PROJECT REPORT

WELSH LANDSCAPES *for* RARE BUMBLEBEES

Prepared by the Local Environmental Records Centres Wales Limited consortium (LERC Wales)

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On behalf of:
Bumblebee Conservation Trust
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1. EXECUTIVE SUMMARY

Whilst Wales supports some of the UK's most important populations of threatened bumblebee species, many of these species continue to decline. Focused conservation action is urgently required to reverse these declines.

Seven species of rare and priority bumblebees were pre-selected for inclusion as the focal species of the study. The exact distribution and status of these focal species in Wales was previously poorly known, with gaps in both the temporal and geographical coverage of records.

A data collation exercise established an up-to-date resource of records of the focal species, allowing the accurate assessment of the status and distribution of each species in Wales. A series of distribution maps were produced for each focal species, showing the volume, reliability and change over time of records (these maps are presented and interpreted in Annex 1), as well as of the spatial coincidence of the seven species and an assessment of geographic variation in recording intensity.

Records of each of the focal species were analysed to establish their habitat associations, as summarised in Figure 1.1. (below).

	PHASE 1 HABITAT TYPE																														
	A1.2.2	A2.1	B1.1	B1.2	B2.2	B3.1	C1.1	D1.1	D2	D5	E1.6.1	E3.1	F1	G1	H1.1	H1.2	H1.3	H2.6	H6.4	H6.5	H6.8	H8.4	H8.5	I2.1	I2.2	J1.1.1	J1.1.2	J3.6	J4
SPECIES	PLANTED CONIFEROUS WOODLAND	DENSE SCRUB	UNIMPROVED ACID GRASSLAND	SEMI-IMPROVED ACID GRASSLAND	SEMI-IMPROVED NEUTRAL GRASSLAND	UNIMPROVED CALCAREOUS GRASSLAND	BRACKEN	DRY ACID HEATH	WET HEATH	WET HEATH/ACID GRASSLAND MOSAIC	BLANKET BOG	VALLEY MIRE	SWAMP	STANDING WATER	INTERTIDAL MUD/SAND	INTERTIDAL COBBLES/SHINGLE	INTERTIDAL ROCKS/BOULDERS	SALT MARSH	DUNE SLACK	DUNE GRASSLAND	OPEN DUNE	COASTAL GRASSLAND	COASTAL HEATH	QUARRY	SPOIL	ARABLE	AMENITY GRASSLAND	BUILDINGS	BARE GROUND
Brown-banded Carder Bee *(Bombus humilis)*		□			□	■							■		□	□	■	■	■	■	■	■	■		□			□	□
Bilberry Bumblebee *(Bombus monticola)*	□	□	□	□	□	■	□	■	□	□	□			□										□	■				
Moss Carder Bee *(Bombus muscorum)*					□							■			□			□	■	■	■	■	■						
Red-shanked Carder Bee *(Bombus ruderarius)*																				■	■								
Broken-belted Bumblebee *(Bombus soreensis)*																					■	■							
Shrill Carder Bee *(Bombus sylvarum)*		□			□								■	□				□	■	■	■	■	■			□	□		■

■ = CORE HABITAT

□ = SUPPORTING HABITAT

FIGURE 1.1. – SUMMARY OF HABITAT ASSOCIATIONS OF THE FOCAL BUMBLEBEE SPECIES

This analysis shows that five of the seven focal species have a strong association with coastal habitats and dune habitats in particular. A sixth species, *Bombus ruderatus*, was excluded from the detailed habitat association analysis due to being so rare in Wales, however, based on the sites from which it is recorded, it is also likely to occur in dune and coastal habitats. The odd species out from the seven focal species, is *Bombus monticola* which is associated with a range of heathland, bog and grassland habitats.

Results: Targeting future survey effort

The report gives worked examples to show how the species distribution, recording intensity and habitat association analyses can be utilised to identify priority areas for targeting future survey efforts (see section 3.5). A full commentary identifying target areas for each species is included in Annex 3.

Some key findings of this analysis are summarised in Figure 1.2 below.

	LOCATION IDENTIFIED IN PRIORITY AREA ANALYSIS															
SPECIES	EASTERN VALLEYS	BRECON BEACONS NATIONAL PARK (CENTRAL)	BRECON BEACONS NATIONAL PARK (SOUTH)	BRIDGEND COASTAL DUNES	GOWER	CARMARTHENSHIRE COAST (PENDINE/PEMBREY)	SOUTH PEMBROKESHIRE (CASTLEMARTIN)	NORTH PEMBROKESHIRE COAST	WEST WALES COASTLINE	CAMBRIAN MOUNTAINS	SNOWDONIA NATIONAL PARK (SOUTH)	BALA TO CORWEN	SOUTH GWYNEDD COAST (HARLECH)	LLEYN PENINSULA	ANGLESEY COAST	CLYWYDIAN RANGE & DEE ESTUARY
Brown-banded Carder Bee *(Bombus humilis)*	✓		■	✓	✓	■	✓	■	✓	✓			■	■	■	■
Bilberry Bumblebee *(Bombus monticola)*	■	■	✓		✓					✓	■	■	✓	✓		✓
Moss Carder Bee *(Bombus muscorum)*				✓	✓	✓	✓	✓	■	■	■		✓	✓	✓	
Red-shanked Carder Bee *(Bombus ruderarius)*				■	■	■	■						□		■	
Large Garden Bumblebee *(Bombus ruderatus)*				✓	■	■	✓									
Broken-banded Bumblebee *(Bombus soroeensis)*				■	■	■	■	■	■				■	■	■	✓
Shrill Carder Bee *(Bombus sylvarum)*				✓	■	■	✓		□				□	□	□	

✓ = Known location
■ = Priority for targeted survey
□ = Outside current known range (lower priority)

FIGURE 1.2. – SUMMARY OF ANALYSIS OF PRIORITY AREAS FOR FUTURE SURVEY

This summary table shows that some parts of Wales have been identified as priority areas for targeted survey for several species. For instance, many coastal areas show as priorities for survey for between 2 and 5 focal species. Examples include:

- **Gower:** Despite being well-recorded, parts of Gower have been identified as a target location for surveys for 4 species, including *Bombus sylvarum* which has strongholds in south Pembrokeshire and the Bridgend coastal dunes, but has not been recorded on similar dune sites on Gower. Detailed analysis of each species priority map will be required to target specific sites for survey.
- **Carmarthenshire Coast:** Identified as a target location for surveys for 5 species.
- **Anglesey Coast:** Identified as a target location for surveys for 3 species.

Results: Targeting land management for bumblebees

Priority areas for targeted land management for rare bumblebee species will be those areas with existing populations of the focal species, in addition to any new locations that come to light as a result of targeted survey.

Data collated during this project was plotted to show hotspots where most focal species coincide (see Figure 3.2.4.). These areas should be considered as priority areas for land management action. They include coastal areas of south-west Wales (including Pembrokeshire

and Carmarthenshire), south central Wales (the Bridgend coastal dunes) and mid Wales (Ynyslas, Borth and Dyfi Estuary). As was demonstrated by the habitat association analysis, *Bombus monticola* shows a markedly different distribution to the other focal species and, partly because of this, there is no single location in Wales which supports all seven focal species.

In addition, the coincidence of records with designated sites was assessed, as was the relative occurrence of the focal species on land owned or managed by several key landowners. It is hoped that engagement with stakeholders and landowners who manage land that supports focal species will enable the efficient planning of surveys and conservation work for these priority species.

Results: Key policy findings

As the final key part of this project, a review was undertaken of key spatial planning and policy frameworks which provide context for bumblebee conservation efforts in Wales, as well as potential mechanisms for delivery of practical improvements for the benefit of the focal species or pollinators in general.

Firstly, it is important to identify and recognise the achievements from previous partner engagement and conservation work across Wales. Several stakeholders, including local authorities, have had and continue to maintain pollinator-friendly policies and carry out practical action. Mapping this information will assist BBCT in identifying where existing efforts are most productive and where there are opportunities to engage with new partners. Whilst much of the existing effort is not specifically for the benefit of the focal species, the outcomes are effectively of benefit to rare bumblebees.

Secondly, the momentum achieved through ongoing efforts should be sustained. Here, additional benefits can be gained with minimal input by increasing the understanding of the habitat requirements of the focal species within existing active programmes. This allows the needs of the focal species to be accommodated alongside more general pollinator-focused work, heightening the profile of rare bumblebees whilst retaining stakeholder enthusiasm and public interest in a way which may not be possible if work is focused exclusively on remote populations of elusive and hard-to-identify species.

BBCT may wish to take advantage of evolving projects and programmes. The forthcoming, NRW-led Nature Network's project will highlight gaps in the existing protected sites network, identifying a plan for future action and potential stakeholders. Nature Networks could help to provide greater connectivity for bumblebee species between protected sites. The Welsh Government's Planning Policy Team will be analysing the efficacy of green infrastructure plans and policies, information that will prove useful to future conservation methodologies. Similarly, Payment for Ecosystem Services (PES) may attract private sector investment for the benefit of rare bumblebees, whilst providing opportunities for engagement with landowners. The emerging sustainable farming scheme also offers an ideal opportunity to engage with the farming community, if targeted appropriately utilising the information contained herein.

This review also highlighted that while some local authorities and public bodies have pollinator-friendly initiatives, there are those that do not specifically mention rare bumblebees or pollinators or green infrastructure. Disseminating this report (and data where possible) to local nature partnerships/local authorities to inform Local Places for Nature, and for data and future surveys to contribute to informing SINC/LWS designation would be of great benefit to rare bumblebees and their associated habitats.

In all instances, the information compiled in this report will assist BBCT in targeting efforts in the most effective way possible: by combining the newly found understanding of which habitat

types to focus on, where to target efforts in the landscape, which stakeholders to engage with and which emerging policy tools can be applied directly for the benefit of rare bumblebees.

Project Outputs

Findings of the project were presented at two webinars, including a stakeholder webinar which over 68 people attended.

All relevant data and outputs were collated and passed to Bumblebee Conservation Trust electronically, to maximise their use in further detailed analysis and action planning.

2. PROJECT BACKGROUND

2.1. Background

The Bumblebee Conservation Trust (BBCT) recognised that whilst Wales supports some of the UK's most important populations of threatened bumblebee species, many of these species continue to decline, and focused conservation work is urgently required to reverse these declines. Existing data available to BBCT suggested that the exact distribution and status of several of the rare and scarce species in Wales was poorly known, with gaps in both the temporal and geographical coverage of records. Additionally, it was recognised that what data did exist was fragmented, across repositories, reports, and recorders, although the precise extent of this data fragmentation was by its nature not fully understood.

In order to prioritise survey and conservation work in an informed manner, the critical first step was to review and draw together the existing data resource for these threatened bumblebee species, to allow the accurate assessment of the state of knowledge on the status, distribution and habitat preferences of each species. Only once that information and knowledge was collated would it be possible to provide both a road map for future survey work and the right tools to conservationists, land managers and decision-makers to inform wider land and natural resource management policy decisions in order to benefit bumblebees.

BBCT obtained funding from Welsh Government's Green Recovery fund, delivered via the National Lottery Heritage Fund, for a project to investigate these issues through the "Welsh Landscapes for Rare Bumblebees" project. Tenders were invited for the project during March 2021. The Local Environmental Records Centres Wales[1] consortium (LERC Wales) successfully tendered for the contract and work commenced during April 2021.

LERC Wales was also aware of significant sources of bumblebee data that are not routinely accessed and incorporated into LERC databases and was very well positioned to use both the analysis of its own data holdings and its existing relationships with other key players in UK bumblebee recording to significantly improve the state of knowledge relating to bumblebee records.

2.2. Focal Species

This project focused on the following seven species, selected by BBCT staff, which are either Section 7 Priority Species (as identified in the Environment Act Wales 2016), have Welsh populations that are important in the UK context, or which are otherwise thought to be at risk:

- Brown-banded carder bee *(Bombus humilis)*
- Bilberry bumblebee *(Bombus monticola)*
- Moss carder bee *(Bombus muscorum)*
- Red-shanked carder bee *(Bombus ruderarius)*
- Ruderal bumblebee *(Bombus ruderatus)*
- Broken-belted bumblebee *(Bombus soroeensis)*
- Shrill carder bee *(Bombus sylvarum)*

These seven species are referred to in this report as the focal species.

[1] Local Environmental Records Centres Wales (LERC Wales) is a consortium company formed by the four individual LERCs covering Wales (Biodiversity Information Service for Powys and Brecon Beacons National Park (BIS), South East Wales Biodiversity Records Centre (SEWBReC), Cofnod – North Wales Environmental Information Service and West Wales Biodiversity Information Centre (WWBIC). Staff of the four LERCs formed a project team to undertake the current contract, with the SEWBReC Manager assuming overall project management responsibility.

3. PROJECT METHODOLOGY AND ACTIVITIES

This section outlines the key activities undertaken by LERC Wales as part of this project.

3.1. Data Collation

Data for the seven focal species held by LERC Wales on its shared database was analysed to extract details of relevant recorders and datasets. An extra dataset held by Cofnod as part of a previous project collating invertebrate data for Natural Resources Wales, which is not available for general use by LERC Wales, was also examined in the same way. Key contacts, recorders and dataset owners identified by LERC Wales and BBCT were added to a Contacts tracking spreadsheet. Each was sent a letter, signed by BBCT and LERC Wales, requesting records not already available to LERC Wales to be shared by a specified deadline. A reminder was sent if no response was received within a reasonable length of time. In addition, social media posts were published and shared which successfully generated some additional records.
Data submitted were assessed, split up, and imported separately for each LERC area.

LERC Wales also analysed the datasets published on the National Biodiversity Network (NBN) Atlas. A small number of additional datasets with additional records of the focal species were identified, from which individual LERCs could download records within their area of coverage and incorporate them into their databases, where the data licence allowed or explicit permission was given.

Data held by each individual LERC is regularly synced into the LERC Wales database, and this was carried out prior to extraction of the data for mapping purposes. In addition, data from three datasets for which records were only allowed to be used for this project (and not incorporated into the LERC Wales database) was collated by Cofnod and made available for mapping purposes. This included two datasets, owned by the Bees, Wasps and Ants Recording Society (BWARS) and the Royal Society for the Protection of Birds (RSPB), where separate data licences were signed by LERC Wales and BBCT to enable BBCT to also hold a copy of the raw data.

Each of the four LERCs in Wales has a network of local experts who verify records on an ongoing basis. Relevant experts were specifically asked to verify records of the focal species prior to data being added to the LERC Wales database. In addition, Dr. Richard Comont of BBCT checked specific unverified records and datasets to ensure as much data as possible was available for the analysis. Unverified records were included in the final maps but were colour coded accordingly.

The chart below (
FIGURE 3.1.*1*. - COMPARISON OF NEW AND EXISTING DATA AT THE END OF DATA COLLATION PHASEFigure 3.1.1.) shows a breakdown of the data on the focal species that was held by LERC Wales at the end of the data collation phase. 2,408 records were already held on Aderyn (the LERC Wales shared database) and 79 were held by LERC Wales (but not integrated into Aderyn). The data collation efforts by LERC Wales during this contract brought in 506 new records with permission for inclusion in Aderyn (meaning these are now widely accessible to the public, with enhanced access available to LERC partners), plus a further 3,307 records that did not have permission for inclusion in Aderyn. These comprise mainly the BWARS and RSPB records (mentioned previously) which were also supplied directly to BBCT for their licensed use.

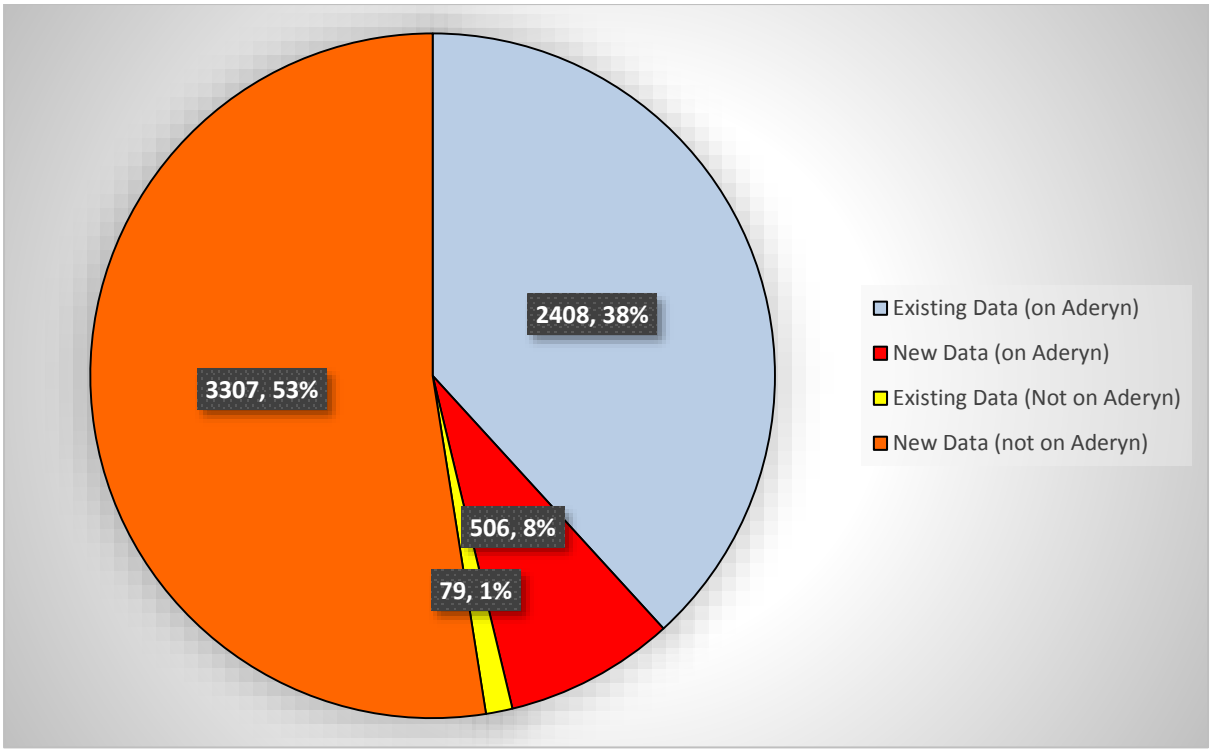


FIGURE 3.1.1. - COMPARISON OF NEW AND EXISTING DATA AT THE END OF DATA COLLATION PHASE

3.2. Mapping rare bumblebee species

Following the completion of the data collation phase, a series of species distribution maps was produced as a key output of the project. These are described below, with examples included. The full map set is included in Annex 1. All mapped data have also been provided to BBCT in electronic format for use in a geographic information system (GIS), so that the data can be explored in full detail and so that further, tailored maps can be produced by BBCT staff, as required.

3.2.1. Species Distribution Maps

In producing distribution maps for the seven focal species, a number of factors were taken into consideration. These included:

Precision: The data collation phase of this project brought together species records captured at a range of resolutions, from 10 kilometre to 10 metre accuracy. It was agreed in early discussions that 10km records were too coarse to be useful for any of the detailed mapping and data analysis required. These records were therefore excluded from the mapping and analysis aspects of the project.

Scale: For plotting national distributions at the Wales scale, it was agreed that the 10km square should be the main mapping unit, although 1km and finer data was utilised to add detail. All data outputs are also being supplied to BBCT in GIS format, so that the data can be displayed at any scale.

Age of data: It was agreed that records would be plotted in three date bands (pre-1980, 1980-2000, and post-2000) as a means of showing changes in distribution over time. For subsequent analyses, only post-1980 and post-2000 records were selected.

Verification levels: Although significant efforts were made to verify as many records of focal species as possible during the data collation phase of the project (see section 3.1), not all records could be verified. It was agreed to illustrate verification levels on distribution maps, so that spatial patterns could be seen whilst remaining transparent about the data quality.

A set of three distribution maps was produced for each focal species encompassing recording intensity, record dates, and data verification levels. An example set of maps is given below for Shrill Carder Bee *(Bombus sylvarum)* with the full set of maps for all focal species provided and interpreted in Annex 1.

Figure 3.2.1. (right) is a heatmap showing the Welsh distribution of records of Shrill Carder Bee *(Bombus sylvarum).* Each 10km square is coloured according to the number of records, ranging from yellow squares with 1-8 records up to red squares with 29+ records. Within each 10km square, the detailed locations of records are illustrated by plotting a series of 1km squares (which represent records captured at 1km resolution or finer).

In the case of *B. sylvarum*, concentrations of records show in South Pembrokeshire, the dunes of the Bridgend coast and the Gwent Levels.

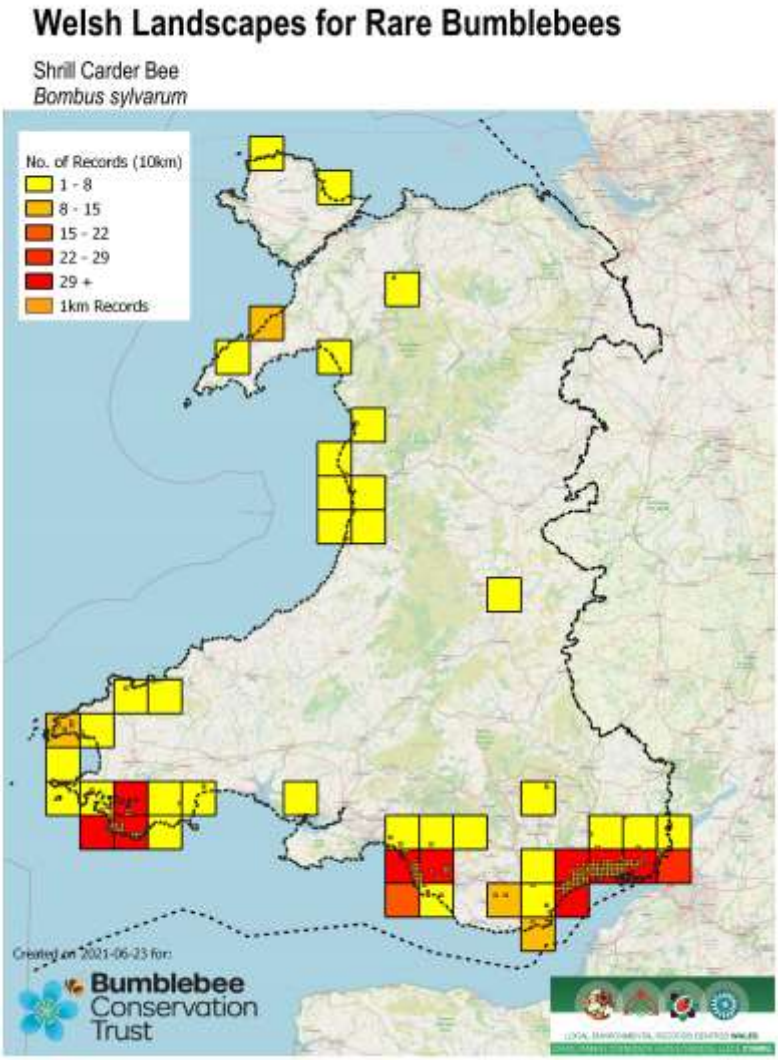


FIGURE 3.2.1.- DISTRIBUTION OF RECORDS OF SHRILL CARDER BEE *(BOMBUS SYLVARUM):* RECORD DENSITY

In Figure 3.2.2. (below, left) records are grouped into age classes. The plot clearly suggests a contraction of range of *B. sylvarum*, with no post-1980 records in north or mid Wales.

Figure 3.2.3. (below, right) shows verification status of records and illustrates that nearly all remaining records are classed as considered correct, with very few assessed only as possible ('possible' records are generally those which appear feasible, but which are unsupported by evidence and where the recorder is not known to verifiers).

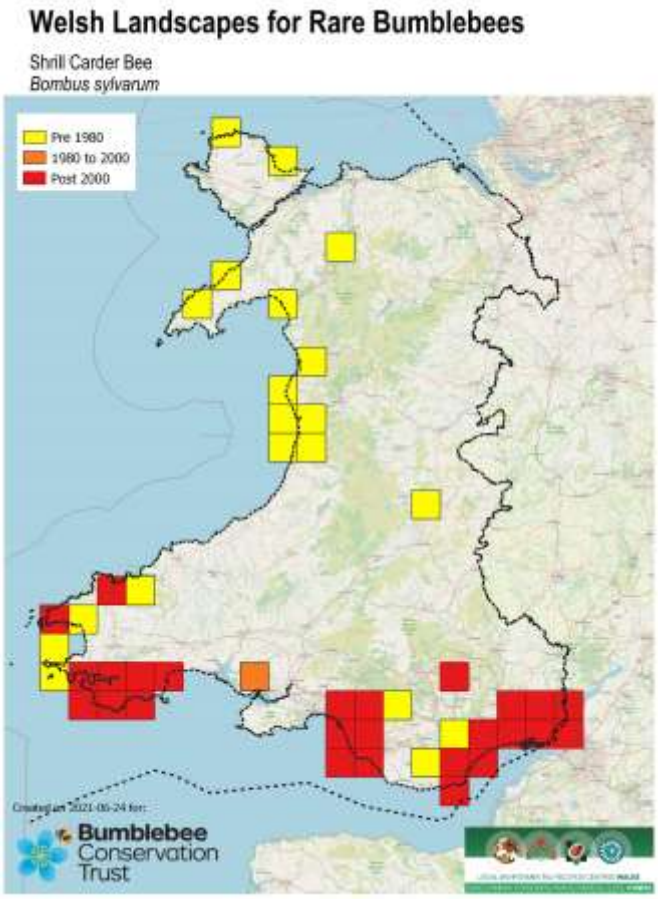


FIGURE 3.2.2. - DISTRIBUTION OF RECORDS OF SHRILL CARDER BEE *(BOMBUS SYLVARUM):* AGE CLASSES OF RECORDS

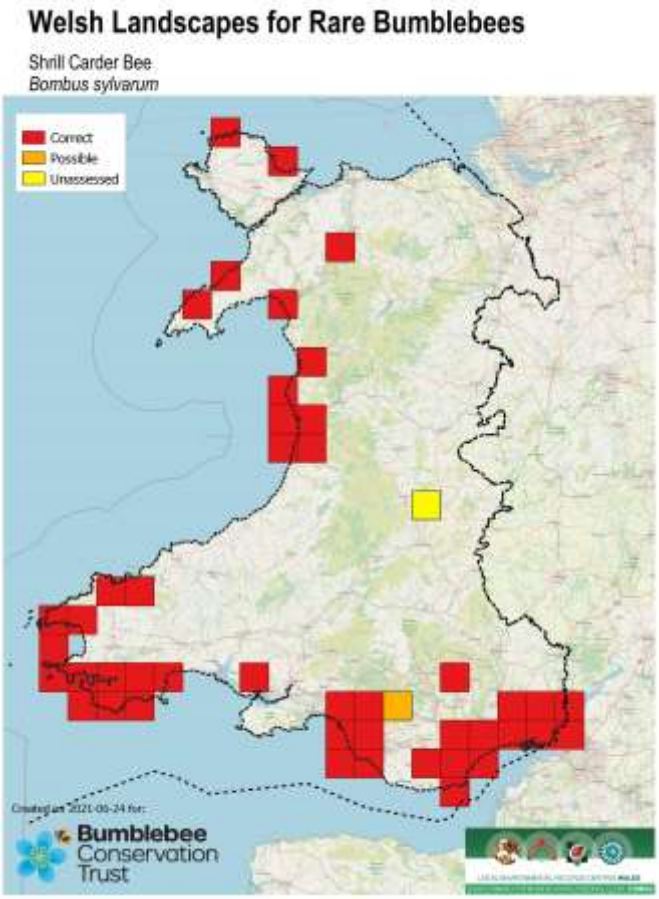


FIGURE 3.2.3. - DISTRIBUTION OF RECORDS OF SHRILL CARDER BEE *(BOMBUS SYLVARUM):* VERIFICATION STATUS OF RECORDS

3.2.2. Species Coincidence Map

All post-2000 records of the seven focal species were plotted at 10km square resolution and the coincidence of the focal species was calculated and displayed in heatmap format, with values between 0 and 5 (no single 10km square holds records of either six or all seven focal species).

