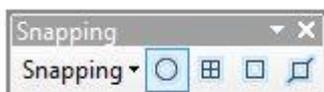
Stamping your plot

To stamp the location of your plot, click the stamp button  on the Vegplots toolbar. You only need to click it once, and you don't need to click on the map as well. If you have set up your log file correctly, a green star will appear on the map at your current location. If it does not appear, click

the 'refresh'  button. Your GPS point may also be 'hiding' underneath your plot point. **Do not** keep clicking the stamp button if a point does not appear (try refreshing the map, ensure 'GPS Plots 2007' is ticked in the menu on the left and check your GPS Log is set up correctly).

Snapping your plot point to the GPS location

If you would like to ensure the location of your plot point is exactly on top of the GPS stamp, you can use the snapping toolbar to move your plot point and snap your points together. To do this, turn on the snapping toolbar (Customize, Toolbars, Snapping).



Ensure snapping is on (Snapping, tick 'Use snapping').

Click the pencil  to start an Edit session.

Click on the select feature icon  and drag the pen across the point marking the plot location on the map (it will highlight in blue).

Click on the black arrow in the  Vegplots toolbar then click your highlighted plot point (a cross symbol will appear when you have your cursor over the point) and drag to move it. It will snap automatically to the GPS point and text will appear (the point you are snapping to – in this case, 'GPS Points 2007') so you can check this is the case.



Don't forget to **Save** and **Stop Editing**.

Note: This is useful but not essential – DO NOT waste time on this if it proves difficult. (It may prove useful if you have accidentally created several GPS stamps and you want to identify which is the correct one with the plot point).

2 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.

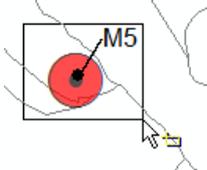
2.1 Logistics of recording on tablets

Ideally vegetation plots will be recorded on one of the tablets per team. However, it is recognised that there may be times when in order to complete the plots in a square, surveyors will want to use two or more tablets to record plots.

2.2 Data entry

In order to begin plot data entry, surveyors will need to locate the position of the relevant plot on the map (X plots only, shown as X) or locate a new plot according to protocols. Once you have

created **and saved** your plot point as described above, click on the select feature icon  and drag the pen across the point marking the plot location on the map (it will highlight in blue)



Once selected, click on the carrot icon  in order to start up the VegPlots software which will open up on the Standard Recording screen for the relevant plot number.

Figure 2.2.1 Standard VegPlots Recording screen

On the standard recording form the **Select Plot ID** and **Nest** fields will appear in the top left hand corner. The Select Plot ID field will be filled with all plots that have been added in ArcMap and listed in alphabetical order. The Nest field will default to 0. Once the plot has been completed and entries validated the surveyor is able to select another plot to record from within the Vegplots application by choosing from the Select Plot ID dropdown. The Nest field is described under the Selected species section (below). At the top right of the form; Square, Plot Type, Plot Number and Plot ID of the plot which was clicked on in the Arc Map screen will be already entered, consisting of the following;

- **Square** – GMEP square number
- **Plot Type** - A,B,D,H,M,S,U,W,P,X,Y
- **Plot Number** - 1, 2, 3,...
- **Plot ID** - Square + Plot Type + Plot Number

Adjacent to these fields are the **Validate**, **Save** and **Exit** Buttons which are to be used on completion of recording (see Completing Plots below). Underneath this information a series of tabs are present across the screen, the first of which 'Headers' will be open for data entry

HEADER

Essential items of information within Vegplots have been organised under a series of sub-headings;

Plot relocation

Some of the options will only apply when squares are revisited. This will occur once a full four year cycle of the survey has been completed and squares are being visited for the second time but **it will also apply in 2016 when Countryside Survey squares will be visited and where surveyors will be re-finding plot locations fixed in place and recorded in previous surveys in 2007, 1998, 1990 and 1978. If you are about to record a Countryside Survey square then please read Additional Note 5.**

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

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
- **Photos taken?** - Yes, No. In most cases this is just a reminder to ensure that you DO take a plot photo. Answer 'No' only where a new photo would make plot re-location harder (e.g. in thick fog) See Plot photo protocol (pg 17)
- **Plot Map drawn?** [MAP]– 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 (pgs 18)

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. **Since Glastir prescriptions attach importance to vegetation height it is critical that these fields are completed.**

- **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

Admin

- **Surveyors** - free text initials (will automatically enter previously entered sets of initials if 'Save Names' to the right of the field is clicked)
- **Plot Completed?** - Complete, Complete with validation errors, Incomplete (as default)

Notes

Free text, mainly to describe why plot has been lost or other reasons why it was not appropriate to do plot (max 250 characters).

PLOT SPECIFIC HEADER INFORMATION

This tab 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 as featured at the top of the screen. The header information relevant to the different plot types is detailed under each plot type which is described later on in this plot manual.

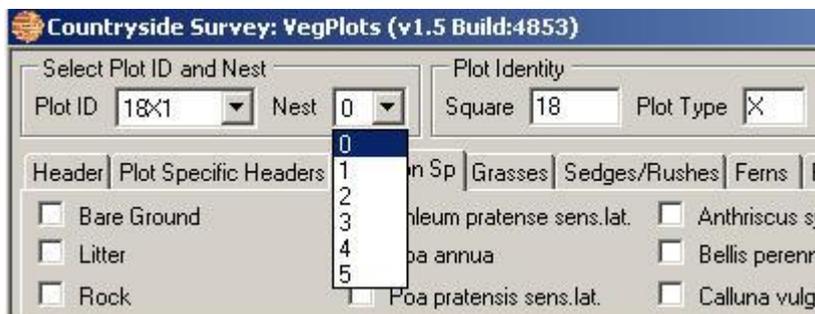


Figure 2.2.2 Vegplots screen showing X plot nest dropdown.

LISTED SPECIES

For some plot types (see individual plot type protocols) species recording will be carried out in a series of nested plots. The **Nest** field will need to be filled in as appropriate when recording. **Note that in 2016, X plots are reduced to 2x2m in size EXCEPT where the plot falls into woodland of any sort or you are in a Countryside Survey square.**

Listed species consists of a series of tabs for different species groups; Common species, Grasses, Sedges/Rushes, Ferns, Forbs/Woody species, Mosses/Lichens, Crops and Unidentified species provide species lists when the relevant tab at the top of the Header screen is clicked. The Common species screen consists of a list of up to 100 common species of plants (herbs, grasses, bryophytes, ferns, sedges/rushes). Other screens for each of the separate groups of species (i.e. grasses, herbs etc) consist of comprehensive lists of possible species. Where any of these is present, then the box against the species name should be checked. Where it is not possible to identify a species immediately it is possible to enter species A-C on the Common species tab and species D-Z on the Unidentified Species tab in the field and the species can be collected for later identification. N.B. Plots can be finalised despite including Unidentified species but surveyors will be alerted to these when validating a plot.

SELECTED SPECIES

As each species is selected using the tablet pen, it is loaded as a record into a growing species/nest list for the plot. When the surveyor has completed identification of all species in the plot he/she should click on the Selected Species tab (**Figure 2.2.3**). The Selected Species tab lists all species ticked in the species lists and the nest in which they have been recorded. On this tab the estimated total cover % of each species (and covers for particular 'nested quadrats' as appropriate) should be entered using presence (recorded as 1%) and thereafter 5% cover categories. When clicked, a drop down list of % cover will appear in the box adjacent to the listed species, it is essential to click on the chosen category for it to appear in the % cover cell of the table. At the bottom of the selected Species list a Delete Selected Rows button enables surveyors to click on the left hand end of a row or series of rows and highlight them for deletion (by pressing the button). Estimates of cover should be constantly checked

between partners to ensure that there is not a tendency to over or under estimate. **Cover may be over 100% if several layers are present e.g. *Pteridium* (100%) over *Agrostis* (25%). Trees and shrubs whose canopies project over the plot should also be listed as present and cover estimated in the normal way.** Do not double count overhanging and rooted material of the same species. 'Bare ground' does not include leaf litter and rock. All vascular plants should be recorded, together with a restricted list of bryophytes and lichens (as indicated on the Species tabs and also see page 43). Mosses and lichens growing on rocks and trees should be ignored.

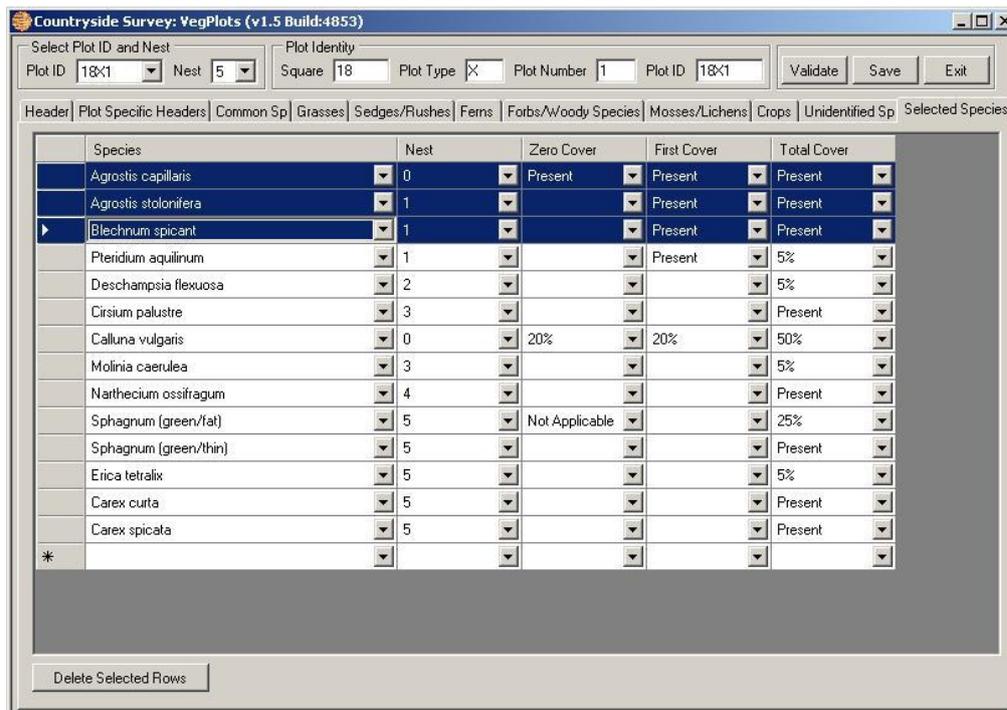


Figure 2.2.3. Selected Species tab with three records highlighted for deletion

Completing Plots

It is recommended that surveyors use the Save button to save regularly to avoid data loss as a result of battery failure or other problem (there is a backup save but this will not avoid loss of all data). On completion of each plot surveyors should use the Validate button to highlight any areas with missing fields. Header fields will be highlighted in Red (Figure 2.2.4) and missing information on the Selected Species tab will show a red circle with an exclamation mark 

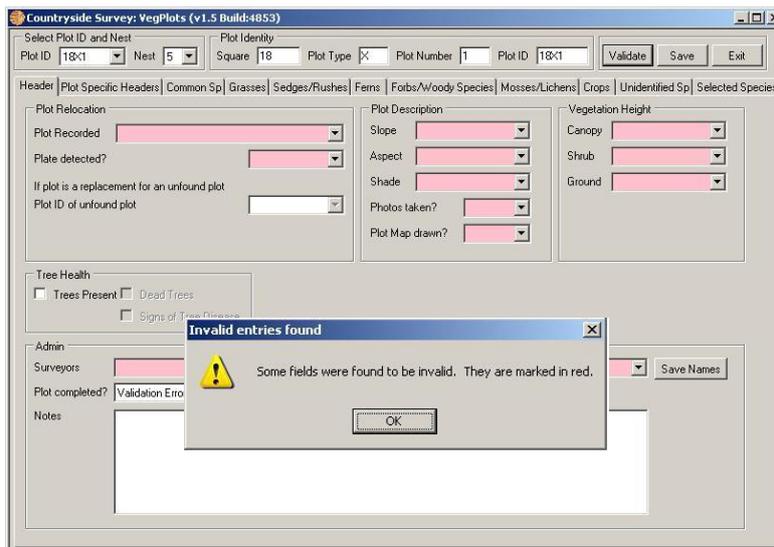


Figure 2.2.4. Header Validation

Once data is validated the surveyor should Save and Exit. If the surveyor attempts to Exit or change the plot (using the Select Plot ID button – top left of the screen) they will be asked to validate the data before doing so.

3 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 move in four years and is unique and obvious for example a prominent rock, tree or fence post. It is essential that all plot photos feature information on plot number and type. Surveyors have been supplied with a set of letters and numbers on waterproof paper which can be attached to the back of a weather writer 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 especially on the sketch maps for P plots.

Because of the volume of photos surveyors have to deal with. Surveyors should put the sd card from the camera into the tablet and then use the dashboard button "Copy square photos from camera for upload" to transfer all photos into the **C://CEH//sq_number//New_Photos folder**. Surveyors should then sort photos into correct subdirectories and label as best as possible. The memory card in the camera is unlikely to be able to hold all photos taken by one team during the survey and therefore at some point during the survey period surveyors will need to erase photos on the camera that have already been downloaded onto the tablet.

Please also take a repeat set of plot photos in Countryside Survey squares even if the existing photos are adequate. Taking up-to-date photos is an important part of updating the time series.

4 Plot Sketch Map Protocol

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

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

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.

5 Plot Types

Table 5.1. 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. See Additional Note 4 for the allocation of plots to land in Glastir options.

Code	Name	Other names	Where	Size	No. per square
<i>Areal plots</i>					
X	Small or Large if in woodland or in a CS square.	'Wally plot' Main	Random points not on linear features	4 m ² or 200m ² if in woodland or in a CS square.	Up to 5
Y	Small	Targeted and Enclosed Habitat	Primarily allocated to 'Enclosed habitats' in or out of option and then additionally placed to record Priority Habitats (PH) not sampled by other plots.	4 m ²	Up to 5 but more if >5 PH
U	Unenclosed		Unenclosed Broad Habitats in or out of Glastir options.	4 m ²	Up to 10
<i>Linear plots</i>					
B	Boundary		Adjacent to field boundaries in or out of option.	10 x 1 m	5
A	Arable		Arable field edges centred on each B plot. In or out of option but only one per arable field. Paired with X plots if out of option.	100 x 1 m	Up to 5
M	Margin		Field margins in or out of option.	2 x 2 m	Up to 15
H	Hedgerow		Alongside hedgerows (i.e. WLF with unnatural shape) and usually coincident with two of the D plots.	10 x 1 m	2
D	Hedgerow diversity		WLF with natural or unnatural shape. Allocated proportionally to WLF in option.	30 x 1 m	Up to 10
S/W	Streamside		Four placed alongside water courses and allocated in proportion to option uptake. One W plot centred on the	10 x 1 m	Up to 5

			RHS stretch.		
P	Perpendicular streamside		Sampling the upslope habitats adjacent to and centred on the S/W plots.	10 x 1 m	Up to 5
R/V	Roadside verge plots		Sampling the 1m strip adjacent to roads and tracks. Only to be re-recorded in Countryside Survey squares. These are NOT recorded in new GMEP squares.	10 x 1 m	Up to 5
				MAX	>=73

All plot types are now subject to strictly proportional sampling of each 1km square. This means that the maximum possible number of plots is reduced as the 'plot-able' area of the square decreases. This is important as it will save you time because fewer plots will need to be recorded. The % plot-able area of the square is inserted into the Plot Calculator spreadsheet (see below and Additional Note 4). **Plot-able land is defined as all linears and habitats on land with access permission excluding urban, sea, inland waters and other unsafe or inaccessible land.**

The B, A, S and H plots are projected from the random X plot locations, as described in the following sections. Some of these plots may need to be uncoupled from the X plot locations if a plot is required to sample in-option linear features but the projected plot falls on out-of-option linear features. In this case the plot will need to be randomly allocated to a position along the length of the respective in-option linear as shown on the GIS options layer. Then, to avoid having too many plots of a certain type, the plot that would have been projected from the X plot is **NOT** recorded. See Additional Note 4.

