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Report on Duke of Burgundy Butterfly *Hamearis lucina* (L.) survey
on Salisbury Plain Training Area SSSI in 2015

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EXECUTIVE SUMMARY

A survey of Duke of Burgundy (DoB) Butterfly was carried out on Salisbury Plain Military Training Area (SPTA) SSSI in 2015. DoB is a priority Species in the UK Biodiversity Action Plan. It is estimated to have declined by 50% in recent decades. SPTA SSSI, which contains the largest area of unimproved calcareous grassland in Europe, is known to be one of the remaining strongholds of DoB in the UK, and as such, DoB is an individually notified feature of SPTA SSSI.

Phase I of the survey consisted of sampling surveys for adults, in the form of timed counts. Documented historical records of the adult butterfly, along with data from two studies which concentrated on searches for larval damage, were used to target sites and areas where the butterfly had been recorded previously. The aim was to survey at least 20 1 km squares (sites). Within each square, suitable habitat was surveyed for adult DoB. Surveys took place in the second half of May.

The second phase consisted of sampling surveys for the characteristic feeding signs (holes) made by the larvae of DoB in Cowslip leaves. This also followed the timed counts methodology. Cowslip plants were recorded for the presence or absence of larval damage (LD), within suitable patches of habitat. Simple habitat parameters were recorded for the surroundings of each Cowslip plant, namely sward height, aspect and habitat type in relation to amount and size of scrub present. Larval damage surveys took place during the period early July to early September. Adult and LD locations were recorded on hand-held GPS units.

A total of 65 timed counts were carried out for adults, in 28 sites, 18 in the west, 6 in the centre and 4 in the east. Adults were seen in 9 of the sites (4 in the west, 3 in the centre and 2 in the east). A total of 50 adults were seen (15 in the west, 21 in the centre and 14 in the east). A total of 130 LD counts were made, in 59 sites, including 26 of those surveyed for adults. LD was identified on 39 counts, with 302 plants recorded with LD. Over 2,000 Cowslip plants were recorded.

The main conclusions are that Duke of Burgundy is widely spread, but localised on SPTA and that all three main areas of the SSSI hold important populations. The information provided (particularly the LD and Cowslip plant records) can be used to identify and highlight important areas, so that a network of suitable breeding sites, including core sites protected against unfavourable management, can be maintained within the overall management framework. The need for this is most acute in the West, where several instances where management could be more targeted were identified.

In the West, colonies appear to be relatively small and sometimes isolated and the more complex overall habitat structure makes locating adults and LD more difficult. Tall grasses and tall herbs growing in old tank tracks in open valley bottoms are used as male lekking areas, as well as the more usual bays and edges in scrub.

In the Centre, DoB is probably restricted to the western side and the south-east, where significant colonies are present. Further adult surveys in the south-east would provide more information on the status of DoB here, where only LD surveys were carried out. In the East, DoB appears more reliant on woodland edges and complex mosaics of scrub and grassland, especially at Milston Firs. Others exist further south but were not surveyed. Areas north of there appeared less promising, but most were not explored.

1. INTRODUCTION

This report summarises the results from a field survey for Duke of Burgundy Butterfly (DoB) on Salisbury Plain Training Area (SPTA) SSSI in 2015. Duke of Burgundy Butterfly is a Priority species in the UK Biodiversity Action Plan, which has declined by 50% in recent decades (source: Butterfly Conservation). It is also considered to be in decline in other parts of Europe. DoB occurs in two biotopes in the UK, namely woodland edges and rides where the larvae feed mainly on Primrose *Primula vulgaris* L. and on scrubby calcareous grassland where Cowslip *Primula veris* L. is the larval foodplant.

A key element in the ecology of this species is that it requires the foodplant to be growing in situations where it is sheltered by other plants. Sites with the foodplant heavily shaded or in very short grassland (where the leaves form tight rosettes on the ground) are not sustainable breeding habitat and a sward height of 5-20 cm is usually preferred. On Salisbury Plain, taller swards are used than at some other sites, i.e. up to 30 cm. On unimproved grassland sites more generally, the species is associated with the middle stages of succession with a medium height sward. Scrub is important where it provides shelter and therefore a warmer microclimate (for both adults and larvae), particularly important for a species flying relatively early in the year, when cool winds are likely to inhibit activity. However, on many sites it needs to be controlled to prevent habitat loss. Scrub management on a long rotation is usually recommended.

Well-developed grass tussocks are also considered to be important, as they provide protected pupation sites. These very specific requirements, the small size and isolation of many sites and other pressures on them, create a situation in which local extinctions can easily occur. Moreover, such sites are often managed for species requiring a shorter sward, and therefore careful management is required to sustain DoB.

In the 19th and early 20th century, DoB was known mainly as a woodland butterfly. However, large scale cessation of dynamic broadleaved woodland management in favour of conifer plantations from the mid-20th century caused an estimated 98% decline in DoB in this habitat from 1950 to 1990 (Oates, 2000). In contrast, the outbreak of myxomatosis in the mid-20th century enabled DoB to colonise many grassland sites. However, more recently the species has declined even on these sites and the reasons why this is the case have been the focus of research.

Salisbury Plain contains the largest area of unimproved calcareous grassland in Europe and is known to be one of the remaining strongholds of DoB in the UK. Consequently, DoB is an individually notified feature of SPTA SSSI. As such, it must be monitored against the mandatory presence/absence attribute and the discretionary population extent/distribution, population size, habitat extent and habitat quality attributes.

The aim of the work was therefore to provide data from which the condition of this feature could be assessed. There were 2 phases to the fieldwork, searches for adults (in May) and searches for the characteristic feeding damage made by the larvae (July-September). SPTA comprises three discrete areas, namely West, Centre and East. As required in the brief, emphasis was placed on the West but with sites in the Centre and East also sampled.

2. METHODOLOGY

2.1 Brief overview of site and rationale

SPTA is estimated to contain 14,000 ha of calcareous grassland and 6,000 ha of mesotrophic grassland with a strong affinity to calcareous grassland (Bealey, 2006). A mix of military activities, including shelling and tank manoeuvres, and grazing, mainly by cattle, maintain a varied sward with ground disturbance, extensive in some places and favouring early colonists. There are scattered small conifer and broadleaved plantations. The grassland tends to be quite tall, more mesotrophic and homogenous on exposed hillsides, with richer CG grasslands with more variable structure having developed more especially on the valley sides, with which DoB is associated. Tall herbs and grasses often dominate in the valley bottoms, where it is often damp. In the West there are a number of dry valleys. There are scattered banks of hawthorn and gorse scrub, often on elevated ground. The Centre and West are generally flatter (apart from the edges and still with dry valleys) and woodland is more extensive in parts of the East.

The aim of the study was to use adult surveys and surveys of larval damage (LD) on Cowslip, to examine the distribution of DoB on SPTA, and assess the condition and suitability of the habitat resources it is using on the site.

2.2 Site selection

The requirement was for a minimum of 20 sites of survey for adult butterflies. Beforehand, to aid site selection, historical records of adult DoB and larval feeding signs on SPTA from 2014 back to 2000 were collated and marked on maps. In this way, 40 potential sites were identified. Adjacent or nearby sites were added as the fieldwork progressed, either where suitable habitat already being surveyed extended significantly into that square, or where suitable habitat was present.

2.3 Adult butterfly surveys

Surveys were carried out on 13th, 15th, 16th, 21st, 23rd and 27th May by Martin Townsend, Steve Gregory and Marc Botham (on one day). A total of 28 sites were surveyed. One km grid squares were used as the basic geographical unit (site) for the survey. Surveys took the form of Timed Counts, using an adaptation of the UK Butterfly Monitoring Scheme (UKBMS) method. The routes taken and locations of DoB were recorded using Garmin GPS units. Start and end times, duration, % sunshine, temperature, site aspect, wind strength and direction and SPTA management areas were recorded. DoB on SPTA is known to have a later flight period than some warmer downland sites (e.g. in Hampshire), and although adults had been seen at other sites in late April and early May, our fieldwork did not start until mid-May.

Habitat patches were selected from the desk study and by on-site visual inspection. Male DoB are territorial and congregate in 'leks', often on the lower parts of calcareous slopes or between scrub, i.e. where there is shelter. The females are more nomadic and regularly travel up to 250m. Since the larva requires *Primula* growing in medium-height grassland, also where there is shelter, in its grassland biotope the butterfly is associated with mosaics of grassland and scrub. The height, extent and density of the scrub is significant but the exact requirement will inevitably vary from site to site, depending on the degree of shelter already provided by the topography. Banks of deep, mature scrub can be highly

beneficial on very exposed sites, provided that sufficiently large areas of suitable habitat are present in open areas within the mosaic, but on more sheltered sites, over-developed scrub is more likely to be detrimental. Scrub is also important in providing roosting sites. DoB tends to roost in bushes, often several metres off the ground, giving the advantage of protection from many predators (Oates, 2000). Oates also observed that mating was inhibited by strong winds.

Therefore, areas with sheltering scrub and valley bottoms were particularly targeted and more open, exposed sites with taller sward were generally avoided as they are less likely to support Cowslips and DoB. Female DoB may be more wide-ranging than the males, and likely oviposition sites were also targeted.

2.4 Larval feeding damage sampling surveys

The larva of DoB eats out numerous small holes and panels in the leaves of the foodplant, often leaving veins intact (figure 6). These are distinguishable from feeding damage made by other invertebrates such as molluscs, which make larger holes and also attack the petiole. Plants selected for oviposition tend to be those with upright leaves in 10-30 cm sward. Two previous projects have utilised this characteristic to gather data on DoB on Salisbury Plain (Bealey, 2006; Martin, 2008). A total of 59 sites were surveyed, including 26 of the 28 surveyed for adults.

DoB larval feeding damage (LD) sampling was carried out on 9th, 11th and 14th of July, 9th, 10th, 11th, 12th, 15th, 16th and 18th August and 2nd-5th September. Adult survey data and historical records were used, and additional suitable-looking habitat patches were targeted. The survey started at a site where females had been seen, in order to maximise the chances of finding LD early on and ensure familiarity with DoB LD. The methodology consisted of walkover surveys similar to the timed counts used for the adults, recording all Cowslip plants/clumps using GPS, presence/absence of DoB LD, sward height (to the nearest 5 cm) in which each plant/clump was growing, and site aspect. Additionally, the predominant habitat in the area where each plant was growing was recorded, using three simple categories:

1. Open species-rich grassland, just very scattered scrub, mainly small (<1 m height).
2. Mix of open species-rich grassland with mainly small scrub (< 1m height) and only small patches of tall scrub, offering limited or only localised shelter.
3. Patches/areas of open species-rich grassland and significant areas of tall scrub or woodland with sheltered edges, glades and clearings.

Field notes were made on each site and the sampled patches within it, i.e. on abundance, distribution and patchiness of Cowslip and it's general suitability for breeding DoB, e.g. extent of scrub. A large number of examples of larval damage were photographed, as well as habitats and habitat features.

2.5 Data

Adult and LD survey data were collected using Garmin GPS units and field recording forms. Waypoints were processed using Garmin Mapsource software and spreadsheets. Counts (corresponding to sampled habitat patches) were allocated numbers and mean sward height in which Cowslips were growing within patches was calculated. Raw LD data was tabulated, including all Cowslips recorded, presence of LD, observer, waypoint number and date. The tables in the results section were derived from this. Since two surveyors were operating independently, each instance of Cowslip was also given a unique numerical code to avoid possible duplication of waypoint numbers in any subsequent analysis.

3. RESULTS

3.1. Overall

Table 1. Overall summary of results.

SPTA Area	Sites surveyed for adults	Sites ads. seen	No. Ads.	Sites surveyed for LD	Sites LD seen	No. of LD	Sites surveyed for ads. and LD	Sites surveyed for ads. only	Sites where ads. only seen	Sites surveyed for LD only	Sites where LD only seen	Sites where ads. and LD seen	Sites where ads. or LD seen
West	18	4	15	41	15	117	18	0	1	23	10	3	16
Centre	6	3	21	13	7	104	5	1	0	10	4	3	7
East	4	2	14	5	3	81	5	1	0	2	1	2	3

The results are summarised in tables 1 and 2 and mapped in figures 1-5. Details of all DoB adult and LD records are in appendix I. The full list of grid references of Cowslip plants recorded during the LD survey has been supplied separately. A total of 61 sites (1 km squares) were surveyed and convincing evidence of Duke of Burgundy (either adults or feeding signs or both) was found in 26 of these.

In total, 28 sites were surveyed for adult DoB, of which 26 were surveyed again for larval feeding damage (LD). A further 33 sites were surveyed for LD, to give a total of 59 sites surveyed for LD. In total, 65 timed counts were carried out and a total of 50 adult DoB were recorded on 13 counts, 38 males and 12 females, from 9 sites (four in the West, 3 in the Centre and 2 in the East). A total of 130 LD counts were made. Larval feeding damage attributable to DoB was found on 39 of these and 302 Cowslip clumps with LD were recorded. In all, 2,112 Cowslip plants/clumps were recorded.

