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Assessment of Marsh Fritillary Habitat Quality around Gweunydd Blaencleddau SAC, Pembrokeshire

Dr. Deborah Sazer

Evidence Report No. 46



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Report series: NRW Evidence Report
Report number: 46
Publication date: February 2015
Contract number: EAS0888
Contractor: Dr. D. Sazer
Contract Manager: A.P. Fowles
Title: **Assessment of Marsh Fritillary Habitat Quality around Gweunydd Blaencleddau SAC, Pembrokeshire**
Author(s): Dr. D. Sazer
Technical Editor: A.P. Fowles
Restrictions: None

Distribution List (core)

NRW Library, Bangor	2
National Library of Wales	1
British Library	1
Welsh Government Library	1
Scottish Natural Heritage Library	1
Natural England Library (Electronic Only)	1

Distribution List (others)

Senior Invertebrate Ecologist, NRW Bangor
Senior Conservation Officer, Preseli
Conservation Officer, Pembrokeshire Coast National Park Authority

Recommended citation for this volume:

D. Sazer. 2015. Assessment of Marsh Fritillary Habitat Quality around Gweunydd Blaencleddau SAC, Pembrokeshire. NRW Evidence Report No. 46, 43pp, Natural Resources Wales, Bangor.

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1. Crynodeb Gweithredol

Mae britheg y gors *Euphydryas aurinia* yn rhywogaeth dan warchodaeth Ewropeaidd, ar restr Atodiad II Gorchymyn Cynefinoedd a Rhywogaethau yr UE. Mae'r glöyn byw hwn a'i gynefinoedd yn brif nodweddion Ardal Cadwraeth Arbennig (ACA) Gweunydd Blaencleddau (GB) yng Ngogledd Sir Benfro. Mae britheg y gors yn dangos dynamigau uwchboblogi, gan ddiflannu a phoblogi clytiau addas yn rheolaidd dros amser. O ganlyniad, mae cael rhwydwaith eang o safleoedd addas yn hanfodol er mwyn cynnal y boblogaeth yn y tymor hir. Mae un o'r uwchboblogaethau britheg y gors mwyaf sy'n bodoli i'w chael yn ACA GB yn ogystal ag un o'r rhwydweithiau cynefin helaethaf yn Sir Benfro.

Mapiwyd amgylchiadau cynefin britheg y gors oddi fewn i ACA Gweunydd Blaencleddau yn 2009 (Stephens 2010). Comisiynwyd yr arolwg presennol i archwilio'r cynefin yn y Tirwedd Weithredol o amgylch yr AGA ar y safleoedd amhenodedig yn ogystal â rhannau AGA y Preseli (sydd hefyd â'r britheg y gors a'i chynefinoedd yn nodweddion allweddol), er mwyn canfod cyfanswm a chyflwr y cynefin oedd ar gael ar gyfer yr uwchboblogaeth. Mae holl safleoedd yr arolwg oddi fewn i ffiniau Parc Cenedlaethol Arfordir Penfro.

Cynhaliwyd yr arolwg rhwng 5 a 20 Hydref 2014. Categoriwyd cyfaddasrwydd y cynefin, a'i fapio yn ôl dulliau safonol Cyfoeth Naturiol Cymru. Didolwyd y tir yn chwe chategori yn ôl presenoldeb/nifer planhigion bwyd larfaol y glöyn byw hwn, sef tamaid y cythraul *Succisa pratensis* a glaswellt y gweunydd *Molina caerulea* (neu dwmpathau glaswellt eraill) yn ogystal ag uchder a ffurf y planhigion.

Dynodwyd 300 hectar o dir glas, ffen a rhostir o fapiau Cymal 1 a 2 ar gyfer eu hasesu ac aseswyd 240 ohonynt: 179 hectar ar dir cyffredin a 61 hectar ar dir preifat. Ni chafwyd mynediad i 60 hectar o dir preifat, yn bennaf oherwydd ni lwyddwyd i ganfod eu perchnogaeth, ni lwyddwyd i gysylltu â'r perchennog neu gwrthodwyd caniatâd i'w harolygu.

O'r tir, categoriwyd 28 hectar yn gynefin 'Da', 'Addas' neu 'Â Photensial' – 21 hectar ar y tir cyffredin a 9 hectar ar safleoedd preifat. Roedd y boethfan ar dir comin Waun Isaf (rhan o ACA y Preseli) a ffermydd cyfagos i'r De Orllewin, i'r De ac i'r Dwyrain. Dim ond 0.84 hectar o gynefin 'Cyflwr Da' a recordiwyd, y cyfan bron ar dir preifat. Serch hyn, gellid meithrin y rhan fwyaf o dir isaf Waun Isaf i fod yn dir 'Cyflwr Da' dan oruchwyliaeth y porwr lleol, sydd bellach yn cydweithio gyda Cyfoeth Naturiol Cymru a Pharc Cenedlaethol Arfordir Penfro. Roedd y rhan fwyaf o'r ucheldiroedd comin wedi cael eu pori'n rhy dynn a thamaid y cythraul yn rhy brin i gynnal britheg y gors, gydag ychydig o Fannau Prin Addas o gynefin is-optimaidd. Pori Cytir Cors Tewgyll yn fwy addas, ond canfyddir y cynefin yn y rhannau uchaf, gwlypaf yn unig.

Mae'r 14 hectar o gynefin cyflwr 'Da' a chyflwr 'Addas' a geir yn yr arolwg hwn yn cryfhau 'Statws Cyflwr Ffafirol' ACA Gweunydd Blaencleddau ar gyfer britheg y gors a'i chynefinoedd.

2. Executive Summary

The marsh fritillary *Euphydryas aurinia* is a European protected species, listed on Annex II of the EU Habitats & Species Directive. The butterfly and its habitats are primary features of the Gweunydd Blaencleddau (GB) Special Area of Conservation (SAC) in north Pembrokeshire. Marsh fritillaries exhibit metapopulation dynamics, experiencing regular extinctions and colonisations of suitable patches over time. Therefore, a large network of suitable sites is essential to maintain their populations in the long term. The GB SAC holds one of the largest extant marsh fritillary metapopulations and one of the most extensive habitat networks in Pembrokeshire.

Marsh fritillary habitat condition within the Gweunydd Blaencleddau SAC was mapped in 2009 (Stephens 2010). The current survey was commissioned to examine the habitat in the Functional Landscape surrounding the SAC, on both undesignated sites and parts of the Preseli SAC (which also includes the marsh fritillary and its habitats as key features), to determine the total amount and condition of habitat available for the metapopulation. All survey sites lie within the Pembrokeshire Coast National Park (PCNP).

The survey was carried out between the 5th and 20th October 2014. Habitat suitability was categorised and mapped following standard Natural Resources Wales (NRW) methods. Land was classed into six categories according to the presence and amount of the butterfly's larval foodplant devil's-bit scabious *Succisa pratensis* and purple moor-grass *Molinia caerulea* (or other tussock-forming grasses), as well as the vegetation height and structure.

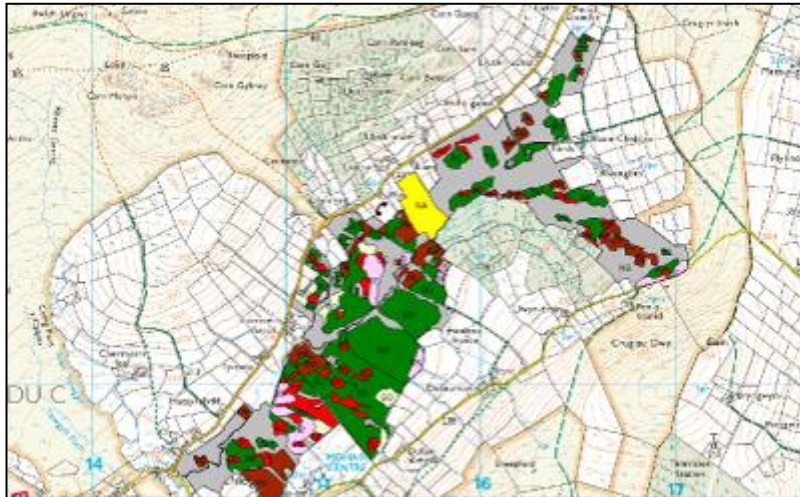
Three hundred hectares of grassland, fen and heathland were identified from Phase 1 and 2 maps, and 240ha were assessed: 179ha on common land and 61ha on private holdings. Sixty hectares of private land could not be accessed, mostly because ownership could not be traced, the owner could not be contacted or survey permission was refused.

Twenty-eight hectares of habitat across the landscape were categorised as Good, Suitable or Potential - 21ha on the commons and 9ha on private sites. The 'hotspot' was on Waun Isaf Common (part of Preseli SAC) and neighbouring farms to the southwest, south and east. Only 0.84ha of Good Condition habitat was recorded, nearly all on private land. However, much of lower Waun Isaf could be brought into Good Condition with suitable management by the local grazier, who is working with NRW and PCNP. Most of the upland commons were too tightly grazed and *Succisa* was too rare to support marsh fritillaries, with a few Suitable Sparse patches of suboptimal habitat. Cors Tewgyll Common is more appropriately grazed, but habitat is only found in the higher, wetter reaches.

The 14ha of Good and Suitable condition habitat found in this survey strengthens the Favourable Condition Status of Gweunydd Blaencleddau SAC for the marsh fritillary and its habitats.

3. Background

The marsh fritillary *Euphydryas aurinia* is a European protected species, listed on Annex II of the EU Habitats & Species Directive. The marsh fritillary and its habitats are primary features of the Gweunydd Blaencleddau Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI) in north Pembrokeshire. The SAC holds one of the largest extant marsh fritillary metapopulations in the county and country, and one of the most extensive habitat networks in Pembrokeshire. Map 1 illustrates marsh fritillary habitat condition within the SAC as mapped in 2009 (Stephens 2010).



Map 1. Marsh Fritillary Habitat Condition, Gweunydd Blaencleddau SAC, 2009
(Stephens 2010) See Figure 3 for legend

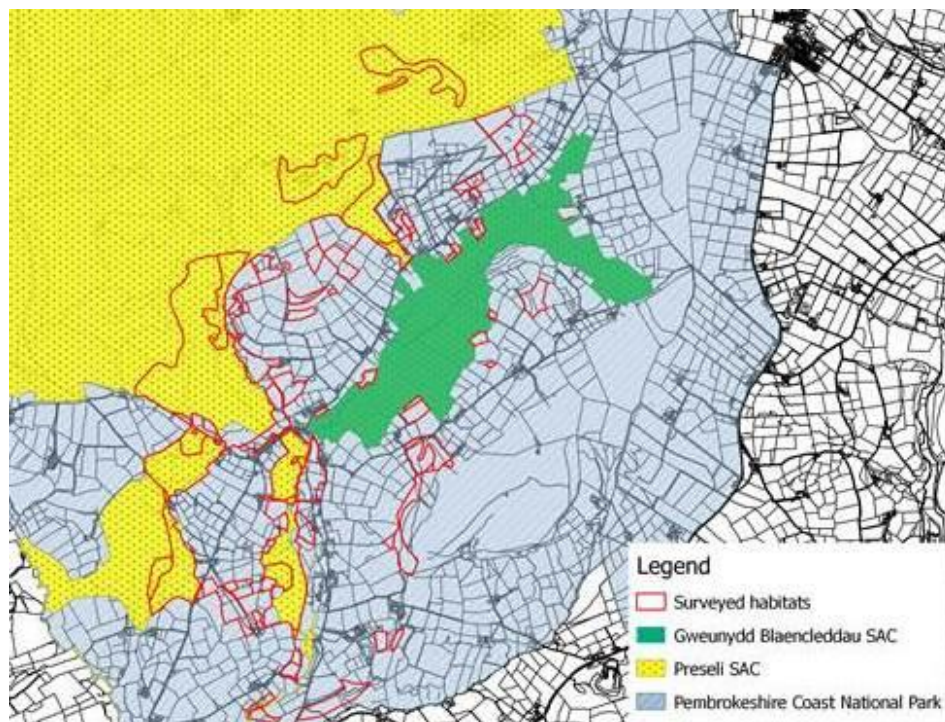
Marsh fritillaries experience regular extinctions and colonisations of suitable habitat patches over time, exhibiting classic metapopulation dynamics. Therefore they require a large network of suitable sites to maintain their populations in the long term. Hence, this survey was commissioned to examine the habitat surrounding the Gweunydd Blaencleddau SAC, on both undesignated sites and parts of the Preseli SAC (which also includes the marsh fritillary and its habitats as key features), to determine the total amount and condition of habitat available for the marsh fritillary metapopulation.

This project is part of Natural Resource Wales' (NRW) reporting process on Favourable Condition and Favourable Conservation Status (FCS) for Natura 2000 features. NRW is required to ensure that FCS applies to Annex II species and the SACs that have been designated to protect them. FCS is defined as a combination of the Favourable Condition of the species and the means to ensure its secure future on the site. It is defined by a Conservation Objective that is assessed by monitoring appropriate attributes against agreed thresholds.