5.1 X Plots – (X1-X5)

In order to speed up the survey, in 2014 X plots were reduced to 4m² with no nesting and so are now exactly equivalent in size and recording method to U and Y plots. They are however, still placed at five predetermined random positions. **Note that following discussions during the past year, the full X plot has been reinstated BUT ONLY when located in a woodland broad or priority habitat, including Conifer Woodland. This means where the 2x2m centre of the plot falls in an MMU (20x20m) that can be mapped as woodland. In all other habitats continue to record the X plot as 4m² in size.**

5.1.1 Locating X plots

Surveyors will be provided with random points for X plot locations. Surveyors should locate plots as close as possible to those points marked on the ArcMap 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 the B plot (see below).

The differential GPS reading should be taken at the south corner of the plot. The distance of the boundary from the plot should be measured from the **south corner** of the X plot to the right hand corner of the Boundary plot where the B plot differential GPS reading is to be made. Note that from 2015 onwards there will be no X plot centre post **unless you are in woodland**, 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 or in an area with no access permission 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 X plots and other plot types. To determine whether a new X plot position can be feasibly recorded, the surveyors should use the five sector overlay on the ArcMap plot location map.

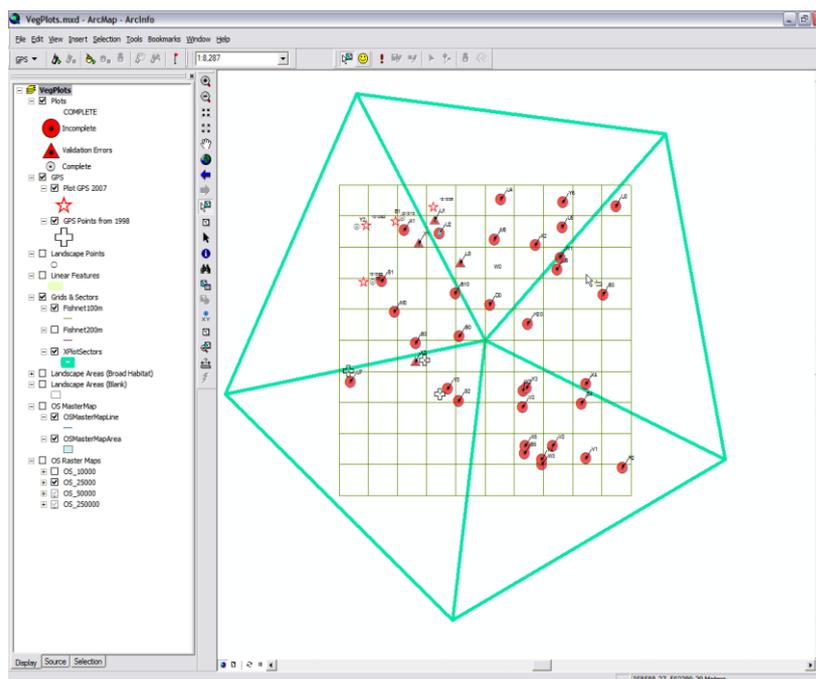


Figure 5.1.1.1 The five sector stratification for X plots

The five sector stratification is a layer (XPlotsectors) available in ArcMap. 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. Surveyors will also need to ensure that the two P plots associated with each of the most distant X plots do not protrude into the X

plot. If this is likely then move the X plot so that it is at least 12m from the end of the P plot. If in an arable field this will mean moving the plot along the field edge rather than farther into the field. Describe this carefully on the plot location map.

Lastly, if you have to re-position an X plot location and find that the B, S and H plots projected from the new positions cross into a different sector then record these as normal. Even plots projected from the given X plot positions may be located in different sectors to their linked X plot so this is nothing to worry about.

5.1.2 Laying out X plots

Unless in woodland, the vegetation plot is 4m² and is set up in the same way as the U and Y plots. 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.

Description of X plot layout to be used in woodlands only

The vegetation plot is 200 m² (14.14 x 14.14m) and is set up by using the survey poles provided with the strings forming the diagonals of the square (Figure 5.1.3.1). The diagonals should be orientated carefully at right angles and the plot should be orientated with the strings on the North/South, East/West axes. In arable fields the plot should be taken as being a 14m square (estimated, not measured), starting 3 metres into the crop (to avoid any edge effect). Access should be made using drill lines where possible and causing minimum disturbance to the crop (or where the crop may be on a future visit). The species list should be compiled from what can be seen in the crop - accuracy is difficult to achieve but samples must be taken from arable crops however possible. The different nested plots shown in Figure 5.1.1.1 are marked by different coloured strings on the appropriate position of the diagonal. The 1m² nest is not marked and comprises the northernmost corner of the inner 4 m² nest.

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

1. Locate the marker tag for nest 1 along the north-pointing 1/2 diagonal string. This tag should be positioned at 1.41m (see Table 5.1.3.1).
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.

The same approach can be used to lay out the Y and U plots.

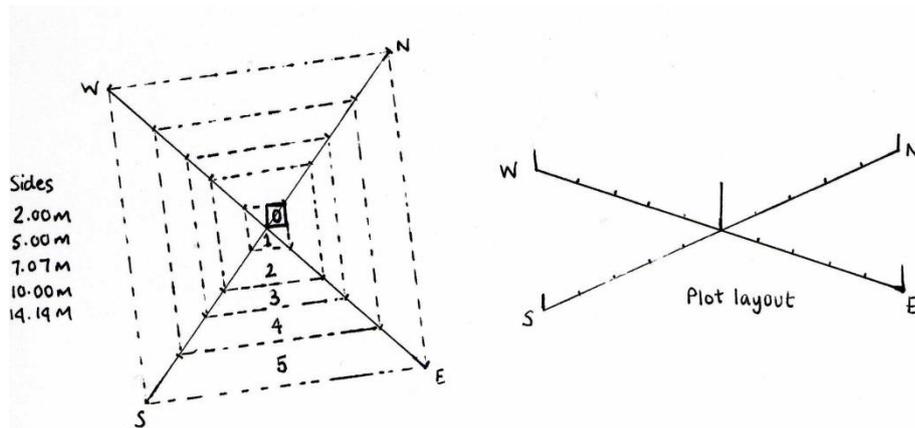


Figure 5.1.3.1 Design of X (Wally) Plot

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

Table 5.1.3.1 X plot dimensions

5.1.3 Recording X plots

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, click to select.
- **Broad Habitat**

The BH selected in the dropdown for X plots should reflect the assignment of the wider mapped polygon **UNLESS the polygon is a Mosaic**. This will invariably be in Unenclosed habitats, for example Bog and heath or Bog and Fen, Marsh & Swamp. In the last survey the absence of any way of recording the BH of the patch sampled by the X or U plots in a Mosaic meant that we did not know which BH to assign the plot to when it came to analysis. This time, the dropdown for X and U plots will record that vital information. In truth this means that BH dropdown is superfluous in all other non-Mosaic polygons since a GIS overlay will establish to which BH the plot should be assigned. Please record this information for completeness however. **If in a Mosaic this information is essential**. If the polygon has not been mapped at the time the plot is recorded then you will have to consult the mapper afterwards.

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

'Signs of tree disease'.

LISTED SPECIES

All species are recorded from the 4m² nest **except in woodlands**. To ensure that you only have to enter one list and one set of covers you need to select nest 5 and enter covers into the Total-cover column. We will know that these data refer just to the 4m² plot and can edit the nest numbers post-survey. **Note that if you are in a woodland you MUST use the full X plot and record species cumulatively starting in nest 0 and then censussing successively larger nests up to nest 5, which is the outermost nest. Any additional species are recorded in each successive nest. The nest they first occur in is indicated by selecting the nest number from the drop-down.** Add species by clicking each species name on the species group tabs or selecting an additional species from the scrollable drop-down BRC list found at the right of the species name field in the Selected Species tab. The cover, in 5% bands, should then be selected using the drop-down in the [Total cover] column.

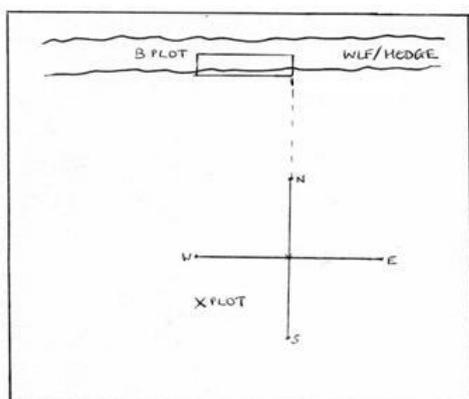


Figure 5.1.3.2. Marking X and B plots. Note that the differential GPS reading for the X plot should be taken at the south corner of the X plot and the reading for the B plot taken at the right hand corner of the B plot facing the boundary and nearest the X plot.

5.2 Y Plots (Y1-Y5)

Y plots are 2x2m in size and can only be positioned in the square after habitat mapping has been completed and all other plots have been positioned. Y plots have two aims; 1) proportionally sampling 'enclosed' habitats in and out of Glastir, 2) sampling Priority Habitats (PH). Enclosed habitats are Broadleaved and Conifer woodland, Arable, Improved and Neutral Grassland.

5.2.1 Locating Y plots

Allocation of Y plots to option land is achieved using the Plot Calculator (see Additional Note 4). After allocating up to 5 Y plots to enclosed habitats further Y plots are deployed to sample any PH missed by the other plots. **One Y plot is placed per PH favouring land in-option.**

5.2.2 Laying out Y plots

Plots in enclosed habitats: Locate plots at random points selected from **the total extent of enclosed habitat**. Allocate the number of random plots to either in or out-of-option land using

the Plot Calculator (see Additional Note 4).

Plots placed in Priority Habitats: Select a random patch of PH but then choose a floristically representative patch as close as possible to this random point. This is the only plot type where plot positioning employs some of the subjectivity of the NVC approach¹. If the plot is put into a linear feature within which a 2x2 m plot will not fit then the area should be made up to 4m² by extending the length - this should be clearly depicted with measurements made on the new plot map.

Y plots should be orientated along north/south, east/west axes. However, in a linear feature, this may not be possible and the main axis of the plot should be measured and recorded (Fig 5.2.2.1). 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.

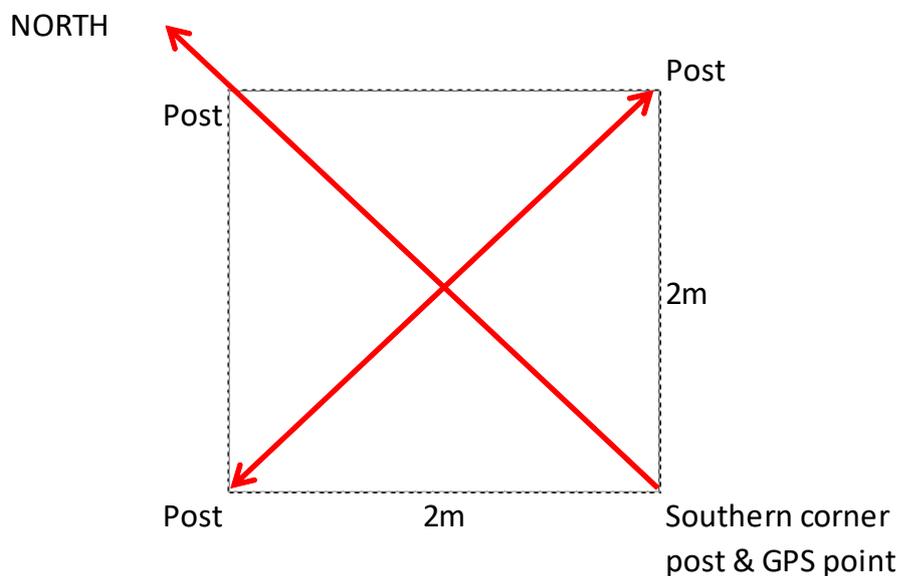


Figure 5.2.2.1 Layout of the X, U and Y plot showing the southern corner and direction of alignment. The plot is 4m² ie 2m x 2m along the sides.

5.2.3 Recording Y plots

HEADER

Surveyors will be asked to record the specific Priority Habitat which the plot represents (or 'none' if the habitat is not a PH). Priority Habitat names or 'None' should be selected from the drop-down list.

- **Priority Habitat:** 22 PH options or None

LISTED SPECIES

¹ This is because these plots are intended to represent uncommon plant species assemblages that will often have an expected similarity with the units of the NVC. They are also few in number; often only one per PH per square. To allow for subsequent matching an NVC style approach is applied by favouring a typical, floristically representative patch.

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

5.3 U Plots – Unenclosed Plots (U1-U10)

Up to 10 plots should be placed in any unenclosed Broad Habitat types that occur within the square (Table 5.3.2.2). The plots are 2 x 2 m in all instances. Two rules apply in determining the number of U plots required. Firstly, 1 obligatory U plot is needed per unenclosed BH. Secondly, having allocated these obligatory plots, the remaining U plots are allocated according to the proportion of the total amount of unenclosed BH in the square, then according to how much of the total area of unenclosed BH is in or out of Glastir option and then according to the proportional contribution of the different unenclosed BH within the out-of-option and in-option land. To determine how many U plots are needed in a square use the Plot Calculator spreadsheet after habitat mapping is complete (see Additional Note 4). **N.B.** all mosaics are treated as one single Broad Habitat category, irrespective of their component parts.

5.3.1 Locating U plots

Numbers of U plots needed and their locations can only be decided after the square has been mapped. The number of U plots to be recorded depends on the proportion of the square that is occupied by unenclosed Broad Habitats. If the whole square comprises unenclosed Broad Habitats then 10 U plots should be deployed. If half the square was made up of these habitats then 5 U plots are needed. A grid is provided to allow estimation of the proportion of the square which is made up of unenclosed habitat types. In the example below (Figure 5.3.1.1), about 63% of the square is in the Unenclosed Broad Habitat area and therefore 6 plots would be allocated ($0.63 \times 10 = 6.3$ then rounded to the nearest integer = 6). The Plot Calculator works this out for you when you answer question B1. The number of plots out of these 6 that are then allocated to land in or out of Glastir is again calculated by the spreadsheet when you answer B2, which is the proportion of the 1km square occupied by U plot option land.

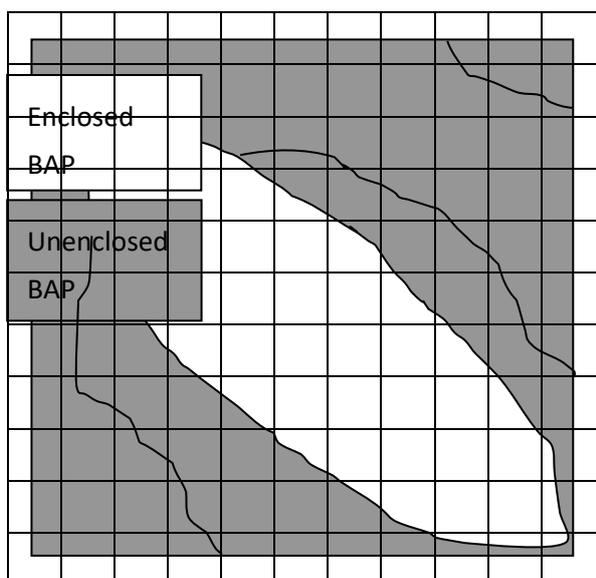


Figure 5.3.1.1. 100m fishnet grid used to help estimate the allocation of U plots

5.3.2 Locating new U plots

Once the number of plots has been determined, then the plots are distributed among the different Broad Habitats, as follows. In table 1 we assume that all land is either in Glastir or all out of Glastir so that the total number of 6 plots is allocated in proportion to the coverage of unenclosed habitats in the square with no apportioning of plots into option and out of option land:

Unenclosed habitat type	% of unenclosed habitat area	Compulsory plots	Allocation of remaining 3 plots	Total plot allocation
8	60	1	60% of 3 = $0.6 \times 3 = 2$	1+2
9	30	1	30% of 3 = $0.3 \times 3 = 1$	1+1
10	10	1	10% of 3 = $0.1 \times 3 = 0.3$	0

Table 5.3.2.1. Example plot allocation for U plots assuming all land is in or out of option.