3.2 Habitat Parameters

Habitat parameter results are summarised in table 3. Sward heights in which surveyed Cowslip plants were growing was recorded. For patches with >4 plants recorded, the mean height per patch was calculated and totals for each overall habitat type (1-3) for each patch. Where a range of habitat types is given in the appendix table, all types in the range are counted. The summary figures in table 3 are calculated from the data in appendix 1.

Table 2. Summarised results of adult and larval damage counts (note that sites are listed according to their geographical position, i.e. in a roughly west to east direction and that the list includes sites originally identified for possible survey that were not surveyed).

Site	Grid square	SPTA Area	Site name (area or landmark)	Prev. record	Ad survey date(s)	Ad. count Nos.	Adults	LD survey dates	LD count nos.	LD
1	ST 8849	W	Warminster Ranges - Dilton Middle Down	Yes	-	-	-	11/07/2015	1-5	1
2a	ST 8848	W	Warminster Ranges - Upton Scudamore Field Barn	Yes	-	-	-	05/09/2015	7	11
3	ST 8945	W	Battlesbury Hill - West side	Yes	13/05/2015	6, 7, 8, 9	4m	10/08/2015	8	2
2	ST 8948	W	Warminster Ranges - Dirtley Wood	Yes	-	-	-	05/09/2015	9,10,11	10
4	ST 9047	W	Shoreham Down	Yes	-	-	-	05/09/2015	13, 14	1
51	ST 9046	W	Harman Lines	No	21/05/2015	10, 50	2m	16/08/2015	15-18	0
49	ST 9045	W	Battlesbury Hill - East side, Harman Lines	Yes	13/05/2015	1, 2, 3, 4, 5, 6	0	10/08/2015	19,20,21	3
59	ST 9145	W	South of Bishopstrow Down	No	-	-	-	03/09/2105	22	0
60	ST 9146	W	Bishopstrow Farm	No	-	-	-	03/09/2105	23	0
5	ST 9147	W	East of Warminster Ranges, South of Imber Road	Yes	-	-	-	11/08/2015	24,25	0
47	ST 9149	W	Middle Ridge Down	No	-	-	-	11/07/2015	26	15
6	ST 9250	W	North-west of Southdown Barn	Yes	-	-	-	09/07/2015	27,28	2
7	ST 9249	W	West of Southdown Barn	Yes	15/05/2015	17, 18, 40	0	09/07/2015	29-32	0
50	ST 9248	W	West of Ladywell Barn	No	-	-	-	11/08/2015	33,34	12
12b	ST 9247	W	South Down Sleight	No	-	-	-	14/07/2015	35,36	0
8	ST 9246	W	Middleton Down	Yes	27/05/2015	60	0	14/07/2015	37,38	0
9	ST 9245	W	Norton Down, Norton Wood	No	27/05/2015	58, 59	-	14/07/2015	39-42	0
12	ST 9347	W	Ladywell Plantation	Yes	15/05/2015	35, 36, 38, 39	0	14/07/2015	43,44	7
11	ST 9348	W	Ladywell Barn	Yes	15/05/2015	11, 12, 13, 14, 16, 37	0	11/08/2015	45-47	13
10	ST 9349	W	Southdown Barn	Yes	15/05/2015	14, 15, 19, 20, 41	2m, 3f	09/07/2015	48-51	17
9a	ST 9350	W	Tenantry Down	No	15/05/2015	19, 41	0	09/07/2015	52-55	10
15a	ST 9450	W	Baynton Down	No	-	-	-	16/08/2015	56	0
15b	ST 9449	W	Wadman's Copse	No	-	-	-	16/08/2015	-	0
13	ST 9448	W	East of Ladywell Barn	Yes	-	-	-	11/08/2015	57-65	0
14	ST 9446	W	Bowl's Barrow	Yes	-	-	-	14/07/2015	66	0
48	ST 9548	W	West of Imber village	No	-	-	-	12/08/2015	67-70	5
15c	ST 9549	W	Imber Wood	No	-	-	-	16/08/2015	71,72	0
15	ST 9550	W	Brounker's Well	No	-	-	-	16/08/2015	73	0
16	ST 9646	W	Imber Firs Barn, Fish Hook	Yes	21/05/2015	49	0	14/07/2015	74-78	0
17	ST 9645	W	South of Fish Hook	Yes	21/05/2015	46, 47, 48	0	14/07/2015	74a	0
20b	ST 9746	W	East of Imber Firs Barn	No	27/05/2015	57	0	11/07/2015	79-81	0
18	ST 9748	W	East of Imber village	No	-	-	-	11/08/2015	82	0
52	ST 9749	W	Rough Down	No	-	-	-	11/08/2015	83	0
19	ST 9847	W	Berril Valley including Berril Plantation	Yes	13/05/2015	33, 34	0	10/08/2015	84,85	0
20	ST 9846	W	South of Tinkers Track and Berril Valley	Yes	15/05/2015	21	0	11/07/2015	86	0
21	ST 9946	W	Berril Valley Track	Yes	13/05/2015	32	2m, 2f	11/07/2015	87,88	8
22a	SU 0046	W	Breach Hill	No	13/05/2015	31	0	16/08/2015	89	0
22	SU 0146	W	East of Breach Hill	No	13/05/2015	29, 30	0	16/08/2015	90,91	0
58	SU 0246	W	Copehill Down	No	-	-	-	02/09/2015	92,93	0

Site	Grid square	SPTA Area	Site name (area or landmark)	Prev. record	Ad survey date(s)	Ad. count Nos.	Adults	LD survey dates	LD count nos.	LD
53	ST 0244	W	South-east of Copehill Down	No	-	-	-	02/09/2015	-	0
54	ST 0243	W	Chitterne Down	No	-	-	-	02/09/2015	94	0
23	SU 0350	C	UGL, Candown (western side)	Yes	16/05/2015	25, 26, 27, 28	6m	18/08/2015	95-98	15
24	SU 0450	C	Candown Copse	Yes	16/05/2015	23, 24, 26	2m	15/08/2015	99	4
46	SU 0449	C	Candown Wood, Candown	Yes	16/05/2015	22, 23, 25	10m, 2f	15/08/2015	100-103	51
25	SU 0648	C	Young Plantation	Yes	-	-	-	18/08/2015	104-105	0
26	SU 0753	C	West of Wilsford Down	Yes	16/05/2015	42	0	-	-	0
26a	SU 0853	C	Wilsford Down	No	16/05/2015	43	0	09/08/2015	106,107	0
27	SU 0854	C	Marden Covert	No	16/05/2015	44, 45	0	09/08/2015	108	0
27a	SU 0954	C	Charlton Clumps	No	-	-	-	09/08/2015	109	0
28	SU 0953	C	East of Wilsford Down	No	-	-	-	09/08/2015	110	0
29	SU 1053	C	Rushall Down	Yes	-	-	-	-	-	-
55	ST 0847	C	Little Folly	No	-	-	-	18/08/2015	111-113	8
56	ST 0947	C	Little Folly/Blackball Firs	No	-	-	-	18/08/2015	114	1
61	SU 1047	C	Newfoundland Farm Wood	No	-	-	-	04/09/2015	115	0
31	SU 1148	C	Well Bottom	No	-	-	-	-	-	-
33	SU 1247	C	Netheravon Down	Yes	-	-	-	04/09/2015	116-118	7
62	SU 1248	C	Wexland Plantation area	No	-	-	-	04/09/2015	119	18
38	SU 1947	E	Brigmerston Firs	No	-	-	-	-	-	-
37	SU 1949	E	Figheldon Down	No	-	-	-	04/09/2015	120	0
37a	SU 1849	E	Bournebottom Plantation	Yes	23/05/2015	52, 53	0	-	-	-
36	SU 1950	E	Haxton O	Yes	23/05/2015	51	0	04/09/2015	121	0
35	SU 1845	E	Bulford Field Barn	Yes	23/05/2015	54, 55, 56	6m, 2f	15/08/2015	122,123	38
39	SU 1945	E	Milston Firs	Yes	23/05/2015	56	3m, 3f	15/08/2015	124,125	6
57	ST 1946	E	North of Milston Firs	No	-	-	-	15/08/2015	126-129	37
34	SU 1754	E	South of Grant's Firs	Yes	-	-	-	-	-	-
40	SU 2049	E	Drydon Copse	Yes	-	-	-	-	-	-
41	SU 2150	E	Sidbury Hill	Yes	-	-	-	-	-	-
42	SU 2149	E	Sidbury Hill South	No	-	-	-	-	-	-
43	SU 2044	E	Bulford Down	No	-	-	-	-	-	-
44	SU 1943	E	Beacon Hill	No	-	-	-	-	-	-
45	SU 1942	E	Beacon Hill South	No	-	-	-	-	-	-

Table 3. Summary of sward heights (SwH) per habitat patch and overall habitat type for each patch.

Note 1. Sward heights are given in cm. Numbers of patches used for analysis in parentheses.
Note 2. Totals of instances of LD within each habitat type/group are given in parentheses.

	Mean SwH LD +ve	Mean SwH LD -ve	Mean SwH overall	Hab 1 LD +ve	Hab 1 LD -ve	Hab 2 LD +ve	Hab 2 LD -ve	Hab 3 LD +ve	Hab 3 LD -ve
SPTA West	20.3 (16)	17.0 (45)	17.9 (61)	5 (21)	12 (--)	8 (45)	25 (--)	7 (34)	17 (--)
SPTA Centre	17.0 (13)	20.1 (7)	18.1 (20)	0 (0)	0 (0)	10 (37)	3 (--)	9 (41)	3 (--)
SPTA East	15.3 (6)	14 (1)	15.1 (7)	0 (0)	0 (--)	0 (0)	1 (--)	6 (81)	0 (--)
Overall	18.2 (35)	17.4 (53)	17.7 (88)	5 (21)	12 (--)	18 (82)	29 (--)	22 (156)	20 (--)

4. DISCUSSION

4.1 Possible constraints to fieldwork

4.1.1 Weather conditions during adult surveys

DoB flies early in the season (late April to early June), when weather conditions are highly variable and often greatly reduce diurnal insect activity, being too windy, wet or cold, such that surveying for butterflies is very difficult. However, the flight period was sufficiently long for the surveys to be carried out when adults were active. They were seen on 5 of the 6 days when surveys took place and no LD was found on the sites surveyed on the remaining day, suggesting that it is probably not present there in any case. It was still possible to find adults in cool, cloudy weather although they were less active, even on a day after overnight rain once the vegetation had dried out, although it was noticeable that this was later in the day than normal. They were present in similar habitat to those seen in warmer, sunny weather so there is no evidence that they were behaving in a way which may have affected the results. Therefore, poor weather is unlikely to have significantly affected the results.

4.1.2 Logistical considerations

The very large area covered presented challenges in terms of navigation, but range and management unit maps provided in conjunction with GPS units were very helpful.

Military activity limits access to SPTA, but the use of Daily Range Summaries, the help of Range Operations and some weekend working meant that access issues were not a problem. Lack of mobile phone reception made co-ordination difficult at times when more than one surveyor was in the field, but this led merely to occasional inconvenience rather than any effect on the data. In terms of risk assessment, single working is a slight concern here, especially in the West where reception was generally least reliable.

Due to the exacting requirements of DoB, the size of the area and apparently very localised distribution of the butterfly and suitable habitat, considerable leg-work was necessary. However, adults were seen on the first day so the visual clues in terms of habitat rapidly became clear, making it easier to target other likely places.

4.1.3 Larval damage

It seems possible that other, similar-sized polyphagous larvae could make similar damage to that made by DoB. Similar holes were noticed in the leaves of other plants, including knapweed and hogweed. Perhaps these are made by other oligophagous species or they could represent casual grazing by more generalist herbivores. Given the large number of both polyphagous and oligophagous herbivorous invertebrates species present in such rich habitat, it seems somewhat dangerous to assume that all LD resembling that of DoB larvae was necessarily made by them. Therefore, all photographs taken of LD were carefully scrutinised and some were rejected. Figure 7 shows feeding damage considered not to be DoB.

However, LD was well correlated with the presence of adults (at least in the limited number of places where adults were found) and it is likely that the vast majority of LD recorded relates to DoB. In particular, at sites where adults were seen, in general the damage was extensive in the immediate local area, i.e. within 5-20m. It was also a feature that LD was often present very close to where males had been seen. This suggests that although females may range over 250m or more, it is a relatively sedentary species and the majority of ova are laid soon after mating and close to the mating site, sometimes resulting in close clusters of LD. Therefore, these are more straightforward to interpret, i.e. clusters of LD are very likely to indicate the existence of a colony. Single examples or very small numbers of LD are more likely to indicate unsustainable transient breeding or possibly misidentification.

