

Developing results-based approaches to supporting the management of common land in Wales – vol. 1: main report

Gwyn Jones, Helen Barnes, Catherine Hughes, Joe Daggett, Tony Little & Nigel Ajax-Lewis



Mynydd Llangatw. Image: Gareth James, Creative Commons Licence



European Forum on
Nature Conservation
and Pastoralism

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European Forum on Nature Conservation and Pastoralism
Penygraig, Llanfair Clydogau, Lampeter SA48 8LJ

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List of abbreviations

AECM	Agri-Environment and Climate Measure
BBNP	Brecon Beacons National Park (Authority)
BPS	Basic Payment Scheme
CCW	Countryside Council for Wales
CDO	Commons Development Officer
CL	Common Land Unit (unit of commons registration)
CM	Cwm a Mynydd LAG
CAP	Common Agricultural Policy
CSM	Common Standards Monitoring
EU	European Union
FRS	Fire and Rescue Service(s)
FUW	Farmers' Union of Wales
GM	Gross margin
GPS	Global Positioning System
HNV	High Nature Value
IACS	Integrated Administration and Control System
JNCC	Joint Nature Conservation Committee
LAG	Local Action Group
LPIS	Land Parcel Information System
LU	Livestock Unit (1 LU is the equivalent of one cow)
NFU	National Farmers' Union
NGO	Non-governmental organisation
NM	Net margin
NPT	Neath-Port Talbot County Borough
NRW	Natural Resources Wales
NSA	National Sheep Association
NVC	National Vegetation Classification
RACT	Rural Action Cwm Tâf LAG
RBAPS	Results-based agri-environment payment scheme (and EU pilot relating to the same)
RCT	Rhondda-Cynon-Tâf County Borough
RSPB	Royal Society for the Protection of Birds
SAF	Single Application Form
SFS	Sustainable Farming Scheme
SMS	Sustainable Management Scheme
WG	Welsh Government
WW	Welsh Water

Executive summary

This is the final report of a LEADER cooperation project supported by six Local Action Groups (LAG) in mid and south Wales and by Natural Resources Wales (NRW) to develop a testable results- or outcomes-based approach to supporting the sustainable management of common land.

Unlike most, if not all, previous projects to develop results-based payments in both the UK and Ireland, it was not focussed largely on biodiversity but rather aimed to cover the whole spectrum of public goods, reflecting the Welsh Government's stated intention to direct all of its future funding for farming through a single Sustainable Farming Scheme. Our proposal is however, with very minor modifications, suitable for consideration as an alternative approach to the current Glastir Commons.

The public goods we considered in the project were:

- Carbon storage and sequestration
- Biodiversity
- Water flow regulation
- Water quality
- Fire risk management
- Landscape
- Public access and recreation, and public health
- Protection of archaeological and historical remains
- Animal health and biosecurity
- Safeguarding of skills and other intangible resources

Of these, we consider the first four to be amenable to a general area-based outcomes-focussed approach. The others are either too amorphous to be easily incorporated (landscape; skills) or are too specific to particular sites (archaeology; arguably, public access) or have too strong a spatial element unique to each area (fire risk management; possibly, public access) or are only weakly linked to the management of the land per se (animal health and biosecurity). This is not to say that some of these may not be amenable to results-based approaches, but these cannot easily be made area-based. In the report, we suggest complementary actions to address those public goods and recommend mandatory complementary fire risk management and animal health and biosecurity plans to accompany the scorecard-based payments.

Having consulted official publications and spoken to statutory bodies, we found that despite some of the public goods needing a particular focus on spatial considerations, it is possible without much difficulty to formulate a coherent vision which can accommodate each public good without the need for significant compromise. Indeed, the delivery of such public goods is not only compatible with continued grazing of common lands, but is made much easier by the better management of such grazing. It was gratifyingly easy to make a case for support which did not revolve around the idea of just doing less.

Our aim was to produce a single seamless scoring methodology which is internally coherent in terms of the signals it gives and the rewards it offers. The scorecard gives points on a scale from 0-10 for positive aspects of the condition of the common and takes points away for damaging or negative aspects of management. The points available in practice to any particular land type are modulated

to the size of the payment corresponding to the scale of points – land types managed with higher densities of livestock generally attract higher scores, all else being equal.

In contrast to the current approach in Wales, the payment rationale was based on additional costs, not income forgone. We considered this not only a reflection of the reality on many commons (abandonment or under-management), but essential if the payments are to indicate who should be supported on a common, viz. those incurring the costs by being active.

While the payments linked to the results-based score should cover the day to day costs of the management needed, incorporating each and every possible cost would be impractical and insufficiently targeted to be good value for money. We therefore see the need for complementary ‘capital works’ funding.

