



**THE STATUS AND DISTRIBUTION OF THE SHRILL
CARDER BEE *Bombus sylvarum* ON THE EASTERN GWENT
LEVELS AND WITHIN THE CAERWENT AND CALDICOT
AREAS OF GWENT IN 2010.**

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2011

CCW CONTRACT SCIENCE No. 972

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PROJECT SPECIFICATION

PROJECT TITLE:

The status and distribution of the shrill carder bee *Bombus sylvarum* on the eastern Gwent Levels and within the Caerwent and Caldicot areas of Gwent in 2010.

PROJECT BACKGROUND:

The shrill carder bee was once relatively widespread throughout southern England and lowland Wales, favouring flower-rich habitats such as sand dunes, well-established grasslands and heathlands, but it is now known from less than 20 sites in the UK. The reasons for its decline are not known with certainty, but the loss of many important flower-rich grasslands as a result of the intensification of agriculture is likely to have been a key factor. Work undertaken to date under the auspices of the UK Bumblebee Working Group, and part-funded by CCW, has identified some of the key pollen and nectar sources as red bartsia *Odontites vernus*, red clover *Trifolium pratense*, bird's foot trefoil *Lotus corniculatus*, black knapweed *Centaurea nigra* and viper's bugloss *Echium vulgare*. The bee constructs nests out of grass and plant fibres at or just below ground level, each of which supports a relatively small colony of worker bees dominated by a single queen and worker bees from May until September. Only the queen survives the winter, establishing a new nest and fresh colony of workers from her eggs in the following spring.

In Wales, the bee is known from a handful of sites in Glamorgan, most notably Kenfig Burrows NNR, Margam Moors SSSI and Parc Slip Nature Reserve, and from the Castlemartin peninsula in Pembrokeshire where large populations occur on Castlemartin Range, with smaller populations on neighbouring farmland. Records of three workers on the Gwent Levels between 1998 and 2002 provoked a wider search in August 2003, as part of a joint project between CCW and the National Museums & Galleries of Wales, Cardiff. As a result, the shrill carder bee was found widely on the Levels with 100s of workers recorded at some sites (Pavett, 2004). Adults were found foraging on a wide range of plants, although ruderal plants were particularly important, especially stands of creeping thistle *Cirsium arvense*. A survey along a proposed pipeline through St. Brides SSSI on the Gwent Levels between July and September 2007 recorded 41 workers and males at 17 locations foraging on 13 species of flowering plants (Ecosulis, 2007), and small numbers of workers have recently been recorded at the Maes Glas landfill site on Newport Docks (Sinead Lynch, Newport Council, pers. comm.).

In August 2009, a CCW-funded survey found the shrill carder bee to be widely distributed across the eastern Gwent Levels, with large populations on the Newport Wetlands National Nature Reserve and Nash & Goldcliff SSSI, and smaller numbers on Redwick & Llandeenny SSSI and Whitson SSSI (Smith, 2010). Only nine bees were recorded on Magor & Undy SSSI. Important forage plants included common knapweed *Centaurea nigra*, narrow-leaved everlasting-pea *Lathyrus sylvestris*, common bird's-foot-trefoil *Lotus corniculatus*, red clover *Trifolium pratense*, tufted vetch *Vicia cracca* and, on Newport Wetlands NNR, the sunflower *Helianthus annuus*.

On the basis of this information, the shrill carder bee has been identified as a Qualifying feature on six of the eight SSSI which comprise the Gwent Levels, namely Newport Wetlands (542 individuals at 18 sites in 2009), Nash & Goldcliff (381 at 32 sites in 2009), Rumney & Peterstone (305 at six sites in 2003), Whitson (300 at one site in 2003; 87 at 29 sites in 2009), St. Brides (220 at two sites in 2003) and Redwick & Llandeenny (61 at 20 sites in 2009). Numbers at Magor & Undy and Magor Marsh (5 individuals) are too small to merit this status unless considered part of a wider Gwent Levels population.

The survey in 2010 will focus on areas of suitable grassland and other habitats adjacent to Magor & Undy SSSI and within the Caerwent and Caldicot areas to determine current status and distribution, and to identify opportunities for range expansion.

References

- Ecosulis 2007. *Terrestrial invertebrate survey at St Brides, Wentlooge*. **E1519 RSK4USP**.
Pavett, P.M. 2004. *The status of the shrill carder bee Bombus sylvarum on the Gwent Levels*. CCW Contract Science. **623**. Countryside Council for Wales & National Museum of Wales, Cardiff.
Smith, M. 2010. *The status and distribution of the shrill carder bee Bombus sylvarum on Magor & Undy*

SSSI and Whitson SSSI on the Gwent Levels and on Newport Wetlands National Nature Reserve in 2009.
CCW Contract Science. **919**. Countryside Council for Wales.

PROJECT OBJECTIVES:

To determine the current status and distribution of the shrill carder bee on the eastern Gwent Levels and within the Caerwent and Caldicot areas, and to identify opportunities for range expansion.

PROJECT METHODOLOGY:

Between late July and August 2010, when workers, males and fresh queens are likely to be at maximum numbers, searches will be undertaken to locate individuals and populations of the shrill carder bee at a range of sites (see below). Bee numbers should be recorded, differentiating between queens, workers and males, and flower species used as forage should be noted. Searches should focus on flower-rich meadows, road verges, reens (ditches) and coastal margins. Incidental records of other bumblebee species, particularly *Bombus humilis*, *B. muscorum* and *B. ruderarius*, should be noted.

The following sites should be included within the survey:

Eastern Gwent Levels - Caldicott Level, Caldicot Moor, Rogiet Moor and Rogiet Firing Range;

Caldicot area - Caldicot Country Park, Ifton Quarries, Nedern Brook Wetlands SSSI, Rogiet Poor Land GWT reserve,

Caerwent area – Brockwells Meadows SSSI, Caerwent Quarries, Common-y-Coed, Dewstow Golf Club, Five Lanes Meadows complex, RAE Caerwent (including Dinham Meadows SSSI), Shirenewton Meadow and Whitehall Fields.

EXPECTED OUTPUTS:

A draft report will be submitted to the CCW Project Officer, Dr. Mike Howe, by 4th December 2010. Twenty copies of the final report will be produced by 28th January 2011. In addition, an unbound, single-sided copy of the report and a copy of the text on disk (in Word 2000 or ASCII format) will also be supplied. The report should contain an executive summary, in both English and Welsh, not exceeding two pages in length.

