Development of a Duke of Burgundy habitat assessment

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Executive summary

- This report details the development and in-field testing of a simple habitat assessment protocol for Duke of Burgundy butterfly *Hamearis lucina* as an output of the Natural England funded SRP 'Chalk Species Revival – The Wiltshire Chalk Partnership' project.
- The results of published research findings (in addition to author expertise) was reviewed (reported separately) to identify the habitat attributes that contribute to suitable habitat conditions for the butterfly.
- The aim was to produce a simple-to-use habitat assessment method that could be used to understand current habitat condition and be repeatable for long-term monitoring, to assess the potential of sites for reintroductions and act as an alert system to any changes in habitat condition that would require intervention.
- Previous methodologies (much of these led by Butterfly Conservation) were reviewed and pros and cons assessed. Our new method incorporates and builds on these previous methodologies to produce a refined method that can achieve the above aims but also be carried out by both Duke of Burgundy experts and non-technical personnel.
- A critical component of the new method is the provision for simple data entry and analysis within the spreadsheet, completed automatically, that provides a summary report of site condition of "Suitable", "Adequate" or "Poor" without the need for complex analysis and expert interpretation.
- The analysis of the variables is designed as such to allow weightings to be adjusted in the future, if new research demonstrates changes in the habitat requirements of Duke of Burgundy.
- This new method was trialled at Grimstead Down, Wiltshire, a well-studied site for Duke of Burgundy so that the results provided by the new method could be compared to the known habitat condition for this site. The results of this trial corresponded well with the known suitability of the site and appropriately highlighted the known management issues, for further investigation.
- Next steps would be to trial the method with different users and on Duke of Burgundy sites in other parts of Wiltshire and across the range of the species, on grassland sites, in England. This will include unoccupied sites under consideration for reintroductions.

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Development of a Duke of Burgundy habitat assessment

1 Aims

This report details the development and testing of a simple habitat assessment and monitoring protocol for Duke of Burgundy butterfly *Hamearis lucina* as an output of the Natural England funded SRP 'Chalk Species Revival – The Wiltshire Chalk Partnership' project.

The aim was to use research knowledge of the current habitat requirements for Duke of Burgundy to produce a simple-to-use habitat assessment method that could function as both a baseline survey for potential re-introduction sites and also allow long-term monitoring of occupied habitat, acting as an alert system for any changes in site condition that would require management decisions. Where possible, the intention was to ensure the method could be adapted in the future, without changing the protocol, to account for any shifts in species requirements or new research findings.

A similar project for the Wood White butterfly *Leptidea sinapis* developed a quick once yearly "traffic light" protocol which has been extensively used for both monitoring and introduction assessments, mainly within Forest England woodlands (Clarke & Green, 2010a & 2010b; Green, 2024).

2 Background

There have been a number of different methodologies developed over the past years to attempt to assess habitat quality, much of this led by Butterfly Conservation.

Often with these methods, at least some level of expertise would be essential, such as judging which features within a site might be a limiting factor for the species. Sometimes this is also combined with mapping suitable breeding habitat, which would need a good knowledge of micro-habitat requirements. While providing a high level of detailed information, this is expensive in time, resources and needing the expertise of species specialists.

A series of Butterfly Conservation Habitat Assessments for various habitats and species (including Duke of Burgundy) were developed and tested in early 2000's (Brereton *et al.* 2005) aimed at using volunteers with little or no previous experience. The idea was that numerous survey stops were made across a site where condition indicators/attributes could be measured and recorded.

In this pilot study, the Duke of Burgundy assessment was fairly limited, only recording vegetation height, larval foodplant, perching points, low invading scrub/Bramble, rabbit droppings and evidence of stock grazing.

However, while teaching on volunteer workshops to promote these Habitat Assessments it became clear that although the method was simple and didn't require skill, it was highly repetitive and not very rewarding for volunteers. Even when the data was collected, an expert was still needed to analyse and interpret the results, which was seldom achieved. Volunteers and site managers often felt that much tedious effort was expended, but without being able to understand and interpret the results and get immediate feedback, there was little point in the surveys being carried out.

When used by specialists, these original habitat condition assessments have been useful and have often been customised for specific site monitoring, such as for Pearl-bordered Fritillary at Ewyas Harold Common, Herefordshire (Green & Clarke, 2022) and for Marsh Fritillary. But it remains a struggle to get volunteer teams to continue monitoring after the first year and often contractors are employed to both survey and to analyse the results. However, the basic idea of a rapid assessment of target features at survey stops does work well.

In 2024, Butterfly Conservation developed a new Duke of Burgundy habitat assessment as part of a wider project researching the current knowledge and status of this species in Dorset (Shellswell *et al.* 2024) and this was circulated soon after the 'Chalk Species Revival – The Wiltshire Chalk Partnership' project began.

It was agreed by the project partnership to utilise these previous versions of Duke of Burgundy habitat assessment and in particular to test the 2024 version and decide if it could meet the project aims or if modification was required.

3 Examining previous Duke of Burgundy habitat assessments

As noted in the previous section, various Duke of Burgundy habitat assessments are/have been in use and a summary of the main versions are shown in Table 1.

The authors had first-hand experience of using and analysing all methods listed in Table 1 and on training volunteer/land managers on use, with the exception of the most recently developed Butterfly Conservation Habitat Assessment for Duke of Burgundy (2024). Therefore, in July and August 2025, the 2024 assessment was tested at Grimstead Down, Wiltshire and at Higher Hill in Dorset.

After this testing, it was concluded that this method certainly had potential, the use of a large sampling point worked well within the sort of mosaic, patchy habitats used by Duke of Burgundy and it gave an excellent assessment of scrub. However, it needed refining before it could meet the requirements of The Wiltshire Chalk Partnership project, for the following reasons:

- It was not particularly quick to carry out in the field. This was particularly an issue on large sites, which were unfamiliar and where the host plant was occasional.
- It had a strong bias on recording percentage cover of scrub over other features.
- At Grimstead Down, the use of percentage cover for the low scrub category (less than 1 m high) gave a strong false impression. Dense patches of single-stem "whips" scored as less than 5% ground cover so falling within the same category as sample points containing only a single small seedling.
- At Grimstead Down and other Wiltshire sites, a major issue is Bramble growth. Bramble can act as scrub (can be a positive feature) or as ground vegetation (a negative feature) and it was unclear how to record this feature in a way that represented the site correctly.
- There was no bare ground and/or grassland cover option which is a useful attribute to record, particularly when assessing sites with potential for reintroductions as flushes of larval foodplant over bare ground are common in early host plant succession, but not for larval survival.
- The field recording form looks very daunting with repetitive categories. Experience suggests that volunteers/site managers don't enjoy completing such forms.

- The results are complex to interpret without expert help.

It was concluded that the 2024 version required further development and by building upon the experience of previous habitat assessments, in particular the 2024 version, a revised habitat assessment could be created that should fit the need for an easy, flexible method that will be of use to volunteers, experts and site managers.

Table 1. Previous Duke of Burgundy habitat assessments

	Type of habitat assessment				
	An assessment of limiting features	**GPS mapping of breeding patches**	**GPS mapping of larval feeding damage**	**2004 version of BC Habitat Assessment**	**2024 version of BC Habitat Assessment**
Suitable for long-term monitoring?	Yes, but can lack detail	Yes	Yes	Yes, but very lacking in detail	Yes
Suitable baseline for re-introduction projects?	Yes	No, only useful on occupied sites	No, only useful on occupied sites	Not very useful	Yes, but limited use
Can be done by a non-expert?	No	No	Yes, with minimal training	Yes	Yes
Quick to do in field?	Yes	No	No	Fairly quick	Not very quick
Easy to learn method?	Needs experience	Needs experience	Minimal training	Yes	Yes
Equipment needed?	Minimal	GPS mapping	GPS mapping	Drop-disc optional	Drop-disc optional
Covers all habitat variables current research suggests are required?	Yes	Yes	No	No	No
Summary	Useful, rapid assessment when done by an expert	Excellent level of detail, but needs expertise & GIS mapping	Excellent level of detail, but needs GIS mapping	Structure is useful, recorded features are limited	Structure is useful, but strong bias on scrub features
	All require some expert input to produce useful results from the field data				

4 Rationale for the revised habitat assessment

Before developing any survey/assessment it is essential to have a clear idea of why it is needed, what resources to carry it out are required and how the results will be used.

It was decided there was a need is for a rapid snap-shot of overall habitat condition and where the assessment could produce an automatic basic alert system when used by non-experts, yet also collect sufficient detail to show species specialists where and when further investigation might be essential.

For any researcher, it is always tempting to add extra features in case it will be interesting or useful, but when developing surveys for multiple users, a more pragmatic and less academic view is often required. Accepting that volunteers usually do not want to spend more than a few hours on site, don't want to take lots of fiddly measurements, but they do want to enjoy themselves and know they have achieved and are contributing something useful.

The aim is to give volunteers or site managers with no expertise in Duke of Burgundy a tool that allows them to carry out surveys and long-term monitoring of the basic habitat features required by this species. Very little training should be needed, although some initial advice on setting suitable survey units would be sensible. This would make long-term monitoring of multiple sites far more achievable and have an added benefit of encouraging more people to directly engage with Duke of Burgundy conservation.

However, from experience with training volunteers and site wardens on such habitat assessments in the past, it is worth considering why these schemes often have poor take-up and get quickly abandoned. That is often despite good, well-published training opportunities. From feedback the main reasons seem to be:

1. Boring and unrewarding
2. Survey takes too long or repeated too often
3. Put off by long and/or complex instructions
4. Worry about plant identification
5. Too much hassle to make, carry and use a drop-disc
6. What does it mean? Lack of direct feedback on results, completed forms disappear into a "black hole"

The apparent lack of "results" is a big feature in people's disillusionment over surveys, but people are willing to put effort into time-consuming surveys (such as a Butterfly Transect) when they get a "score" and might record something rare.

With the above in mind, it was decided the revised assessment should try and incorporate the following features:

- Single survey visit per year (or less often)
- Simple and fairly quick to use in the field with only basic equipment
- No training and only basic knowledge of plants required
- Field survey possible with either paper forms or digital
- Provide an automatic quick summary report of site condition Maintain previous basic format of survey (it works well and maintains continuity with other BC species habitat assessments)

It should also be suitable for:

- Site survey, long-term monitoring and between site comparisons
- Occupied and un-occupied sites (reintroduction assessments)

Obviously, for any potential reintroduction project, expert input will be needed to accurately map habitats and breeding areas, also to look at all the wider issues involved. This habitat assessment can't replace that work, but it is envisaged as an initial step to highlight potential areas and provide a baseline for any long-term monitoring.