There appears to be some variability in the LD pattern. Larger larvae will make larger holes and sometimes only larger holes were found, possibly explained by larvae changing plants, which is known to happen (Oates, 2000). Oates and also Bealey (2006) illustrate leaves with small holes, but those shown by Martin (2008) are larger. In the 2015 work both patterns were observed, at sites where DoB adults were seen and at sites where adult surveys were not carried out.

The tussocky nature of some of the *Bromopsis erectus* CG grassland which DoB inhabits on SPTA meant that Cowslip plants were sometimes difficult to locate, especially later in the season. However, sustainable colonies of DoB are only likely to occur in habitat where Cowslip is numerous, such that some is always visible and searches were intensified in those areas. In a few cases (e.g. Battlesbury Hill), extensive grazing and poaching by cattle had removed most of the Cowslip leaves, making effective LD survey impossible.

More generally, some of the earlier leaves (i.e. those fed upon by DoB) may die off, and LD was occasionally found on shrivelled or yellowed leaves. Therefore, although the LD surveys carried out in the first week of September are considered valid, it would not have been advisable to survey any later in the year.

Despite the caveats, the combination of adult surveys and larval damage surveys seems a good strategy. Ideally, LD surveys would be followed up by adult surveys the following year to confirm presence, but in some areas, particularly the wide, open valley west of Imber in Harman Lines, it was difficult to identify areas where males might congregate. These are probably rather limited and patches of suitable Cowslip are small and well dispersed.

It was interesting that a patch of LD was found extending several metres within a plantation in semi-shade, i.e. the small plantation north of Ladywell Barn. This apparently atypical behaviour suggests a paucity of suitable patches in an area with a previous record and where DoB must still be present, as confirmed by our observations. Close attention was paid to plantation edges elsewhere, and although Cowslip was sometimes found to be quite numerous in them (more especially young plantations, the more mature ones generally being bordered by tall grasses), no other patches of LD were found in this type of situation. This suggests that such sites are not generally preferred for oviposition.

To add to the restrictions DoB is facing west of Imber, a substantial area (just north of Ladywell Plantation) had been burned. Our overall results do suggest that DoB is quite faithful to optimal habitat patches in the long-term and such events could lead to local extinctions, or at least significant reductions in numbers. It was therefore pleasing to be able to confirm that DoB was still present in this area.

4.2 Summary and assessment of the results

4.2.1 Overview

Given the challenges associated with surveying for DoB on Salisbury Plain, it is likely that only a proportion of the extant colonies have been detected by this work. Colonies of this butterfly are often small, with only a handful of adults active on any one day at any point during the flight period and they can be restricted to very small areas even within a larger area of suitable habitat.

Although Cowslip is, overall, an abundant plant on SPTA, its abundance is very patchy and areas with numerous Cowslip plants coinciding with the right microclimate for DoB are relatively scarce when the whole area is taken into consideration. A number of suitable-looking areas were encountered, which on closer examination were found to contain very little or no Cowslip. Perhaps not surprisingly, the adult surveys on their own suggest that in the West and Centre, DoB is highly localised but in the East it is more numerous (when taken together with regular monitoring by local volunteers). However, when the LD results are added, even with the caveats regarding correct identification, the picture appears considerably more encouraging and indicates a wider, albeit still rather localised distribution.

4.2.2 Adult behaviour

Due to the different nature of the terrain, the search pattern for adult DoB tended to be different in the West as compared to the Centre and East. The males are generally easier to find than the females, since they habitually perch in warm, sheltered situations, sometimes forming leks. On sloping downland, this often happens at or near the base of the slope. Therefore, in the West the lower slopes were the main target and this is where males were usually found. What was slightly surprising was that tall grasses and herbs in the valley bottoms were used, including nettles, (in quite open situations) on which a mating pair of DoB were found (at site 21). This vegetation is often growing on old, often quite deep tank tracks and it appears that these sites are likely to provide the best shelter in what is generally a very open landscape, and thus are effectively surrogates for sheltered woodland/mature scrub edges and glades, in terms of providing sunny, sheltered bays. The foodplant is sometimes close by but in some cases 20-30 m away, further up the slope. These habits should be a key consideration in any follow-up surveys of adults in SPTA West.

In the Centre and East, males tended to be found in more typical situations, i.e. open, sunny but sheltered bays among scrub, or along scrubby woodland edges. Where numbers were high, it soon became easy to predict where males would be found within scrub mosaics, simply by targeting the most sheltered bays and rides, provided they were at least about 3-4m in width with a gradient of vegetation heights. Females are more wide-ranging but were seldom seen far from potential male lekking positions.

4.2.3 Habitat parameters - sward height

Sampling did not in any way control for bias in terms of proportions and distribution of different habitats, aspect, height above sea level, etc. Therefore, only broad conclusions can be made from the basic habitat data gathered. DoB is known to utilise Cowslip plants in swards roughly 5-20 cm high on most calcareous grassland sites, but in taller swards of up to 30 cm on Salisbury Plain. Therefore, the mean sward heights (table 3) of roughly 15-20 cm (18. 2 cm overall) for LD were within the range that would be expected from previous work. The mean sward height of Cowslip on which LD was present was very similar to that on which no LD was found. This is undoubtedly a reflection of the highly targeted nature of the sampling, i.e. habitat unlikely to be suitable was avoided.

Comparisons between the 3 main areas of the plain are difficult since levels of sampling differed between them. Therefore, although it appears that Cowslip-rich swards tend to be taller in the West than in the Centre and (in particular) the East, the samples from the East may not be a true reflection of that area as a whole. However, the overall general impression was gained that taller swards predominate in the West, and this does seem to be reflected in the figures, albeit in a rough and ready way.

4.2.4 Habitat parameters – habitat type and aspect

Only broad conclusions can be drawn, for the reasons given in section 4.3.2. However, the difference between numbers of instances of LD in very open grassland (Habitat 1 – 21) and habitat with some scrub shelter (Habitat 2 – 82) and habitat with a high degree of shelter from blocks of scrub (Habitat 3 – 156) is a good indicator of the importance of scrub blocks in providing warm, sheltered ground on which the adults can warm up, as well as sheltered habitat for the larvae.

It is interesting that all the LD in Habitat 1 was found in the West. This might suggest that DoB is forced to use more open sites in this part of the plain, but in fact most of those instances were at one site where scrub had recently been removed, and its future there seems uncertain. Thus, there is nothing in the data to suggest that DoB has in any way adapted to coping with more exposed situations in the West. Rather, the scattered and highly localised distribution of Habitat 3, and the preponderance of Cowslip growing in Habitats 1 and 2, are most likely important factors in the apparently low site occupancy observed.

Overall aspect of all the patches used in the analysis was recorded. Of the 34 patches, 15 (44%) had a south-easterly aspect. The next highest was south-west, with 5 (15%). No patches with LD were facing east and 4 were facing west. Of the remainder, 24 (55%) were either facing south-east, south or south-west and only 6 (18%) were facing north, north-east or north-west. These results are in line with the findings of Martin (2008) who found a preponderance of LD on sites with a southerly aspect on Salisbury Plain.

4.2.5 SPTA West

In the West, of the 18 sites surveyed for adults, they were found at 4 (all with previous records) and a total of 15 were seen. These sites are distributed in 3 well separated areas, namely Battlesbury Hill/Harman Lines (sites 3 and 4), Southdown Barn (site 10) and a small site in Berril Valley (east of Berril Valley Track) (site 21). LD was found at all of these sites. In addition, significant clusters of LD were found on Warminster Ranges and nearby east, north and west of Dirtley Wood (sites 1, 2, 2a), Tenantry Down (site 9a, adjacent to site 10), Middle Ridge Down (site 47), Ladywell Barn and Ladywell Plantation area (sites 11 and 50) and immediately west of Imber (site 48). The LD in site 2 was on an unusually exposed site near the top of a hill.

Of the 22 sites identified from the historical data in the West, convincing evidence of a colony of DoB was found at 10. With the exception of site 21, all are either to the north or west of Imber village. Adults or LD were also found at a further 3, apparently new sites, all close to known sites. These were the two males at Harman Lines (in a different location to the previous record), the cluster of 5 LD in a gulley west of Imber (site 48) and the extensive LD west of Dirtley Wood (site 2a). No convincing evidence of DoB was found at a further 7 sites distributed around the north, west and south sides of Imber. Suitable-looking patches exist, but many are in rather flat, open terrain.

The important colony at Southdown Barn appears to rely mainly on the steep slope on the eastern side (Site 10, LD count 49), which has extensive small trees on its lower part, mainly Ash. The terrain is particularly rough and challenging to survey so it is difficult to assess the extent of the population here. However, the fact that adults of both sexes were seen on a cool cloudy day, and that LD was extensive, together suggest that the colony is healthy. The sward is quite tall, but the quite sheltered, undulating terrain and tussocky nature of the vegetation create a situation in which large Cowslip plants have developed alongside abundant good quality pupating opportunities. The young trees at the base of the slope are creating significant shade, but this probably means that males simply lek slightly higher up, so control is probably unnecessary but in the long term, the slope should not be allowed to become wooded or heavily scrubbed.

Adults and LD were found at the northern end of the slope and further north-east into a valley which leads into site 9a (LD counts 48 and 52). Cowslip appeared rare on the south side of this valley, but could be found on the northern slope. However, much of this has become very dense B. erecta/low hawthorn scrub mosaic. Targeted winter/early spring grazing would be beneficial here in encouraging Cowslips. Cowslip was also found abundantly as open rosettes in very short sward field further north (LD counts 53, 55). No LD was found and given the lack of suitability, no attempt was made to record Cowslip, but many hundreds, if not thousands, of plants were present. Given the proximity of the Southdown Barn colony, this stand of Cowslip would be suitable for habitat restoration for DoB, if the opportunity arose.

Site 21 Berril Valley Track appears very isolated, with no convincing evidence of DoB at the 12 other sites surveyed to the south and east of Imber, extending east to Copehill Down and south to Chitterne Down. Optimal habitat, i.e. meeting all the criteria for DoB, appears scarce in this area generally. No historical records emanated from this area or from north or northeast of Imber north of sites 18 and 19, and it seems most likely that it is absent, although the existence of suitable habitat holding colonies in squares not surveyed cannot be ruled out. The potential is greater north and northwest of Imber, but suitable patches were found to be scarce and suitable grassland containing patches of cowslips was generally

rather open. Areas of DoB habitat appear to be relatively small at some of the sites. Consequently, colonies appear to be rather small and suggested specific measures to improve or maintain them are indicated in appendix I. Considerable suitable habitat exists at the previous location in site 19, but Cowslips were relatively scarce. At site 21, the Cowslip is almost entirely restricted to the southern end of the west-facing bank. Therefore, although the vegetation on this bank appeared to be quite stable, i.e. with no signs of major ground disturbance (recent or not) from military activities, it does seem possible that the colony is vulnerable if that occurred in the future. Perhaps this happened at site 19 and recolonization by DoB is yet to occur. Evidence of scrub removal (i.e. patches of re-growth) leaving the habitat very exposed, was quite widespread, in some cases at known locations. E.g. at site 1, Cowslip was abundant at the known location but only one possible example of LD was found. Similarly, at site 14 Cowslip was extensive but is now in very open habitat on a large exposed slope. At the site 2a location, the grassland now has little shelter and DoB is unlikely to thrive. Scrub should, if possible, be allowed to regenerate here. In other cases, no suitable habitat was found in the area indicated by the grid reference for the historical record. This is assumed to be due to changes in the habitat, unless some grid references were less accurate.

On Battlesbury Hill, extensive grazing and poaching by cattle had removed most of the Cowslip leaves, making effective LD survey impossible. This was in mid-August, by which time most larvae would have pupated, and it is not known if grazing started early enough to affect the larvae. Heavy grazing is also likely to reduce pupal survival as the sward structure is broken up. The sward was shorter on Battlesbury Hill than on other sites within the plain, and this may make it more susceptible to over-grazing. Observations from other sites on SPTA in the study suggested that many eggs are laid close to lekking sites. Here, poaching was particularly bad at the lower end close to the woodland, which is the only place where male DoB were seen on the hill. Cowslip is quite common in this area and since other observations have suggested that many eggs are laid close to lekking sites, losses are likely to be high, either from grazing of leaves and/or poaching. The cattle were ranging freely and their effect could be seen on the northern slopes as well as the south-facing slope.

The slopes immediately above the woodland and below the battlements on the south-east side also have abundant Cowslip growing among protective scrub. Some LD was found here and the adult has been recorded, so it appears to be surviving. However, further survey for adults in this particular area would be valuable, as would greater control of grazing. The hill had not been grazed for two years when it was surveyed in 2015, but in spite of that, at the time of the adult survey did not appear to be in need of extensive grazing, being still shorter than elsewhere. A more regulated regime would be more beneficial. Most beneficial would be to prevent cattle accessing scrubby areas which are known to be breeding sites, until perhaps such time as the sward/scrub is becoming too over-shading. This applies also as a general observation on the SSSI, especially in the west, where the samples suggest that far fewer habitat patches are occupied than elsewhere.