If we now find that 20% of the square is unenclosed land in-option and enter this as the answer to B2, we get 4 plots to put in out-of-option land and 2 for in-option land. Assuming the same proportions as above in each of these two zones of the square we get the following allocations:

a) **Out-of-option** (43% of square so 4 out of 6 plots to allocate).

Unenclosed habitat type	% of unenclosed habitat area	Compulsory plots	Allocation of remaining 4 plots	Total plot allocation
8	80	0	80% of 4 = $0.8 \times 4 = 3$	3
9	15	0	15% of 4 = $0.15 \times 4 = 1$	1
10	5	0	5% of 4 = $0.05 \times 4 = 0$	0

b) **In-option** (20% of square so 2 out of 6 plots to allocate).

Unenclosed habitat type	% of unenclosed habitat area	Compulsory plots	Allocation of plots	Total plot allocation
8	60	1	NO PLOTS LEFT TO ALLOCATE	1
9	30	1		1
10	10	1		1

Table 5.3.2.2. Example plot allocation for U plots

Because we want to target option land, the compulsory 1 plot per unenclosed BH are all placed in the area that is in-option. The exception would be if an unenclosed BH only

occurred in the out-of-option land since that is where you would have to place the obligatory one plot per unenclosed broad habitat. In the example above areas of all the unenclosed BH occur in the in-option land and so this receives all the obligatory plots. This is because in-option land is still likely to be less common than land out-of-option across the Gmep sample. The result is that the in-option land is over-sampled by 1 plot and 4 plots are all placed in the out-of-option land in proportion to the coverage of habitats. NB. When taking proportions round to the nearest integer i.e. $0.2=0$ and $0.5 = 1$. This is the approach used in the Plot Calculator.

Once it is known how many plots are to be placed in each habitat type, then plots should be placed at random points, within each habitat, where each point is an intersection of the 100m fishnet (Figure 5.3.2.1). The best way to do this is simply to count up the number of fishnet intersections that coincide with, or are next to, each unenclosed Broad Habitat. Then, if you need 3 plot locations, select three random numbers from the random number generator provided on the tablet or from the table at the end of the handbook. In order to scale the random numbers, which are between 0 and 1, to the number of intersections for the Broad Habitat, simply multiply each random number by the total number of intersections and round to the nearest integer – also see section 10 Additional Note 2 for a worked example. Where a Broad Habitat type is not ‘hit’ by any grid point because it’s patches are too small yet still >MMU, then randomly select from the total number of patches and randomly place a plot in the selected patch. You can use any method for selecting random points as long as it really does mean that every point has an equal chance of being selected. Methods such as walking a number of paces between 1 and 20 or throwing a quadrat behind you are not random.

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



Figure 5.3.2.1. Fishnet overlay on a completed map of a survey square.

Table 5.3.2.2. List of unenclosed Broad Habitat types eligible for U plot sampling. See key for definition of constituent Priority Habitats.

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

5.3.3. Laying out U plots

Plots should be orientated along north/south, east/west axes as for X and Y plots (Fig 5.2.2.1). However, in a linear feature, this may not be possible and the main axis of the plot should be measured and recorded. If the plot is put into a linear feature within which a 2x2 m plot will not fit then the area should be made up to 4m² by extending the length - this should be clearly depicted with measurements in the sketch map.

5.3.4 Recording U plots

HEADER

- **Broad Habitat type;** select a habitat from the drop-down list to which the vegetation sampled by the plot can be best assigned. This is particularly important if the U plot is sampling a mosaic.

LISTED SPECIES

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

5.4 Linear Plots

General rules for linear (10 x 1m) plots:

- Before positioning and recording linear plots use the Plot Calculator to determine the numbers of each plot type to be allocated to linear features under Glastir options (see Additional Note 4). Use the OS Mastermap layer and aerial photo to

estimate the lengths of all boundaries, all WLF and all watercourses. These estimates should be good enough to allow you to calculate the proportional lengths of the respective in-option linear features (see Additional Note 4) and to insert these into the Plot Calculator.

- The two H, two S, five A and five B plots can all be projected from the X plots. If any of these land on in-option linear features then they can count towards the number of in-option plots you need. If they do not land on in-option linear features but the number of plots allocated to in-option requires that they sample in-option linear features then you'll need to uncouple the linear plot from the X plot location and randomly position it along the total length of the in-option linear feature as follows: You will already have measured the length of the in-option linear feature in the square in order to answer the questions in the Plot Calculator. Call the place you started measuring from 0 and then decide the route to get to the end, for example say the total length of B plot option linear is 765m then decide where 0 and 765m will be. If you need to randomly locate one B plot then select a random number between 0 and 1, multiply by 765 and round to the nearest metre. Now go to this distance from the 0m starting point.
- **So as to avoid doing too many plots of each type, do not forget to deduct the number of uncoupled randomly placed plots, which could have been projected from the X plot, from the total needed in the square.** For example, if you needed one B plot to be in-option and none of the B plots projected from the five X plots landed on in-option boundary then you will have had to randomly place one B plot, uncoupling it from an X plot. So one X plot will lack a B plot otherwise you'll end up doing 6 rather than 5 B plots. Choose X plots at random from which to delete these uncoupled plots.
- **No two linear plots of the same type should be placed within 10 m of each other on the same linear feature.**
- **No two linear plots of different types should overlap.**
- **The 1 metre width should be measured across the surface of the terrain so that, on a bank, the true horizontal width, as viewed from above, would be less than 1 metre.**
- To ensure that in-option linear features are well sampled a single linear plot is allocated by default to in-option linear even if there is <5% in the square. Then the only reason the one linear plot would NOT be recorded is if there was so little linear in-option it could not be fitted into a plot (i.e. <10m).

5.5 B Plots – Boundary Plots (B1-B5)

Boundary linear plots are recorded at the boundary marker of each of the X plots in enclosed land (see [Figure 5.1.3.2](#)).

5.5.1 Locating B plots

B plots should be located at a position on the boundary closest to the X plot and on a cardinal bearing from it (i.e. N, S, E or W) or located at random along the linear in-option length. A boundary is taken to be any physical feature that has a length and which is an interface between the parcel containing the 200m² plot and any other land cover type. This might

include a hedge, wall, fence, ditch, embankment etc. It will not include land cover which is associated with the management practice of the field e.g. headlands.

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

5.5.2 Laying out B plots

The linear plot should be laid out so that the differential GPS recording position is at the right hand corner of the plot at 1m away from the boundary feature (**Figure 5.5.3.1**). In most cases the feature recorded will be vertical, i.e. a hedge, wall or fence - in the case of a hedge, the plot should occupy the 1m strip running outwards from the centre of the feature. In other cases the 1m width will run out from the base of the feature (e.g. wall or fence).

Where the boundary is composed of several different elements e.g. hedge with ditch, then the laying out procedure should be decided by reference to the dominant vertical feature e.g. hedges/walls/fences are dominant to ditches which are dominant to grass strips. Once the dominant feature has been identified and the plot laid out accordingly, then recording takes place in the 1m strip, irrespective of whether it includes part of another linear feature. (N.B. different rules apply in the case of H and S/W plots - see below).

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

5.5.3 Recording B plots

HEADER

- **Distance of ploughed edge from centre of boundary feature** : Not Applicable, <2m, 2-4m, 4-6m, 6-12m , 12-20m
- **Boundary type** : Fence, Hedge, Wall, Ditch, Grass Strip, Earth Bank, Stone Bank, Earth & Stone Bank, Other (should be noted on plot map)

LISTED SPECIES

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

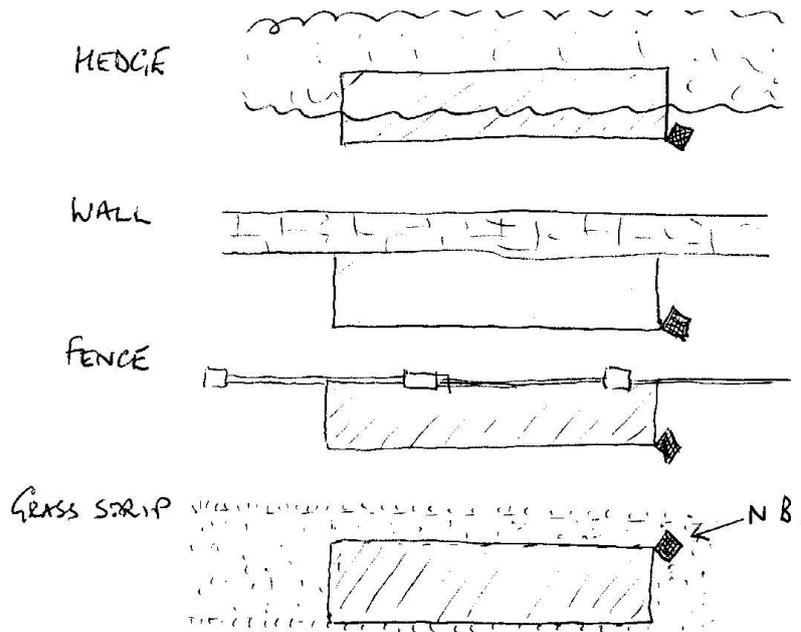


Figure 5.5.3.1 Laying out a boundary plot in different circumstances. The black square indicates where the differential GPS location should be made.

5.6 A Plots – Arable Field Margin Plots (A1-A5)

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

5.6.1 Locating new A plots

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

If there is A_M option land in the square then use the Plot Calculator to determine how many A plots are needed to sample cultivated margins in-option (see Additional Note 4). Then determine how many of the required in-option A plots are covered by projecting A plots from the random X plots. Any that are not covered by projecting from the X plot need to be uncoupled from the X plots and randomly placed along the arable margin in-option. Irrespective of the total number of A plots allocated to A&M option land, only place 1 A plot per in-option field. Also, if there is no cultivated strip you cannot place a plot. Any remaining A plots that apply to out-of-option land should be linked to X plots that fall randomly into arable fields.

5.6.2 Laying out A plots

It is unrealistic to mark out the exact dimensions of A plots. Instead, the rangefinder should be used to measure 50m in each direction from the centre of the B plot (Figure 5.6.3.1). A plot pole or cane, with a 1 metre mark, should then be used to check the width of the plot as it is walked and recorded.

5.6.3 Recording A plots

HEADER

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

LISTED SPECIES

Species cover and presence should be recorded in the central 4x1m section (nest 0). In the rest of the plot (nest 1) only species presence should be recorded.

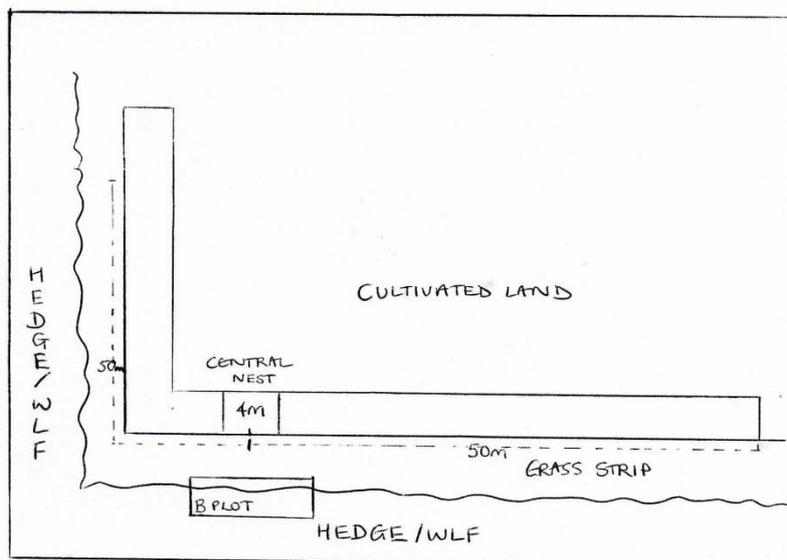


Figure. 5.6.3.1 Laying out an arable field margin plot

5.7 M Plots –Margin Plots (M1-Mx)

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

environment support. Types of margin include:

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

5.7.1 Locating M plots

M plots are associated with A plots, i.e. in an arable field, which is bounded by margins. The number of M plots per square will depend on the widths of margins present, with up to 3 per field. If an A plot samples in-option cultivated margins then M plots are coupled to this A plot but a B plot may not be present because the A plot was not projected from an X plot. This will happen if the Plot Calculator said you needed one or more A plots in-option but none of the A plots projected from X plots landed on margins in the A_M option layer. If the A plot has been placed in out-of-option arable then M plots will be positioned between the B plot and the A plot (Figure 5.7.2.1).

5.7.2 Laying out M plots

Where a margin or margins are present at the edge of the field the first M plot will be placed at 3m from the centre of the hedge (where a hedge is the boundary feature). Where the boundary feature is a wall or fence the M plot will be placed at 2m from the boundary in order to avoid overlap with the B plot and to avoid recording at the edge of the margin. If margins extend beyond 6m into the cropped area further quadrats will be recorded at intervals of 6m. Thus if the first M plot is at 3m from the hedge centre, the 2nd is at 9m, the 3rd at 15m etc (Figure 5.7.2.1).

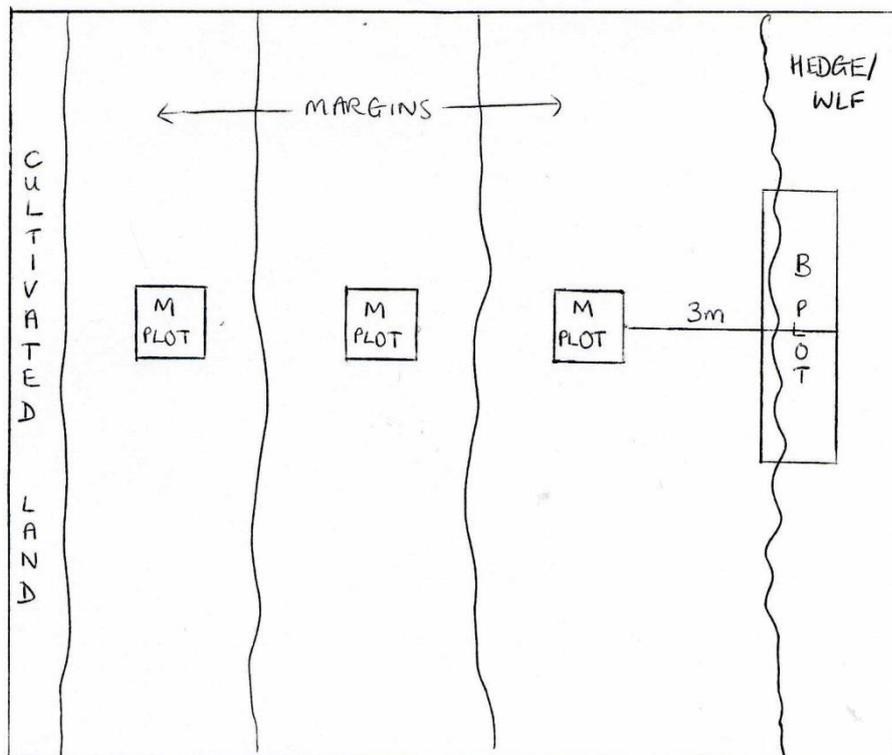


Figure 5.7.2.1. Laying out a margin plot

5.7.3 Recording M plots

HEADER

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

LISTED SPECIES

Species presence and cover will be recorded.

