SPRING Minimum Viable Scheme Pilot: Site Survey Guidance

Version: 19th April 2022

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Guidance notes

Background information

This survey is part of the Strengthening Pollinator Recovery through INdicators and monitorinG (SPRING) project, funded by the European Commission. It forms the first pilot of an EU-wide monitoring survey of insect pollinators as part of the EU Pollinator Monitoring Scheme (EUPoMS). This pilot will inform the final design of a scheme to provide statistically robust data that will enable us to establish how pollinator populations are changing across the EU. The SPRING project is led by the Helmholtz Centre for Environmental Research (UFZ, Germany), working with 18 partners: the Université Libre de Bruxelles (Belgium), the University of Mons (Belgium), the University of Helsinki (Finland), the Finnish Museum of Natural History (LUOMOS, Finland), the Senckenberg Research Institute (Germany), the University of The Aegean (Greece), the Centre for Ecological Research (CER, Hungary), the Council for Agricultural Research and Economics - Research Centre for Agriculture and Environment (CREA-AA, Italy), the Naturalis Biodiversity Centre (Netherlands), the European Invertebrate Survey (EIS, Netherlands), , the University of Novi Sad (Serbia), the Ecological and Forestry Application Research Centre (CREAF, SPAIN), the University of Alicante (Spain), Lund University (Sweden), the UK Centre for Ecology and Hydrology (UKCEH, UK), the University of Reading (UK), Butterfly Conservation Europe (BCE), Dutch Butterfly Conservation, and Butterfly Conservation (UK). New partners will join during the course of the project.

This guide has been based on experiences from the UK Pollinator Monitoring Scheme:

Carvell, C., Isaac, N. J. B., Jitlal, M., Peyton, J., Powney, G. D., Roy, D. B., Vanbergen, A. J., O'Connor, R. S., Jones, C. M., Kunin, W. E., Breeze, T. D., Garratt, M. P. D., Potts, S. G., Harvey, M., Ansine, J., Comont, R. F., Lee, P., Edwards, M., Roberts, S. P. M., Morris, R. K. A., Musgrove, A. J., Brereton, T., Hawes, C., and Roy, H. E. (2016) Design and Testing of a National Pollinator and Pollination Monitoring Framework. Final summary report to the Department for Environment, Food and Rural Affairs (Defra), Scottish Government and Welsh Government: Project WC1101.

O'Connor R., Kunin W.E., Garratt M.P., Potts S.G., Roy H.E., Andrews C. … Carvell C. (2019) Monitoring insect pollinators and flower visitation: the effectiveness and feasibility of different survey methods. Methods in Ecology and Evolution 10, 2129-2140 https://doi.org/10.1111/2041-210X.13292

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How does the SPRING MVS survey work

The survey has been set up to test an approach to monitor the abundance of pollinating insects across a network of sites. The Minimum Viable Scheme (MVS) protocol described here comprises pan trapping and transect walks, coupled with simple habitat and flower assessments, and should ideally be conducted on repeated sampling visits to each site each year. The number and timing of visits will be different in different parts of the EU. It has been designed to be undertaken by one or two people in a single day, and aims to collect data needed to detect long-term changes in pollinating insects across the EU. The protocol has also been designed to be implemented by either professional field staff or volunteer non-experts and as such does not require a high degree of expertise in pollinator identification or survey techniques.

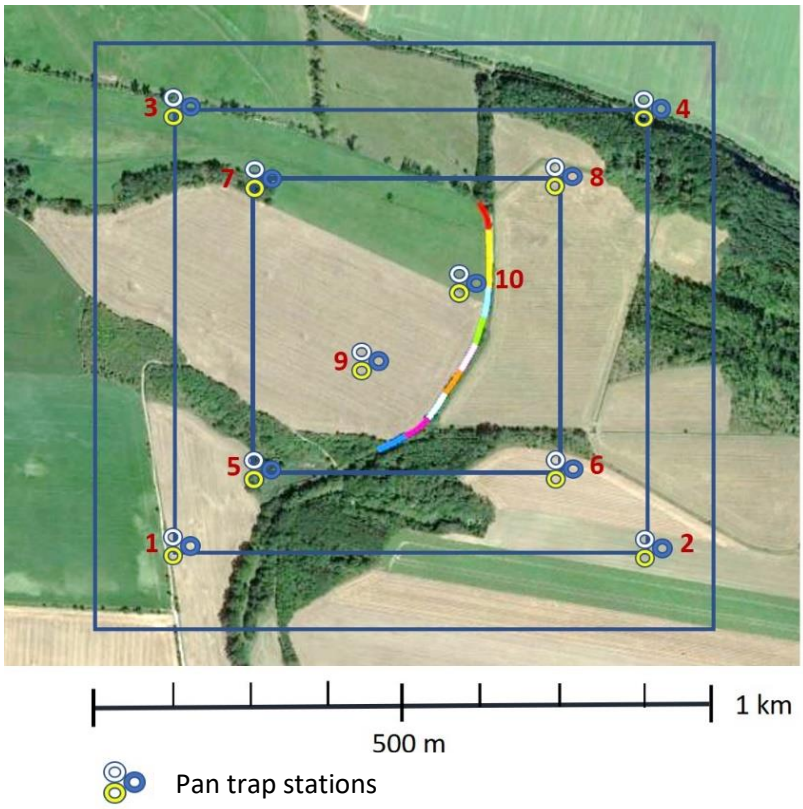
Carrying out the survey

When should I survey?

We would like you to make several visits to your survey site per year, during the summer (see further details below).

What am I being provided with?

1. **A Minimum Viable Scheme (MVS) site to survey**: you will have been allocated a 1 km square in which to do your survey. During the SPRING project, survey sites have been selected by regional teams. It is important that you continue to survey within this square following the maps and guidance provided. Please contact your regional co-ordination team if you become aware of any changes in land ownership or access potential within your square.
2. **A site map**: You may be provided with a map of your survey site showing locations of pan trap sampling stations (see example below).