The resulting plot (see Figure 3.2.4. below) shows hotspots for occurrence of the focal bumblebee species in coastal areas of south Pembrokeshire and the Glamorgan coast in Bridgend and Neath Port Talbot (each with two 10km squares supporting 5 focal species). Other locations supporting 4 focal species in a 10km square include the Ynyslas/Dyfi Estuary area, Gower, further parts of the Pembrokeshire coast and Bridgend/Neath Port Talbot areas, the Vale of Glamorgan coast and the Gwent Levels.

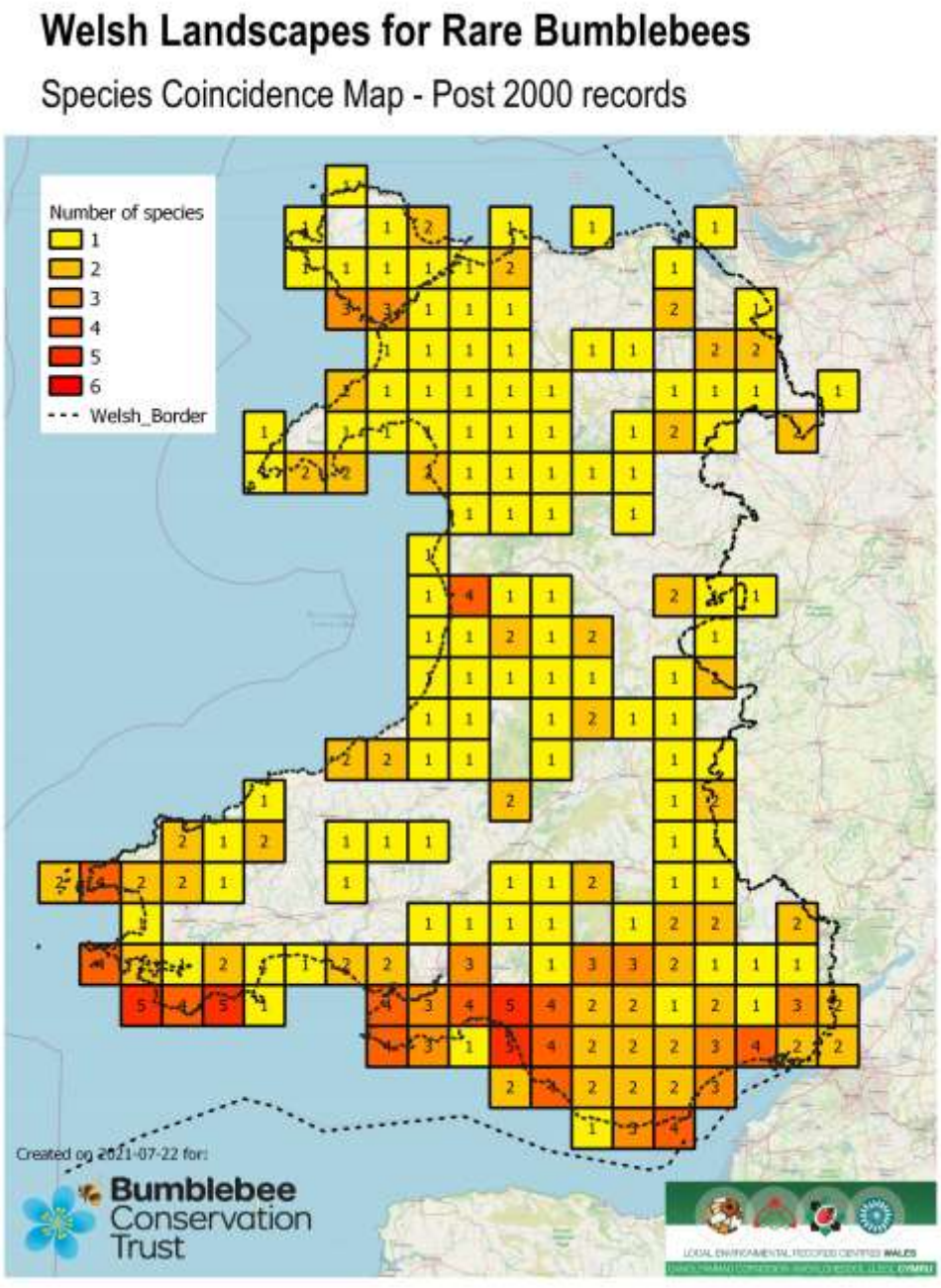


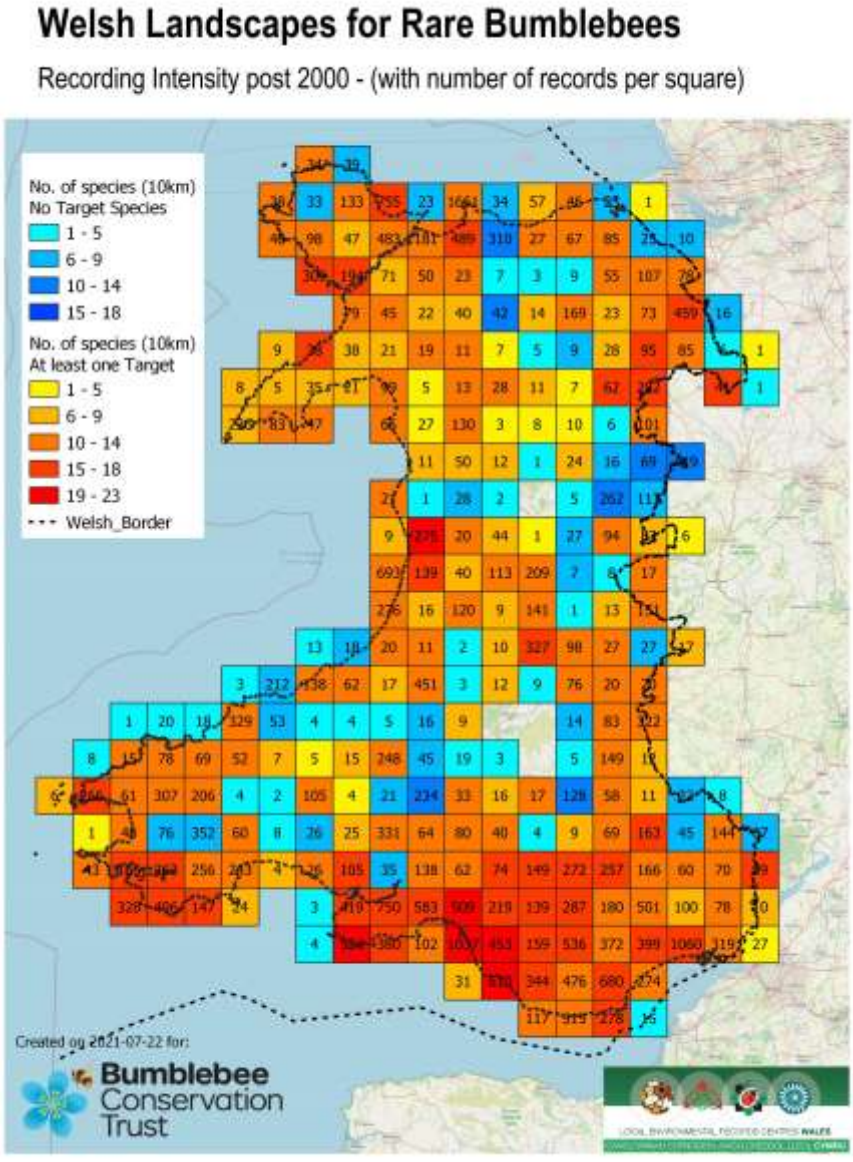
FIGURE 3.2.4. - SPECIES COINCIDENCE MAP SHOWING POST-2000 RECORDS OF THE SEVEN FOCAL SPECIES

3.2.3. Recording Intensity Map

In order to illustrate how the distribution of records of the seven focal species are influenced by recording intensity, the plot in Figure 3.2.5. (below) was produced.

This plot analyses records held in the shared LERC Wales database of all *Bombus* species, as a proxy measure of bumblebee recording intensity. Numbers overwritten on each 10km square show the number of records in that square across all *Bombus* species. Higher numbers are a proxy for higher recording intensity (which may be influenced by a greater abundance of *Bombus* species or individuals or may include popular sites that attract more bee recorders or general wildlife recorders, e.g., squares containing the Great Orme or Kenfig).

The colour gradations of the 10km squares illustrate the number of different *Bombus* species recorded, with darker squares containing more species. Blue squares contain no records of the seven focal species, but do contain records of other *Bombus* species, while squares coloured with the yellow-red palette do contain records of the focal species in addition to the other species.



As a general rule, it is considered by LERC Wales that squares with low record totals require further recording effort and some may subsequently be shown to include populations of focal species. Conversely, it is considered that very well-recorded squares without records of focal species (namely dark blue squares with higher superimposed numbers) should be a lower priority for surveys as focal species are likely to be absent or nearly so. This plot will require careful interpretation, but, as with all plots and data selections in this report, it is also supplied to BBCT in GIS format to allow for further manipulation.

FIGURE 3.2.5. - RECORDING INTENSITY PLOT SHOWING LOCATIONS OF POST-2000 RECORDS OF ALL *BOMBUS* SPECIES (WITH DIFFERENTIATION ACCORDING TO NUMER OF *BOMBUS* SPECIES RECORDED AND WHETHER FOCAL SPECIES ARE RECORDED).

3.3. Identification of key rare bumblebee habitats, landscapes and sites

Following the completion of the data collation and species distribution mapping, analysis of the collated data could be undertaken with the aim of identifying geographic trends and groupings, especially in relation to particular habitats and landscape types, taking into account issues such as species ecology, life cycles and habitat requirements.

The aims of this analysis were to identify habitat associations within Wales for each focal species, and to plot the known distribution of these associated habitats. This allows the identification of areas of suitable habitat which do not have contemporary records of the focal species, which can be prioritised for targeted survey work as part of ongoing BBCT projects. These areas of apparent suitability can also be used in a wide range of ways to guide future conservation work, including the provision of habitat corridors between known populations, or identification of areas with potential to help several species with the same habitat work. An analysis of the coincidence of records of the focal species and any statutory and non-statutory site designations was also undertaken (to understand how well bumblebees were served by the current designation system), as was a landowner and stakeholder analysis.

3.3.1. Habitat association analysis

To estimate which habitats were associated with each of the seven focal species, a frequency analysis was conducted of common Phase 1 habitat types in the OS grid squares in which each species had been observed. Habitat types were assigned to each grid square from the Terrestrial Phase 1 Habitat Survey dataset, conducted by the Nature Conservancy Council (NCC) and later by the Countryside Council for Wales (CCW) between 1979-1997.

First, a presence map of all grid squares where each species had been recorded was created. This was treated as presence-absence, with record density per grid square ignored. This yielded a total of 6,456 squares across all species, of which 83% were at 100m resolution or finer. Records from before 1980, or at 10km resolution, were not included. The analyses were conducted for all species except for *Bombus ruderatus*, for which there were only two post-1980 records.

Each grid square was assigned the Phase 1 habitat classification which covered the largest amount of its area. For a habitat type to be assigned to a grid square, it did not need to cover the majority of that square, only a greater area of it than any other habitat type. For example, a square covered by 40% D.1.1 Dry Acid Heath, 30% A.1.2.2 Planted Coniferous Woodland and 30% D.2 Wet Heath would be assigned D.1.1 Dry Acid Heath.

A habitat frequency table was then created for each species, including all habitats which were assigned to at least one of that species' occupied grid squares. First, the number of occupied grid squares for which each habitat was most common were computed. This was then expressed as a percentage of the total of the species' occupied grid squares. Next, the percentage of the total area of Wales covered by each habitat was computed. Finally, an association value of the species for each habitat was computed, by dividing the percentage of the species total occupied grid squares for which that habitat was most common, by the percentage cover of Wales contributed by that habitat. A section of the resulting table for *Bombus humilis* is presented overleaf as an example (Figure 3.3.1.).

Habitat Code	Vegetation Type	Occupied grid squares	Occupied grid squares (%)	Habitat cover in Wales (%)	Association
B.4	Improved grassland	262	29.64	48.6	0.61
H.6.8	Open dune	79	8.94	0.14	63.78
B.2.2	Semi-improved neutral grassland	78	8.82	1.81	4.87
J.3.6	Buildings	73	8.26	3.75	2.2
H.6.5	Dune grassland	62	7.01	0.12	56.53
H.1.1	Intertidal mud/sand	42	4.75	1.61	2.96
J.1.1	Arable	34	3.85	3.14	1.22
H.2.6	Salt marsh	27	3.05	0.29	10.49
H.6.4	Dune slack	25	2.83	0.03	88.37
H.8.4	Coastal grassland	21	2.38	0.08	30.01

FIGURE 3.3.1. - EXAMPLE PORTION OF THE HABITAT FREQUENCY TABLE FOR *BOMBUS HUMILIS*, SHOWING THE TOP 10 HABITATS BY NUMBER OF OCCUPIED GRID SQUARES FOR WHICH THEY ARE MOST COMMON. 'Occupied grid squares' shows the number of grid squares with records for *B. humilis* in which each habitat was most common. 'Occupied grid squares (%)' expresses this as the percentage of *B. humilis*' total occupied grid squares. 'Habitat cover in Wales (%)' shows the % of Wales covered by each habitat. 'Association' is the 'Occupied grid squares (%)' value divided by the 'Habitat cover in Wales (%)' value.

The association value provides some indication of the likely degree of association between a species and a habitat. It shows the contribution of a habitat to the percentage of a species' occupied grid squares, relative to the total area of that habitat. Values that are close to 1 indicate no association between the species and the habitat. The contribution of the habitat to the percentage of species' occupied grid squares is roughly equal to the percentage cover of the habitat across Wales, suggesting the presence of the habitat has no effect on the probability of the species occurrence. Values that are far below 1 indicate there are fewer occupied grid squares in which the habitat is most common than would be expected from its area, suggesting a negative association between the species and the habitat. Similarly, values that are significantly greater than 1 suggest the habitat is most common in more of the species occupied grid squares than would be expected from its area, suggesting a positive association.

Where possible, results of the initial analysis were filtered to select those habitats that are most likely to reflect meaningful biological associations. For example, B.4 Improved Grassland is the most common habitat in a significant number of occupied grid squares for all the focal species, and for many of them contributes the largest share of grid squares of any habitat. However, this is likely to be an artefact of the dominance of improved grassland across Wales, occupying almost 50% of the area in the Terrestrial Phase 1 Habitat Survey. Field observations indicate that bumblebees, particularly the focal species here, largely avoid this habitat but instead use the marginal habitats such as hedgerows and riparian vegetation. When the association value for improved grassland is computed, it is below 1 in all species, and significantly so in all except *B. sylvarum*, indicating a negative association. In order to retain only the habitats that are most

likely to be truly associated with a species, the results were filtered to only include habitats with an association value of 1.5 of greater.

Many scarce Phase 1 habitat classes occupy an area far less than 1% of the total area of Wales. These habitats can take on high association values even if they are the most common habitat in only one or two of the species' occupied grid squares. In these cases, it is difficult to determine if the association is likely to be meaningful. To account for this, a further filter was applied to include only habitats that were most common in at least 5 of the species' occupied grid squares. It was not possible to apply this filter for *Bombus soroeensis* and *B. ruderarius*, due to the low number of records, and hence occupied grid squares, for these species (a figure of 4 occupied grid squares was used for mapping analysis – see Section 3.5).

Results are presented as bar charts (see Figures 3.3.2. and 3.3.3. below) showing the top habitats by percentage of occupied grid squares for which they are most common, and by association value, for each species. Where the species had results for more than 15 habitats after filtering, the top 15 habitats were presented. Examples for *B. humilis* are shown and explained below. Charts for all species are included and interpreted in Annex 2.

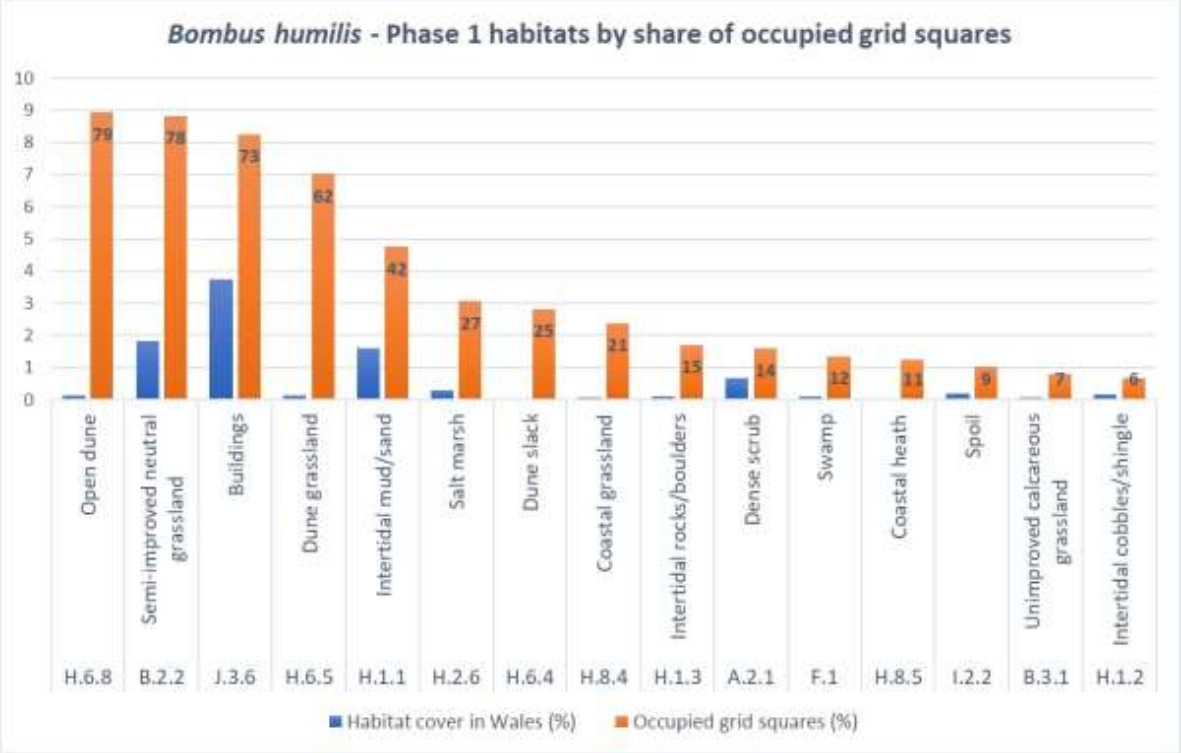


FIGURE 3.3.2. - TOP 15 HABITATS ORDERED BY SHARE OF OCCUPIED GRID SQUARES FOR *BOMBUS HUMILIS*. The y-axis units are %. The height of the blue bars corresponds to the % cover of each habitat in Wales, while the height of the orange bars corresponds to the % of the species' total occupied grid squares for which that habitat was most common. Numbers are the top of each bar are the absolute number of occupied grid squares where that habitat was most common. Results have been filtered to include only those habitats with an association value (height of orange bar relative to blue bar) of 1.5 or greater, and which were the most common habitat in at least 5 of the species occupied grid squares. Where no blue bar is showing, the % cover in Wales of that habitat class is too small to show at this scale.

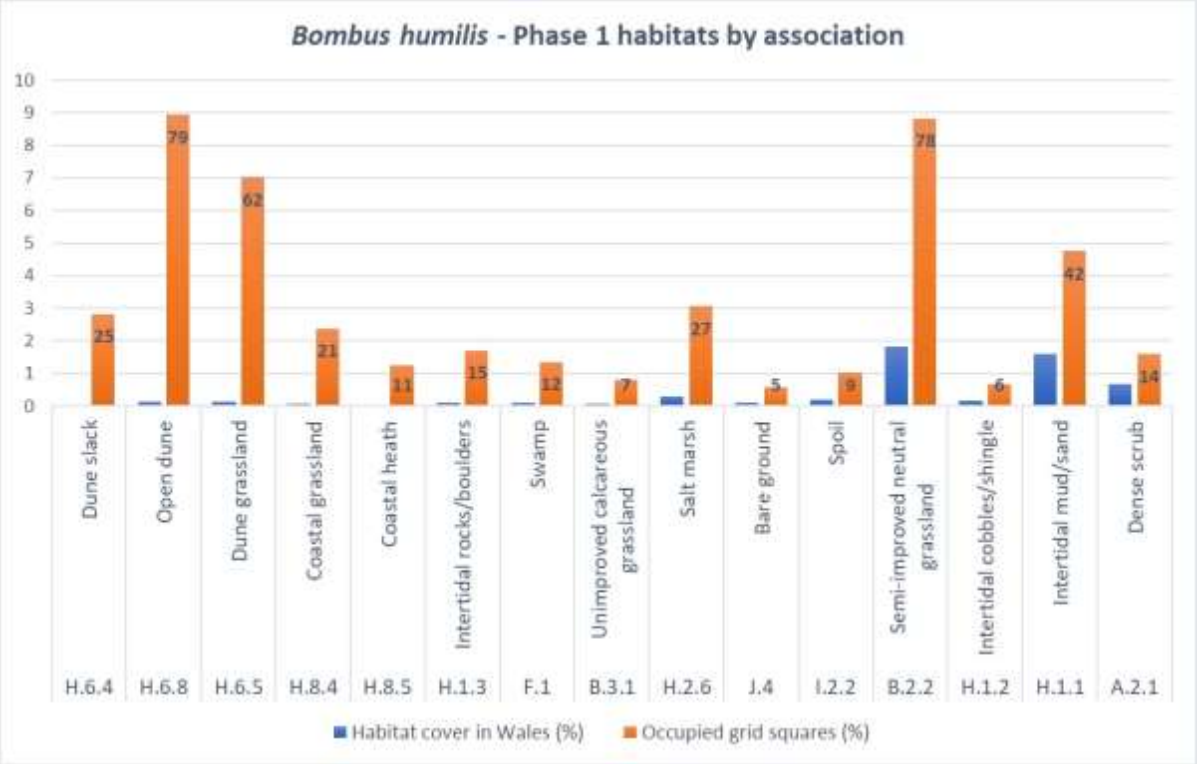


FIGURE 3.3.3. - AS FIGURE 3.3.2, BUT NOW SHOWING THE TOP 15 HABITATS ORDERED BY ASSOCIATION VALUE (height of orange bar relative to blue bar). Note that J.3.6 Buildings is no longer in the top 15.

The intention had been to also include analysis of association of the focal species with landscape types, as directed by the project brief, however, no suitable landscape classification layers were identified which would work well in the analysis. Instead, analysis has focused on habitats associations, using publicly available Phase 1 habitat mapping. The short duration of the contract and the lack of availability of appropriate additional habitat data layers meant that it was also not possible to include Phase 2/NVC information or any other similar digitised habitat layers that may be in existence.

3.3.2. Designated site analysis

An analysis was conducted to establish the proportion of each species' known range that coincides with land subject to either statutory designation (Special Area of Conservation, Special Protection Area or Site of Special Scientific Interest) or non-statutory designation (Site of Importance for Nature Conservation or Local Wildlife Site).

For each species, a flight range layer was created by applying a 1km buffer from all records and clipping this buffered layer to the mean high-water mark across Wales. Records from before 1980 or at 10km resolution were excluded. A 1km buffer was chosen to account for the typical flying ranges of bumblebees. For each species, the percentage of this buffered area that overlapped with statutory or non-statutory forms of protected site designation was then computed. For areas that simultaneously overlapped both non-statutory and statutory designated sites, only the statutory designated area was counted. Results of this analysis are shown in Figure 3.3.4. (overleaf):

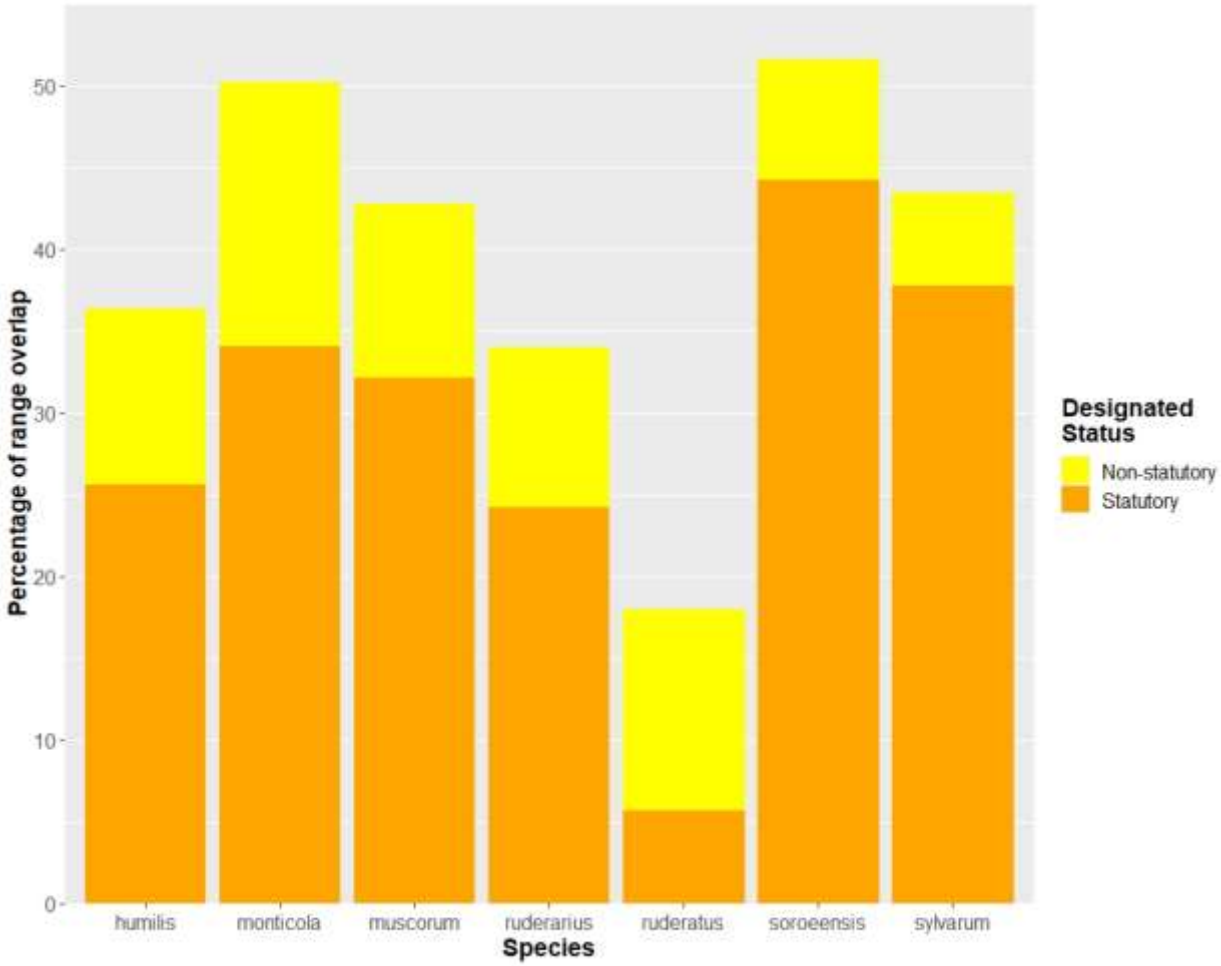


FIGURE 3.3.4. - RESULTS OF THE DESIGNATED STATUS ANALYSIS FOR THE SEVEN FOCAL SPECIES.