5.8 H Plots –Hedgerow Plots (H1-H2)

5.8.1 Locating H plots

H plots are linear 10 x 1m plots. H plots are placed on the hedge² nearest to each of the two X plot locations that are farthest apart in the square. The 10m x 1m H plot is laid out to the left and the 1m width extends out towards the field from the centre of the hedge. The H and B plots should not be nearer than 10m to each other, so if there is not more than 30m of continuous hedge in the square, only one plot (the B) should be recorded. Where the nearest feature is ineligible (because it is not wide enough, or is confused by the presence of a different type of linear within its width – see below) then a new location should be chosen at the nearest permissible position. The position of a new plot will be marked on the GIS tablet

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

and clearly marked on a sketch map.

If D plots are split between in and out-of-option WLF then ensure one H plot is in-option and one out by linking to the D plots. Check whether any of the H plots projected from the two most distant X plots fulfil this role. If one or both do not coincide with in-option hedgerow then link one or both H plots to a randomly chosen one or two of the in-option D plots. Any out-of-option H plots should be projected from an X plot to the nearest out-of-option WLF. Where there is less than 10% of H & D plot option in the square the Plot Calculator will ensure that at least one D plot samples the in-option linear. If so then one of the H plots should be recorded with this D plot.

Because H plots have to sample WLF with unnatural shape (i.e. hedgerows) you may end up being unable to do an H plot coupled with a D plot. If so then the H plot may not be possible or may need to be randomly placed on a different in-option WLF that has unnatural shape. Do not spend ages on this process. Err on the side of sampling in-option WLF where possible so if there is some doubt over the shape of the WLF favour unnatural and record the H plot with the D plot.

5.8.2 Laying out H plots

H plots are each 10 x 1 m. The position of the plots should be temporarily marked with a survey pole at each end, one metre out from the centre of the hedge (see Figure 5.8.2.1). A measuring tape can be used to mark the outer edge of the plot.

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

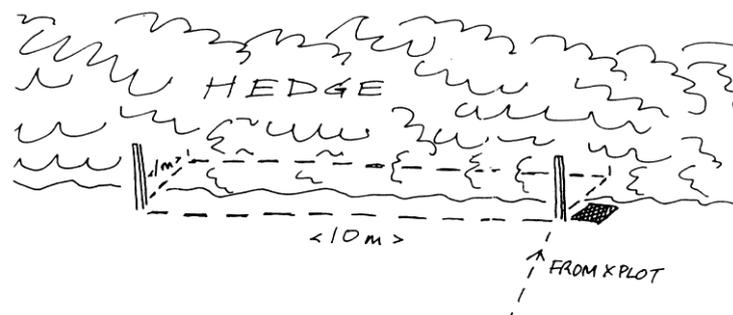


Figure 5.8.2.1. Laying out a hedgerow plot. The black square indicates the corner of the plot where the differential GPS location should be measured.

5.8.3 Recording H plots

HEADER

- **Distance of crop from centre of hedge :** Not Applicable, <2m, 2-4m, 4-6m, 6-12m , 12-20m. Note that this refers to cultivated land not to established grassland. The idea is to capture ploughing too close to the hedge base. Distance is from the mid-line of the hedge.

- **Tree disease.** Dead trees. Disease present.

LISTED SPECIES

Species presence and cover will be recorded

5.9 D Plots – Hedgerow Diversity Plots (D1-10)

5.9.1 Locating new D plots

D plots are allocated in proportion to the length of H & D option in the square using the Plot Calculator. Up to 10 D plots are possible per square. Note that the number of D plots to be allocated is also proportional to the plot-able land available in the square (see Additional Note 4). Two of the D plots are coupled with H1 and H2 unless the WLF is of unnatural shape. Thus the central 10m of the D plot coincides with each H plot. The GPS point for the H plot should therefore suffice for refinding the D1 and D2 plots next time round. Any D plots not linked to X plots, should be randomly placed along the in-option and out-of-option WLF. The numbers of plots to be allocated in and out of option are given by the Plot Calculator.

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

5.9.2 Laying out D plots

Each plot is 30 m long and includes the full width of the **WLF**. The plot does not need to be fully marked out but, rather, the rangefinder should be used to check the length of the plot (15 m in each direction from the centre point) (see **Figure 5.9.2.1**).

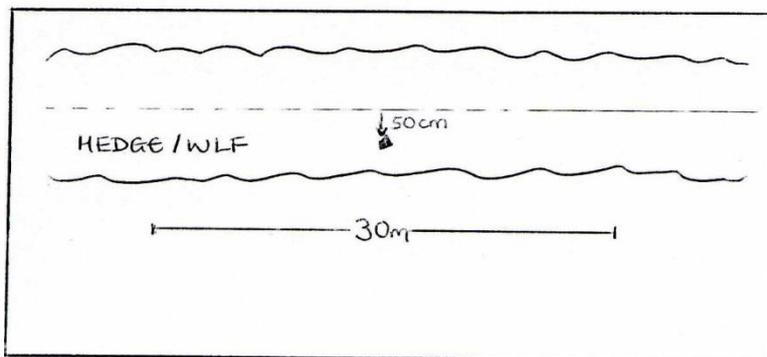


Figure 5.9.2.1. Laying out a hedgerow diversity plot

5.9.3 Recording D plots

D plots may be placed on either of the types of WLF described in the Mapping handbook or on linear features which comprise both.

HEADER

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

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

- **Tree disease.** Dead trees. Disease present.
- **Modal Feature height** (excluding earth banks, see illustrations for measuring asymmetric **WLF** heights) (modal height is the average for most of the length of the feature rather than an average between the tallest and shortest part of a feature): <1m, 1-1.5m, 1.5-2m, 2-2.5, 2.5-3m, 3-4m, 4-6m, 6-15m, >15m
- **Feature width** : <1m, 1-1.5m, 1.5-2m, 2-2.5, 2.5-3m, 3-4m, 4-5m, 5-10m, >10m
- **Vertical Gappiness** % gappiness: none, <10%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%
- **Are there gaps >5m:** Yes, No
- **Distance of adjacent managed or ploughed land from midline of the WLF:** Not Applicable, <2m, 2-4m, 4-6m, 6-12m , 12-20m
- **Are there trees that take their natural shape?** : Yes (forming a separate layer above a shrubby WLF), Yes (but there is no separate shrubby layer), No. Note that natural shape means devoid of any apparent trimming or pruning anywhere from the base to the crown.
- **Are trees and shrubs?**- Uniform in height, Different heights. If the trees and shrubs form two or more obvious strata then they are of 'different heights'. If all intermixed and variable but forming a single mixed canopy then answer 'uniform in height'.
- **Height of base of canopy** : <0.5m, 0.5-1m, 1-2m, >2m
- **Width perennial vegetation** : <1m, >1m, Not Applicable. This question refers to the width of any herbaceous strip of vegetation next to the WLF. Hence, if it is just an adjacent grassland then it would probably be >2m. If next to cultivated ground it may well be less.
- **If trees present are the tree or shrub canopies touching?** : Not at all, Partially, Mostly, Completely, Not applicable. This question refers to the extent to which the tree layer is gappy or whether it is continuous; either as a largely uninterrupted tree canopy or tree and shrub canopy.
- **Are there any signs of historic management? (e.g. layered base, old coppice stools, slanting main stems with large vertical branches.** Yes, No. Historic management really refers to impacts that happened >10 years ago. However this will difficult to determine with certainty so apply your best judgement.

5.9.4 D Plot: Invasive Species Presence/Cover

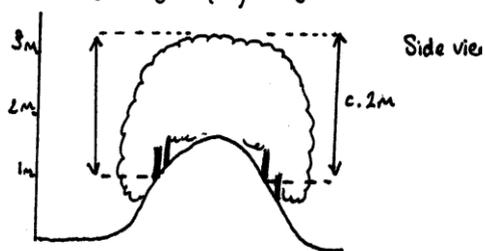
- *Leylandii*: <10% , >10%
- *Fallopia japonica*: <10% , >10%
- *Crocsmia aurea* hybrid (Montbretia): <10% , >10%
- *Fallopia sachalinensis*: <10% , >10%
- *Fallopia x bohemica*: <10% , >10%
- *Fallopia baldschunica*: <10% , >10%
- *Heracleum mantegazzianum*: <10% , >10%
- *Impatiens glandulifera*: 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

LISTED SPECIES

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

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

A Average height (2m) Hedgerow on bank



A Average height (2m) Front view



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

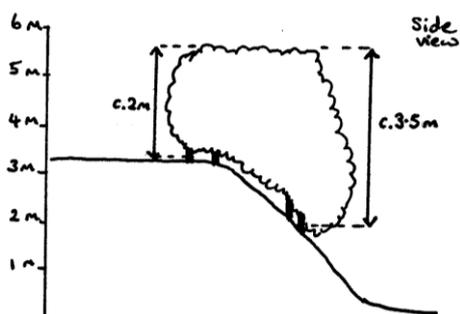


Figure 5.9.4.1. Illustrations to help in the assessment of modal height (referred to here as average) in different circumstances N.B Modal differs from average as described above (i.e. it is NOT the heights of different features added together and then divided by the number of features).

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

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

- S plot** The two Streamside plots are projected to the nearest watercourses to the two X plot locations that are farthest apart in the 1km square. This gives two random samples of the watercourses in the square.
- W plots** Three further Waterside plots are used to sample additional watercourses. Two plots are located in a stratified random fashion to sample types of watercourse not sampled by the S plots. One Waterside plot is then placed at the centre of the RHS sampling stretch.

From 2015 all S and W plots will be available for allocation to watercourse in S,W & P option as determined first by examining the option layer to calculate required lengths in or out of option. The number of plots required to sample in-option watercourse is then decided using the Plot Calculator. These plots will be located along in-option watercourse following exactly the same approach as used for D and B plots. Assign the S plots first by determining whether any of them land in-option when projected from the X plots. If none do then determine whether there are enough W plots available to meet the required total number of streamside plots for in-option watercourse. For example if three out of five S/W plots are needed to sample in-option watercourse then three W plots can be randomly placed in option if the two S plots do not fall in option. However, if you have an RHS section and it is out of option then to meet the requirement for three plots to sample in-option and two out-of-option one of the S plots will need to be uncoupled from its X plot and randomly placed in-option. Hence one X plot will end up not having an S plot associated with it.

Note that in squares with an RHS section, one W and one P plot are automatically allocated to the centre of the section as in previous surveys. If this happens to coincide with watercourse in option then fine, use the plot as one of the required in-option streamside plots. Note that if you have <10% but >0% of the total length of watercourse in-option the Plot Calculator will by default assign one watercourse plot to sample the in-option linear.

5.10.1 Locating S/W plots

Use the Plot Calculator to determine how many waterside plots are to be allocated to in-option or out-of-option watercourse. Then proceed as follows:

5.10.1.1 S plots

The two linear S plots should be located on watercourses such that they are as close as possible to the two X plots (200m²) which are furthest apart. They must then be marked on

the map provided. Once reached, the 10m plot is laid out to the left and the 1m width extends landwards from the point where it appears that water reaches when the watercourse is full. Only permanent water courses should be included; ditches may be included if they appear to be normally wet. If the S plots end up sampling in-option watercourse then count them as contributing to the required in-option total.

5.10.1.2 W plots

If there is an RHS section in the square then it will be sampled by one of the W plots. The remaining two W plots should be placed at random to sample types of water course not already sampled by the S plots with the number of in and out of option plots determined by the Plot Calculator and whether any of the S plots landed in-option. When placing in-option plots do not additionally stratify by watercourse types. It is simpler just to place plots at random along the entire length of in-option watercourse. To randomly place plots see the method described on page 29. Where plots lie on the same feature they should not be put within 10m of each other. Try to avoid over-sampling the same kind of watercourse, only doing so when some plots are in and some out-of-option. Where the nearest feature is ineligible (because it is not wide enough, or is confused by the presence of a different type of linear feature within its width) then a new location should be chosen at the nearest permissible position.

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

5.10.2 Laying out S/W plots

S and W plots are each 10 x 1 m. The waterside edge of the plot should be along what appears to be the normal highest point that water reaches (i.e. excepting flood situations). So if the watercourse is not in flood then the 1m width should extend upslope from the water surface. In dry grip drains the lower edge of the plot should run along the base of the drain. **Pay particular attention to the position of the plot in relation to the waters edge when drawing the sketch map and taking photos. A shift up or down the bank of only 10cm or so could appreciably change the chances of recording species where these occupy narrow zones.** The most important thing is that your GPS point, sketch map and photos allow the plot to be positioned in exactly the same place when visited again in 4 years time.

5.10.3 Recording S/W plots

HEADER

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

LISTED SPECIES

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

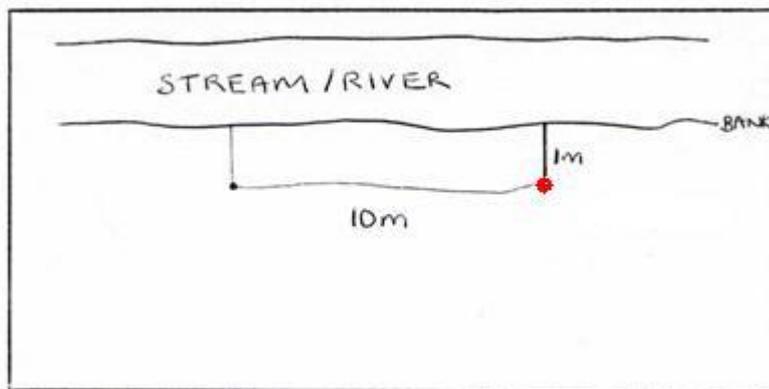


Figure 5.10.3.1. Laying out a streamside plot. The red dot marks the corner where the differential GPS reading should be made.

5.11 P Plots –Perpendicular Plots (P1-5)

A wide range of Glastir measures are designed to impact habitat diversity, structure and species composition along watercourses. P plots are designed to detect impacts resulting from the creation of buffer zones and other kinds of managed change that might take place up the bank and into the riparian buffer zone and adjacent habitats. P plots are aligned perpendicular to, and centred on, each S and W plot to form a T shape (Figure 5.11.1). Because they extend upslope they are likely to traverse different kinds of vegetation type and be internally very varied in their species composition. For example a single P plot could record wetland herbs associated with the downslope end of the plot, through a scrub or woodland strip and then traverse a path, multiple boundary features and into an arable crop (Figure 5.11.1). These plots are therefore likely to be relatively species rich.

Do NOT place and record a P plot where it would cross a road on non-agricultural land. This is because such land will not be subject to Glastir intervention and so is of no interest to GMEP. Placing a plot across a road will also put surveyors and road-users at serious risk. A P plot could be placed if for example a track alongside the edge of a field was traversed by the plot but if in doubt about the agricultural status of the land then do not put in a P plot.