The results-based approach envisages a different pattern of interaction between the participant and other actors – the traditional roles of advisor and administrator/inspector would not survive unchanged (Section 11.1); we reflected on the options.

We recognise that working together on commons is a unique challenge not faced by the sole use farmer, one which can easily stifle participation in Government schemes. In the past, this necessitated the creation of a team of Commons Development Officers. Our strong impression is that a similar service will be needed again, and not only to secure entry into the scheme, but to a lesser extent on an ongoing basis, contributing to and facilitating capacity-building amongst the graziers and commons associations themselves. We find the mixed Irish model, with its project officers and advisors, convincing, albeit without the compulsory use of an advisor which is traditional over there. Regardless, it is essential that the process of accessing the scheme has no cost for commons associations and that support for this preparation work is not contingent on deciding at the end of it to enter the scheme.

Finally, we drew up a list of uncertainties which we recommend should be the subject of further investigation in any piloting of the approach.

As this phase of the work drew towards its conclusion, WG produced a further roadmap for scheme development to replace BPS and Glastir (Welsh Government 2021). The section on commons reads:

The consultation highlighted the important role of common land and that it should receive greater attention and consideration in terms of how common land is effectively managed and protected. Through our further engagement on the scheme proposals we will ensure the needs of those with common land rights are taken into account and that they will have fair access to the future scheme.

In terms of the specific proposals on common land there were limited responses. We will work to develop the evidence base with stakeholders in this area before taking forward legislation.

This project aims to help fill that gap and to ensure that, for the first time ever, commons are at the vanguard of policy development, not merely an uncomfortable afterthought.

Crynodeb gweithredol

Dyma adroddiad terfynol prosiect cydweithredu LEADER a gafodd nawdd chwe Grŵp Gweithredu Lleol yn ne a chanolbarth Cymru yn ogystal â Chyfoeth Naturiol Cymru er mwyn datblygu dull talu-am-ganlyniadau parod i'w beilotu sydd â'r nod o gefnogi rheolaeth gynladwy tiroedd comin.

Yn wahanol i'r rhelyw o'r prosiectau a ddaeth o'i flaen i ddatblygu taliadau am ganlyniadau, os nad y cwbl ohonynt, a ph'un ai yn lwerddon neu'r Deyrnas Gyfunol, nid edrych ar ystyriaethau bioamrywiaeth yn bennaf a wnaeth y gwaith. Yn hytrach, rhaid oedd cymryd i ystyriaeth y sbectrwm gyfan o nwyddau cyhoeddus os am adlewyrchu bwriad Llywodraeth Cymru i sianelu y cwbl o'r arian a ddaw i amaethyddiaeth yn y dyfodol trwy un Cynllun Ffermio Cynladwy. Serch hynny, gellir gweld ein hargymhellion fel ffordd i wella ar y Glastir Tir Comin presennol yn unig, heb ond un neu ddau newid angenrhaidd.

Ystyriwyd y nwyddau cyhoeddus canlynol yn y prosiect:

- Secwestru a storio carbon
- Bioamrywiaeth
- Rheoli llif dŵr
- Ansawdd dŵr
- Rheoli'r risg o dân
- Tirwedd
- Mynediad cyhoeddus a hamddena, a iechyd cyhoeddus
- Gwarchod olion archaeolegol a hanesyddol
- Biolddiogelwch a iechyd da byw
- Gwarchod sgiliau ac anoddau anniriaethol

O'r rhain, ystyriwn y pedwar cyntaf yn addas i'w cynnwys mewn cynllun cyffredinol talu-am-ganlyniadau sy'n seiliedig ar arwynebedd. Mae'r gweddill un ai'n rhy annelwig i'w cynnwys yn ddi-ffwdan (tirwedd, sgiliau) neu'n gwahaniaethu gormod rhwng safleodd pennodol (archaeoleg a, mi ellid dadlau, mynediad cyhoeddus) neu ag elfen ofodol gref sy'n unigryw i wahanol diroedd comin (rheoli risg tân; mynediad cyhoeddus, mwy na thebyg) neu â chysylltiad gwan braidd â rheolaeth y tir (biolddiogelwch a iechyd da byw). Nid nad oes elfen o'r nwyddau hynny nas gellid talu amdanynt ar sail canlyniadau, ond anodd fyddai gwneud hynny bob yn hecтар. Yn yr adroddiad, argymhellwn noddi gweithredu cydategol er mwyn mynd i afael â'r nwyddau cyhoeddus hynny; yn bennodol, ariannu cynllunio cydategol (gorfodol os am hawlio'r taliadau ar sail arwynebedd) ar gyfer rheoli risg tân ac ar gyfer biolddiogelwch a iechyd da byw.