The marsh fritillary's 'core landscape' is defined as the area within a 1km radius of recent marsh fritillary records (encompassing the typical dispersal distance of a female marsh fritillary) – in this case, the core has been defined as the area covered by the Gweunydd Blaencleddau SAC. This survey has

examined all potential habitat within a 2km radius of the core, which is known as the functional landscape; this covers the average dispersal distance of the males (Fowles, 2005).

The entire survey area lies within the Pembrokeshire Coast National Park (PCNP). Sixty percent of the survey target area was on common land, all of which is part of the Preseli SAC (Map 1). None of the 40% of privately owned land in the survey area is designated as an SSSI or SAC. The survey landscape surrounds the village of Mynachlog-ddu, in the Eastern Cleddau River valley, and includes the eastern slopes of the Preseli Mountains and the west-facing slope of Foel Dyrch.



Map 2. Designations in Survey Area

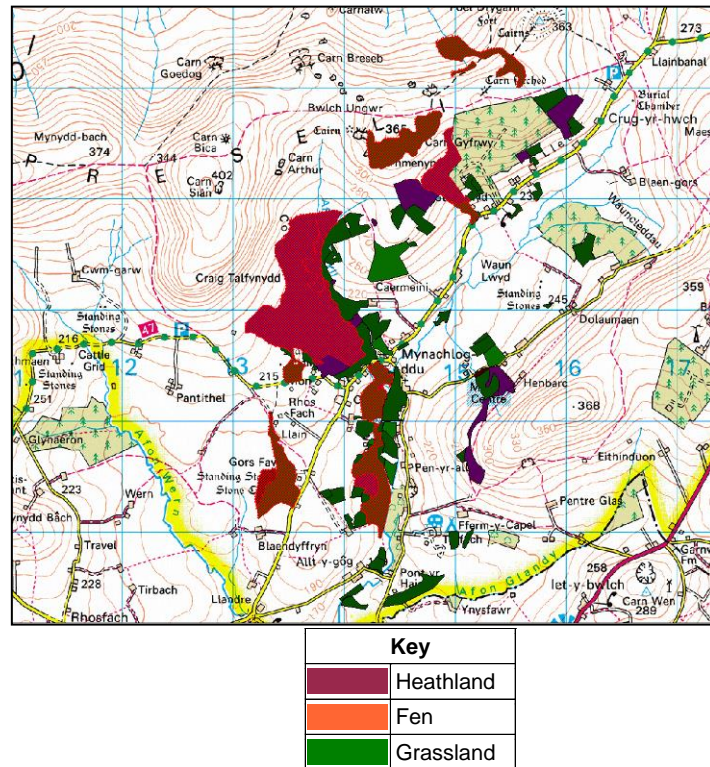
4. Methods

4.1 Maps

NRW supplied the contractor with digital MapInfo Phase One and Phase Two vegetation maps, identifying 301 hectares of pasture, fen and heath in the surrounding landscape (Map 3). These habitat areas were believed to include all vegetation communities with the potential to support marsh fritillaries in the functional landscape.

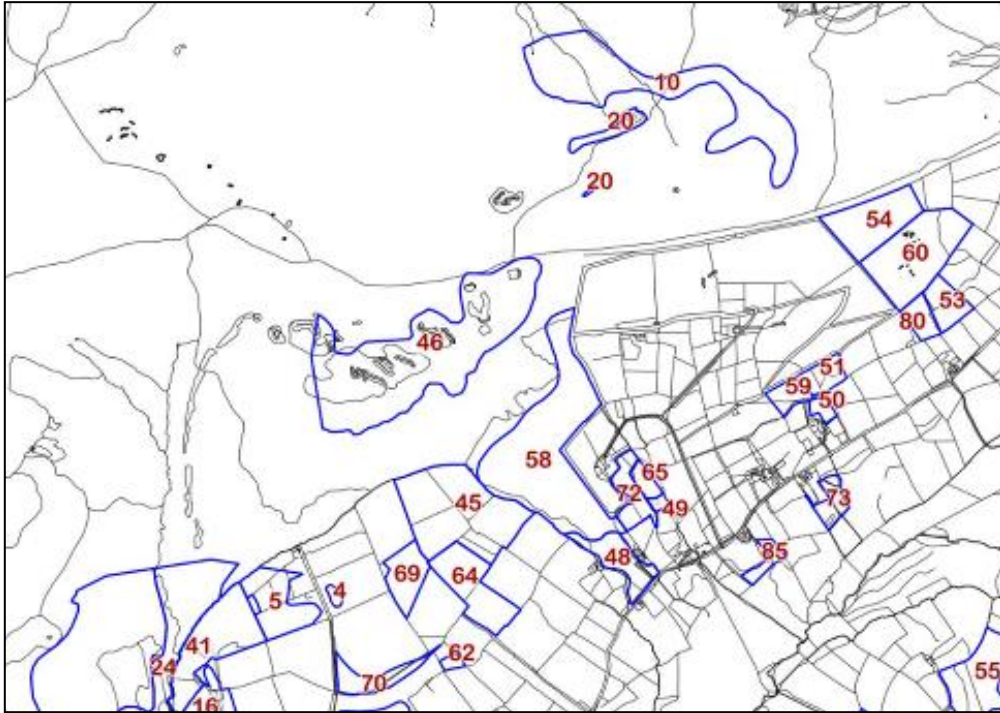
When undertaking the surveys, some inaccuracies and omissions were found in the Phase 1 and Phase 2 maps, and additional unmapped areas were surveyed where they appeared to have potential for the marsh fritillary. The final habitat condition maps were digitised using Ordnance Survey maps supplied by NRW (© Crown copyright and database rights 2014 Ordnance Survey 100019741, © Hawlfraint y Goron a hawliau cronfa ddata 2014 Arolwg Ordans 100019741). The original survey area boundaries were tightened up

to match existing field and topographical boundaries when habitat condition was mapped.

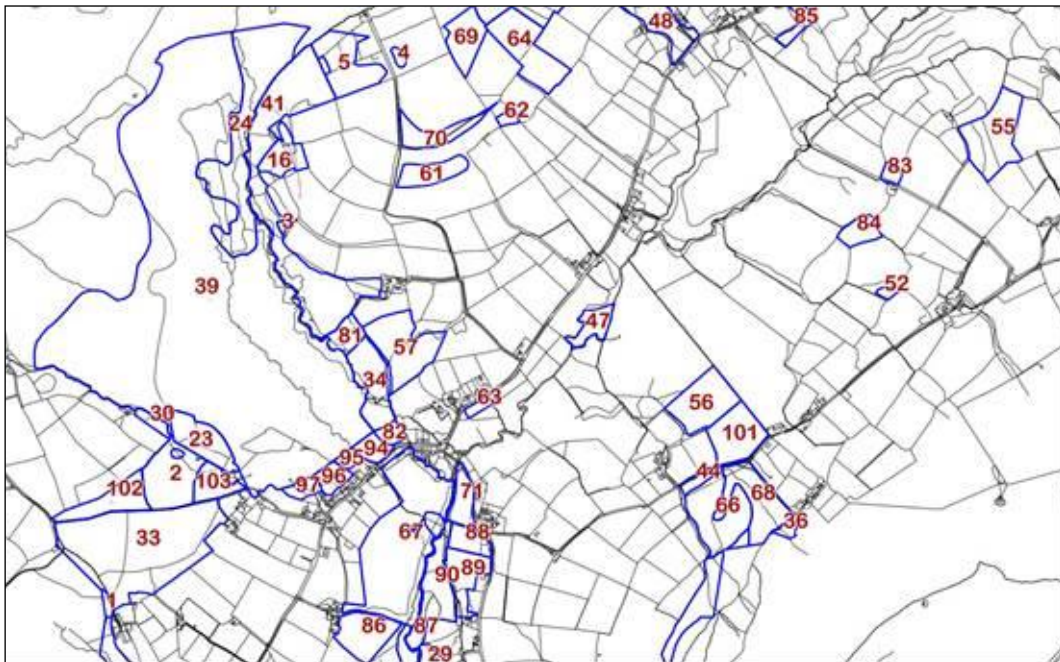


Map 3. Survey sites: potential marsh fritillary habitat within the Gweunydd Blaencleddau functional landscape

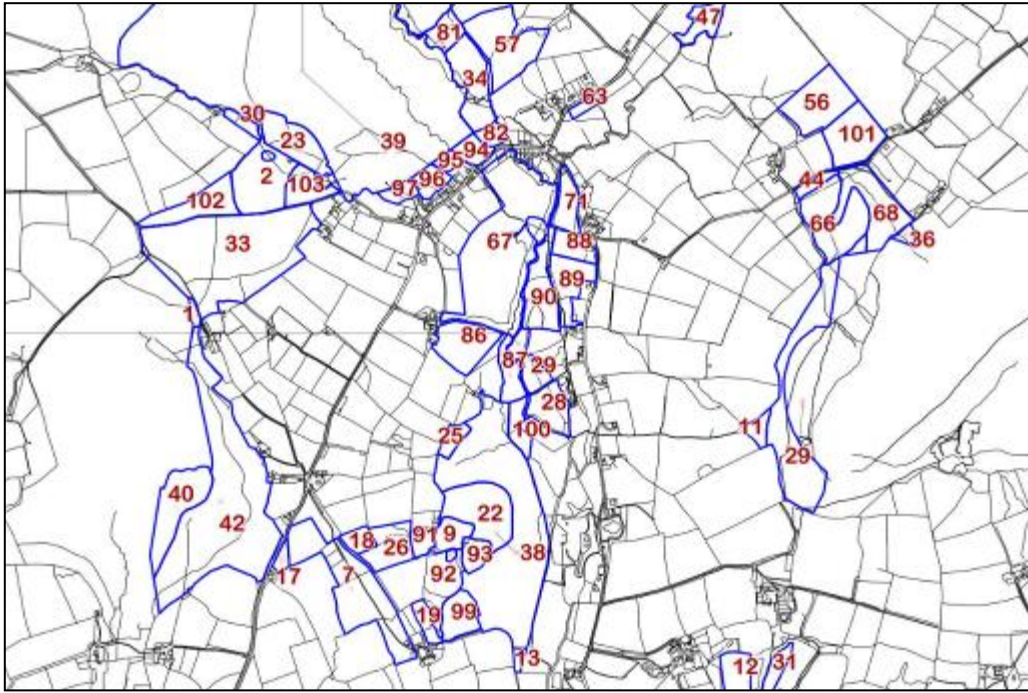
- 4.2 **Ownership** Sixty percent of the target survey sites were on open access common land, where no survey permission was required (Map 4). NRW provided landowner names and contact details, where available, for the privately owned land holdings. Pembrokeshire Coast National Park staff and local landowners also provided contact details. The contractor was responsible for obtaining survey permission from these owners and/or managers before undertaking the surveys, and for tracing the ownership of fields where the owners had not been identified.
- 4.3 **Field numbers** Field numbers were automatically generated from the Phase 1 and 2 GIS layers supplied by NRW, with numbers added where additional habitat was found or Phase 1 / 2 polygons (sites) were subdivided (Maps 6 – 7). Map 8 illustrates the names used in this report to identify blocks of common land, and Map 9 shows the names used for blocks of key private sites. Farm names have not been used, to protect owners' anonymity.