5 Development of the revised habitat assessment

5.1 Type of site – grassland and/or woodland

Considering this is for use by The Wiltshire Chalk Partnership project and there are only a few remaining woodland Duke of Burgundy colonies in this region, it seems most straightforward to develop the assessment just for grassland habitats. This would include grassland/scrub and woodland edge sites.

To include the additional necessary features to adequately record woodland glade, young plantation and coppice habitat would make the assessment and instructions complicated. It would be better to develop a stand-alone woodland version if required.

5.2 Site landscape and management details

With the aim of keeping the field form short and simple, wider site and landscape features such as aspect, connectivity and altitude are not included. These details can be more accurately acquired from other sources.

Similarly, features recording site management (signs of grazing both stock and wild animals, scrub cutting, mowing etc) are not included. To attempt to record sufficient management features to be useful across all sites would add considerable time and complexity to the field survey and such information would be more accurately collected directly from the site managers/owners.

Any results of management which impacts on Duke of Burgundy, such as over-grazing, should be clear from the results, and then can be investigated further as required.

5.3 Selection of recording features

To help decide which features to include, a list was made of those used in previous habitat assessments (not including specific breeding or larval feeding damage surveys). Table 2 gives this list and reasons for or against inclusion into the revised assessment.

Table 2. Features in past assessments and rationale for inclusion in revised assessment

Features recorded in past habitat assessment	**Inclusion into revised assessment**
Type of site - grassland and/or woodland	Assessment for grassland sites only
Sward height	Yes
Cowslip/Primrose abundance	Yes
Cowslip/Primrose leaf size (in May)	Yes
Droughting of larval foodplant	No. Too dependent on survey timing. A spring survey, droughting is unlikely. A later survey could find this feature; but can be difficult to distinguish droughting & natural senescence of older leaves. Best left for more detailed site examinations
Low scrub	Yes
Tall scrub	Yes
Presence of rabbit droppings	No. The presence of rabbits can be important on some sites but recording droppings is of marginal use, would need to consider recording deer droppings. Best covered by asking for general site management information within the site detail section
Indications of stock grazing	No. Can be best covered by asking for general site management information within the site detail section
Presence of Duke of Burgundy perching points	No. Can be subjective & difficult to define, especially when no adult males present
Presence of negative indicators including Clematis, docks (excl. Sorrel), Creeping/ Spear Thistle, Common Nettle	Yes
Site connectivity	No. Too complex for this assessment
Distribution of scrub	No. Often highly variable across a site, difficult to define, requires mapping
Site management	Partly. A section at the top of the fieldsheet will ask for brief management details. More detailed information provided separately.

5.3.1 Features to be included from previous habitat assessment versions

As shown in Table 2.

Sward/grassland height

Most field studies have found, and therefore management advice recommends, a spring sward height for Duke of Burgundy of between 5 to 20 cm.

The butterfly seems to cope with longer swards (and taller grasses can be good perching points for the adults), but on very short swards the foodplant it at risk of drought before the caterpillars complete their development. Yet, recruitment of the foodplant is often best in short sward with bare ground patches. Therefore, a variability of sward heights, within this range, is vital for the lifecycle of the butterfly and to ensure availability of the host plant.

Previous assessments have used various methods – drop-disc or direct measurement with a tape or using height categories. Using a drop-disc has the advantage of being standardised, but on fine grasses, uneven steep slopes with terracettes and sites with low scrub or Bramble then drop-discs can be a problem to use. Volunteers also tend to dislike using and carrying them. Direct measurement using a tape could be used, but there seems very little advantage in spending time and effort collecting accurate sward height when the optimum height category is fairly wide (5 to 20 cm). For a research project or detailed survey then accurate measurement would be required, but it's not needed for a basic habitat assessment.

It was decided to assess sward height within three categories. If more than one category is present at a sample point (which is highly likely) then this can still be recorded to give some measure of variability. This is quick to collect in the field, without a drop-disc and often without needing to use a tape measure.

Cowslip/Primrose abundance

While the assessment is for grassland sites and these predominately contain Cowslip, Primrose is included because several of the Wiltshire sites do have Primrose along hedgerows and Duke of Burgundy larval feeding damage is sometimes found on these plants.

Some previous assessments have used percentage cover and others DAFOR (or similar) category of abundance. It was decided to use DAFOR categories rather than percentage cover because over a large sample area it can be challenging to correctly estimate the percentage cover of small plants such as Cowslips. The plants can be very patchy and often only the flowering heads are showing above the sward, leading abundance to be underestimated with percentage cover. Using the more intuitive and familiar DAFOR seems to be quicker for non-experts and a consistent indicator of abundance in such circumstances.

While the DAFOR scale is sometimes defined in the literature as directly equivalent to a range of percentage cover, it is not intended to be used with this level of accuracy in this assessment, only as a very rough and quick description of abundance. However, the following version of the DAFOR range is given in the instructions to help users better understand the categories and ensure consistency. Dominant (>75% cover), Abundant (50-75% cover), Frequent (25-50% cover), Occasional (10-25% cover) and Rare (<10% cover).

Cowslip/Primrose leaf size

Longest leaf size was recorded in three length categories on the 2024 version and this seems useful to retain.

Low scrub

The 2024 version defined low scrub as under 1 m high and used six percentage cover categories (including none) for recording. The height definition seems useful to retain. However, during the trial of the 2024 version the use of percentage cover for low scrub gave a strong false impression. Dense patches of single-stem “whips” scored as less than 5% ground cover, but so did sample points with only a single small Hawthorn seedling.

While not directly a problem for Duke of Burgundy, the presence of numerous seedling or sapling scrub plants is a warning signal of rapid scrub invasion of the grassland and certainly needs to be flagged on the assessment. It was found that recording number of plants (rather than percentage cover) in three categories seemed to supply sufficient information and was quick to use in the field.

Tall scrub

The 2024 version defined tall scrub as over 1 m high and used six percentage cover categories (including none). The height definition seems useful to retain and also to record as percentage cover. However, to maintain simplicity on the fieldsheet the feature will be recorded as a single estimate to the nearest 5%. This then allows for a single row or column on the sheet.

Presence of negative indicators

The 2024 assessment recorded presence/absence of the following, all indicators of degradation of species-rich unimproved grassland:

- Clematis *Clematis vitalba*
- Docks *Rumex spp.* (excl. Sorrel)
- Creeping/ Spear Thistle *Cirsium arvense/ C. vulgare*
- Common Nettle *Urtica dioica*

These will be retained on the revised assessment.

It seems very possible that with climate change there is a longer growing season and combined with increasing atmospheric nitrogen deposition (Plantlife 2017), competitive plants such as Clematis and Bramble *Rubus fruticosus* are better able to spread rapidly and dominate, even usually low-nutrient habitats such as chalk downland. The issue of recording Bramble is covered below.

5.3.2 Additional features to be included

During the testing of the 2024 habitat assessment and also from recent Duke of Burgundy research, several additional features emerged as worth including. These are:

Bramble

During the trial of the 2024 habitat assessment on Grimstead Down, there were problems deciding how to record Bramble. While it could be fitted into the low and tall scrub categories it was clear that on a site such as Grimstead Down this didn’t adequately represent the habitat structure.

Firstly, there was an issue of whether low-growing bramble, often growing as dense runners creeping along the ground, should be recorded as part of the ground flora or as low scrub. This could be solved by deciding that where it provides the same structure as woody scrub then it is counted as scrub, but otherwise as ground vegetation. However, this is fairly arbitrary and proved tricky to decide in the field.

Secondly, recording Bramble under a scrub category would be a lost opportunity to adequately monitor a feature that is causing problems on many Wiltshire Duke sites and in other locations. Although just viewing Bramble as a problem is over-simplifying the situation. While it can very rapidly take over grassland habitat and then be hard to remove, it can also be a positive feature for Duke of Burgundy, providing sheltered moist edge habitat where Duke often seem to choose to lay eggs (personal observation). Also, males often use Bramble as perching locations. Regardless, high levels of Bramble on a grassland site is a management issue and needs to be adequately recorded and monitored.

It was decided to record Bramble in two categories:

1. Ground/creeping (less than 40 cm high). Where the plant is part of the ground cover structure.

2. Scrubby/thicket (over 40 cm high). Where the plant is providing a scrub-type structure.

Recording via percentage cover didn't work well in the field. With large sample points and Bramble growing over, under and through other vegetation (including scrub), using the more intuitive DAFOR scale seemed to work better and an exact percentage is not required.

Moss

It is possible that moss and thatch may retain humidity and warmth at ground level and so support larval development. It was felt worth recording moss, but litter/thatch is a tricky concept to define for non-experts and so is not included.

Oates (pers com.) considered good Duke sites very often had abundant moss. The presence of moss would indicate a site that does not become too dry during the summer and therefore where larval foodplants are likely to remain lush and nutritious throughout the larval stage. However, Fartmann (2006) found that the plants Duke used for egg-laying usually had only low levels of moss and lichen nearby, but did have a certain amount of litter, so any relationship with moss may not be simple. Of course, temperature will vary with aspect, latitude and slope but it seems that the presence of moss is a useful and easy attribute to record and a proxy for moisture conditions (further research is required on this).

With a large sample area and moss hidden under sward it was decided that recording using the DAFOR scale of abundance was simplest.

Grassland/herb cover

This is recorded to nearest 5% cover.

Recording grassland cover seems highly useful. Fartmann (2006) found that egg-laying sites were characterised by high overall vegetation cover.

This feature is also essential to adequately record any lack of grassland sward on sites with unusual habitat such as brownfield locations, which often have rubble, rocks, gravel or scree. It should also help show if grassland habitat is being reduced by invasive scrub, Bramble or similar.

Bare ground cover

Most sites will have small patches of bare ground, but if this is over 5% of the 250cm radius sample point then it is to be recorded (as percentage cover). Features such as rubble, concrete, rocks or pile/mats of dead vegetation are not included as bare ground.

As mentioned above, bare ground patches play a role in maintaining larval foodplant abundance. However, plants growing on bare ground tend to quickly desiccate and so are not very suitable for maintaining Duke caterpillars into the summer months.

Large areas of bare ground might mean high site disturbance which could have management implications.

Small-scale ground irregularities

The role of irregular ground structures such as banks, ditches, pits, terracettes and ant-hills in supplying micro-habitat conditions for butterflies is well documented (Dennis, 2010). These features seem particularly important for Duke of Burgundy; males often gather in ditches or on banks and Cowslip plants growing on the sheltered edge of terracettes seem to be favoured for egg-laying (personal observation).

These features are grouped into a single category and recorded as presence/absence.

Hedge

On some Duke of Burgundy sites, both male perching points and the breeding habitat can be closely associated with hedgerows. This is recorded as presence/absence.

5.4 Deciding sampling techniques and area

The basic technique of fixed-point habitat recording on a structured walk (or grid) across a site will remain for the revised habitat assessment, but the sampling point recording will be simplified.