4.2.6 SPTA Centre

Overall, evidence of DoB was found in 7 sites and in 3 of the 6 sites with a post-2000 historical record. Six sites were surveyed for adults (found in 3, 21 adults). LD was found in the 3 sites where adults were found and in a further 4 sites which were not surveyed for adults. The 3 sites where adults were found are in a cluster on the western side, sites 23, 24 and 46. Of the 50 seen overall in the survey, 20 were at these 3 sites (all on one day, in warm, sunny but windy conditions) and this area clearly holds a large colony. The habitat comprises several mosaics of deep, mature (sufficiently so for a singing Nightingale to be present) scrub and CG grassland, edged by patches of more open scrub all with abundant Cowslip. The largest patch is west of Candown Copse on the south-facing slope (in site 46). This produced the majority of the adults. Smaller patches are north of the east-west track and extend northwest to Candown Copse. Here, Cowslip is less abundant and fewer adults were seen. LD was abundant in the large scrub patch and was also found more widely. In addition, LD was found in and around the UGL firing range (mainly within it). This site was surveyed for adults and none were seen, but this was in cool, breezy conditions late in the afternoon and the firing range was not accessed.

The large scrub mosaic in particular seems ideal habitat. Sheltered (but open and sunny) bays, rides and scallops are numerous. It was necessary to look in the most sheltered places to find males in territory. In fact, their ability to locate completely windless spots was remarkable. A teneral adult male (with wings fully formed but still limp) was found in a sheltered bay deep within the mosaic and LD was widespread within and around the taller scrub. To some extent, adults may have been more restricted than they would have been on a less windy day, but clearly the more sheltered areas are also important as breeding sites. This is emphasised by the greater frequency of LD in the northern part of the mosaic, compared to the southern portion where a large proportion of the scrub has been cleared. Clearance of large areas of scrub should be avoided and scrub management should consist of scalloped and localised ride widening. Large-scale clearance of well-developed scrub rarely results in colonisation (Oates, 2000), as it either leaves bare ground, or else any foodplant is rapidly out-competed by rapid re-growth of the scrub and by tall herbs.

Habitat is less extensive in the scrub north of the track, where taller, denser swards tend to predominate. No LD was found above the main scrub patch on the northwest side of the valley at Candown Copse, which had been grazed in the spring. Two males were found in small clearings among elder lower down, but the sward here was very high and the breeding sites are unlikely to be close-by.

Five sites were surveyed in the north-eastern part of the Centre and no evidence of DoB was found. Two precise locations were available from the historical records and both were visited. Site 26 was surveyed for adults, but Cowslip was very scarce in relatively tall grassland at the marked location and it was not surveyed for LD. Site 27 was surveyed for LD but although abundant Cowslip was found at the site of the record (to the east of Marden Covert), most had recently been heavily grazed and most of the remainder was in neglected dense, tussocky grassland with scrub beside the woodland. Optimal or even sub-optimal habitat patches were scarce in this area generally and it seems unlikely that DoB is present.

Evidence of DoB was found at four separate locations in the south-eastern part of the Centre, all LD (there were no adult surveys in this area). No previous records were found for three of these, so they may be new sites. Significant amounts of LD were found very locally in open CG grassland south of Honeydown Copse, all close to a linear block of Blackthorn scrub

beside a track (to the south of it). A limited amount was found between Little Folly and Blackball Firs, in a scrub/grassland mosaic similar in quality to that in site 46, but smaller.

LD was also found to be quite widespread in a CG grassland/scrub mosaic either side of the track between Great Lynch and Cherry Tree Farm Wood (site 62). This is a relatively elevated, gently-sloping and therefore somewhat exposed site, with little in the way of solid blocks of scrub. However, many examples of LD were beside slight ditches and in the denser areas. LD was also found extensively in the shallow dry valley, east of Mortimer's Penning (sites 62/33) in relatively open grassland with generally individual hawthorn bushes rather than blocks of scrub. Here again, LD was always within 1-5m of bushes. This site comes to within approximately 200m of the historical record, which is near Round Covert on the other side of the valley to the south. That site is no longer suitable, unless the grid reference is slightly inaccurate and refers to the current site.

A previous record in site 25 referred to open grassland west of Young Plantation, and only small patches of habitat were located beside the track further east, with limited amounts of Cowslip. A few Cowslip plants were found in the small scrub/CG grassland patch on the south side of Newfoundland Farm Wood. Site 29, with a previous record but location not specified, was not surveyed.

4.2.7 SPTA East

Overall, 5 sites were surveyed for adults (found in 2) and 5 sites were surveyed for LD (found in 3). Other sites where the butterfly has been recorded were not surveyed, including Bulford Down, Bulford Camp, Silbury Hill and Beacon Hill.

Surveys were concentrated around the Bulford Field Barn and Milston Firs area (sites 35, 39 and 57), where evidence of DoB was abundant. Also further north around Haxton O, Hound Plantation and Bournebottom Plantation area (sites 36, 37, 37a) where no evidence of DoB was found.

A strong colony exists around the northern and western edges of Milston Firs (site 39). A total of 13 adults were recorded and 26 instances of LD. A single territorial male was noted in a small, open copse some 250m west of Milston Firs. This was initially thought to be a stray male from the larger colony, but breeding was subsequently confirmed with 12 instances of LD subsequently found.

LD was also abundant in the scrub mosaic and woodland edges immediately to the north of Milston Firs (site 57), but Cowslip and LD was scarce around the pine woodland in the northern section of site 57. Also in site 57, some LD (4 instances) was found in herb-rich rabbit grazed grassland adjacent to a large bank of mature scrub. More open CG grassland to the south of this area produced no LD although Cowslip was quite frequent.

Very little suitable habitat was noted in sites 36, 37 and 37a. A patch of gorse and *Prunus* scrub was surveyed for adults south of Bournebottom Plantation and a patch of rough scrub west of it for LD. A previous site near Hound Plantation was surveyed for LD but no habitat was found and ground disturbance was extensive with apparent clearance of vegetation.

5. CONCLUSIONS

- Duke of Burgundy is widely spread, but localised on SPTA.
- All three main areas of the SSSI hold important populations.

This report, including the annotations in appendix I, and the raw data supplied separately, can be used to identify and highlight important areas for further survey and in management plans, so that every effort can be made to maintain a network of suitable breeding sites, including core sites protected against unfavourable management, within the overall management framework. The highly dynamic nature of the overall management of the SSSI, and the fact that much intervening habitat lacks the necessary vegetation structure needed for the butterfly, and the right kind of Cowslip plants in sufficient quantity, together with its apparent faithfulness to certain sites, indicates the importance of core areas.

In the West, colonies appear to be relatively small and the more complex overall habitat structure makes locating adults and LD more difficult. Much tall, dense and/or exposed/summer grazed grassland exists in intervening areas. Open valley bottoms with tall grasses and tall herbs growing in old tank tracks are used as male lekking areas, as well as the more usual bays and edges in scrub. Several examples of habitat loss or quality reduction due to scrub removal on known sites for DoB and an issue regarding possible effects of unpredictable grazing on Battlesbury Hill was identified, all in the West.

In the Centre, DoB is probably restricted to the western side and the south-east, where significant colonies are present. The largest population seems to be around Can Down, but LD was also found quite extensively in the south-east as well. Adult surveys in this area would be worthwhile to obtain more information on the status of DoB here. The acceptance of the possibility that some LD recorded could have been caused by other invertebrates is another reason for follow-up survey, perhaps by local volunteers, especially if no adults have been recorded previously.

In the East, DoB was surveyed in areas where grassland management tends to be more intensive and ground disturbance due to tank movements is less. Here, it is more reliant on woodland edges and complex mosaics of scrub and grassland. In particular, a strong, extensive and well-known colony is present at Milston Firs, with others further south. Areas north of there appeared less promising, but most were not explored.

In terms of networks and continuity, it is noticeable that in the West the colony at site 21 (east of Berril Valley Track), appears very isolated, with no other evidence of DoB east of Imber village extending into the south-west corner of the West. Follow-up surveys in this area along with enhanced management, if possible, might be able create better linkage between this colony and the more extensive populations west of Imber and thereby reduce the risk of it's extinction.

Early summer grazing should be avoided if possible, banks of scrub sufficiently large and tall and complex to provide significant shelter should be encouraged in appropriate places. In some instances, allowing previously cleared scrub to regrow could be beneficial in the long term. DoB on SPTA appears to favour *B. erecta* dominated grassland and a fairly dense sward is required, but not so dense that Cowslips are lost, so it is accepted that it will not always be possible to achieve this within every habitat patch, at least not all the time.

ACKNOWLEDGEMENTS

The author is most grateful to several people who contributed in different ways to the production of this report. Steve Gregory for long, arduous days in the field and provision of the resultant data, Sarah Grinstead (Natural England) for guidance, information and mapping the data for the figures, also Julie Swain and Lisa Wade (DIO), SPTA Range Operations staff for keeping us safe and Stephen Ellwood for providing figure 1.

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Figure 1. Overview of adult DoB, larval damage survey and Cowslip recorded on SPTA in 2015.

Notes. Blue triangles are instances of Cowslip recorded, green symbols indicate larval damage, red stars are adult sightings and black-ringed orange symbols are historical records of DoB.

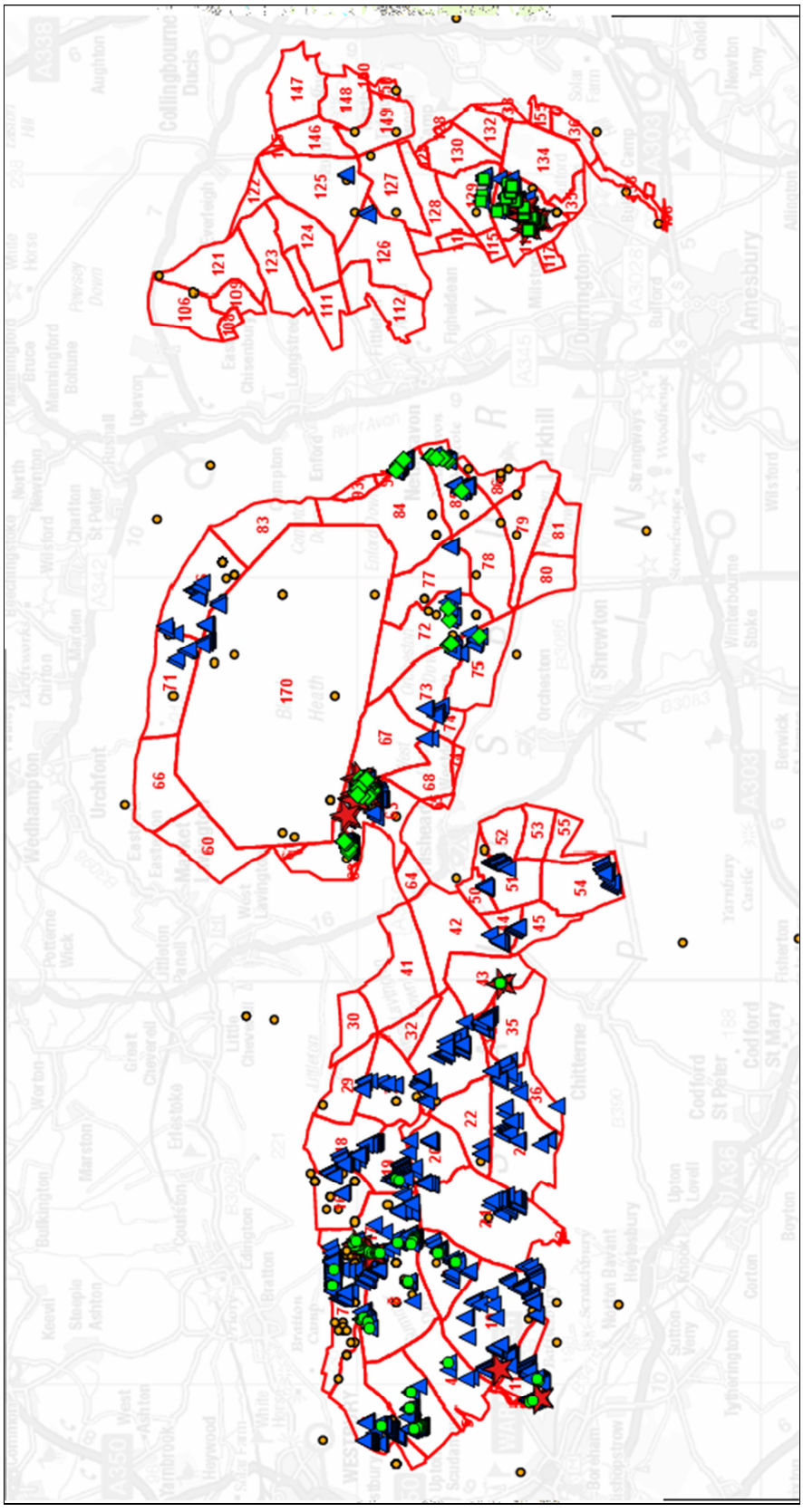

Figure 2. Overview of 2015 survey and historical DoB records on SPTA.