This analysis shows that significant parts of the known occupied range for the majority of the focal species are covered by site designations, with typically 25-45% falling within statutory sites and a further 5-15% falling in non-statutory sites. The exception is *Bombus ruderatus* for which only 5% of records fall within statutory sites (with almost 15% falling within non-statutory sites), although this species had only two post-1980 records from Wales, so there is less chance of a large area of its range falling under designated status.

It is likely that designated sites receive a greater survey intensity than do most areas without designations. Overall, however, the designated sites should perform a significant role in protecting the seven focal bumblebee species, although for five species more than half of their known ranges fall outside the designated site network.

3.4. Identification of key stakeholders and landowners

This analysis aimed to establish the proportion of each species known range that overlapped with land owned by key potential stakeholder organisations. Land ownership layers were obtained by LERC Wales staff from a number of organisations[2]. The short timescale for the current project prevented LERC Wales staff from being able to proactively identify landowners responsible for locations where focal species have been recorded. Several organisations were

[2] The following land ownership layers were obtained for inclusion in this analysis: National Trust, Ministry of Defence, Wildlife Trusts, Woodland Trust, NRW/Welsh Government Forest Estate (does not include all land owned by NRW), Royal Society for the Protection of Birds, Brecon Beacons National Park Authority, Pembrokeshire Coast National Park Authority.

approached to request a digitised land ownership boundary for use in this analysis. Alongside this, some publicly available data (such as the Welsh Government Forest Estate) was downloaded and utilised.

Using the same flight range layers created for the designated site analysis (described in section 3.3.2), the percentage of range overlap with land owned by each of the stakeholders for which we held data was computed for each species. Results are shown in Figure 3.4.1. (below).

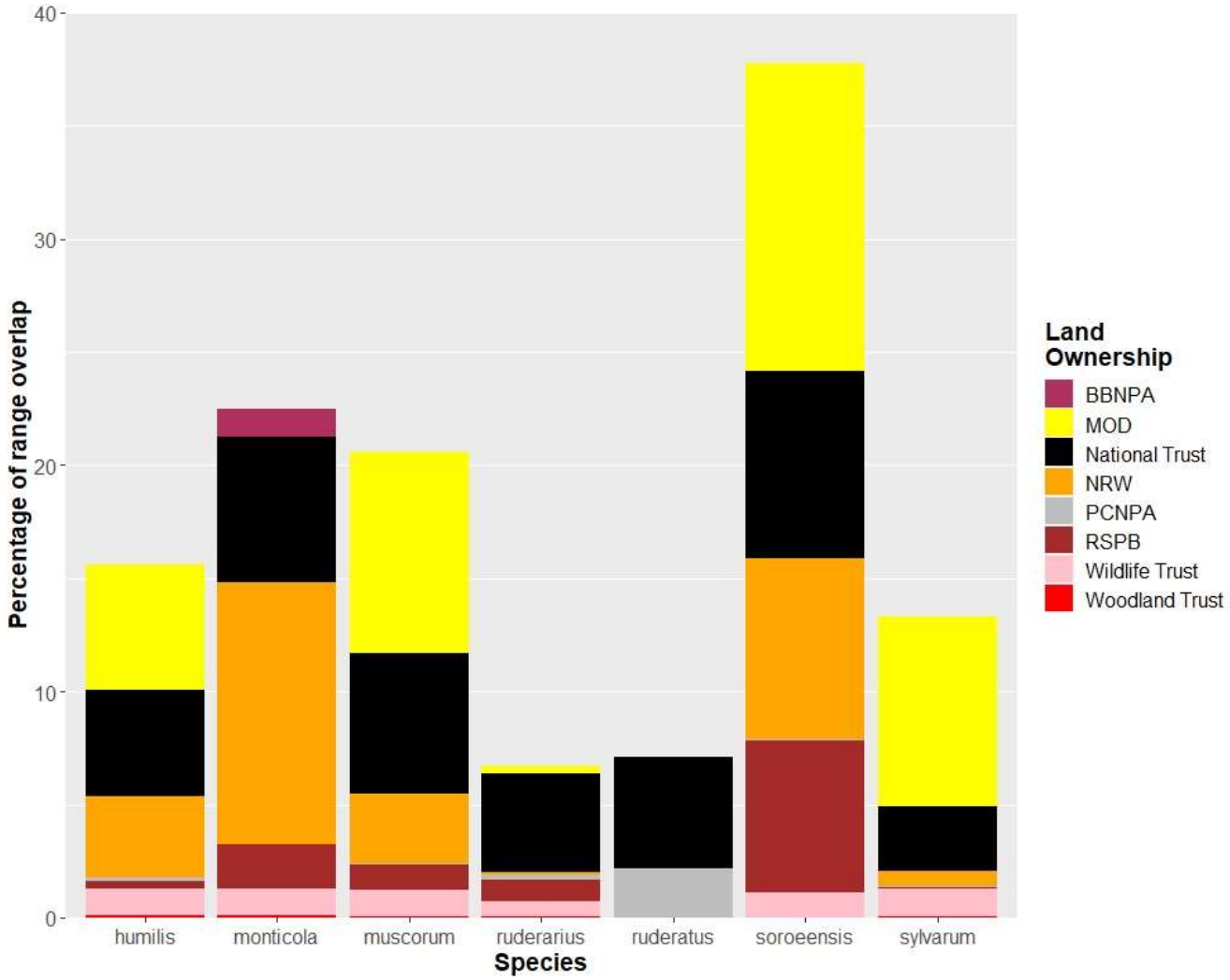


FIGURE 3.4.1. - INTERSECTION OF KNOWN FLIGHT RANGE OF THE SEVEN FOCAL SPECIES WITH LAND OWNED BY ALL STAKEHOLDERS FOR WHICH DATA WAS OBTAINED.
Key to abbreviations used: Brecon Beacons National Park Authority (BBNPA); Ministry of Defence (MOD); Natural Resources Wales (NRW); Pembrokeshire Coast National Park Authority (PCNPA); Royal Society for the Protection of Birds (RSPB).

It is clear from this analysis of a relatively small group of landowners/potential stakeholders, that some organisations have a particularly important role in the conservation of the seven focal species. National Trust land has a significant overlap with the range of all seven focal species, whilst MOD and NRW are significant stakeholders for three or more species. Whilst less significant in terms of their overall share of the range of the focal species, the Wildlife Trust have six out of the seven species occurring on or near their reserves.

Another striking feature of this analysis is how this relatively small range of landowners is responsible for a significant part of the known range of some species. The most significant is

Bombus soroeensis with over 37% of its recorded range overlapping with land owned by these organisations.

Ideally LERC Wales would have obtained more land ownership information for inclusion in this analysis, however, should further boundaries be shared (particularly following stakeholder engagement at the project webinar), the analysis will be repeated so that more organisations and individuals who have a stake in the conservation of these rare species can be identified.

3.5. Identification of priority areas for future surveys and conservation work

Taking all previous phases of this project into account, an important outcome for the project is to be able to identify priority areas for future surveys and conservation work (taken to include habitat management and restoration/re-creation work). Priority areas for future survey should be those where the data suggests presence of habitats and landscapes that are strongly associated with each of the focal species, but where the focal species have not been recorded, or have not been recorded recently, particularly where these areas have few bumblebee records. Priority areas for conservation action include existing known areas for each of the focal species and areas of suitable habitat bordering known areas, as well as those areas prioritised for further survey.

In this section methodologies developed by LERC Wales to map and identify these priority areas are described and detailed examples are given. A full set of priority area analysis outputs and interpretation for all focal species is provided in Annex 3.

Taking the habitat association analysis (see section 3.3.1) as a starting point, "Core" and "Supporting" habitats were identified and mapped for each species[3].

Core habitats are those habitat types selected as having the strongest association with each species (usually having an "Association" score of greater than 10[4], as shown in the right-hand column of the table in Figure 3.3.1. – the example table for *Bombus humilis*). Core habitats are shown in red on subsequent maps.

Supporting Habitats are those with less strong, but still significant association (usually an "Association" score of 1.5-10). These supporting habitats are shown in yellow on subsequent maps.

Figure 3.5.1. (overleaf) shows an example of a Habitat Association plot for the whole of Wales for Brown-banded Carder Bee *(Bombus humilis).* It is important to note that this plot (and other plots of a similar type shown in Annex 3) contain too much information to readily interpret when shown small enough to fit on a page or screen. They are best viewed using a GIS so that the user can zoom into smaller areas and see habitat data overlaid on meaningful base maps. Taking this into account it is still possible to interpret the maps in this report to a limited degree.

The plot shows locations of post-2000 records of *B. humilis* as large grey (10km) squares. The "core habitats" to which *B. humilis* shows the strongest association (including dune slack, open dune, dune grassland, coastal grassland and coastal heath) are shown in red whilst the "supporting habitats" to which *B. humilis* shows a less strong, but still significant association

[3] *Bombus ruderatus was excluded as there are insufficient records to allow analysis of habitat associations.*

[4] For most species, the core habitat was defined as those where the association was greater than 10. For *Bombus monticola*, the threshold for 'association' was lowered to 5, as this brought in dry acid heath, which had the most notable association.

(including bare ground, spoil and semi-improved neutral grassland) are shown in yellow. Locations of all records (including pre-2000 records) are also shown as small (1km), blue-filled squares, although it is recognised that these are hard to discern at the scale of the plot, as illustrated.

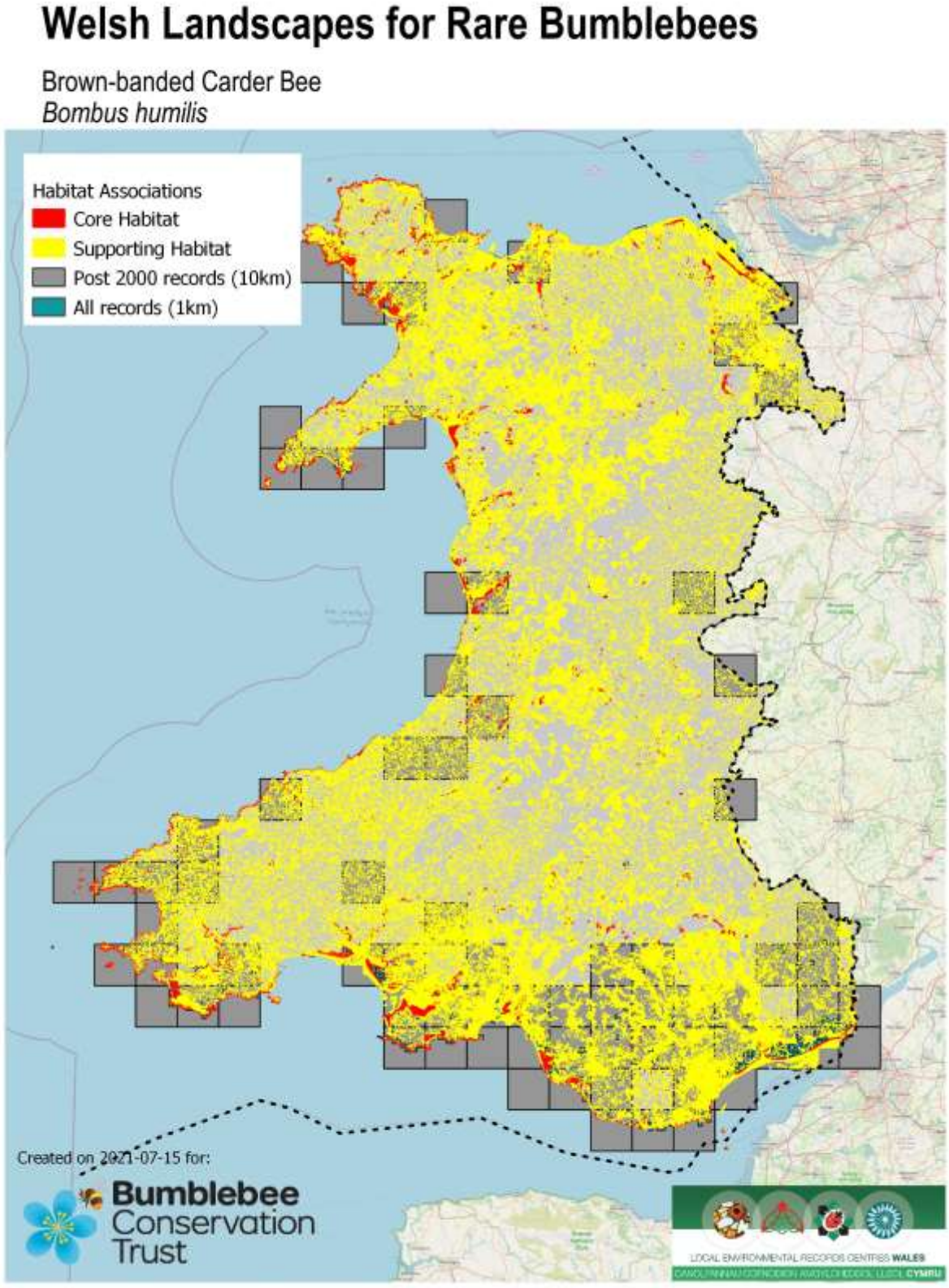


FIGURE 3.5.1. - HABITAT ASSOCIATION ANALYSIS PLOT FOR BROWN-BANDED CARDER BEE *(BOMBUS HUMILIS)*

A basic interpretation of this example map is that priority areas for future survey should be those where there are good concentrations of habitats that are strongly associated with *B. humilis*, but where it has not been recently recorded. Although much more detailed analysis at a finer scale is required, an initial assessment indicates priority areas for further survey might include: the Anglesey coast, the Lleyn Peninsula, the Gwynedd coast around Harlech, the Clwydian Range and Deeside coast, the north Pembrokeshire coast west of Strumble Head, the Carmarthenshire coast near Pendine and southern parts of the Brecon Beacons National Park.

Priority areas for conservation action might include all existing areas with recent records of *B. humilis*, plus those areas identified above.

A set of similar Habitat Association plots for all species (except *Bombus ruderatus*, which has insufficient records to analyse) is provided and interpreted in Annex 4. Constraints of project duration and report length prevent the possibility of full interpretation of each of these plots, but LERC Wales will assist BBCT with future interpretation upon request.

Figure 3.5.2. (below) is zoomed in on the area in the vicinity of Bala in Gwynedd and Corwen in Denbighshire. This example uses Bilberry Bumblebee *(Bombus monticola)* data to illustrate the utility and interpretation of the Habitat Association Analysis plots at a finer scale. (It will be possible for BBCT staff to perform this analysis themselves, as they will have access to all data layers produced during this project.)

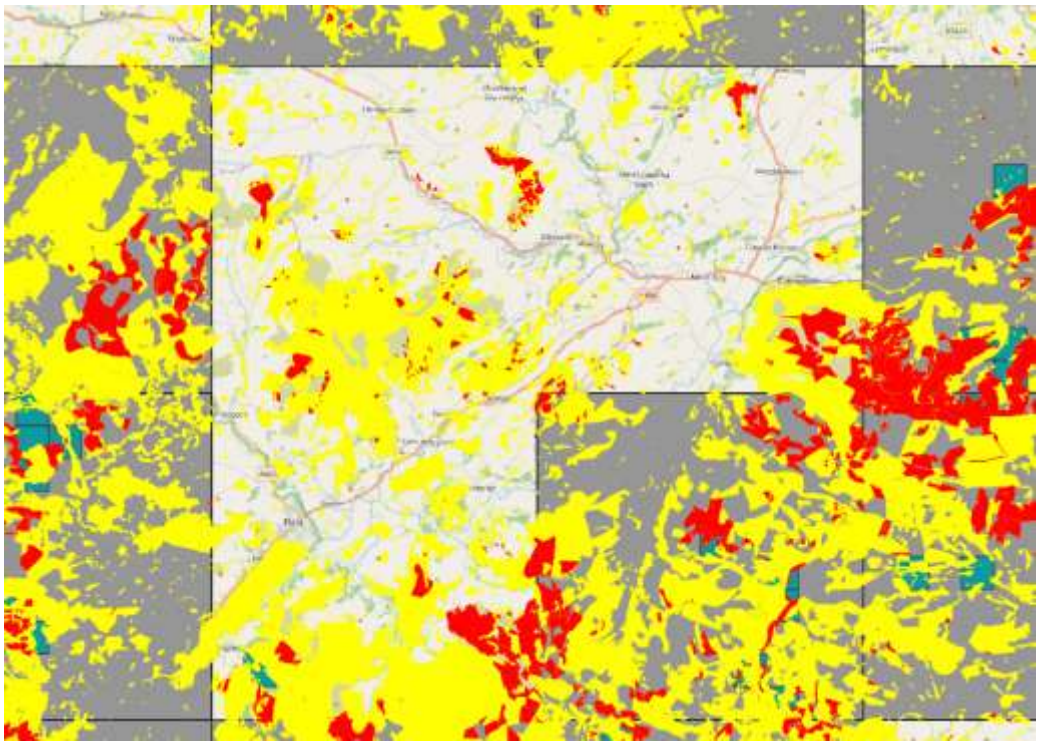


FIGURE 3.5.2. - HABITAT ASSOCIATION ANALYSIS PLOT FOR BILBERRY BUMBLEBEE *(BOMBUS MONTICOLA)*, FOCUSED ON THE VICINITY OF BALA, GWYNEDD AND CORWEN, DENBIGHSHIRE.

The plots shows that there are recent (post-2000) records in the adjacent 10km squares (large grey squares), and one older record just south of Bala Lake (smaller blue squares). The red areas show core habitats that have a strong association with *B. monticola,* and yellow areas show supporting habitats with a weaker, but still significant association with *B. monticola*. A simple interpretation of this plot suggests that it would be worth targeting survey in the three unshaded 10km squares shown in the centre of the plot, possibly prioritising locations with higher densities of core habitats (red).

A further aspect of data analysis can be undertaken by overlaying the recording intensity layer (originally illustrated in Figure 3.2.5. in section 3.2.3). In Figure 3.5.3. (below) we can see that the three blue 10km squares in the centre of the plot (these are OS squares SH93, SH94 and SJ04) have only 14, 5 and 9 *Bombus* records, respectively. Further interrogation of the recording intensity data shows that the squares all have fewer than 9 *Bombus* species recorded. These are therefore considered poorly recorded squares. The available evidence suggests that the absence of records of focal species may in part be due to low recording intensity in the area, thereby further adding to the suggestion that this would be a good area to target surveys, in this case focused on *Bombus monticola*.

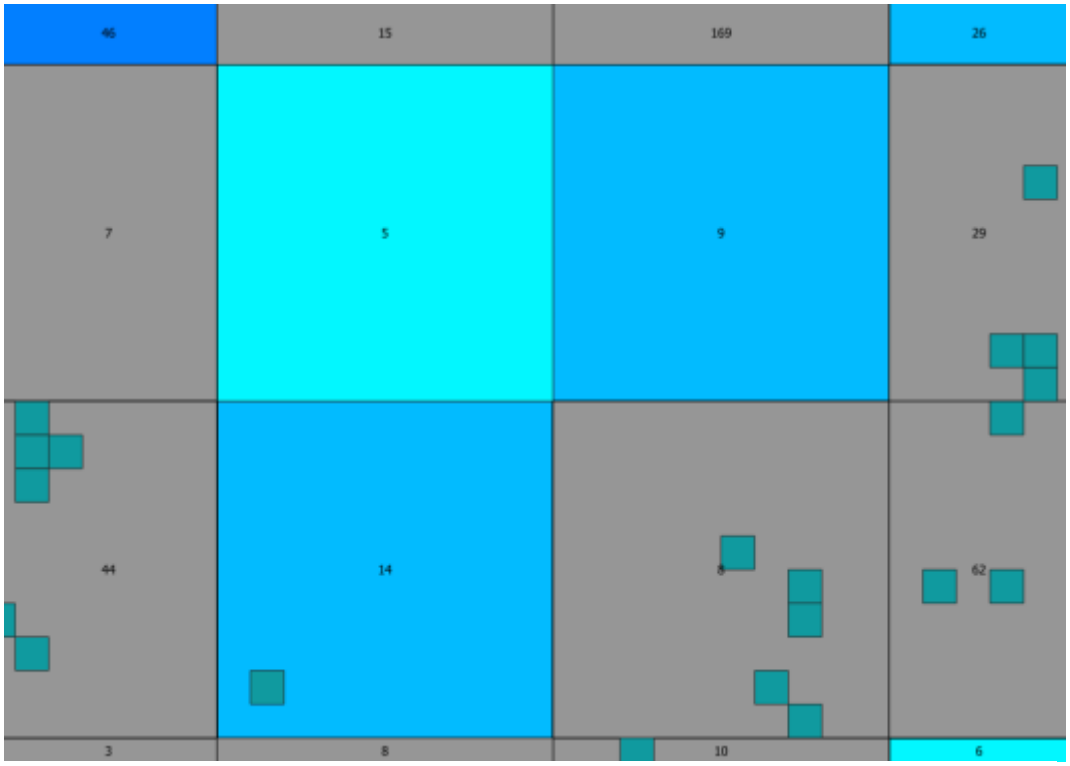


FIGURE 3.5.3. - RECORDING INTENSITY ANALYSIS (FOCUSED ON THE VICINITY OF BALA, GWYNEDD AND CORWEN, DENBIGHSHIRE), INCLUDING RECORDS OF BILBERRY BUMBLEBEE *(BOMBUS MONTICOLA)*.

As before, constraints of project duration and report length prevent the possibility of full interpretation of all potential areas for priority survey, but LERC Wales can assist BBCT with interpretation in the future upon request.

As a further example of the type of analysis that is possible using habitat association and survey effort data, Figure 3.5.4. (overleaf) looks at data for Red-shanked Carder Bee *(Bombus ruderarius)* in south Pembrokeshire.

In this area, very few of the squares that contain the red-shaded core habitats that are strongly associated with *B. ruderarius* (in this case open dunes and dune grassland) have recent records of other *Bombus* species, so locations of core habitats in this area would be worthy of targeted survey work.

Recording intensity data (introduced in section 3.2.3) is also shown in Figure 3.5.4. This shows that some 10km squares in the area have many more records of *Bombus* species than others.

For instance, the 10km square to the west which is between grey squares with recent records of *B. ruderarius* and has some core habitat present (this is SR99 which contains Castlemartin Ranges, Bosherton and Stackpole). It has 536 existing *Bombus* records on the LERC Wales database and so is considered well-recorded. This possibly suggests that *B. ruderarius* is not present here at a level above the threshold of detection. Other 10km squares further east (SN20 and SN30, containing Pendine Sands and Pembrey) support core habitat, but are significantly less-intensively studied with only 24 and 71 *Bombus* records, respectively. These may warrant further targeted survey for *B. ruderarius*.

FIGURE 3.5.4. - HABITAT ASSOCIATION ANALYSIS AND RECORDING INTENSITY PLOT FOR RED-SHANKED CARDER BEE *(BOMBUS RUDERARIUS)*, FOCUSED ON THE SOUTH COAST OF PEMBROKESHIRE AND

3.6. Summary of priority areas for future survey

Some key findings of this analysis are summarised in tabular form in Figure 3.5.5. overleaf. This table summarises information collated in the preceding analysis of potential priority areas for future survey. Please note, this does not represent an exhaustive list of known locations for each species, but rather areas identified as possible locations for survey. Where a species is known to occur in an area this is indicated by a tick, however not all locations that each species is recorded in are described, for example, the upland areas favoured by *Bombus monticola* are not exhaustively listed, nor is an area such as the Gwent Levels listed for *Bombus sylvarum*, as this location was not identified as a priority survey area for any of the other focal species.

Locations are ordered by their approximate location if travelling clockwise around Wales from south-east to north-east.

This summary table shows that some parts of Wales have been identified as priority areas for targeted survey for several species. For instance, many coastal areas show as priorities for survey for between 2 and 5 focal species. Examples include:

- **Gower:** Despite being well-recorded, parts of Gower have been identified as a target location for surveys for 4 species, including *Bombus sylvarum* which has strongholds in south Pembrokeshire and the Bridgend coastal dunes, but has not been recorded on similar dune sites on Gower. Detailed analysis of each species priority map will be required to target specific sites for survey.

- **Carmarthenshire Coast:** Identified as a target location for surveys for 5 species.
- **Anglesey Coast:** Identified as a target location for surveys for 3 species.

	LOCATION IDENTIFIED IN PRIORITY AREA ANALYSIS															
SPECIES	EASTERN VALLEYS	BRECON BEACONS NATIONAL PARK (CENTRAL)	BRECON BEACONS NATIONAL PARK (SOUTH)	BRIDGEND COASTAL DUNES	GOWER	CARMARTHENSHIRE COAST (PENDINE/PEMBREY)	SOUTH PEMBROKESHIRE (CASTLEMARTIN)	NORTH PEMBROKESHIRE COAST	WEST WALES COASTLINE	CAMBRIAN MOUNTAINS	SNOWDONIA NATIONAL PARK (SOUTH)	BALA TO CORWEN	SOUTH GWYNEDD COAST (HARLECH)	LLEYN PENINSULA	ANGLESEY COAST	CLYWYDIAN RANGE & DEE ESTUARY
Brown-banded Carder Bee *(Bombus humilis)*	✓		■	✓	✓	■	✓	■	✓	✓			■	■	■	■
Bilberry Bumblebee *(Bombus monticola)*	■	■	✓		✓					✓	■	■	✓	✓		✓
Moss Carder Bee *(Bombus muscorum)*				✓	✓	✓	✓	✓	■	■	■		✓	✓	✓	
Red-shanked Carder Bee *(Bombus ruderarius)*				■	■	■	■						□		■	
Large Garden Bumblebee *(Bombus ruderatus)*				✓	■	■	✓									
Broken-banded Bumblebee *(Bombus soroeensis)*				■	■	■	■	■	■				■	■	■	✓
Shrill Carder Bee *(Bombus sylvarum)*				✓	■	■	✓		□				□	□	□	

✓ = Known location
■ = Priority for targeted survey
□ = Outside current known range (lower priority)

FIGURE 3.5.5. – SUMMARY ANALYSIS OF PRIORITY AREAS FOR FUTURE SURVEY

Further analysis involving designations and land ownership information would also be possible using data supplied to BBCT[5], in order to prioritise survey efforts and conservation action. This may entail targeting land owned or managed by key stakeholders that are engaged and keen to help conserve the focal bee species, or it may entail targeting efforts on more vulnerable land which currently lies outside the designated sites network.

3.7. Policy Context and Delivery Opportunities

In order to deliver improvements on the ground for the focal bumblebee species, it is essential that BBCT and stakeholders are aware of the key spatial planning and policy frameworks which provide context for bumblebee conservation efforts in Wales, as well as potential mechanisms for delivery.

This section aims to audit and review a range of key policy drivers affecting biodiversity conservation in Wales, including national and local Nature Recovery Action Plans, Area Statements, green infrastructure assessments, agri-environment schemes and planning policy.

[5] Only limited land ownership information may be shared directly with BBCT due to copyright and other restrictions on use and onward sharing. Land ownership data will be shared where it is in the public domain or where appropriate permissions are in place. Where such information cannot be shared, LERC Wales still has permission to utilise the data for the purposes of this project and therefore further interpretation may be undertaken on behalf of BBCT after the completion of the project, upon request.

Suggestions of opportunities for engagement and delivery via these mechanisms are made as a means of not only increasing the visibility of status of rare bumblebees, but also for achieving practical conservation outcomes.