The 2024 habitat assessment used a 50cm radius sampling point to record vegetation height, larval foodplant and scrub features. Then within a 250cm radius, additional scrub measurements were recorded and also the presence/absence of Clematis, Docks (excluding Sorrel), Thistles and Common Nettle.

This does provide an excellent assessment of scrub but using both an inner and outer sample point was felt to be over-complicated for volunteers. However, it was noted in the field that using a large sampling point of 250cm radius was effective at recording the generally very patchy distribution of larval foodplant and scrub. Also, the large sample area, to some extent, reduces the number of stopping points that are needed to adequately represent such mosaic habitat.

The revised assessment was therefore tested using a 250cm radius sampling circle only. A circle, rather than a square, was used to maintain consistency with the various Butterfly Conservation Habitat Assessments already in use and a circle is easy to visualise in the field.

As with all the habitat assessments it can be difficult to decide the boundary of the site which is to be sampled and whether this should be sub-divided. The assessment instructions (Section 7) offer some guidance, but if long-term monitoring is to be set-up it could be worth seeking expert advice before doing the first survey.

5.5 Field form design

The field form was designed to fit onto a single printed sheet and to be suitable for use on a digital device. Shading is used to define recording sections and so help reduce mistaken entries. 30 sample points are given on the form, but it is easy to add more (or use more than a single sheet).

The field form is presented in the same format as the spreadsheet data entry form (see Section 6), to help reduce mistakes when entering data.

6 Automatic report; analysis and spreadsheet entry

Integral to this updated habitat assessment was the ability to simply enter the data and analysis to be completed automatically so as to provide a brief summary report of site condition, without the need for complex analysis and expert interpretation.

The summary that has been developed does not attempt to cover all the recorded features, but aims to provide a basic estimate of condition and to act as an alert system if there is a habitat condition problem developing on the site. If required, additional features can always be examined further to supply more detail.

The complexity of habitat requirements for most butterfly species means that it is not usually possible to just average the score of features on a linear scale and state that the highest scores (or lowest for negative features) show the most suitable habitat. Features such as scrub are seldom just positive or negative and this is certainly true for Duke of Burgundy. However, it is possible to give weightings to the recorded features so that the final scores do directly indicate habitat suitability.

Full details of the weighting and scoring system for each feature are given in Appendix 1. A summary of the suitability scoring is shown in Table 3 below.

Table 3 Summary of feature suitability scoring

Feature	Suitable	Adequate	Poor	Maximum score
Grassland height	7 or more	≥4 and <7	below 4	10
Larval foodplant leaf size	4 or more	≥3 and <4	below 3	10
Larval foodplant abundance	4 or more	≥3 and <4	below 3	10
Scrub less than 1 m high	5 or more	≥4 and <5	below 4	10
Scrub more than 1 m high	10	6	1 or 0	10

“Suitable” suggests this feature fits Duke of Burgundy requirements, “adequate” is when conditions only just meet requirements and habitat could be considered marginal, then “poor” is suggesting that this feature does not supply what is needed to support Duke of Burgundy.

These scores are then combined to give three overall site condition scores as detailed in the summary box below. These could be used to compare between sites or between years at the same site.

Overall site suitability scores – results & interpretation

Overall site suitability is divided into three categories with larval foodplant conditions kept separate from habitat structure features. Sites often have excellent habitat structure for Duke of Burgundy breeding, but lack larval foodplant, or conversely have foodplant but unsuitable habitat structure. This would clearly show under this system.

1. Site structure suitability score (maximum score =30)

This is the sum of the overall grassland height suitability score + overall low scrub suitability score + overall taller scrub suitability score.

This indicates the gross structural suitability of the site at the time of the survey.

2. Site larval foodplant suitability score (maximum score =20)

This is the sum of the overall larval foodplant leaf size score + overall larval foodplant abundance score.

3. Total site problem features score (maximum score =15)
This is the sum of scores from Bramble (creeping & thicket combined) + the low scrub over 16+ plants per stop score + scores from the presence of Clematis, docks, Nettle, thistles.

A breakdown of this score is given in the lower orange table on the spreadsheet to allow the main features to be quickly identified.

This score is useful in the early detection of issues. On one trial site the overall structure and larval foodplant condition scored as fully suitable, but a high site problem score indicated Bramble growth as an issue and indeed this has become a management problem over the last few years.

A dedicated spreadsheet has been set-up so that entry of the field data will automatically create a summary table of these scores and suitability. An example is shown below.

August 2025	Maximum score		
Overall larval foodplant leaf size score	10	**3.56**	Adequate
Overall larval foodplant abundance score	10	**3.36**	Adequate
Overall grassland height suitability score	10	**8.6**	Suitable
Overall low scrub suitability score	10	**6.24**	Suitable
Overall taller scrub suitability score	10	**0**	Poor
Site structure suitability score	30	14.84	
Site larval foodplant suitability score	20	6.92	
Total site problem features score	15	3.28	

The spreadsheet also produces a second table showing the breakdown of the "Total site problem features score" so that specific issues can be clearly identified (example shown below).

PROBLEM FEATURES	Maximum score	AVERAGE SCORE
Bramble (creeping & thicket combined)	10	2.76
Low scrub if over 16+ plants per stop	1	0.24
Presence of Clematis, docks, nettle, thistle	4	0.28

Full instructions for data entry into the spreadsheet are given in the assessment instructions (Section 7). The spreadsheet file (in Excel) contains the following:

- A printable fieldsheet
- Blank entry form with summary tables
- Copy of the scoring information
- An example site

Note that the blank entry form allows for up to 30 sample points, but more can be added if required (the sheet will need to be unlocked first, the password is "password").

6.1 Future flexibility

The aim was to make the analysis as resilient as possible, yet also transparent and flexible to allow for future adjustment and alterations.

Full details of weighting and scoring of features are given in the habitat assessment instructions so that this remains directly connected to the surveys (not lost in a separate report).

The system has been developed so that these weightings can be easily changed, if experience suggests alterations are needed or if research shows shifts in Duke of Burgundy habitat needs. (Note: The dedicated spreadsheet is locked to prevent changes in the calculations being made by accident, password is “password”)

Using the dedicated spreadsheet, any previous data would be simple to re-analyse after changes in the weighting and scoring systems.

7 Revised Habitat Assessment. Survey instruction & field form

This section contains the survey instructions and blank fieldsheet, as will be provided to surveyors.

Habitat Condition Assessment: Duke of Burgundy

This methodology has been devised as an output of the Natural England funded SRP 'Chalk Species Revival – The Wiltshire Chalk Partnership' project. This builds on previous assessment methods developed by Butterfly Conservation. Through further testing and refinement, this revised method has been adjusted to provide flexibility of use on both occupied and unoccupied sites and locations where colonisation is possible and/or re-introduction may be considered.

When should this method be used?

- The aim is to determine the general condition (suitability) of a habitat patch occupied by a population (colony) of the Duke of Burgundy butterfly.
- This is for **grassland, grassland/wood edge or grassland with scrub sites**. It will not work well for coppice glades or young plantations.
- This survey is fairly rapid, easy to carry out and analyse, without complex statistics, but still retains enough detail to indicate positive ecological features for the species and an alert to where changes to management might be required.
- The method involves repeat recording of vegetation structure and relevant attributes (based on ecological research studies) that are currently known to influence the suitability of grassland sites for the Duke of Burgundy.
- The data can be used to a) score habitat suitability to make an initial assessment of the condition of the site for this species, b) provide an alert if suitability is poor and c) provide a baseline for which management changes can be monitored.
- The scoring and analysis system (via a dedicated spreadsheet) allows for a simple collation, presentation and interpretation of the results. Where further research findings suggest that there are changes in the habitat requirements for the species, then the spreadsheet weighting features can be adjusted in the future.
- This initial analysis is designed to be an alert for land managers and advisors, if the results indicate that a site, or features at a site are unfavourable, then further detailed analysis might be required.

Preparation before undertaking the survey assessment

SURVEY EQUIPMENT

- Duke of Burgundy habitat condition assessment form – printed out or downloaded to a mobile device if collecting the information digitally. A print-ready version of the field form is given in the spreadsheet file and a copy at the end of these instructions.
- Clipboard plus pen and/or pencil if using a printed form.
- Assemble relevant information including a good map of the site with the area to be surveyed marked (and preferably the sample pattern such as a grid or w-shape).
- A ruler for measuring Cowslip or Primrose leaves and vegetation height.
- Download GPS Logger app and/or another free GPS app to your smartphone if you have one or bring a GPS unit.

FREQUENCY, TIME OF YEAR AND CONDITIONS

- Surveys should be carried out either around the peak flight period for the Duke of Burgundy in May-June and/or when the caterpillars are present in July. Timings may vary between sites, regions and years.
- Surveys can be done in any weather, but it is quicker in dry weather and foodplants are more visible.
- The time of day does not matter and sites can be surveyed over multiple days if required.
- A single assessment per year (or every 2 to 3 years) should usually be adequate.
- The method is designed to be time-efficient and completed easily. For example, a medium sized site with a fairly steep and moderately scrubby slope took about 30 to 45 mins to walk and complete 10 sample stops. As an example, each trial survey compartment of between 1.5 to 3 ha took between 1.5 to 2 hours.
- Ensure formal permission is obtained from the landowner/land manager, even if public access land. Permission to survey land is essential to building relationships with land managers and to ensure appropriate habitat management can be implemented.

Carrying out the field survey

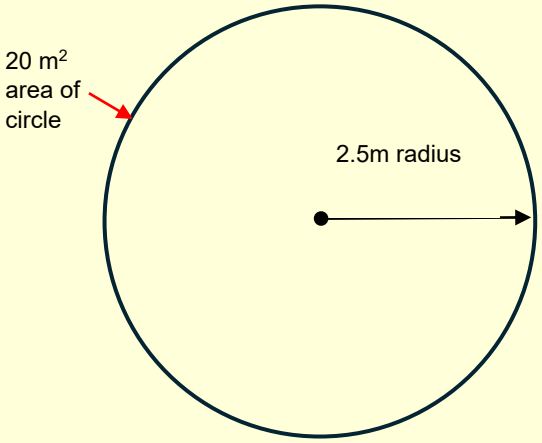
DETERMINE SURVEY COMPARTMENTS

- If necessary, divide the site into survey compartments that are based on management units and/or habitat changes. Avoid sampling only the best areas, but don't sample habitat that is never used by Duke where there is no larval foodplant (i.e.: inside a dense mature conifer patch or the trampled enriched patches around water troughs).
- Deciding survey compartments can be difficult particularly on unknown sites. It is easy to combine for future surveys if results suggest this is best, but splitting a previously recorded compartment is tricky. For setting-up long-term monitoring it might be best to seek expert advice.
- On small sites (less than 1 ha) it is probably best to record as a single unit, unless there are obvious management/habitat changes across the unit.
- On very large sites, it may not be practical to survey the entirety and in such cases concentrate on the area/s likely to hold the majority of potential breeding habitat.
- Note that Duke of Burgundy adults are usually seen in sheltered zones towards the bottom of slopes, however these are often predominately males and the secretive females can be more widely spread across a site as they search for Cowslip or Primrose plants. Don't ignore the top of slopes, unless the habitat is obviously totally unsuitable with no larval foodplant. Also remember that larval foodplant distribution can quickly change between years, so do cover low density patches.
- In all cases, accurately map/record the survey compartments.