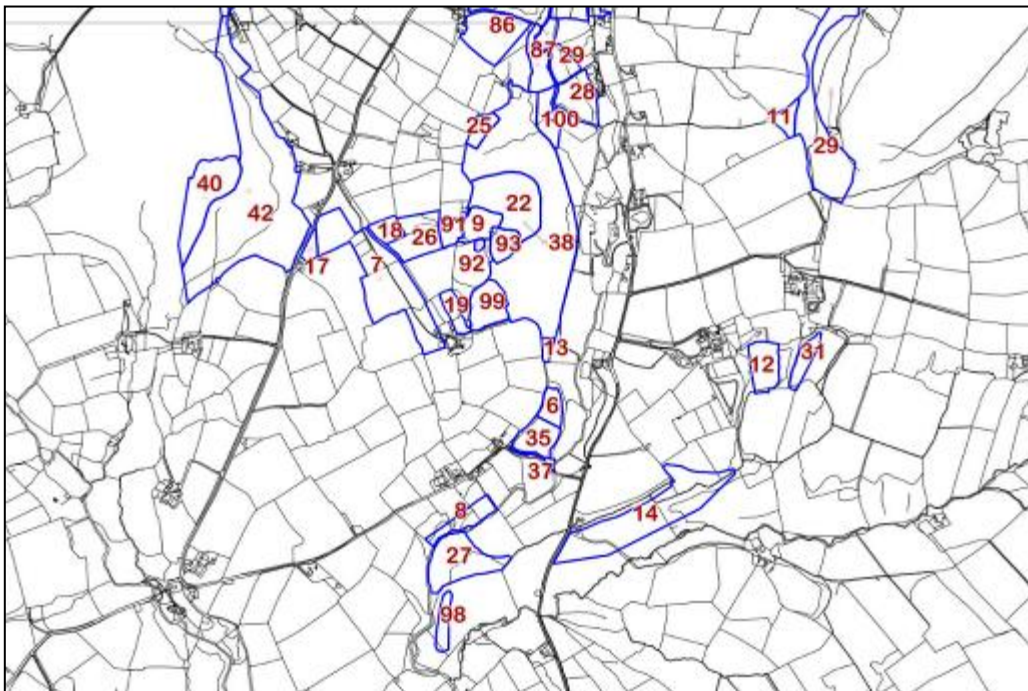
Map 4. Site Numbers – Northeast



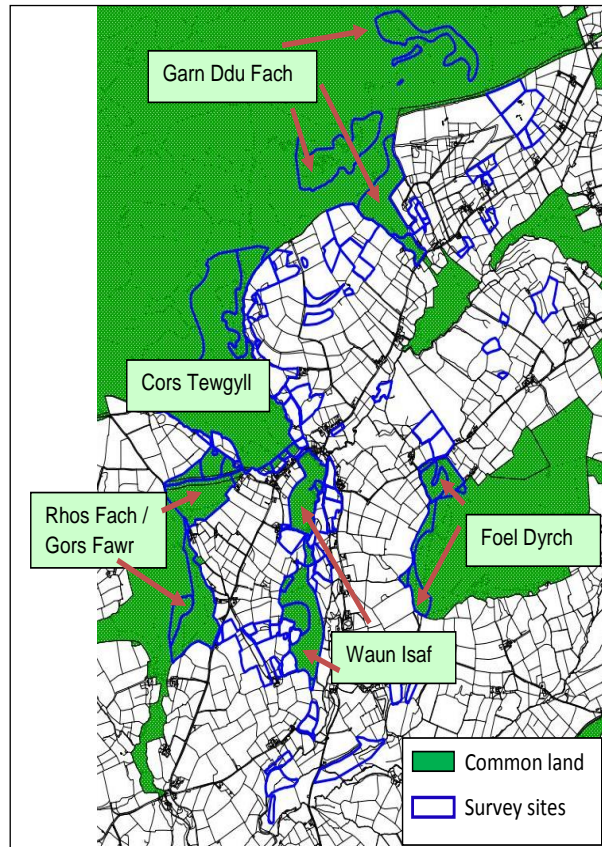
Map 5. Site Numbers – Central



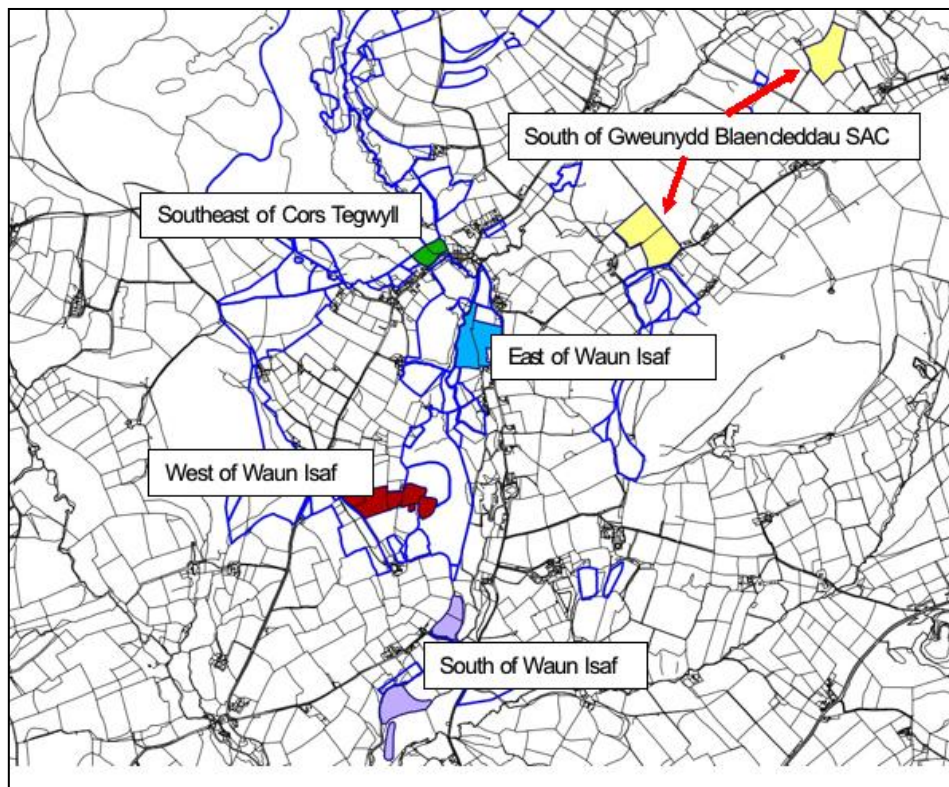
Map 6. Site Numbers – West



Map 7. Site Numbers – South



Map 8. Common land – simplified site names used in this report



Map 9. Private land - site names used in this report

4.4 Surveys

The survey was carried out between the 5th and 20th October 2014. Each enclosure (with survey permission where required) was surveyed, except for the few occasions when the land was not physically accessible, or when the expert advice had identified particular sites as Not Suitable. The suitability of the habitat was categorised and mapped following the standard NRW methods outlined in Fowles 2005. Land was classed into six categories (Table 1), according to the presence and abundance of the butterfly's larval foodplant devil's-bit scabious *Succisa pratensis* and purple moor-grass *Molinia caerulea* (or other tussock-forming grasses), as well as the vegetation height and structure. The mapping results have been supplied with this report as a Mapinfo GIS file, and are illustrated in Maps 11 to 22.

Habitat code	Habitat Classification
GC	Good Condition
SU	Suitable Undergrazed
SO	Suitable Overgrazed
SS	Suitable Sparse
PR	Potential Rank
NS	Not Suitable
NA	Not Accessed

Figure 1. Habitat codes

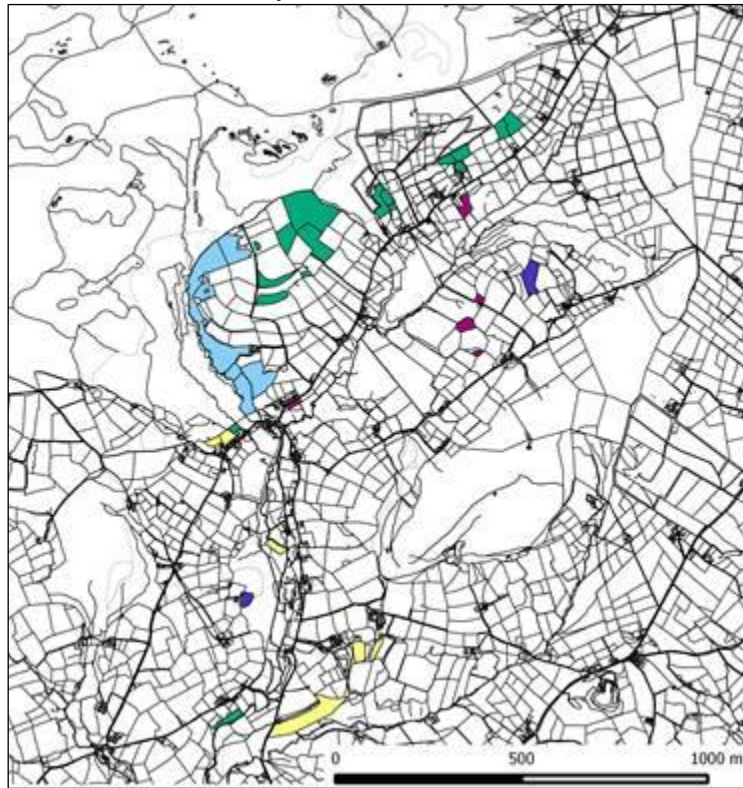
5. Results

5.1 Owners and access

No private access land was surveyed unless permission was obtained from the owner or site manager. Any new ownership details obtained by the contractor were passed on to Jon Hudson, NRW Senior Conservation Officer.

Despite best efforts, ownership could not be established or owners could not be contacted for 13ha. When viewed over the fence or through binoculars, up to 7.6ha of this land appeared unlikely to be suitable. Permission could not be obtained for another two landholdings (total 18ha) because the owners had recently died. One owner (22ha, less than 1% of survey area) refused

permission. Three and a half hectares were physically inaccessible, due to extremely wet ground and/or dense scrub. Twelve additional hectares were reliably identified as Not Suitable (by NRW, land managers or neighbouring landowners), and so were categorised as Not Suitable without further survey. Map 9 illustrates the unsurveyed sites.



	Sheep farms
	Access refused
	Owner unknown or could not be contacted
	NRW identified as Not Suitable, not surveyed
	Physically inaccessible

Map 10. Unsurveyed sites

5.2 Survey results - Habitat Condition

Just over 300 hectares of fen, heathland and grassland were identified for survey and 240 ha were assessed. Twenty-eight hectares of Good, Suitable or Potential habitat were identified, while 213ha were Not Suitable. There was very little Good Condition (0.84ha) or Suitable Overgrazed (1.15ha) habitat. Most Suitable habitat was either Undergrazed (4.6ha) or Suitable Sparse (7.59ha).

	Private holdings	Common land	Total
Good Condition	0.79	0.05	0.84
Suitable Undergrazed	0.38	4.18	4.56
Suitable Overgrazed	0.6	0.55	1.15
Suitable Sparse	3.99	3.6	7.59
Suitable only (excluding GC)	4.97	8.33	13.3
Potential Rank	1.05	12.69	13.74
All potential habitat: GC, all Suitable and Potential	6.81	21.07	27.88
Not Suitable (NS)	55.89	157.55	213.44
Area Assessed	62.7	178.62	239.75
Not Accessed (NA)	58.44	0.82	59.26
Total	121.14	179.44	300.58

