

JULY 2017

GLASTIR MONITORING & EVALUATION PROGRAMME

FINAL REPORT – Annex 11

Quantifying and defining High Nature Value Farmland in
Wales

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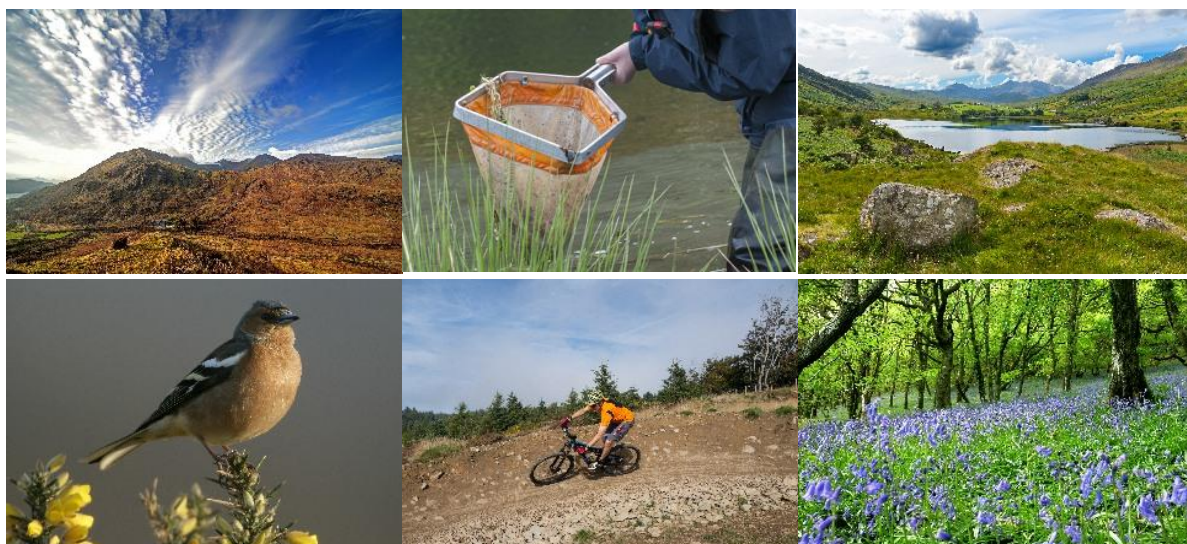
NATURAL ENVIRONMENT RESEARCH COUNCIL



How to cite this report:

Maskell L, Emmett B.E, Henrys P, Jarvis S, Rowland C, Siriwardena G, Botham M, Peyton J, Tebbs E, Williams B, Smart S (2017) Quantifying and defining High Nature Value Farmland in Wales. Annex 11. In: Emmett B.E. and the GMEP team (2017) Glastir Monitoring & Evaluation Programme. Final Report to Welsh Government (Contract reference: C147/2010/11). NERC/Centre for Ecology & Hydrology (CEH Projects: NEC04780/NEC05371/NEC05782)

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Contents

Summary	5
Policy Context and Background	5
Aim	2
Results.....	4
Further work	5
Appendix 1:	8
Appendix 2	10



Summary

The use of HNV as an indicator for Glastir and the RDP is a regulatory requirement. This report provides an update on the development of the HNV indicator for Glastir and the wider Welsh RDP carried out as part of the GEMP project. Repeated rounds of analysis and consultation with stakeholders have resulted in final agreement on the methodological approach to defining the extent and condition of HNV in Wales. In summary, multivariate methods sought to test the fundamental hypothesis that amount of semi-natural habitat (Type 1 HNV) and habitat diversity and complexity (Type 2 HNV) could explain gradients in biodiversity across Wales.