SAMPLING AND STOPPING DISTANCES

- This survey involves carrying out point sampling of habitat features across the site or sub-sites. Work out a grid or W shape (zigzag) route that will cross thoroughly and evenly the whole of each survey compartment (as far as is possible with natural barriers such as dense scrub thickets).
- W-shaped or zig-zags will be better on sites where scrub or other features limit access and it is difficult to physically reach or find set grid points. Grid sampling patterns may be more appropriate on large open sites.

- Make sure that the sample points (stops) are evenly spread across whichever route is being used. If this is a repeat survey, try to use a similar route/grid to the original baseline survey so that there is a direct comparison, but the stop points do not need to be identical. If management has taken place, such as scrub clearance then adjustments to sample these areas will be needed.
- Decide rough stopping distances along this route where repeat recordings of habitat condition will be made e.g. every 20-50 paces. The survey circles are large in area (2.5m radius) and therefore 25 stops should be sufficient for most sites/survey compartments. In trials, 25 stops seemed to give enough detail for sites between about 1 to 3 ha, without becoming too time-consuming. The dedicated spreadsheet allows up to 30 stops to be entered & more can be added (see ASSESSMENT SPREADSHEET & ANALYSIS below)
- Using a GPS/GPS Logger app, record the start of your structured walk to map your route taken, remembering to press stop and name the file at the end. This can also be used to 'mark' your sample points (stops) if this would add useful detail.
- Alternatively record the British National Grid Reference of each sample point using a phone app or GPS unit and send this in with your survey form (10 figure grid reference preferred).
- At each stop record the attributes as listed on the recording form using a 2.5 metre radius sampling point (see below diagram).



FEATURES TO RECORD

The top of the fieldsheet asks for details of the site, survey date/s, surveyor, the larval foodplant species that are present and also brief notes on site management. Feel free to provide additional notes on management if known, including if rabbit or deer grazing has a noticeable impact, stock type and numbers, if management has changed recently and any scrub management /treatment that has occurred.

For the sampled features, on paper a tick can be used to indicate presence of a feature. When entering onto the spreadsheet, to allow for calculations use "1" to indicate presence. For absence it is usually easier to leave the cell blank, but a zero can be used if wished (see ASSESSMENT SPREADSHEET & ANALYSIS below).

1. Grassland height

- Take the height as the main bulk of the grassland sward, not flowering heads.
- Three height categories are listed, mark all that apply within the 2.5 radius sampling circle. This might mean all categories are ticked. Leave blank if a category isn't present.

2. Larval foodplant leaf size

- It's not necessary to check every plant, just look at a representative sample within the circle taking the longest leaf on each plant. Three length categories are listed, mark all that apply, which might mean all categories are ticked.
- Leave blank if no larval foodplants are present.

3. Larval foodplant abundance

- Give an overall estimate, don't go searching for every plant.
- For each sampling circle make an estimate of larval foodplant using the DAFOR scale of abundance (D - dominant, A - abundant, F - frequent, O - occasional, R - rare). See notes on estimating DAFOR below.
- Use "X" if no larval foodplants are present or can be left blank, but do not use a zero when writing on the fieldsheet because this could be interpreted as "occasional".
- On paper, D, A, F, O or R can be used, but when entering onto a spreadsheet use D=5, A =4, F= 3, O= 2, R=1 and none = 0 (or can be left blank).

4. Moss

- Only record if moss is an obvious feature within the sward, don't go searching deep within vegetation.
- For each sampling circle make an estimate of abundance using the DAFOR scale of abundance (D - dominant, A - abundant, F - frequent, O - occasional, R – rare and use "X" or blank for none) see Larval foodplant abundance above for details.

5. Bramble (ground/creeping)

- Leave blank if none present.
- The difference between ground-growing bramble and scrubby bramble (see below) will be slightly arbitrary but the idea is to differentiate between bramble that is growing as part of the sward and bramble that has enough structure / height to be acting like scrub within the habitat. As a suggestion, if the bramble is less than 40 cm in height then it can be considered as ground/creeping.
- For each sampling circle make an estimate of abundance using the DAFOR scale of abundance (D - dominant, A - abundant, F - frequent, O - occasional, R – rare and use "X" or blank for none) see **Larval foodplant abundance** above for details.

6. Bramble (scrubby/thicket)

- Leave blank if none present.
- Consider bramble as falling into this category when it is creating the same structure and shading opportunities as woody scrub, as a rough estimate if bramble is more than 40 cm in height then it could be considered as scrubby/thicket.
- For each sampling circle make an estimate of abundance using the DAFOR scale of abundance (D - dominant, A - abundant, F - frequent, O - occasional, R – rare and use "X" or blank for none) see **Larval foodplant abundance** above for details.

7. Scrub less than 1m height

- Leave blank if no low growing scrub is present.
- Bramble is assessed above and therefore not considered in this category, but Wild Rose should be included.
- Four abundance categories are listed, mark the category that best applies within the 2.5 radius sampling circle, but don't go searching for every small shoot.

8. Scrub more than 1m height

- Roughly estimate the percentage canopy cover within the sampling circle to nearest 5%.
- Bramble is assessed above and therefore is not considered in this category, but Wild Rose should be included. Hedges should be noted separately under 11. Other features present.

9. Grassland/herb sward cover

- Roughly estimate the percentage cover within the sampling circle to nearest 5%. Note that grassland sward can continue under scrub or bramble.
- Do not include dense patches of Common Nettle or similar, unless the grassland sward continues beneath.

10. Bare ground if more than 5% cover

- There is always likely to be some small patches, but if this covers more than or equal to 5%, then roughly estimate the percentage cover to nearest 5%.
- Do not include rubble, concrete, large rocks or piles of dead vegetation.

11. Other features present

- Clematis
- Docks (excl. Sorrel)
- Creeping/ Spear Thistle
- Stinging Nettle
- Ant-hills/ bank/ ditch/ pit/ terracettes
- Hedge

Indicate the presence of any of these features. Note that terracettes are small step-like formations on steep slopes, which seem to be formed by soil creep or erosion, exacerbated by livestock trampling. These can also form alongside fence boundaries. Only indicate ant-hills, banks, ditches, pits, terracettes when they are a fairly strong defined feature, not just the typical uneven surface of grazed grassland.

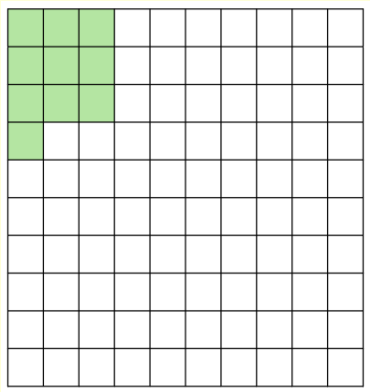
NOTES ON ESTIMATING DAFOR ABUNDANCE (for sections 3, 4, 5 and 6)

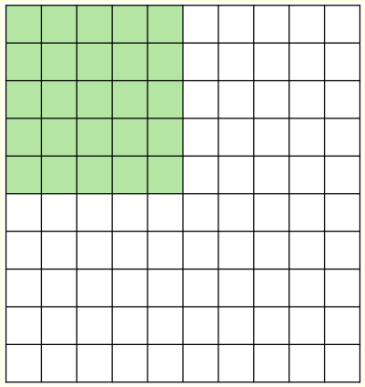
While the DAFOR scale is sometimes defined in the literature as directly equivalent to a range of percentage cover, it is not usually intended to be used with this level of accuracy. In this survey it should be used as a very rough, quick description of abundance and not as directly equivalent to percentage cover.

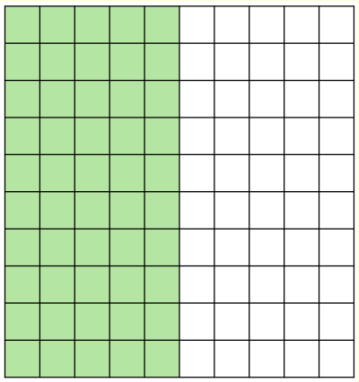
DAFOR is used here because when faced with a large sample point, it is difficult to correctly estimate the percentage cover of small plants such as Cowslips, which are very patchy and often only flowering heads are showing above the sward. Percentage cover then tends to underestimate Cowslip abundance, but DAFOR seems to be more accurate and better indicate small differences in abundance.

However, one version of the DAFOR range is given here to help with understanding the categories. Dominant (>75% cover), Abundant (50-75% cover), Frequent (25-50% cover), Occasional (10-25% cover) and Rare (<10% cover).

NOTES ON ESTIMATING PERCENTAGE COVER (for sections 8, 9 and 10)
The easiest way is to imagine the plant/ feature is grouped into a corner of a sample point. The coverage can then be estimated depending on the number of squares filled by that feature on an imaginary 10x10 grid. Each square represents 1%. Using a circular sample point makes it a little trickier to visualise, but the same principle applies.


10% cover


25% cover


50% cover

ASSESSMENT SPREADSHEET & ANALYSIS

Spreadsheet entry
The spreadsheet is locked so that only the field data can be entered. This protects any accidental deletion of the calculations. However, if changes or extra stops are needed then the spreadsheet can be unlocked using the password = “password”.

- For any present/absence features, use “1” for presence, “0” can be used for absence but if “absence” is left blank on the spreadsheet then it takes less time and makes checking the input clearer.
- For any DAFOR abundance features use 5 for D, 4 for A, 3 for F, 2 for O, 1 for R and 0 for none. This is also shown on the spreadsheet for ease of entry.
- Remember to enter the number of sample stops in the red-bordered box at the top right of the spreadsheet, otherwise the calculations will not work!

Interpreting the results
Once the field results are inputted into the spreadsheet, the results are automatically calculated and displayed on the adjacent summary tables.

An average is used for every recorded feature, to accommodate the use of different numbers of sample points (so unused columns do not have to be removed). A weighting is then given to each category within that feature, to reflect relative suitability of the attribute for the species. There is a maximum score of 10 for every feature. Full details of the weighting and scoring system are given in Appendix 1 below.