ADDITIONAL INFORMATION:

The project will involve 15 to 20 days of fieldwork.

The CCW Project Officer will provide site details to the successful tenderer and can also supply OS maps and aerial photographs of areas to be surveyed. Access permission to some sites can be organised by CCW, and the contractor should contact either the Project Officer or the CCW Regional office in Cardiff prior to any visits. The contractor should ensure that appropriate Health & Safety measures are in place, particularly in relation to working along roadside verges, alongside ditches and on MoD properties.

SUMMARY

During a survey of 68 localities on the Gwent Levels between Magor and Chepstow and 55 inland localities around Caerwent, Caldicot and Mynydd-bach in August-September 2010, 12 species of bumblebees were recorded. The shrill carder-bee *Bombus sylvarum* was recorded from 16 localities on the Levels, as far east as Chepstow, and 4 inland localities, but in very small numbers, and was not found on the relatively large grasslands at RAF Caerwent. Individuals foraged on 15 species of plants, with pollen collected from purple loosestrife and tufted vetch. The brown-banded carder bee *Bombus humilis* was much more widespread, with records from 35 coastal localities and 18 inland localities.

Whilst *B.sylvarum* occurs throughout the Gwent Levels from Cardiff to Chepstow, inland populations are very scarce and appear vulnerable to habitat loss and fragmentation. These factors seem to have less of an impact upon *B.humilis* which still occurs on small, isolated pockets of suitable grassland.

CRYNODEB

Yn ystod arolwg ar 68 o ardaloedd yng Ngwastadeddau Gwent rhwng Magwyr a Chas-gwent a 55 o ardaloedd mewndirol o amgylch Caerwent, Cil-y-coed a Mynydd-bach yn ystod Awst-Medi 2010, cofnodwyd 12 o fathau gwahanol o gacwn. Cofnodwyd y gardwenynen fain *Bombus sylvarum* mewn 16 o ardaloedd o fewn y Gwastadeddau, cyn belled i'r dwyrain â Chas-gwent; a chofnodwyd nifer fechan ohoni hefyd mewn 4 o ardaloedd mewndirol. Ni ddaethpwyd o hyd iddi ar y glaswelltiroedd cymharol fawr yn RAF Caerwent. Roedd y cardwenyn main unigol yn chwilio am fwyd ar 15 o fathau gwahanol o blanhigion, gan gasglu paill ar lysiau'r-milwr coch a ffabys y berth. Roedd y gardwenynen rhesi brown *Bombus humilis* i'w gweld dros ardal ehangach o lawer. Yn wir, fe'i cofnodwyd ar 35 o ardaloedd arfordirol ac 18 o ardaloedd mewndirol.

Er bod *B.sylvarum* i'w gweld drwy Wastadeddau Gwent, o Gaerdydd i Gas-gwent, mae'r poblogaethau ar y mewndir yn anfynych iawn, ac ymddengys bod colli a darnio cynefinoedd yn cael effaith arnynt. Mae'n ymddangos bod y ffactorau hyn yn effeithio llai ar *B.humilis*, sy'n dal i fodoli mewn pocedi bach ac arunig o laswelltir addas.

INTRODUCTION

The shrill carder bee *Bombus sylvarum* is a small bumblebee once relatively widespread throughout southern England and lowland Wales. However, it is currently known from less than 20 'sites' in the UK. The reasons for its decline are not known with certainty, but the loss of many important flower-rich grasslands and habitat fragmentation as a result of the intensification of agriculture are likely to have been key factors. Because of this decline, *B.sylvarum* is listed as a UK Biodiversity Action Plan (BAP) Priority Species.

The bee is known from a handful of sites in Wales, with large and extensive populations occurring on the Gwent Levels and on the Castlemartin peninsula in Pembrokeshire. At the latter, the core populations occur on the Castlemartin MoD Range, with smaller populations on neighbouring farmland. Much smaller populations occur at Kenfig Burrows NNR, Margam Moors SSSI and Parc Slip Nature Reserve in Glamorgan.

Records of three *B.sylvarum* workers on the Gwent Levels between 1998 and 2002 instigated a wider search in August 2003, as part of a joint project between CCW and the National Museums & Galleries of Wales, Cardiff. As a result, the shrill carder bee was found widely on the Levels with hundreds of workers recorded at some sites (Pavett, 2004). Adults were found foraging on a wide range of plants, although ruderal plants were particularly important, especially stands of creeping thistle *Cirsium arvense*. A survey along the route of a proposed gas pipeline through the St. Brides SSSI in the western part of the Gwent Levels undertaken between July and September 2007 recorded 41 workers and males foraging on 13 species of flowering plants at 17 locations along the pipeline route (Ecosulis, 2007). Small numbers of workers have also recently been recorded at the Maes Glas landfill site on Newport Docks.

In August 2009, a CCW-funded survey found the shrill carder bee to be widely distributed across the eastern Gwent Levels, with large populations on the Newport Wetlands National Nature Reserve and Nash & Goldcliff SSSI, and smaller numbers on Redwick & Llandeenny SSSI and Whitson SSSI (Smith, 2010). Only nine bees were recorded on Magor & Undy SSSI. Important forage plants included common knapweed *Centaurea nigra*, narrow-leaved everlasting-pea *Lathyrus sylvestris*, common bird's-foot-trefoil *Lotus corniculatus*, red clover *Trifolium pratense*, tufted vetch *Vicia cracca* and, on Newport Wetlands NNR, the sunflower *Helianthus annuus*.

On the basis of this information, the shrill carder bee has been identified as a Qualifying feature on six of the eight SSSI which comprise the Gwent Levels, namely Newport Wetlands (542 individuals at 18 sites in 2009), Nash & Goldcliff (381 at 32 sites in 2009), Rumney & Peterstone (305 at six sites in 2003), Whitson (300 at one site in 2003; 87 at 29 sites in 2009), St. Brides (220 at two sites in 2003) and Redwick & Llandeenny (61 at 20 sites in 2009). Numbers at Magor & Undy and Magor Marsh (5 individuals) are too small to merit this status unless considered part of a wider Gwent Levels population.

This survey was commissioned to determine the current status and distribution of the shrill carder bee on the eastern Gwent Levels adjacent to Magor & Undy SSSI, and also to investigate the possibility that the species might be present at suitable inland localities within the Caerwent and Caldicot areas. Although the focus of the survey was *B.sylvarum*,

all species of bumblebee encountered were recorded, in particular the BAP species *B.humilis*, *B.muscorum* and *B.ruderarius*.