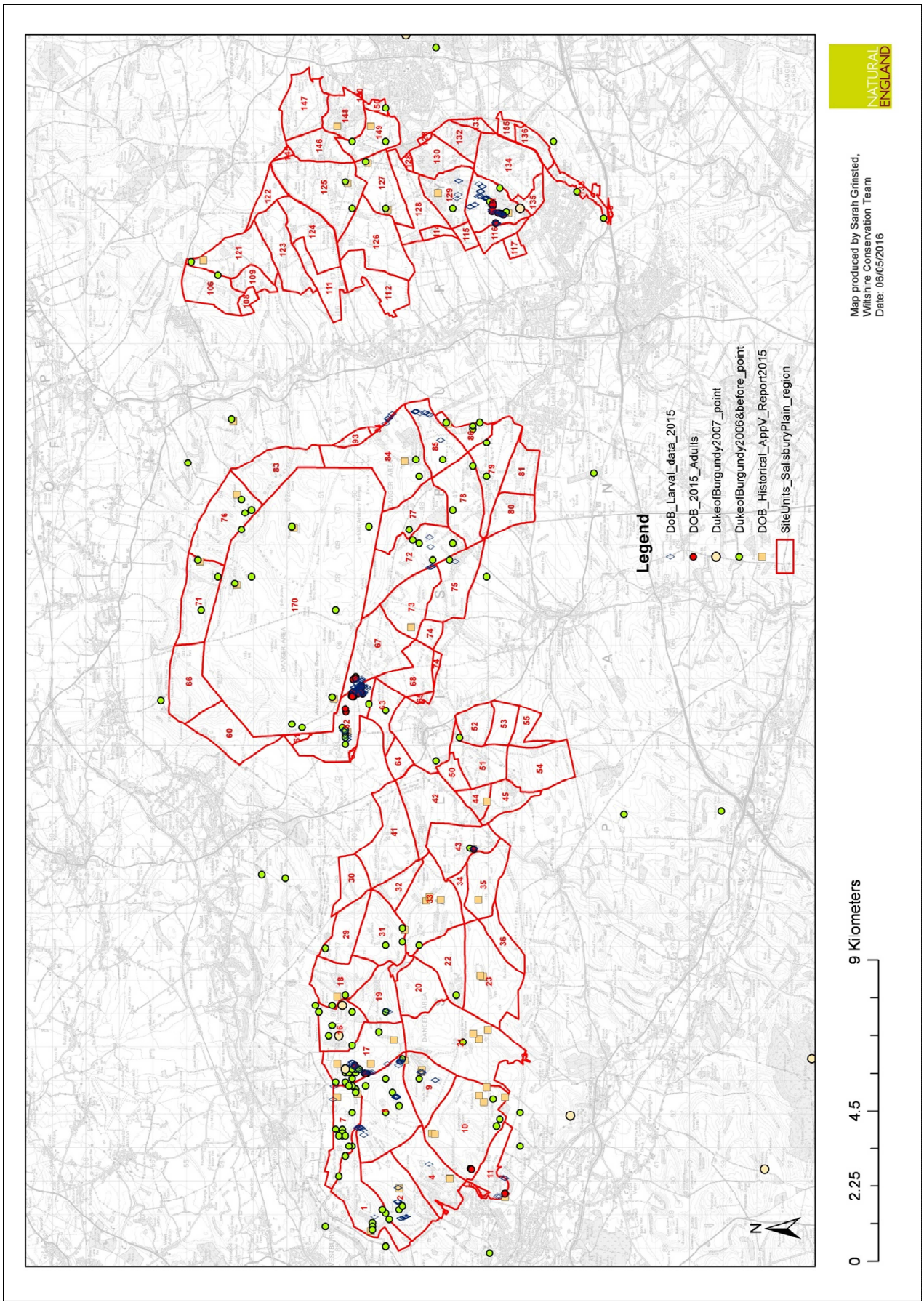

Figure 3. The 2015 survey and historical DoB records on SPTA West.

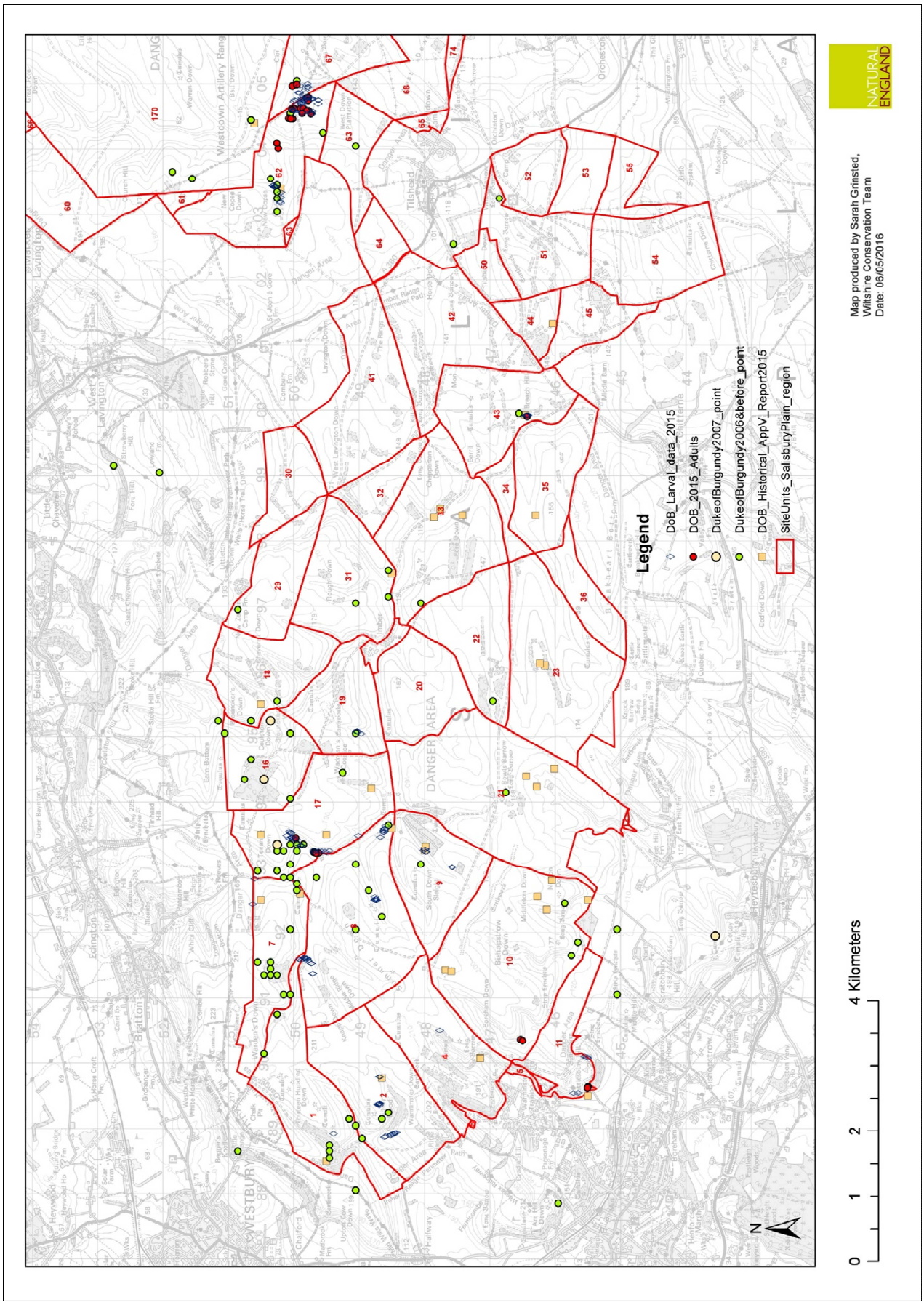

Figure 4. The 2015 survey and historical DoB records on SPTA Centre.

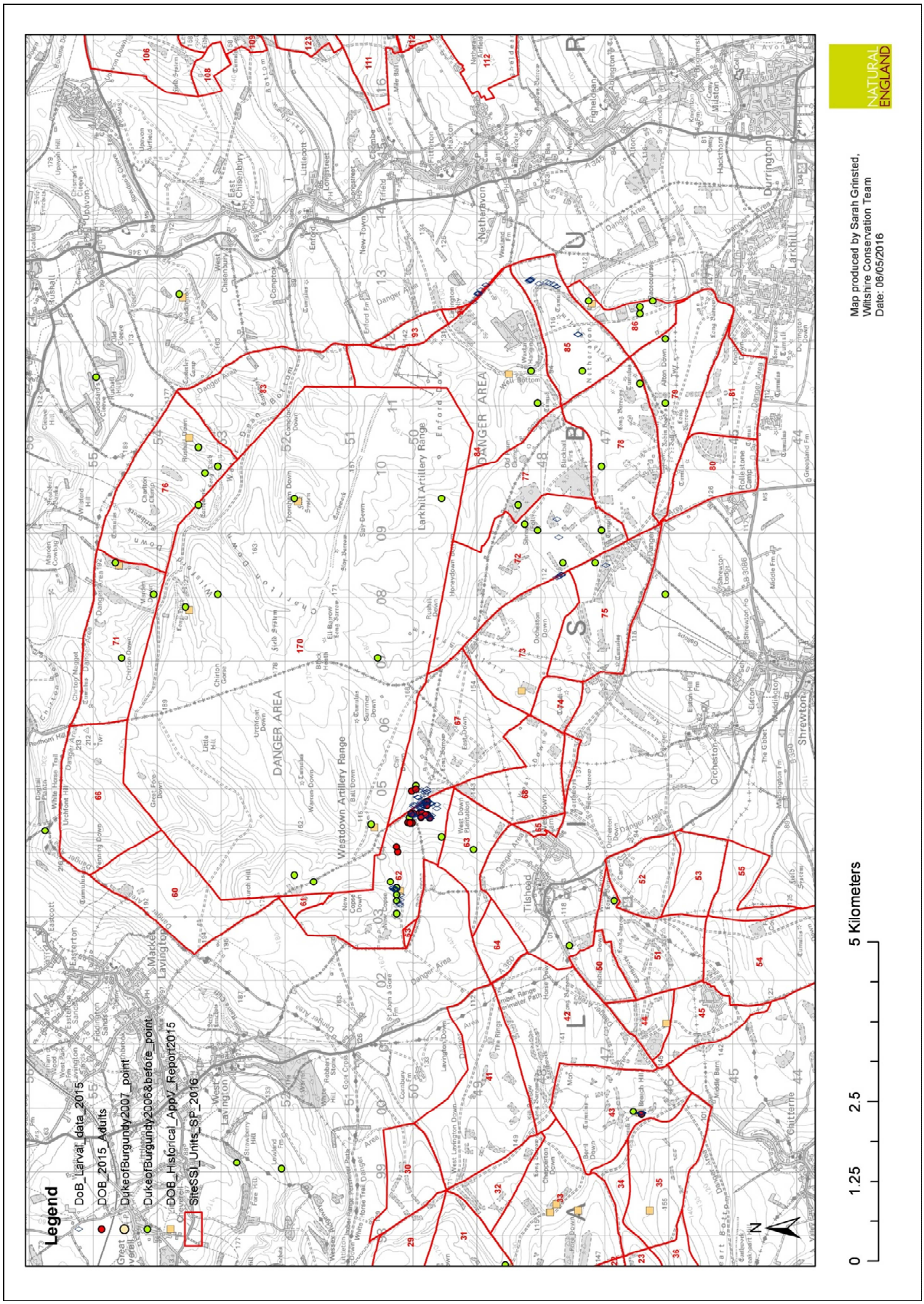

Figure 5. The 2015 survey and historical DoB records on SPTA East.