O astudio cyhoeddiadau swyddogol a siarad â chyrrff statudol, ystyriwn y gellir, heb fawr o drafferth, lunio gweledigaeth gyson-ystyrlon sy'n dod â'r holl nwyddau cyhoeddus ynghyd, a hynny heb fawr o gyfaddawdu, dim ond i anghenion gofodol neilltuol rhai ohonynt gael sylw pennodol. Yn wir, nid yn unig y mae delifro'r nwyddau cyhoeddus yn bosib tra'n parhau i bori tiroedd comin, ond mae rheolaeth dda o bori yn gwneud hynny'n rhwyddach. Yr oedd yn bleserus o rwydd i lunio achos dros gael cefnogaeth nad oedd yn cymryd yn ganiataol mai gwneud llai oedd ei angen.

Ein nod oedd datblygu un methodoleg sgorio di-fwlch, sy'n cyfleu negeseuon cyson trwy ei eriad a'i daliadau fel ei gilydd. Mae'r garden sgorio yn rhoi pwyntiau ar raddfa o 0-10 i wobrwyo agweddau

positif o gyflwr y comin, ac yn tynnu pwyntiau am agweddau negyddol neu ddifrodol o'i rheolaeth. Mae'r pwyntiau sydd ar gael ar gyfer gwahanol fathau o dir yn dibynnu ar faint y taliad sy'n cyfateb i'r gwahanol bwyntiau – os yw popeth arall yr un peth, byddai tir sydd angen fwy o'i bori fel arfer yn cael taliad uwch.

Yn wahanol i'r system bresennol yng Nghymru, mae ein taliadau wedi'u hadeiladu ar sail costau ychwanegol yn hytrach nag incwm a ildwyd. Ystyriwyd hynny'n well adlewyrchiad o'r sefyllfa ar lawer comin (dim pori neu dan-reoli), ond hefyd yn anhepgor os am gyfleu'n glir pwy ddylai gael eu talu, hynny yw, y rhai sy'n talu costau drwy wneud gwaith ar y comin.

Tra dylai'r taliadau sydd ynghlwm wrth y sgôr talu-am-ganlyniadau gyfateb i faint y costau dydd-i-ddydd, byddai cynnwys pob cost posib yn anhylaw ac yn ffordd aneffeithiol iawn o dargedu cyllid cyhoeddus. Gwelwn yr angen am ariannu 'gwaith cyfalaf' cydategol.

Mae'r dull talu-am-ganlyniadau o weithio yn gofyn am batrwm cryn wahanol o ryngweithio rhwng y rhai sy'n cymryd rhan a'r actorion eraill – byddai'r swyddogaethau cynghori a gweinyddu/arolygu traddodiadol yn newid tipyn (adran 11.1); yr ydym yn ystyried rhai o'r opsiynau.

Cydnabyddwn bod cyd-weithio ar gomin yn sialens tra gwahanol i'r un sy'n gwynebu amaethwr unigol ar ei fferm – un a all yn rhwydd gyfyngu ar gymryd rhan yng nghynlluniau'r Llywodraeth. Yn y gorfennol, rhaid oedd creu tîm o Swyddogion Datblygu Tir Comin o'r herwydd. Credwn yn gryf byddai rhaid creu rhywbeth tebyg unwaith eto, nid yn unig i sicrhau bod y cynllun yn llwyddiant ond, i ryw raddau wrth fynd ymlaen, i helpu a chefnogi codi capasti'r cymdeithasau pori a'r porwyr unigol. Yr ydym yn gweld cryfderau model cymysg lwerddon, gyda'i swyddogion prosiect a'i gynghorwyr, ond yn gwrthod y defydd gorfodol o gynhorwyr a ddaeth yn draddodiad yno. Ta beth, mae hi'n hanfodol nad oes unrhyw gost i'r porwyr o gymryd rhan mewn cynllun o'r fath ac nad yw'r gefnogaeth ariannol i'r gwaith paratoi yn dibynnu ar gymryd rhan yn y cynllun yn y pen draw

Yn olaf, lluniwyd rhestr o'r pethau yr ydym yn ansicr yn eu cylch – pethau yr argymhellwn mynd i afael â hwynt tra'n peilotu'r cynllun.