Table 1: Habitat Condition

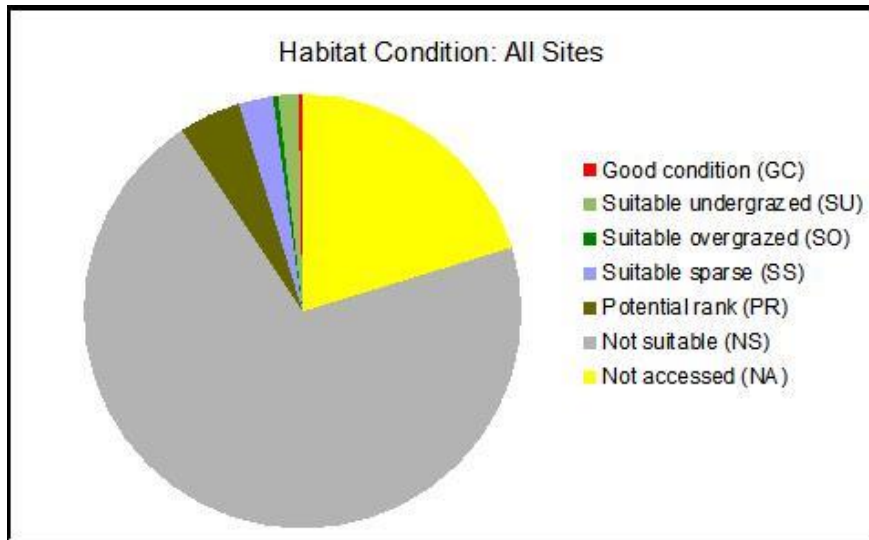


Figure 2. Habitat Condition – All Sites

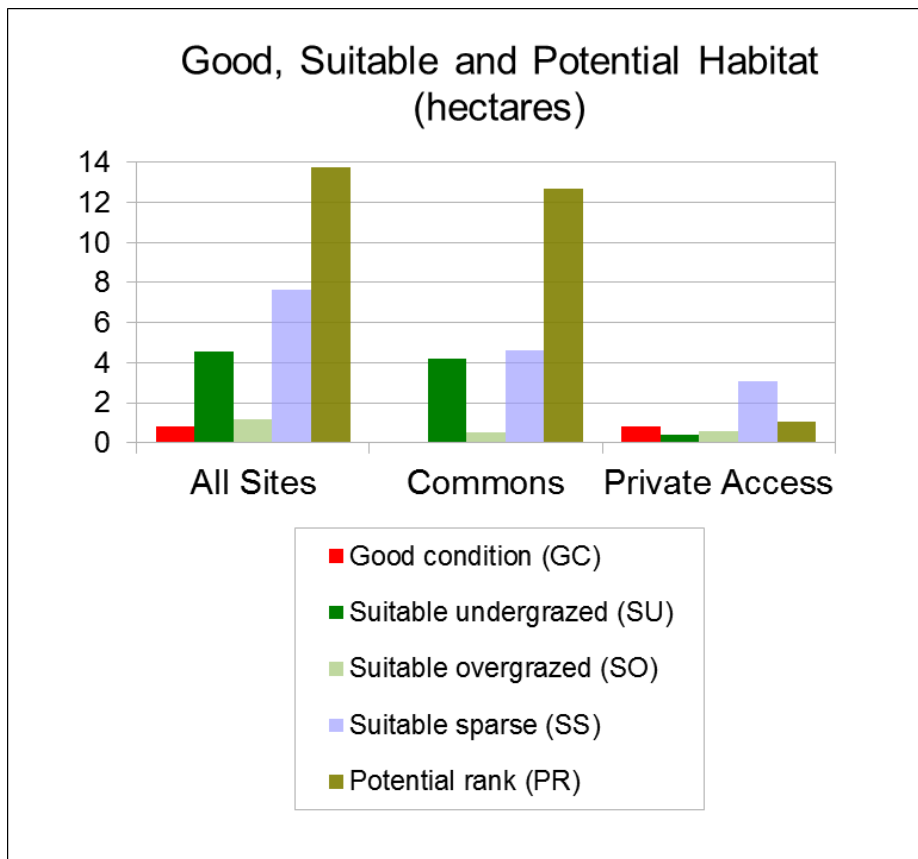


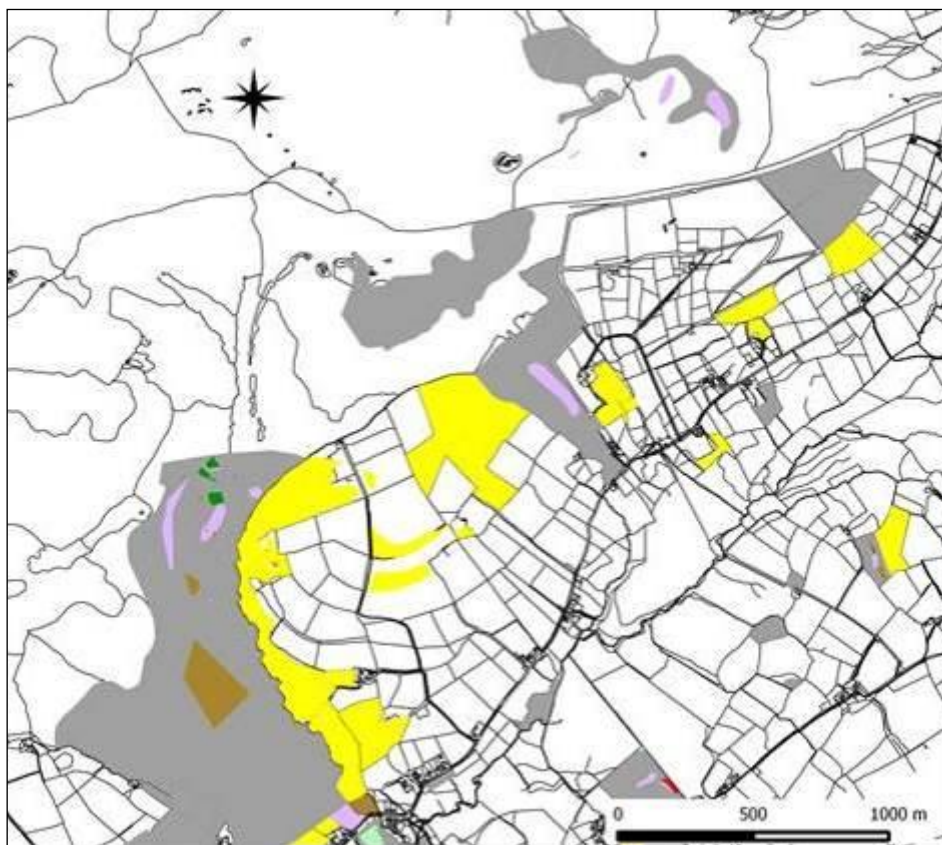
Figure 3. Good and Suitable habitat across all sites

Twenty-five percent of the assessed land was privately owned, the rest was on open access commons. The distribution of grouped Good/Suitable/Potential habitat reflected this breakdown (21/79), with no strong pattern of 'better' or 'worse' habitat on privately-owned sites compared to the commons. The same pattern was found on Not Suitable habitat.

When the individual categories were analysed different patterns emerged. Fifty-two percent of Suitable Overgrazed and 40% of Suitable Sparse habitat was recorded on private holdings. However, ninety-four percent of the small amount (0.84ha) of Good Condition was on private landholdings, while 92% of all Suitable Undergrazed and all Potential Rank habitat was found on the commons.

	Good Condition
	Suitable Undergrazed
	Suitable Overgrazed
	Suitable Sparse
	Potential Rank
	Not Suitable
	Not Accessed

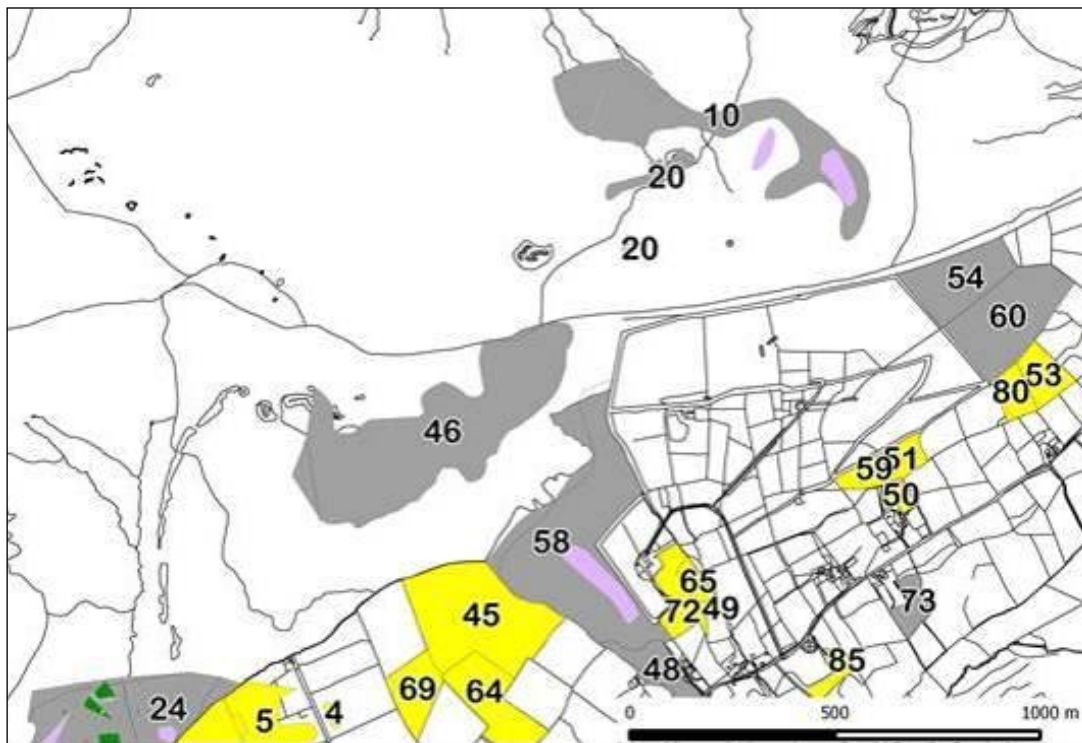
Figure 4. Key to Habitat Condition Maps



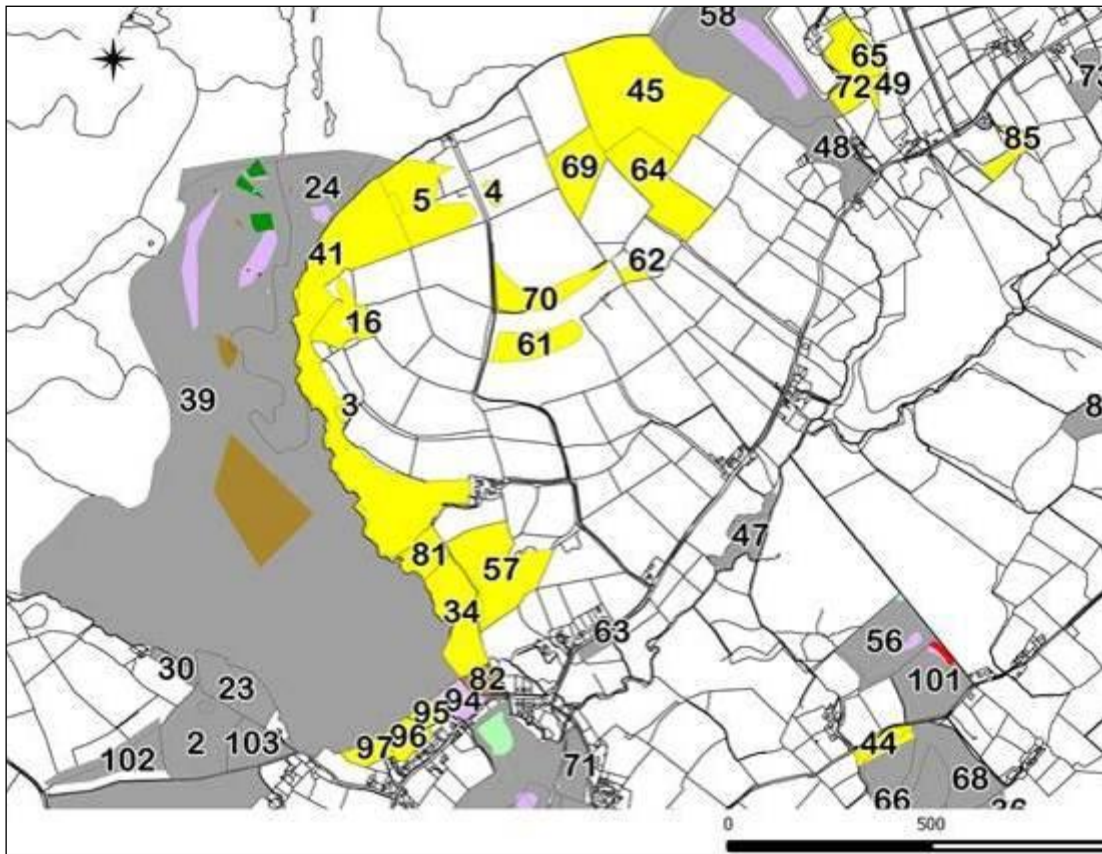
Map 11: Habitat Condition Overview: North



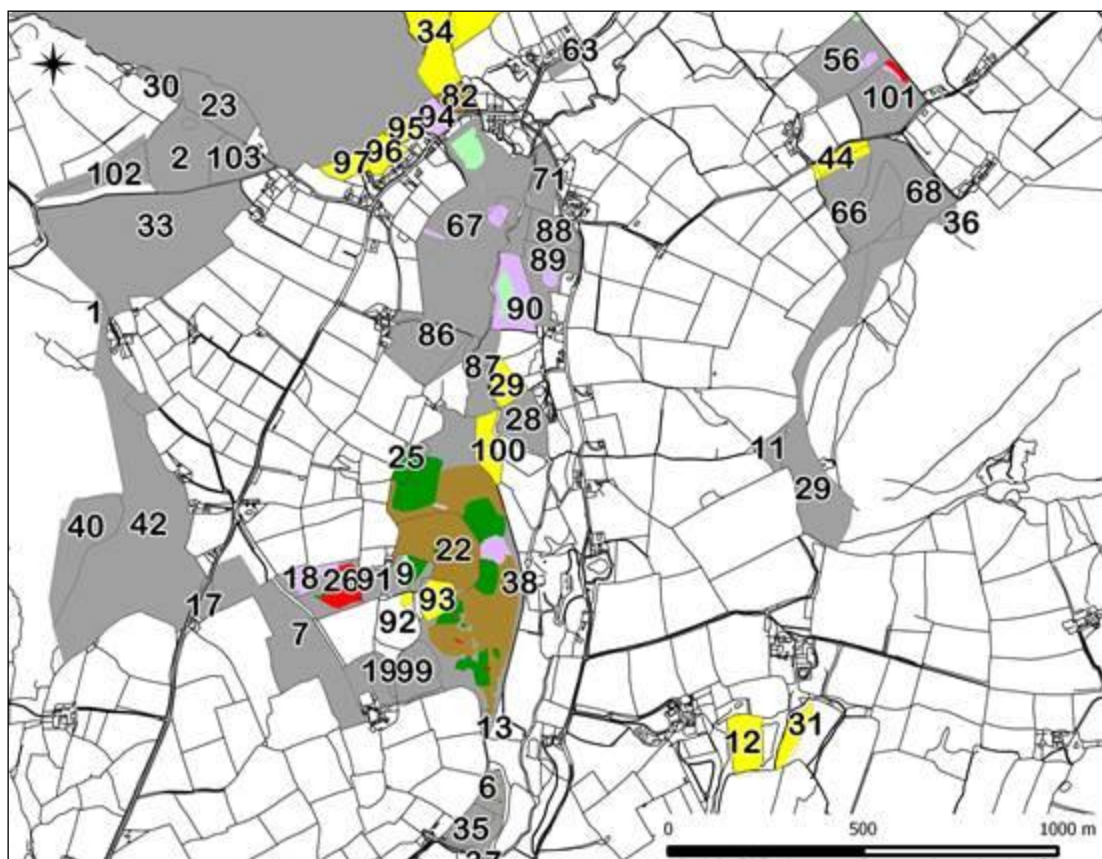
Map 12: Habitat Condition Overview: South