3. **A kit box**: most of the equipment and consumables you need to carry out the survey are supplied by the project. An EUPoMS/SPRING team surveyor will go through everything with you on your first visit.
4. **Recording forms**: for each survey visit you will need to complete 3 recording forms (one Pan Trap recording form and two forms for transects – one for butterflies and one for the other pollinators; see Annexes A-C).
5. **A flower list:** a list of the common flower species or types that are likely to be found during surveys., incl. floral units to be counted for the EUPoMS/SPRING survey (see Annex E with a longer list of plant species and flower units).
6. **An insect guide:** this has photos and descriptions to help you distinguish between the different insect groups during a transect Count (done within Task 2.1: Manual for Pollinator categories.

Responsibilities for access to land, health and safety and biosecurity

Responsibilities for access to land, health and safety and biosecurity are different in different member states. Please follow your local guidance.

Dates and spacing of survey visits

For each year of surveys we ask you to visit the square each month during the main period of activity for pollinating insects, depending on the biogeographic region of Europe[1].

Mediterranean – March to October
Atlantic – April to September
Continental – April to September
Pannonian – April to September
Boreal – May to August
Alpine – May to August

There should be a gap of at least two weeks between survey visits to any given site. Visits should ideally be made in the first half of each month, depending on weather conditions.

What weather conditions are suitable?

Sampling visits should be planned using weather forecasts, selecting days when the weather is to be dry and warm. Pan traps can be set out for a 6-hour period between 09:00 and 17:00. Transects can be carried out during this period.

Ideal conditions are:

- a minimum temperature of 13°C if the sky is clear (less than 50% cloud)
- a minimum temperature of 15°C if the sky is cloudy (cloud cover more than 50%)
- wind speed at a maximum of 5 on the Beaufort scale

For pan trapping, the above conditions should be met at the start of the day and for at least 50% of the total 6-hour exposure time (so a slight drop in temperature during the day is acceptable). Do not abort pan traps before 6 hours unless there is very heavy rain.

For some locations in northern Europe, or early visits to any square in other parts of Europe, these minimum temperature requirements may not be reached. In such cases a minimum temperature of 11°C can be used under clear sky conditions and 13°C if cloud cover is > 50%. If you have access to a thermometer please use this to monitor and record air temperature on your site (in the shade, not full sunlight or from within your rucksack). Otherwise please use the air temperature measure from the dashboard of your car.

Timings for a typical SPRING MVS survey day

An example of timings and suggested order of activities for a single survey visit (but these can be varied as long as the traps are operational for 6 hours and the transects are completed in suitable conditions). This example is based on a main survey period between 10am and 4pm (the time period may be longer in warmer parts of Europe):

09:00 arrive on site (having notified landowners at least 1 day in advance), sort kit, walk to first pan trap station
9:30–11:30 set out pan traps across diagonals of the square
11:30-13:00 count flowers and classify habitats surrounding pan traps (or do this while setting out traps)
13:00–13:30 lunch break
13:30- 16:00 - conduct transect walks
15:30–17:30 collect pan traps across diagonals after 6 hrs in same order as set out

[1] Biogeographic regions of Europe - Wikipedia

17:30 return to vehicle, keep samples cool and prepare for postage (submitting your data to the EUPoMS website later)

If you have additional time during the day on site, it would be a good opportunity to submit any additional species sightings to Observation International, or conduct some Flower-Insect Timed Counts (see step 5 below). This extra information will help researchers to understand the status of pollinating insects.

Equipment – what is in my kit box and what do I need to take with me?

Your kit box should containing everything needed to complete sampling visits.

For setting out pan traps and other survey activities your kit box contains:

- 10 pre-drilled wooden stakes (up to 90 cm high, with holes every 10cm)
- 10 wire holders for pan traps (with bolt and wing nut)
- 30 pan traps (12oz plastic bowls), 10 x UV blue, 10 x yellow and 10 x white
- Small container with non-scented washing up liquid (eg. Ecover zero)
- 10 Pan trap information signs
- Site maps (two per square)
- MVS survey Guidance notes, including guidance for pan traps and transects
- Recording forms

For collecting and returning pan trap samples your kit box contains:

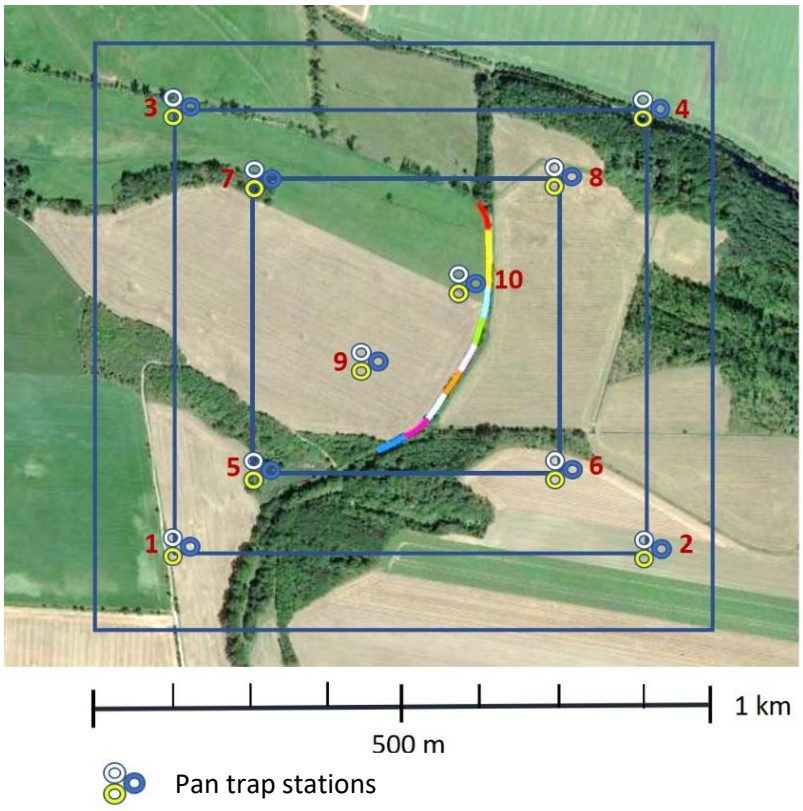
- Tea strainer (small sieve)
- 40-100 sample tubes (100ml plastic, use 10 per visit, number of visits varies per region)
- 40-100 fleece/muslin (17g/m2) squares cut to fit the tea strainer (approx. 15x15 cm, use 10 per visit)
- 10 zip lock plastic bags for sample tubes
- 2-4 x 1L bottle filled with 70% Ethanol (assume 1L enough for 3 sampling visits, to be kept secure)
- 1 x 300ml bottle for taking Ethanol on each visit
- 4-10 cardboard boxes for posting samples back after each visit
- 4-10 Freepost stickers for posting samples