Wrth i'r rhan yma o'r gwaith ddod i ben, cyhoeddwyd Blaengynllun sy'n cynnwys ei bwriadau ym maes datblygu cynllun newydd yn lle'r Taliad Sylfaenol a Glastir (Llywodraeth Cymru 2021). Dyma'r adran sy'n ymwneud â thir comin:

Amlygodd yr ymgynghoriad rôl bwysig tir comin ac y dylai gael mwy o sylw ac ystyriaeth o ran sut y caiff ei reoli a'i ddiogelu'n effeithiol. Drwy drafod cynigion y cynllun ymhellach, byddwn yn sicrhau bod anghenion y rhai sydd â hawliau tir comin yn cael eu hystyried ac y byddant yn cael mynediad teg i'r cynllun yn y dyfodol.

O ran y cynigion penodol ar dir comin, prin oedd yr ymatebion a byddwn yn gweithio i ddatblygu'r sylfaen dystiolaeth gyda rhanddeiliaid yn y maes hwn cyn cyflwynodeddfwriaeth yn hyn o beth.

Amcan y prosiect oedd llawn'r blwch hynny ac i sicrhau bod tiroedd comin, am y tro cyntaf erioed, wrth flaen y gad wrth ddatblygu polisi. Dyna'r unig ffordd i osgoi problemau lletchwith yn y dyfodol.



Figure 1. Looking over to the Blorenge from Coity and Mynydd James (Photo: Gareth James, Creative Commons Licence)

Acknowledgements

The project took place in a very challenging time of Covid and only got to the finish line with the help a number of individuals and organisations whose help we must recognise at the start of this report. Some were responsible for securing our funding from the six LAGs and NRW; some gave invaluable expert input; others introduced us to key graziers. Although most non-graziers interacted with us as part of their job, we thank them for choosing to be engaged and supportive when some chose otherwise.

We want to single out one individual by name – Hamish Osborn of NRW and chair of the Swansea LAG. His enthusiasm and support, especially when things were at their most challenging, has been unflinching and inspirational and this project wouldn't have got to where it has without him.

But most of all we thank the graziers of South Wales who, without any financial reward, gave us some time in their busy schedule to listen patiently and interestedly to us talking about a topic they had never heard about. You are poorly understood and inadequately supported; hopefully this work will be one step towards getting the encouragement and reward you deserve.

1 Introduction

This is the final report of the LEADER and NRW funded project on results-based approaches to supporting the sustainable management of common land, which ran from October 2020 to October 2021. The aims of the project were:

- 1) To evaluate, adapt and build on existing results-based approaches to supporting positive management on commons so that they can potentially be used in any ‘tests and trials’ programme set up by the Welsh Government (WG) as part of the development process of the new Sustainable Farming Scheme (SFS)
- 2) To set out the possibilities and limitations (ecological, technical agricultural, socio-economic, organisational, legal) on results-based approaches as a general mechanism for supporting positive management on common land, empowering, encouraging and increasing the viability of active management by graziers and better delivering on a range of ecosystem services for the taxpayer

The report first outlines some of the underlying rationale for the project – the pros and cons of the agri-environment traditional prescriptive approach and the immediate policy context. It then describes the practicalities of the process we followed. It touches on the limitations forced upon us by Covid and how we tried to work around them. It then looks at general principles which should guide the design of results-based payments, focussing in particular on aspects peculiar to common land.

We turn then to a general description of the common land within the study area through both the public goods and the farming lenses.

After that, we describe what is at the heart of the project – how we went about designing a set of scorecards which have the potential to be applicable and useful on any and all of the area’s commons and potentially throughout Wales as a whole. What are the potential public goods targets, are there conflicts between them and if so, how can they be resolved? How can their quality or level of delivery be measured in a simple, repeatable way?

An essential complement to the scorecards is the set of payment rationales and the payment matrix which was developed on those foundations.

We then look at issues of process and delivery. First we describe how very different a results-based scheme feels to those involved compared to traditional action-based approaches. This is particularly the case for commons, where the forward-looking commitments of prescription-based undertakings pose a real challenge for graziers’ associations. Results-based approaches offer the potential for release from such difficulties, but doing so requires a well-supported, firmly-guided process of working out a protocol for allocating money and responsibilities on each individual commons.

Finally, we look forward to a potential tests and trials phase, setting out some of the challenges which would need to be faced and uncertainties needing further work.

2 What is a results-based approach to agri-environment and what is its possible relevance to Wales?

All agri-environment policy should be designed to deliver some kind of 'result'. Only the most cynical of policy-making would not attempt to ensure that those 'outcomes' did not include the better maintenance or enhancement of specific target habitats and/or of the populations of certain target species and/or the encouragement or discouragement of certain beneficial or negative agricultural practices. In this fundamental sense, all policy is to some degree results-based and any attempt at increasing the effectiveness of policy concerns itself with increasing the delivery of those outcomes achieved for each unit of public expenditure. Indeed, the Environment Act places everyone in receipt of WG funds under its biodiversity obligations.