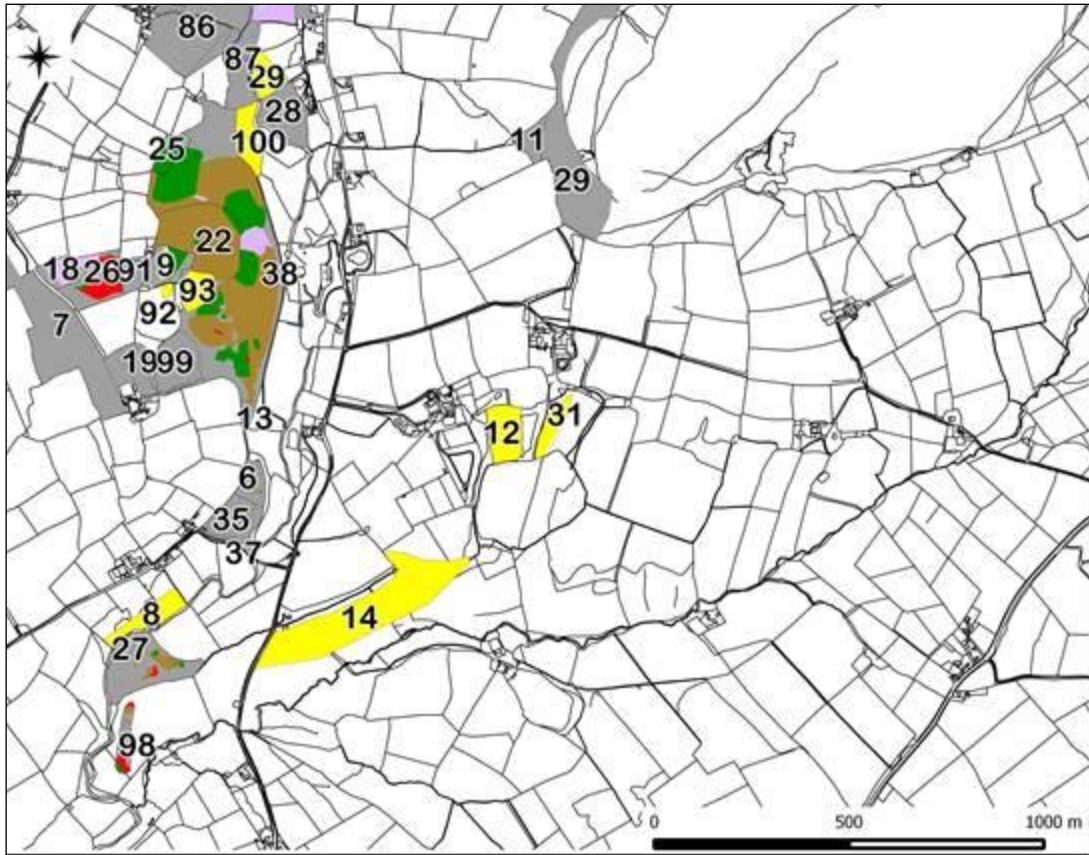
Map 13. Habitat Condition – Northeast



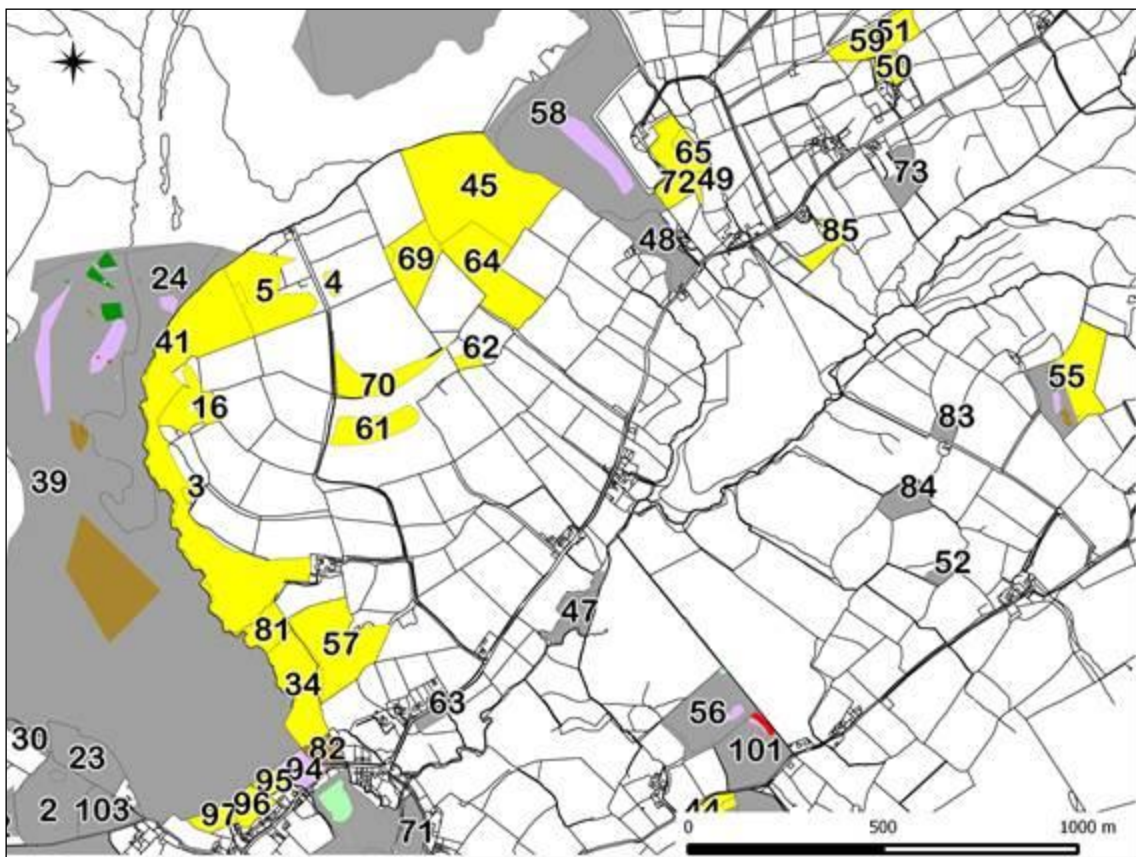
Map 14. Habitat Condition – Northwest



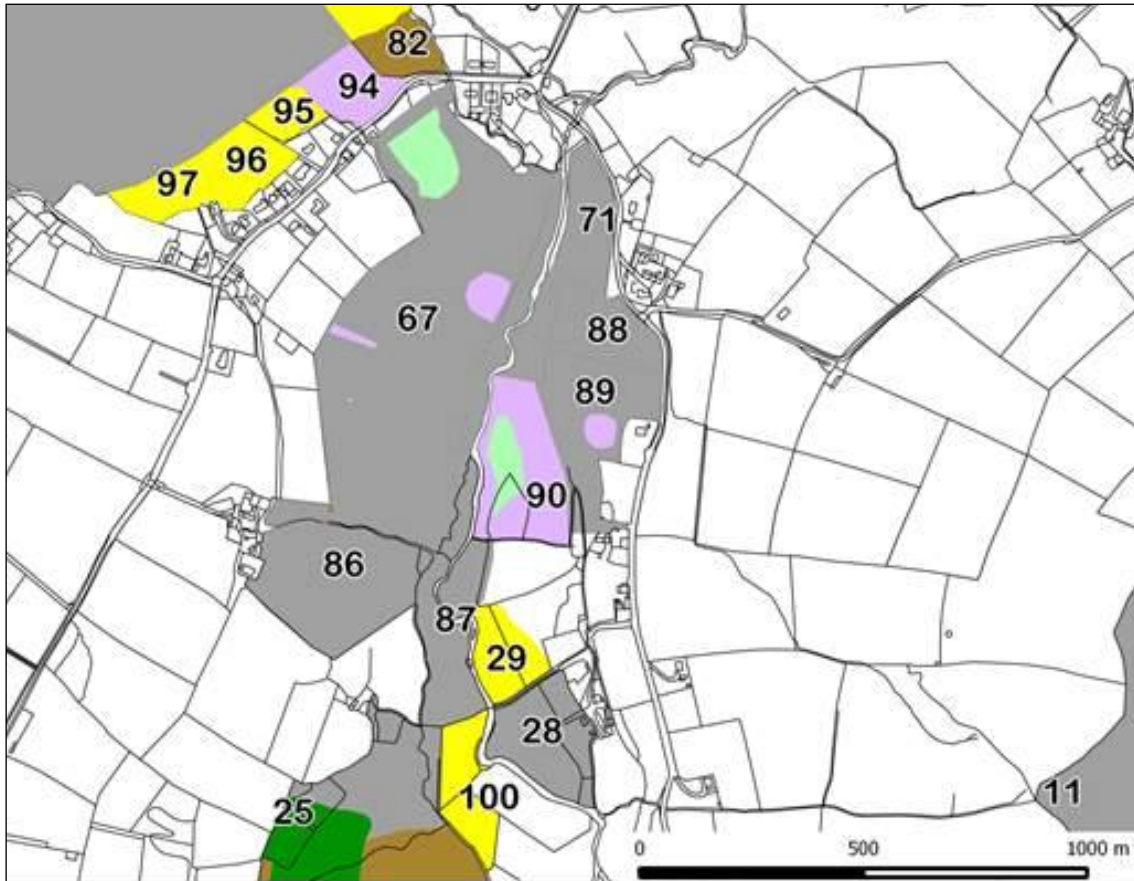
Map 15. Habitat Condition - West



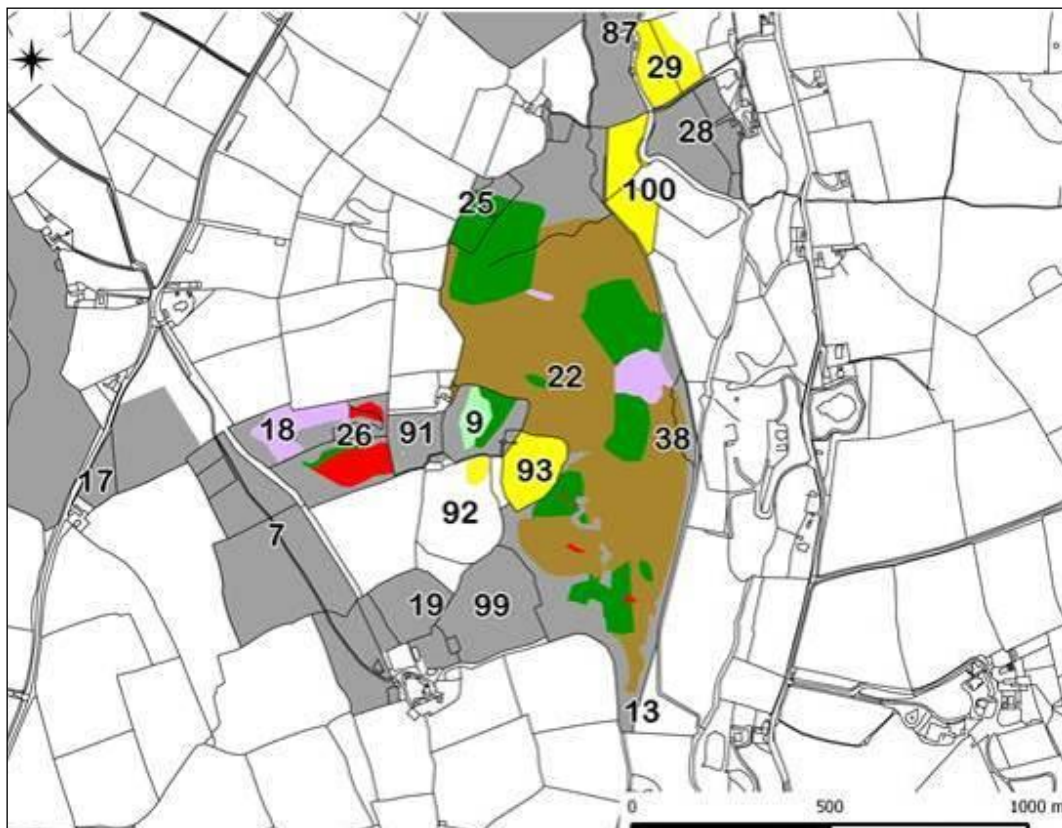
Map 16. Habitat Condition - South



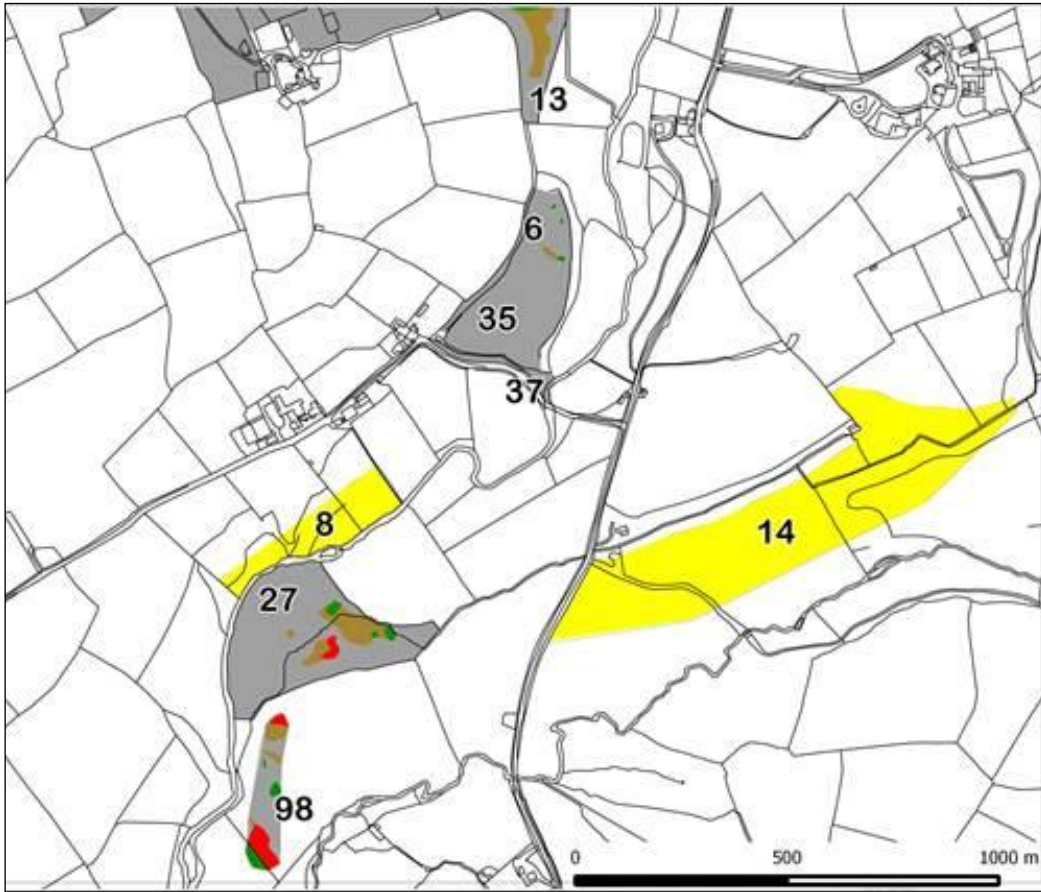
Map 17 Habitat Condition – Central



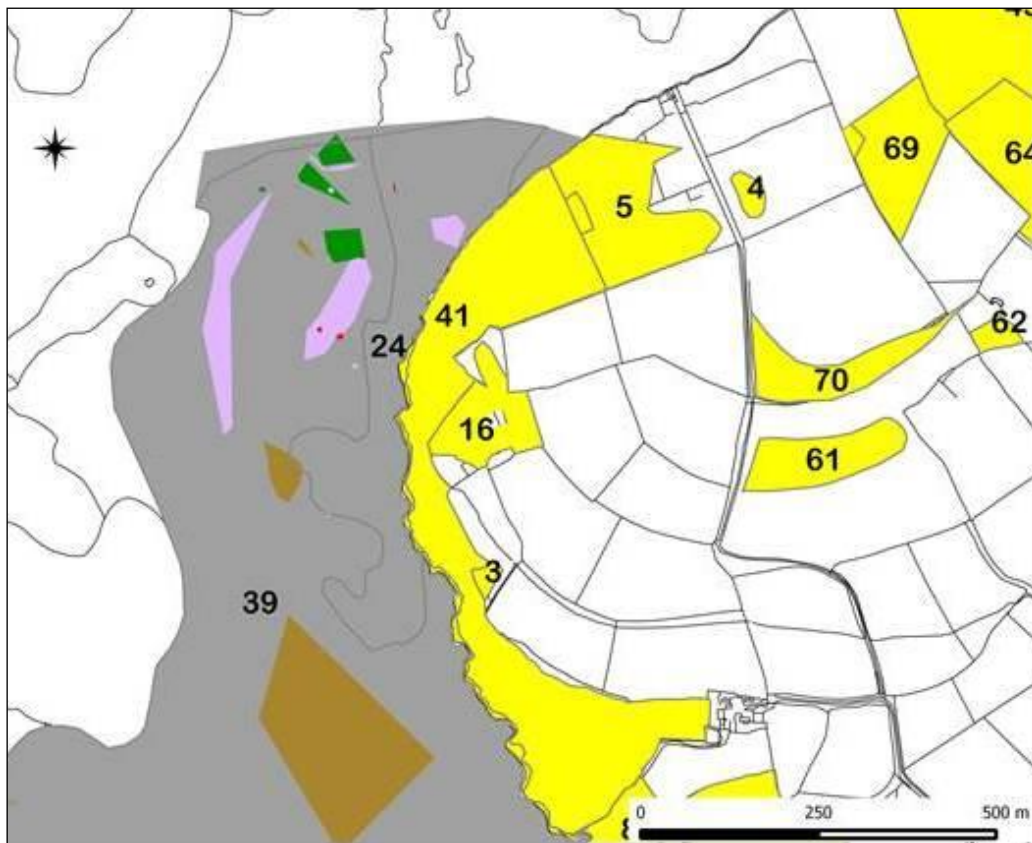
Map 18. Habitat Condition Detail - Upper Waun Isaf habitat network



Map 19. Habitat Condition Detail - Lower Waun Isaf habitat network



Map 20. Habitat Condition Detail – Far south



Map 21. Habitat Condition Detail – Cors Tewgyll North
Nb. Scale smaller than other detail maps

Good Condition

There were only 0.84 hectares of Good Condition habitat across all surveyed sites. The greatest 'concentrations' were to the southwest and south of Waun Isaf, with small amounts on two sites close to Gweunydd Blaencleddau SAC. Only 0.5 ha of GC habitat was found on common land - less than 0.03ha on lower Waun Isaf itself (although much of the SU was 'nearly' GC), and less than 0.15ha on Cors Tewgyll.



Figure 5. Good Condition marsh fritillary habitat

Suitable Undergrazed, Suitable Overgrazed and Suitable Sparse (SU, SO and SS)

The three 'Suitable' categories (not including Good Condition) amounted to just over 13ha. As with GC, the main concentration was in the Waun Isaf 'complex' - nearly 5ha on Waun Isaf, with just under a hectare on the farm to the southwest and 1.87ha on fields to the east. Up to 1.78ha of additional habitat at the 'southwestern' farm could not be physically accessed – but recent marsh fritillary records indicates suitable habitat.

Small amounts of suitable habitat were found on the same sites where the GC occurred: to the south of Waun Isaf (0.11ha), and two sites (total 0.33ha) on the southern and southeastern edge of Gweunydd Blaencleddau SAC. There are patches of suitable habitat on the moorland in the north of the survey area, with over two hectares of Suitable Sparse habitat on and below Garn Ddu Fach, and over 2ha of SU, SO and SS in the wettest patches high on Cors Tewgyll. Another 0.7ha of SS habitat was seen over the fence in one field behind houses backing onto Cors Tewgyll, with another hectare or so of unsurveyed habitat with *Molinia* in adjacent fields.

Potential Rank