In the scoring table shown below, “suitable” suggests this feature fits Duke of Burgundy requirements, “adequate” is when conditions only just meet requirements, habitat could be considered marginal and “poor” is suggesting that this feature does not supply what is needed to support Duke of Burgundy.

Summary of feature suitability scoring

Feature	Suitable	Adequate	Poor	Maximum
Grassland height	7 or more	≥4 and <7	below 4	10
Larval foodplant leaf size	4 or more	≥3 and <4	below 3	10
Larval foodplant abundance	4 or more	≥3 and <4	below 3	10
Scrub less than 1 m high	5 or more	≥4 to <5	below 4	10
Scrub more than 1 m high	10	6	1 or 0	10

These scores can also be combined to give three overall site conditions scores as detailed in the box below. These could be used to compare between sites or between years at the same site.

Overall site suitability scores – results & interpretation

Overall site suitability is divided into three categories with larval foodplant conditions kept separate from habitat structure features. Sites often have excellent habitat structure for Duke of Burgundy breeding, but lack larval foodplant, or conversely have foodplant but unsuitable habitat structure. This would clearly show under this system.

1. Site structure suitability score (maximum score =30)

This is the sum of the overall grassland height suitability score + overall low scrub suitability score + overall taller scrub suitability score. This indicates the gross structural suitability of the site at the time of the survey.

2. Site larval foodplant suitability score (maximum score =20)

This is the sum of the overall larval foodplant leaf size score + overall larval foodplant abundance score.

3. Total site problem features score (maximum score =15)
This is the sum of scores from Bramble (creeping & thicket combined) + the low scrub over 16+ plants per stop score + scores from the presence of Clematis, docks, Nettle, thistles.

A breakdown of this score is given in the lower orange table on the spreadsheet to allow the main features to be quickly identified.

This score is useful in early detection of issues. On one trial site the overall structure and larval foodplant condition scored as fully suitable, but a high site problem score indicated Bramble growth as an issue and indeed this has become a management problem over the last few years.

For full details on entering data onto the spreadsheet and the subsequent analysis, see Appendix 1

Habitat Condition Assessment Form - Duke of Burgundy

Site name & county	Survey date	Site grid reference (central 6 figure)
Surveyor	Most frequent larval foodplant on site	Any other larval foodplant/s on site
Management (grazing/mowing/stock type etc)	Survey section number	Survey section gid reference (central 6 figure)

version 2025

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Grassland height (tick all that apply)	**<5cm**																														
	5-20cm																														
	20cm+																														
Largest larval foodplant leaf size (tick all that apply)	**<4cm**																														
	4-8cm																														
	8cm+																														
Larval foodplant abundance	**D5,A4,F3,O2,R1, X0**																														
Moss	**D5,A4,F3,O2,R1, X0**																														
Bramble (ground/creeping)	**D5,A4,F3,O2,R1, X0**																														
Bramble (scrubby/thicket)	**D5,A4,F3,O2,R1, X0**																														
Scrub <1m height	**1 to 5 plants**																														
	6 to 15 plants																														
	16+ plants																														
Scrub >1m height	**% cover (nearest 5%)**																														
Grassland/herb sward	**% cover (nearest 5%)**																														
Bare ground if ≥ 5% cover	**% cover (nearest 5%)**																														
Other features present	**Clematis**																														
	Docks (excl. Sorrel)																														
	Creeping/ Spear Thistle																														
	Stinging Nettle																														
	Anthills/ bank/ ditch/ pit/ terracettes																														
	Hedge																														

8 Field trials of the Revised Habitat Assessment method

The following section shows the results of field testing of the revised assessment and illustrates ways that the automatically generated results can be used to interpret habitat condition.

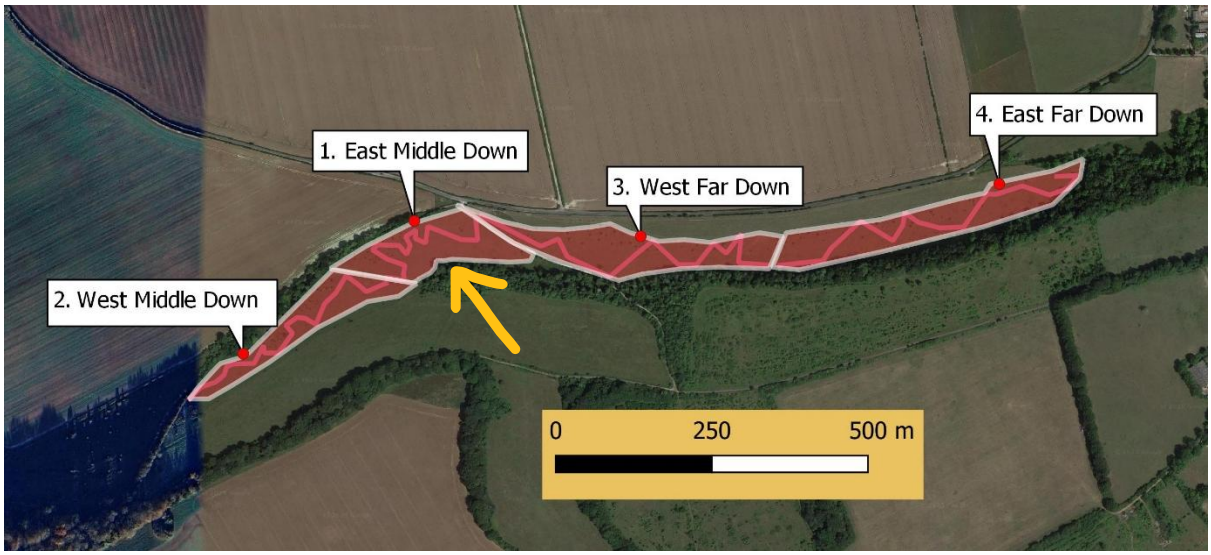
Grimstead Down near Salisbury (SU216255) was the ideal site to trial the revised habitat assessment as it has a known monitoring history and offers variation in habitat suitability.

Grimstead Down is part of Brickworth Down & Dean Hill SSSI and has a well monitored Duke of Burgundy colony where both adult and larval feeding damage locations have been mapped across this site between 2022 and 2025 (Clarke, 2024) and also a long running UKBMS butterfly transect. How Duke of Burgundy uses this site and the variation in habitat quality across the site are well understood.

The two grazing units (Middle Down and Far Down) are different in aspect and habitat structure, plus there is variation within each unit. Also, in the last year the western section of Far Down has been cleared of scrub and then intensively grazed to try and restore sward diversity that was being lost to bramble thickets. This provides one section under restoration management that can be compared with the other three survey sections which are being managed for Duke of Burgundy breeding habitat.

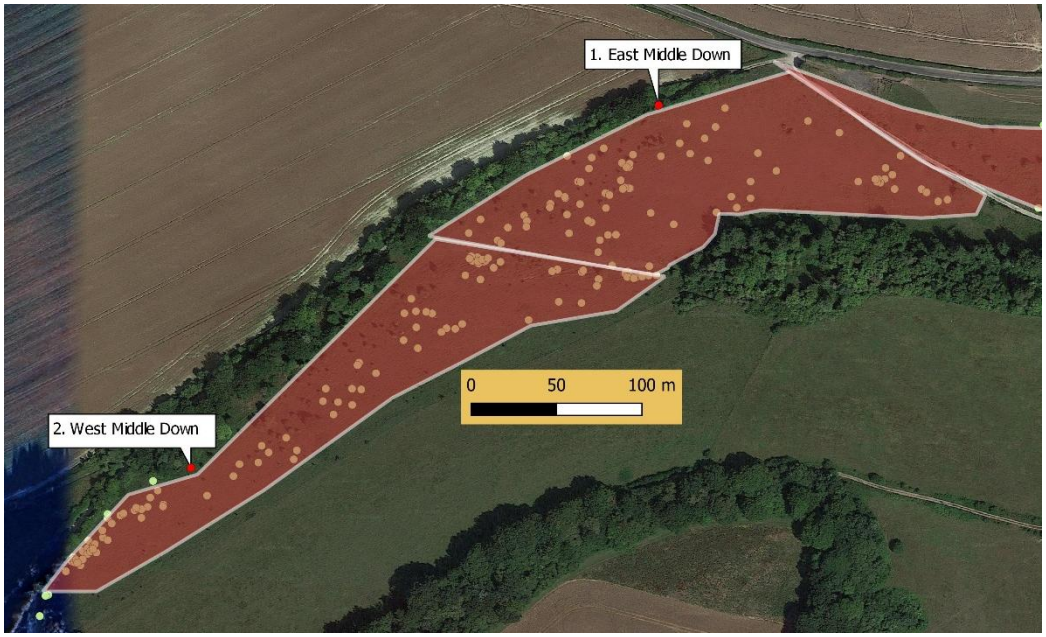
8.1 East Middle Down (Grimstead Down)

Assessment on 19 August 2025, 25 sample points which will have examined 0.049 ha of this approx. 2 ha assessment compartment (about 2.5%).



Map 1 Assessment compartments and the approximate sample tracks used for the habitat assessment

This section of the site is well used by adults and contains abundant larval feeding damage (Map 2). It is more open and higher with less scrub than the rest of Middle Down with most of the scrub concentrated at the base of the slope, where there are quite a few bramble thickets developing. There is a deep gulley along the western boundary.



Map 2 Locations of Duke larval feeding damage at Middle Down 2025

8.1.1 Results, East Middle Down

August 2025

	Maximum score		
Overall larval foodplant leaf size score	10	**4.76**	Suitable
Overall larval foodplant abundance score	10	**4.16**	Suitable
Overall grassland height suitability score	10	**7.8**	Suitable
Overall low scrub suitability score	10	**4.68**	Adequate
Overall taller scrub suitability score	10	**0**	Poor
Site structure suitability score	30	12.48	
Site larval foodplant suitability score	20	8.92	
Total site problem features score	15	2.12	

PROBLEM FEATURES	Maximum score	AVERAGE SCORE
Bramble (creeping & thicket combined)	10	1.56
Low scrub if over 16+ plants per stop	1	0.28
Presence of Clematis, docks, nettle, thistle	4	0.28

Key to suitability scoring

Feature	Suitable	Adequate	Poor
Grassland height	7 or more	≥4 and <7	below 4
Larval foodplant leaf size	4 or more	≥3 and <4	below 3
Larval foodplant abundance	4 or more	≥3 and <4	below 3
Scrub less than 1 m high	5 or more	≥4 and <5	below 4
Scrub more than 1 m high	10	6	1 or 0

East Middle Down summary

Larval foodplant abundance and leaf size both scored as just within Suitable range with an overall score of 9/20. It would be expected to be higher if the survey had been carried out in May, rather than in August after a period of drought. The fact that it is still within the suitable range in August is a sign of good site resilience.