METHODS

The survey was carried out during August and early September 2010, when numbers of workers and males were likely to be at their maximum. Fifteen days fieldwork was planned, though heavy rain prevented surveying for a total of two of these days. Survey sites were reached using a combination of roads, tracks, footpaths and green lanes. Surveys focussed on flower-rich meadows, road verges, reën banks and coastal margins where bumblebees were likely to be foraging.

A total of seven areas were selected for survey. These were:

1. The Eastern Gwent Levels - Caldicot Moor, Rogiet Moor and Rogiet Firing Range.
2. Caldicott Level.
3. Caldicot Country Park and Nedern Brook Wetlands SSSI.
4. Caldicot area, Ifton Quarries, Caerwent Quarries, Brockwells Meadows SSSI, Dewstow Golf Club and Rogiet Poor Land GWT reserve.
5. RAE Caerwent (including Dinham Meadows SSSI).
6. Five Lanes Meadows complex.
7. Shirenewton Meadow and Whitehall Fields.

These areas are shown in Figures 1-3 below. The majority of recording took place within these areas, with a limited number of records coming from nearby sites.

Except for a few very large areas of meadows or pastures, each field was treated as a single survey unit, with a grid reference taken at the approximate centre of the field. With linear features such as trackways or green lanes, grid references refer to 100m sections of the track and a single site may include a number of survey points along its length.

At each locality surveyed, the species and sex of any bumblebee species present were noted, together with flower species being used as forage. Individual bees with pollen loads seen to be consistently visiting a series of flowers of one species were assumed to have collected pollen from that particular species of flower. A small number of voucher specimens, mostly of males of the “orange” carder bee species, were retained to allow accurate identification, but the majority of the survey records made were field records. Most sites were surveyed only once, although a few sites were visited on 2 or 3 occasions.

Grid references for each locality were obtained with a hand-held GPS system (Garmin GPS 12). Site names were obtained using a combination of 1:25000 Ordnance Survey maps and the “Magic” on-line mapping system (www.magic.gov.uk), which proved particularly useful by providing the names of some of the larger reens or tracks.

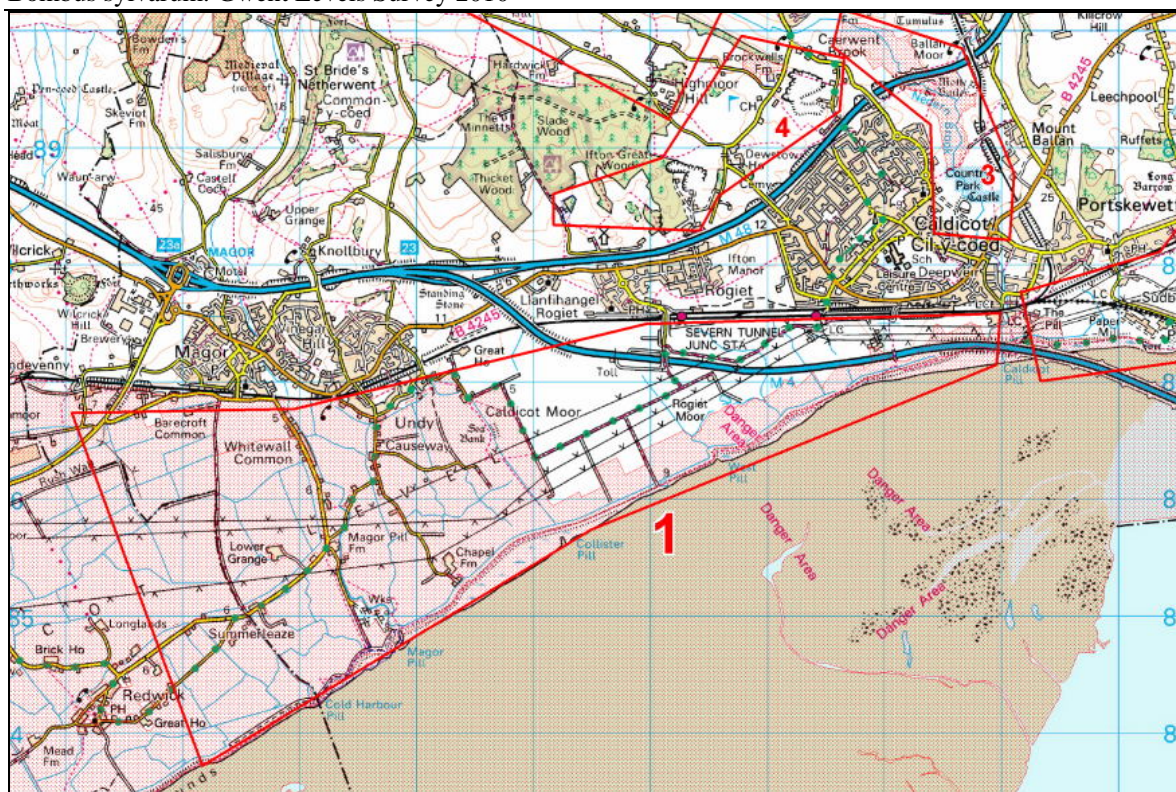


Figure 1. 2010 Survey areas.



Figure 2. 2010 Survey areas.