In April 2016 a meeting between stakeholders and GMEP scientists considered draft results from the analysis. A series of actions was agreed that when implemented would bring the sub-project to the point of sign-off. Two are still outstanding and are recommended as part of a subsequent phase of work. They are a) incorporating contemporary distributional data for rare species from the Wales Local Environmental Record Centres in the definition of Type 3 HNV, b) further consultation and discussion with NRW regarding the identity of Type 3 species and elaborating further options for mapping connectivity and resilience.

The definition and mapping of Type 1 and 2 HNV is complete. Applying the analysis to the whole of Wales gives an estimate of approximately 15% of land as Type 1 HNV and 15% as Type 2 with an overlap of 2%, hence 28% of Wales in total is Type 1 or 2 HNV farmland. Note that the cut-off point separating HNV from non-HNV is essentially arbitrary since the underlying ecological gradients that have been used to define HNV are continuous in nature. The overall percentage areas derived here, strike a compromise. Too stringent a definition would risk assigning only those 1km squares with the highest habitat complexity and highest amounts of semi-natural habitat to HNV. Such areas would have less scope for improvement in condition resulting from mechanisms such as Glastir intervention, whilst logically excluding other areas that would be responsive to intervention. Whilst we have estimated the extent of HNV Type 1 and 2 at the national scale, the approach ought to be able to accommodate regional variation. To this end a prototype HNV exploration tool was produced (Appendix 2). This is a web-based application that would allow users to explore the impacts of adjusting cut-off values for variables that define HNV on the extent and location of HNV in their region of interest.

Policy Context and Background

HNV farmlands have been defined as *'areas in Europe where agriculture is a major (usually the dominant) land use and where that agriculture supports or is associated with either a high species and habitat diversity or the presence of species of European concern or both'* (Anderson et al 2003)¹.

¹ Andersen E., Baldock D., Bennet H., Beaufoy G., Bignal E., Brower F., Elbersen B., Eiden G., Godeschalk F., Jones G., McCracken D.I., Nieuwenhuizen W., van Eupen M., Hennekes S., Zervas G. (2003). Developing a high nature value indicator. Report for the European Environment Agency, Copenhagen.

In the 2014-2020 period the European Commission Common Monitoring and Evaluation Framework (CMEF) was extended to cover the CAP as a whole, and HNV farming is included as an impact indicator (baseline plus updates). It is also one of the context indicators used in drawing up the territorial analyses around which RDP strategies for 2014-2020 are based.

The HNV indicator (2014-2020) is defined as the "% of Utilised Agricultural Area farmed to generate High Nature Value" with the Estimated area of HNV farmland given as a supporting indicator². HNV farming is the only CAP impact indicator for which there is no common methodology explicitly provided at the EU level. Each Member State or Managing Authority uses data and methodologies appropriate to their specific situation. This flexible system allows Member States or regions that have more sophisticated data series, collection methods or capacity, to make full use of them thereby taking into account different physical, historical and political contexts.

Aim

Through the Glastir Monitoring and Evaluation Programme (GMEP) the Welsh Government has been developing an indicator for HNV farmland in Wales. The principal objective was to define baseline extent of the three types of HNV. In doing so however, data and methods needed to also account for the need to report on changes in extent and condition and to develop a method that can be repeated over time. The implication is that the approach should allow HNV extent to be defined as a spatially explicit proportion of Welsh land area but also that the variables used to define HNV are widely available and continuous so that changes can be measured for the whole of Wales along ecological gradients of biodiversity response and ecological driving variables.

Over the past two years agreement was reached regarding the conceptual approach to deriving an HNV indicator. It was agreed that:

- The approach should be simple
- That the term HNV farmland should be used rather than HNV farming i.e. not including farming system in the definition.
- That HNV should be defined on the basis of biodiversity but the coincidence of HNV should be tested with Natural Capital and ecosystem service indicators
- The stakeholders and GMEP project team were asked to propose criteria and datasets that might contribute to an indicator.

HNV farmland (e.g. Andersen *et al* 2003¹) can be classified into 3 types and each of these implies that a different suite of metrics will be important.