The usual way in which the terms 'results-based' or 'outcomes-based' are deployed in discussions of policy is about something rather narrower. They refer to one particular approach by which Government tries to ensure that effective delivery of its policy objectives, an approach where the farmer him or herself is rewarded according to his or her success in delivering specific aspects of the desired outcomes.

Every agri-environment policy implies a co-delivery process by farmer and civil servant in which the farmer somehow does things or avoids doing things which it is hoped will deliver certain improvements in habitat condition or species viability. The traditional approach – nowadays called prescriptive or action-based – takes the following logic:

- a) State chooses target
- b) State works out in detail what the target needs
- c) State works out what actions or cessation/reduction in actions will address those needs and deliver a better outcome
- d) State writes those down as a set of rules
- e) Farmer undertakes to follow those prescriptions to the letter (or refuses to enter the scheme)
- f) State checks compliance with the rules (which becomes in practice its over-riding concern)
- g) Achieving of result is checked by a monitoring and evaluation process, but this happens over the overall cycle and only slowly filters back into measure design
- h) One-off variations in the prescription are rare and very difficult to obtain, because the rules in a very real sense *are* the scheme

This approach is seen by the advocates of a more results-based approach as having at least three fundamental weaknesses:

- 1) It requires more knowledge on the part of Government than is often available; it requires it at the start of the process and it is difficult to adapt once broader or better knowledge becomes available.
- 2) Once the rules are in place, they move day to day from being an environmental policy delivery issue to being a matter for an inspectorate charged with catching non-compliance and fraud and with recovering funds; delivery of the higher policy outcome in practice ceases to be a concern, while breaches are not considered in the context of their impact on

delivery. (Concern for 'outcomes' is relegated to a monitoring and evaluation process which is highly inefficient in terms of feeding back timeously into policy)

- 3) The farmer is nothing more than an agent for the delivery of the prescriptions; there is little or no room for the use of experience or knowledge, even in consultation with the State

The unintended consequences flowing from these weaknesses include:

- NRW staff bemoaning the lack of flexibility and poor outcomes
- NRW staff bemoaning the lack of a positive tool with which to engage with farmers
- Farmers bemoaning poor outcomes, sometimes outcomes very different to the ones for which they understood the scheme to be aiming
- A quest for the route of least resistance which brings the most money for the least disruption to the status quo, with farmers 'working round' the measures, 'sacrificing' certain fields in order to avail themselves of the funding (something even more likely when 'targeting' means a shift away from the whole farm approach). However, for those who can manage, the scheme is potentially easy money.
- Horrendous stories of penalties applied in ways which make little sense (and in circumstances which have no bearing on delivery of the policy objectives), where appealing is seen as asking for more frequent and rigorous inspection

The results-based approach is different in a number of key ways:

- a) State chooses target (it is not an approach where 'farmers choose what they want to get paid for' – we are still distributing scarce public funds)
- b) State works out in detail what the target needs
- c) State sets out, in a descriptive and if possible quantified way, what it wants the farmer to work towards (and away from), using surrogate indicators where appropriate, set within the lightest touch framework of prescriptive rules possible given the sensitivities of the target
- d) State links the scorecard to a payment matrix which sets appropriate signals over the whole range of possible scores
- e) Farmer chooses the level of aspiration which has the right balance of undertaking and reward and chooses how to respond day to day in terms of management choices etc.
- f) State gets annual quantified feedback on state and trends of the habitat through the scoring process
- g) Monitoring and evaluation is focussed on ensuring the appropriateness of the metrics as indicators of more fundamental aspects of habitat quality, species viability etc., including by measuring the target itself where the scorecard is scoring surrogate metrics

In this approach, while the State certainly needs to be clear as to its intended outcomes, the mechanics of how to achieve them are at best subject of an ongoing dialogue with the farmer and at worst is left to the farmer to delivery using his or her skills and experience; the approach easily accommodates an adaptive learning ethos. The farmer is very much an active participant and decision-maker in the process, which can be both empowering and challenging. The process is potentially very responsive and dynamic. The focus never shifts away from the environmental to one of pure financial and administrative control. While there may be fundamental rules in place, with their accompanying penalties, the results-based aspects have no penalties – poor performance gets poor rewards.

Results-based approaches are not an easy and universal panacea. And they are sometimes just not appropriate. Scorecards which ‘incentivise’ farmers to effect changes which are in practice either impossible or only possible over the long term (Figure 2) will not only be ineffective but extremely demoralising; they are an inappropriate sharing of risk between State and grazier and the antithesis of results-based policy design.