Eighteen hectares of Potential Rank habitat were recorded. The greatest amount (8.3ha) was on Waun Isaf – most of this was in the northern part of the lower common. The only other large concentration was 4.4ha on Cors Tewgyll,

but this is probably over-estimated – the 4ha block is a rectangle drawn between 4 small patches of *Succisa* recorded while walking 'zigzag' transects. Detailed searching of this 88ha site was impossible, so it is assumed that there is more *Succisa* in this area (lying downslope of suitable and GC habitat), but the amount of PR habitat is likely to be less than 4ha.

Not Suitable

Eighty-eight percent (213ha) of all assessed land was recorded as Not Suitable. Ten hectares were scrub or woodland edges and patches. Nearly 158ha of common land were deemed NS, mostly species-poor acid grassland or heather moorland.



Figure 6. West slope of Foel Dyrch: Species-poor sheep-grazed common

Not Accessed

The condition of 59 hectares could not be assessed. As much as 33ha is probably heavily sheep grazed, according to information from NRW, neighbouring landowners, seen from neighbouring land or viewed through binoculars. Much of this lies in one block in the north of the survey area, on the southeastern slope of the Preselis above Gweunydd Blaencleddau SAC. These sites are unlikely to provide much if any suitable habitat. Survey permission was refused on just under 22ha of land which lies between this block and Cors Tewgyll. Some of this appears to be wet cattle-grazed grassland, and so may be more suitable than the other sheep-grazed fields in this block.



Figure 7: Unsurveyed block of sheep farms north of Gweunydd Blaencleddau SAC

Larval webs

The survey was carried out late in the marsh fritillary larval web survey season (usually late August to late September). However, three webs were found in the southwest of lower Waun Isaf on 7th October. See Map 21, below, for local 2014 marsh fritillary records. Another 21 larval webs were recorded by NRW at Pont Mynachlog-ddu this year, which lies 1.5km west of this survey area.



Figure 8: Marsh fritillary larval web, Waun Isaf

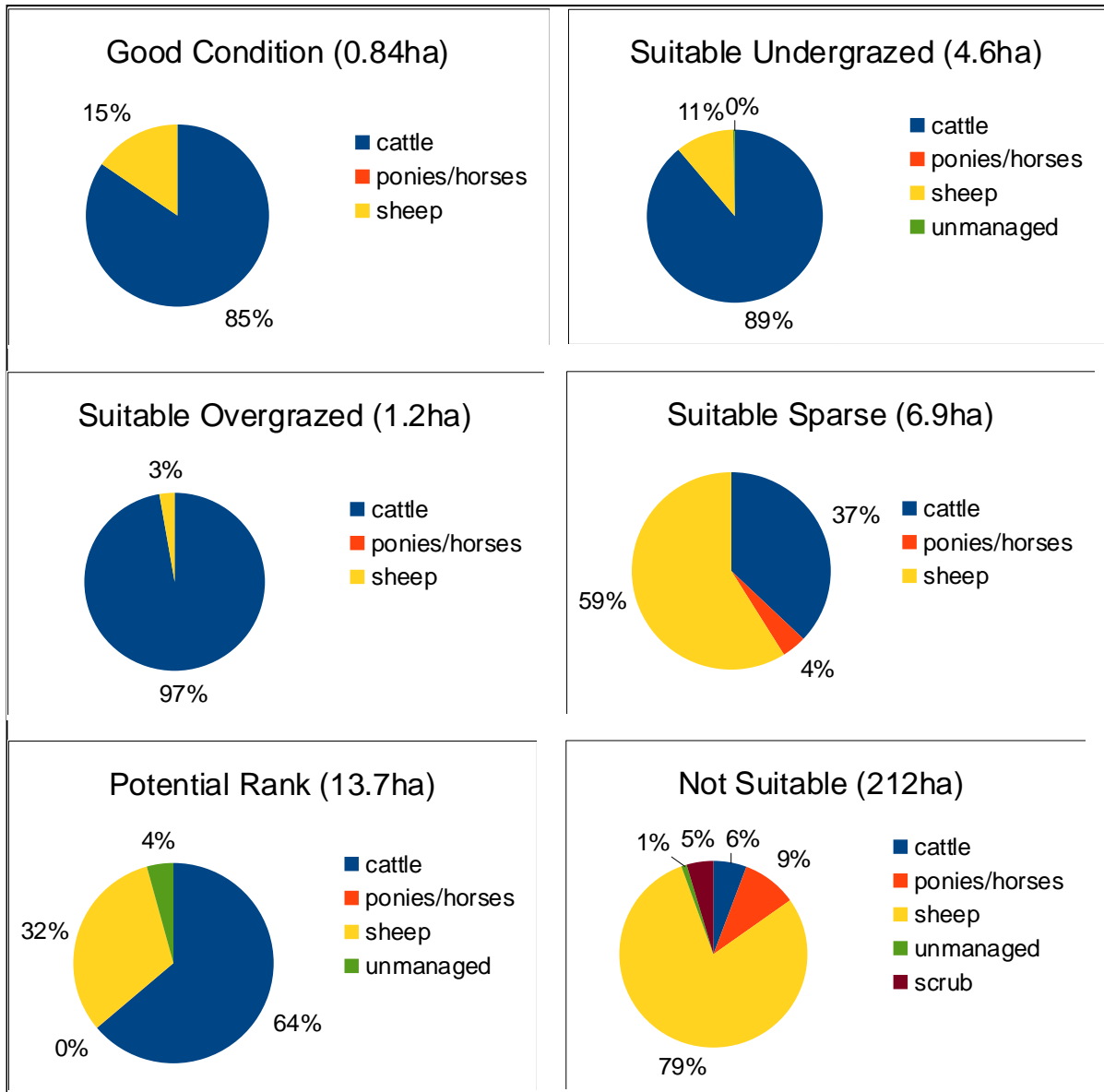


Figure 9. Grazing by Habitat Category

Cattle grazing predominates in most of the suitable habitat types - except for SS which, along with Not Suitable, was more often grazed by sheep. Note the large variation in sample sizes, with less than 1% of all assessed habitat considered GC or SU and 88% classified as NS.