Grassland height scored fairly well within the Suitable range, but on the overall site structure suitability the score was low (12.5/30) because of the lack of tall scrub cover, although low scrub does score as Adequate.

The site problem score was low (2/15) with the main problem feature noted as bramble.

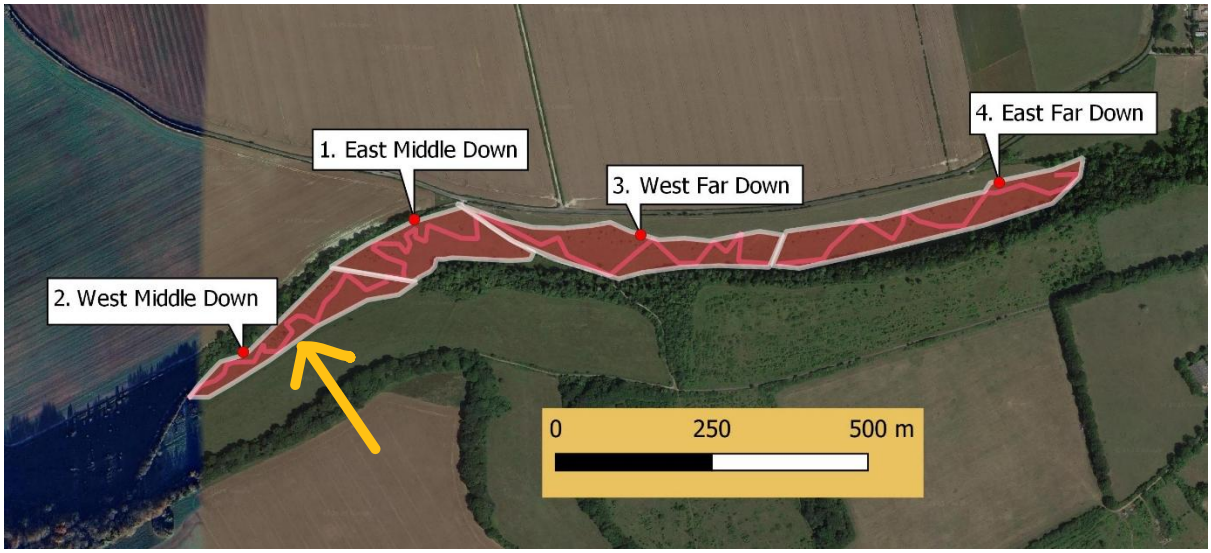
This assessment describes the site fairly well. The low score for tall scrub was a slight surprise, but examining the site in more detail this is fairly accurate considering the whole unit. Tall scrub is very much concentrated at the base of the slope with open grassland above. Also, some of what acts as scrub structure on the lower slope is actually bramble.

8.2 West Middle Down (Grimstead Down)

Assessment on 19 and 20 August 2025, 25 sample points which will have examined 0.049 ha of this approx. 1.6 ha assessment compartment (about 3%).

This section starts after the gulley. As shown on the maps, the species-poor grassland along the top boundary and the inaccessible scrub/bramble edge along the lower boundary do not have Cowslip and so are not included as part of this survey unit.

The whole section is well used by adults and contains abundant larval feeding damage (see Map 2 above). Overall, this section is very suitable for Duke at the moment but is developing issues with bramble and scrub that is reducing the grassland habitat and has created a barrier for stock movements.



Map 3 Assessment compartments and the approximate sample tracks used for the habitat assessment

8.2.1 Results, West Middle Down

August 2025	Maximum score		
Overall larval foodplant leaf size score	**10**	**4.72**	Suitable
Overall larval foodplant abundance score	**10**	**4.96**	Suitable
Overall grassland height suitability score	**10**	**7.28**	Suitable
Overall low scrub suitability score	**10**	**5.36**	Suitable
Overall taller scrub suitability score	**10**	**10**	Suitable
Site structure suitability score	30	22.64	
Site larval foodplant suitability score	20	9.68	
Total site problem features score	15	3.12	

PROBLEM FEATURES	Maximum score	AVERAGE SCORE
Bramble (creeping & thicket combined)	10	2.84
Low scrub if over 16+ plants per stop	1	0.16
Presence of Clematis, docks, nettle, thistle	4	0.12

Key to suitability scoring

Feature	Suitable	Adequate	Poor
Grassland height	7 or more	≥4 and <7	below 4
Larval foodplant leaf size	4 or more	≥3 and <4	below 3
Larval foodplant abundance	4 or more	≥3 and <4	below 3
Scrub less than 1 m high	5 or more	≥4 and <5	below 4
Scrub more than 1 m high	10	6	1 or 0

West Middle Down summary

Larval foodplant abundance and leaf size both scored as just within Suitable range with an overall score of 10/20. It would be expected to be higher if the survey had been carried out in May, rather than in August after a period of drought. The fact that it is still within the suitable range in August is a sign of good site resilience.

Grassland height and tall scrub abundance scored well within the Suitable range, with low scrub just within the Suitable category. This gave a high overall site structure suitability score of 23/30

The site problem score was slightly higher than that for East Middle Down (3/15) with the main problem feature noted as bramble.

This assessment describes the site fairly well. It probably slightly underestimates both the bramble and the low scrub problem, but then this is fairly localised along the boundary and the mid-section of the site.

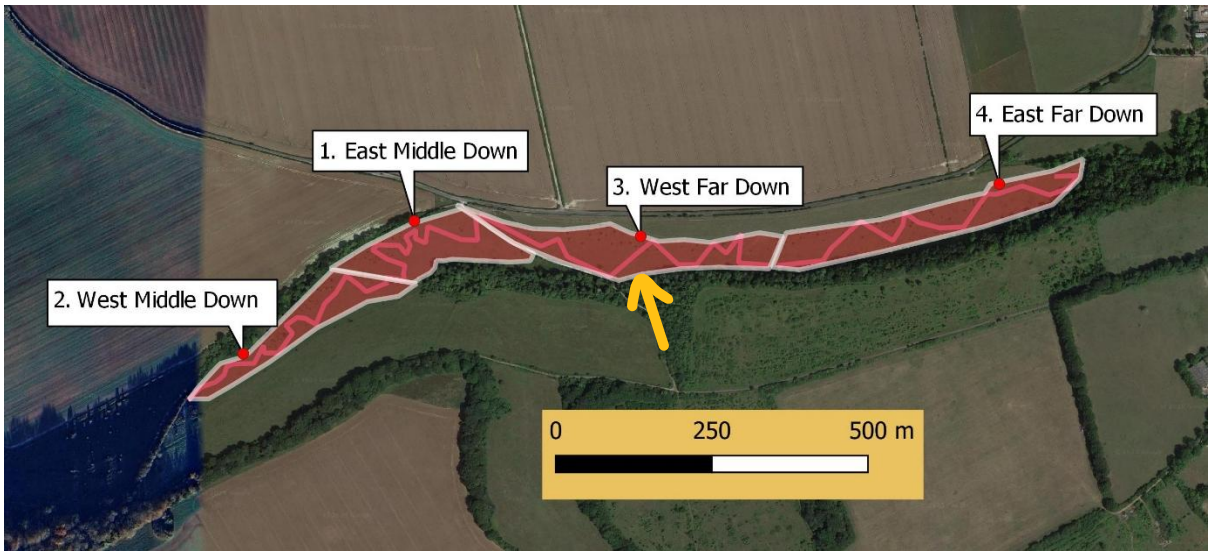
It does highlight a survey constraint which is always a concern within scrubby habitat, that small glades/ edge habitat within dense scrub are almost impossible to access and therefore to sample accurately.

Making sure that the survey routes are mapped will give accurate information on which patches have not been covered. Careful planning of sample points can help, but in reality, dense scrub/bramble is a barrier to sampling and it has to be accepted that these features will be slightly underestimated in the final results.

8.3 West Far Down (Grimstead Down)

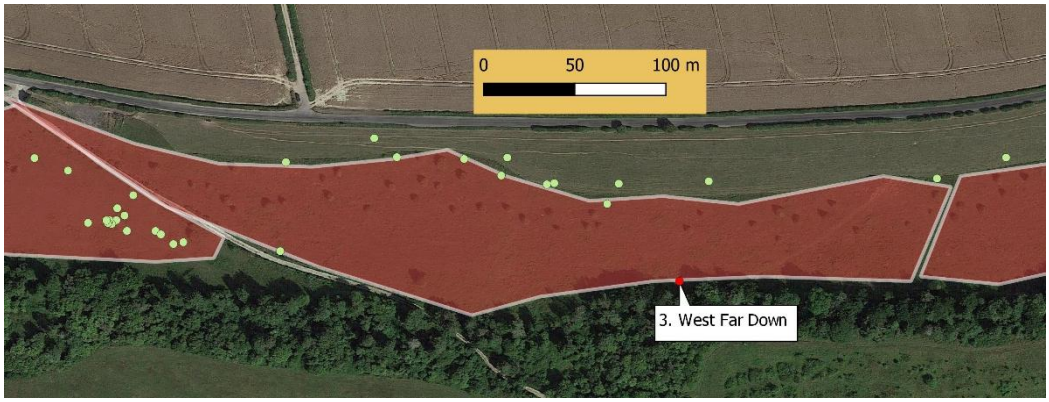
Assessment on 20 August 2025, 25 sample points which will have examined 0.049 ha of this approx. 2.4 ha area (about 2.0%).

This section of the Grimstead Down site is under restoration management after the grassland habitat became increasingly lost and degraded under dense young scrub, bramble thickets and Clematis. In winter 2024/25, much of this section was cleared of low scrub and bramble using a roboflail and this was followed by winter, spring and summer grazing (some sheep, mainly cattle). At the time of this survey in August, cattle had been grazing all spring and summer and were still on site.



Map 4 Assessment compartments and the approximate sample tracks used for the habitat assessment

A grassy margin had been left uncut in the adjacent field unit (Road Strip) with the intention of allowing easy dispersal access for Duke between Middle Down and East Far Down. Duke larval feeding damage was found on this margin and under the fence line (see Map 5). As expected during this restoration management, no larval feeding damage was found on the main area of West Far Down, but Cowslips were surviving within the remaining grassy patches and also developing within the cleared areas. However, during 2025 the habitat was certainly unsuitable for breeding.