The full review of the range of policies, programmes and projects is included in Annex 4. This review covers the following:

- **Welsh Government national legislative measures and initiatives:**
  - Well-being of Future Generations (Wales) Act 2015
  - Environment (Wales) Act (2016)
  - Planning Policy Wales 11.0 (2021)
  - Nature Recovery Action Plan (Wales) (2020)
  - Pollinator Task Force & Action Plan for Pollinators Review and Future Action (2018)
  - Agri-environment Schemes
  - Climate Emergency (Wales, 2019) and Nature Emergency (Wales, 2021)
  - Payment for Ecosystem Services (PES)

- **Natural Resources Wales (NRW) projects and initiatives:**
  - Area Statements
  - Vital Nature
  - NRW Business Plan Nature Emergency Objectives
  - Natur am Byth (lead partner, working with BBCT and other eNGOs)
  - Nature Networks Project
  - Managing the NRW estate

- **Local Authorities:**
  - Local Development Plans (LDPs)
  - Green Infrastructure (GI) and Pollinator Action Plans
  - Local Site Designation
  - Local Nature Recovery Action Plans (LNRAPs)
  - Local Places for Nature (LPfN)

- **Other projects and initiatives:**
  - Bee Friendly Scheme
  - B-Lines
  - UK Pollinator Monitoring Scheme (PoMS)
  - Saving Pollinators Programme

This audit and review of relevant policy is by no means comprehensive[6], but it does highlight the large number of successes that have resulted from sustained effort of pollinator awareness campaigns. Supportive legislation, policies, plans and initiatives exist at the national, regional and local scales across Wales. BBCT is an active partner in many of these programmes.

There are also many current and emerging opportunities for BBCT to engage with partners and stakeholders to raise the profile of rare bumblebees and to agree actions and policies to encourage their conservation. Prime examples include:

- **Action Plan for Pollinators in Wales:** BBCT is a key partner in delivering identified actions, as a member of the Wales Pollinator Task Force.

[6] A complete review of all local authority GI and pollinator plans, LDPs, etc. has not been completed. This would require significant additional time because of the varied state and complexity of these documents. However, Section 6 reports available on the Wales Biodiversity Partnership website have been reviewed and known initiatives have been mentioned where possible.

- **Payment for Ecosystem Services (PES):** As the regulatory framework for PES develops, BBCT will be able to use this incentive to influence investment in conservation of bumblebee habitats, whilst engaging landowners and managers.
- **Area Statements:** Opportunities for further involvement as Area Statements begin to engender nature recovery action.
- **NRW Nature Networks project:** Opportunity to influence plans during the 2021 stakeholder engagement phase. The results of the current study should enhance the knowledge base of the Nature Networks programme.
- **Natur am Byth:** BBCT is an existing partner, so is well placed to maximise the potential of the project to deliver for rare bumblebees.
- **Local site identification:** BBCT could play a more active role in pushing for SINC designation for locations where data collated and supplied as part of this project demonstrates that there are strong populations or concentrations of rare bumblebee species outside existing designated sites.
- **Local Nature Recovery Actions Plans (LNRAPs):** Currently being produced as part of the Local Nature Partnerships (LNP) Cymru project. BBCT engagement in priority areas for rare bumblebees could ensure that actions are identified in emerging LNRAPs.
- **Pollinator Monitoring Scheme (POMS):** Further uptake of POMS could be promoted as a potential means of filling gaps in known distribution of the focal bumblebee species in Wales.
- **Bee Friendly:** Promoting initiatives such as Bee Friendly and Monmouthshire County Council's "Nature Isn't Neat" project could benefit rare bumblebees by raising the profile of bumblebees and building stakeholder engagement and enthusiasm.

Through this review, LERC Wales has identified a clear need for a single, centralised repository for pollinator-related information across Wales, including GI assessments, pollinator action plans, projects, and relevant conservation efforts. The Wales Pollinator Task Force may be best placed to act as the central point of contact across Wales while the Wales Biodiversity Partnership website could host the relevant information (as it already holds some of it). This information could be included in an interactive, searchable map, similar to what is being developed by the Local Nature Partnerships Cymru project to map other local nature recovery projects and activities. This would make it easier for organisations like BBCT to quickly assess the status of rare bumblebee conservation efforts and help target geographic areas and project partners.

3.8. Webinars

Two webinars were planned and delivered by the LERC Wales team (with support from BBCT staff) during the final weeks of the contract with the aims of raising the profile of this project and the status of rare bumblebees in Wales, as well as engendering positive action for their protection and conservation.

The first was a webinar (actually run as a Zoom meeting, rather than a webinar, due to small numbers) for BBCT staff and trustees which took place on 12/07/2021 (attended by 22 people). This was only advertised internally within BBCT and was recorded and shared for those staff and trustees who were unable to attend.

The second webinar was a stakeholder engagement event which took place on 15/07/2021 (attended by 68 people). This event was promoted to all organisations and individuals who were considered potential stakeholders in the delivery of future recording and conservation efforts for the seven focal species. A copy of the flyer produced to promote the webinar is included in Annex 4. Organisations and individuals approached included those that had provided data, those who were asked for land ownership information, project funders, staff of environmental NGOs, Natural Resources Wales and Welsh Government, as well as those

engaged with Local Nature Partnerships across Wales. A final promotion via social media took place with many retweeting the booking link for the stakeholder webinar. A recording of the event was made to be shared on the BBCT YouTube channel where it will be accessible to those interested parties who could not attend the webinar.

4. CONCLUSIONS

This project has assembled a new and accurate baseline for understanding the status of the seven focal bumblebee species in Wales.

This data has been presented and analysed in innovative ways to assess the habitat associations of each species and the extent to which locations where the species occur are protected by site designations.

Additionally, the species data has been overlaid on land ownership data to identify key stakeholders in the delivery of initiatives to conserve rare and threatened bumblebees.

Spatial analysis of habitat data alongside species records and considerations of recorder effort have been used to demonstrate how priority areas may be identified for further species survey and for conservation action.

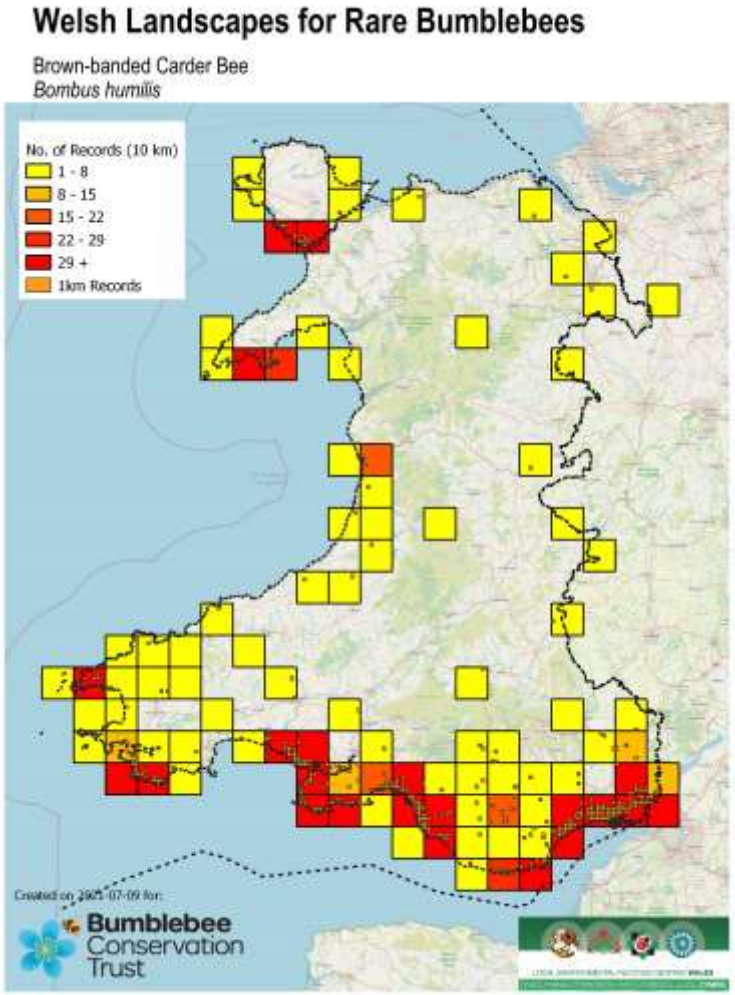
Finally, a review of a range of key policy drivers and initiatives affecting biodiversity conservation in Wales was undertaken and some of the most relevant opportunities for engagement and action were highlighted.

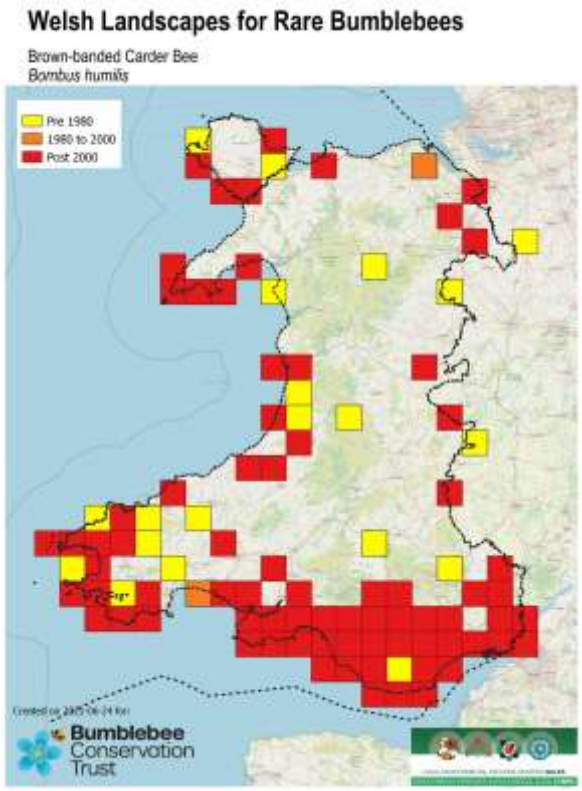
The project, which was commissioned and completed entirely during Covid-19 pandemic restrictions, has demonstrated the immense value and potential of new ways of collaborative and environmentally sensitive working, with 100% of meetings, discussions and presentations taking place virtually.

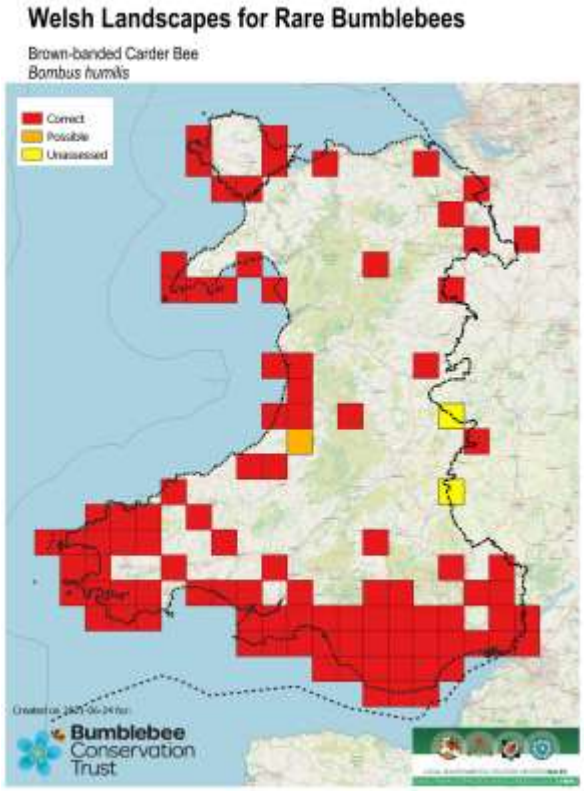
ANNEX 1 – SPECIES DISTRIBUTION MAPS

Brown-banded Carder Bee *(Bombus humilis)*

Bombus humilis shows a strong coastal distribution in Wales, with biggest concentrations of records all along the south coast from Pembrokeshire to Monmouthshire, and with additional concentrations of records on Anglesey and the Lleyn Peninsula. There is also a scattering of records along the mid Wales coast and along the length of the borders. The time-banded analysis (middle map) suggests that there may be a slight decline in range with the most significant areas with older records, but no recent records, being in Pembrokeshire and mid Wales. Most of the records are verified for this species (see right map).

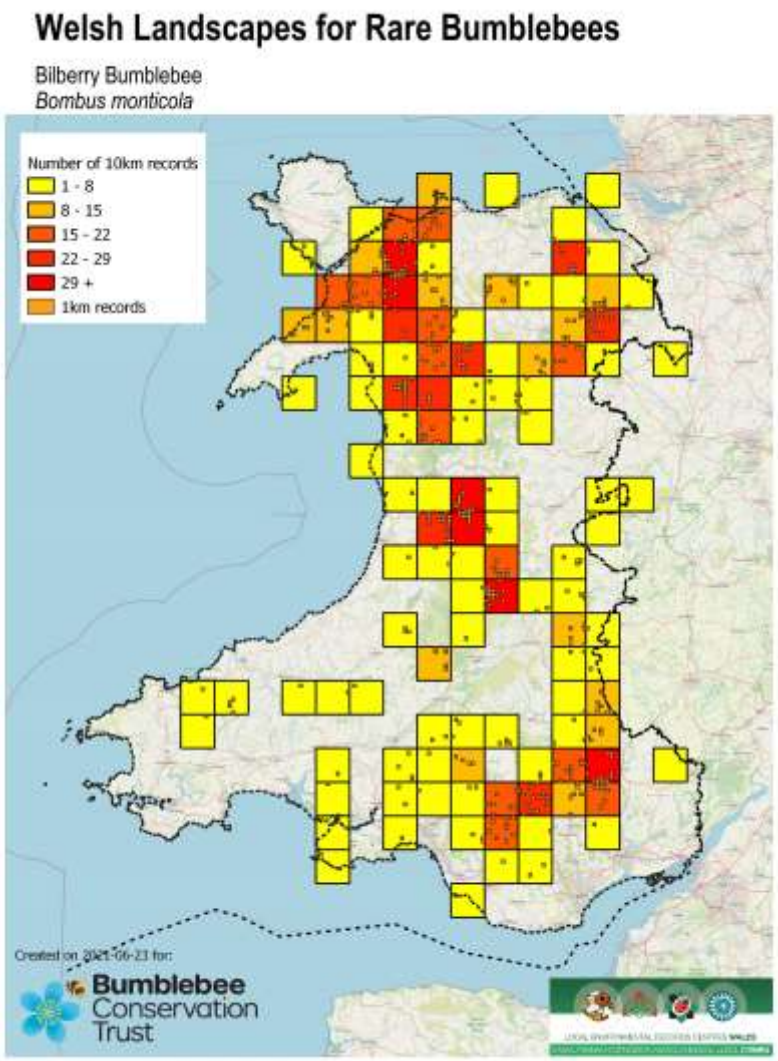


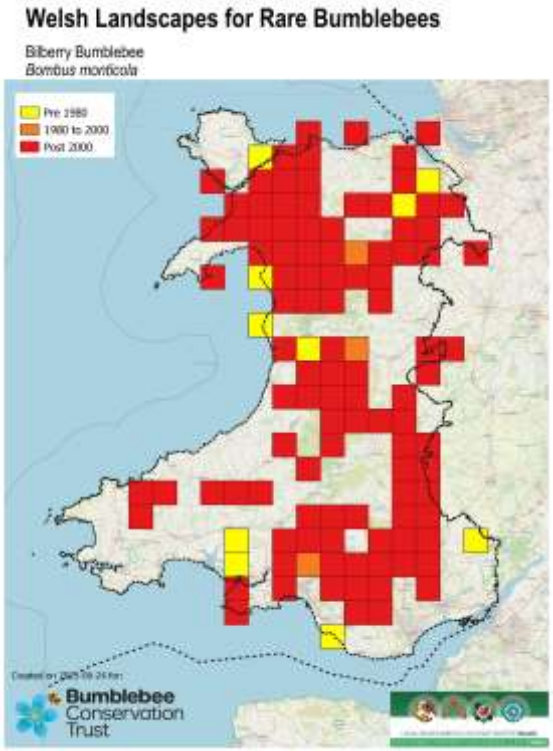


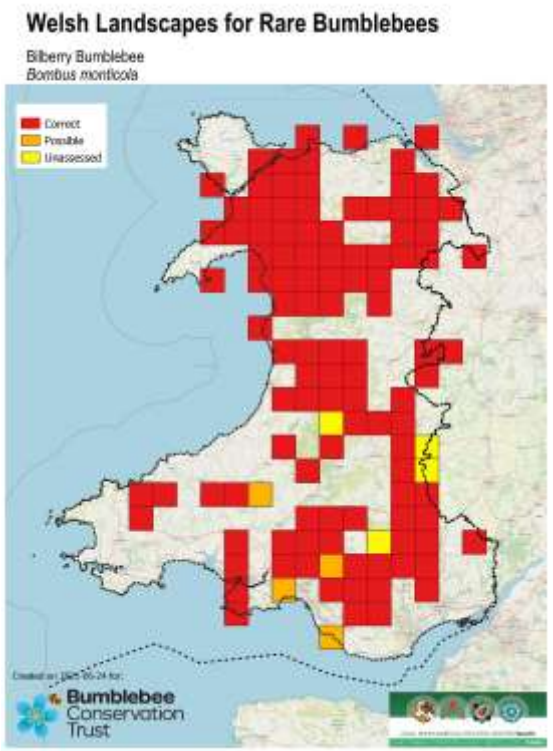


Bilberry Bumblebee *(Bombus monticola)*

Bombus monticola shows a strong inland and upland distribution in Wales, with biggest concentrations of records across north Wales into mid Wales and in the south Wales coalfield. A lower concentration of records occurs across much of south-east Wales and the borders, but with only occasional records in south-west Wales. The time-banded analysis (middle map) suggests no likely decline in range, although there are scattered locations with older records, but no recent records. Most of the records are verified for this species (see right map), although there are scattered records in the southern half of Wales which are either classed as unassessed or possible.

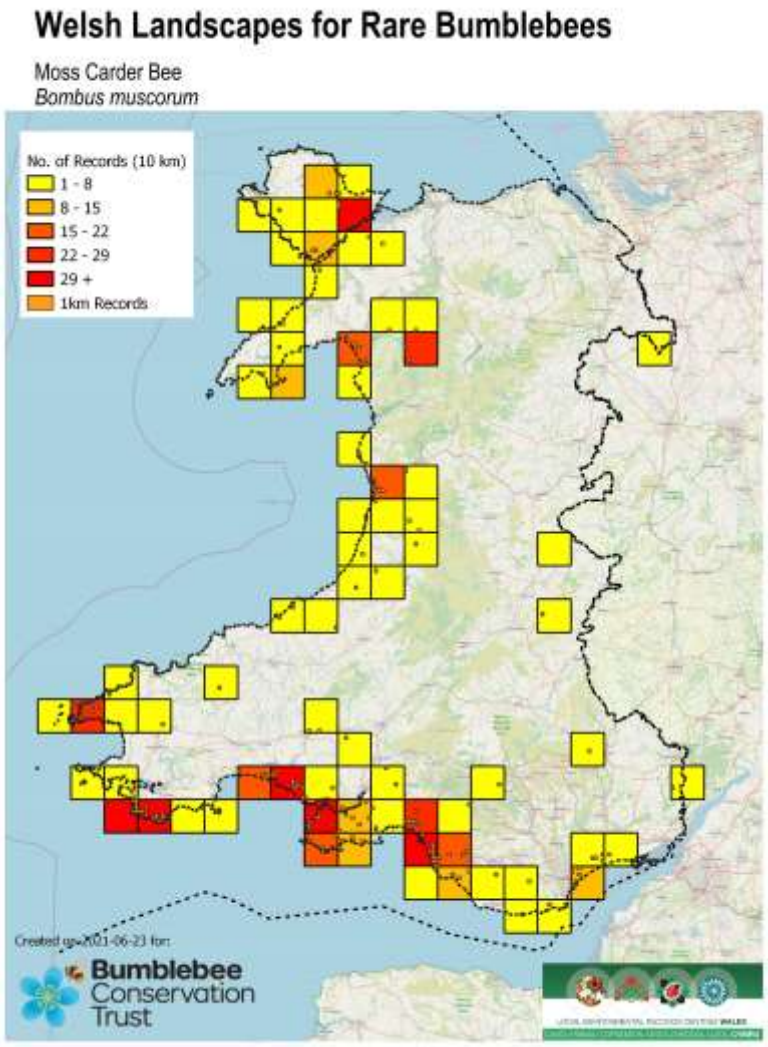


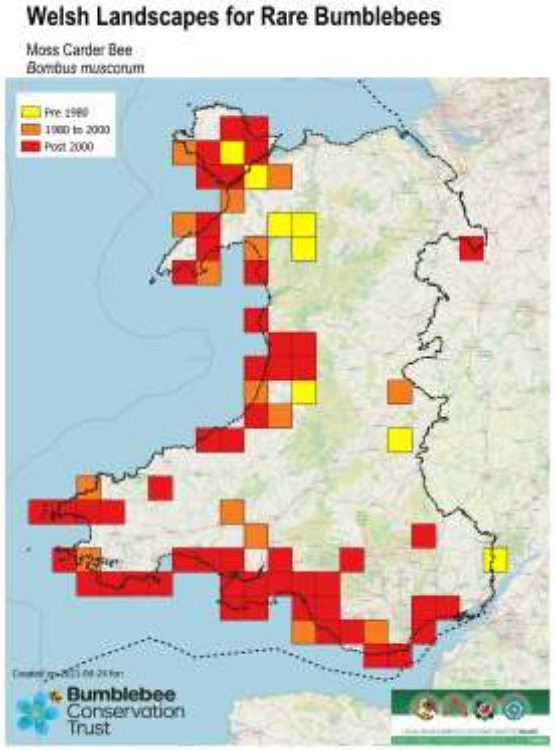


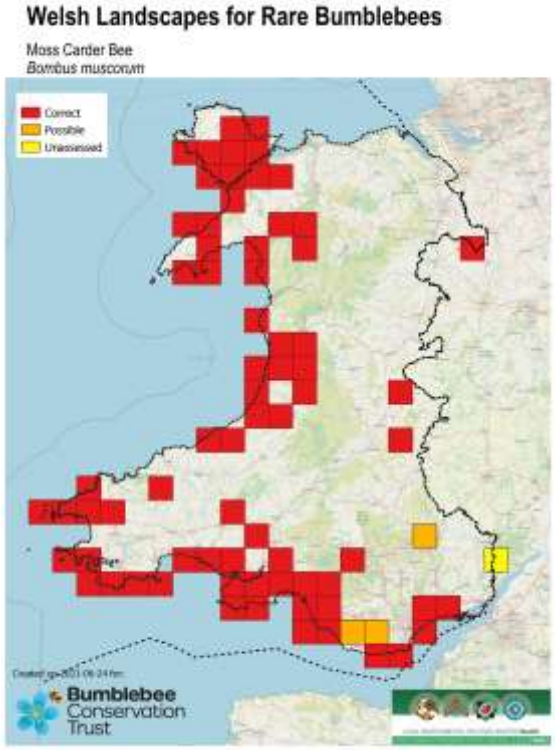


Moss Carder Bee *(Bombus muscorum)*

Bombus muscorum shows a strong western and coastal distribution in Wales, with biggest concentrations of records all along the south coast from Pembrokeshire to Bridgend, and with a further concentration of records on Anglesey and lower density records along much of the rest of the Welsh coast, with the marked exception of the north Wales coast east of Bangor. There is also a scattering of records in the borders and inland areas of south and west Wales. The time-banded analysis (middle map) suggests that there may be a decline in range with the most significant areas with older records, but no recent records, being in north Wales (Snowdonia and Anglesey). Most of the records are verified for this species (see right map), except for a few in south-east Wales.

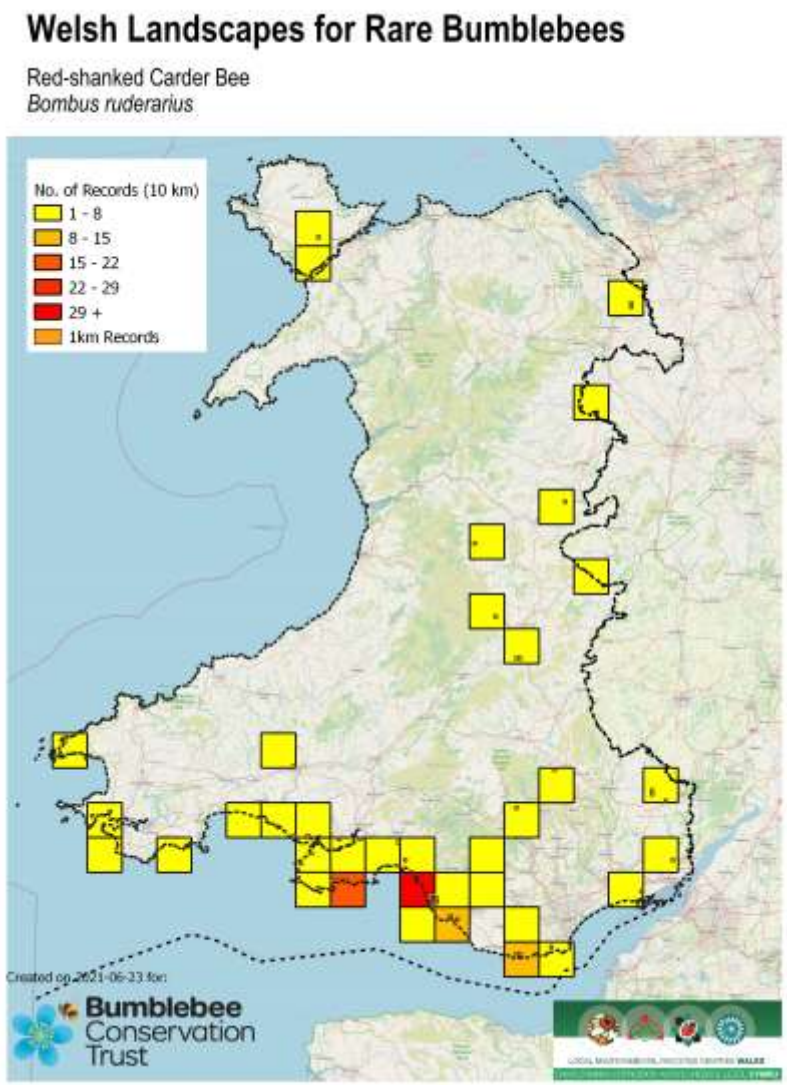


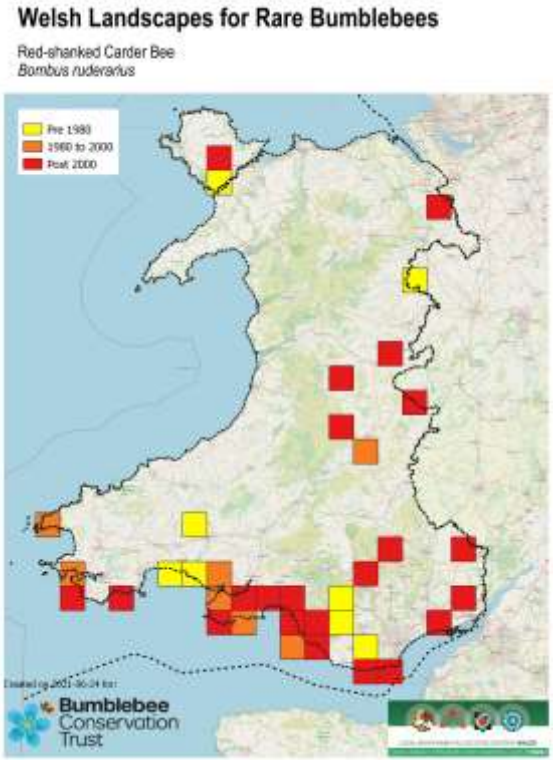


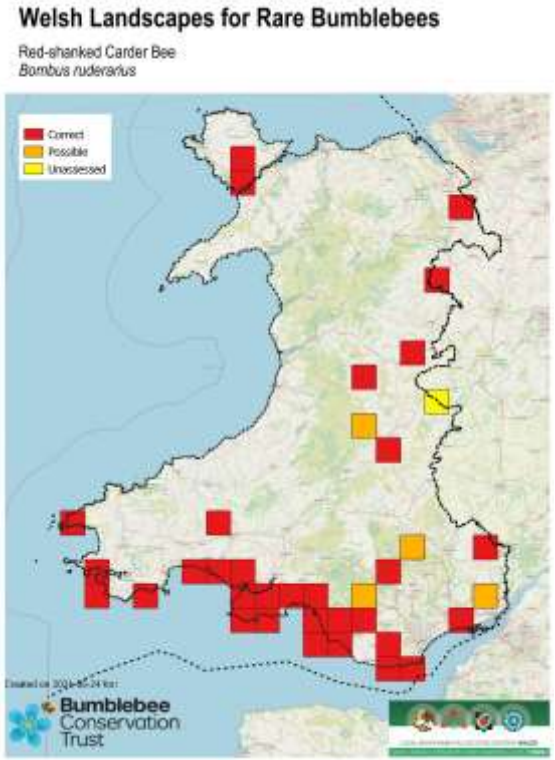


Red-shanked Carder Bee *(Bombus ruderarius)*

Bombus ruderarius shows a mainly southern distribution in Wales, but with a scattering of records in the Marches and on Anglesey. Record density is generally low with only 1-8 records in most 10km squares where it is recorded. The strongest concentrations of records occur on the Bridgend coast and the south Gower coast. The time-banded analysis (middle map) suggests a decline in range with several areas with older records, but no recent records, particularly in Carmarthenshire and the south Wales valleys. Most of the records are verified for this species (see right map), except for a few in south-east and mid Wales.