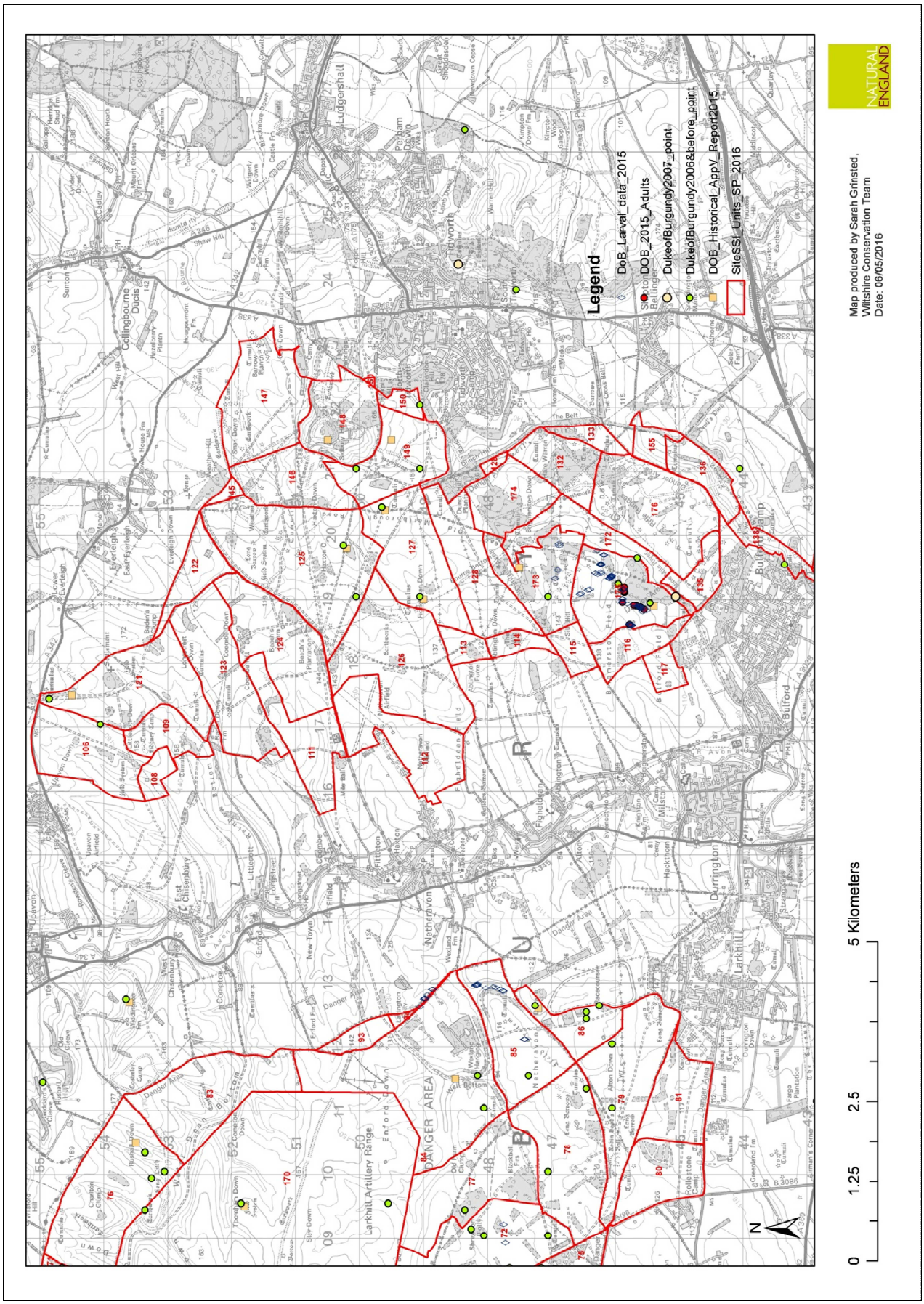

Figure 6. Examples of Duke of Burgundy larval feeding damage on SPTA in 2015.

Figure 7. Examples of Cowslip leaf damage by other invertebrates on SPTA in 2015.

Appendix I. List with notes of LD records in SPTA West (H = habitat score, sward height = mean sward height for the patch, n = number of Cowslip plants from which mean derived, CS = Cowslip).

Note 1. To find OS co-ordinates for a particular habitat patch, refer to the raw data file using the waypoint number, date and observer together for reference. MCT = Martin Townsend, SJG = Steve Gregory.

Note 2. Entries relating to sites where a Condition Threat has been entered are in red. Other sites of particular interest, including where changes in management could be beneficial, are in blue.

Warminster Ranges:

Date	Obs.	Site	Grid square	Count No.	Way-points	H	Aspect	Sward height	n	LD	Habitat
11/07/2015	SJG	1	ST 8849	1	274-281	1	SW	14.5	8	0	Much CS towards top of hill, but very sparse scattered scrub.
11/07/2015	SJG	1	ST 8849	2	282-308	1	SE	18.5	26	1	As count 1.
11/07/2015	SJG	1	ST 8849	3	309	3	NW	10	1	0	Isolated plant.
11/07/2015	SJG	1	ST 8849	4	310-317	3	NW	27	8	0	Rank grassland (Arrhenathrum, Dactylis, etc) at edge of arable field/woodland.
11/07/2015	SJG	1	ST 8849	5	318-344	2	NW	20	18	0	CS frequent and continuous from wp 318 to 344.
05/09/2015	MCT	2a	ST 8848	7	283-319	1	N	20.5	32	11	Strip of rough grassland west of western end of Dirtley Wood. Recent removal of large hawthorn bushes with much ground disturbance. CS numerous, but now exposed and likely to be swamped by regrowth. See also section 4.2.5.
11/07/2015	SJG	2	ST 8948	9	251-254	2	SE	16	4	3	Close to known site. Very little CS, most scrub cut out and rank grasses and regrowth. Fairly sheltered in narrow valley.
11/07/2015	SJG	2	ST 8948	10	255	3	NW	30	1	0	Isolated plant.
11/07/2015	SJG	2	ST 8948	11	256-272	2	SW	18.5	18	7	Sparse CS, with patchy low scrub, exposed on top of hill.

Battlesbury Hill:

Date	Obs.	Site	Grid square	Count No.	Way-points	H	Aspect	Sward height	n	LD	Habitat
10/08/2015	MCT	3	ST 8945	8	109-142	2	W	nr	-	2	See main text
10/08/2015	-	49	ST 9045	-	-	-	-	-	-		See main text
10/08/2015	MCT	49	ST 9045	20	55-91, 107-108	2	SE	10	28	3	Eastern side of hill above plantation. Open grassy slope with only scattered low scrub. CS numerous although grazed off, but some LD found. See also section 4.2.5.
10/08/2015	MCT	49	ST 9045	21	92-106	1	N	10	-	0	Open slope with abundant CS but grazed off.

Harman Lines and adjacent areas:

Date	Obs.	Site	Grid square	Count No.	Way-points	H	Aspect	Sward height	n	LD	Habitat
05/09/2015	MCT	4	ST 9047	13	277-279	3	W	25	3	0	Scattered plants mainly around range. Steep-sided valley with some CS but partly sheep-grazed. CG/scrub at top of valley but very overgrown.
05/09/2015	MCT	4	ST 9047	14	280	3	NW	15	1	1	Isolated plant on south side of wood at top of slope.
16/08/2015	MCT	51	ST 9046	15	549-557	1/2	NW	23.5	9	0	Patchy scrub but generally rather open and exposed on high ground.
16/08/2015	MCT	51	ST 9046	16	560-564	1/2	E	12.5	4	0	Slope with some scrub removal but very little CS.
10/08/2015	MCT	51	ST 9046	17	144-161	2	S	nr	-	0	Quite open with mainly rather tall (10-30cm), rich sward, scattered scrub; few sheltering blocks.
10/08/2015	MCT	51	ST 9046	18	161	3	S	nr	-	0	Sheltered, suitable looking slope but only the one CS clump located so clearly very scarce.
10/08/2015	MCT	49	ST 9045	19	49-53	3	SW	30	-	0	Strip along side of road with mature hawthorn bushes, smaller scrub and glades. Sward very tall and very difficult to find CS.
03/09/2015	MCT	59	ST 9145	22	133-138	3	S	23.5	6	0	Fairly steep slope with extensive scrub blocks and uneven ground, but CS scarce.
03/09/2015	MCT	60	ST 9146	23	139-141	3	nr	25	3	0	Elevated ground; extensive scrub and shelter in valley although sward generally tall and CS very scarce.
11/08/2015	SJG	5	ST 9147	24	441	3	NW	15	1	0	Isolated plant. Close to a known site. Much dense hawthorn and gorse scrub in western part of this square, centrally more suitable but CS rare.
11/08/2015	SJG	5	ST 9147	25	442-444	3	SE	20	3	0	Much suitable open scrub, but very little CS. Close to a known site.
14/07/2015	SJG	8	ST 9246	37	365	2	SE	15	1	0	Isolated plant.
14/07/2015	SJG	8	ST 9246	38	366-372	1	NW	18	7	0	Very open south-facing slope with very sparse scrub. No other suitable habitat in this square.
14/07/2015	SJG	9	ST 9245	39	373-386	1/2	S	14.5	14	0	Open grassland with CS at top of slope, in rather short sward.
14/07/2015	SJG	9	ST 9245	40	405-408	2	E	16.5	4	0	Very little CS.
14/07/2015	SJG	9	ST 9245	41	409-430	2	SE	13.5	22	0	Open scrub with CS.
14/07/2015	SJG	9	ST 9245	42	431-439	2/3	S	18	9	0	Scrubby woodland edge with sparse CS.

West and immediately east of Southdown Barn:

Date	Obs.	Site	Grid square	Count No.	Way-points	H	Aspect	Sward height	n	LD	Habitat
11/07/2015	SJG	47	ST 9149	26	222-245	2	NW, SW	16.5	24	15	Middle Ridge Plantation area. Scrub cut out in some areas.
09/07/2015	SJG	6	ST 9250	27	199-209	3	S	27.5	11	0	Much Arrhenathrum with few CS plants. Hedge bank.
09/07/2015	MCT	6	ST 9250	28	64-116, 138-147	3	S	25	55	2	Fields with CS along hedge banks. Tall dense grassland in fields and sward quite tall along hedge banks.
09/07/2015	SJG	7	ST 9249	29	210-212	1	S	18.5	3	0	Small clump CS in sparse scrub.
09/07/2015	SJG	7	ST 9249	30	213-218	2	N	27	5	0	Sparse CS among open scrub.
09/07/2015	SJG	7	ST 9249	31	219-221	3	SE	13.5	3	0	Few plants along sheltered scrubby track edge.
09/07/2015	MCT	7	ST 9249	32	117-137	3	S	21	21	0	Network of fields with CS along hedge banks. Tall dense grassland in fields and sward quite tall even along hedge banks.
09/07/2015	MCT	10	ST 9349	48	2-13	3	SE	24.5	12	7	CG3 slope but mainly very dense B. erecta and CS very localised, mainly at southern end. See also section 4.2.5.
09/07/2015	SJG	10	ST 9349	49	169-180	3	W	28.5	19	9	Quite tall grassland on slope with small trees on lower part, and scrub, but more open further up and at southern end. Rough ground with sheltered bays, especially near bottom of slope, giving opportunities for CS to grow where not swamped.
09/07/2015	SJG	10	ST 9349	50	181-186	1	SW	22.5	6	1	Rank B. erecta with open scrub in small valley.
09/07/2015	SJG	10	ST 9349	51	187-188	1	SW	23.5	2	0	Isolated plants.
09/07/2015	MCT	9a	ST 9350	52	14-26	2	SE	24	13	10	CG3 slope but mainly very dense grassland and CS very localised, mainly around plantation. Extends into Site 10 at southern end. See also section 4.2.5.
09/07/2015	MCT	9a	ST 9350	53	34-55	1	SE	n/r	-	0	Sloping field periodically grazed. CS abundant at northern end but mainly open rosettes in short sward. Suitable for restoration to DoB habitat. See also section 4.2.5.
09/07/2015	MCT	9a	ST 9350	54	27-33	3	SE	26.5	7	0	CS growing in ride, semi-shaded under tall trees.
09/07/2015	SJG	9a	ST 9350	55	189-196	1	SE	nr	-	0	Sloping field periodically grazed. CS abundant at northern end but mainly open rosettes in short sward. Suitable for restoration to DoB habitat. See also section 4.2.5.