In addition you will need:

- Mallet (rubber or wooden, for securing stakes) and/or a hammer to fix the stakes
- A pack of tent pegs (for securing the wire holders to the ground in short vegetation)
- Drawing pins (to attach signs to pan trap stakes)
- Bottle with 3 - 4 litres water
- A funnel if you require this for decanting Ethanol into 300ml bottles (at home)
- A 1m tape measure for floral assessments and a 2 m piece of string
- Pencils (soft or darker pencils are recommended as easier to photocopy or scan if needed)

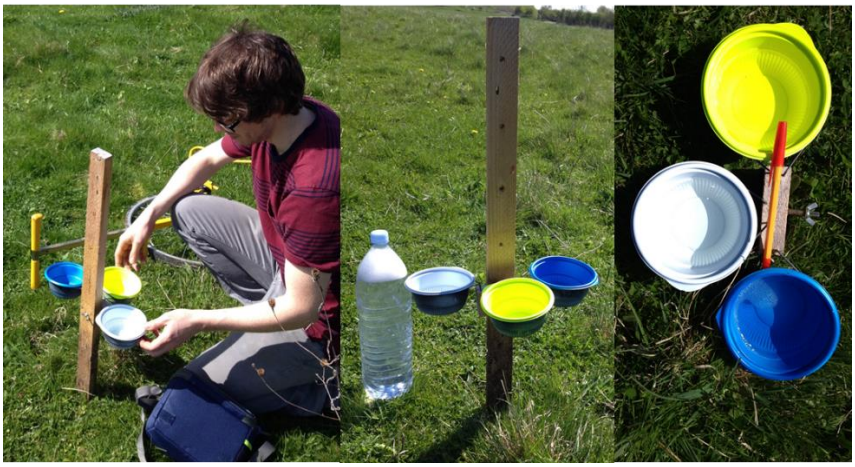
Survey Step 1: Setting out pan traps

Place out your pan traps in a cross arrangement across the ~1km site, starting at Trap station 1 at bottom-left corner of the square (or 6, 7 or 10 - top right, bottom right or top left corner respectively, if more convenient for access). If available, use the survey square map, target notes and GPS points specified. It may also be useful to take a photo of the local area to remind you of the pan trap position. Whatever the starting trap station, make sure the traps are collected in the same order to setup.



At each pan trap station:

1. In long vegetation (> 10cm), hammer a wooden stake into the ground.
2. Attach the wire pan holder to the stake at a height even with the top of the vegetation, approximately level with the position of flowers or where flowers would be, securing it in place with the wing nut (see image below, and videos available from the EU PoMS data entry website). The pan supports must be level, and the nut secure enough that they won't move. If adjacent to a hedge or other boundary, have the pan traps facing outwards.
3. In short vegetation, pan traps can be placed directly on the ground, but still in their wire holder, and secured with a tent peg (as in picture to the right below).
4. **Avoid trampling the vegetation** surrounding the trap station, since estimates of flower abundance will need to be made within a 2 m radius.



5. Place three pan trap bowls: one white, one yellow and one blue into the pan holder.
6. Add a few drops of the washing up liquid provided to your large water bottle, briefly and gently turn the bottle a few times to ensure mixing and then fill each trap bowl up to the first line marked on the inside of the bowl (this is approx 100 ml).
7. Attach an information sign to each stake if the traps are likely to be encountered by anyone else
8. Record the time each pan trap was set out along with starting weather conditions on your recording sheet.

What if I cannot access the pan trap station at the location specified on the map?

Pan trap stations are designed to be systematically placed throughout the survey site. However, in practice, these locations are not possible due to being unsuitable (e.g. in water, artificial surfaces) or inaccessible (e.g. due to being unsafe or on private land). Any changes in pan trap location must follow the rules below, and any new locations MUST be clearly marked on your survey square map, with revised GPS co-ordinates specified on the recording form (even if you have only moved the trap by a few metres):

- Traps should be in relatively open areas and not heavily shaded (or likely to become heavily shaded during the growing season). In woodlands, traps should be positioned in clearing or at edges. Although pan-traps may be shaded for parts of the day, they should not be set under closed canopy during the time period that the traps are run (e.g. time of day and times of the year).
- Traps should be set out in places where they won't be disturbed by livestock or people. Check local requirements provided by landowners. **Do NOT place stations within enclosed livestock fields**, use the nearest suitable boundary. As they will only be out for 6 hours, open areas with low-intensity stocking (e.g. commons or upland grazing) may be safe if necessary.
- In cropped **arable fields**, use tramlines to access sampling stations and avoid crop damage. If the suggested location is too far into the crop, move to the nearest accessible point along a tramline.
- Try to avoid sampling on days when known operations are planned (e.g. spraying or harvest); if these are encountered then move to the nearest field margin and record GPS location.
- **Road verges** can be used if >2m and if safe to access from minor roads. Check whether permission is needed. Where possible use boundary features next to roads for which we have access permission from the landowner.
- **Built-up areas**, farm yards and gardens should be avoided but where accessible, areas of rough ground near to footpaths can be used within them.
- Try to maintain a minimum distance of 100 metres between any pair of trap stations at a square.