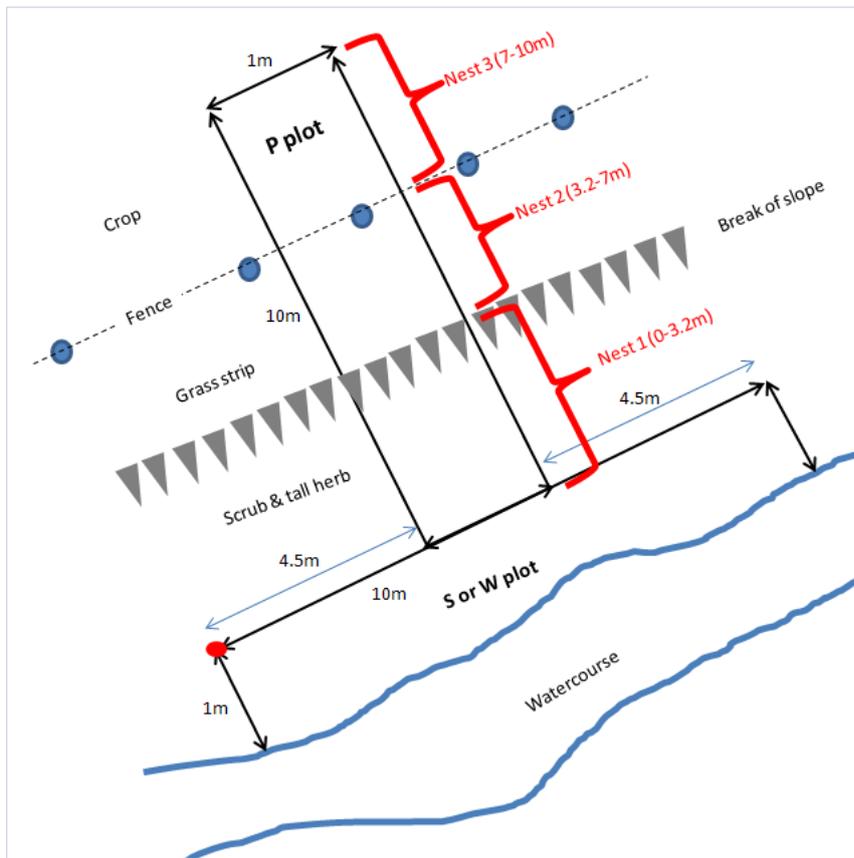


Figure 5.11.1: Layout of P plot. The red blob shows the location of the differential GPS point for the S or W plot. The nest lengths here are an example only. In reality the number of nests and their sizes will vary at the surveyor's discretion up to a total of 6 nests i.e. from 0 to 5 as for the X plots.

5.11.1 Locating a P plot

There are a maximum of 5 P plots per square. They will be projected from the centre of each S and W plot. Each P plot will run directly upslope taking the shortest route toward the break of slope from the channel edge. This should mean that the direction upslope is approximately perpendicular to the direction of the S or W plot. A compass bearing showing the direction upslope from the water's edge must be carefully taken and recorded on each sketch map. Particular care needs to be taken in recording the position of the P plot at its upslope limit. This is because any error in the angle at the bottom of the slope will translate into a larger shift in the plot position at the top of the slope. If possible add distances to upslope features to help locate the upslope end of the P plot. Note that the P plot starts 1m up from the edge of the water course so that it does not overlap the middle of its associated S or W plot (Figure 5.11.1).

5.11.2 Laying out P plots

First, draft a plot location sketch map and take photographs marking the position of these on the sketch map. P plots should then be recorded in the same way as an S or W plot. However, the plot should be subdivided into a number of nests at the surveyor's discretion and species recorded next to their nest number. The nesting is designed to help the surveyor with recording and to provide potentially useful information on the number of distinct vegetation

types sampled within each P plot. In Fig 5.11.1 the P plot is divided into three nests that coincide with three vegetation zones. The surveyor should decide how many nests to divide the plot into. A maximum of six nests is possible, numbered from 0 to 5. **The critical job is to measure the length of each nest, number each nest and mark these clearly on the sketch map (see Figure 5.11.1).** Having done this each species is recorded starting at the bottom of the slope. Species are recorded against their nest number but once recorded a species is not recorded again even if it occurs in another nest. **So as you move upslope record species only once.** Once all species have been recorded as present in the plot then estimate total %cover values for each. Do not try and record cover values for each nest. The main aim is to effectively census the whole P plot. It is hoped that nesting will make for a more efficient search pattern just as it does in the X plots. The size and number of nests can also be turned into a diversity index indicating how the buffer strip changes in its habitat structure over time in parallel with its species composition.

P plots and the RHS reach

One of the W plots should be positioned at the centre of the RHS stream reach at the point where water is sampled. A P plot should also be coupled with this W plot.

***** IMPORTANT NOTE *****

The RHS survey and other in-stream recording will be not be carried out by the GMEP survey teams this year but will be done separately. It is therefore critical that the location of the RHS reach and the central section coinciding with the W and P plot is communicated by the GMEP team to the CEH team doing the river work.

HEADER

- There are no headers specific to P plots.

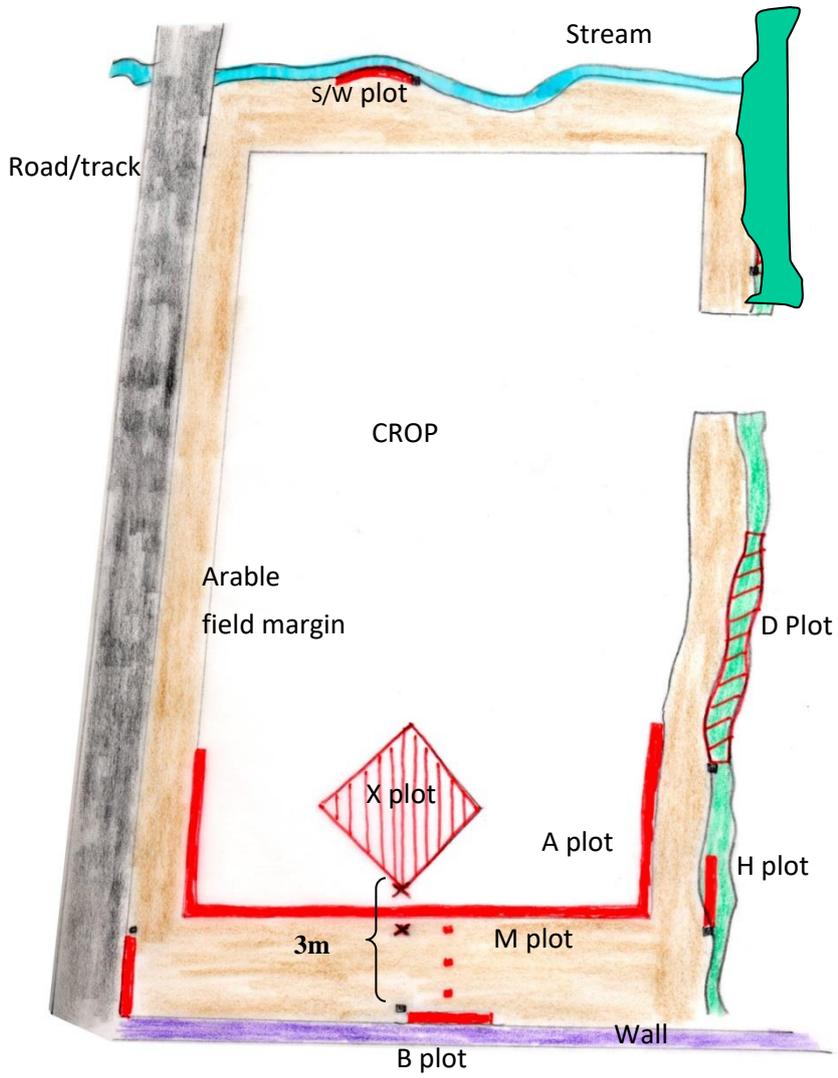
LISTED SPECIES

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

6 Other Information

The layout of plots in an arable field is summarised in **Figure 6.1**. This figure demonstrates how the different plots relate to one another.

Figure 6.1. The relationship between different plots in an arable field. *What are the deliberate mistakes in this diagram and what is missing?*



7 Guidelines on Species Identification

7.1 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!

7.2 Bryophytes and Lichens

Only the bryophytes and lichens listed in section 7.2.1 (mosses only) and on the Vegplots tab 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

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/Fat
S. magellanicum

Red/Thin
S. subnitens
S. capillifolium
S. russowii (red form)
S. warnstorffii

7.2.1 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 chrysocoma</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 sp.</i>	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>Warnstorffia 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

8 Additional Note.

Updates and edits to the Vegplots software in light of surveyors' comments in 2013 and '14. Unfortunately still no changes have been made in advance of the 2016 survey.

Issue identified from 2013 survey	Notes and actions	Status
Hide GPS streaming option.	That is easy for the surveyors themselves to turn on and off. Training will be provided.	Complete
Drop down menus unresponsive with pen, and cause problems with autosave.	Pen issue not software. New pens will help. Motion tablets seem fine.	
D-plots guidance in training and manual.		Handbook updated.
P-plots require validation before saving.		Not completed
A-plots always have validation error - is it because no cover value in final box?	Training issue: Update VegPlots Manual to clarify what is required in cover boxes. Also flag up that plot won't validate.	Handbook updated.
BRC error e.g. Hypnum. Locks out database - see Jo's original notes.	Investigated and sorted the missing species issue. Upon testing error did not re-occur, but we need to be watchful of this issue.	Complete
Add feature to delete GPS stamps e.g. Moved plot.	Insufficient time to investigate, though surveyors can do this manually. Possibility to cover during training.	
Add feature to label GPS stamps	Insufficient time to investigate	
Snapping to GPS stamp to move Veg Plot location.	Snapping toolbar added to ArcMap -training to be provided on this.	Complete
Widen app screen size to include all tabs.	Screen has been widened to include all tabs	Complete
More appropriate species list for tick boxes - missing commonly recorded species which are then selected from the drop downs.	Afraid it's the same list as last year. We will change this but not for 2014.	No changes made.
For species tick boxes, use sub-tables for mosses, bryophytes etc.	Insufficient time to investigate	
Have list of all bryophytes we want them to record on tab?		List included as in handbook.

Button to sort final sp list by alphabetical order to check.	Investigation showed that this would take more time than available.	
Calculate total % cover by major group (e.g. grass).	Investigation showed that this would take more time than available.	
Y plots are missing priority/glastir habitats data entry.		No changes made.
Issues with species spuriously appearing in the list/disappearing/boxes ticking themselves etc	Issue sorted with the same issue as <i>Hypnum</i> listed above. Again, care needs to be taken with this.	Complete

9 Additional Note 1 – GPS log file setup

GPS Log file setup

When the VegPlots ArcMap document is opened for the first time the GPS log file needs to be set. The Log Setup dialog box (Figure 9.1) appears each time the ArcMap document is opened.

First time opening

- Log Setup dialog click **Open...** (Figure 9.1 highlighted in green)
- Select Log navigate to C:\CEH\- Select **VEG_PLOTS_GPS_2007**
- Click **Add**
- Log Setup dialog click **OK**

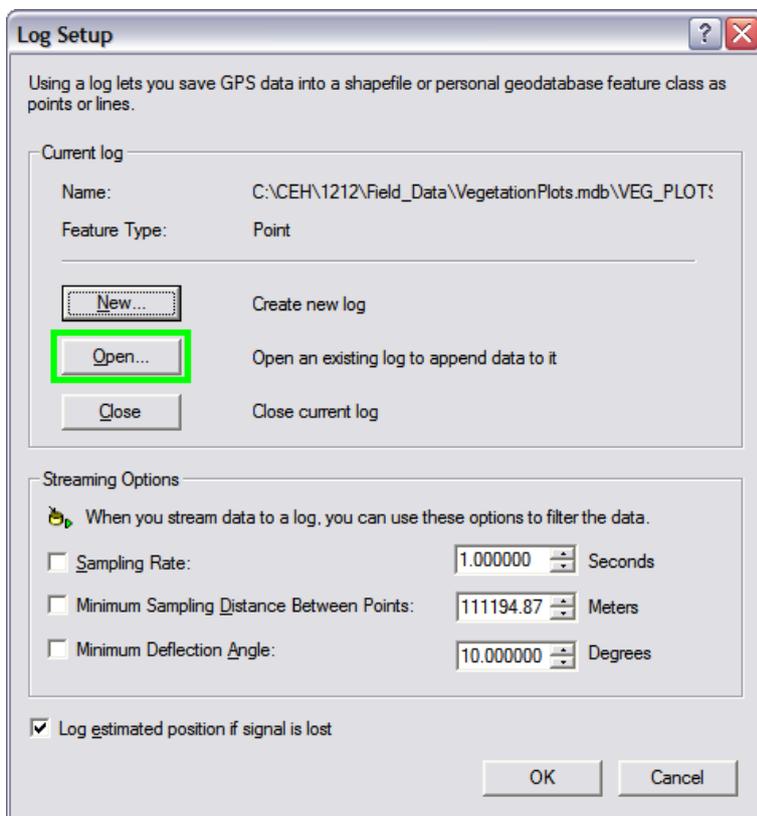


Figure 9.1 Log Setup

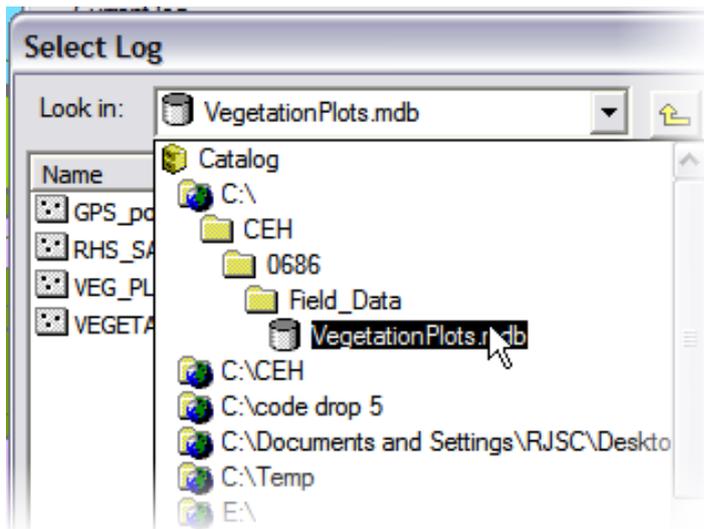


Figure 9.2 Select Log

Subsequent opening

When the ArcMap Veplots document is opened again the log file will be correct. In **Figure 9.1** the Current log - Name: will be set to the square you are working on. When you move to a new square, don't forget to check the log is correct.

- Log Setup click **OK**

GPS Troubleshooting (also see Technical Manual)

You may encounter problems with your tablet GPS, both internal and external (Trimble). Here are a few things to try if your GPS stops working.

- Firstly, always try to reconnect by going to GPS – GPS Connection setup – Detect GPS port' and 'Test connection'



- Turn it off and on again with these buttons
- Save everything and restart your tablet

On the Getac:

- Go to Start – Programs – Virtual GPS
- Start the GPS, on the 'data' view you should see moving lines of code. Try again to reconnect in ArcMap.

On the Motion:

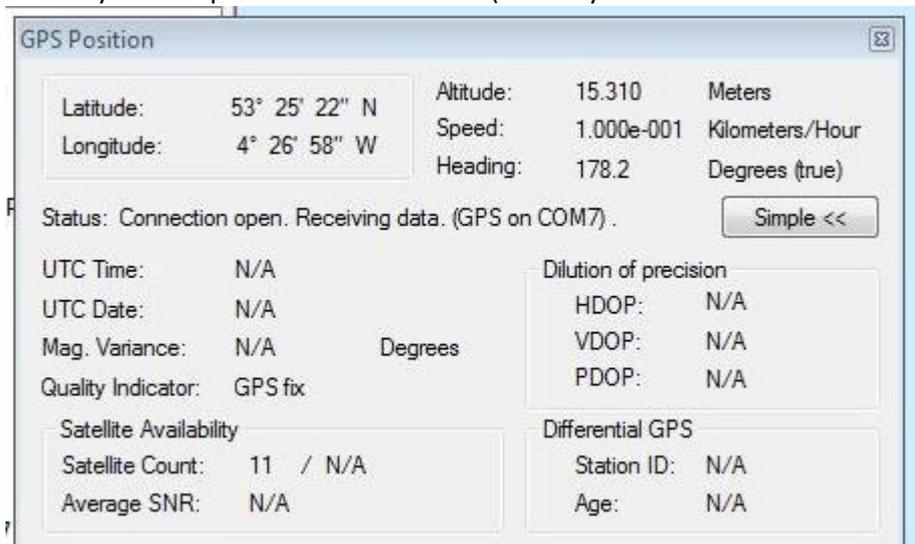
You will find the GPS on the Motion responds more slowly than on the Getac. It is always worth

waiting for 10-20 minutes if the GPS appears not to be working when starting up.