Valley west of Imber:

Date	Obs.	Site	Grid square	Count No.	Way-points	H	Aspect	Sward height	n	LD	Habitat
11/08/2015	SJG	50	ST 9248	33	445	2	E	10	1	0	Isolated plant.
11/08/2015	SJG	50	ST 9248	34	446-461	2	SE	16	17	12	CS and suitable scrub only in this area in valley. However, patches of scrub have been cut out.
14/07/2015	SJG	12	ST 9347	43	345-353	3	NW	26.5	9	5	Rank grass, very little CS.
14/07/2015	SJG	12	ST 9347	44	354-364	3	NW	17.5	11	2	Ladywell Plantation. Rank grass, very little CS.
14/07/2015	SJG	12b	ST 9247	35	387-389	2/3	NE	21.5	3	0	Few CS among open scrubby grassland. Blocks of gorse scrub in area.
14/07/2015	SJG	12b	ST 9247	36	390-404	1-3	E	17.5	15	0	Open scrub.
11/08/2015	SJG	11	ST 9348	45	462-465	3	NW	9	4	0	Near known site, suitable scrubby bank with sparse CS, but recently burnt. Now being grazed tight by skittish cattle with calves (and noisy bulls) and survey abandoned.
11/08/2015	SJG	11	ST 9348	46	466-8 & 491-6	1	E	12	9	0	Scrubby copse edge and sheltered scrubby track edge. Much of track-side scrub cut out.
11/08/2015	SJG	11	ST 9348	47	469-490	3	S	16	22	13	Small plantation north of Imber road woodland edge and rides. LD in edges and within plantation in semi-shade. Otherwise, much tall, highly disturbed grassland in this area. May be beneficial to link to scrubby areas further south near road.
11/08/2015	SJG	13	ST 9448	57	497-502	2/3	E/W	20	6	0	Rather rank grassland, very little scrub and very little CS.
11/08/2015	SJG	13	ST 9448	58	503	1	E	10	1	0	Isolated plant.
11/08/2015	SJG	13	ST 9448	59	504-510	2	NW	15	7	0	CS among scrub in or near old impact crater
12/08/2015	MCT	13	ST 9448	60	354-358	2	E	21	5	0	Scrubby Bromopsis grassland on slope but very dense grass and CS either very scarce or very hard to find. Close to an old record and targeted winter grazing may reveal Cowslip to be more numerous and create suitable conditions.
12/08/2015	MCT	13	ST 9448	61	359-361	1	W	20	3	0	Good structure and shorter sward than west side but too open.
12/08/2015	MCT	13	ST 9448	62	365-367	1/2	SW	15	3	0	Grazed and rather exposed.
12/08/2015	MCT	13	ST 9448	63	368	1	S	nr	-		Very open, virtually scrub-less valley after scrub removal.
12/08/2015	MCT	13	ST 9448	64	369-370	1	S	27.5	2	0	Open slope with low, scattered scrub.
12/08/2015	MCT	13	ST 9448	65	371-375	1/2	W	29	5	0	Slope with sparse scrub and CS in quite tall sward.
12/08/2015	MCT	48	ST 9548	67	233-236	2	N	35	4	0	CS scattered and scarce on lower slopes with rank grassland, scattered bushes and mature trees.
12/08/2015	MCT	48	ST 9548	68	237-258	1	NW	20	22	0	Open valley side with grassland largely quite dense but CS numerous.

Date	Obs.	Site	Grid square	Count No.	Way-points	H	Aspect	Sward height	n	LD	Habitat
12/08/2015	MCT	48	ST 9548	69	262-321	2/3	SE	17.5	60	0	Mosaic of quite tall scrub clumps (but none extensive) creating fairly sheltered conditions. Recent grazing evident. CS abundant, often partly protected from grazing by bushes, but grazing probably preventing colonisation. DoB found to west (count 70) in gulley and restriction of grazing could be beneficial, if feasible.
12/08/2015	MCT	48	ST 9548	70	322-352	2	S	21.5	31	5	Narrow dry valley leading down into gulley. Grazed but not heavily in places due to topography. Poaching has provided shelter for CS in places. Scrub not extensive but sheltered habitat. Strip of scrub along western side of valley near top beside track and narrow belt of trees.

Northwest of Imber:

Date	Obs.	Site	Grid square	Count No.	Way-points	H	Aspect	Sward height	n	LD	Habitat
16/08/2015	MCT	15	ST 9550	73	587-628	1/2	SW	22.5	25	0	Scrubby patches along valley sides.
16/08/2015	SJG	15a	ST 9450	56	770-773	2	SW	17.5	4	0	CS among B. erecta with open scrub on west facing slope.
16/08/2015	MCT	15b	ST 9449	-	-	-	-	-	-		No suitable DoB habitat found.
16/08/2015	MCT	15c	ST 9549	71	565-586	2	SW	20	19	0	Scrubby slope suitable with CS frequent. Scrub should be allowed to continue to develop in this area.
16/08/2015	SJG	15c	ST 9549	72	760-769	2	SW	12	10	0	Scrubby slope suitable with CS frequent. Scrub should be allowed to continue to develop in this area.

South side Bowl's Barrow to Berril Valley.

Date	Obs.	Site	Grid square	Count No.	Way-points	H	Aspect	Sward height	n	LD	Habitat
14/07/2015	MCT	14	ST 9446	66	102-206	1	S	16	105	0	Extensive open slope. CS numerous in places but where CS present sward quite short and open (so that CS rosettes open) from grazing and only small scattered scrub with no shelter. Evidence of removal of larger scrub that may have provided better shelter. See also section 4.2.5.
14/07/2015	MCT	16	ST 9646	74	207-228	2	N	17	22	0	Area around Fish Hook Plantation. Short sward and scarce CS north and east of plantation. Undulating topography with hollows and low scrub. CS more frequent here.
14/07/2015	MCT	16	ST 9646	77	236-241	2	S	18.5	6	0	Some sheltering scrub but sward mostly too tall.
14/07/2015	MCT	16	ST 9646	78	242-245	3	SE	26	5	0	Grassy rides in plantation but mainly very tall sward and semi-shade from trees also.
14/07/2015	MCT	17	ST 9646	74a	229-235	2	S	25	7	0	Small patch - suitable if rather open slope. Also an isolated plant on suitable-looking slope.
11/07/2015	MCT	20	ST 9846	86	30-77	2	NE	16	48	0	Open slope around large gorse scrub. CS generally away from scrub in fairly short sward. Rather mesotrophic and less tussocky with less B. erecta.
11/07/2015	MCT	20b	ST 9746	79	80-90	2	NW	19.5	11	0	Sparse lines of scrub with CS nearby along sides of shallow dry valley.
11/07/2015	MCT	20b	ST 9746	80	91-96	2	NE	15	6	0	CS on and around mounds with a few bushes on elevated ground.
11/07/2015	MCT	20b	ST 9746	81	97-98	2	N	17.5	2	0	A few CS south of track in rather open area with scattered bushes.

Berril Valley:

Date	Obs.	Site	Grid square	Count No.	Way-points	H	Aspect	Sward height	n	LD	Habitat
11/08/2015	MCT	18	ST 9748	82	178-205	3	S	21.5	28	0	Rough banks, slopes and glades around eastern side of Imber village. Some groups of CS and generally quite sheltered. Colonisation seems possible.
11/08/2015	MCT	52	ST 9749	83	164-176	1/3	nr	18.5	9	0	Patches of CS scattered along valley, in open grassland and among scrub. Scrub could be allowed to develop.
10/08/2015	MCT	19	ST 9847	84	207-231	3	NE	24.5	24	0	West side of Berril valley. Extensive sheltering scrub and CS widespread but not especially numerous and sward height quite high, especially on lower part of slope. Previous records from this site but possibly lost.
03/09/2015	MCT	19	ST 9847	85	143-160	2	S	20	18	0	Shallow dry valley with scattered scrub along sides. Some uneven ground creating shelter and CS quite frequent. Comments as for previous entry. Also could allow scrub to develop.
11/07/2015	MCT	21	ST 9946	87	1-23	3	W	19.5	22	8	Scrubby slope sheltered by plantation at top of slope. CS concentrated at southern end. Adults seen also. See also section 4.2.5.
11/07/2015	MCT	21	ST 9946	88	24-29	1	NE	14	5	0	Open banking with sparse scrub.
16/08/2015	SJG	22a	SU 0046	89	752-759	2/3	N	17.5	6	0	Scrubby edge to woodland near V4. Sheltered but very little CS.
16/08/2015	SJG	22	SU 0146	90	734-749	3	NE	19.5	16	0	Known site. Rough scrubby grassland in sheltered valley.
16/08/2015	SJG	22	SU 0146	91	750-751	3	NE	12.5	2	0	CS in shelter belt.
02/09/2015	MCT	58	SU 0246	92	23-108	2	NW	22	86	0	Narrow belt of small trees. CS numerous along edges and in semi-shade just inside.
02/09/2015	MCT	58	SU 0246	93	112-131	2/3	NE	25	20	0	Section of open banking between wooded strips. Rather tall grassland but CS quite numerous.
02/09/2015	MCT	53	SU 0244	-	-	-	-	-	-	0	No suitable DoB habitat found.
02/09/2015	MCT	54	SU 0243	94	1-22	2/3	SE	20.5	22	0	Chitterne Down. Fairly extensive mosaic of scrub and grassland with CS moderately frequent but regularly grazed. Cattle present on day of survey so only part sampled.

Appendix II. List with notes of LD records in SPTA Centre (H = habitat score, sward height = mean sward height for the patch, n = number of Cowslip plants from which mean derived, CS = Cowslip).

Note 1. To find OS co-ordinates for a particular habitat patch, refer to the raw data file using the waypoint number, date and observer together for reference. MCT = Martin Townsend, SJG = Steve Gregory.

Note 2. Entries relating to sites where a Condition Threat has been entered are in red. Other sites of particular interest, including where changes in management could be beneficial, are in blue.

Southwest:

Date	Obs.	Area	Site	Grid square	Count No.	Way-points	H	Aspect	Sward height	n	LD	Habitat
18/08/2015	MCT	C	23	SU 0350	95	1-78	2	NE	20	78	1	Rough bank/grassy strip at bottom of grazed field alongside access track. Mainly low scrub but quite sheltered as near valley bottom.
18/08/2015	MCT	C	23	SU 0350	96	79-110	3	NE	25	41	3	North side of access track scrub/glade mosaic with taller sward and sheltered.
18/08/2015	MCT	C	23	SU 0350	97	111-159	3	nr	nr	48	11	Flat grassland inside firing range, sheltered in bottom of shallow valley. CS concentrated at southern end.
18/08/2015	MCT	C	23	SU 0350	98	160-165	3	nr	25	6	0	CS in rather lush grassland in sheltered area between mature scrub/small trees, CS hard to find but seen in adult survey.
15/08/2015	SJG	C	24	SU 0450	99	532-540	2/3	SE	11.5	7	4	Around Candown Copse. Open scrub with some CS.
15/08/2015	MCT	C	46	SU 0449	100	376-391, 396-471	3	SW	21	92	37	Large scrub complex.
15/08/2015	MCT	C	46	SU 0449	101	392-395	2	SE	25	4	0	Small area beside track slightly banked with some large scrub giving limited shelter.
15/08/2015	SJG	C	46	SU 0449	102	511-531	2/3	SW	13	21	8	Open scrub with CS
15/08/2015	SJG	C	46	SU 0449	103	539-549	2/3	SW	14	10	6	Open scrub with CS, contiguous with above.
18/08/2015	MCT	C	25	SU 0648	104	166-178	1	E	nr	-	0	Small areas beside track. Mainly tall sward but some scrub cover and CS. Otherwise quite exposed.
18/08/2015	MCT	C	25	SU 0648	105	179-180	3	S	15	2	0	Grassy edges of copse and rides. Very disturbed ground.

Northeast:

Date	Obs.	Area	Site	Grid square	Count No.	Way-points	H	Aspect	Sward height	n	LD	Habitat
09/08/2015	MCT	C	26a	SU 0853	106	29-36	1	S	32.5	8	0	CS in open, grassy gully.
09/08/2015	MCT	C	26a	SU 0853	107	37-48	3	SW	23.5	12	0	CS on steep bank at lower end of dry valley with good shelter from clumps of tall scrub.
09/08/2015	MCT	C	27	SU 0854	108	1-7	2	SE	nr	7	0	CS found in small patches of suitable habitat, either along edges or in gullies. Eastern edge of Marden Covert (old site) too tall, dense. Field adjacent recently heavily grazed. CS present in both.
09/08/2015	MCT	C	27a	SU 0954	109	8-15	2	SE	24	8	0	Mostly tall dense grassland, grazed or woodland. CS present locally in open, fairly tall grassland.
09/08/2015	MCT	C	28	SU 0953	110	16-28	1	NW	21.5	13	0	CS present locally in what is generally open, fairly tall grassland.

Southeast:

Date	Obs.	Area	Site	Grid square	Count No.	Way-points	H	Aspect	Sward height	n	LD	Habitat
18/08/2015	MCT	C	55	SU 0847	111	181-197	2	NW	22.5	36	6	Open slope with rather tall sward and isolated bushes, but CS with LD in shelter from linear thicket along side of track.
18/08/2015	MCT	C	55	SU 0847	112	198-201, 205	3	nr	nr	3	1	Scrub/grassland mosaic with good shelter and open areas between scrub. Also trenches with scrub. CS not abundant but quite widespread.
18/08/2015	MCT	C	55	SU 0847	113	211-224	2/3	SE	20	6	1	Patch of scrubby grassland near Downbarn plantation.
18/08/2015	MCT	C	56	SU 0947	114	202-204, 206-210	2/3	SE	20	8	1	Scrub/grassland mosaic with good shelter and open areas between scrub. Also trenches with scrub. CS not abundant but quite widespread.
04/09/2015	MCT	C	61	SU 1047	115	169-170	3	S	30	2	0	Small patch of scrubby grassland at southern end of plantation. Quite tall sward and good shelter but very little CS.
04/09/2015	MCT	C	62	SU 1248	119	171-211	2/3	SE	25	41	10	Strips of scrubby grassland either side of track. Good shelter from scrub and topography.
04/09/2015	MCT	C	62	SU 1248	116	212-225	2	W	25	14	8	Slope dotted with bushes some quite large. CS present but sward tall and hard to find.
04/09/2015	MCT	C	33	SU 1247	117	227-238	2	SE	25	12	7	Open but reasonably sheltered gentle dry valley slope and extensive tussocky B. erecta.
04/09/2015	MCT	C	33	SU 1247	118	239-264	2/3	SE	15	26	0	Large blocks of scrub with surrounding grassland. Sward probably too short in many places probably due to over-grazing, but CS frequent.