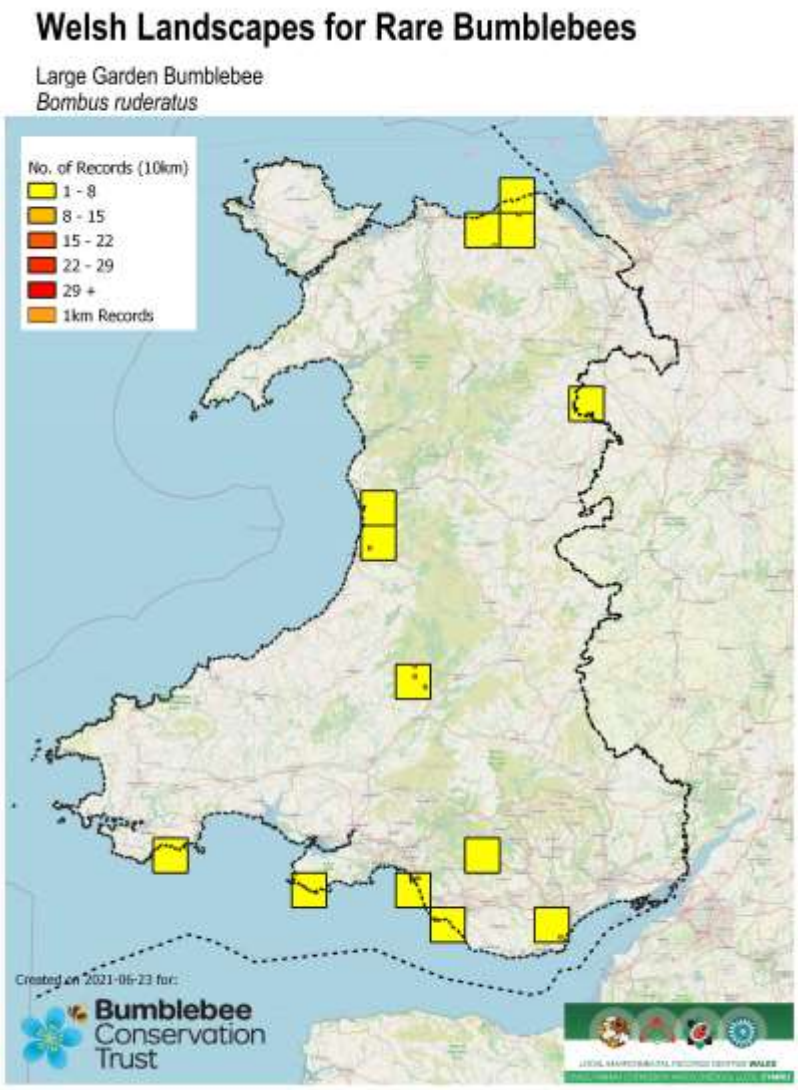


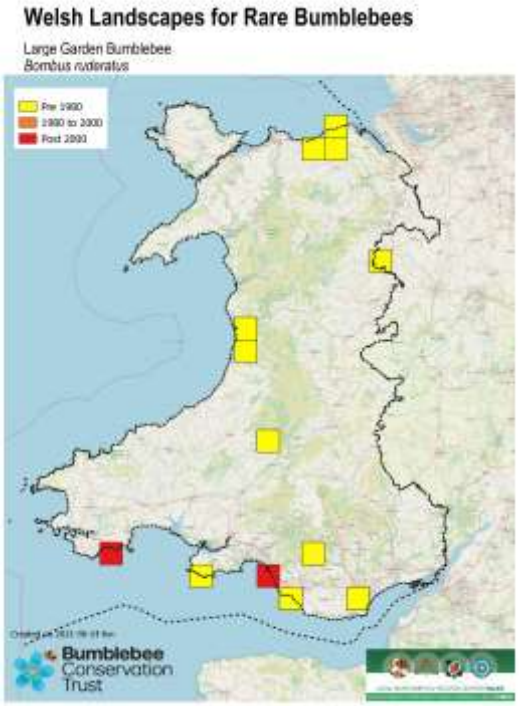


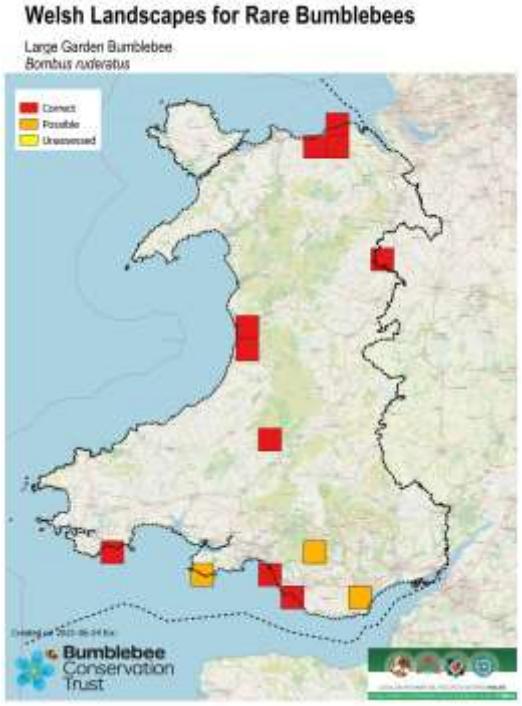


Ruderal/Large Garden Bumblebee *(Bombus ruderatus)*

Bombus ruderatus shows a very sparse and rather scattered distribution in Wales with no single 10km square having more than 8 records. Main locations include the north-east coast, the south coast and the mid Wales coast, with a further small concentration of records in one 10km square in the Cambrian Mountains. The time-banded analysis (middle map) shows a very significant story of decline in range with the species only recorded in two 10km squares since 2000. The majority of records are verified for this species (see right map), with a few classed as possible in south Wales. Post-2000 record locations are both verified.

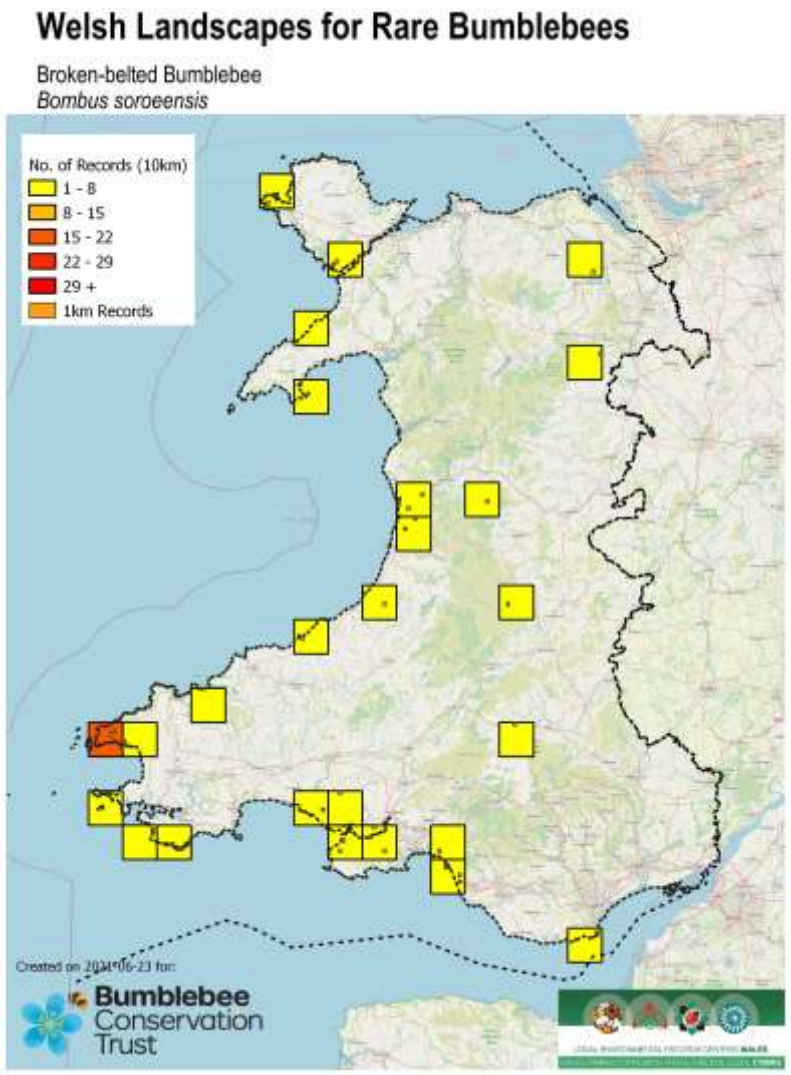


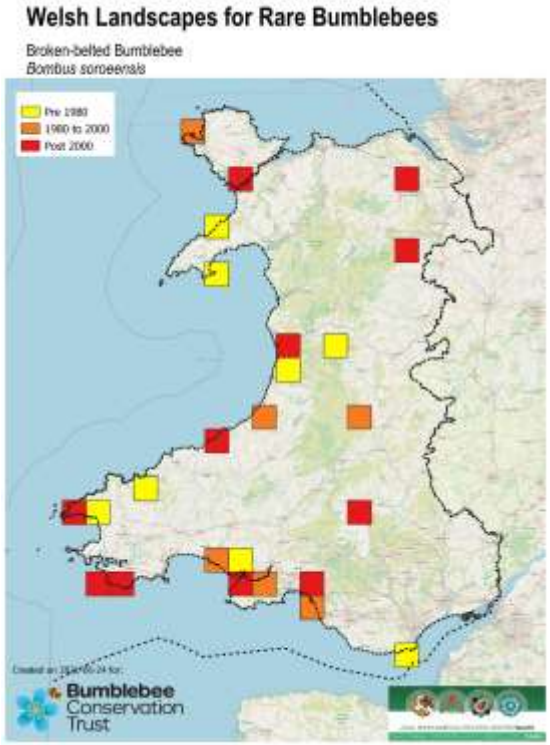


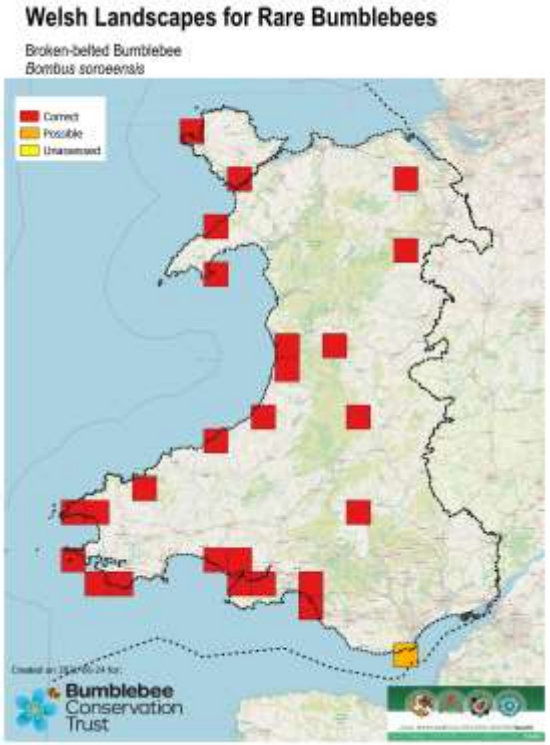


Broken-belted Bumblebee *(Bombus soroeensis)*

Bombus soroeensis shows a somewhat sparse distribution in Wales with only a single 10km square having more than 8 records. There is a distinct coastal bias, with records around the coast from Anglesey to the Vale of Glamorgan. In addition, there are a few scattered records in mid and north Wales. The time-banded analysis (middle map) suggests a likely decline in range with post-2000 records in only around half of all 10km squares across its recorded range. Almost all records are verified for this species (see right map).

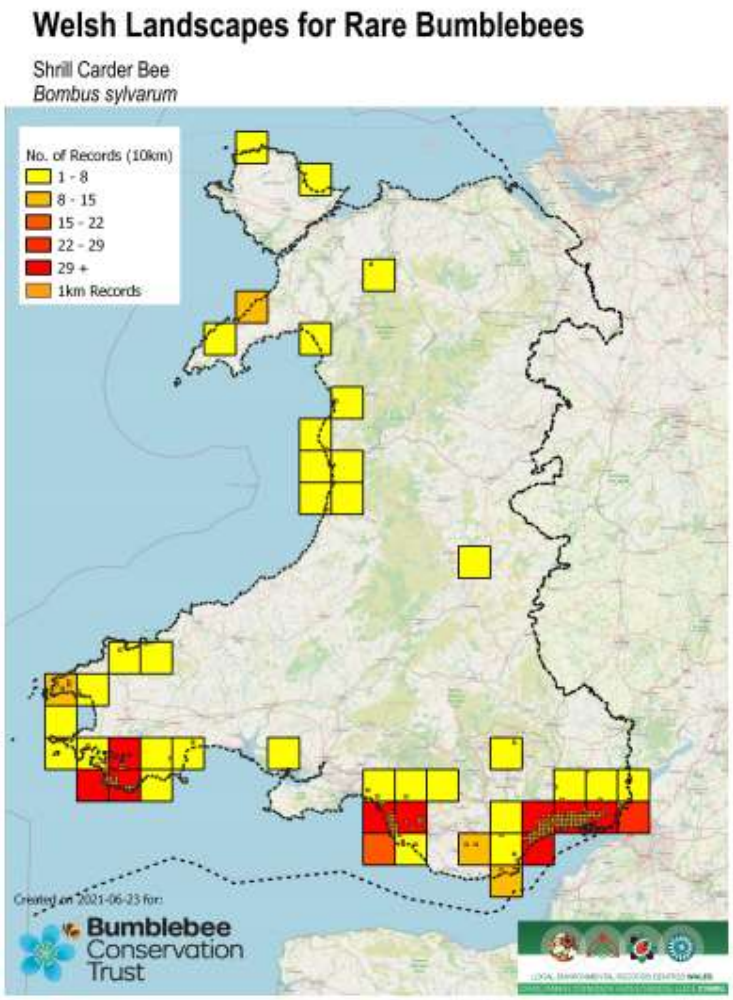


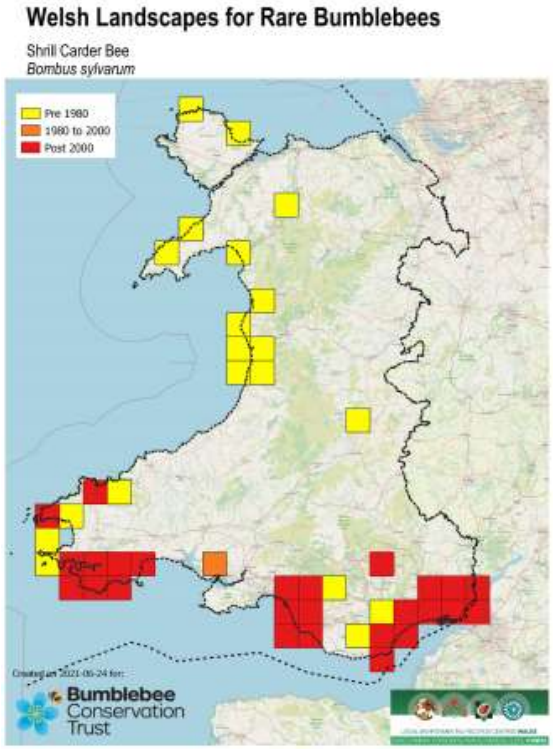


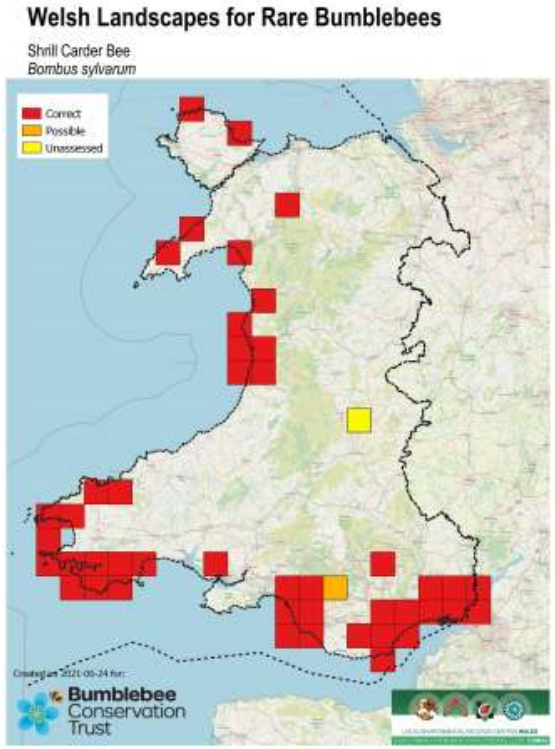


Shrill Carder Bee *(Bombus sylvarum)*

Bombus sylvarum shows a strong coastal distribution in Wales, with biggest concentrations of records in patches along the south coast from Pembrokeshire to Monmouthshire, and with a lower density of further records on the mid and north-west Wales coast. The time-banded analysis (middle map) shows a very strong indication of range contraction with no post-1980 records in the northern half of Wales. The species is now centred on three south Wales locations in Pembrokeshire, the Glamorgan coast around Bridgend and Neath Port Talbot, and the Gwent Levels. The great majority of the records are verified for this species (see right map).



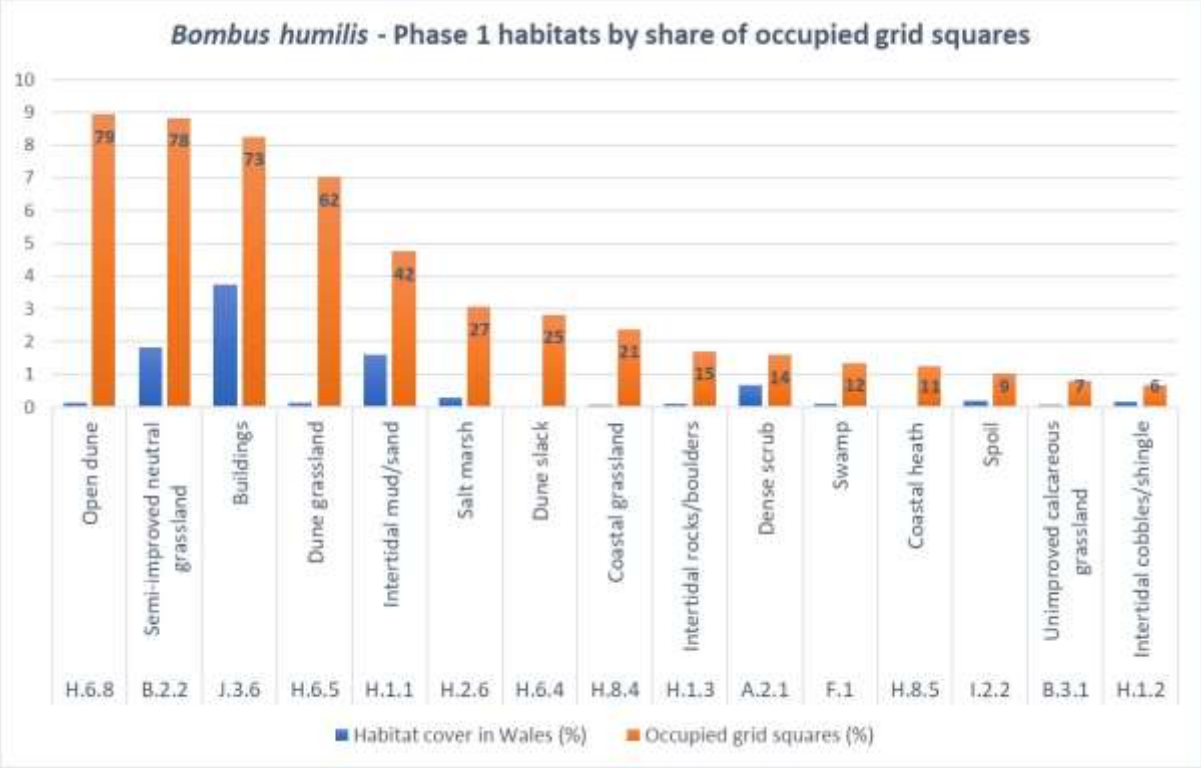




ANNEX 2 – HABITAT ASSOCIATION ANALYSIS OUTPUTS

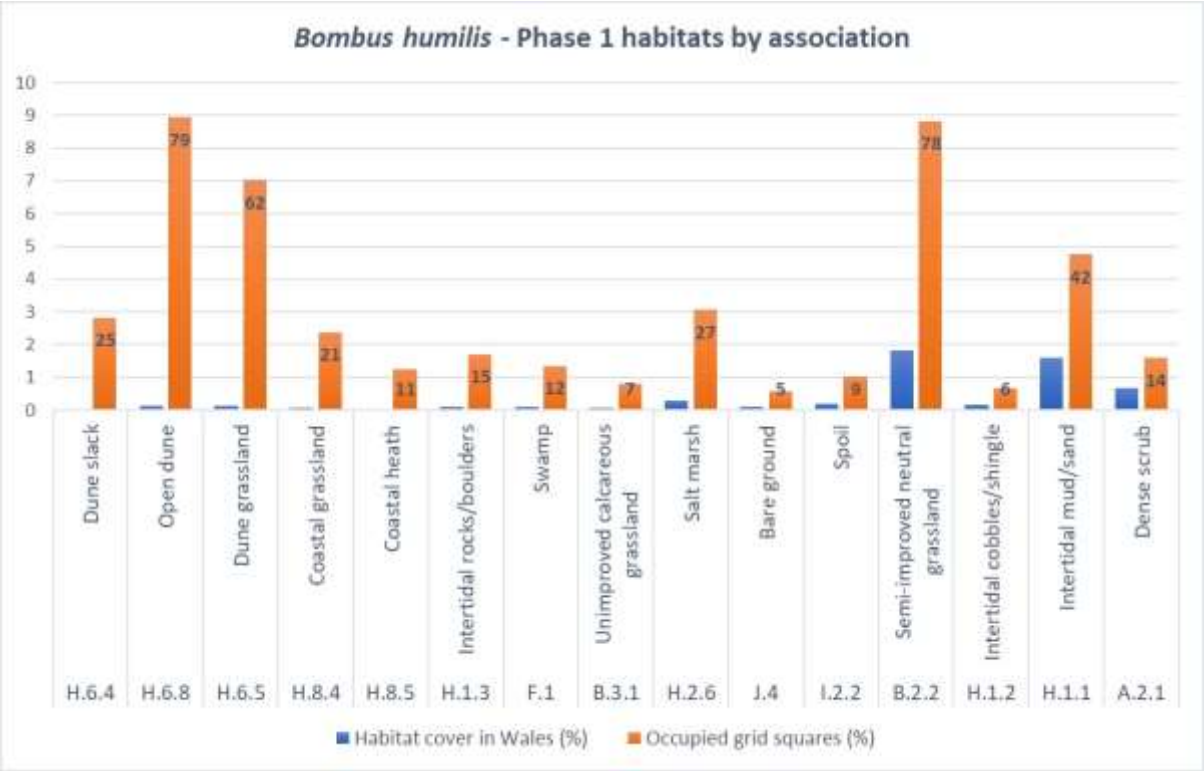
Introduction

Results of the habitat association analysis are displayed in bar charts below, for six of the seven focal species. *Bombus ruderatus* was excluded due to insufficient data. Habitats are ordered by percentage share of occupied grid squares for which each habitat was most common and by association value. For all species, results were filtered to include only habitats with an association value of 1.5 or greater. For all species except *B. ruderarius* and *B. soroeensis*, results were further filtered to include only habitats which were most common in at least 5 of the species occupied grid squares. If there were more than 15 habitats after filtering, only the top 15 are displayed. The apparent absence of a blue bar indicates the % cover of the habitat is too small to be displayed at this scale.



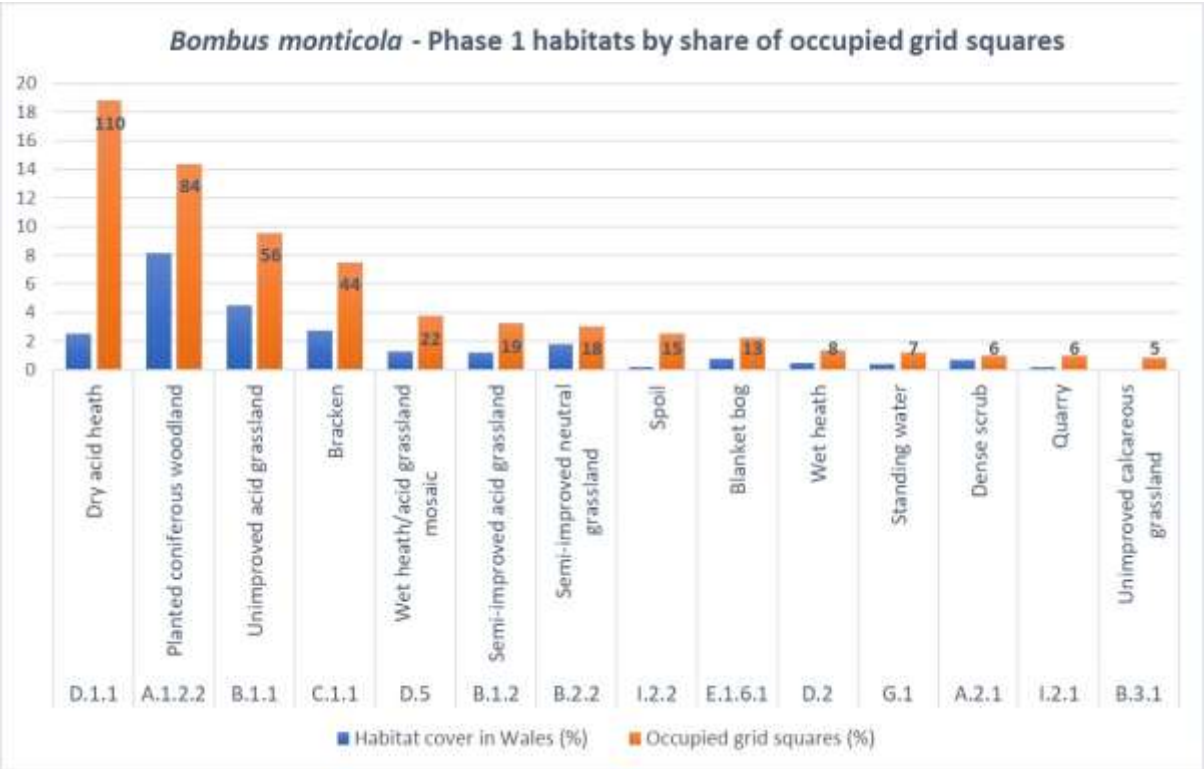
***Bombus humilis* Phase 1 habitats by share of occupied grid squares.**

In absolute terms, the phase 1 habitat classes that dominate are Open dune, Semi-improved neutral grassland and Buildings, with Dune grassland and Intertidal mud/ sand also contributing large numbers of occupied grid squares. In the Terrestrial Phase 1 Habitat Survey, urban and suburban gardens fall under the 'Buildings' habitat class, which may account for the large number of grid squares for this habitat. 'Intertidal mud/ sand' covers a relatively large area, and many of the grid squares dominated by this habitat will also contain smaller areas of dune and coastal grassland habitats.