Type 1: Farmland with a high proportion of semi-natural vegetation

Type 2: Farmland with a mosaic of habitats and/or land uses

Type 3: Farmland supporting rare species or a high proportion of European or world populations

Not HNV: Typically areas dominated by intensively managed land.

Methodological Approach

The approach comprised 3 sequential steps:

Step 1: Agree on which metrics of biodiversity were of primary interest to the community and identify those for which relevant data existed. A long list of possible metrics related to habitat structure and species diversity were proposed and the data availability and accessibility of these

² http://ec.europa.eu/agriculture/cap-indicators/context/2015/2015-10-01-context-indicators_en.pdf

were explored. The results indicated few metrics were available which would allow for consistent change mapping at a national scale.

Step 2: Statistical approaches were used to identify individual metrics which best explained spatial variation among the set of biodiversity metrics. For this work we primarily used data from the GMEP project as this has co-located fine-scale spatial data for most metrics of interest. To do justice to the multi-faceted nature of biodiversity and its correlated factors, multiple variables needed to be compiled and their inter-relationships explored. The multivariate nature of the analysis means that many possible correlations can arise but our approach to the problem was guided by the two basic hypotheses associated with each of two types of HNV. That is the proportion of semi-natural habitat (Type 1) and complexity of habitat, land-use and landscape features (Type 2) correlate with biodiversity. So while many variables can be assembled, each can be associated with either of these hypotheses playing the role of a response or explanatory variable. The starting point was to conduct analysis at the resolution of vegetation quadrats and mapped features within the GMEP 1km squares. At this resolution ecological relationships ought to emerge more clearly because of the precise spatial coupling of measurements and the greater range of variables that could be analysed. We used data from GMEP baseline measurements covering mapped habitats (broad and section 8 priority habitats, hedgerows, trees, streams), plants (including Common Standards Monitoring indicators of habitat condition, woodland and wetland plants), and bird and pollinator numbers and diversity (bees, butterflies, rare invertebrates) counted within the squares. Data was analysed using multivariate techniques (CCA/RDA) to test for correlations between biodiversity, habitat composition and diversity including connectedness. See Appendix 1 for a full list of the biodiversity response variables and habitat-related explanatory variables used in the analysis of GMEP data.

Results

Analysis supported the two key hypotheses that habitat complexity and amount of semi-natural habitat are correlated with biodiversity. Interestingly these two groups of explanatory variables were expressed along two separate gradients. Thus GMEP 1km squares can be placed in two dimensions according to their position on a gradient of land-use intensity and habitat complexity (Fig 1).

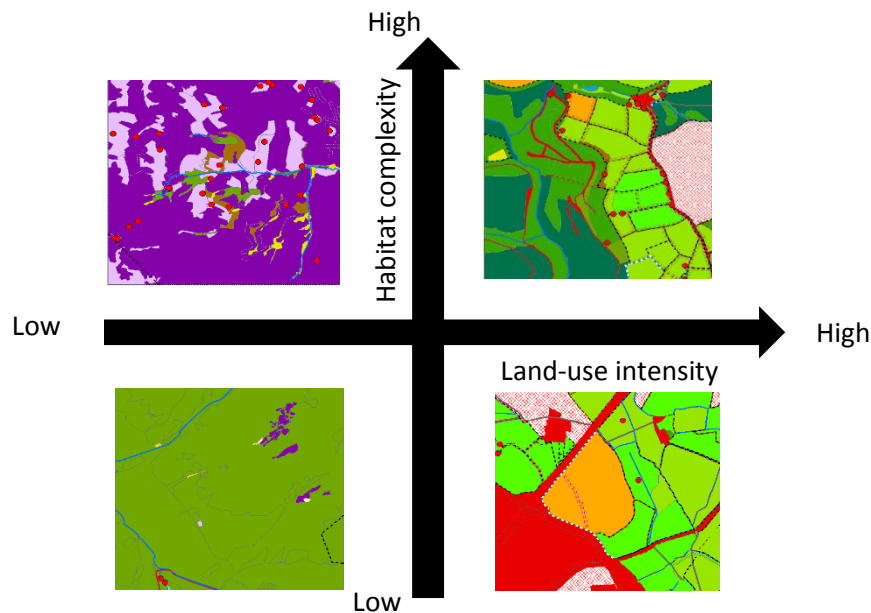


Figure 1: Depiction of the two gradients that define HNV farmland in Wales. Habitat maps from GMEP 1km squares are shown as examples of the kind of landscape mosaics associated with the four corners of the ecological space defined by these two gradients.