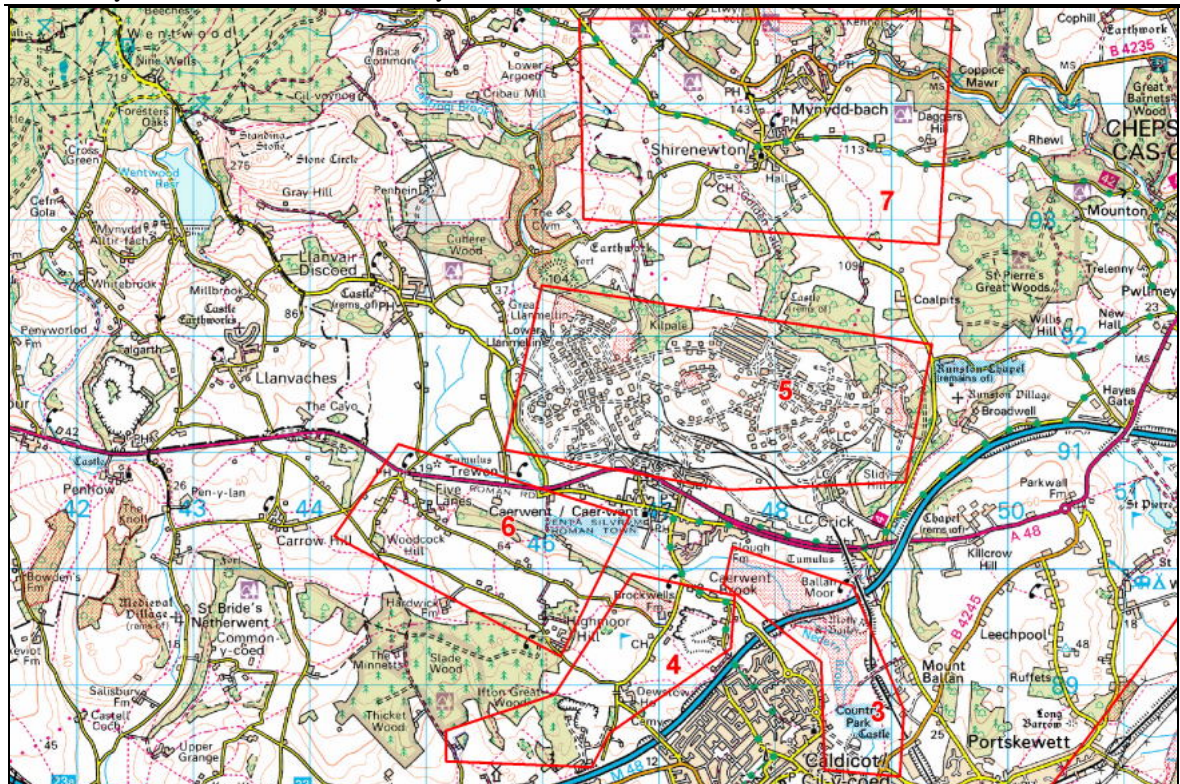


Figure 3. 2010 Survey areas.

RESULTS

12 species of bumblebee were recorded from a total of 123 localities during the survey. The species recorded are shown in Table 1 and the localities mapped in Figure 4. *B. sylvarum* was recorded from 20 localities (Figure 5), with numbers noted per locality ranging between 1 to 3 individuals, and the brown-banded carder bee *B. humilis* was recorded from 53 localities (Figure 6). Details of the localities for records of *B. sylvarum* are provided in Table 2 and Appendix I and those for *B. humilis* are in Appendix II. Neither the moss carder bee *B. muscorum* nor the red-shanked carder bee *B. ruderarius* was recorded.

Table 1. Bumblebee species recorded during the survey. * includes 2 records outside survey area.

Species	BAP Species	Number of localities
Bumblebees		
<i>Bombus hortorum</i>	BAP	11
<i>Bombus humilis</i>		53
<i>Bombus hypnorum</i>		1
<i>Bombus lapidarius</i>		61
<i>Bombus lucorum</i>		10
<i>Bombus pascuorum</i>		89
<i>Bombus pratorum</i>		19
<i>Bombus sylvarum</i>	BAP	22*
<i>Bombus terrestris</i>		26
Cuckoo Bumblebees		
<i>Bombus campestris</i>		2
<i>Bombus rupestris</i>		5
<i>Bombus vestalis</i>		3

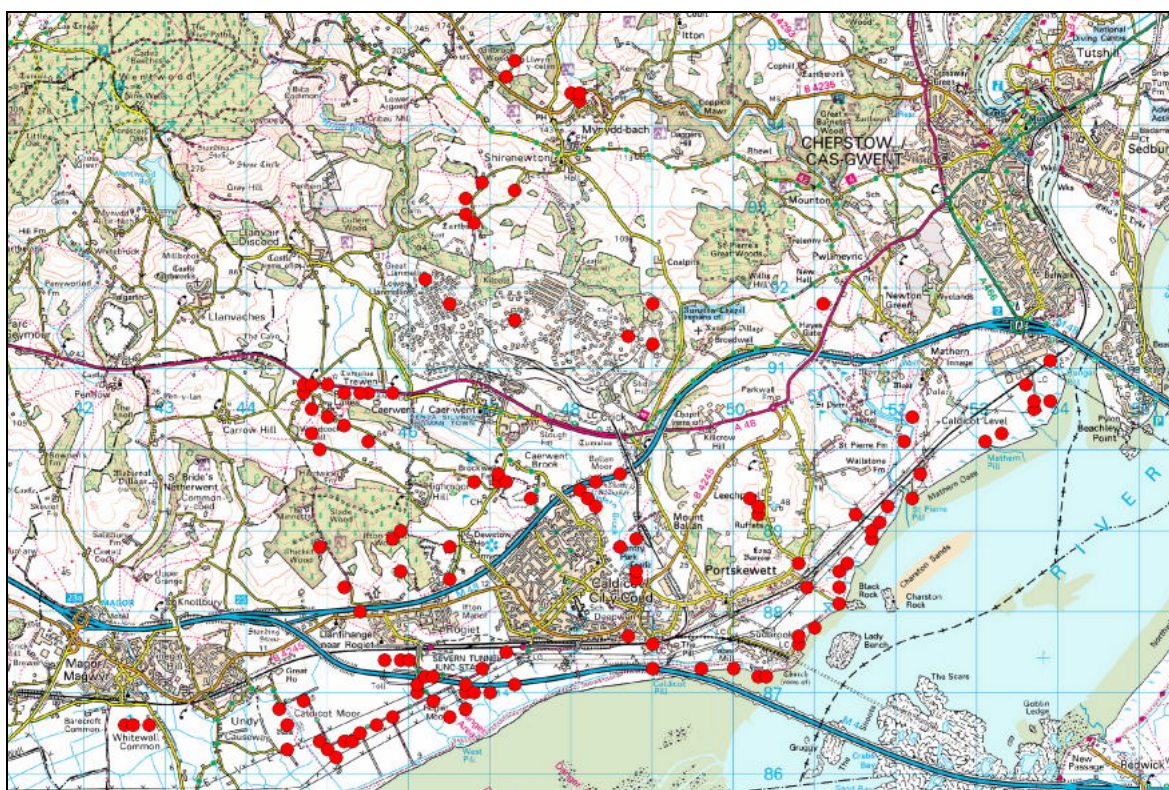


Figure 4. 2010 Survey: all bumblebee records.