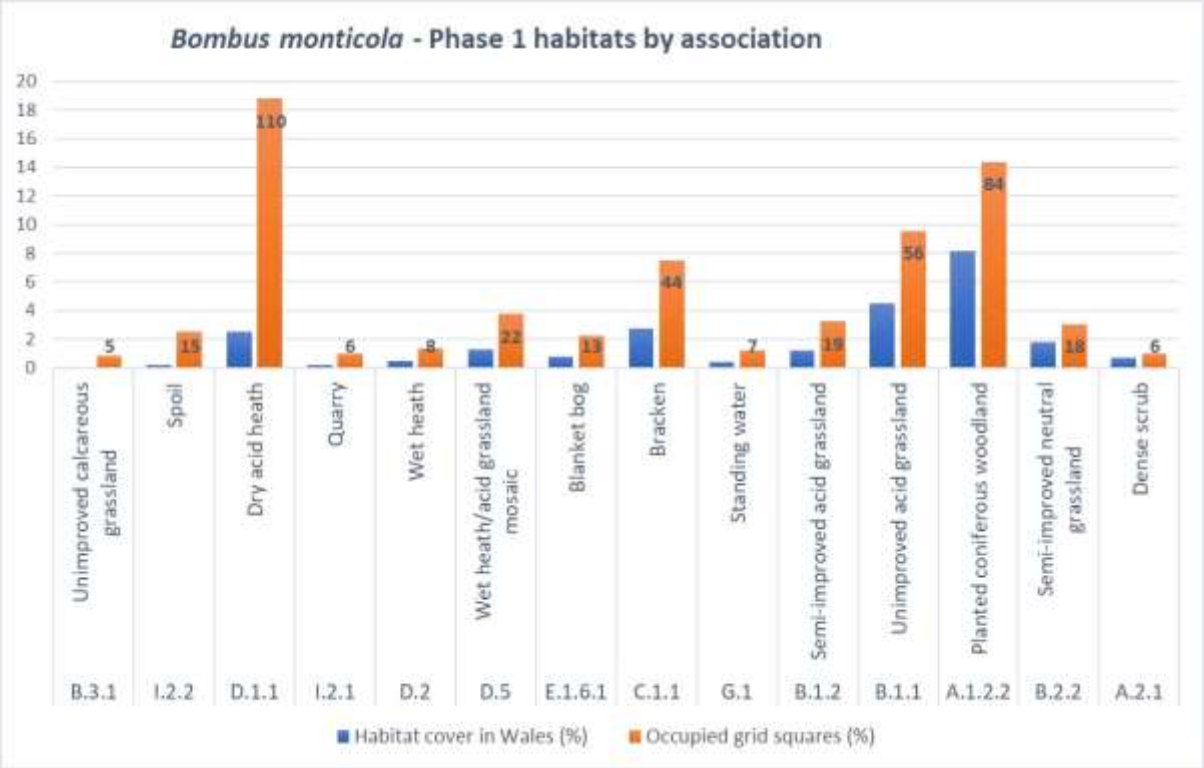
***Bombus humilis* Phase 1 habitats by association.**

Relative to their area, the top 5 habitats for *Bombus humilis* are all dune and coastal grassland/ heath habitats. 'Buildings' are no longer in the top 15 habitats when sorted by association.



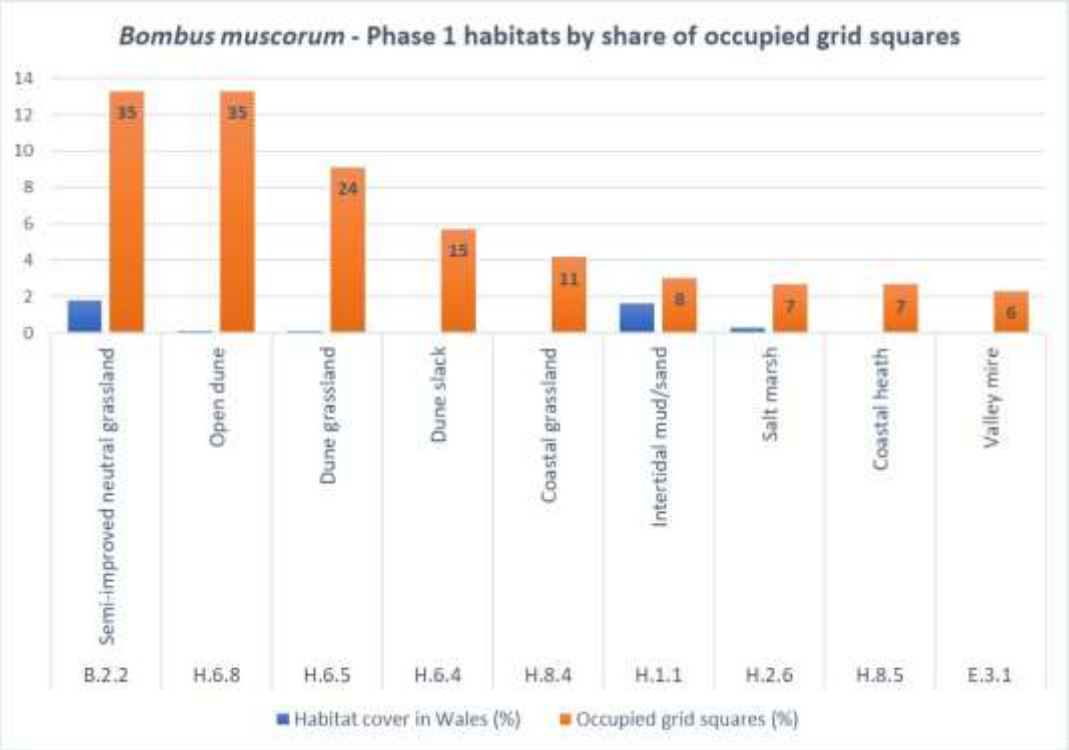
***Bombus monticola* Phase 1 habitats by share of occupied grid squares.**

The top 5 habitats for *B. monticola* by share of occupied grid squares are all upland habitats, with Dry acid heath the most common habitat in almost 20% of the grid squares.



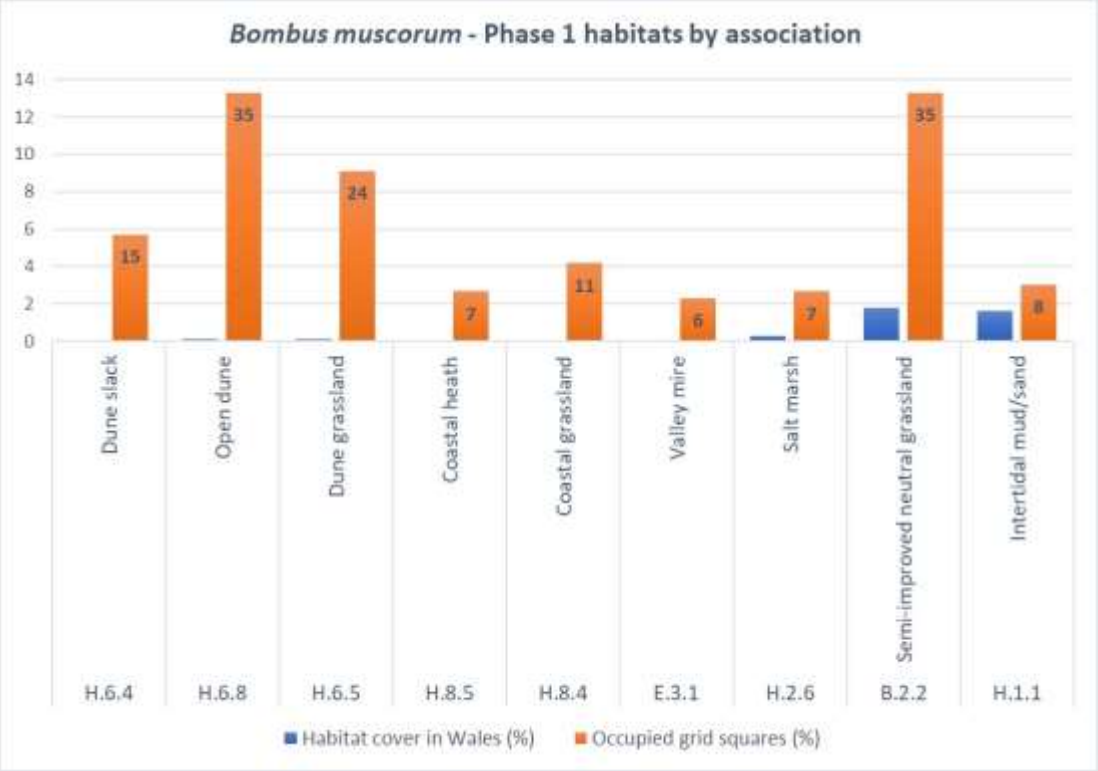
***Bombus monticola* Phase 1 habitats by association.**

Sorting the habitats by association reveals a large contribution of Spoil habitats relative to their area and a diminished importance of Planted coniferous woodland and Unimproved acid grassland. Dry acid heath remains in the top 3, emphasising the importance of this habitat. Unimproved calcareous grassland ranks the highest by association value, but the true association of this habitat is difficult to assess due to the scarcity of the habitat and the low number of grid squares for which it is most common.



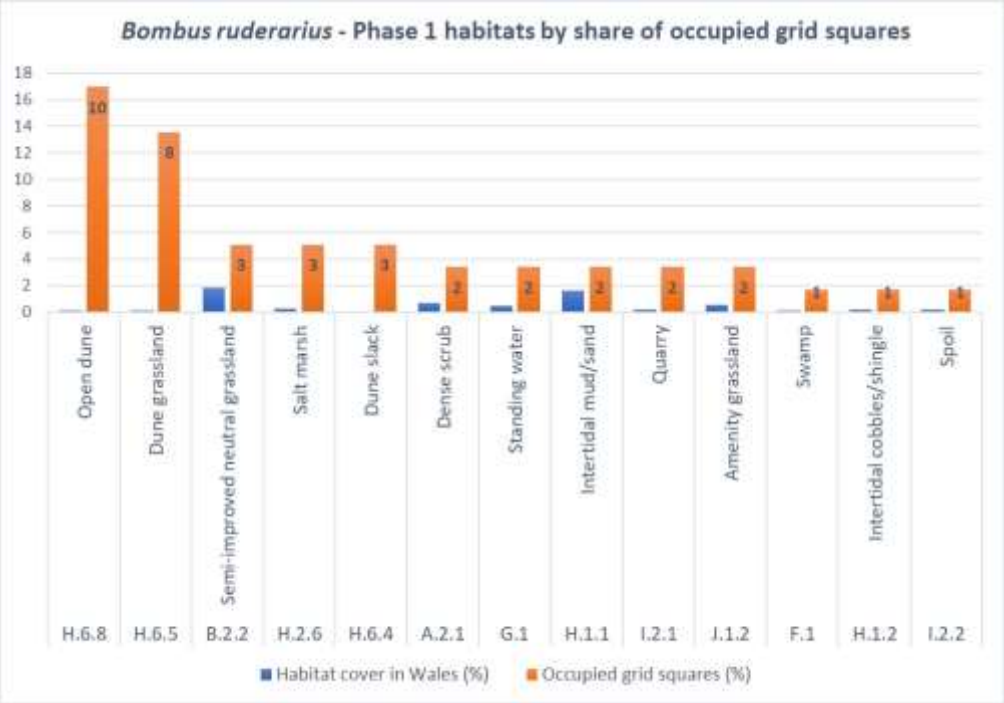
***Bombus muscorum* Phase 1 habitats by share of occupied grid squares.**

Similar habitats to *Bombus humilis* are highlighted when sorting *B. muscorum* habitats by share of occupied grid squares.



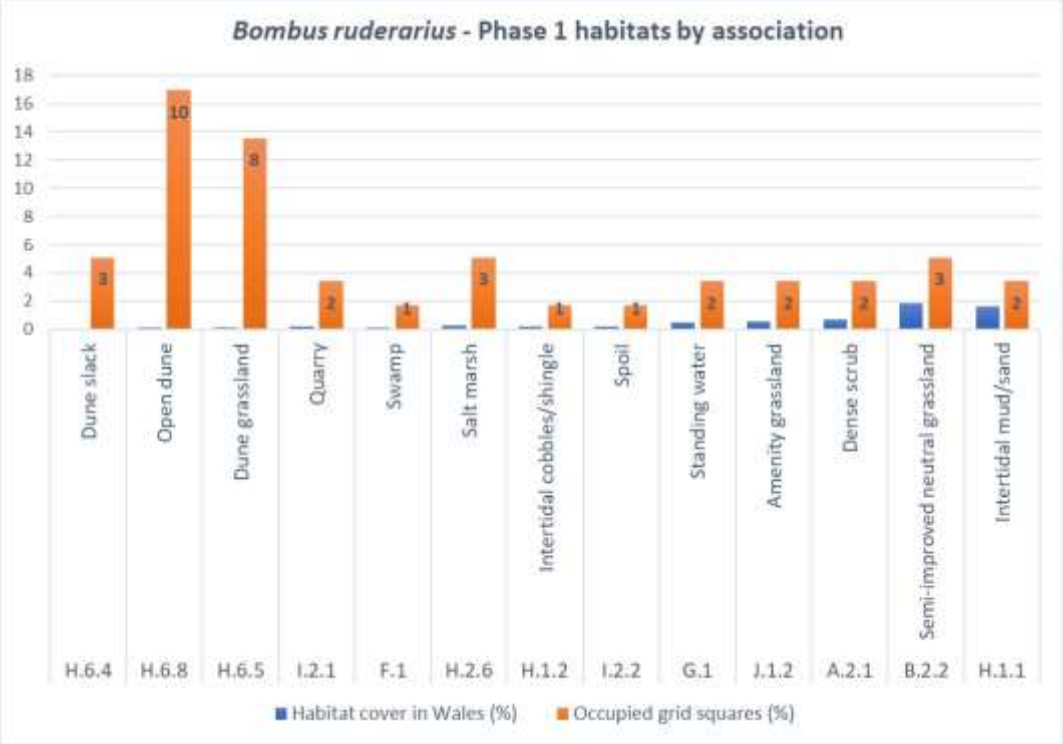
***Bombus muscorum* Phase 1 habitats by association.**

The habitats that are highest ranking habitats by association for *Bombus muscorum* are the same five coastal habitats that are highest for *B. humilis*.



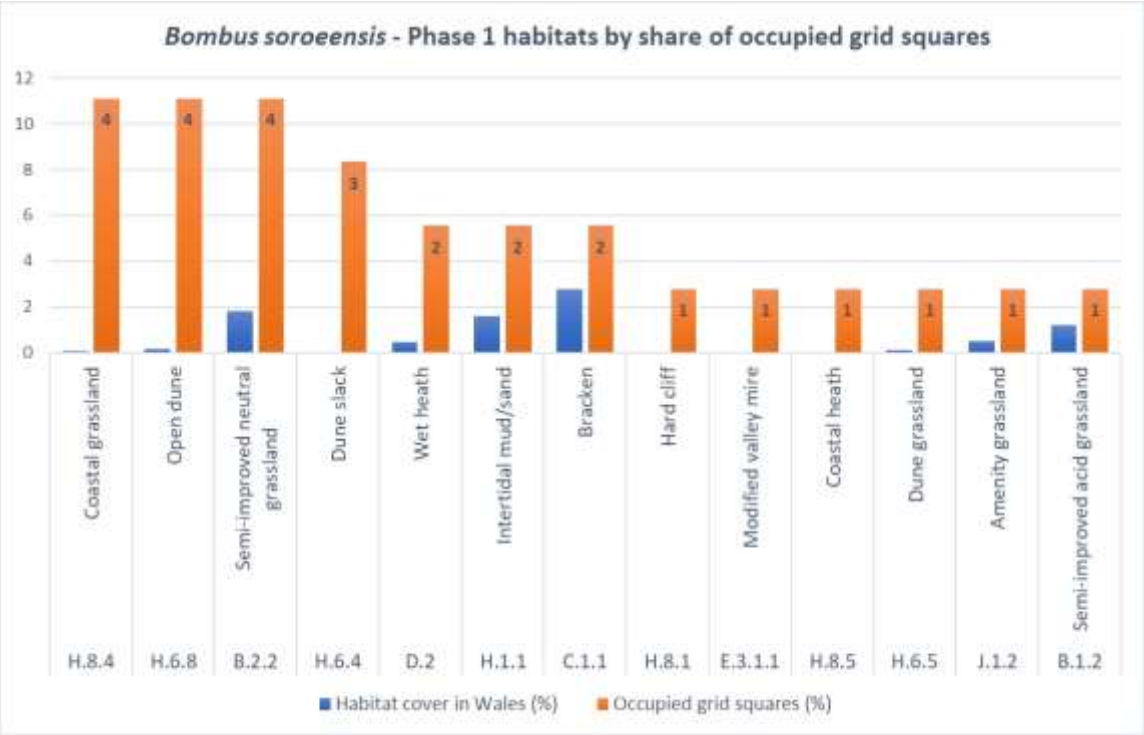
***Bombus ruderarius* Phase 1 habitats by share of occupied grid squares.**

Open dune and dune grassland habitats are highlighted as important for *Bombus ruderarius*. For the other habitats, there are too few occupied grid squares to draw firm conclusions, although there is some suggestion of a similar picture to that for *B. humilis*.



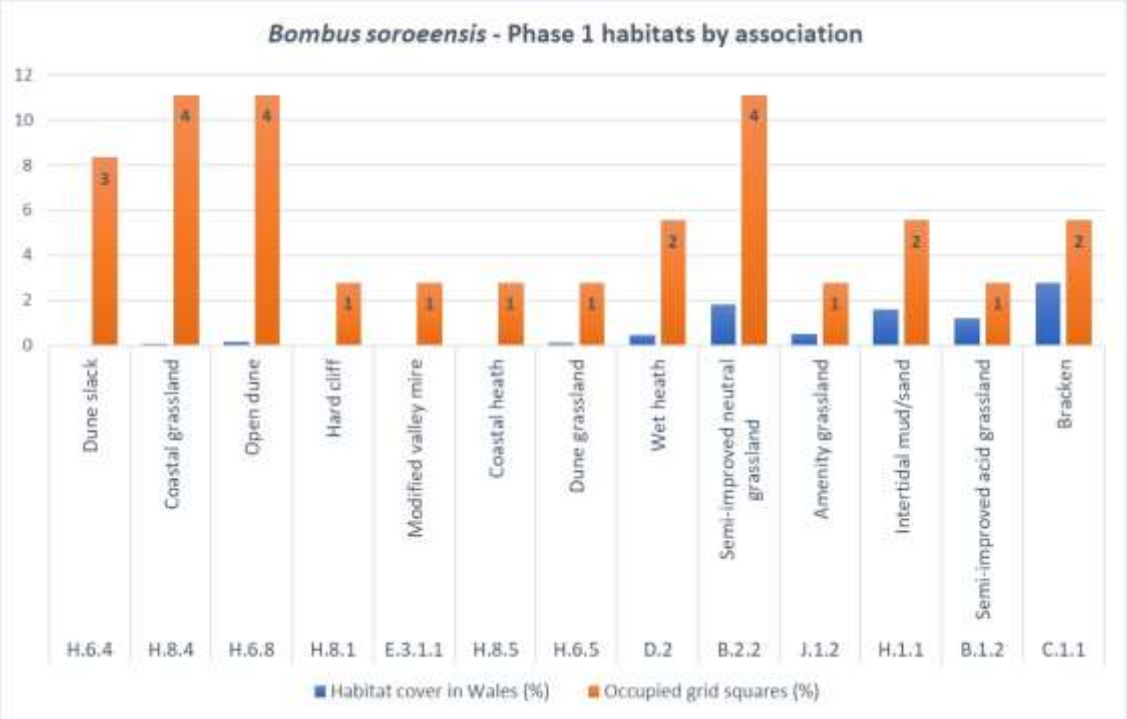
***Bombus ruderarius* Phase 1 habitats by association.**

Sorting habitats by association for *Bombus ruderarius* gives similar overall results to sorting by share of occupied grid squares, with Open dune and Dune grassland habitats again being highlighted as important.



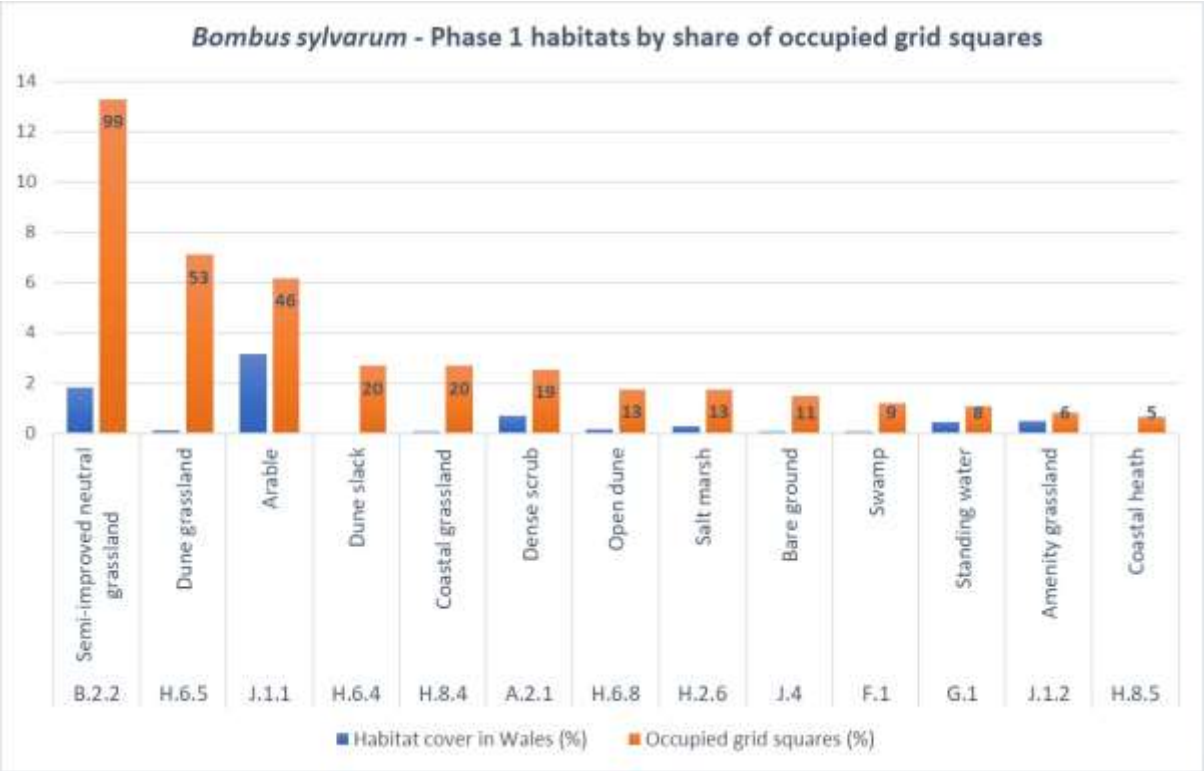
***Bombus soroeensis* Phase 1 habitats by share of occupied grid squares**.

For *Bombus soroeensis,* no habitats met the filtering criteria of having at least five occupied grid squares in which they were most common. Although only tentative conclusions can be drawn, the importance of coastal grassland and dune habitats appear again to be highlighted, alongside 'Semi-improved neutral grassland'.



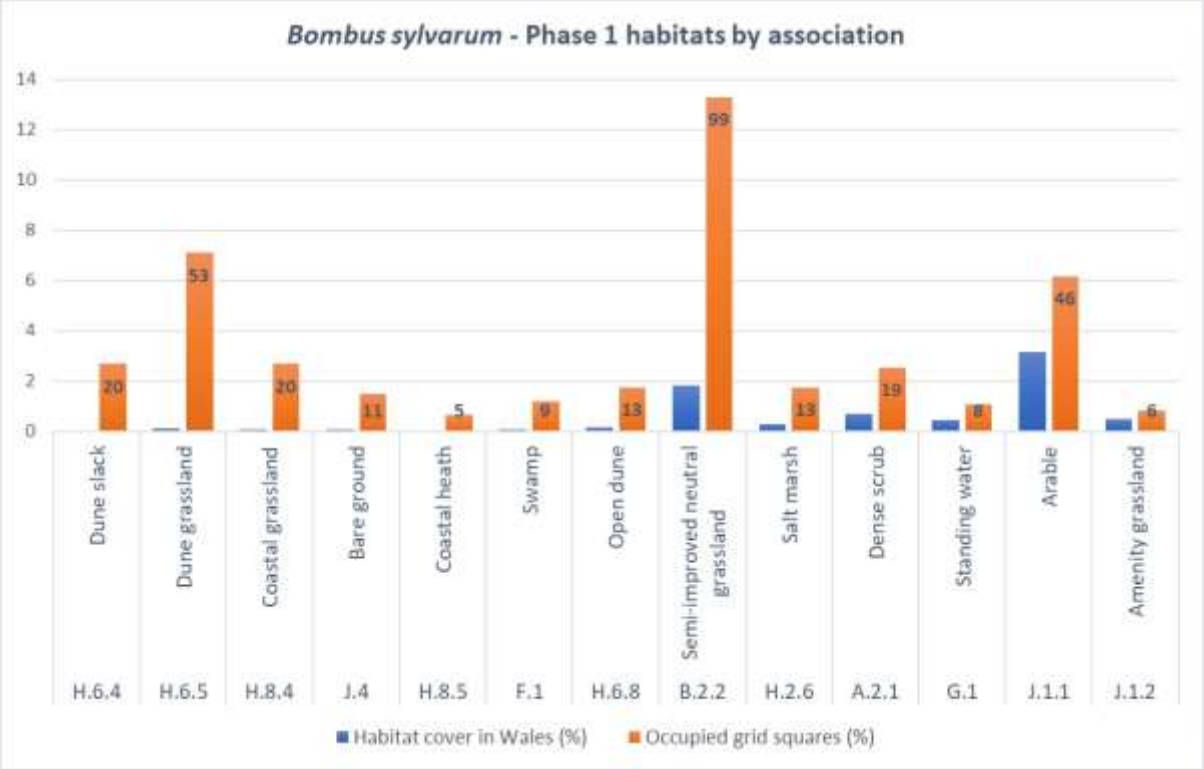
***Bombus soroeensis* Phase 1 habitats by association.**

Sorting habitats by association for *Bombus soroeensis* gives similar overall results to sorting by share of occupied grid squares.



***Bombus sylvarum* Phase 1 habitats by share of occupied grid squares.**

The top habitat for *Bombus sylvarum* by share of occupied grid squares is Semi-improved neutral grassland, with Arable and coastal habitats also featuring strongly.



***Bombus sylvarum* Phase 1 habitats by association.**

Sorting the habitats by association for *Bombus sylvarum* brings coastal habitats to the top, and also highlights the importance of bare ground. Semi-improved neutral grassland and arable habitats have a lesser ranking by association. The top five habitats are similar to the coastal habitats which comprise the

top five for *B. humilis and B. muscorum*, although Open dune is ranked lower for *B. sylvarum*. Although not shown on this graph, *B. sylvarum* is the only species that did not show a significant negative association with improved grassland, having an association value of 0.91.