Appendix III. List with notes of LD records sightings in SPTA East (H = habitat score, sward height = mean sward height for the patch, n = number of Cowslip plants from which mean derived, CS = Cowslip).

Note 1. To find OS co-ordinates for a particular habitat patch, refer to the raw data file using the waypoint number, date and observer together for reference. MCT = Martin Townsend, SJG = Steve Gregory.

Note 2. Entries relating to sites where a Condition Threat has been entered are in red. Other sites of particular interest, including where changes in management could be beneficial, are in blue.

Date	Obs.	Area	Site	Grid square	Count No.	Way-points	H	Aspect	Sward height	n	LD	Habitat
04/09/2015	MCT	E	37	SU 1949	120	265-267	3	NW	22.5	3	0	Small area but good shelter from scrub but little CS.
04/09/2015	MCT	E	36	SU 1950	121	268-269	1	NE	15	2	0	Area very open and grazed or highly disturbed. No suitable habitat found in this square including site of old record, also near Hound Plantation in area as described above.
15/08/2015	SJG	E	35	SU 1845	122	550-632	3	SE	14.5	83	26	Western edge of Milston Firs. Lots suitable scrub, lots CS and plenty of DoB feeding damage.
15/08/2015	SJG	E	35	SU 1845	123	713-733	3	SE	13	21	12	Small copse west of Milston Firs. Lots of CS in open scrub along northern edge.
15/08/2015	SJG	E	39	SU 1945	124	633-644	3	SE	20	12	6	Northern edge of Milston Firs. Lots suitable scrub, lots CS and plenty of DoB feeding damage.
15/08/2015	SJG	E	39	SU 1945	125	711-712	3	SE	20	2	0	Northern edge of Milston Firs. Isolated plants.
15/08/2015	SJG	E	57	SU 1946	126	645-710	3	SE	13.5	65	28	Woodland edges and more open scrub, with sheltered areas and including mature clumps, with much CS.
15/08/2015	MCT	E	57	SU 1946	127	473-513	2	S	14	42	0	CS abundant but in quite short sward and open habitat with little sheltering scrub. Includes a run of CS just in square SU 1846 but in contiguous habitat.
15/08/2015	MCT	E	57	SU 1946	128	514-529	3	S	16	16	4	Large area of mature scrub with sheltered bays and edges and quite extensive grassland. Sward different here, more herb-dominated not grassy, rabbit-grazed with much Galium and Helianthemum, but CS still frequent.
15/08/2015	MCT	E	57	SU 1946	129	530-548	3	SE	15	20	5	Grassland around pine woodland and areas of scrub with good shelter including Juniper.

Appendix IV. Details including grid references of DoB adult found during the survey (WP = waypoint, MCT = Martin Townsend, SJG = Steve Gregory, MB = Marc Botham, WP = GPS waypoint, M = males, F = females, * = newly emerged drying wings).

Obs.	Date	SPTA Area	Site	Count	WP	Time	1 km grid square	Grid reference	M	F	Total
MCT	13/05/2015	West	3	8	65	14.10-14.59	ST 8945	ST 89644 45496	2	0	2
MCT	13/05/2015	West	3	8	66	14.10-14.59	ST 8945	ST 89626 45503	2	0	2
SJG, MB	13/05/2015	West	21	23	104	13.13-13.31	ST 9946	ST 99907 46426	2	2	4
MCT	15/05/2015	West	10	15	67	11.15-11.45	ST 9349	ST 93217 49616	0	1	1
MCT	15/05/2015	West	10	19	69	15.01-15.29	ST 9349	ST 93452 49968	1	0	1
MCT, SJG	15/05/2015	West	10	20	71	15.27-16.35	ST 9349	ST 93226 49684	0	1	1
MCT, SJG	15/05/2015	West	10	20	72	15.27-16.35	ST 9349	ST 93223 49673	1	0	1
MCT, SJG	15/05/2015	West	10	20	73	15.27-16.35	ST 9349	ST 93216 49653	0	1	1
MCT	16/05/2015	Centre	46	22	76	10.45-12.19	ST 0449	SU 04630 49892	1	0	1
MCT	16/05/2015	Centre	46	22	77	10.45-12.19	ST 0449	SU 04628 49855	1	0	1*
MCT	16/05/2015	Centre	46	22	78	10.45-12.19	ST 0449	SU 04656 49864	1	0	1
MCT	16/05/2015	Centre	46	22	79	10.45-12.19	ST 0449	SU 04788 49800	0	1	1
MCT	16/05/2015	Centre	46	22	80	10.45-12.19	ST 0449	SU 04799 49771	0	1	1
MCT	16/05/2015	Centre	46	22	81	10.45-12.19	ST 0449	SU 04747 49776	1	0	1
MCT	16/05/2015	Centre	46	22	82	10.45-12.19	ST 0449	SU 04545 49734	1	0	1
MCT	16/05/2015	Centre	46	22	83	10.45-12.19	ST 0449	SU 04596 49770	1	0	1
MCT	16/05/2015	Centre	46	22	84	10.45-12.19	ST 0449	SU 04595 49795	1	0	1
MCT	16/05/2015	Centre	46	22	85	10.45-12.19	ST 0449	SU 04555 49871	1	0	1
MCT	16/05/2015	Centre	24	23	86	13.05-13.40	ST 0450	SU 04972 50016	1	0	1
MCT	16/05/2015	Centre	24	23	87	13.05-13.40	ST 0450	SU 04995 49951	2	0	2
MCT	16/05/2015	Centre	24	24	88	13.50-14.04	ST 0450	SU 04625 49989	1	0	1
MCT	16/05/2015	Centre	24	24	89	13.50-14.04	ST 0450	SU 04609 50024	1	0	1
MCT	16/05/2015	Centre	23	25	90	14.05-14.25	ST 0450	SU 04470 50014	1	0	1
MCT	16/05/2015	Centre	23	25	91	14.05-14.25	ST 0450	SU 04479 50073	2	0	2
MCT	16/05/2015	Centre	23	25	92	14.05-14.25	ST 0450	SU 04471 50043	1	0	1
MCT	16/05/2015	Centre	24	26	93	14.47-14.49	ST 0450	SU 04014 50234	1	0	1
MCT	16/05/2015	Centre	24	26	94	14.47-14.49	ST 0450	SU 04098 50253	1	0	1
SJG	21/05/2015	West	51	50	138	15.51-15.56	ST 9046	ST 90365 46526	1	0	1
SJG	21/05/2015	West	51	50	139	15.51-15.56	ST 9046	ST 90346 46493	1	0	1
SJG	23/05/2015	East	35	54	150	13.38-13.50	ST 1845	SU 18608 45774	1	0	1
SJG	23/05/2015	East	35	56	153	15.22-16.17	ST 1845	SU 18851 45546	1	0	1
SJG	23/05/2015	East	35	56	154	15.22-16.17	ST 1845	SU 18883 45605	1	1	2
SJG	23/05/2015	East	35	56	155	15.22-16.17	ST 1845	SU 18907 45674	1	0	1
SJG	23/05/2015	East	35	56	156	15.22-16.17	ST 1845	SU 18912 45706	1	1	2
SJG	23/05/2015	East	35	56	158	15.22-16.17	ST 1845	SU 18956 45884	1	0	1
SJG	23/05/2015	East	39	56	159	15.22-16.17	ST 1945	SU 19118 45858	0	1	1
SJG	23/05/2015	East	39	56	160	15.22-16.17	ST 1945	SU 19125 45861	1	0	1
SJG	23/05/2015	East	39	56	161	15.22-16.17	ST 1945	SU 19138 45862	1	1	2
SJG	23/05/2015	East	39	56	162	15.22-16.17	ST 1945	SU 19188 45857	1	1	2

Appendix V. Collated historical records as used to form the basis for the fieldwork.

Site	Area	1 km sq	grid ref(s)	Fuller	Bealey	Martin	Year(s)	Life stage(s)	Name of location, record details
1	West	ST 8849	-	Yes		Yes	2000, 2002, 2007	Adult, LS	Ranscombe Bottom; 18 ads seen in 2000, 5 in 2002
2	West	ST 8948	ST 89771 48653		Yes	Yes	2006, 2007	LS	not given
3	West	ST 8945	-			Yes	2007	LS	not given
4	West	ST 9047	ST 90082 47146 ST 90069 47146		Yes	Yes	2006, 2007	LS	not given
5	West	ST 9147	ST 91426 47679 ST 91404 47588		Yes		2006	LS	not given
6	West	ST 9250	-	Yes		Yes	1999, 2007	Adult, LS	Thornacombe Farm track
7	West	ST 9249	ST 926 499	Yes			2005	Adult	New Farm end of track
8	West	ST 9246	ST 92355 46131 ST 92553 46273 ST 92803 46049		Yes		2006	LS	not given
9	West	ST 9245	-			Yes	2007	LS	not given
9a	West	ST 9350	-	Yes			2004	Adult	not given
10	West	ST 9349	-			Yes	2007	LS	not given
11	West	ST 9348	ST 936 485	Yes	Yes	Yes	2005	LS	West of Imber village
12	West	ST 9347	ST 93258 47994 ST 93320 47979		Yes	Yes	2006, 2007	LS	not given
13	West	ST 9448	ST 94208 48813		Yes		2006	LS	not given
14	West	ST 9446	ST 94237 46284 ST 94394 46442 ST 94510 46016		Yes		2006	LS	not given
15	West	ST 9550	-			Yes	2007	LS	not given
16	West	ST 9646	ST 96097 46157 ST 96124 46236		Yes		2006	LS	not given
17	West	ST 9645	ST 96285 45875		Yes		2006	LS	not given
18	West	ST 9748	ST 975 485	Yes			2000		East of Imber incl. small quarry
19	West	ST 9847	ST 98367 47859 ST 98368 47853 ST 98492 47756 ST 98396 47417		Yes	Yes	2006, 2007	LS	not given
20	West	ST 9846	ST 98386 46298		Yes		2006	LS	not given
21	West	ST 9946	ST 99925 46456		Yes		2006	LS	not given
22	West	SU 0146	SU 01327 46039		Yes		2006	LS	not given
23	Centre	SU 0350	SU 034 502	Yes			2003	Adult	New Copse verge, 4 adults
24	Centre	SU 0450	SU 044 506	Yes			2003	eggs	Can Down, 45 eggs on 14 plants
25	Centre	SU 0648	SU 06535 48300		Yes		2006	LS	not given
26	Centre	SU 0753	SU 078 535	Yes			1999	Adult	Wilsford Down
27	Centre	SU 0854	SU 085 546	Yes			2005	Adult	Marden Down, 3 seen
28	Centre	SU 0951	SU 095 518	Yes			2000	Adult	Thornham Down, 11 seen
29	Centre	SU 1053	-	Yes			2004	Adult	Rushall Down, 14 seen
31	Centre	SU 1148	-	Yes			1999	Adult	Well Bottom, 1 seen
32	Centre	SU 1253	SU 127 536	Yes			1999	Adult	Widdington Farm, 1 seen
33	Centre	SU 1247	SU 126 472	Yes			1999	Adult	The Broom, 1 seen
34	East	SU 1754	-	Yes			2004	Adult	Littlecott Down, 1 seen
35	East	SU 1845	SU 189 454	Yes			2006	Adult	Milston Firs, 18 seen in a day
36	East	SU 1950	SU 198 502	Yes			2006	Adult	Hound Plantation, Haxton Down, singles seen
37	East	SU 1949	SU 190 490	Yes			2006	Adult	Figheldon Down, 1 seen
38	East	SU 1947	-	Yes			2006	Adult	Bourne Bottom, 1 seen
39	East	SU 1945	SU 192 459	Yes			2006	Adult	Milson Firs, counts of 3 and 6
40	East	SU 2049	SU 204 496	Yes			2006	Adult	The Milestone, 2 seen
41	East	SU 2150	-	Yes			2006	Adult	Sidbury Hill, 2 seen
42	East	SU 2149	-	Yes			2006	Adult	Sidbury Hill, no details

Further information

Natural England evidence can be downloaded from our **Access to Evidence Catalogue**. For more information about Natural England and our work see **Gov.UK**. For any queries contact the Natural England Enquiry Service on 0300 060 3900 or e-mail **enquiries@naturalengland.org.uk** .

Report number RP02329
ISBN 978-1-78354-428-8