Step 3: Based on the analysis of the GMEP 1km squares we scaled up to a national map of all 1km squares in Wales. This was accomplished using statistically significant variables from step 2, which represented the two axes of habitat complexity and land use intensity but where the datasets representing each axis were available for all 1km squares as opposed to just GMEP field survey squares: The variables are:

- Wetland connectivity
- Grassland connectivity
- Heathland connectivity
- Broadleaved woodland connectivity
- % of semi-natural Habitats
- Rare and occasional soils
- Density of hedgerows
- % of Improved land
- Habitat diversity

Data comes from the Land Cover Map, the soil survey of England and Wales (NATMAP) and the NRW Phase 1 survey i.e. all nationally available data sources. Connectivity between

habitats was determined by calculating the distance between habitat patches of the same type i.e. woodland, wetland, grassland, heathland and averaging over the 1km square.

Building on this analysis the Working Group propose that:

Type 1: “Farmland with a high proportion of semi-natural vegetation” is linked to the metrics associated with land use intensity;

Type 2: “Farmland with a mosaic of habitats and/or land uses” is linked to metrics associated with habitat complexity;

The distribution of these can be seen in the two maps below (Figure 2).

For Type 3: “Farmland supporting rare species or a high proportion of European or world populations” we propose using the maps created using the Glastir target layers for rare species (Figure 3a) and habitats (Figure 3b), combining the distribution of these species and habitats with the scores for those species in the Glastir advanced scheme. However, further work is needed to incorporate up-to-date species distributional data at optimal resolution. Since the focus is on rare species, datasets from the Wales Local Environmental Record Centres should be fully exploited to increase the accuracy and realism of a map of Type 3 HNV.

From these maps the area of land under Type 1 and 2 HNV can be calculated and it is approximately 28% of land in Wales. These maps can be considered the final output of this phase of the HNV project. It is perhaps more useful for interpretation if the maps shown below are provided separately as the HNV types are very different, however, they could be merged to produce one map and a single figure.

The maps were produced by using species data from the Glastir Monitoring and evaluation programme field survey in 2013 and 2014 as response variables and scaling nationally using remotely sensed data primarily from the Land Cover Map 2007 although some phase 1 data from NRW which is older was also used for Heathland and wetlands.

Condition (i.e. impact indicator) will be assessed by using updated field survey data in association with updated remotely sensed data (Land Cover Map 2015 is being produced currently and the intention is for it to be part of a rolling programme of production with updates using the new sentinel satellite). The new data can be added into the analysis and the HNV indicator re-calculated to compare with the baseline.

Further work

The members of the HNV Working Group have highlighted further fruitful areas of work that could be considered in subsequent phases. These include:

- Exploration of additional connectivity and resilience mapping options based on species selected in consultation with NRW experts.
- Further development of a prototype web application (Appendix 2) that allows users to explore the impact of altering values of input variables that currently define HNV on the spatial extent and location of HNV in Wales.
- Incorporation of contemporary high resolution species records from Wales LERC into the definition of Type 3 HNV farmland.