ANNEX 3 – PRIORITY AREA ANALYSIS OUTPUTS

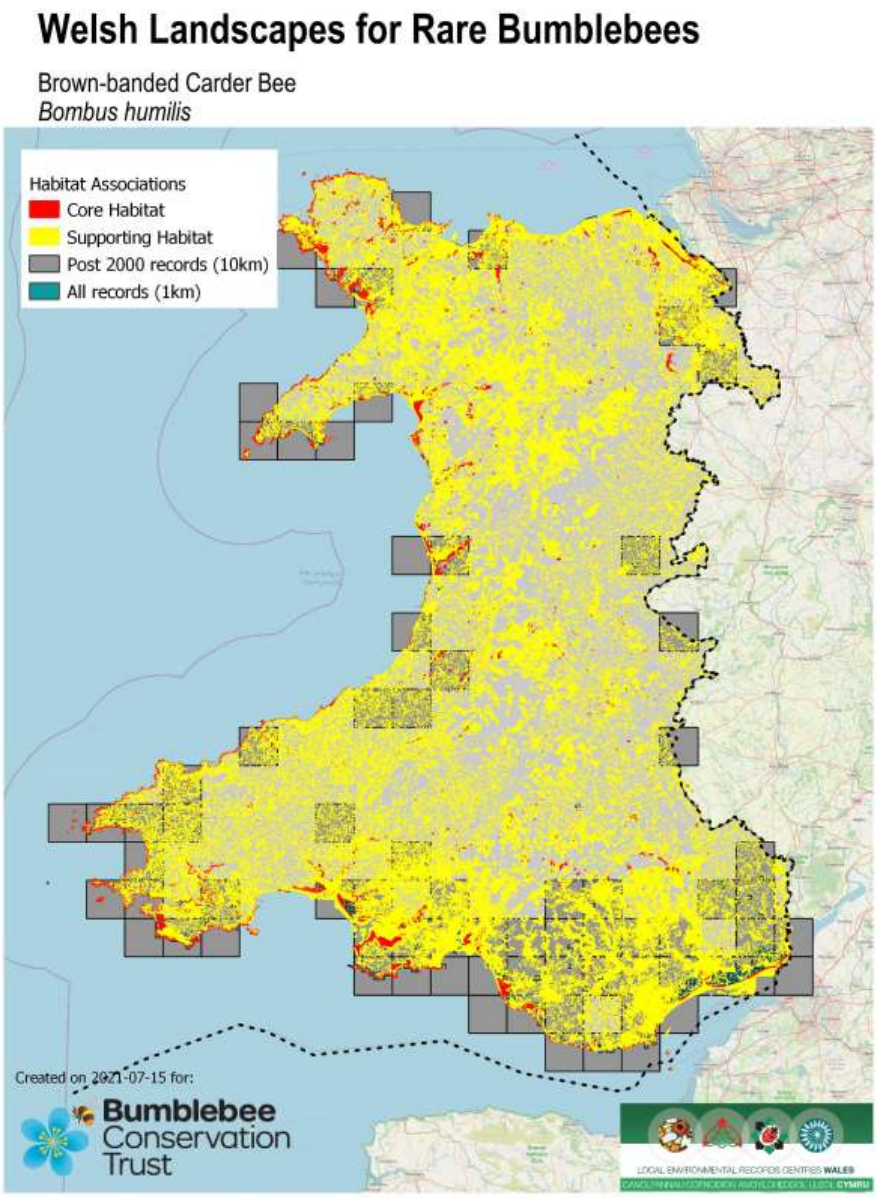
Plots shown in the following pages were created by mapping "core" and "supporting" habitats for each species. A table summarising the habitats plotted for each species is given below.

	PHASE 1 HABITAT TYPE																												
	A1.2.2	A2.1	B1.1	B1.2	B2.2	B3.1	C1.1	D1.1	D2	D5	E1.6.1	E3.1	F1	G1	H1.1	H1.2	H1.3	H2.6	H6.4	H6.5	H6.8	H8.4	H8.5	I2.1	I2.2	J1.1.1	J1.1.2	J3.6	J4
SPECIES	PLANTED CONIFEROUS WOODLAND	DENSE SCRUB	UNIMPROVED ACID GRASSLAND	SEMI-IMPROVED ACID GRASSLAND	SEMI-IMPROVED NEUTRAL GRASSLAND	UNIMPROVED CALCAREOUS GRASSLAND	BRACKEN	DRY ACID HEATH	WET HEATH	WET HEATH/ACID GRASSLAND MOSAIC	BLANKET BOG	VALLEY MIRE	SWAMP	STANDING WATER	INTERTIDAL MUD/SAND	INTERTIDAL COBBLES/SHINGLE	INTERTIDAL ROCKS/BOULDERS	SALT MARSH	DUNE SLACK	DUNE GRASSLAND	OPEN DUNE	COASTAL GRASSLAND	COASTAL HEATH	QUARRY	SPOIL	ARABLE	AMENITY GRASSLAND	BUILDINGS	BARE GROUND
Brown-banded Carder Bee *(Bombus humilis)*		□			□	■							■		□	□	■	■	■	■	■	■	■		□			□	□
Bilberry Bumblebee *(Bombus monticola)*	□	□	□	□	□	■	□	■	□	□	□			□										□	■				
Moss Carder Bee *(Bombus muscorum)*					□							■			□			□	■	■	■	■	■						
Red-shanked Carder Bee *(Bombus ruderarius)*																				■	■								
Broken-belted Bumblebee *(Bombus soreensis)*																					■	■							
Shrill Carder Bee *(Bombus sylvarum)*		□			□								■	□				□	■	■	■	■	■			□	□		■

■ = CORE HABITAT

□ = SUPPORTING HABITAT

Brown-banded Carder Bee *(Bombus humilis)*



This plot shows:

- Locations of post-2000 records of *B. humilis* as large grey (10km) squares.

- Locations of all records (including pre-2000 records) as small (1km), blue-filled squares.

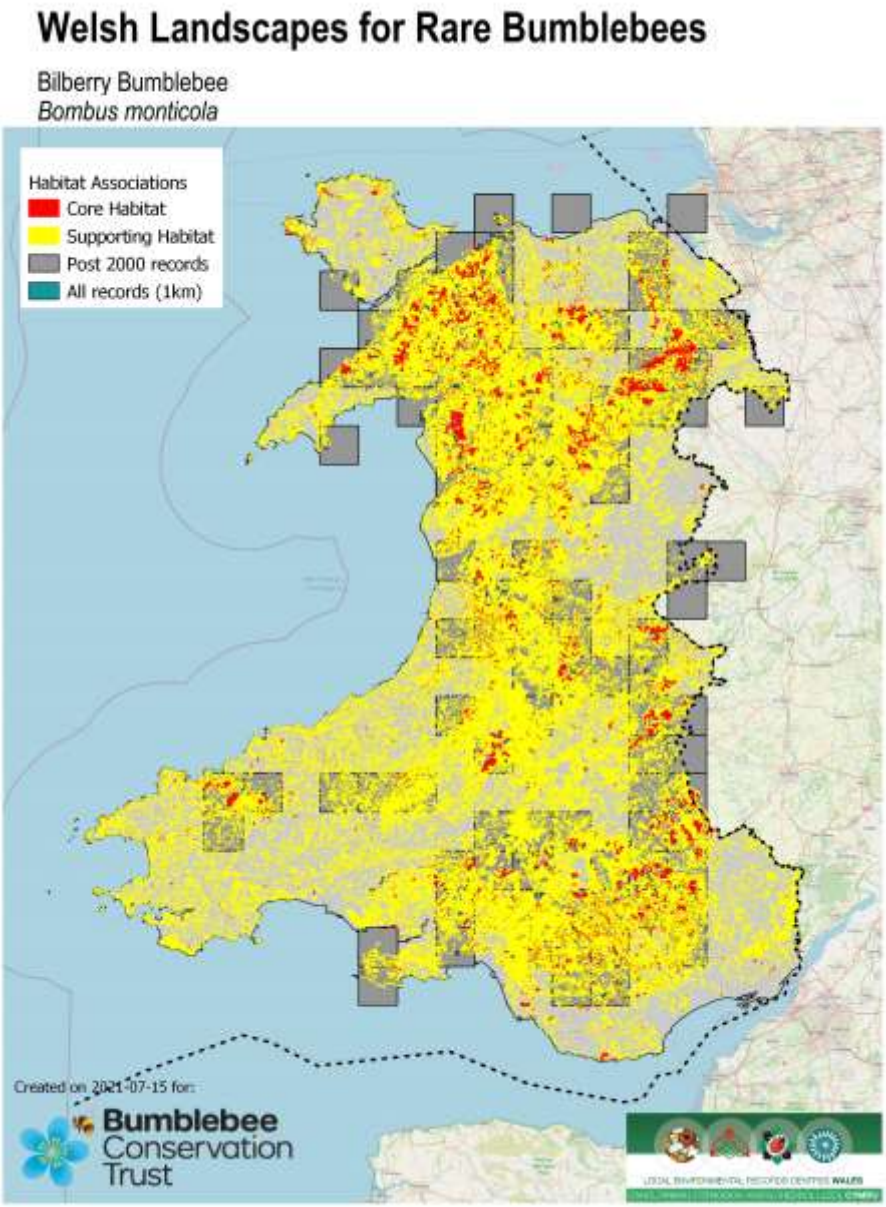
- "Core habitats" (shown in red) to which *B. humilis* shows the strongest association, include: dune slack, open dune, dune grassland, coastal grassland and coastal heath.

- "Supporting habitats" (shown in yellow) to which *B. humilis* shows a less strong, but still significant association, include: bare ground, spoil and semi-improved neutral grassland.

Priority areas for future survey (those where there are good concentrations of habitats that are strongly associated with *B. humilis*, but where it has not been recently recorded), include: the Anglesey coast, the Lleyn Peninsula, the Gwynedd coast around Harlech, the Clwydian Range and Deeside coast, the north Pembrokeshire coast west of Strumble Head, the Carmarthenshire coast near Pendine and southern parts of the Brecon Beacons National Park.

Priority areas for conservation action might include all existing areas with recent records of *B. humilis*, plus those areas identified above.

Bilberry Bumblebee *(Bombus monticola)*



This plot shows:

- Locations of post-2000 records of *B. monticola* as large grey (10km) squares.

- Locations of all records (including pre-2000 records) as small (1km), blue-filled squares.

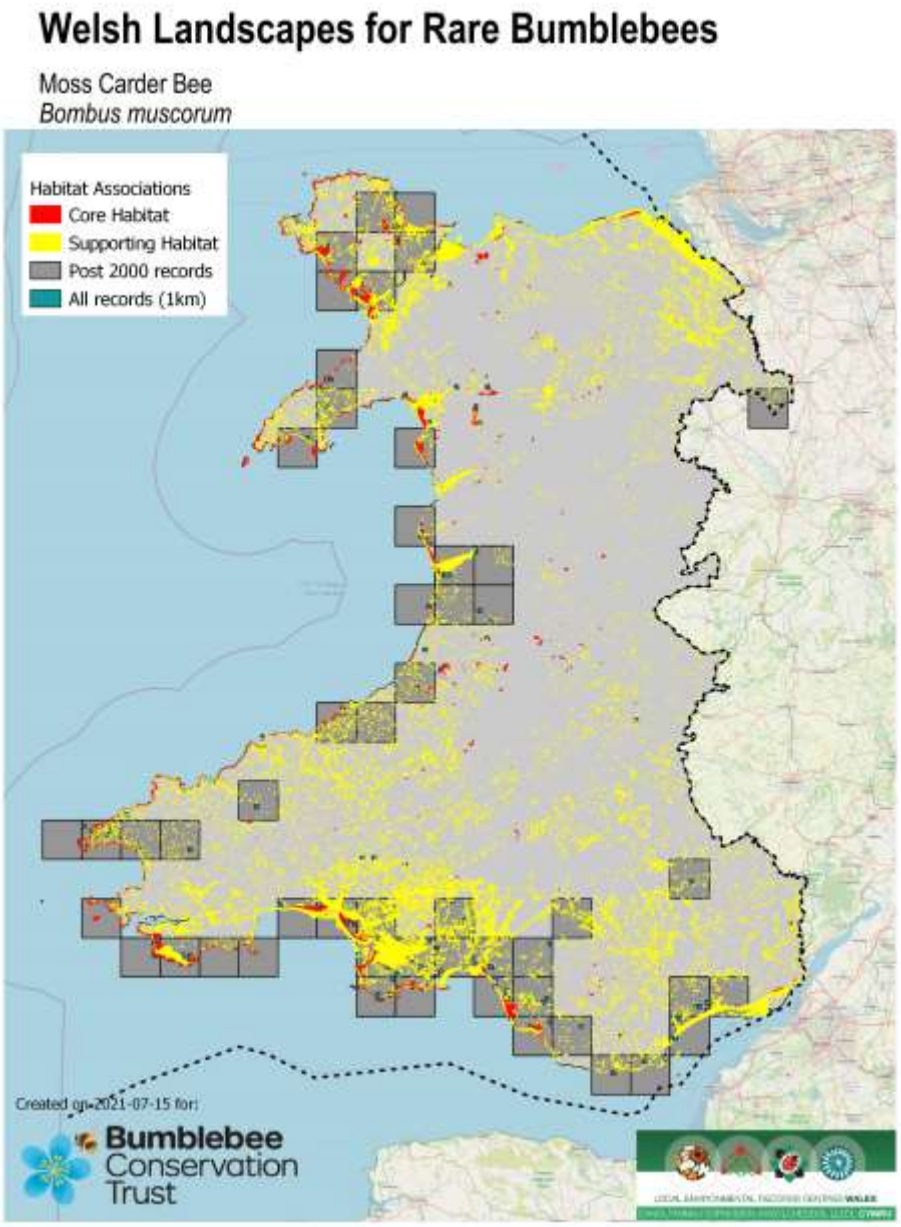
- "Core habitats" (shown in red) to which *B. monticola* shows the strongest association, include: unimproved calcareous grassland, spoil, dry acid heath, quarry and wet heath.

- "Supporting habitats" (shown in yellow) to which *B. monticola* shows a less strong, but still significant association, include: wet heath/acid grassland mosaic, blanket bog and bracken.

Priority areas for future survey (those where there are good concentrations of habitats that are strongly associated with *B. monticola*, but where it has not been recently recorded), include: upland areas of north, mid and south Wales. Particular areas of focus could be the area between Bala and Corwen (see example in section 3.5 including Figure 3.5.2.), squares SH60, SH70 and SH80 (in southern Snowdonia and east of Machynlleth), parts of the central Brecon Beacons National Park including SN91 (around Ystradfellte) and SO02 (which includes Brecon and Pen-y-Fan) and the area of the eastern Valleys at ST19 (containing Bargoed and Ystrad Mynach).

Priority areas for conservation action might include all existing areas with recent records of *B. monticola*, plus those areas identified above.

Moss Carder Bee *(Bombus muscorum)*



This plot shows:

- Locations of post-2000 records of *B. muscorum* as large grey (10km) squares.

- Locations of all records (including pre-2000 records) as small (1km), blue-filled squares.

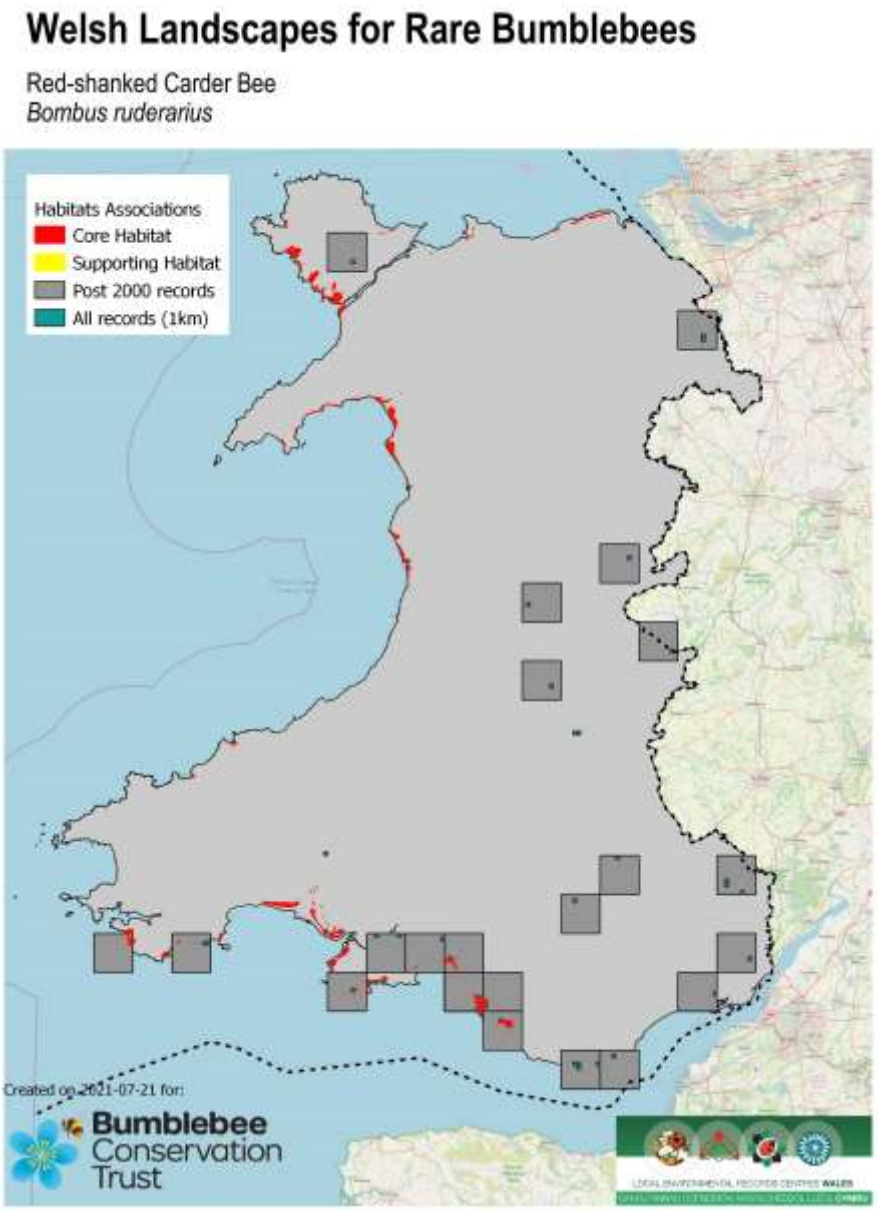
- "Core habitats" (shown in red) to which *B. muscorum* shows the strongest association, include: dune slack, open dune, dune grassland, coastal heath, coastal grassland.

- "Supporting habitats" (shown in yellow) to which *B. muscorum* shows a less strong, but still significant association, include: saltmarsh and semi-improved neutral grassland.

Priority areas for future survey (those where there are good concentrations of habitats that are strongly associated with *B. muscorum*, but where it has not been recently recorded), include: much of the coastline from south Pembrokeshire to Anglesey, parts of south Snowdonia from Morfa Harlech to Trawsfynydd (SH53 and SH63) and where core habitats are present in the Cambrian Mountains including the area south-east of Aberystwyth and around Devil's Bridge (SN67 and SN77).

Priority areas for conservation action might include all existing areas with recent records of *B. muscorum*, plus those areas identified above.

Red-shanked Carder Bee *(Bombus ruderarius)*



This plot shows:

- Locations of post-2000 records of *B. ruderarius* as large grey (10km) squares.

- Locations of all records (including pre-2000 records) as small (1km), blue-filled squares.

- "Core habitats" (shown in red) to which *B. ruderarius* shows the strongest association, include: coastal grassland and open dune.

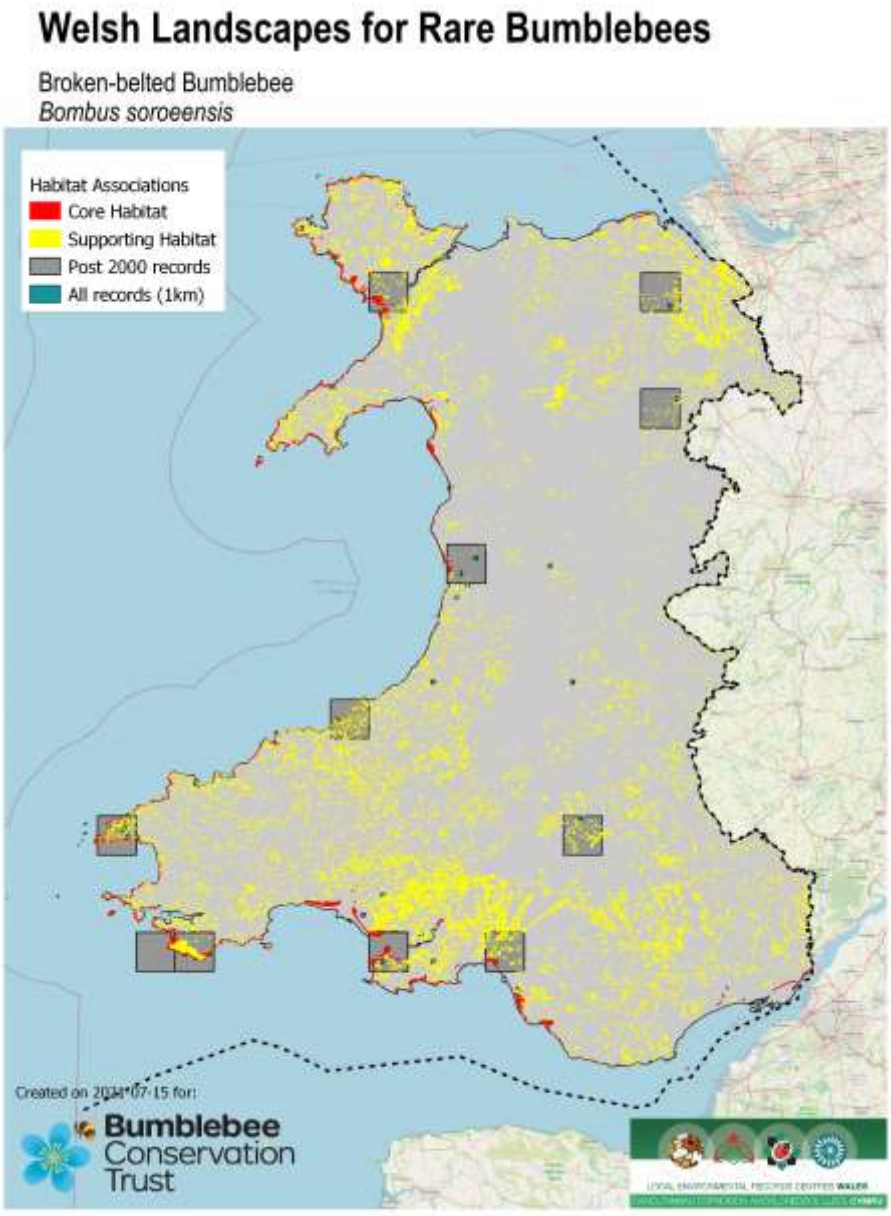
- "Supporting habitats" were not defined for *B. ruderarius*, as there were insufficient occupied grid squares for all potential habitats.

Priority areas for future survey (those where there are good concentrations of habitats that are strongly associated with *B. ruderarius*, but where it has not been recently recorded), include: the Carmarthenshire coast around Pendine and Pembrey (SN20and SN30), north-west Gower (SS49) and Castlemartin and Stackpole area of Pembrokeshire (SR99)[7] and the western coast of Anglesey. Further suitable habitat, although with no recent records nearby, can be found on the Gwynedd coast around Harlech and Porthmadog (SH52 and SH53).

Priority areas for conservation action might include all existing areas with recent records of *B. ruderarius*, plus those areas identified above.

[7] See more detailed discussion on recording intensity in this area in Section 3.5 and Figure 3.5.4. of the main report.

Broken-belted Bumblebee *(Bombus soroeensis)*



This plot shows:

- Locations of post-2000 records of *B. soroeensis* as large grey (10km) squares.

- Locations of all records (including pre-2000 records) as small (1km), blue-filled squares.

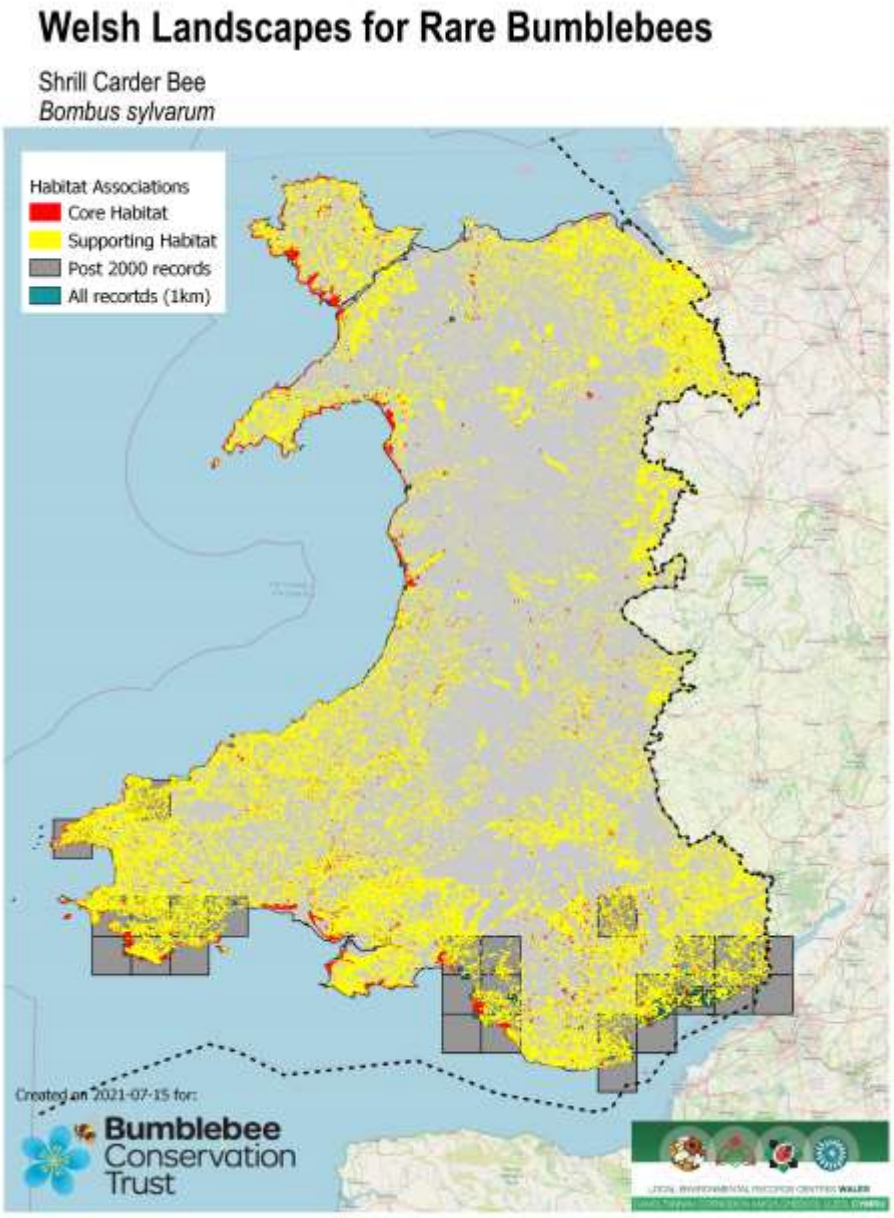
- "Core habitats" (shown in red) to which *B. soroeensis* shows the strongest association, include: dune slack, coastal grassland, open dune

- "Supporting habitats" (shown in yellow) to which *B. soroeensis* shows a less strong, but still significant association, include: semi-improved neutral grassland.