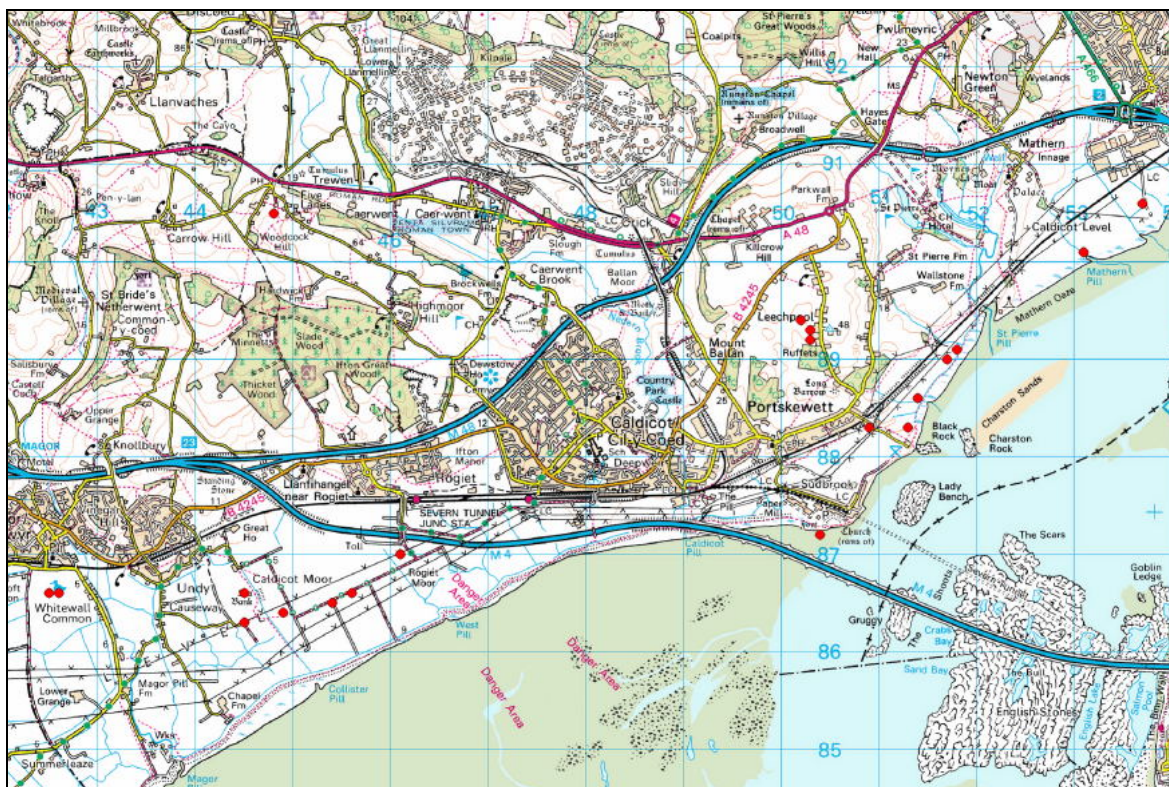


Figure 5. 2010 Survey: *Bombus sylvarum* records.

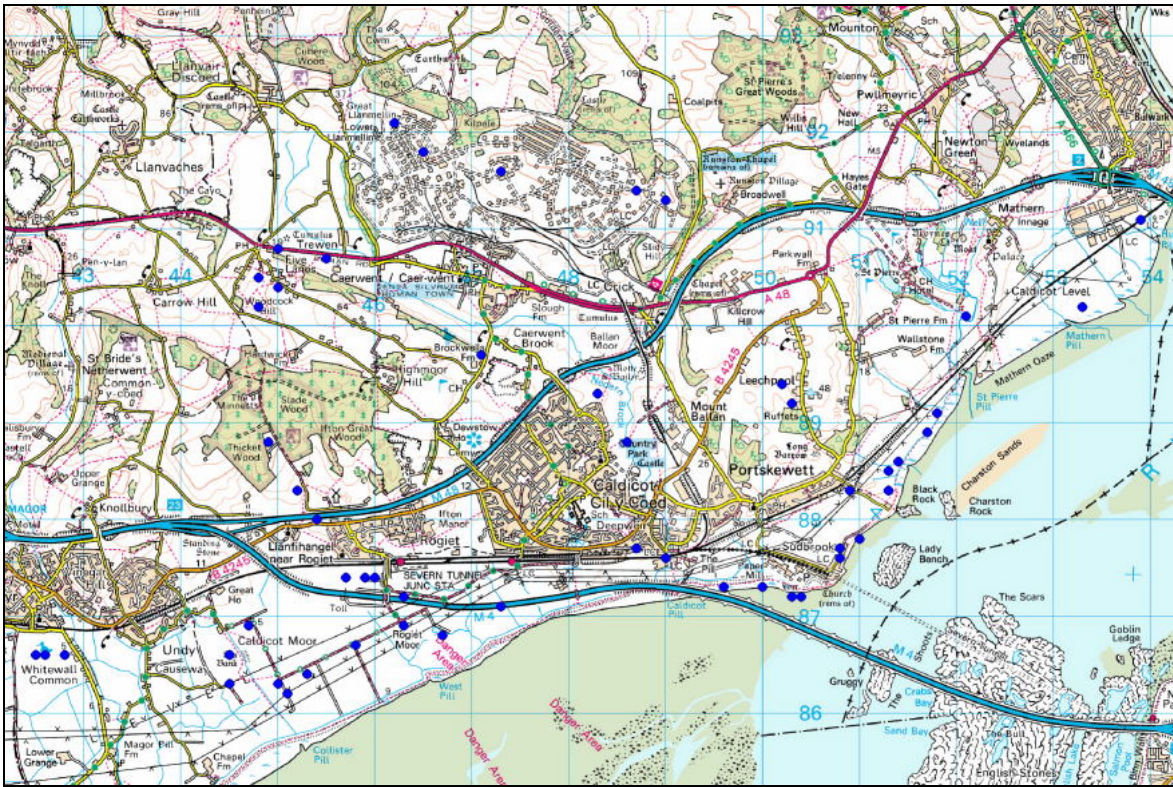


Figure 6. 2010 Survey: *Bombus humilis* records.