How to distinguish between the Internal GPS and the External Trimble in Vegplots/ArcMap

When you are stamping your plot, you will need to know whether your tablet is using the *Trimble* or the internal GPS device. 3 ways you can tell if the *Trimble* is working are:

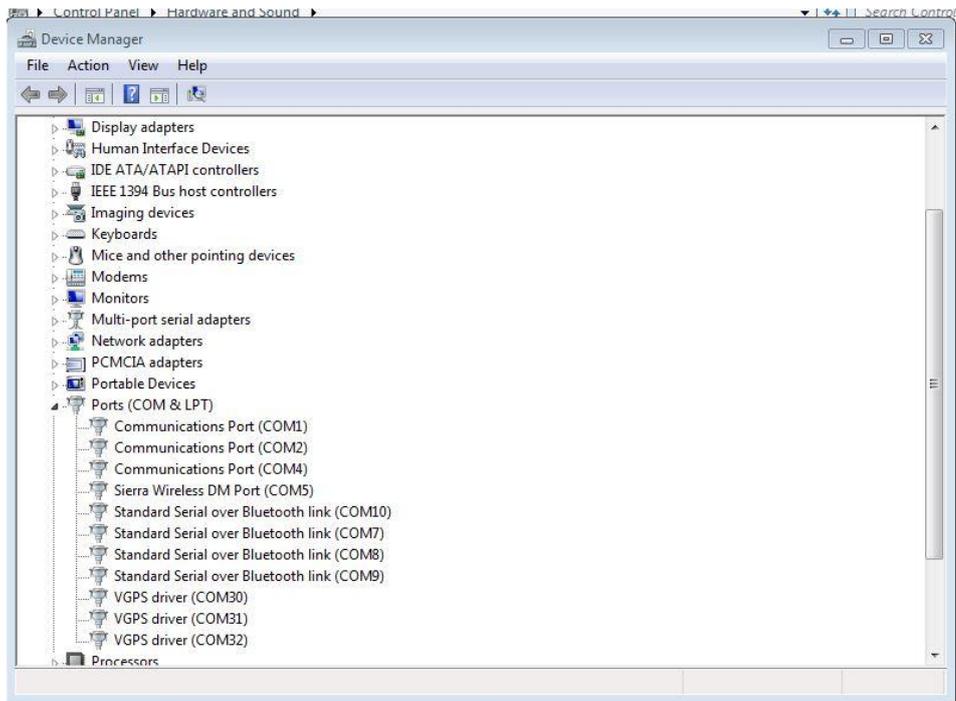
- The GPS location point on your map will be very stable and still when connected to the Trimble. The internal GPS will tend to bounce around the map considerably.
- The internal GPS tends to be found on COM Port 30 when you detect the port. The *Trimble* will appear on a different port*.
- In the GPS - GPS Position option in ArcMap (GPS Toolbar), in the advanced view, the internal GPS will display values in the bottom half of the window, whereas the Trimble will show N/A for many of the options as shown below (ensure you are in the advanced view).



You have **GPS Controller** on the desktop for use with the Trimble. Connecting to the GPS (GNSS) is not possible in combination with the GPS in ArcMap.

It is recommended that you test the *Trimble* in ArcMap first and if all is well (as described above) do not use the 'GPS Controller' as it tends to disrupt the Trimble connection in Arcmap (particularly on the Getac) and makes it difficult to reconnect in Vegplots. It can be checked to see how many satellites are in use and the accuracy of the Trimble GPS. If things aren't working, you may have to check the settings in the GPS Controller as described in the Technical Manual.

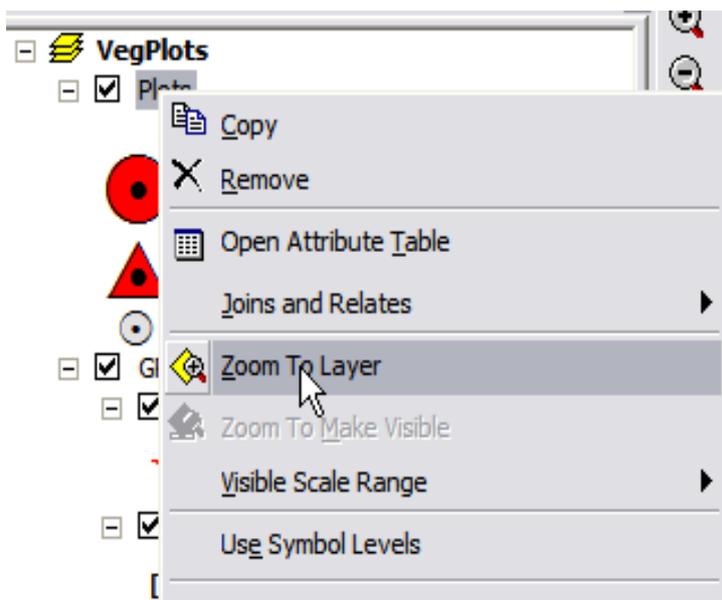
** You can check which ports your GPS is using by going to the tablet Start Menu, Select Control Panel, Click on Hardware and Sound, then 'Device Manager' in Devices and Printers. The Trimble appears as Standard Serial over Bluetooth link (usually 4 entries, ArcMap usually detects the lowest of the port numbers).*



Centre map on square

When the VegPlots ArcMap document for a square is first opened the map will not be centred on the square.

To centre the map on the square right-click **Plots** in the Table of Contents (**Error! Reference source not found.**) and click **Zoom To Layer**. Save the document and next time it is opened the map will be centred on the square.

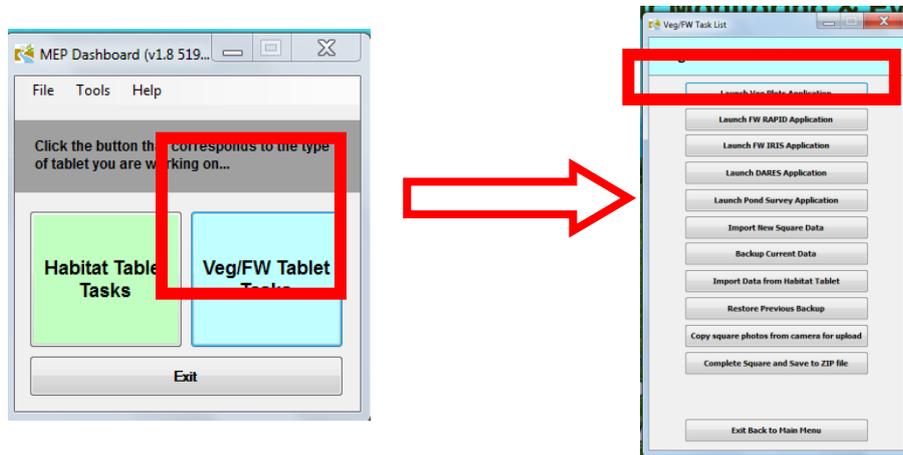


10 Additional Note 2 – Startup notes for Vegplots

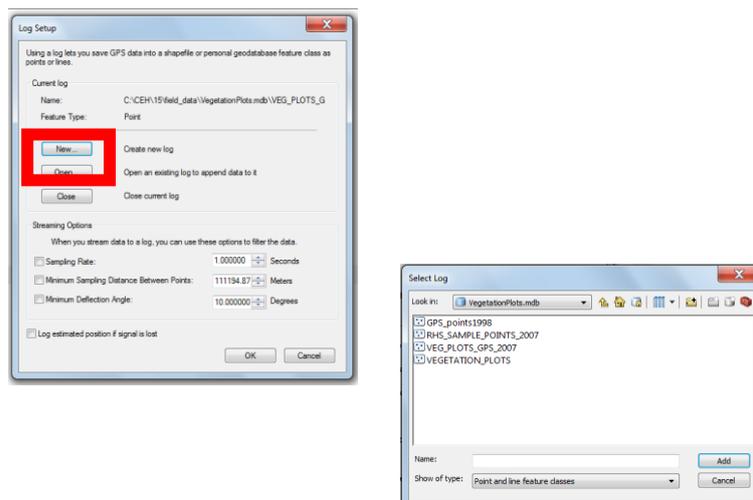
Vegetation plots

To set up for vegetation plots:

1. From the dashboard, click Veg/FW Tablet Tasks, then click Launch Veg Plots Application

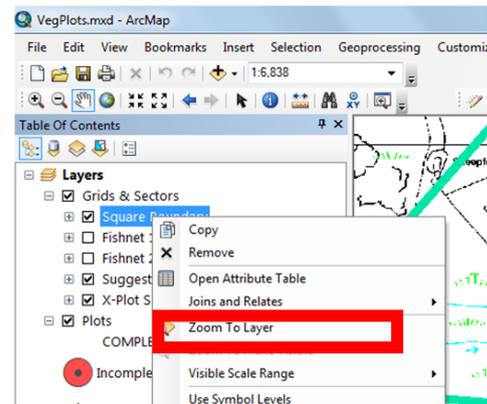


2. Ensure you select the relevant square from the list and click OK, then ArcMap will launch.



3. A GPS Connection window will appear. Click 'Open' and set the file to CEH_PLOTS_GPS_2007. **ENSURE YOU CHOOSE THE CORRECT SQUARE.** The file path should be C:\CEH**Sq no**\field_data\Vegation_plots.mdb **CEH_PLOTS_GPS_2007**

4. If your map appears blank, right click on the layer name **'Square Boundary'** as illustrated and click **'Zoom to Layer'**



11 Additional Note 3 - Landscape Photographs; field survey methodology

PURPOSE

- To support the work to be undertaken in WP4 (Landscape) on quantifying the landscape quality of the Glastir sites.
- To provide repeatable, fixed-point photographs to monitor landscape change over time.
- To provide an objective photographic record of the 1km field survey sites, capturing the typical rather than just the prettiest view. The landscape analysis will attempt to quantify aspects of enclosure / openness / variety / texture as well as determining what can be seen from public rights of way. These landscape photographs will be an important tool in undertaking this work and will help to validate some of the spatial analysis methods being undertaken.

METHOD

1. In 2014 the method has changed to speed things up. Photographs will be taken from the four X plot locations nearest to the centre point of each quadrant. These have been preselected and are indicated on the ArcMap layer. The only situation in which you may have to manually select a landscape photo location is if the predetermined X plot falls in a location where it has to be repositioned such as the sea or in land with no access permission (see page 20).
2. Standing at the southern corner post, place each plastic marker at a cardinal bearing so that it is clearly visible in the foreground of each photograph. The coloured markers should be placed as follows; North=Blue, East=Red, South = Yellow, West=White. This step is critical since it is the only way of identifying the direction that the camera was pointing.
3. Standing at the southern post of the X plot use a compass to orientate yourself due North. **To avoid cluttering the north facing photo with X plot paraphernalia make sure you take the photos before setting out the plot.**
4. Using a digital camera, on automatic settings, with the horizon (if there is one) situated approximately $\frac{2}{3}$ from the bottom of the photograph take the first photograph NORTH. Try to hold at a height which captures the view in front of you. This will be approximately between shoulder and eye height on most adults. Sometimes, due to the location, your horizon may be very short (blocked by a building, vegetation etc.) Default to eye height if in doubt. Check the photograph is in focus and is representative of your view. If not, delete and re-shoot. Please photograph what you see, do not be tempted to move around to find a better view as this will make repeating the photography difficult in future years.
5. Turn through 90 degrees clockwise to face due EAST, check your direction with a compass. Repeat the photograph.
6. Turn through 90 degrees clockwise to face due SOUTH, check your direction with a compass. Repeat the photograph
7. Finish by turning through 90 degrees clockwise to face due WEST, check your direction with a compass. Repeat the photograph.
8. Check the focus and quality of your photographs at each stage.
9. If the camera has the option of taking a panorama photograph, then a 360degree panorama from each of the four quadrant centres should also be attempted.

10. Repeat 2-8 for each of the 4 X plot locations.

FIELD PRACTICALITIES

Aim to take the photographs in as clear and bright conditions as possible; surveyors are advised to check the weather forecast for the whole survey period to ascertain which of the four days of the survey may deliver the best weather for landscape photography. If conditions are poor (thick fog / poor visibility) then please make a note in a text document to explain why photographs are missing (see Read.me file above).

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



South East quadrant



12 Additional note 4: Allocating plots to Glastir land

ESSENTIAL STEPS AND ADVICE

1. Look at the option layer on the tablet. Only options that are present in the square need to be assigned to plots. For all other options and plot types there is no need to apportion plots but please use the Plot Calculator to enter the % of plot-able land in the square. This will tell you whether you need do fewer than the possible maximum number of plots per square.
2. Use the Plot Calculator to work out how many plots of each type you need in and out of option. Follow the questions carefully and let it do the work.
3. To work out where and how to place plots please read the handbook sections pertaining to each plot type.
4. **If in any doubt give Simon Smart a ring on XX. If no answer then leave a message and I'll get back to you as soon as I can.**

The main objective of Gmep is to be able to say what effect the Glastir scheme has had on Welsh habitats and landscape over time. This means being able to quantify ecological change linked to the impact of specific Glastir options. In years 1 and 2 there was no targeting by option uptake primarily because the scheme was new. However, inspection of year 1 and 2 survey data has shown that the sampling of 1km squares and of vegetation plots within squares needs to be optimised to target linear features and areas of habitat subject to Glastir management.

Fortunately, most Glastir options target particular groups of habitats and linear features, which in turn coincide with different types of vegetation plots. Glastir options have therefore been assigned to six option groups defined by habitat, linear feature type and hence by plot type (Fig 1). These groups have been mapped for each 1km square reflecting their uptake and these layers will be available on each tablet

The allocation of plots to the different option groups needs to be carried out by surveyors. Allocation of plots to options defined by areas of habitat requires that the 1km square has been mapped. This is because estimates are needed of the percentage of the square that is covered by unenclosed and enclosed habitats. Enclosed habitats comprise conifer and broadleaved woodland, arable, improved and neutral grasslands. Allocation of plots to linear feature options can be done by estimating lengths of different types of linear feature using OS Mastermap and the aerial photograph. Having estimated a) the total length of each linear option group, b) the length in option, c) the % area in the square of each areal habitat group and d) the % in option, you enter these data into the Plot Calculator spreadsheet (Fig 2) to get

the number of plots of each type to be targeted onto option land. This spreadsheet will be available on each tablet.

Using the Plot Calculator

When filling in the Plot Calculator focus just on one option group at a time. I suggest doing this for half hour in the evening after the square has been mapped.

Having completed the map of the square answer the questions in the left-hand column and fill in the data in the pink boxes on the right. The first job is to estimate the % of plot-able land in the square and insert the number into the Plot Calculator. The total numbers of plots are reduced in proportion to the area of the square that is eligible for plots.

Be careful to note that the % area estimates required for unenclosed (U plot) and enclosed (Y plot) groups are always a % of the entire square including the refused access, sea and inaccessible land. This avoids taking percentages of percentages and means that **you always estimate in relation to the total area of the square.**

The linear option groups require an estimate of the total length of each type of linear feature and then the length of each feature in option. Work out both lengths using the measurement tool or a marked slip of paper. This really need not be terribly accurate. Just do it quick with minimum fuss. Lengths of linear features (watercourses, WLF and all boundaries combined) can be estimated from OS Mastermap and the aerial photo. These estimates will be less certain than mapped information on the ground but will be good enough for deriving workable estimates of the proportions of linear feature in option in each square. However, any uncertain linear features could be quickly checked on the ground and the data entered into the Plot Calculator updated quickly if need be.