Once pan-trap locations are setup on the first sampling occasion, these **locations should remain fixed for all subsequent sampling visits to ensure we can track any changes in pollinating insects over time**. If the initial pan trap station then become inaccessible (for example, by enclosed livestock or major change in land use) then you may need to move it to a nearby location, using the same rules explained above.

Survey Step 2: Collecting the pan trap catch (after 6 hours)

Collect in your pan traps as close as possible to 6 hours from when they were set out, collecting pan traps in the same order as you set them out. Record collection time "Time in" on your recording sheet. If you notice anything unusual when picking up the trap, e.g. if the pan has been disturbed, dried out or emptied, or if you see evidence that birds have been eating the catch (e.g. bird droppings on pan or support), make a note of this on the recording form.

For each pan trap station you will need a sample tube with the following information on the label provided:

Site reference

Trap station number: 1-10 (pre-filled on the labels)

Date: (YYYY/MM/DD)

Recorder: (your surname or initials if no room)

A standard labelling system will be used across the whole MVS pilot as follows:

- Sites coded by country and a number sequence: e.g. HU_MVS1
- Pan traps to be numbered in the order set out across the squares: e.g. PT1 to PT10
- Date of sampling to be added in a standard format of YYYY-MM-DD: e.g. 2022-06-10
- A full sample label will therefore be in the format: e.g. HU_MVS1_PT1_2022-06-19

Cut or tear the pre-printed label (from a laser printer, not inkjet) from your Pan trap Recording form, complete with the above information **in pencil** to be placed inside each tube.

For each pan trap station:

1. Place a fleece/muslin square in your tea strainer and carefully pour the contents of all three pans through it, so that the water falls through and the insects are retained. A second pan can be used to collect the water for rinsing. One square will suffice for all three pans. If any insects are left sticking to the insides of any bowl, either rinse or use a finger to gently transfer them to the fleece. Fold the fleece into a loose square whilst still in the strainer, wrapping up the specimens.
2. Place the fleece/muslin square into the sample tube along with its label. Add enough ethanol to cover the specimens (50-100 ml), then seal securely.
3. Place the sample tube in the zip lock bag labelled with Site Grid ref, unique square number and sampling date. All 10 tubes should be placed in the same labelled bag from each visit.
4. Collect in the pans, pan supports and stake. Take care when stacking pan trap bowls and carrying these in your rucksack (do not stack or squash them alongside the wooden stakes) to avoid cracking the paint where possible.
5. Add weather conditions at the end of your trapping period to the recording form.
   Sun (% duration exposure): describes the % of time (of the 6 hr pan trap exposure) during which the sun is shining, so if it was sunny all day then record 100%. A rough estimate for this is fine.
   Cast shadow (% duration exposure): describes the % of the 6 hr exposure time during which a shadow was being cast over the pan traps. This means if within a woodland ride, it might have been sunny all day but the trap was in the shade cast by trees for approx. 20% of time. If the trap is out

in the open then record 0% even if the sun was behind cloud for part of the exposure time. A rough estimate for this is fine.

6. Once all your samples have been collected, place the sample tubes in a cool box for transport.

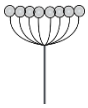
Survey Step 3: Local flower abundance and habitat type surrounding pan traps

Count the flowers present within an area of 2m radius centred on each pan trap station (see diagram). All herbaceous species in bloom should be recorded and all 'flower units' within the 2 m radius counted (i.e. do not count grasses but include all forbs regardless of their value for pollinators). **In diverse/ homogenous flower-rich grassland or flowering crops, flowers within half or a quarter of the area of the circle can be counted and these numbers multiplied up to give the total count**. Only count flowers that are reasonably fresh and that are likely to attract insects – 'dead-head' flowers and seedheads should not be counted.

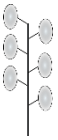
Examples of flower units include an individual flower, flower spike, umbel or flower head. See below and refer to the table in Annex E for a full list of plant species you are likely to encounter along with the flower units to use. If you really do not know the name of a plant for which you have counted flowers, you can select 'Dicotyledons' from the drop down list when you enter your data, but in this case please always take a photo to allow us to verify the species.

individual flowers (e.g. hawthorn) – each flower counts as one unit

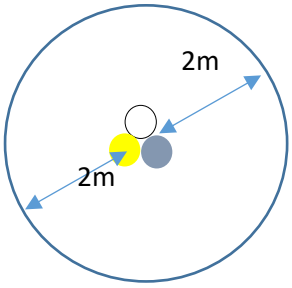
flower heads (where there are lots of tiny flowers within a larger flower head, e.g. dandelion) – each flower head counts as one unit



flower umbels (for flowers that have small flowers grouped into 'umbels', like inside-out umbrellas, e.g. hogweed) – each umbel counts as one unit



flower spikes where a number of small flowers are arranged along a stem (e.g. lavender) – each spike counts as one unit



Count all flower units within a 2 m radius of the pan trap station. Either pace out and calibrate the 2 m distance for the first few attempts, or use a 2 m piece of string pinned to the top of the pan trap stake to mark out the area.

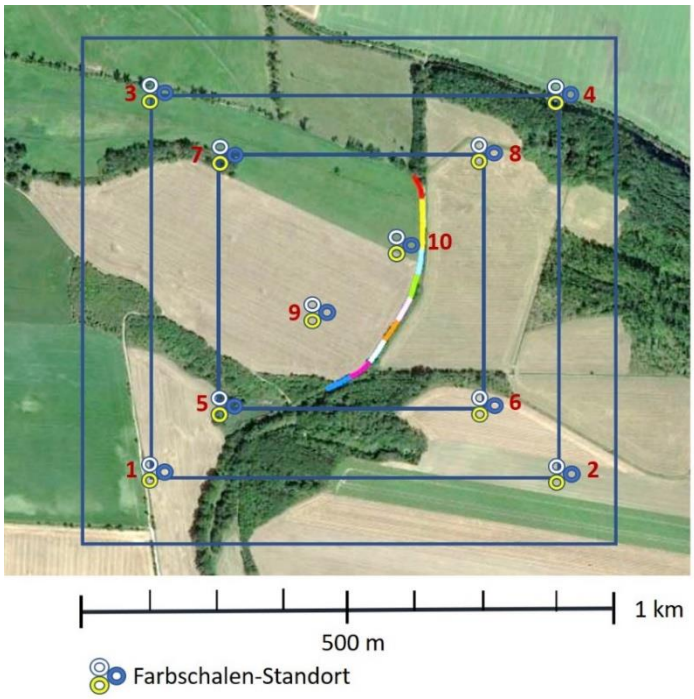
Record the average height of the vegetation within the 2 m radius.