Ninety-six hectares of common land was judged to be too closely grazed to be suitable for the marsh fritillary: 87ha by sheep (supplemented by a small number of ponies on Cors Tewgyll) or by ponies alone on upper Waun Isaf (8.7ha). Cattle or horses grazed roughly one-third each of the short-grazed 33ha of NS on private land, with only 5ha grazed by sheep (light grazing with cattle).

6. Discussion

6.1 Habitat Condition

The bulk of recorded Good, Suitable and Potential habitat lies in the south of the survey area, with over 13ha on Waun Isaf SSSI (part of Preseli SAC), and more than 4.5ha on surrounding farms. These lie along the Eastern Cleddau River valley, with only the village of Mynachlog-ddu dividing this block of habitat from the Gweunydd Blaencleddau SAC metapopulation. The other small patches of Good and Suitable habitat on private land are on two farms just south or southeast of the SAC, but just over 1km apart from each other.

Although there was less than one hectare of Good Condition habitat in any surveyed sites, much of the southern half of lower Waun Isaf could be brought into Good Condition with a small increase in grazing level.



Figure 10. Lower Waun Isaf

The other main concentrations of habitat, mostly Suitable Sparse, were found on the upland moors in the north of the survey area. There is undoubtedly more habitat outside of the areas indicated on the Phase 1 and 2 maps, in an area too large to be included in this survey. The scarcity of *Succisa* is probably a legacy of decades of sheep grazing (see Grazing Discussion, below). The patches of Good Condition and Suitable habitat on the slopes of Cors Tewgyl were all in the wettest areas, which presumably deter sheep grazing.



Figure 11. Lower Cors Tewgyll
Suitable or potential condition sward with little or no *Succisa pratensis*



Figure 12. Upper Cors Tewgyll – marsh fritillary habitat in very wet heath

The upland habitat is very exposed, with a mainly southeastern aspect, and most lies above 300m. It has probably never provided optimal habitat for marsh fritillaries, but it may be colonised in warmer summers. While some of the upland habitat is separated from the Gweunydd Blaencleddau SAC by more than 1km of intensively grazed sheep farms, there are potential links or

stepping stones: the arm of moorland extending downhill just west of Glanrhyd, and, possibly, the unsurveyed land along the eastern edge of Cors Tewgyll (where survey permission was denied). Even without these links, this is not outside of the marsh fritillary's potential colonisation range, especially in a 'good' year such as 2014.



Figure 13. Garn Ddu Fach, looking west

6.2 Grazing

The survey results (Figure 8) confirm the prescribed management for the marsh fritillary: light grazing by cattle or ponies, to create a 10-25cm tussocky mosaic with frequent to abundant *Succisa pratensis*. This provides warm, sheltered pockets with plentiful larval foodplant, where the eggs and larvae have the greatest chance of survival.

Summer sheep-grazing is prevalent on all of the upland commons in the study area (excluding Waun Isaf, which lies in the river valley), where most of the Suitable Sparse and Not Suitable habitat was recorded. Sheep are not recommended for marsh fritillary habitat, since they will use their small mouths to target *Succisa* and other favoured herbs, creating a short, even and often species-poor sward. This compares with more indiscriminate grazing by cattle and equines.

The upland common land grazing regime was generally too intensive for marsh fritillaries, featuring short, even swards and few tussocks. Extensive stands of heather (*C. vulgaris*) also occur on Garn Ddu Fach, with scattered to dense gorse on Foel Dyrch, Rhos Fach and eastern Gors Fawr.

Only cattle and horses were grazed on the Gweunydd Blaencleddau SAC before 1945 (CCW, 2011b), and they featured much more on the Preseli SAC than they do today (CCW, 2011a). It is likely that there was a much greater extent of *Succisa* and marsh fritillary habitat then – even today, a great deal of 'regionally typical' marsh fritillary habitat with rare or no *Succisa* can be found. The post-war increase in use and numbers of sheep has, in all likelihood, contributed to the loss of *Succisa*.

No *Succisa* could be found on the tight, species-poor swards of Rhos Fach, Gors Fawr and the western slope of Foel Dyrch. Most of Cors Tewgyll (except the western and southern fringes) is not as severely grazed, with a mix of suitable-type habitat and a denser *Juncus-Molinia* sward. But *Succisa* only remains in the wettest patches, where, as discussed above, sheep are less likely to venture.

Waun Isaf provides by far the greatest amount of potential habitat for the marsh fritillary metapopulation. The upper half is overgrazed by ponies, with less *Succisa* than would be expected compared to the lower half of the common or the private fields on the east. It is likely that a long history of 'over-grazing' has led to the decline of *Succisa* here. Lower Waun Isaf is mainly undergrazed, with much of the very wet SU habitat in 'almost' Good Condition. It has a more open sward, due possibly to the soil chemistry and/or the reintroduction of cattle grazing in 2013 – although the only direct evidence of grazing during the survey were some pony droppings in short-grazed patches in the north of lower Waun Isaf.

6.3 Habitat Condition Categories

Most good and suitable habitat in the study area occurred in wet rhos pasture and/or wet heath with *Sphagnum*. There were also several occupied marsh fritillary sites on neutral grassland with *Molinia caerulea*, *Deschampsia cespitosa* and/or other grasses, which is less tussocky than the more 'typical' rhos pasture marsh fritillary habitat found in Southwest and Southeast Wales.



Figure 14. Neutral grassland with *Succisa pratensis*

6.4 Future surveys

Much of the unsurveyed land is unlikely to be suitable, but several sites would be worth following up for survey.

Up to 2ha of inaccessible land that could be partially viewed from neighbouring land contained *Molinia*, and so may be suitable for the marsh fritillary (on the southeast boundary of Cors Tewgyll, and possibly along the lane at the north edge of the Foel Dyrch survey area).

Over 5 hectares at a farm east of the 'south of Waun Isaf' farm (site 14) could not be surveyed, because the owner had recently died and the tenant was in hospital. The parts of the field by the road were NS (short-grazed) but there could be habitat in the lower-lying areas not visible from the road. Aerial photographs show some rough grassland, and the site resembles the neighbouring farm which had marsh fritillary larval webs in 2014.

Under one hectare of land at the farm to the west of Waun Isaf could not be accessed (dangerous stock or extremely wet access), but marsh fritillaries have been recorded there in the last two years, so much of this is definitely suitable.

The farm east of Cors Tewgyll (survey permission refused) may contain marsh fritillary habitat, which may be an important link between the Gweunydd Blaencleddau SAC and Cors Tewgyll common.

7. Conclusions and Recommendations

Metapopulation modelling has suggested that marsh fritillary metapopulations require between 76 and 104ha of suitable habitat for their long-term survival (Bulman, et.al. 2007). Fowles (2004) regards 50ha of Good and Suitable Condition habitat within 2km of the SAC featuring marsh fritillary as an appropriate target to represent Favourable Condition. Hence, 50ha is the lower limit for achieving Favourable Condition for the marsh fritillary SAC feature, cited in the Gweunydd Blaencleddau and Preseli SAC Core Management Plans (CCW. 2011a and b). At least 10ha of this habitat should be in Good Condition.

The 2009 Gweunydd Blaencleddau SAC survey reported over 70ha of Good Condition, and Suitable habitat in the metapopulation core area. The 14ha of Good or Suitable habitat recorded in the surrounding landscape in 2014 adds to the strength of the network, and exceeds the FCS for the Gweunydd Blaencleddau SAC. The only concern is the relatively small proportion of Good Condition habitat, with less than a hectare in the wider landscape adding to the target 10ha found within the core sites in 2009.

Additionally the marsh fritillary habitat in the landscape is fairly well connected across open ground. This aids the movement of marsh fritillary adults between colonies, and further adds to the viability of this habitat network in the eastern Preselis. The village of Mynachlog-ddu lies between the GB SAC and Waun Isaf, which probably discourages but does not entirely prevent butterfly movement between the sites.

NRW and the Pembrokeshire Coast National Park are working together with the Waun Isaf grazer to enable an appropriate level cattle grazing on this key

site. This could greatly increase the amount of Good Condition habitat for the Gweunydd Blaencleddau metapopulation, adding to its Favourable Condition Status.

It would be a challenging task to improve the management of the large upland commons with marsh fritillary potential (Cors Tewgyll and Garn Ddu Fach). Even with cooperation from the commoners, it is very difficult to control grazing levels on such large sites where sheep range widely and the *Succisa* is rare or lost.

On private sites, NRW and PCNP work with local landowners to manage their marsh fritillary habitat. Two owners of cattle farms (south of Waun Isaf and southeast of Gweunydd Blaencleddau SAC) are amenable to conservation management, but are failing to graze Potential Rank areas, risking them becoming Not Suitable. They either have too few cattle or lack the advice and/or infrastructure to better manage the grazing, such as additional fencing or, if dry enough, paths mown through the sward to encourage more even grazing.

8. References

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9. Appendix 1: Site Descriptions

Habitat code	Habitat Classification
GC	Good Condition
SU	Suitable Undergrazed
SO	Suitable Overgrazed
SS	Suitable Sparse
PR	Potential Rank
NS	Not Suitable
NA	Not Accessed

Figure 15. Habitat codes

	Site	Description	Management
001	Common - Rhos Fach	Not Suitable sheep-grazed common, with very short, species-poor acid grassland and gorse. No <i>Succisa</i> .	Sheep grazing
002	Common - Southern edge of Cors Tewgyll	NS sheep-grazed common, with very short, species-poor acid grassland and gorse. No <i>Succisa</i> .	Sheep grazing
003	Private – north	Not Accessed – permission refused.	
004	Private – north	NA - ownership unknown - appeared NS, short, sheep-grazed. when viewed through binoculars.	
005	Private – north	NA – permission refused.	
006	Private – just south of Waun Isaf	Mostly NS rank <i>Juncus</i> , <i>Molinia</i> and <i>Deschampsia</i> , with bramble encroachment, just south of Waun Isaf. Small patches of Potential Rank and Suitable Undergrazed	Ungrazed. Western edge mown (by PCNP)
007	Private – southwest of Waun Isaf	Not surveyed - advised by the site manager that this is Not Suitable .	
008	Private – south of Waun Isaf	Not surveyed - advised by neighbour that this is Not Suitable .	Intensive sheep grazing

009	Private – southwest of Waun Isaf	20% Suitable Overgrazed neutral grassland, not tussocky, but <i>Succisa</i> frequent to abundant. Roughly half was NS rank <i>Molinia</i> , <i>Juncus</i> , <i>Salix</i> . The rest was scrub/woodland edge, although the scrub on the western edge had recently been cleared.	Cattle and sheep grazing, scrub clearance
010	Common - Garn Ddu Fach	10.5ha of upland moorland. Mostly NS mixed patches of <i>Juncus</i> , <i>Nardus stricta</i> , mature <i>Calluna vulgaris</i> (including large dense stands) or <i>Molinia</i> . Much of the grassy habitat structure was GC, SU or SO, but no <i>Succisa</i> . One ha (3 separate patches) wet <i>Molinia</i> , <i>Erica tetralix</i> , <i>C. vulgaris</i> , <i>J. acutifloris</i> , <i>Sphagnum</i> with rare <i>Succisa</i> , therefore categorised as Suitable Sparse – the structure was mostly SU, some overgrazed.	Sheep-grazed
011	Common - Foel Dyrch	NS sheep-grazed common, with very short, species-poor acid grassland and abundant gorse. No <i>Succisa</i> .	Sheep-grazed
012	Private – south	NA - ownership unknown.	
013	Common - Southern tip of Waun Isaf	Mostly NS - scrubby, with <i>Juncus</i> along west edge. Small area of PR habitat.	Open to cattle but appeared ungrazed
014	Private – south	NA - owner deceased, tenant in hospital. Fields by road were NS , but judging from aerial photograph and neighbouring land, the northeastern section may have suitable habitat.	
015		<i>No site number 15</i>	
016	Private – north	NA – permission refused.	
017	Private – southwest of Waun Isaf	Not surveyed - advised by the site manager that this is Not Suitable .	
018	Private – southwest of Waun Isaf	SS - short-grazed with tussocks, and <i>Succisa</i> rare – adjoins larger amount of SS in field no. 26, the same grazing unit.	Cattle and sheep grazing