Bombus sylvarum was recorded on various dates across the whole of the survey period from 2nd August to 10th September, albeit in small numbers indicating small populations only. It was found at three sites on Magor & Undy SSSI, having been recorded here in 2009 (Smith, 2010) as well as two sites in Magor Marsh SSSI. The current survey provided further records on Caldicot Moor and Rogiet Moor, and extended the distribution of the bee along the entire coastal levels to Chepstow. Inland populations were confined to Five Lanes and Leechpool, with none recorded from RAE Caerwent. *Ad hoc* recording noted *B.sylvarum* at Nash village (Waterloo Inn) and Newport Wetlands SSSI (within the NNR) but these are excluded from Figure 5.

Table 2. Records of shrill carder bee in 2010.

Location	<i>Bombus sylvarum</i>
Magor Marsh SSSI	2 workers
Moor Magor & Undy SSSI	3 workers
Caldicot Moor	2 workers
Caldicot Level, Black Rock	4 workers +1 male
Caldicot Level, Aust Farm	1 worker
Sudbrook old fort	1 worker
Rogiet Moor	1 worker
Five Lanes	1 worker
Leechpool	3 workers + 2 males
Caldicot Level, Mathern	1 worker + 1 male
Newport Wetlands SSSI	1 worker
Waterloo Inn, Nash (Nash & Goldcliff SSSI)	1 worker

Bumblebees were seen to visit flowers of 52 different species of plant during the survey (Table 3), with a total of 432 flower visits observed. *B.sylvarum* was recorded visiting 15 species of plant and noted as collecting pollen from 2 (purple loosestrife and tufted vetch). Workers were seen visiting 14 species of plant and males were recorded on 3 species.

Table 3. Plants visited by bumblebees during the survey.

Plant Species	Bumblebees	Bombus hortorum	Bombus humilis	Bombus hypnorum	Bombus lapidarius	Bombus lucorum	Bombus pascuorum	Bombus pratorum	Bombus sylvarum	Bombus terrestris	Cuckoo bumblebees	Bombus campestris	Bombus rupestris	Bombus vestalis	Total
Black Medick					•										1
Borage								•							1
Bramble			•		•	•	•	•	•	•			•		8
Burdock			•		•		•	•							4
Butterfly-bush			•		•		•			•		•			5
Catmint			•						•						2
Cat's Ear						•	•								2
Chicory					•										1
Common Bird's-foot-trefoil			•		•		•		•	•					5
Common Comfrey		•	•				•	•							4
Common Hemp-nettle		•					•								2
Common Knapweed			•		•	•	•	•	•	•		•	•	•	10
Common Ragwort			•		•		•	•	•						5
Common Toadflax		•													1
Creeping Thistle			•		•		•		•						4
Crocsmia cultivar		•					•								2
Devil's-bit Scabious			•				•						•		3
Field Scabious			•				•								2
Geranium cultivar				•											1
Great Willowherb			•		•		•								3
Hebe cultivar							•			•					2
Hedge Woundwort							•								1
Hemp-agrimony						•				•					2
Honeysuckle		•													1
Hymalayan Balsam			•		•	•	•			•					5
Hypericum							•			•					2
Iceplant								•		•					2
Large Bindweed		•	•				•		•						4
Marsh Thistle							•								1
Marsh Woundwort			•				•								2
Meadow Vetchling			•				•								2
Narrow-leaved Everlasting-pea			•				•	•							3
Penstemon cultivar		•					•	•							3
Persicaria cultivar							•								1
Phacelia			•				•								2
Purple-loosestrife			•		•		•	•	•	•					6
Red Bartsia			•		•	•	•	•	•	•					7
Red Clover		•	•		•		•	•	•						5
Rosebay Willowherb					•		•	•		•					4

Bombus sylvarum: Gwent Levels Survey 2010

Runner Bean		●													1
Self-heal					●		●								2
Sow-thistle							●								1
Spear Thistle			●		●		●	●	●	●			●		7
Sunflower		●	●		●	●	●		●	●			●		7
Tufted Vetch			●		●	●	●		●	●					5
Water Mint			●												1
White Clover			●		●		●	●	●	●					6
White Dead-nettle							●	●							2
Wild Marjoram			●				●						●	●	4
Wild Teasel			●		●	●	●		●	●				●	7
Woody Nightshade							●			●				●	2
No. of plant species visited		10	28	1	21	9	40	15	15	17		2	5	3	

DISCUSSION

Populations of the shrill carder bee in south-east Wales are almost entirely focussed on the Gwent Levels. These consist of three large areas of reclaimed alluvial wetlands bordering the Severn Estuary between Cardiff and the River Rhymney in the west and Chepstow on the River Wye in the east, and are characterized by low-lying fields divided by a network of ditches or reens. The extent of this low-lying habitat varies considerably, with extensive areas at the western end and a narrow strip along the coast at the eastern end. Within the current survey area, the main east-west railway effectively marks the northern edge of this type of habitat.

The current survey has extended the known distribution of the shrill carder bee along the entire coast from Cardiff to Chepstow, a distance of c.32km, although numbers in the eastern part of its range between Magor to Chepstow are small. This survey recorded *B.sylvarum* from 20 localities (Figure 5). Sixteen of these sites were located on the levels, 15 on low lying sites with a single record coming from an area of flower rich unimproved grassland on the headland at Sudbrook Fort. The majority of locality records were generated by the finding of single individuals, the large numbers noted at some of the survey sites in 2009 (Smith 2010) was not repeated during this survey.

This survey provided the 1st records of the shrill carder bee for ST59 (Caldicot Level, Mathern) and ST49 (Five Lanes Meadow), and the 1st for ST58 (Aust Farm; Caldicot Level, Blackrock; Leechpool; Sudbrook old fort) since 1976.

The low numbers of individuals recorded and the restricted distribution noted during this survey are most likely due to a combination of factors. The majority of records of *B.sylvarum* collected during the 2009 (Smith 2010) and 2010 Gwent Levels surveys came from low-lying habitats on the levels. However, it is unlikely this distribution is explained by any particular requirements for “damp” habitats, as the species was once widely distributed across central and southern Britain (Edwards & Telfer 2001).

At the eastern end of the survey area towards Chepstow the levels are restricted to a narrow strip along the coast, at times extending inland only a few hundred metres. *B.sylvarum* is found here, but not in large numbers. In contrast, the levels south of Newport extend inland for up to 4 – 5 km. In addition to the more extensive reen system, there are also small areas of less intensively managed flower grassland such as paddocks, hay meadows and roadside

verges. Here, *B.sylvarum* can be found in large numbers, particularly around the Newport Wetlands NNR where there are large amounts of narrow-leaved everlasting-pea (Smith 2010).