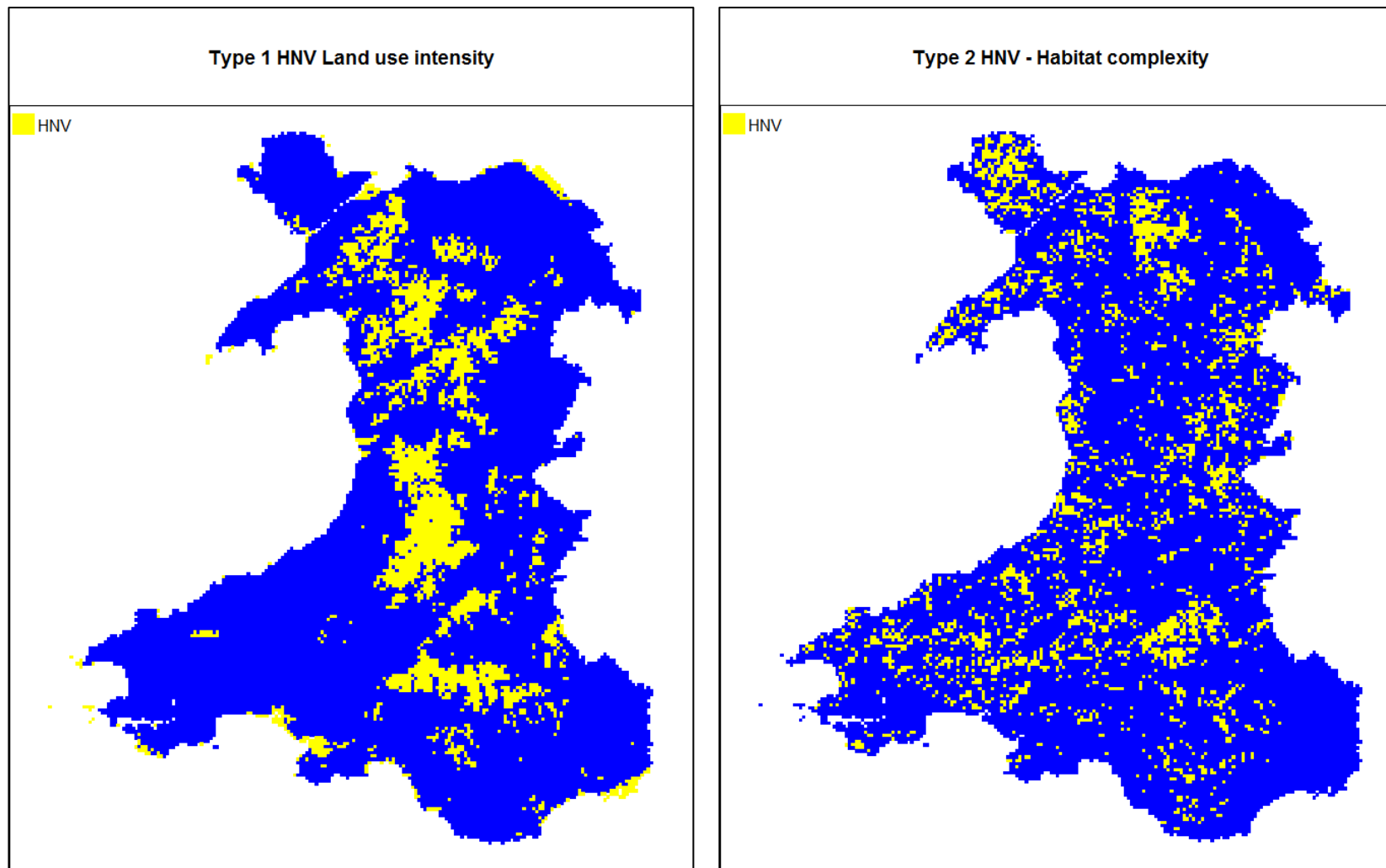


Figure 2: Draft maps of High Nature Value farmland in Wales a.) Type 1; a high proportion of semi-natural land, low land-use intensity and b.) Type 2; complex habitat structures, high habitat diversity, woodland connectivity, hedgerows.