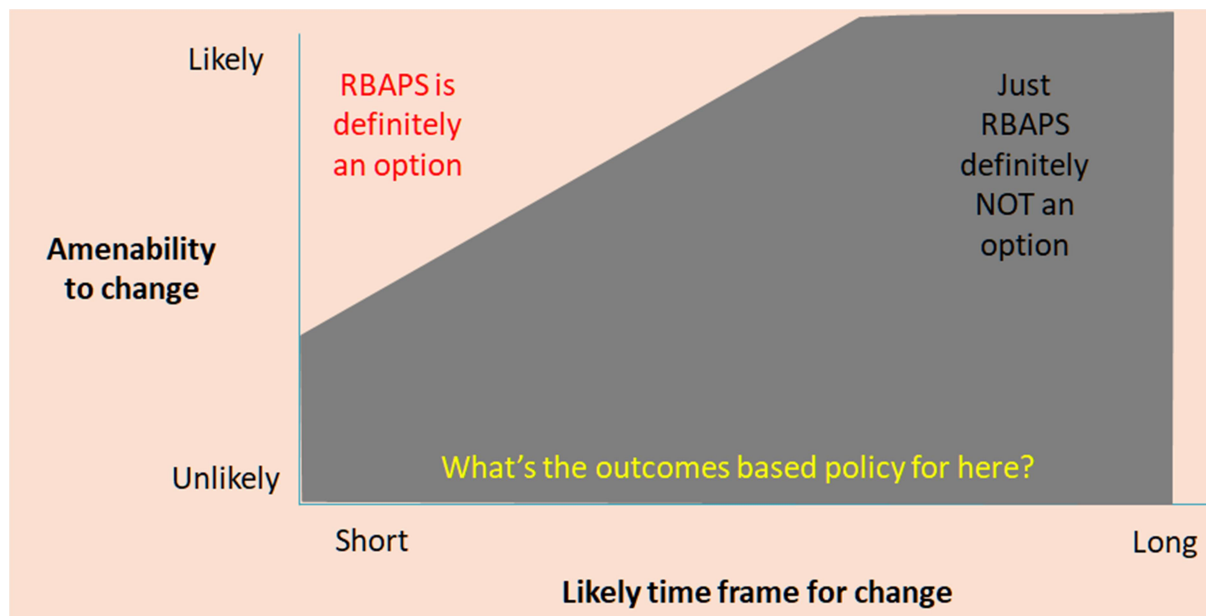


Figure 2. When are results-based approaches appropriate?

Even the design of measures where they are appropriate involves significant challenges (see section 5 below); they rarely if ever stand alone, usually needing one or more complementary actions to work alongside them, for example, overcoming a lack of human capacity (training, advice measures), or the high initial activation costs (subsidised non-productive investments), or knowledge/experience (support for innovation). Individual species may be more demanding; the aim is not to cover everything perfectly but to give a positive sense of direction where positive things are valued and the negative things discouraged.

Results-based area payments are no more than a useful, but potentially powerful, tool for use in the appropriate circumstances; one which, in those circumstances, does however offer considerable advantages over traditional action-based prescriptions.

3 Results-based approaches in Post-Brexit agricultural policy?

3.1 Brexit and our land and the project rationale

The impetus for this project was provided by the Welsh Government’s first consultation paper on its post-Brexit, post-CAP, proposals for delivering its objectives for the Welsh countryside through its support for farmers and other land managers, *Brexit and our land* (Welsh Government 2018a). The document sets out the perceived weaknesses of the current policy in terms of delivering both agricultural competitiveness and the delivery of public goods.

“In environmental terms, CAP has not done enough to take account of the wider benefits and consequences from land management. In particular, it has:

- had mixed results for Wales’ natural environment;*
- done little to respond to the challenge of decarbonisation – over 10% of Welsh emissions come from the agricultural sector, especially livestock; and*
- reinforced a separation between forestry and agriculture as restrictions on eligibility for woodland areas to receive BPS are a barrier to new planting¹.”*

“BPS has been insufficiently targeted to realise all the benefits potentially available from Welsh land” and so will be abolished.

In the case of agri-environment, the “limited scope and the funding structure drives a focus on inputs rather than outcomes. It is therefore possible to have an agri-environment scheme where land managers fully meet the requirements of the scheme but without delivering the desired outcomes.”

[Post-Brexit reform] “is also a significant opportunity to dramatically increase the services that Welsh society can receive from our land. We want to establish a new and flexible Public Goods scheme. The scheme will enable land managers to be paid for the production of outcomes for which there is currently no market.”