Record the habitat type of the area within the 2 m radius of your pan trap station, using the H-code classifications provided in Annex F. If the area includes more than one habitat type (for example your pan trap station is next to a hedge, such that there is herbaceous grassy vegetation (H32) as well as hedgerow (H25) within the 2m radius), you can enter both a 'primary' and 'secondary' habitat type on the form. These categories are based on the EUNIS pan-European classifications.

Survey Step 4: Setting out and recording the Transects

Transect route setup

One transect route should be setup through the 1km square, divided into 10 sub-sections each of 50m (i.e. 500m length in total). A tape measure should be used to measure the transect length and markers can be used to distinguish each section. To provide a representative sample of the survey area, the transect line should ideally be placed diagonally through the grid square in an south-east to north-west direction. In practice, it will not be possible to arrange the line transect to match this design. It will be necessary to draw the transect route when entering data via the EUPoMS data entry website – please ensure the site map is sufficiently detailed to allow this. Alternatively, the transect route can be captured via a GIS track captured through a mobile application or via a GPS unit.



The transect should be walked twice on each survey visit. Once to give a count of numbers of individual butterfly species. The transect should be walked separately to count bee and hoverflies within groups – see below for grouping of bee and hoverfly species. The order of walking the transect (e.g. for butterflies, or bee and hoverflies) should be chosen at random on each survey visit (e.g. by tossing a coin). A minimum of 15 minutes should elapse between transect walks to account for disturbance to the insects present (e.g. transect walks will flush butterflies, bees and hoverflies from the vegetation). Recording forms for the transects can be found in Annexes A-C.

When to count

Visits should be done in good weather: sunny and warm with no rain and not too much wind. Count only when pollinating insects are active, in the central hours of the day, at least 13°C if sunny of 17°C with some cloud cover. Specific criteria are:

- Time of day: between 09:00 – 17:00 (when temperature requirements are met)
- Temperature and cloud cover: Do not record if the temperature is below 13ºC. The minimum criteria are either 13-17ºC with at least 60% sunshine, or if there is no

sunshine the temperature must be 17ºC or above. Do not record if the temperature is above 35ºC,

- Windspeed: The Beaufort scale should be no more than 5 (fresh breeze), i.e. <24mph winds. Calmer conditions are preferable.
- Transects should not be recorded in the rain.

What to count

For one transect, only butterflies should be counted. For the second transect, counts of bee and hoverfly groups should be made – see below for grouping of bee and hoverfly species.

The method varies by pollinating insect group

- For butterflies: For the first transect, count all butterfly adults present in an imaginary box of 2.5m to each side, 5m high and 5m ahead while walking at a constant, steady pace - taking 30 minutes to walk 500m. Record all individuals to species where possible, with some taxa counted as aggregates (e.g. *Pieris rapae/napi/mannii* in regions where all three species occur concurrently).

- For other pollinating insect groups: For the second transect, count all adult insects present from two target pollinator groups (bees and hoverflies). This includes flying insects and non-flying insects (e.g. on flowers or on the ground) present in an imaginary box of 1m to each side, 2m high and 2m ahead while walking at a constant, steady pace – taking 30 minutes to walk 500m.

Count to major groupings as follows:

Butterflies: total count of individuals seen;

Bees: total count of individuals seen, identified to groups as below.

Hoverflies: total count of individuals seen, identified to six groups (refer to training material for details):

Bee and hoverfly groups for transect counts

1. Bees

BEE GROUP 1: honeybees

BEE GROUP 2: bumblebees

Bumblebees subgroup A: ginger

Bumblebees subgroup B: black-red

Bumblebees subgroup C: all-dark

Bumblebees subgroup D: yellow-black-white

Bumblebees subgroup E: yellow-black-red

BEE GROUP 3: large bees (> 10 mm)

BEE GROUP 4: small bees (3-10 mm)

BEE GROUP 5: wasp bees and blood bees

2. Hoverflies

HOVERFLY GROUP 1: Large, robust hoverflies. Tribes Eristalini & Volucellini

HOVERFLY GROUP 2: distinctly bumblebee-like hoverflies

HOVERFLY GROUP 3: distinctly wasp-like hoverflies

HOVERFLY GROUP 4: hoverflies with black-and-yellow stripes or spots. Core: subfamily Syrphinae

HOVERFLY GROUP 5: other hoverflies

Optional Survey Step 5: Flower-Insect Timed Counts (FIT Counts)

Optionally if you have time during the survey day, e.g. between setting and retrieving pan traps when not walking transects of floral assessments, we would like you to conduct at least two 10-minute FIT Counts on each survey visit to an EUPoMS square. During the course of traversing the 1 km square to set out pan traps you will hopefully have spotted one or more of the flowering plants on the list provided in the EUPoMS FIT Count Target Flower list (see EUPoMS_FITCount_guidance). If you find more than one target flower use a different one for each of your timed counts. If you cannot find one of the target species then select a species in flower that is abundant within the square and receiving insect visits, providing a description (with photo) or ideally a species name. Please use the FITCount mobile application for submitting your count.

- **Download Android app** from Google Play
- **Download Apple (iPhone/iPad) app** from the App Store

Survey Step 6: Packing and posting your insect samples for identification

- As soon after your survey visit as possible, place your sealed zip lock plastic bag containing 10 sample tubes with their corresponding labels clearly marked into the double-walled cardboard box provided.
- Add a note explaining if any sample tubes are missing (e.g. due to pan traps being disturbed)

- Pad out the tubes in the box using tightly scrunched up newspaper or bubble wrap, and securely seal the box with tape.
- Use a postal service or courier that meets the relevant regulations (e.g. liquids with alcohol content up to 70% are permitted and must be securely closed and placed in a leak-proof liner, such as a sealed polythene bag; dead insects are also allowed).