Priority areas for future survey (those where there are good concentrations of habitats that are strongly associated with *B. soroeensis*, but where it has not been recently recorded), include: much of the western part of the Welsh coast from Anglesey to Bridgend, including sand dune sites such as Merthyr Mawr, Kenfig, Pembrey, Pendine, Harlech and the west coast of Anglesey beyond Newborough Warren.

Priority areas for conservation action might include all existing areas with recent records of *B. soroeensis*, plus those areas identified above.

Shrill Carder Bee *(Bombus sylvarum)*



This plot shows:

- Locations of post-2000 records of *B. sylvarum* as large grey (10km) squares.

- Locations of all records (including pre-2000 records) as small (1km), blue-filled squares.

- "Core habitats" (shown in red) to which *B. sylvarum* shows the strongest association, include: dune slack, dune grassland, coastal grassland, bare ground, coastal heath and swamp.

- "Supporting habitats" (shown in yellow) to which *B. sylvarum* shows a less strong, but still significant association, include: semi-improved neutral grassland and saltmarsh.

Priority areas for future survey (those where there are good concentrations of habitats that are strongly associated with *B. sylvarum*, but where it has not been recently recorded), include: coastal, sand dune sites such as Oxwich, Pembrey, Pendine, Harlech and the west coast of Anglesey including Newborough Warren. This species is known to have significantly declined in range since the 1980s and therefore sites in the northern half of Wales may not support the species despite the presence of suitable habitat.

Priority areas for conservation action might include all existing areas with recent records of *B. sylvarum*, plus those areas identified above.

ANNEX 4 – REVIEW OF POLICY CONTEXT AND DELIVERY OPPORTUNITIES

A brief review of a range of key policy drivers affecting biodiversity conservation in Wales.

Welsh Government national legislative measures and initiatives

Well-being of Future Generations (Wales) Act 2015

The Well-being of Future Generations Act (WFGA) requires public bodies to act in a manner which seeks to ensure that the needs of the present are met without compromising the ability of future generations to meet their own needs. Public bodies in Wales must seek to achieve the seven well-being goals set out in the WFGA. Although bumblebees and pollinators are not mentioned explicitly in the WFGA, there are opportunities to make direct linkages to all seven well-being goals.

- A Prosperous Wales: The value of pollination as a contribution to the UK crop market in 2007 was £430 million. The value of honey produced in Wales is also considerable with a wholesale value in excess of £3 million in 2016.
- A Resilient Wales: People and nature are inextricably linked. We are dependent on natural resources for our basic needs and creature comforts. Healthy populations of pollinators support more diverse habitats which in turn make our ecosystems more resilient to change, allowing us to utilise their products and services into the future.
- A Healthier Wales: The diversity of habitats and species in Wales provides a valuable resource, supporting our physical needs for clean water and fresh air. Access to the natural environment also helps to improve physical and mental health through recreation and positive outdoor experiences, leading to reduced healthcare costs for individuals and the NHS.
- A More Equal Wales: Studies show that access to good-quality green space benefits everyone. However, this access can often be limited in poorer communities. Increasing pollinator-rich habitats across Wales can provide cultural services that contribute to equality in Wales.
- A Wales of Cohesive Communities: Involving communities in the management of their local parks and woodlands has been shown to improve community cohesion and reduce anti-social behaviour.
- A Wales of Vibrant Culture and Thriving Welsh Language: The diversity of habitats and species across Wales—supported by pollinators—has and continues to play a significant role in Welsh culture, language, art and literature. Many placenames are descriptive of local ecology, for example, creating a sense of place.
- A Globally Responsible Wales: The diverse habitats of Wales provide a diversity of ecosystem services which owe much of their functionality to pollinators. To be globally responsible, we need to ensure that we adhere to principles of sustainable management of natural resources, conserving habitats and species for future generations as well as our own.

Consequently, the conservation of rare bumblebees can be directly linked to the resilience of ecosystems as well as the health and well-being of the economy culture and communities of Wales. There is significant scope for implementation of practical management and public engagement initiatives under the WFGA framework.

Environment (Wales) Act (2016)

The Environment (Wales) Act 2016 introduced the Section 6 Duty requiring public bodies in the exercise of their functions in relation to Wales to demonstrate how they have contributed to enhanced biodiversity and the resilience of ecosystems. This duty applies to achieving the well-being goals of the WFGA. Public bodies are required to report on their achievements annually either in a separate report or as part of their well-being report. Wales Biodiversity Partnership (WBP) maintains an active list of available Section 6 reports.

Of the 43 Section 6 reports on WBP's website, 14 public bodies reported undertaking significant measures (e.g., habitat restoration, funding external projects, public engagement) to encourage or improve habitat for pollinators. Two specifically mentioned rare bumblebee species, though most discussed pollinators generally. Another eight reports highlighted minor activities for the benefit of pollinators (e.g., installing a honeybee hive or wildflower patch on the grounds). Four links did not connect to the appropriate report.

According to the Pollinator Task Force approximately 25% of public bodies have provided reports to date, but there is currently no standard reporting template. This makes it difficult to extract information for bumblebees or other pollinators even though many public bodies have carried out actions for pollinators. Equally it is often unclear if the actions are a part of existing pollinator action plans, green infrastructure plans, LDPs or other strategic documents.

Section 7 of the Environment (Wales) Act 2016 requires biodiversity lists to be produced, particularly for habitats and species which are of "principal importance" for the purpose of maintain and enhancing biodiversity in relation to Wales.

The following is a list of the focal species included in the Section 7 list giving them significant protection and weight in legislation, planning and policy frameworks.

- *Bombus humilis* (Brown-banded carder-bee; Cardwenynen lwydfrown)
- *Bombus muscorum* (Moss carder-bee; Cardwenynen y mwsogl)
- *Bombus ruderarius* (Red-shanked carder-bee; Cardwenynen goesgoch)
- *Bombus ruderatus* (Large garden bumblebee; Gwenynen bwm yr ardd)
- *Bombus sylvarum* (Shrill carder-bee; Cardwenynen feinlai)

Planning Policy Wales 11.0 (2021)

Planning Policy Wales 11.0 makes it clear that planning authorities must also adhere to the Section 6 Duty of the Environment (Wales) Act 2016, addressing diversity, extent, condition, connectivity and adaptability to change. It notes that the planning process "has a key role to play in helping to reverse the decline in biodiversity and increasing the resilience of ecosystems, at various scales, by ensuring appropriate mechanisms are in place to both protect against loss and to secure enhancement." Planning authorities are encouraged to adopt green infrastructure assessments that capture existing ecological assets and set out plans for improving biodiversity and green infrastructure. Green Infrastructure (GI) plans should call upon available information, including Area Statements, state of natural resources reports, species data from Local Environmental Record Centres and existing development plans and policies. Consideration should be given for climate change and ecological connectivity for the benefit wildlife.

No specific mention is made of rare bumblebees or other pollinators, only "wildlife."

Nature Recovery Action Plan (Wales) (2020)

The NRAP supports the WFGA 2015 and the Environment Act (Wales) 2016. It aims to reverse the decline in biodiversity, address the underlying causes of biodiversity loss by putting nature at the heart of decision-making and increasing the resilience of ecosystems by taking specific action focused around six objectives for habitats and species. Part II of the Plan was updated for 2020-21. The NRAP mentions the Bee Friendly scheme, B-Lines and the Action Plan for Pollinators as delivery mechanisms for relevant strategic actions in the NRAP. Several habitat restoration and green infrastructure projects across Wales are also cited which would benefit rare bumblebees.

There is no single strategic plan or programme to address bees or pollinators specifically, but the six objectives and five themes encompass key elements beneficial to future conservation and management of rare bumblebees.

Pollinator Task Force & Action Plan for Pollinators Review and Future Action (2018)

The Wales Pollinator Task Force was established under the original Action Plan for Pollinators (2013-18). The Task Force brings together representatives from Welsh Government, statutory bodies, NGOs and other interest groups and has been the driving force in co-ordinating the delivery of the Action Plan. The Task Force comes together twice a year to discuss issues, share practice and to ensure consistency in the promotion of pollinators.

The Action Plan for Pollinators has four target outcomes:
- Outcome 1: Wales has joined up policy, governance and a sound evidence base for action for pollinators.
- Outcome 2: Wales provides diverse and connected flower rich habitats to support our pollinators.
- Outcome 3: Wales' pollinator populations are healthy.

- Outcome 4: Wales' citizens are better informed and aware of the importance and management of pollinators.

The 2018 review highlighted the achievements of the first plan period of which there were many and noted that there is still much work to be done. Future actions were defined along with responsible parties for each action.

Queries to the Chair of the Pollinator Task Force indicated that they currently do not hold a comprehensive list of local authorities with pollinator action plans or relevant green infrastructure plans and do not have a list of nature recovery action plans with actions targeting bumblebees (or pollinators more broadly).

Agri-environment Schemes

With specific reference to rare bumblebees, the Glastir agri-environment scheme includes an option for farmers to improve food resources for the rare bumblebee species, Shrill Carder Bee and Brown-banded Carder Bee, by sowing Red Clover in whole fields. The current Glastir Small Grants Scheme offers a 'Landscape and Pollinators' option to restore landscape features, providing habitat for pollinator species. Over 750 landowners across Wales committed to undertake land management options beneficial for pollinators. This small grant scheme is still available in 2021. There is also ample pollinator-friendly management guidance available.

The Welsh Government's *Sustainable Farming and Our Land* consultation document does not make direct mention of pollinators or bumblebees. It does mention that "Greening" initiatives were not successful and would not be continued in their current form. It is uncertain what opportunities will be available for bumblebee conservation initiatives in forthcoming agri-environment schemes in Wales. Welsh Government are in the midst of a co-design phase targeting the Sustainable Farm Review. One of the key objectives of this scheme is habitat management and how to move from a prescriptive scheme to a farmer-led approach.

The Pollinator Task Force agriculture subgroup submitted comments to the Agriculture (Wales) Bill. Responses from Welsh Government should be available in July 2021.

Climate Emergency (Wales, 2019) and Nature Emergency (Wales, 2021)

On 30 June 2021, the Welsh parliament declared a nature emergency and called for statutory targets to be set to halt and reverse the decline in biodiversity. The Nature Emergency was declared with cross party support in the Senedd and recognises that the nature and climate crises are inextricably linked. This reinforces the Senedd's declaration of a climate emergency in 2019. The linkage between the two declarations will strengthen the urgency of bumblebee conservation initiatives given documented declines in pollinators across Wales and the likelihood of this trend being exacerbated by climate change.

Payment for Ecosystem Services (PES)

The Welsh Government has been exploring options for implementing Payment for Ecosystem Services (PES) schemes across Wales. These are schemes in which the beneficiaries of ecosystem services or other investors provide payment to the providers of those services. Currently the Peatland Code and carbon trading are well-developed forms of PES, though biodiversity metrics, offsetting and other natural capital accounting methodologies are being legitimised. A formal framework has not been adopted by Welsh Government for the latter methodologies, but PES provides opportunities to attract both public and private investment for the benefit of rare bumblebees and their associated habitats where the outputs and outcomes are measurable and achievable. PES can act as a conduit for engagement with private landowners and land managers with long-term and landscape-scale results. The Ecosystem Knowledge Network retains a wealth of information pertaining to PES and related topics.

Natural Resources Wales (NRW) projects and initiatives

Area Statements

Northeast, Southeast, South Central and Mid Wales Area Statements do not explicitly mention bumblebees, bees or pollinators. The recovery of biodiversity, wildlife and habitats as well as green infrastructure and ecosystem services are priorities and will contribute to the conservation of focal bumblebee species.

The Southwest Wales Area Statement notes that "…we need to take into consideration the importance of plants and pollinators in species-rich arable land at a landscape scale. In addition to specific actions, landscape scale designations such as Buglife B-lines and Important Invertebrate Areas should be considered."

The Northwest Area Statement also mentions pollination in the context of important ecosystems services, but it does not discuss actions or priorities designed to address pollination specifically. Bumblebees would, of course, benefit from more generic nature recovery aspirations.

Vital Nature

Vital Nature is a statement of NRW priorities, direction of travel and ways of working. It establishes a high-level framework for actions for biodiversity in line with the Nature Recovery Action Plan for Wales and the Section 6 Duty. NRW has identified priority areas for work on biodiversity and ecosystem resilience, under the following six themes:

- Connecting people and biodiversity.
- Embedding the consideration of biodiversity and ecosystem resilience into all NRW's functions.
- Improving the approach to protected sites.
- Working with others to maintain and enhance biodiversity.
- Having the right evidence to inform our work.
- Investing in the knowledge and skills of our staff.

Pollination is mentioned in relation to its importance as a vital ecosystem service, but there are no specific plans or strategies identified within the document for bumblebees, bees and pollinators. Nevertheless, there are opportunities to work with NRW under these six themes for the benefit of rare bumblebees in Wales.

NRW Business Plan Nature Emergency Objectives

NRW's Business Plan includes (under the responding to the Nature Emergency heading): "Help reverse the decline in biodiversity through delivering targeted action for declining species or those on the edge of extinction, including curlew, salmon and sea trout, native oyster, marsh fritillary butterfly, shrill carder bee and red squirrel for example."

Nature Networks Project

The aim of NRW's Nature Networks Project (initially named Adfer Natur) is "to increase the resilience of protected sites and the terrestrial, freshwater and marine networks in which they sit through a sustained programme of positive actions."

The project is currently in the design phase (2021/22) with the subsequent delivery phase commencing April 2022. The design phase includes:

- Identifying Priority Ecological Networks based on the protected sites network.
- Mapping and identifying gaps within current planned NRW and stakeholder contributions to understand what else may be required as part of the programme.
- Identifying additional prioritised costed delivery actions.
- Identifying appropriate monitoring, reporting and evaluation options.

A range of stakeholders will be engaged between June and October 2021 through interviews and workshops. The delivery phase is envisaged to run across a three-year period from April 2022 until 2025-6 and is expected to include:

- Enhanced direct management funding to improve protected site condition and ecological networks via landowner/occupier Section 16 Land Management Agreements, or for relevant marine environment improvement actions,
- Enhanced National Nature Reserves and Welsh Government Woodland Estate management funding,
- Enhanced NRW staffing levels to support direct management delivery, and
- Grants to stakeholder organisations to help deliver programme objectives and actions.

Natur am Byth

The 'Natur am Byth!' (NaB) species recovery and engagement application to National Lottery Heritage Fund (NLHF) has been successful. It includes an 18-month development phase and a four-year delivery phase facilitating nature recovery that connects communities to nature whilst developing skills.

NaB will support marine, terrestrial and freshwater management issues. The focus areas are the Lleyn peninsula and Anglesey; Pembrokeshire; Gower and Swansea City; Neath Port Talbot and Bridgend; Vale of Glamorgan, Cardiff and Gwent Levels; Snowdonia; Powys; and Wrexham. In many areas the project will employ an integrated multi-taxon approach to deliver multiple benefits for rare species, species identified by partners as facing the greatest threat of extinction and those of particular importance to Wales. Bumblebee Conservation Trust are an existing partner.

Managing the NRW Estate

There are examples across Wales in which NRW manage their estate either directly or indirectly to the benefit of rare bumblebees.

For example, NRW manage the sea wall between Cardiff and Chepstow for flood defence purposes. The grass on the landward face is cut once or twice annually to enable inspection of the defence. NRW are currently trialling new methods of working, including cut and collect, to improve the botanic diversity of the seawall and benefit species such as shrill carder bee, whilst still allowing the defence to be maintained and inspected.

Local Authorities

Local Development Plans

Local Development Plans (LDPs) provide an opportunity for integrating pollinator-friendly policies into the development process, particularly as LDPs are reviewed on a five-year cycle. Planning Policy Wales (see previous discussion) supports and encourages this via green infrastructure assessments, biodiversity audits and connectivity mapping. There are no centralised figures pertaining to the number of local authorities with pollinator-friendly policies in their LDPs. However, some local authorities have developed green infrastructure plans and/or pollinator action plans.

Green Infrastructure and Pollinator Action Plans

There is no centralised, comprehensive list of local authorities with green infrastructure (GI) and pollinator action plans. Relevant organisations were asked if they had GI or pollinator action plans in their areas. No responses were received. Several local authorities have, however, created and published their plans. The Southeast Wales Green Infrastructure Plan for Pollinators was launched in 2015. Torfaen, Monmouthshire, Cardiff and Swansea have more recent green infrastructure plans. Monmouthshire, Carmarthenshire, Conwy, Denbighshire, and Cardiff have pollinator action plans in place or under way. Caerphilly, Monmouth, Torfaen and Wrexham local authorities are all undertaking work beneficial for pollinators under GI funding from Welsh Government. Buglife Cymru and Friends of the Earth Cymru also produced helpful guidance for local authorities in 2017 called *Helping Pollinators Locally in Wales – Developing a Local Pollinator Action Plan or Strategy*.

Denbighshire County Council and Rhondda Cynon Taff County Borough Council introduced new management plans (in 2019 and 2020 respectively) for grassland and roadside verges. Other local authorities engaged with this and related GI initiatives and share information via the Wales Green Infrastructure Forum.

The Welsh Government Planning Policy team are undertaking research into Local Planning Authorities' implementation of Green Infrastructure Assessments (GIAs) and legislation regarding protected species and Permitted Development Rights (Regulation 75 of the Habitat Regulations). The aims of this research are to assess how Local Planning Authorities have responded to Planning Policy Guidance and at what stage they are at and to assess how Local Planning Authorities are implementing protected species legislation. The information collected during the project will inform a report published on the Welsh Government website.

Local Site Designation

Sites of Importance for Nature Conservation (SINCs) and Local Wildlife Sites (LWSs) provide an opportunity for BBCT to work with local landowners to identify and manage private land for the benefit of rare bumblebees and other pollinators. Criteria for identifying SINCs/LWSs across Wales differ among local authorities, though there are many similar criteria. The following list of invertebrate criteria have been extracted from the Criteria for the Selection of Local Wildlife Sites in Powys (2020) and serve as a relevant example.

- All undesignated sites which support populations of one or more species, which is listed in the UK Red Data Book, or listed on Section 7 of the Environment (Wales) Act 2016, with the specific requirement for site protection action.
- All undesignated sites which support one or more bee species listed on the Wales Threatened Bee Report (Olds et al., 2019).
- All undesignated sites which support an important assemblage or population(s) of 'Nationally Scarce' species (to be determined in consultation with appropriate experts).
- All undesignated sites which support a species, recorded from 10 or fewer 10km grid squares in Wales (where the distribution is well known).
- All undesignated sites which support a species that breeds in 4 or fewer sites within a Vice County.
- All undesignated sites which support a significant population or assemblage of Local Priority Species listed in the Powys Nature Recovery Action Plan.
- All undesignated sites supporting an assemblage of invertebrate species considered to be of significance (to be determined in consultation with appropriate experts); for example, 9 or more Odonata species, 7 or more Orthoptera species.

BBCT could play a more active role in pushing for SINC designation for locations where data collated and supplied as part of this project demonstrates that there are strong populations or concentrations of rare bumblebee species outside existing designated sites.

Local Nature Recovery Action Plans (LNRAPs)

It is unclear how many Local Nature Partnerships (LNPs) in Wales have produced Local Nature Recovery Action Plans (LNRAPs) that include actions and outcomes targeted at rare bumblebees or pollinators more broadly. This information is not currently available from the LNP Cymru website, Wales Biodiversity Partnership website or from the Pollinator Task Force. Several LNRAPs are in the process of being developed. This presents BBCT with an opportunity to ensure that appropriate actions for rare bumblebees are embedded in the emerging action plans. LNP coordinators were contacted and asked for information, but no responses were received.

Local Places for Nature (LPfN)

Over the past year LNPs through Local Places for Nature (LPfN) have been working with local authorities and councils to change mowing practices. Below is a list of some of the work they have achieved:

- LPfN is a capital fund to create places for nature "on your doorstep." It is intended to be "bottom up" with local communities taking forward projects. As part of LPfN, each year Local Nature Partnerships (LNPs) produce plans to "green the public service estate" and showcase "local places for nature."
- As part of the First Minister's "modest measures," LPfN aims to change mowing practices across the public service estate, to encourage pollinators. LPfN intends to stop harmful practices, change to pollinator-friendly practices and grow good practice, with the public sector leading by example.
- Many LNPs have engaged with the mowing agenda in both 2020/21 and 2021/22 and bought machinery. Outturn was £2.6m in 2020/21. £5.6m is available in 2021/22 to LNPs.

- Several LNPs, including Denbighshire have, via LPfN, procured iPads and a GIS system to map the changes. This will help to define and evidence the 2,000 pollinator sites target. Other LNPs are coming on board with GIS this year.
- National Lottery Heritage Fund (NLHF) have funded projects to change mowing practices in 2020/21. In 2021/22 there will be a funded post in One Voice Wales to develop collaborative projects across town and community councils and with other smaller "not for profit" land managers to create pollinator friendly mowing projects.
- The first collaboration was funded by NLHF in 2020/21. Cwmaman Town Council is the lead for three councils including Llanedi and Llannon. The machinery will be held and used to the benefit of all three, with generic contracts. LPfN hopes to expand this model.
- Swansea LNP have been funded to procure cut-and-collect machinery. Mumbles town and community councils have received both a Keep Wales Tidy package and NLHF funding for an LPfN project.

Other projects and initiatives

Bee Friendly Scheme

Bee Friendly is a national certification scheme designed to make Wales pollinator friendly. It is aimed at: communities and community organisations, schools, public bodies, town and community councils, businesses, universities and colleges and places of worship. To date, organisations ranging from businesses to statutory bodies have successfully entered the scheme and are promoting their successes. Denbighshire, St Davids, Newport City, Conwy and Monmouthshire are part of the Bee Friendly scheme, for example.

Monmouthshire County Council was also involved in developing the 'Nature Isn't Neat' project. The project aims to raise awareness and engage with the people of Monmouthshire about the need to help all pollinators, why they are important and what can be done to help them.

B-Lines

In 2017 Buglife Cymru produced B-Lines maps for South and West Wales, further to consultation with a large partnership including Welsh Government, local authorities, LERCs, environmental NGOs and others. Whilst co-ordinated by Buglife, B-Lines is a tool that can be used by any organisation, business or individual that wishes to restore or create habitat for pollinators and other wildlife. The B-Lines are a series of "insect pathways" running through our countryside and towns, along which we are restoring and creating a series of wildflower-rich habitat stepping-stones. They link existing wildlife areas together, creating a network of new habitat areas that benefit pollinators and other wildlife.

UK Pollinator Monitoring Scheme (PoMS)

PoMS is an established monitoring scheme generating systematic data on the abundance of bees, hoverflies and other flower-visiting insects at a national scale. Two methodologies are utilised: a flower-insect timed count and a systematic survey of flowers and pollinators across a one- kilometre square.

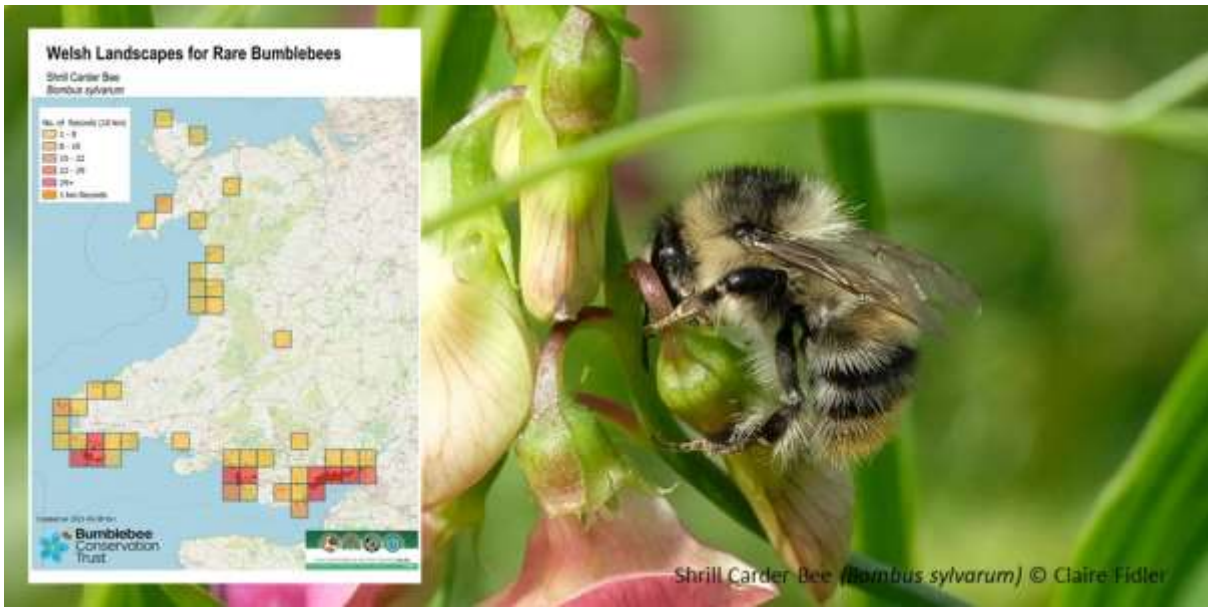
Together with long-term occurrence records collated by the Bees, Wasps and Ants Recording Society and Hoverfly Recording Scheme, these data form an invaluable resource from which to measure trends in pollinator populations and target conservation efforts. BBCT are a partner of this scheme.

Further uptake of the POMS scheme could be promoted as a potential means of filling gaps in known distribution of the focal bumblebee species in Wales.

Saving Pollinators Programme

The Saving Pollinators Programme at The National Botanic Garden of Wales investigates the foraging requirements of honeybees and wild pollinators, using cutting edge DNA barcoding research. It aims to ensure that suitable plants can be provided within gardens, amenity areas and within agricultural landscapes. In conjunction with this work, the National Botanic Garden of Wales also runs a "Saving Pollinators Assurance Scheme." Plants displaying the Saving Pollinators logo are: 1) proven to support pollinators by the Botanic Garden's research scientists, and 2) grown without the use of synthetic insecticides and peat compost.

ANNEX 5 – WEBINAR PROMOTIONAL FLYER



WELSH LANDSCAPES *for* RARE BUMBLEBEES

Wales supports some of the UK's most important populations of threatened bumblebee species. However, many of these species continue to decline, and focused conservation work is urgently required.

In order for this conservation work to be effective it must be accurately targeted, but several of the rare and scarce species in Wales are poorly known; data is fragmented across organisations, many sightings are decades old and some areas have not been surveyed at all.

The WELSH LANDSCAPES for RARE BUMBLEBEES project set out to untangle this situation and to accurately prioritise survey and conservation work. The project collated and reviewed existing data to assess what is known for each species, providing a road map for future survey work and providing decisionmakers with the right tools to inform wider land and natural resource management policy decisions, in order to benefit these rare and priority bumblebees.

A webinar will take place on **Thursday 15th July 2021 at 10:30-12:00** at which staff from Local Environmental Records Centres Wales and Bumblebee Conservation Trust will present the key findings of the project and aims to inspire action across Wales to protect and conserve these rare and threatened Bumblebee species.

To reserve a place at this FREE event, please visit https://www.eventbrite.co.uk/e/webinar-welsh-landscapes-for-rare-bumblebees-tickets-160520371753.

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Bumblebee Conservation Trust
Ymddiriedolaeth Cadwraeth Cacwn

LOCAL ENVIRONMENTAL RECORDS CENTRES WALES
CANOLFANNAU CofnodionAmgylcheddol Lleol CYMRU

Mewn Partneriaeth â Llywodraeth Cymru
In Partnership with Welsh Government

ANNEX 6 – ACKNOWLEDGEMENTS AND LIST OF CONTRIBUTORS

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