B.sylvarum will forage at a wide variety of plants and key species include red bartsia *Odontites vernus*, red clover *Trifolium pratense*, common bird's-foot-trefoil *Lotus corniculatus*, narrow-leaved everlasting-pea *Lathyrus sylvestris* and black knapweed *Centaurea nigra*. Smith (2010) recorded the flowers visited by 1018 *B.sylvarum* workers, 62% of which were visiting plants in the family Fabaceae such as narrow-leaved everlasting-pea, tufted vetch *Vicia cracca* and common bird's-foot-trefoil, with a further 17% noted on black knapweed.

Vetches and clovers were once an important component of the agricultural cycle, with vetch or clover leys being planted as part of a crop rotation system to add nitrogen to the soil. Similarly, vetches, clovers and knapweeds were a valued component of "traditional" unimproved hay meadows. With modern intensive agriculture, vetch or clover leys are no longer required, fields can be cut for silage several times in a season without being allowed to flower and pasture can be 'improved' with herbicides and fertilisers, resulting in a loss of many flowering plant species from the sward. The loss of these flower-rich grasslands is likely to have been a key factor in the decline of many of our now scarce bumblebee species.

As can be seen from Figures 4 and 6, the areas north of the levels do support a range of bumblebee species including *Bombus humilis*. Agricultural practices across the whole of the survey area are very similar, with a mix of permanent pasture used for both the grazing of sheep and cattle and silage production, together with some areas of mixed arable production. What is noticeably different between the areas north of the levels and the Gwent Levels themselves is the way in which the fields are separated. Both areas have the usual mixture of hedgerows and fences separating the fields, but within the levels there are also a large number of ditches and reens between the fields and alongside tracks and roads. These are normally fenced off to prevent livestock access and remain ungrazed and mostly uncut; it is along these reens and other less intensively managed areas such as the sea wall that the plant species favoured by *B.sylvarum* can be found in flower. These observations suggest that the small populations of *B.sylvarum* observed at the eastern end of the survey area are essentially restricted to the Gwent Levels by the lack of suitable sources of forage elsewhere.

This has implications for the conservation and management of *B.sylvarum* in and around these areas. Whilst conservation efforts on the Gwent Levels east of the River Usk should focus undoubtedly on the Newport Wetlands National Nature Reserve, Nash & Goldcliff SSSI, Whitson SSSI and Redwick & Llandeenny SSSI, the smaller populations associated with Magor & Undy SSSI, Magor Marsh SSSI and the non-statutory levels towards Chepstow should not be overlooked as the entire area should be considered as supporting a single metapopulation of *Bombus sylvarum*.

Provision of additional areas of appropriate flower rich forage within the Gwent Levels, in particular the somewhat more intensively managed eastern parts of the levels, should be encouraged. These efforts should also extend out to the areas immediately adjacent to the levels, particularly in areas where the populations of *B.sylvarum* are small or where the

levels are restricted to a narrow area along the coast. A variety of options are available, ranging from the sowing of areas with a specific flower rich seed mixture containing plants preferred by *B.sylvarum*, down to the simple expedient of not mowing reed margins and allowing the vegetation to flower during the months when *B.sylvarum* is active.

Despite wide-ranging searches of 55 inland localities around Caldicot, Caerwent, Rogiet, Shirenewton and Mynydd-bach, the only sightings of the shrill carder bee were of a single worker on red bartsia in Five Lanes Meadow and several workers and males at three adjacent localities at Leechpool. The Leechpool records are centred on a 2ha pasture leased by Monmouthshire County Council to an interested private individual and managed for the benefit of wildlife, in particular farmland birds (see www.leechpoolwildlife.co.uk). Field margins have been sown with a seed mix, including sunflowers, to provide shelter and winter food for seed-eating birds. As on the Newport Wetlands NNR in 2009, where it was noted that sunflowers within the 'bird food' plantings were attractive to a range of bumblebee species including *B.sylvarum* and provided an important late season forage particularly for queens (Smith 2010), 8 species of bumblebee, including *B.sylvarum* and *B.humilis*, were observed foraging on sunflowers at Leechpool.

Many of the pastures around Five Lanes are grazed by horses and, whilst many are agriculturally-improved, a reasonable percentage support flower-rich swards which could support the shrill carder bee. The only individual was recorded from a 1.2ha overgrown meadow, Five Lanes Meadow (a Site of Interest for Nature Conservation – SINC) which supported an abundance of common knapweed, meadow vetchling and red bartsia. A contiguous 7.2ha cattle-grazed pasture at Woodcock Hill looked very suitable, with widespread common knapweed and chicory.

Disappointingly, the shrill carder bee was not recorded at RAE Caerwent, the largest area of inland semi-natural grassland within the survey area. This may be due to a rather "one dimensional" flora with few of the preferred foodplants available. Large amounts of low growing bird's-foot-trefoil were present, particularly along road verges which appeared to be mown on a regular basis. Apart from a very few small patches, little in the way of stands of vetches or knapweeds could be found suggesting the site does not have the continuity of flowers across the flight season needed to support a population of *B.sylvarum*. It was also absent from Gwent Wildlife Trust reserves at Brockwells Meadows, Lower Minnett's Field and Rogiet Poor Land, perhaps because they are too small and isolated to support populations of the bee.

The brown-banded carder bee *Bombus humilis* was much more widespread, with records from 53 localities including 35 on the coastal levels and 18 inland. It was the 3rd most frequently encountered bumblebee after the ubiquitous *B.pascuorum* and *B.lapidarius*, occurring at 43% of the survey sites and found at all the localities from which *B.sylvarum* was recorded. It was also found in greater numbers than *B.sylvarum*. Although this species has declined across the UK in a similar manner to *B.sylvarum*, it has not declined to the same extent. It would seem able to tolerate a greater degree of habitat fragmentation and survive on smaller habitat patches than the shrill carder bee, as well as being slightly less specialised in its choice of foodplants. During this survey, *B.humilis* was recorded visiting 28 plant species compared to just 15 species visited by *B.sylvarum*.

A single male of *Bombus hypnorum* was found visiting flowers in a roadside garden at Five Lanes. This species was first noted in the UK in 2001 when a single male was taken at

Landford on the northern edge of the New Forest in Hampshire (Goulson & Williams 2001). Since then, it has rapidly expanded its range in Britain and was first recorded in Wales in 2009 at sites in Cardiff and Barry; this record is one of a number of records noted for this species in south Wales in 2010.