When estimating quantities for the Plot Calculator only include lengths of linear features and areas of habitat within areas for which you have permission to survey. **Note that in coastal areas this DOES include maritime habitats since these are generally accessible and do not require permissions.** Also include linear features around the edge if accessible from land with permission but exclude linear features around curtilage.

If the Plot Calculator tells you there are plots to allocate to option land then follow the guidance below for each option group referring also to the rules for each type of plot in section 5 above.

Definitions and guidance for plot types

Plot-able land:

All land except dangerous, inaccessible, refused ownership, sea, urban and any other land that you cannot or should not put plots in. Estimate this as a total % of the square.

Unenclosed (U plot) options:

An example would be “41a Grazing management of Open Country”.

These options target the unenclosed habitats listed on page 27. Remember that the default is to allocate one U plot to each unenclosed habitat. The simplest approach is therefore to count up the number of unenclosed habitats and see if that number exceeds or equals the total in the Plot Calculator. If so then all you have to do is to randomly allocate a U plot to each habitat but favouring in-option land (see page 26).

If the number of plots in the Plot Calculator exceeds the number needed to sample each unenclosed habitat once, then you proceed to allocate the extra plots to the unenclosed habitats within option land and then to the unenclosed habitats out of option. Within each of these strata assign plots in proportion to the area of each unenclosed habitat following the U plot rules starting on page 24.

If you find an enclosed habitat area (improved, woodland, neutral, arable) in an area covered by an unenclosed option then allocate that area to the % of enclosed habitat in the square. This scenario is likely to arise where large areas of upland were placed under an option such as grazed open country. The important point here is that the plots are linked to options and habitat types. Thus even if an unenclosed option is present, if it is an enclosed habitat type it must be sampled by a Y plot and not a U plot. The exception is where you decide to map a mosaic that consists for example of Neutral and Acid Grassland. Using a mosaic implies it is impossible to define polygons of each. In this case if the area is under an Unenclosed option then treat the mosaic as eligible for U plots.

Enclosed (Y plot) options:

Examples would be “100 Woodland Stock Exclusion”, “15 Grazed pasture – no inputs”, “33 Wildlife Cover crop on Improved Land”.

The biggest change in 2015 is in the way Y plots are allocated. From now on Y plots are targeted on what we have defined as 'enclosed habitat' land as well as any Priority Habitats not sampled by the other plots. Enclosed habitats are defined as all plot-able areas of habitat that are not on the unenclosed list. So these are **broadleaved and conifer woodland, arable, improved and neutral grassland**. Many Glastir options target these habitat types so they are important to represent in the sample. After this try to sample all priority habitats.

To work out how many Y plots are needed in these enclosed habitats, in or out of option, answer the questions in the left column of the Plot Calculator and fill in the pink boxes with % area estimates. **Note that if any X plots fall into enclosed land this reduces the number of Y plots needed.** So take care to answer questions A1 and A2 else you'll end up doing more Y plots than you need to. Since you can do the five X plots without any mapping having been done you'll have this piece of information to hand very quickly and can enter it into the Plot Calculator.

Having worked out how many Y plots are allocated to enclosed habitats you return to the default rule that used to be the primary criterion in years 1 or 2 and allocate one additional Y plot to each Priority Habitat not already sampled by a U or X plot.

If you find an area of unenclosed habitat included in an area covered by an enclosed option then allocate that area to the % of unenclosed habitat in the square. This could happen for example, if the Glastir officer determined that a swathe of hillside was all neutral grassland but you mapped some as acid grassland or fen.

H & D options:

An example would be, "6 Double-fence gappy hedges – 3m width".

In some instances you may arrive at your random location for a D plot in-option to find no WLF present. This is only likely to happen where the option is to allow woodland to develop out onto adjacent field corners or onto improved land. These situations are identifiable because there will be no hedge just a woodland adjacent to a field. In these cases record an extra B plot or a Y plot on the edge of the woodland or scrub instead of the D plot.

The two H plots, whether in or out of option, will need to coincide with two of the D plots unless the WLF is of an unnatural shape. See page 33 for instructions.

S, W & P plot options:

Examples include "8a Management of existing streamside corridor" and "559 Grip blocking".

If there is a headwater stream in the square then one W and P will be allocated to the RHS section whether in option or not, leaving 4 plots to proportionally allocate. The Plot Calculator is set up to assume you have no RHS section. If you do then just deduct one plot from the in-option total if the centre of the RHS reach is in option or, if not, then deduct one plot from the out of option total. See page 38 for further instructions.

A & M plot options:

Examples include “226 fixed rough grass margins on arable land” and “32 Unsprayed root crops on Improved land”.

Only 1 A plot per field is allowed so if the Plot Calculator says you have 4 A plots in-option but there are only two arable fields in-option you only do 2 A plots. Also, a range of A & M plot options will appear as areas rather than linears. This reflects options that result in a change in the way the whole field is managed rather than just the margins. In these situations the same areas will also feature in the Y plot option layer and so should be included in the total for % ‘enclosed’ habitat in the square and therefore are eligible for Y plots. In many cases the change from grassland to cultivation may not yet have happened and so an A plot cannot be placed. However if there is a cultivated margin present then place an A plot randomly along the field margin. The result is that an arable field could end up with a random Y plot, because it is ‘enclosed habitat’ in-option and an A plot because it has a cultivated margin and is in A & M plot option.

Irrespective of the total number of A plots allocated to A&M option land, only place 1 A plot per in-option field and if there is no cultivated strip you cannot place a plot. Any remaining A plots that apply to out-of-option land should be linked to X plots that fall randomly into arable fields and located following the methods on page 30.

B plot options:

Examples include “40, Fence around stock-excluded Woodland” and “3, Wildlife corridor-Wooded strip”.

The B plot options include all those linear feature options that do not obviously target watercourses, hedges and WLF or cultivated field margins.

Numbers of plots in and out of option can be calculated for the following plot types without having to map the square:

B, S, W, P, H, D.

Note that mapping may be required to check on linears whose interpretation from Mastermap and the aerial photo is uncertain. Also, mapping of the different kinds of watercourse and WLF in the square is necessary to enable consideration of whether the numbers of D or W plots could be reduced to avoid over-sampling the same kinds of feature.

All X plots can be recorded without having to map the square. The W plot associated with the RHS section can also be recorded along with its linked P plot.

*******IMPORTANT NOTE*******

We have only had one season to fully test this change in protocol. You are likely to encounter issues with this new approach so use common sense and your experience and make sensible tactical decisions. Also phone the Helpdesk or Simon Smart on XXX to discuss problems.

Fig 1: Option groups

MAP REMOVED: SENSITIVE DATA

Fig 2: Plot calculator

AFTER MAPPING THE SQUARE ANSWER THESE QUESTIONS:

Any enclosed option land? YES. **Fill in A.1 to 4.**
 NO. Sample Priority Habitats with Y plots as usual.

Any unenclosed option land. YES. **Fill in B.1 and B.2.**
 NO. Sample unenclosed habitats with U plots as usual.

Any H_D options present? YES. **Fill in C.1 and C.2.**
 NO. Sample D and H plots as usual.

Any S_W_P options present? YES. **Fill in D.1 and D.2.**
 NO. Sample S and W plots as usual.

Any B options present? YES. **Fill in E.1 and E.2.**
 NO. Sample B plots as usual.

Any A_M options present? YES. **Fill in F.1 and F.2.**
 NO. Sample A plots as usual.

FILL IN THE PINK BOXES TO GET NUMBERS OF REQUIRED PLOTS

Number of X plots falling in enclosed land?

A.1	X	- in -option?	2.000
A.2	X	- out-of-option?	2.000
B.1	U	Total % of sqr that is unenclosed habitat?	50.000
B.2	U	Total % of sqr; unenclosed in-option ?	50.000
A.3	Y	Total % of sqr that is enclosed habitat?	50.000
A.4	Y	Total % of sqr; enclosed in-option ?	15.000
C.1	D	Total length of WLF in square (m)	1000.000
C.2	D	- in option (m)	300.000
D.1	S & W	Total length of watercourse in square (m)	1000.000
D.2	S & W	- in option (m)	1.000
E.1	B	Total length of all linear features in square (m)	1000.000
E.2	B	- in option (m)	1.000
F.1	A	Total length of arable margin in square (m)	1000.000
F.2	A	- in option (m)	1.000

Total % of plot-able land in sqr **100**

PLOTS TO BE ALLOCATED

				Max plots per square	Total plots per square given plotable area
OUT-OF-OPTION	0	U		10	10
IN-OPTION	5	U			
OUT-OF-OPTION	0	Y		5+	5
IN-OPTION	0	Y			
OUT OPTION	7	D		10	10
IN-OPTION	3	D			
OUT OPTION	4	S&W		5	5
IN-OPTION	1	S&W			
OUT OPTION	4	B		5	5
IN-OPTION	1	B			
OUT OPTION	4	A		5	5
IN-OPTION	1	A			

13 Additional Note 5 – Methods to be applied in Countryside Survey Squares

13.1 Finding vegetation plot locations from the previous surveys

A summary plot location map showing the distribution of all vegetation plots within the 1km is provided on the tablet. This will resemble the ArcMap layer for a finished GMEP square because that is precisely what it represents. However what you will see are the locations of all the plots that the surveyors placed and recorded in 2007 when the last Countryside Survey took place. The precise locations of individual plots are then found using individual plot sketch maps (in most cases, one per plot, in others one map for 2 or more associated plots; an X and a B for example) and plot photos. Again you'll be familiar with these items because you will have been spending time in GMEP squares preparing the ground for the repeat survey by taking photos and drafting plot location maps.

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 32 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. U plots on open moorland), then the plot should be located as well as possible using the sketch map and photograph or put in a new plot if surveyors are not confident that the plot will be a valid repeat.

13.2 Filling in Vegplots headers

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, the same uncertainty over the location of a Y plot could result in the plot being in a very different habitat type than that originally targeted – Y plots target uncommon, often small patches of vegetation. This might lead you to recommend that the data cannot be reliably analysed as if it were a repeat recording of the vegetation in the same position as last time. The decision is left to the surveyor as they are in the best position to decide. Basically if you feel the plot can be considered to be in the same location as previous then select ‘Found’ from Plot Recorded.

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 an Arable margin (A) plots should not be recorded in non-arable fields whilst 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.

- **Plot Recorded** [Found, Not Found, New Plot (Replacement for unfound plot), New Plot (New feature/Land cover), Not appropriate, Access Denied, Too Dangerous]
- **Plate detected?** [– Yes, No, ‘No (new plate buried)’, No plate to find (this may refer to upland plots where metal plates were considered inappropriate plot markers)]
- **Plot ID of unfound plot** [– Rep ID of plot that has been replaced when plot not found. – list of all plots in square]
- **Plot Map drawn?** [MAP]– Yes, No, Edited, Redrawn.

13.3 Updating existing plot maps

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 surveyors considers a map to be inadequate (e.g. missing an essential feature) or where something has changed in the landscape since the previous map was drawn they may want to edit or redraw the map they have been provided with. If this is the case it should be indicated in the Vegplots software by answering Edited or Redrawn. 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.

Always use the Trimble to record a GPS position for the CS plot. This will be a valuable to aid to refinding the plot in the next survey. Having successfully refound a plot using sketch map and photos you may often find that is in a different position to that indicated by the point on the ArcMap layer. This is because GPS was not used to stamp the plot in the last CS and so the plot point is an approximation. To make the plot point more accurate please snap the plot point symbol to the newly recorded GPS location.

13.4 Finding previous plot locations

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 visiting the square in 2016 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 in 2016 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.

X plots

Metal plates for X plots were placed at the south-most corner of the plot (or in the field boundary). Check the plot map and photographs provided.

Y plots

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

U plots

U plots were often marked with either a metal plate or a wooden stake immediately adjacent to the south corner of the plot but just outside (15cm) the plot boundary. The pilot survey in CS2006 revealed that U plots were particularly difficult to relocate. A degree of judgement is needed. If for example, the vegetation being sampled is reasonably homogenous bog or upland heath then a greater amount of 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 then the plot may be considered as a valid replicate. In cases like this it is not worth spending much more than 10 minutes searching for the specific plot location. In all cases check plot map and photos provided for any further detailed info.

B plots

The marker plate for the 200m² plot may have been positioned at the boundary nearest to the plot and should be lying on one of the cardinal points of the compass, as measured from the centre of the X plot. The metal plate should be to the right of the plot when viewed from the field, and located 1m away from any vertical feature such as the base of a wall or fence.

A plots

The plots are not marked with metal plates or photographed due to their relationship with B plots. Thus the B plot photos may prove helpful. **N.B.** It is possible that the position of the A plot may be different from that in 1998 because of the adoption of agri-environment scheme margin options. This would result in a change in the distance to the start of cultivated land from the boundary. In such a case the A plot would need to be recorded as a new plot.

H plots

Each plot should have been marked with a metal plate at the right hand end of the plot when you are facing it from the field. Check the plot map and photographs provided. **If a fence has been installed since the plot was recorded last then repeat the plot in its original position. This means that the long axis of the plot follows the centre of the hedge and projects into adjacent land by 1m rather than following the base of the new fence.**

D plots

Except for plots co-located with H plots which are marked as for H plots, D plots were marked at the centre point along the 30 m length. The plate was buried 50 cms out from the centre line of the **WLF**. Please check plot map.

S and W plots

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

R and V plots

R/V plots were marked with a plate at the right end of the plot when you are facing the plot from within an adjacent field, for example from the direction of the X plots from which R1 and R2 were projected. Use the plot sketch map and photographs provided.

R/V plots are not included in GMEP because they generally do not sample agricultural land subject to Glastir intervention. These plots will therefore be unfamiliar to surveyors and so the description from the last Countryside Survey Handbook is copied below for information. Note that you should NOT have to position a new R/V plot because you will always be trying to repeat those recorded previously.

#####

From the CS2007 Handbook...

“Roadside plot” is a convenient name given to those linear plots which lie alongside transport routes (mainly roads and tracks). The R and V prefixes refer to the different origins of the plots:

R plots two Roadside plots were established in 256 1 km squares in 1978, using a random allocation procedure (and were re-recorded in 1990 and 1998)

V plots three additional Verge plots were placed in the 256 1 km squares in 1990 and were re-recorded in 1988 to increase representation of other transport types

Locating new R/V plots

R plots

The two linear R plots should be located on roadsides such that they are as close as possible to the two X plots (200m²) which are furthest apart (see Figure 10). They must then be marked on the map provided. On reaching the nearest linear feature, from the 200m² (X) plot, the 10m plot is laid out to the left and the 1m width extends from the road edge, away from the carriageway. Where the nearest feature is ineligible (because it is not wide enough, or is confused by the presence of a different type of linear within its width) then a new location should be chosen at the nearest permissible position. If it is necessary to move the plot to the other side of the road (because the first verge is not wide enough) it should be made clear which side of the road is recorded on the sketch map. (In such cases, the plate is still on the right hand side of the plot when viewed from the X plot).

V plots

The plots should be located in the centre of that part of the verge type which lies within the square. Where plots lie on the same feature they should not be put within 10m of each other. Verge plots should not be located where the verge is less than 1m wide; instead the nearest verge with a 1 metre width should be located.

Finding previous R/V plot locations

R/V plots were marked with a plate at the right end of the plot when you are facing it from the field. Use the plot sketch map and photographs provided.

Laying out R/V plots

R and V plots are each 10 x 1 m.. The roadside edge of the plot should start at the interface between soil and tarmac, not where overhanging vegetation starts.