“Answering the criticism of existing schemes and reflecting our desire to keep land managers on the land, we will develop an outcome-based scheme that focuses on rewarding delivery. The outcomes will directly relate to domestic or international commitments and land managers will be paid an appropriate value for those outcomes rather than being compensated for input costs.”

“The scheme will enable farmers, foresters and other land managers to be paid for the production of goods for which there is currently no functioning market. The scheme will be outcome-based and we will often use proxy outputs to calculate payments to land managers.

The public goods we will consider supporting include:

- Decarbonisation and climate change adaptation.*
- Resilient habitats and ecosystems*
- Reducing flood risk*
- Air quality*
- Water quality*
- Soil conservation*
- Heritage and recreation”*

It seemed clear to us that experience in Ireland² and elsewhere, as well as the small National Trust/SMS-funded pilot in Llŷn³, suggests strongly that paying farmers for results is a very useful part of any toolbox which aims to deliver such objectives in a manner consistent with the ethos set out.

¹ This last claim as stated is arguably false, since new planting is explicitly made BPS-eligible in the relevant Regulations; the issues arise rather from the eligibility difficulties arising in the case of *existing* woodland

² Notably the Burrenprogramme.com; henharrierproject.ie; pearlmusselproject.ie

³ <https://www.nationaltrust.org.uk/features/farming-for-the-future-on-lln>

But it was equally clear that developing a workable approach takes a lot of thought and trialling, and that that in turn takes time and resources.

Common land is known to pose a particularly difficult set of challenges, involving as it does multiple set of actors with often conflicting interests or aspirations. Common land often seems to be an afterthought, even for schemes targeting public goods, for whose delivery common land is disproportionately important (Brackenbury and Jones 2016). Wales has experienced those challenges at first hand; so great were they that WG had to set up a team of Commons Development Officers to help get over the lack of uptake. The project therefore set out to develop, if possible, a testable measure for supporting the sustainable management of common land using a results-based or outcome-based payment.

3.2 The policy context at the end of the project

Following on from *Brexit and our land*, WG brought out a second consultation paper *Sustainable farming and our land* (which did not greatly develop its proposals for direct support) and then a White Paper (Welsh Government 2020).

By that time, the proposal for separate efficiency and public goods schemes had been replaced by one for a single Sustainable Farming Scheme (SFS). But the underlying ethos seemed very similar. In the Ministerial foreword, Lesley Griffiths writes: *“Managing the land differently to maintain and restore biodiversity whilst still producing food may mean learning new skills for some but will also mean drawing on the skills and knowledge already within the farming community”* – we would argue that that last aspiration is very difficult to achieve under the prescriptive approach, but lies at the centre of the results-based ethos.

“For their own and society’s benefit, Welsh farmers will need to continue producing high quality food whilst maintaining high production standards. However, there is increasing evidence that agricultural intensification has adverse impacts upon society through reductions in air and water quality, carbon emissions and reductions in farmland biodiversity. We propose asking Welsh farmers to go further, by adopting an approach that enables sustainable food production from farms which are characterised by having a very low carbon footprint, increased biodiversity and minimised nutrient losses to air and water. Rewarding farmers for achieving these goals through our proposed Sustainable Farming Scheme would help create a sustainable and resilient agriculture sector in Wales for future generations.”

“This scheme should reward farmers appropriately for the production of non-market goods (improved soils, clean air, clean water, improved biodiversity, actions to reduce global warming) at levels above those set by regulation through the management of land in a sustainable way.”

“The SFS should reward farmers appropriately for the production of outcomes (healthier soils, clean air, clean water, improved biodiversity, actions to reduce global warming) at levels above those set by regulation, through and alongside the production of food in a sustainable way. We will need to consider the different opportunities for the delivery of these outcomes on each farm as it enters the scheme. This work will define the actions needed to deliver sustainability for that farm business.”

“The SFS is intended to reward farmers for the delivery of outcomes rather than compensate them for the cost of their inputs. We want farmers to regard their input costs to meet the requirements of the scheme as an investment in order to reap the reward of continued payments for the outcomes they deliver. As part of our economic analysis work we will be undertaking cost-benefit analysis to ascertain the best way to incentivise farmers to do the additional work required to deliver the outcomes we seek.”

What this would mean in practice still remained very opaque however. In discussions with WG officials, there was a sense of extreme nervousness about a truly results-based approach of the type initially implied. The sentence quoted above *“This work will define the actions needed to deliver sustainability for that farm business”* gives a hint of what seemed at the time to be a shift in thinking. Wouldn't it be better, WG seemed to be saying, if we give farmers a list of actions by which they could achieve these outcomes for us? Actions which, if they carry out faithfully, they can be sure of being paid for?