Map 5 Locations of Duke larval feeding damage at West Far Down 2025

8.3.1 Results, West Far Down

August 2025	Maximum score		
Overall larval foodplant leaf size score	10	**1.84**	Poor
Overall larval foodplant abundance score	10	**1.52**	Poor
Overall grassland height suitability score	10	**6.7**	Adequate
Overall low scrub suitability score	10	**3.96**	Poor
Overall taller scrub suitability score	10	**6**	Adequate
Site structure suitability score	30	16.66	
Site larval foodplant suitability score	20	3.36	
Total site problem features score	15	4.76	

PROBLEM FEATURES	Maximum score	AVERAGE SCORE
Bramble (creeping & thicket combined)	10	3.68
Low scrub if over 16+ plants per stop	1	0.36
Presence of Clematis, docks, nettle, thistle	4	0.72

Key to suitability scoring

Feature	Suitable	Adequate	Poor
Grassland height	7 or more	≥4 and <7	below 4
Larval foodplant leaf size	4 or more	≥3 and <4	below 3
Larval foodplant abundance	4 or more	≥3 and <4	below 3
Scrub less than 1 m high	5 or more	≥4 and <5	below 4
Scrub more than 1 m high	10	6	1 or 0

West Far Down summary

This section of the Grimstead Down site is under restoration management as detailed above. In 2025, the habitat was certainly unsuitable for breeding, with no larval feeding damage found on the main area of West Far Down (but some on the boundary fence line, see Map 5).

Testing the method on this section was a good opportunity for comparing results with the adjacent breeding sections of this site.

Grassland height scored within the Adequate range, almost in the Suitable category which was slightly surprising considering the recent management. However, a closer look at the section showed that this was accurate. There was large variation in grassland height and cover across the compartment with some areas fairly bare of vegetation, but over most of the section there were scattered 5 to 20 cm height grass patches.

Low scrub scored as just within the Poor category on the boundary with Adequate, so it certainly had not been fully removed during the recent cutting management. Many of the dense patches of low scrub had either not been cut or were re-growing. Tall scrub was not targeted by the recent restoration clearance and scored as Adequate.

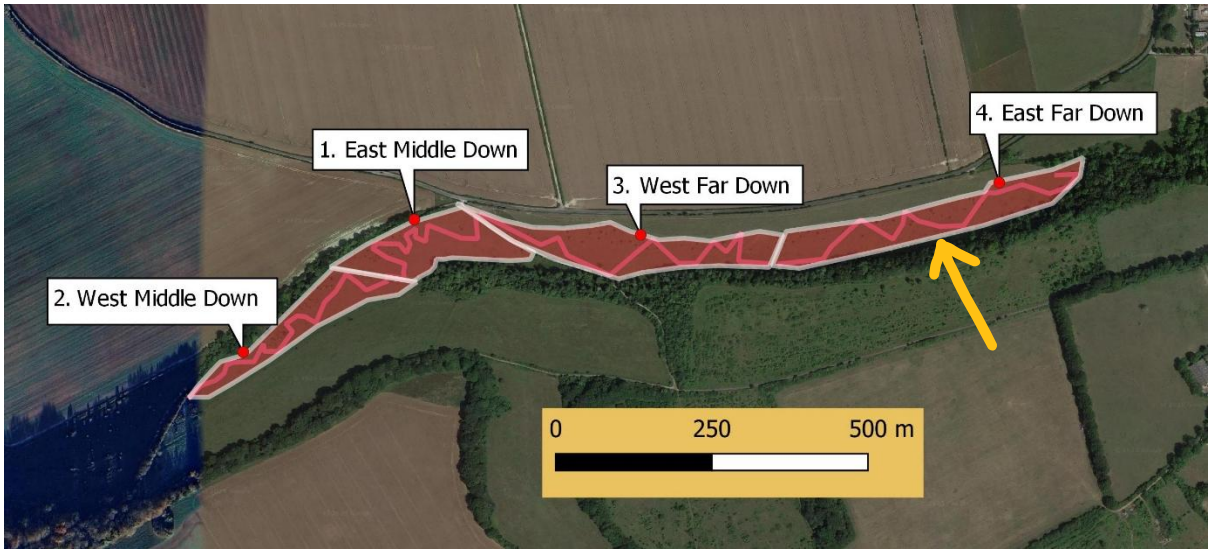
The survey gave an overall site structure suitability score of 17/30, close to that scored by the other section of this management unit (East Far Down, overall site structure suitability score of 15/30).

As expected, the larval foodplant abundance and leaf size both scored low within the Poor range, with an overall score of only 3/20 (compared with East Far Down, 7/20). However, it was encouraging to find that despite the clearance and continuous grazing, Cowslip was still present in sufficient abundance to be recorded by this survey.

The problem score was higher than the other sections of Grimstead Down (4.8/15) with the main problem feature noted as bramble.

8.4 East Far Down (Grimstead Down)

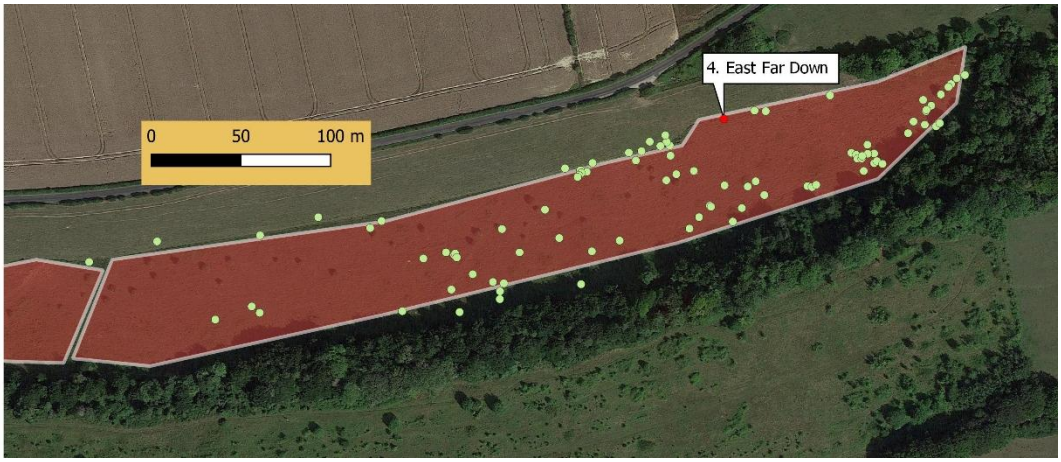
Assessment on 20 August 2025, 25 sample points which will have examined 0.049 ha of this approx. 2.7 ha area (slightly less than 2%).



Map 6 Assessment compartments and the approximate sample tracks used for the habitat assessment

In the last few years, the western part of this section and the top boundary developed patches of dense young scrub, also bramble and Clematis, but the eastern end retained good conditions for Duke of Burgundy. This is reflected in the Duke larval feeding damage distribution (Map 7).

In general, East Far Down has good patches of Duke habitat and Cowslip, but not the widespread distribution seen on the Middle Down survey sections.



Map 7 Locations of Duke larval feeding damage at East Far Down 2025

8.4.1 Results, East Far Down

August 2025	Maximum score		
Overall larval foodplant leaf size score	10	**3.56**	Adequate
Overall larval foodplant abundance score	10	**3.36**	Adequate
Overall grassland height suitability score	10	**8.6**	Suitable
Overall low scrub suitability score	10	**6.24**	Suitable
Overall taller scrub suitability score	10	**0**	Poor
Site structure suitability score	30	14.84	
Site larval foodplant suitability score	20	6.92	
Total site problem features score	15	3.28	

PROBLEM FEATURES	Maximum score	AVERAGE SCORE
Bramble (creeping & thicket combined)	10	2.76
Low scrub if over 16+ plants per stop	1	0.24
Presence of Clematis, docks, nettle, thistle	4	0.28

Key to suitability scoring

Feature	Suitable	Adequate	Poor
Grassland height	7 or more	≥4 and <7	below 4
Larval foodplant leaf size	4 or more	≥3 and <4	below 3
Larval foodplant abundance	4 or more	≥3 and <4	below 3
Scrub less than 1 m high	5 or more	≥4 and <5	below 4
Scrub more than 1 m high	10	6	1 or 0

East Far Down summary

Larval foodplant abundance and leaf size both scored as Adequate with an overall score of 7/20. It would be expected to be higher if the survey had been carried out in May, rather than in August after a period of drought. It is noted that the feeding damage survey earlier in the summer (Map 7) showed a lack of Cowslip at the western end of this survey unit and this will reflect in the score for the unit as a whole.

Grassland height scored fairly well within the Suitable range. Low scrub scores as Suitable across the whole unit, but it was obvious that one end of the unit has a patch with too much and the other end mostly lacks any low scrub.

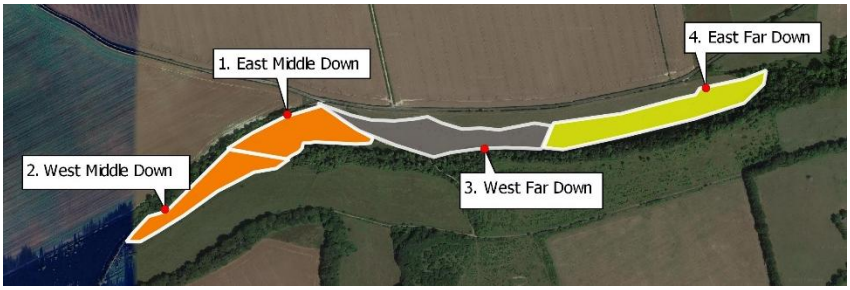
For the overall site structure suitability the score was low (15/30) this was due to the lack of tall scrub cover. The site problem score was low (3/15) with the main problem feature noted as bramble.

This assessment does describe the site fairly well. Obviously, this survey is too broad-scale to specifically pick out the patch of developing young scrub, bramble and Clematis which is becoming a problem for management and reducing Cowslip abundance in the mid and top slope of the western end. This is on the boundary with the restoration section of Far Down and includes a couple of patches of impenetrable bramble thicket over young scrub.

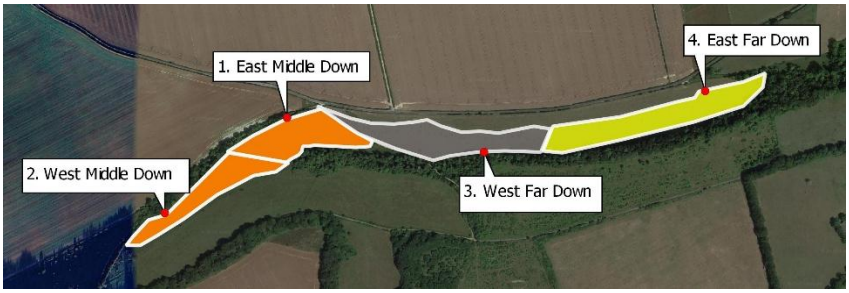
It does indicate that a localised problem may not show up strongly using this survey (unless survey sections are picked carefully to examine a specific issue or the number of sample points are greatly increased). However, the survey did show an impact on Cowslip which certainly would be an alert signal to more fully examine the site condition. If needed, the survey could then be carried out on a sub-section only, with the aim of monitoring any subsequent management.