RECOMMENDATIONS

Conservation effort on the shrill carder bee in south-east Wales should focus mainly on the Gwent Levels. On the levels to the east of the River Usk, the focus should be on the larger populations associated with Newport Wetlands SSSI, Nash & Goldcliff SSSI, Whitson SSSI and Redwick & Llandeenny SSSI.

Inland populations appear to be very small and fragmented reflecting the current condition of flower-rich grasslands, but should not be ignored. Suitable grasslands within the Five Lanes area are relatively frequent and it may be worth undertaking further survey work for the bee in order to determine the status and distribution of this somewhat isolated population.

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APPENDIX I. *Bombus sylvarum* survey site localities and numbers recorded for each caste. For sites where recording took place over more than one visit, the numbers indicate the highest overall day count for that particular caste.

Site Number	Location	Grid Ref	Worker	Male
BS17	Magor Marsh SSSI	ST425866	●	
BS17	Magor Marsh SSSI	ST426866	●	
BS42	Caldicot Moor, Magor & Undy SSSI	ST445863	●	
BS42	Sea Wall Reen, Caldicot Moor Magor & Undy SSSI	ST445866	●	
BS42	Caldicot Moor, Magor & Undy SSSI	ST449864	●	
BS42	Caldicot Moor, Undy	ST454865	●	
BS42	Caldicot Moor, Undy	ST456866	●	
BS43	seawall footpath, Newport Wetlands SSSI*	ST343823	●	
BS45	coastal footpath, Black Rock, Caldicot Level	ST513883	●	
BS45	coastal footpath, Black Rock, Caldicot Level	ST514886	●	●
BS45	coastal footpath, Black Rock, Caldicot Level	ST517890	●	
BS45	coastal footpath, Black Rock, Caldicot Level	ST518891	●	
BS49	Aust Farm, Caldicot Level	ST509883	●	
BS51	Sudbrook old fort	ST504872	●	
BS53	Rogiet Moor	ST461870	●	
BS61	Five Lanes Meadow (SINC), Five Lanes	ST448905	●	
BS67	Leechpool Holdings, Leechpool	ST502894	●	●
BS68	pastureland, Leechpool	ST503893	●	
BS69	birdfood strip, Leechpool	ST503892	●	●
BS75	Caldicot Level, Mathern	ST531901		●
BS75	Caldicot Level, Mathern	ST537906	●	
BS86	The Waterloo Inn, Nash*	ST342836	●	

Sites names indicated with an '*' are ad-hoc records from outside of the survey area.

APPENDIX II. *Bombus humilis* survey site localities and recorded caste.

Site Number	Location	Grid Ref	Queen	Worker	Male
BS17	Magor Marsh Reserve, Magor	ST425866		●	
BS17	Magor Marsh Reserve, Magor	ST426866			●
BS17	Magor Marsh Reserve, Magor	ST428866		●	
BS41	Caldicot Industrial Estate, Caldicot	ST490876		●	
BS42	Caldicot Moor, Undy	ST445863		●	
BS42	Sea Wall Reen, Caldicot Moor	ST445866		●	
BS42	Moor Reen, Caldicot Moor	ST447869		●	
BS42	Caldicot Moor, Undy	ST450863		●	
BS42	Caldicot Moor, Undy	ST451862		●	●
BS42	Caldicot Moor, Undy	ST453864		●	
BS42	Caldicot Moor, Undy	ST458867		●	
BS44	coastal footpath, Sudbrook	ST508876			●
BS44	coastal footpath, Sudbrook	ST508877			●
BS44	coastal footpath, Sudbrook	ST510878		●	
BS45	costal footpath, Black Rock, Portskewett	ST513883	●		
BS45	costal footpath, Black Rock, Portskewett	ST513885			●
BS45	costal footpath, Black Rock, Portskewett	ST514886		●	
BS45	costal footpath, Black Rock, Portskewett	ST517889		●	

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Site Number	Location	Grid Ref	Queen	Worker	Male
BS45	costal footpath, Black Rock, Portskewett	ST518891		●	
BS49	Aust Farm, Portskewett	ST509883			●
BS50	seawall footpath, Caldicot to Sudbrook	ST496873			●
BS50	seawall footpath, Caldicot to Sudbrook	ST500873			●
BS50	seawall footpath, Caldicot to Sudbrook	ST503872		●	●
BS51	old fort, Sudbrook Point, Sudbrook	ST504872		●	
BS52	old fort, Sudbrook Point, Sudbrook	ST487877			●
BS53	Rogiet Moor, East Gwent Levels	ST463872		●	●
BS57	Palace Farm, Mathern	ST521901		●	
BS58	Caerwent Quarry, Caldicot	ST471897			●
BS59	Rogiet Poor Lands GWT Reserve, Rogiet	ST452883		●	●
BS60	Minnett's Lane, Rogiet	ST454880		●	●
BS61	Five Lanes Meadow (SINC), Five Lanes	ST448905		●	●
BS62	Woodcock Hill, Five Lanes	ST448902		●	
BS64	paddock at 'Cherry Orchard', Five Lanes	ST450904			●
BS65	A40 verges, Five Lanes	ST450908		●	
BS65	A40 verges, Five Lanes	ST455907			●
BS67	Leechpool Holdings, Leechpool	ST502894		●	●
BS69	birdfood strip, Leechpool	ST503892		●	●
BS71	Caldicot footpaths, Caldicot	ST486888		●	●
BS74	Rogiet Firing Range, Rogiet Moor	ST463869		●	●
BS74	Rogiet Firing Range, Rogiet Moor	ST467868			●
BS74	Rogiet Firing Range, Rogiet Moor	ST473871			●
BS74	Caerwent Lane, Chepstow	ST539911			●
BS75	Caldicot Level, Mathern	ST533902			●
BS76	Rogiet Country Park, Rogiet	ST457874		●	
BS76	Rogiet Country Park, Rogiet	ST459874		●	
BS76	Rogiet Country Park, Rogiet	ST460874		●	
BS77	RAF Caerwent, Caerwent	ST462921	●	●	
BS77	RAF Caerwent, Caerwent	ST465918		●	
BS77	Building 208, RAF Caerwent, Caerwent	ST487914		●	
BS77	RAF Caerwent, Caerwent	ST490913		●	
BS80	Block 3 SSSI, RAF Caerwent	ST473916		●	
BS84	Nedern Brook, Caldicot	ST483893			●
BS85	Lower Minnett's Field GWT Reserve, Rogiet	ST449888			●