019	Private – southwest of Waun Isaf	Not surveyed - advised by the site manager that this is Not Suitable .	
020	Common - Garn Ddu Fach	Less than one hectare of upland moorland. Mostly NS short <i>C. vulgaris</i> and <i>Vaccinium</i> , a small amount of wet <i>Molinia</i> , <i>Sphagnum</i> , etc., and one small patch of SS .	Sheep-grazing
021		<i>No site number 21</i>	
022	Common - Waun Isaf	3 ha of mostly PR habitat - almost SU , but too tall with bramble encroachment. Two small SU patches.	Very light cattle grazing
023	Private - southeast of Cors Tewgyll	NS viewed over fence - very short sheep-grazed and gorse.	Sheep-grazing
024	Common - Cors Tewgyll	8 ha NS , with 0.15ha of SS and a tiny patch of 8 ha NS , with .15ha of SS and a tiny patch of GC .	Sheep-grazing
025	Common - Waun Isaf	70% mix of SU and PR , categorised as Suitable Undergrazed . The rest was either short-grazed wet heath or rank <i>Molinia</i> with no <i>Succisa</i> found.	Very light cattle grazing
026	Private – southwest of Waun Isaf	<i>same grazing unit as 18</i> . 35% Good Condition , small amount of SU . The rest either NS grassland or scrubby edge.	Light cattle and sheep grazing
027	Private – south of Waun Isaf	Two and a half hectares NS rank <i>Molinia</i> , with <i>Deschampsia cespitosa</i> and <i>Juncus effusus</i> . Small scattered patches of PR , SU and one patch of GC , in southeastern third. Marsh fritillary larval webs recorded in 2014.	Open to cattle and ponies, but barely any evidence of grazing.
028	Private – east of Waun Isaf	Southern section Not Suitable , short-grazed. Northern field NA	Southern section – sheep grazing
029	Common - Foel Dyrch	NS - <i>Sphagnum</i> , <i>Molinia</i> in the north, the rest was species-poor, short acid grassland with scattered to dense gorse.	Sheep grazing
030	Private - Southern edge of	Viewed over fence – NS , very short sheep-grazed.	Sheep grazing

	Cors Tewgyll		
031	Private – south	NA - ownership unknown.	
032		<i>No site number 32</i>	
033	Common – Rhos Fach	Not Suitable - very short, species-poor acid grassland and gorse. No <i>Succisa</i> .	Sheep grazing
034	Private – north	Not Accessed – permission refused.	
035	Private – just south of Waun Isaf	Mostly NS rank <i>Juncus</i> , <i>Molinia</i> and <i>Deschampsia</i> , with a lot of bramble encroachment, just south of Waun Isaf. Small patches of PR and SU .	Ungrazed. Western edge mown (by PCNP)
036	Common - Foel Dyrch	Not Suitable bracken and species-poor acid grassland.	Sheep grazing
037	South of 035	Not Suitable road verge, no <i>Succisa</i> or habitat, unclear why this was included in Phase 1/2 map.	
038	Common - Waun Isaf	2ha, most of the southern half of the common and the largest block of marsh fritillary habitat in the survey area. 26% SU , 44% PR , patches of SS and GC . Much of the SU is nearly GC in the southern third. Marsh fritillary larval webs recorded.	Very light cattle grazing, with some harder grazed patches in the north.
039	Common - Cors Tewgyll	67ha moorland - 90% a NS mix of 'GC to SO' boggy habitat with no <i>Succisa</i> , and taller <i>Juncus</i> & <i>Molinia</i> . Tiny patches of GC and SO , and small patches of SS and SU . 4% PR , but this is probably over-estimated.	Sheep grazing, small number ponies - not as intense as other sheep-grazed commons.
040	Common – Gors Fawr	Not Suitable <i>Sphagnum</i> wet heath with <i>Molinia</i> and <i>Juncus</i> , but no <i>Succisa</i> .	Sheep grazing
041	Private – north	Not Accessed – permission refused.	
042	Common – Gors Fawr	NS - very short,-grazed species-poor acid grassland and scattered gorse. No <i>Succisa</i> .	Sheep grazing
043		<i>No site number 43</i>	

044	Common - Foel Dyrch	NA - owner unknown, part is 'open access', but fenced off from common, viewed from edges. Scrubbed up and ungrazed, with some <i>Molinia</i> but no <i>Succisa</i> could be seen	Unmanaged
045	Private – north	NA - owner recently died. Appeared NS when viewed through binoculars - short, sheep-grazed.	
046	Common – southwest of Garn Ddu Fach	NS - species-poor moorland, with <i>C. vulgaris</i> , <i>N. stricta</i> , some <i>Molinia</i> , no <i>Succisa</i> . Most very short-grazed.	Sheep-grazing
047	Private - central	NS - semi-improved, species-poor <i>D. cespitosa</i> and dense <i>J. effusus</i> .	Horses or sheep
048	Common – south of Garn Ddu Fach	NS - Gorse and <i>Juncus</i> , no <i>Succisa</i>	Sheep-grazing
049	Private – north	NA - ownership unknown - appeared NS, short sheep-grazed when viewed through binoculars.	
050	Private – north	NA - ownership unknown - appeared NS short, sheep-grazed when viewed through binoculars.	
051	Private – north	NA - ownership unknown - appeared NS, short, sheep-grazed when viewed through binoculars.	
052	Private - central	Not surveyed. NRW advised that this is NS .	
053	Private – north	Not surveyed. not accessible from adjacent field. NRW advised as NS .	Sheep grazing
054	Private – north	NS - very short-grazed with no <i>Succisa</i> evident.	Horse grazing
055	Private – south of GB SAC	The western third of this 3.3ha field was mainly NS neutral grassland, <i>Juncus</i> , or scrub, with a strip of 0.2ha of GC, SU, SS and PR . The eastern third was dense <i>Molinia</i> and <i>Juncus</i> , separated by scrub and a deep stream, and so could not be accessed. It is either PR or NS .	Cattle grazing on west, east ungrazed (not fenced off)
056	Private – south of GB SAC	Mostly NS dense <i>Juncus</i> with wide mown strips. Small patch of SO (mown) and SS .	Sheep grazing and mowing

057	Private – north	Not Accessed – permission refused.	
058	Common – south of Garn Ddu Fach	Nearly 13ha, mostly NS <i>Juncus</i> , some <i>Molinia</i> , but no <i>Succisa</i> . One hectare was SS : good condition grazing, <i>E. tetralix</i> , <i>Sphagnum</i> , <i>Carex</i> , etc., but <i>Succisa</i> rare & scattered.	Short sheep-grazed on west side, east more rank, small mown areas in north.
059	Private – north	NA - ownership unknown - appeared NS short, sheep-grazed when viewed through binoculars.	
060	Private – north	NS - very short-grazed with no <i>Succisa</i> evident, or dense <i>Ulex europaeus</i> .	Horse grazing
061	Private – north	NA - ownership unknown - appeared NS short, sheep-grazed when viewed through binoculars.	
062	Private – north	NA - owner recently died. Appeared NS when viewed through binoculars - short, sheep-grazed.	
063	Private – north	Not surveyed. NRW advised that this is NS .	
064	Private – north	NA - owner recently died. Appeared NS when viewed through binoculars - short, sheep-grazed.	
065	Private – north	NA - ownership unknown - appeared NS short, sheep-grazed when viewed through binoculars.	
066	Common – Foel Dyrch	NS species-poor <i>Molinia</i> and <i>N. stricta</i> , with patches of <i>Sphagnum</i> , <i>Vaccinium</i> , <i>C. vulgaris</i> , and no <i>Succisa</i> .	Sheep and pony grazing
067	Common – Waun Isaf (north)	Over 90% of this 10ha block is NS (a strip of gardens and playground at the top; scrub; <i>Juncus</i> , <i>Ulex</i> , and 1.7ha of very short-grazed wet heath where no <i>Succisa</i> was found). 5% is SO wet heath, and 3% SS , with a tiny amount of PR .	Pony grazing
068	Common – Foel Dyrch	NS sheep-grazed common, with very short, species-poor acid grassland and gorse. No <i>Succisa</i> .	Sheep grazing
069	Private – north	NA - owner recently died. Appeared NS when viewed through binoculars	

		- short, sheep-grazed.	
070	Private – north	NA - ownership unknown - appeared NS short, sheep-grazed. when viewed through binoculars.	
071	Private – east of Waun Isaf	NS – typical wet heath 'marsh fritillary habitat' with <i>Sphagnum</i> and <i>Molinia</i> but grazed very short and no <i>Succisa</i> found.	Horse grazing
072	Private – north	NA – ownership unknown	
073	Private – east	Not surveyed. NRW advised that this is NS .	
074 - 079		No field numbers 074-079	
080	Private – north	NA. Not accessible from adjacent field, and NRW advised as NS .	
081	Private – north	Not Accessed – permission refused.	
082	Private – southeast of Cors Tewgyl	PR : <i>Juncus</i> , <i>Molinia</i> with rare <i>Succisa</i> on short-grazed hillocks.	Unknown
083	Private – east	NA - NRW advised that this is NS .	
084	Private – east	NA - NRW advised that this is NS .	
085	Private – east	NA - unable to contact owner, and NRW advised that this is likely to be NS .	Horse grazing
086	Private – southwest of Waun Isaf	NS <i>Juncus</i> -dominated field bordering Waun Isaf, with one tiny patch of <i>Succisa</i> at SN142392991. Property for sale, farmer has moved.	Unmanaged, previously sheep-grazed
087	Common - Waun Isaf	NA - NRW advised that this is NS .	
088	Private – east of Waun Isaf	NS – typical wet heath 'marsh fritillary habitat' with <i>Sphagnum</i> and <i>Molinia</i> but grazed very short and no <i>Succisa</i> found.	Cattle grazing
089	Private – east of Waun Isaf	Mostly NS very short grazed with remains of <i>Molinia</i> tussocks and <i>Juncus</i> but no <i>Succisa</i> found. One small patch of SS .	Cattle grazing
090	Private – east of	Large area of SS with some SO in very wet short-grazed heath.	Cattle grazing

	Waun Isaf		
091	Private – southwest of Waun Isaf	NS neutral grassland with some tussocks along southern edge and a tiny patch of SO .	Cattle and sheep grazing
092	Private – southwest of Waun Isaf	NA with unmapped Good/Suitable habitat - Unable to access field due to dangerous livestock, but marsh fritillary larval webs recorded in 2013. The patch of rough grassland visible on the aerial photograph has been mapped as a .09ha patch.	Cattle and sheep grazing
093	Private – southwest of Waun Isaf	NA with unmapped Good/Suitable habitat - unable to access field due to extremely wet access point, but marsh fritillary larval webs recorded in 2013 and adults in 2014. Scrub and rank wet grassland on northern side.	Light cattle and sheep grazing
094	Private – southeast of Cors Tewgyl	NA - appeared SS when viewed over the fence – undergrazed <i>Molinia</i> with sparse <i>Succisa</i> .	Unknown
095	Private – southeast of Cors Tewgyl	NA - ownership unknown, but viewed over fence and appeared very short-grazed NS .	Sheep-grazing
096	Private – southeast of Cors Tewgyl	NA - ownership unknown, but viewed over fence. <i>Molinia</i> present, may be suitable.	Unknown
097	Private – southeast of Cors Tewgyl	NA - ownership unknown, but viewed over fence. <i>Molinia</i> present, may be suitable. Part of field id'd on Phase 1/2 map is occupied by a small building and scrub/trees.	Unknown
098	Private – south of Waun Isaf	0.24ha of GC , SU and PR habitat with 2014 marsh fritillary larval web records, in otherwise short-grazed neutral grassland with some scrub.	Cattle-grazed. A small SU area has been fenced off and is unmanaged
099	Private – southwest of Waun Isaf	Not surveyed - advised by the site manager that this is Not Suitable .	Scrub clearance
100	Common - Waun Isaf	NA – physically inaccessible.	
101	Private – south	Most is NS dense <i>Juncus</i> , with a	Sheep grazing

	of GB SAC	small patch of GC and SS in northeastern corner.	
102	Private – south of Cors Tewgyll	NS - 85% dense gorse with very short-grazed species-poor neutral grassland between, no herbs.	Sheep and very light pony grazing
103	Private – south of Cors Tewgyll	NS – very short-grazed species-poor neutral grassland and gorse.	Sheep and very light pony grazing

10. Appendix 2: Data Archive

Data outputs associated with this project are archived on server-based storage at Natural Resources Wales.

The data archive contains:

- [A] The final report in Microsoft Word and Adobe PDF formats.
- [B] A full set of images produced in .jpg format.
- [C] A series of GIS layers on which the maps in the report are based

Metadata for this project is publicly accessible through Natural Resources Wales' Library Catalogue <http://194.83.155.90/olibcgi> by searching 'Dataset Titles'.

11. Appendix 3: Acknowledgements

All maps included this report were produced from Ordnance Survey Data under licence to Natural Resources Wales: © Crown copyright and database rights 2014 Ordnance Survey 100019741 / © Hawlfraint y Goron a hawliau cronfa ddata 2014 Arolwg Ordnans 100019741.

All photographs by Deborah Sazer.

Adrian Fowles and Jon Hudson of NRW, along with Pembrokeshire Coastal Park and Butterfly Conservation Wales, provided invaluable assistance in planning the survey and preparing this report. Richard Smith and particularly John Anderton provided substantial support.



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Natural Resources Wales

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