8.5 Grimstead Down; site condition summary

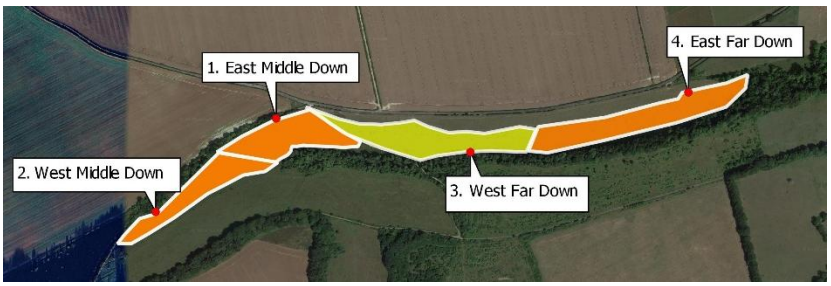
The following shows examples of ways the habitat assessment can be illustrated and compared between sites and/or site sections.



Larval foodplant size score

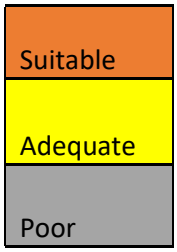


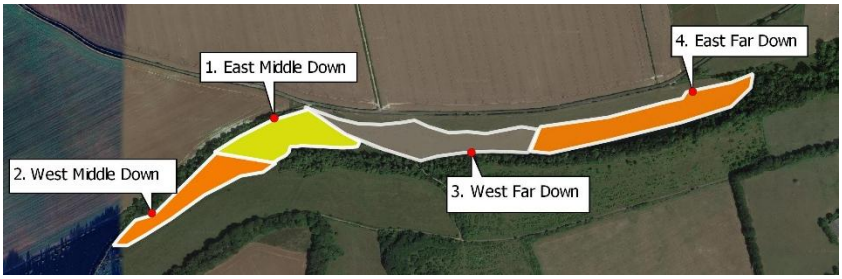
Larval foodplant abundance score



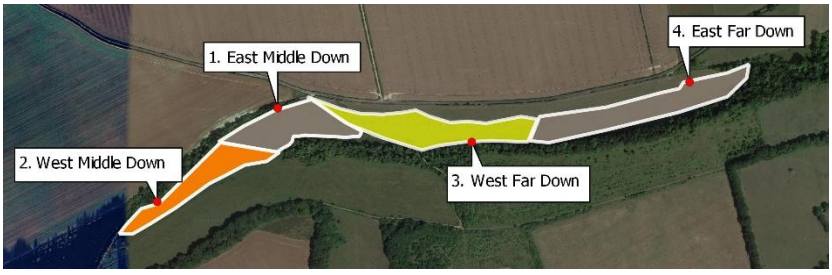
Grassland height suitability score

KEY





Low scrub suitability score



Taller scrub suitability score

Site unit	Structure score	Foodplant score	Total problem score	Main problem noted
1.East Middle Down	12.5	8.9	2.1	Bramble
2. West Middle Down	22.6	9.7	3.1	Bramble
3. West Far Down	16.7	3.4	4.8	Bramble
4. East Far Down	14.8	6.9	3.3	Bramble

The results shown above do correspond well to the larval feeding damage mapping and also to the known issues for each section.

Middle Down has the best breeding patches and abundance of larval foodplant. The best scrub shelter is at the western end, but this section is developing issues with bramble thickets.

East Far Down maintains some good breeding patches, but is starting to lose grassland under bramble growth and also larval foodplant abundance is becoming patchy, especially in the west of this unit. West Far Down is under restoration management so is unsuitable as a breeding area at present.

8.6 Summary of the Habitat Assessment field trial performance

- It was easy to use the fieldsheet and took about 1.5 to 2 hours to carry out 25 survey stops
- The use of a 2.5 m radius circular sample point seemed suitable, was easy to judge in the field and didn't usually need much movement from a central point to assess the required features
- The use of 25 stops per unit seems adequate for this site (where each unit was between 1.5 and 3 ha in area). This level of coverage does miss some good and also some problem patches, but seemed to give a reasonable compromise
- Using the dedicated spreadsheet it was quick to type in field results and this then generated the scores and the summary tables automatically
- Dividing habitat scores into structural, foodplant and problems is useful and then allows further interrogation of the raw data to identify details. For example, identifying which variable gives the main score for site problems
- For Grimstead Down the results do align very well with what is expected from overall knowledge of this site, although the late date of the survey almost certainly means that Cowslip abundance has been slightly under-estimated
- As with all such surveys, where scrub or bramble becomes very dense or impenetrable it is not possible to sample and so there will be some bias towards open areas
- While the trial surveys did not always accurately pin-point localised problems (such as bramble and young scrub thickets in one section of a survey unit), these did seem to

reduce the overall scores sufficiently to raise a query about site conditions which could then be investigated in detail

- If needed, this assessment is sufficiently flexible and quick for use within a sub-section of a previous survey unit to monitor localised problems
- The problem score should be able to highlight issues before they have a strong impact on breeding habitat
- The weighting and scoring systems can be changed if required, so the method can be adjusted if research shows shifts in Duke of Burgundy habitat needs
- Using the dedicated spreadsheet it would be simple to re-analyse previous data after any changes in the weighting and scoring systems
- As more sites are surveyed the scoring system should become increasingly valuable for comparison

9 Acknowledgements

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Very many thanks to Stevie Upton and Stuart Hales (Natural England) for their time and effort in co-ordinating and advising on this project. Thank you to Alex Rose (National Trust), Tim Mallett, Tim Mundy and Malcolm Read for allowing the use of Grimstead Down, also to Wiltshire Branch of Butterfly Conservation for permission to use previous survey results for the site.

Consent to use the 2024 Habitat Assessment for Duke of Burgundy was kindly given by Butterfly Conservation.

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Appendix 1

Spreadsheet details and rationale for analysis

Details on scoring and rationale are given below for information and to aid consistency.

1. SCORING

An average is used for every recorded feature, to accommodate the use of different numbers of sample points. A weighting is then given to each category within that feature, to reflect relative suitability of the attribute for the species. There is a maximum score of 10 for each feature.

1.1 Scoring grassland height suitability

- Uses "1" for each height category present at a sample point. More than a single category can be noted and so the final score is given as a total from all height categories.
- In general, field studies suggest that the most advantageous spring sward height for Duke of Burgundy is between 5 to 20 cm. Therefore, this has a weighting of x5.5 on the final average score.
- The butterfly can cope with longer swards so the category of higher than 20cm has a weighting of x3.5, but on very short swards the foodplant can drought before the caterpillars develop, so swards shorter than 5 cm have a weighting of x1.
- It is assumed there is an advantage in having a variability of sward across a site. Therefore, if every stop point has some patches of every height category then this gives the maximum score of 10.

Sward height	Score weighting
<5cm	x1
5-20cm	x5.5
20cm+	x3.5

Maximum overall score of 10
≥7 is "Suitable" condition
≥4 and <7 is "Adequate"
<4 is "Poor"

1.2. Scoring for larval foodplant leaf size

- Leaf size uses "1" for each category present at a sample point with the weightings given below to the final average.
- More than a single category can be recorded per sample point and all are included in the final score (because it is assumed it is likely to be an advantage to have diversity in leaf size) giving a maximum overall score possible of 10.

Leaf size	Score weighting
<4cm	x1
4-8cm	x4
8cm+	x5

Maximum overall score of 10
≥4 is "Suitable" condition
≥3 to <4 is "Adequate"
<3 is "Poor"

1.3 Scoring for larval foodplant abundance

- Foodplant abundance uses a single estimate for each sample point on a rough DAFOR scale. This can be entered into the spreadsheet as D=5, A=4, F=3, O=2 and R=1 and then doubled to give a maximum score of 10 if all sample points have larval foodplant abundance as "Dominant"

Maximum overall score of 10
≥4 is "Suitable" condition
≥3 to <4 is "Adequate"
<3 is "Poor"

1.4. Scoring for scrub cover suitability

A Duke site does not always need a significant scrub component; much depends on the nature of the site and aspects of structural shelter. However, on many sites scrub is the vital feature that provides much of the needed shelter and protection of the foodplant from desiccation. Balancing appropriate scrub control is an important issue in site management and will require monitoring.

1.4.1 Scrub less than 1 m high

The survey uses number of plants within the survey sample rather than percentage cover (as used for tall scrub) because the low scrub are often small "whips" which give a very small percentage cover even when numerous. A large number of such plants (although useful to Duke of Burgundy) do indicate future site management issues even if their actual ground cover is very small at present.

- Uses "1" for presence at a sample point with the following weightings given to the final average. Only a single category can be noted. Maximum score possible =10 if all stops have a few low scrub plants.
- Some presence of low growing scrub seems to be liked by Duke of Burgundy, but large numbers of such plants does indicate potential problems for future management, so the category 16+ plants is also used to calculate the total site problem score (see **Overall site suitability scores** below).

Number of low scrub plants	Score weighting
none	0
1 to 5 plants	x10
6 to 15 plants	X5
16+ plants	X1

Maximum overall score of 10
≥5 is "Suitable" condition
≥4 to <5 is "Adequate"
<4 is "Poor"

1.4.2 Scrub more than 1 m high

- This is given as a rough estimation of percentage cover (to nearest 5%). The average for the site is then scored as shown below with a maximum score possible of 10.

Average percentage cover of scrub more than 1 m	Score weighting
None / less than 5%	0
5% to 10%	6
10 to 20%	10
20 to 40%	6
40%+	1

Maximum overall score of 10
10 is "Suitable" condition
6 is "Adequate"
1 or 0 is "Poor"

2. NOTES ON ANALYSIS

- An average is used for every recorded feature, so as to accommodate the use of different numbers of sample points.
- For the key structures and features that are considered most important for supporting Duke of Burgundy, a weighted score is applied to the average. So sward height, scrub level and larval foodplant condition are given a higher score when falling within the known suitability range for Duke of Burgundy. This has been used to provide a rapid, direct indication of overall site suitability, with the assumed most advantageous outcomes scoring a maximum of 10 for each of the key features.
- All weightings and the categorisations of the final scores can easily be altered on the dedicated spreadsheet if further research suggests shifts in the niche range for Duke of Burgundy. Any changes in scoring could also be quickly applied retrospectively to previous survey data allowing for continued comparison.
- An assessment of "Poor" should be considered as an alert for further investigation of that feature. For example, if grassland height scores as "Poor" then it should be obvious from the height category averages if this is due to under or over-grazing. However, it might be that more detailed field investigation of a feature is required.
- Not all recorded features are weighted or used in the final assessment scoring. However, these unscored features are included because they are useful indicators of habitat suitability. If an assessment scoring gives "Poor condition", then these additional features can pinpoint problems. For example, if moss doesn't feature on a site then it could indicate that sward becomes too dry during the summer and might not be very suitable for supporting larval foodplants while the caterpillars are developing.