Survey Step 7: Submitting your pan trap and transect survey data

To submit your data you need to register with the EUPoMS data entry website. If you have not already done so, select "log in" from the menu and then click on "Create new account". We then need to give your website account the correct role to be able to enter the 1 km square data, so please contact the EUPoMS contact email at UKCEH (eupoms@ceh.ac.uk) if this has not already been done for you.

Once you have logged on, and once we have given you the correct role, you will see the 1 km survey data entry forms under the "Add your results" menu.

Please complete one form for each pan trap station and each transect. The online form should match the field recording forms, so all you need to do is to transfer the information you wrote down in the field onto the online form. A few tips for use during data entry:

- If you are entering details for several pan-traps or transect in succession, it is good to get into the habit of locking the fields for date, recorder name etc. – locking (and unlocking) is done via the padlock symbol, which saves having to repeatedly enter data that is the same for several records in succession.
- For the first data field containing survey site name, you should be able to start typing in the first two letters of the site name, and then see a dropdown list of sites – select the one you need.
- The recorder name should get populated automatically with the name you have set up in your website account, but if you need to change it (e.g. if entering someone else's data) you can just delete your name and add the new one.
- For data fields where you have to enter a time, this has to be in 24-hour format, e.g. 16:44.
- Cloud/sun percentages, and temperatures, are set up to store whole integers, not decimals. For the wind speed we would prefer that you enter a whole number, but if you ended up recording a range then you should enter this as an average, which can include a decimal (e.g. if you recorded a wind speed of "3 to 4" you can enter 3.5).
- In most cases you will find that you can use the tab key to go from one data field to the next (but this doesn't work very well for the map – you are likely to need a mouse click to move on from the map to the next field below it)
- When entering plant species names you can start typing *either* the English name or the scientific name (genus) and a dropdown list will appear from which you can select the relevant species or genus. If you really do not know the name of a plant for which you have counted flowers, you can select 'Dicotyledons' from the drop down list but in this case please always upload a photo for us to verify the species.

Please aim to enter all your data online as soon as possible after carrying out each survey, and all data entry should be complete by the end of September at the latest, to enable your efforts to contribute to the EUPoMS analyses and reporting. Keep your recording form safe for backup if you can.

Can I record any individual insect species that I recognise?

We do not need you to record particular insect species for transect or from your pan traps. If you have identified any insects to species level at any time during the survey, then we would encourage you record these, either by adding them to the Observation International website or app, or by sending records an equivalent national portal. In order to use records for conservation and research expert verifiers often need to check that species records have been identified correctly, and a good starting point is to get a photo of the species you are recording, where possible. Not all species can be identified from photos, but they can often help to confirm your identification.

Annex A. Recording Form for Pan Traps

Site code:	Recorder(s):	Date:
Location name:		

Pan Trap Station	1	2	3	4	5	6	7	8	9	10
Time Out (hh:mm)										
Time In (hh:mm)										
Disturbance (Y/N)										
Conditions at start										
Temp (°C):										
Wind:										
Cloud (% cover):										
Conditions at end										
Temp (°C):										
Wind:										
Cloud (% cover):										
Sun (% duration exposure):										

Local flower abundance (number of units per plant species within 2m radius of trap station)										
Plant species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Vegetation Height (provide average height within the 2m radius around each trap station)										
Average height (cm)										
Habitat type (refer to Habitat classifications H1 - 40)										
Pan trap parcel (H code)										
Pan trap parcel (area m^2)										
Other parcel (H code)										
Other parcel (H area)										

Comments

Annex B. Recording Form for Transects (Bees and Hoverflies)

Site code:		Recorder(s):				Site name:					
Start time (hh:mm)			End time (hh:mm)				Date:				
Average temp. (°C)		Avg. wind speed (0-6)					Avg. wind direction				
Transect section:	1	2	3	4	5	6	7	8	9	10	Avg. Cloud
Cloud (%)											
	1	2	3	4	5	6	7	8	9	10	Total
BEES											
Honeybees											
Bumblebees											
Group A: Ginger											
Group B: Black-red											
Group C: all-dark											
Group D: yellow-black-white											
Group E: yellow-black-red											
Large bees (> 10mm)											
Small bees (3-10mm)											
Wasp or blood bees											
HOVERFLIES											
Group 1: large, robust hoverflies (Tribes: Eristalini & Volucellini)											
Group 2: distinctly *bumblebee-like* hoverflies											
Group 3: distinctly *wasp-like* hoverflies											
Group 4: hoverflies with black-and-yellow stripes of spots (Core: subfamily Syrphinae)											
Group 5: other hoverflies											
Total											
Transect section:	1	2	3	4	5	6	7	8	9	10	
Comments:											

Annex C. Recording Form for Transects (Butterflies)

Site code:		Recorder(s):		Site name:	
Start time (hh:mm)		End time (hh:mm)		Date:	
Average temp. (°C)		Avg. wind speed (0-6)		Avg. wind direction	

Transect section:	1	2	3	4	5	6	7	8	9	10	Avg. Cloud
Cloud (%)											

Butterfly species	1	2	3	4	5	6	7	8	9	10	Total
Total											
Transect section:	1	2	3	4	5	6	7	8	9	10	

Comments:

Annex D. The Beaufort wind scale

Beaufort No.	Description	Wind speed (knots)	Wind speed (m/h)	Wind speed (km/h)	Land signs	Sea signs
0	calm	<1	<1	0-1	smoke rises vertically, leaves still	mirror smooth
1	light air	1-3	1-3.5	1-5	smoke drifts	scaly ripples
2	light breeze	4-6	4.5-7	6-11	leaves rustle, flags not extended	small wavelets, crests don't break
3	gentle breeze	7-10	8-11.5	12-19	light flags extended	large wavelets, crests may break
4	moderate breeze	11-16	12.5-18.5	20-28	all flags extended	small waves, some white horses
5	fresh breeze	17-21	19.5-24	29-38	trees in motion	moderate waves, many white horses
6	strong breeze	22-27	25.5-31	39-49	tree branches in motion	large waves with foam crests
7	near gale	28-33	32-38	50-61	walking into wind difficult	white foam from breaking waves blown in streaks
8	gale	34-40	39-46	62-74	twigs break from trees	high long waves, spin drift
9	strong gale	41-47	47-54	75-88	roof & fence damage	high waves, dense streaks of foam
10	storm	48-55	55-63	89-102	trees uprooted, structural damage	sea white, violent waves

Annex E. List of potential flowering plant species and flower unit classifications for pan trap flower counts and FIT Counts. Flowering times based on UK phenology.

English name	Scientific name	Family	Flowering from	Flowering to	Flower Units
Apple	*Malus pumila*	Rosaceae	April	May	**individual**
Aster	*Aster (Symphyotrichum) spp.*	Asteraceae	August	October	**head**
Bedstraw - Cleavers and Hedge Bedstraw	*Galium aparine* and *G. mollugo*	Rubiaceae	June	September	**individual**
Bedstraw - Marsh/Heath Bedstraw	*Galium palustre and G. saxatile*	Rubiaceae	June	September	**umbel**
Bedstraw - Meadow Bedstraw	*Galium verum*	Rubiaceae	June	August	**spike**
Bell Heather and Cross-leaved Heath	*Erica cinerea* and *Erica tetralix*	Ericaceae	June	September	**spike**
Bellflower	*Campanula spp.*	Campanulaceae	June	September	**individual**
Bird's-foot Trefoil	*Lotus corniculatus* and *L. pedunculatus*	Fabaceae	June	September	**head**
Black Horehound	*Ballota nigra*	Lamiaceae	July	August	**spike**
Blackthorn and Cherry	*Prunus spp.*	Rosaceae	March	May	**individual**
Borage	*Borago officinalis*	Boraginaceae	April	October	**individual**
Bramble	*Rubus fruticosus*	Rosaceae	May or June	September	**individual**
Buddleia	*Buddleja spp.*	Scrophulariaceae	July	September	**spike**
Bugle	*Ajuga reptans*	Lamiaceae	May	July	**spike**
Burdock	*Arctium spp.*	Asteraceae	July	August	**head**
Buttercup	*Ranunculus spp.*	Ranunculaceae	April	September	**individual**
Campion	*Silene spp.*	Cariophyllaceae	April	September	**individual**
Cat`s ear	*Hypochaeris radicata*	Asteraceae	June	August	**head**
Cinquefoil and Tormentil	*Potentilla spp.*	Rosaceae	June	September	**individual**
Clover and Medick	*Trifolium spp.* and *Medicago spp.*	Fabaceae	May	September	**head**
Comfrey	*Symphytum officinale*	Boraginaceae	March	June	**individual**
Cow Parsley	*Anthriscus sylvestris*	Apiaceae	April	June	**umbel**
Cow-Wheat	*Melampyrum spp.*	Scrophulariaceae	May	September	**spike**
Cranesbill and Storkesbill	*Geranium spp.* and *Erodium spp.*	Geraniaceae	May	September	**individual**
Daisy	*Bellis perennis*	Asteraceae	March	October	**head**
Dandelion	*Taraxacum aggregate*	Asteraceae	April	September	**head**
Deadnettle - White and Red Deadnettle	*Lamium album* and *L. purpureum*	Lamiaceae	March	October	**spike**
Devil's-bit Scabious	*Succisa pratensis*	Dipsacaceae	July	September	**head**
Dock and Sorrel	*Rumex spp.*	Polygonaceae	May	August	**spike**
Elderberry	*Sambucus spp.*	Rosaceae	May	June	**umbel**
Enchanter's-nightshade	*Circaea lutetiana*	Onagagraceae	May	July	**spike**
Eye-bright	*Euphrasia spp.*	Orobanchaceae	June	August	**individual**
Field Scabious	*Knautia arvensis*	Dipsacaceae	July	August	**head**
Fleabane	*Conyza spp.*	Asteraceae	June	September	**head**