Recording R/V plots

HEADER

- **Road type:** A Road, B Road, Single Track Tarmac, Unmade Road
- 2nd nest no longer required

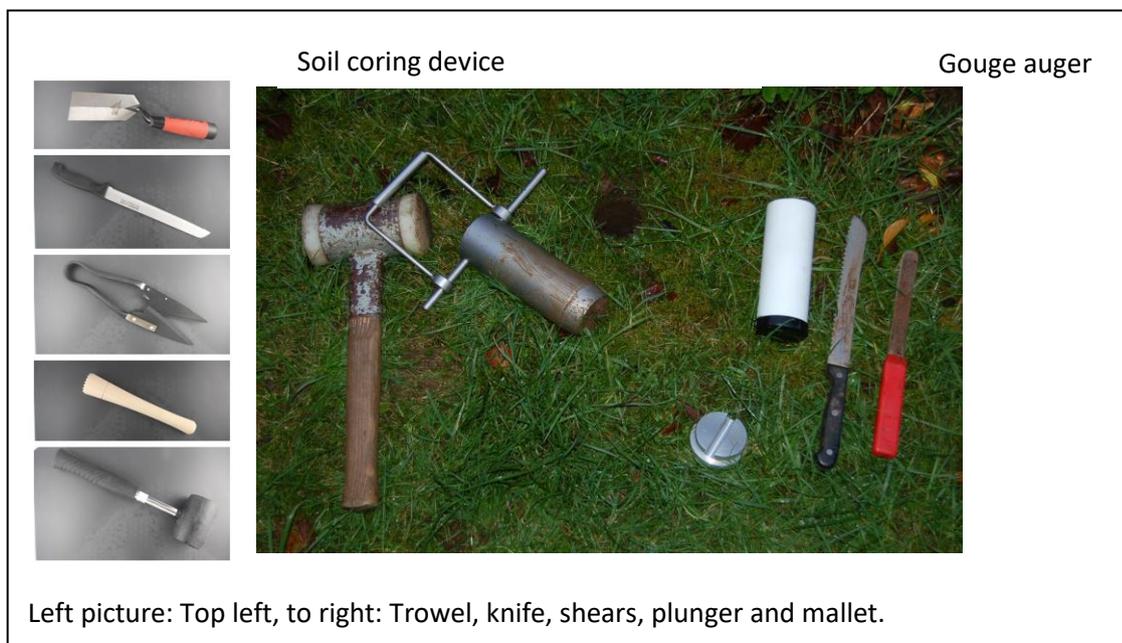
#####

14 Soil Sampling Procedure

14.1 Equipment

Electric Cold Box: which *should* be kept cool by charging whenever the vehicle is being driven (connected to the vehicle lighter socket).

Tool pack in small rucksack: Containing:



Additional items, ruler, gouge auger, spanners, spatula, pliers, cool-box for vehicle

1 pack for the appropriate square containing:

5 X-plot packs with cores (5 black long; 5 long white, and 5 short white), end caps, drilled tin with screw lid & labelled bags

Stamped & addressed mailbags for 5 X-plots and a Lancaster Envelope for the 5 small white cores

14.1.1 Soil plastic core samples

The cores will be taken approximately 15 cm out from the SOUTH corner (2014) of the centre (2m) quadrat in each X-plot of every square. Sampling procedures for each core are detailed below. If there are problems taking any of the soil samples or a specific comment needs to be made regarding the sampling then a note must be placed in the envelope (e.g. "large tree roots - 1st soil core taken 1 m E of centre quadrat"). If there is unusual vegetation, cow pat, boulder etc move minimum distance to get more homogenous sensible location and record problem on a note. Teams smaller this year, 3 people x 4 teams, so can't split up?

(2013, South; 2014, South; 2015, South, 2016, South)

LAYOUT FOR **X** PLOTS IN GMEP SQUARES IN WOODLAND AND FOR ALL **REPEAT X** PLOTS IN COUNTRYSIDE SURVEY SQUARES

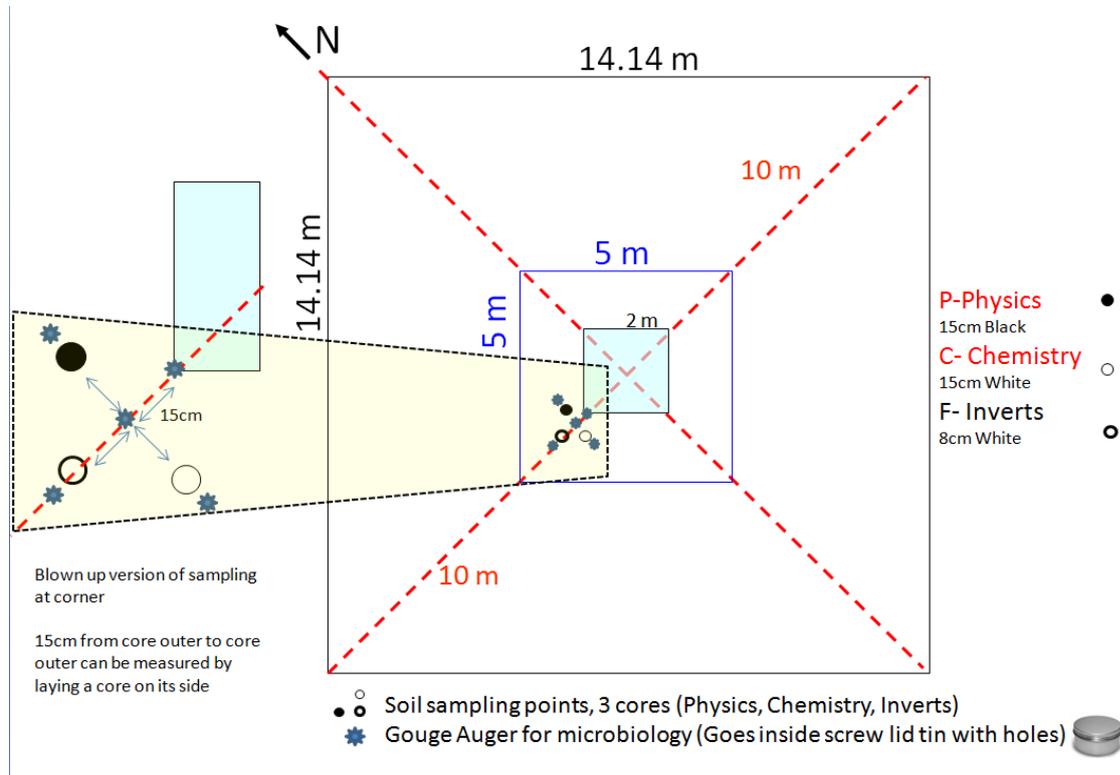


Figure 14.2.1. The X plot soil sampling layout is shown above: **Note the difference between X plots in new GMEP squares and X plots in woodlands in new GMEP squares and wher X plots are being repeated in Countryside Survey squares.**

Take the appropriate labelled plot bag for this X-plot from the clear plastic bag for the square. Each plot bag has 3 plastic cores and 1 screw lid tin.

14.2.2 Plastic Soil Cores and Auger Samples in Tin

- Core C (Chemistry): LONG BLACK 15cm long x 5cm dia.
- Core P (Physical): LONG WHITE 15cm long x 5cm dia.
- ✿ Tin B (Biology): SCREW LID TIN WITH HOLES 90mm diameter x 45 mm (composite sample of 5 Gouge auger samples from 0-15cm)
- Core F (Fauna): SHORT WHITE 8cm long x 4cm dia.
This core is 15 cm further away from the centre of the X-plot than all the other cores.
(USEFUL TIP: use one of the long cores for distance as they are 15 cm long, distance between black and white core centres is 40cm).

Lay the cores on the ground 15 cm out from the South corner of the plot. Long Black core on left, long white core on the right. The 5 Gouge auger samples that were placed in the grey core in 2013 are now placed in the screw lid tin with holes:

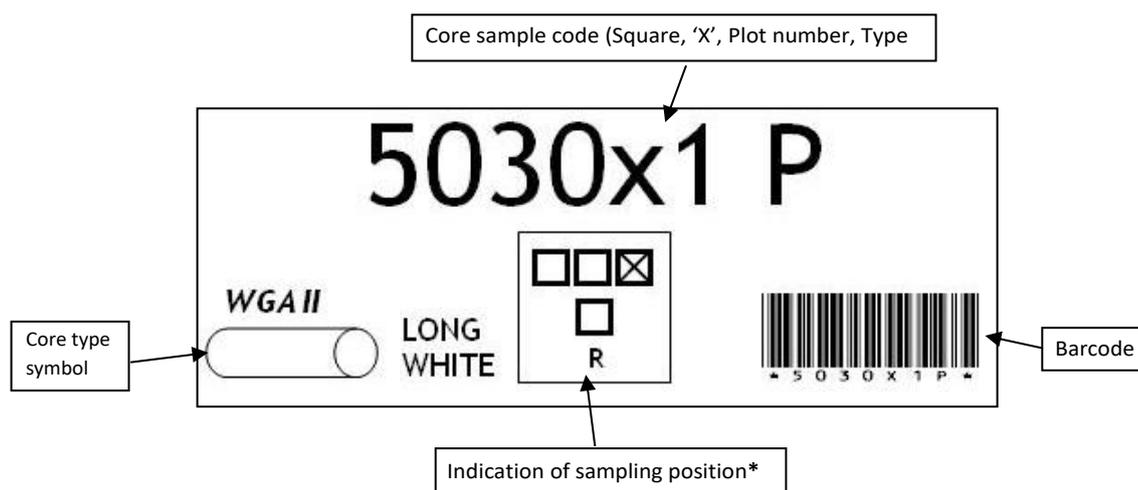


Figure 14.2.2 Format of bag label

14.2.2.1 Step 1 long White, Black and short White Plastic Core Sampling

Clear the surface of vegetation and fresh plant material

In the forest this means loose leaves or fresh pine needles, it does not include the fermented needles/leaves (these are included in the sample).

In a peat soil, the top is regarded as the point the sphagnum changes to brown, no green material.

Mineral soils

- Ensure the coring device is clean.
- Insert first core in coring device, hold it upright with the bevelled end on the soil surface while you cut round the bottom edge with the knife; cut vertically down into the soil through any roots and push in a little to prevent bouncing when hammered. Use the plastic mallet to drive the corer into the soil until the horizontal cross bar is flush on the soil surface, the soil should rise in the core accordingly.
- If there is not enough depth of soil, move the sampling points slightly and start again. Record if a full sample was not taken because soil was too shallow.
- **If the core only went in 10cm due to rock, measure the depth of the hole and write in pencil on the bag label. This allows us to differentiate between compressed soil and thin soil.**
- Use the handle and pull the core to one side to break the soil at the bottom, pull the coring device out. If difficult to remove, use the handle of the mallet through the core handle and a block resting the mallet head on and use the mallet handle as a level to lever the core out. If the soil is very sandy and likely to fall out, use the trowel to dig underneath and hold the sample in.
- Push the core out of the coring device, cap the top with a **RED** cap as it comes out. **(Roger red hat, top)**
- Slide the remaining core out with the soil end in the air, trim the soil and fit the **BLACK** cap on the bottom.

Sampling for long white and long black cores:



1
Long white / black core
Remove green plant material



2
Use knife to cut roots
around core



3
Place plastic core in coring device



4
Knock coring device into soil



5
Knock coring device in until
cross bar is flat on surface



6
Remove from soil, extract core,
cap, red at top, black at bottom,
bag

Organic soil and Fauna core

- **For organic soils clear the surface of vegetation and fresh plant material. For the Fauna core leave the litter but remove fresh plant material.**
- The coring device may not work in organic or fibrous soil. In these circumstances (with an organic layer extending more than 15cm) place the plastic core directly on the soil surface while you cut round the bottom edge with the knife; cut vertically down into the soil through any roots.
- Push plastic core firmly into the ground, continue to use the knife to cut ahead of the core, and push the core into the cut until the soil has come to the top of the core; you can use mallet to knock the core in.
- Cut under the core with the trowel, use pliers to twist the plastic core free from the soil if necessary, being careful not to lose soil from either end of the plastic core (especially in dry/sandy soils). The trowel can be used to dig the plastic core out or to stop soil falling from the bottom. If soil falls out, put it back in.
- Carefully scrape/remove any lumps of soil from the exterior of the plastic core
- If needed, cut the bottom end of the core sample until it is level with the end of the plastic core

When each sample is obtained, ensure the caps cover the sample, **RED** on top, **BLACK** on the bottom.

Carefully seal the sample in its bag and return to the plastic bag with the label on.

Taking a small white fauna core:



1 Small white core



2 Cut around the core into the soil with the knife



3 Place plastic block on core to knock into soil



4 Carefully knock in core



5 Use pliers to pull the core out of the soil, loose with trowel if needed before using pliers



6 Cap the core, red on top

14.2.2.2 Step 2 Tin sample (Biology) collected with Gouge Auger

Collect 5 gouge auger samples from the locations shown in Figure 1.

Make sure that the Gouge auger is clean.

Insert the gouge auger to 20 cm if possible, twist the auger round several times, pull back and pull out of the ground at an angle.

Measure 15cm from the top of the sample (keeping grass out) and cut at this point.

Remove any excess soil from the bottom.

Use the spatula to lever out the 15 cm topsoil into the screw lid tin with holes. **Avoid touching the inside of the tin with hands, or the soil in the auger with your hands (use nitrile gloves, provided, if necessary). The samples will be tested for DNA and we don't want yours!**

Repeat for all 5 samples.

When all 5 samples are in the tin, screw the lid back in and place in the correct labelled envelope.

If the auger won't go 15 cm, write the length of the gouge auger sample and put the note in the envelope for posting.

14.3. Soil sample storage and dispatch

Take all 3 cores and tin back to the vehicle and store in cool box:

If anyone is travelling back to Bangor that week they could bring the samples back in the coolbox rather than post. Place in the walk in cold room downstairs, in marked "GMEP" green boxes on floor.

14.3.1 Posted to Bangor (Long black, Long white and tin sample in plot envelope)

Core C (Chemistry): LONG BLACK

Store this core in its sample bag in the plastic box. Keep as cool as possible and not in direct sunlight, fridge in house until mailed.

Core P (PHYSICS): LONG WHITE

Store this core in its sample bag in the plastic box. Keep as cool as possible and not in direct sunlight, keep in fridge in house until mailed (if no room in fridge place in a box).

Core B (BIOLOGY): SCREW LID TIN

Store this core in its sample bag with the bag open so it can breathe. Store in the vehicle cool box. **MUST** be placed in fridge when return to house until mailed.

14.3.2 Posted to Lancaster (5 small white cores for square)

Core F (FAUNA): SHORT WHITE

Store this core in its sample bag in the cool box; **MUST** be refrigerated in the house until mailed. Mail as soon as all 5 fauna cores from the square have been taken. Do not mail on a Thursday or Friday evening.

Mail preparation in the house for BANGOR

Place the core description sheet in the envelope with any details about the depth of cores, or notes about the site; seal and staple for mailing.

Xplot Envelope (Bangor): there will be 5 Xplot envelopes for a square, each containing the screw lid tin and the 2 long plastic cores (black and white).

Fauna envelope LANCASTER: will have the 5 cores for the square

POSTING:

Post samples as soon as possible on a Monday, Tuesday or Wednesday. Do not post on Thursday or Friday, or over the weekend, instead refrigerate the cores until Monday. Take to the nearest post office.

Instructions from post office which explains why we wrap the samples:

- A leak-proof primary receptacle (Plastic core or tin)
- A leak proof secondary receptacle (Sealed plastic bag), and
- An outer packaging of adequate strength for its capacity, mass and intended use, and with at least one surface measuring 100mm x 100mm. (Tyvek envelope)

- If there is any liquid (or the possibility of) then an absorbent material must be placed between the primary receptacle and the secondary receptacle so that any release or leak will not reach the outer packaging. (Use absorbent cloth)

The packaging described is that used for exempt patient specimens.

14 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