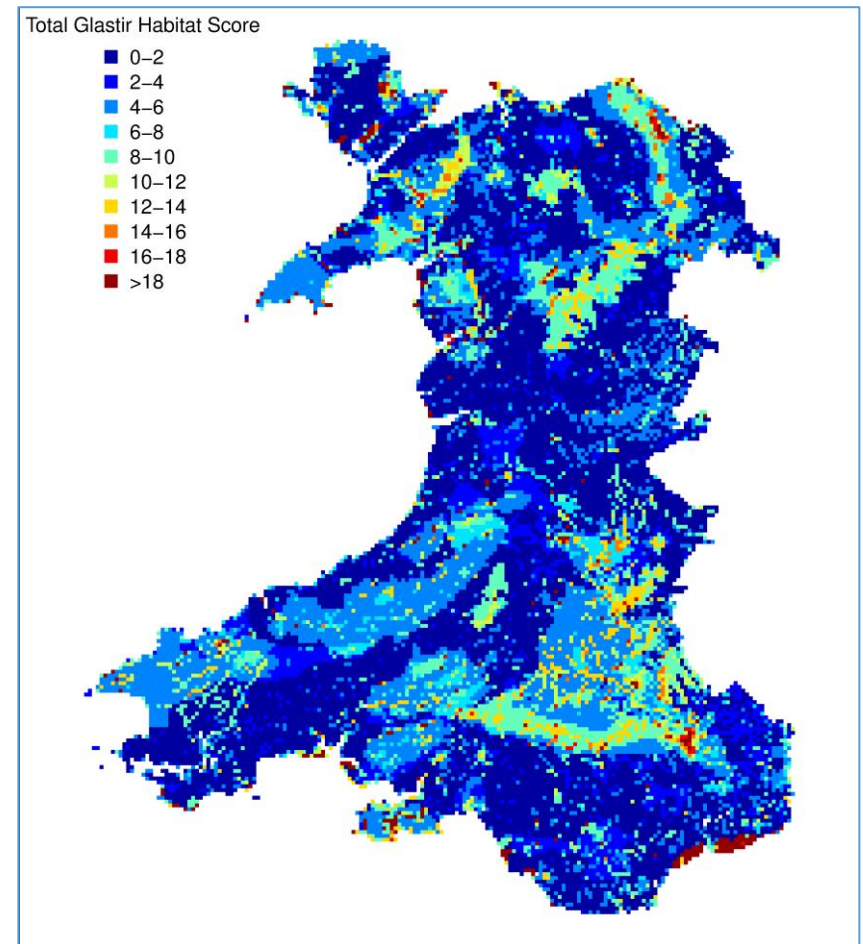
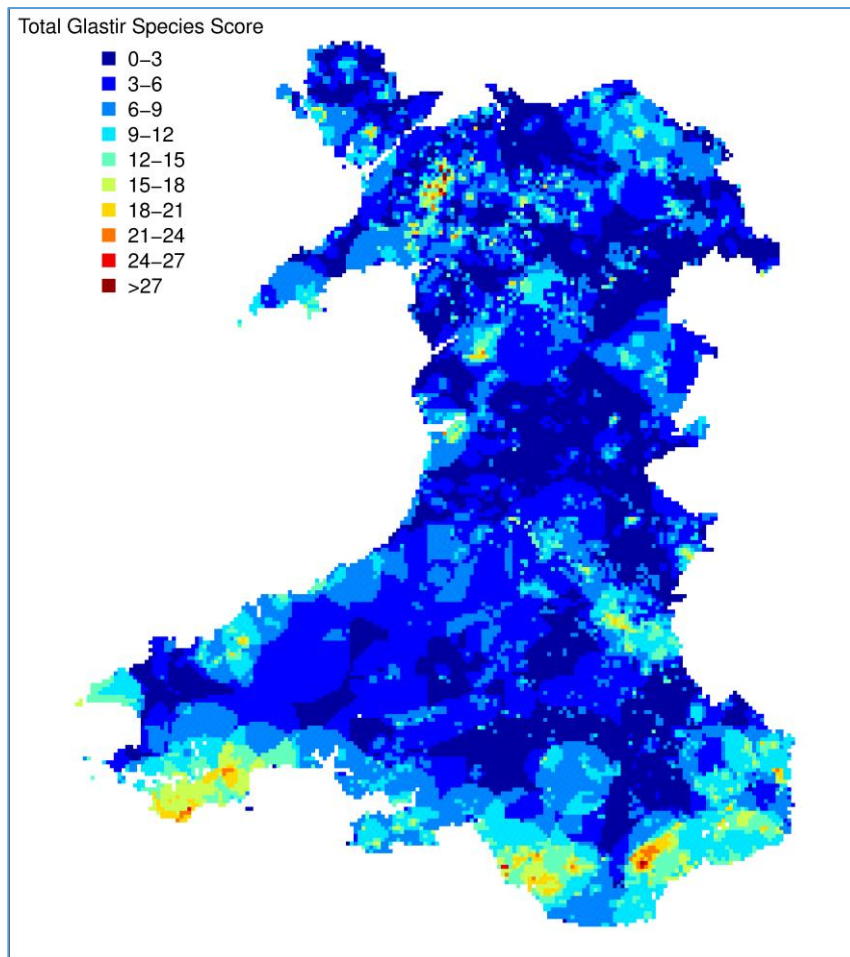