English name	Scientific name	Family	Flowering from	Flowering to	Flower Units
Fleabane	*Pulicaria dysenterica*	Asteraceae	July	September	**head**
Forget-me-not	*Myosotis spp.*	Boraginaceae	April	September	**individual**
Foxglove	*Digitalis purpurea*	Scrophulariaceae	June	September	**individual**
Gorse	*Ulex spp.*	Fabaceae	April	October	**individual**
Green Alkanet	*Pentaglottis sempervirens*	Boraginaceae	April	July	**individual**
Ground Ivy	*Glechoma hederacea*	Lamiaceae	March	June	**spike**
Hawksbeard	*Crepis spp.*	Asteraceae	April	September	**head**
Hawthorn	*Crataegus spp.*	Rosaceae	April	June	**individual**
Heather	*Calluna vulgaris*	Ericaceae	July	September	**spike**
Hemp-agrimony	*Eupatorium cannabinum*	Asteraceae	July	September	**head**
Himalayan/Indian Balsam	*Impatiens glandulifera* and relatives	Balsaminaceae	July	October	**individual**
Hogweed	*Heracleum sphondylium*	Apiaceae	June	August	**umbel**
Ivy	*Hedera helix*	Hederaceae	September	September	**umbel**
Knapweed and Cornflower	*Centaurea spp.*	Asteraceae	June	September	**head**
Knotweed	*Persicaria (Polygonum) spp.*	Polygonaceae	June	October	**spike**
Lavender	*Lavandula angustifolia*	Lamiaceae	June	September	**spike**
Lungwort	*Pulmonaria officinalis*	Boraginaceae	March	May	**spike**
Marjoram	*Origanum spp.*	Lamiaceae	July	August	**spike**
Mayweed	*Matricaria spp.* and *Tripleurospermum spp.*	Asteraceae	June	August	**head**
Meadowsweet	*Filipendula ulmaria*	Rosaceae	June	July	**umbel**
Mint	*Mentha aquatica and M. arvensis*	Lamiaceae	June	August	**head**
Mustard	*Sinapis spp.*	Brassicaceae	April	September	**head**
Nettle	*Urtica dioica*	Urticaceae	May	July	**spike**
Oil-seed rape	*Brassica napus*	Brassicaceae	April	June	**head**
Ox-eye Daisy	*Leucanthemum vulgare*	Asteraceae	May	July	**head**
Oxtongue	*Picris spp.*	Asteraceae	June	August	**head**
Pansy and Violet	*Viola spp.*	Violaceae	June	August	**individual**
Petty Whin	*Genista anglica*	Lamiaceae	June	July	**spike**
Plantain	*Plantago spp.*	Plantaginaceae	May	September	**spike**
Poppy	*Papaver spp.*	Papaveraceae	May	August	**individual**
Purple Loosestrife	*Lythrum salicaria*	Lythraceae	July	August	**spike**
Radish	*Raphanus spp.*	Brassicaceae	April	September	**head**
Ragwort	*Senecio jacobaea* and relatives	Asteraceae	June	September	**head**
Rhododendron	*Rhododendron ponticum*	Ericaceae	May	June	**individual**
Rosebay Willowherb	*Chamerion angustifolium*	Onagraceae	July	September	**spike**
Rough Hawkbit	*Leontodon spp.*	Asteraceae	June	September	**head**
Rowan/Mountain Ash	*Sorbus aucuparia*	Rosaceae	May	June	**umbel**
Sallow/Willow	*Salix spp.*	Salicaceae	February	May	**head**
Sanfoin	*Onobrychis viciifolia*	Fabaceae	July	August	**spike**
Scarlet Pimpernell	*Anagallis arvensis*	Primulacea	June	August	**individual**
Selfheal	*Prunella vulgaris*	Lamiaceae	March	August	**spike**
Shepherd's purse	*Capsella bursa-pastoris*	Brassicaceae	May	August	**spike**
Sow-thistle	*Sonchus spp.*	Asteraceae	June	October	**head**

English name	Scientific name	Family	Flowering from	Flowering to	Flower Units
Speedwell	*Veronica spp.*	Scrophulariaceae	March	September	**individual**
Spurge	*Euphorbia spp.*	Euphorbiaceae	April	September	**umbel**
St. John's wort	*Hypericum spp.*	Hypericaceae	June	August	**individual**
Stitchwort and Chickweed	*Stellaria spp.*	Cariophyllaceae	May	August	**individual**
Teasel	*Dipsacum fullonum*	Dipsacaceae	July	August	**head**
Thistle	*Cirsium spp.* and *Carduus spp.*	Asteraceae	July	September	**head**
Toadflax	*Linaria spp.*	Scrophulariaceae	June	October	**spike**
Tufted Vetch	*Vicia cracca*	Fabaceae	July	September	**spike**
Vetch, Field Bean and Tare (apart from Tufted Vetch)	*Vicia spp.*	Fabaceae	May	September	**individual**
Vetchling (Pea)	*Lathyrus spp.*	Fabaceae	June	September	**individual**
Viper`s bugloss	*Echium vulgare*	Boraginaceae	July	August	**spike**
Wild Angelica	*Angelica sylvestris*	Apiaceae	July	August	**umbel**
Wild Carrot	*Daucus carota subsp. carota*	Apiaceae	June	September	**umbel**
Willowherbs (apart from Rosebay Willowherb)	*Epilobium spp.*	Onagraceae	June	September	**individual**
Wormwood	*Artemisia spp.*	Asteraceae	June	August	**spike**
Woundwort	*Stachys spp.*	Lamiaceae	June	September	**spike**
Yarrow	*Achillea millefolium*	Asteraceae	June	September	**umbel**

Annex F. Habitat classifications

Code	Habitat Type
H1	Marine saltmarshes/estuaries/saline reedbeds
H2	Coastal dune grassland
H3	Coastal dune and sand heath
H4	Coastal dune and sand scrub
H5	Coastal dune and sand woods
H6	Coastal dune slacks
H7	Coastal machair
H8	Coastal shingle
H9	Coastal cliffs/undercliffs
H10	Fen/swamp/marsh vegetation of inland freshwater edges
H11	Bare ground/sparse vegetation of inland freshwater edges
H12	Acid bog/mire habitats
H13	Flushes
H14	Inland swamp/fen stands without open water (e.g. reedbeds)
H15	Semi/unimproved chalk/limestone grassland
H16	Semi/unimproved acid grassland
H17	Semi/unimproved neutral grassland
H18	Agriculturally improved/re-seeded/ heavily fertilised grassland
H19	Seasonally wet and wet marshy grasslands
H20	Bracken dominated glades or hillsides
H21	Stands of tall herbs (e.g. nettle and willow-herb beds)
H22	Dry scrub/shrub thickets
H23	Wet and dry heathland/ dry heather moorland
H24	Wet Willow scrub of fen, river and lake-side
H25	Hedgerows
H26	Mature broadleaved woodland
H27	Mature coniferous woodland
H28	Mature mixed broadleaved and coniferous woodland
H29	Lines of trees or scattered trees of parkland
H30	Small man-made woodlands
H31	Recently felled areas/early-stage woodland and coppice
H32	Herb/grass/bare ground mosaics of wood rides, hedgebanks and green lanes
H33	Orchards, hop gardens and vineyards
H34	Inland screes/cliffs/ rock pavements, and outcrops
H35	Intensive arable crops
H36	Horticultural crops
H37	Organic arable crops
H38	Bare ground/weeds of arable field margins or fallow/recently abandoned arable crops (e.g. set-aside)
H39	Ornamental shrubs/trees/lawns of parks/domestic gardens, etc.
H40	Bare ground/weed communities of post-industrial sites