Figure 3: Draft maps of Type 3 High Nature Value farmland in Wales created using the Glastir advance target layers of species/habitats and their scores within the Glastir advanced scheme a) species, b) habitats.

Appendix 1: Variables used in the analysis of GMEP survey data to define Types 1 and 2 HNV.

Table 1. Explanatory variables related to habitat structure, extent, complexity and land-use.

Variables (1km sqr)	Source
Broadleaved woodland connectivity	Calculated using LCM2007 and the Conefor program
Wetland connectivity	As above
Heathland connectivity	As above
Semi-natural grassland connectivity	As above
Visual Quality Index	See Gmep year 1 and 2 reports
Shannon diversity index (GMEP)	Abundance-weighted diversity of field mapped habitats (section 8 and broad)
Shannon diversity index (GMEP)	Abundance-weighted diversity of LCM2007 habitats
Patchsize	Mean size of polygons
Habrigh	Number of habitats
habwoodpatch	Mean size of broadleaved woodland polygons
propwood	% broadleaved woodland
propImp	% improved grassland
propwet	% wetland
sumWUS	Total mapped length of managed woody linear features
sumWNS	Total mapped length of woody linear features of natural shape
sumIW	Total mapped length of woody linear features
soilshan	Abundance-weighted diversity of soil types
RareOccpro	% rare soil types
propSN	% total semi-natural habitat
pigs	Number of pigs (AgCensus data)
Totalsheep	Number of sheep (AgCensus data)
Horses	Number of horses (AgCensus data)

Table 2. Response variables related to biodiversity.

Variable (1km sqr)	Source
meanPlantsall	Mean richness of vascular plants and selected bryophytes in GMEP quadrats
meanAWIall	Mean richness of vascular plants and selected bryophytes in GMEP quadrats
meancsmPall	Mean richness of vascular plants and selected bryophytes in GMEP quadrats
SpShanndiv	Abundance-weighted diversity of plant species in GMEP quadrats
avgwetCSM	Mean richness of Common Standards Monitoring positive indicator species in GMEP quadrats
woodBflyrich	Count of woodland butterfly species
woodBflyabun	Total numbers of woodland butterflies
Wbirdcount	Total number of woodland birds
but_div	Butterfly species richness
bee_div	Bee and hoverfly group richness
N_bee	Total number of bees and hoverflies
N_pollinator	Total numbers of pollinators
sec42_sp	Count of section 42 (now section 8) butterfly species
Farmbirdcount	Total number of farmland birds

Appendix 2: Prototype web-based application to explore the definition and extent of HNV farmland in Wales.