When questioned as to how this differs from the previous tradition from ESAs in the 1990s to Glastir in the present day, the answer was that this would be different, because for the first time it would be underpinned by robust 'logic chains'.

Asked to give examples of such logic chains of relevance to commons, WG only cited one-off highly targeted actions – fencing off a stream from livestock to alleviate particular erosion or pollution issues, for example. WG was unable to give any example relating to parcels of semi-natural vegetation (still some of the key features for biodiversity in the Welsh landscape and thus a primary focus of the WG's stated objectives for the policy). Civil servants were however explicit in their rejection of central elements of the prescriptive approach – stocking calendars, grazing dates, stocking density limits. Advocates of results-based approaches welcome such sentiments, of course. However, if both the key aspects of prescriptions *and* results-based approaches are rejected, it is far from clear what tools are left.

At the same time, it is clear from discussions with WG that designing a measure which replaces both BPS and Glastir will pose special challenges on common land in particular. Tailoring a measure to address the full range of public goods on potentially all farms and at all levels of delivery is going to be difficult, but on a 'normal' farm there are a number of basic measures which could be rewarded – nutrient management, maintenance of boundary elements, pollution control – which are absent or only marginally relevant on commons. A potentially large proportion of the graziers' income is therefore tied up in whatever reward there is for managing that common land, and access to that money is dependent on the attitudes and potentially even the actions of perhaps hundreds of fellow rightsholders.

What is clear then is that common land is very likely to need an approach which is either subtly or significantly different from that applied to sole use farms. It seems obvious to the project team that there will be a point in the process at which suggestions of approaches to test on common land, if nowhere else, will be desperately sought, and our work continued down the same path with this in mind, despite the lack of a clearly-expressed direction from WG.

As the Forward Plan published in September 2021 (Welsh Government 2021), there is a recognition both of the importance of common land and of the difficulties of designing measures which work there:

The consultation highlighted the important role of common land and that it should receive greater attention and consideration in terms of how common land is effectively managed and protected. Through our further engagement on the scheme proposals we will ensure the needs of those with common land rights are taken into account and that they will have fair access to the future scheme.

It seems clear that the door is wide open for workable policy ideas:

In terms of the specific proposals on common land there were limited responses. We will work to develop the evidence base with stakeholders in this area before taking forward legislation.

The outputs of this project, both technical and human in the form of an interested set of graziers, are surely well-suited to answer this need.

4 What the project did and how we did it

The project is funded by LEADER (78%) and NRW (22%). It is a LEADER cooperation project involving six Local Action Groups (LAG), each contributing the same proportion of funding – Swansea; Neath-Port Talbot; Rural Action Cwm Tâf (Merthyr Tydfil and Rhondda-Cynon-Tâf); Cwm a Mynydd (Caerphilly and Blaenau Gwent); Torfaen and Powys. The project contract is with the Swansea LAG. In principle, the project covers all common land within the LAG areas with the exception of Powys where, for reasons of scale, it is focussed on the area south of the river Usk (further details on the commons are set out in section 6 and the annexes to this report).

The project started in October 2020, just in time to be able to appoint a project team who could be in post for a full 12 months; the project had a fixed end date of 31/10/21. The 1 FTE worth of funding was split between 3 part-time project officers – Helen Barnes, Catherine Hughes and Tony Little, with management and support work carried out by Gwyn Jones and Karen MacRae. As it became apparent, in July 2021, that the project would benefit from a reallocation of resources, a further two part-time project officers were taken on at this point – Joe Daggett and Nigel Ajax-Lewis.

The project steering group met roughly quarterly and consisted of Neil Stokes representing Swansea as the lead LAG, Hamish Osborn representing NRW and Tony Little and Gwyn Jones on behalf of the project. Gwyn Jones also reported regularly but less frequently to a liaison group of all the LAG officers. The project also had an advisory group of 12 individuals from a range of stakeholder groups both public and private and from each LAG area, which met 3 times over the life of the project.

Our approach was intended to be twin track, with expert input to reinforce our technical approach to the work on the one hand and engagement and awareness-raising with graziers on the other. Technical input was needed especially for understanding our extremely wide range of targets and pinning down qualitative and quantitative criteria of quality for each and for working through the implications of the law of commons and other relevant legislation and of the realities of commons governance.

We engaged with Welsh Government at the senior level and with a range of NRW personnel at the central and technical level, as well as with local area staff. We also carried out engagement work with a range of stakeholder organisations, initially virtually, but latterly also in the field. We held workshops online for Welsh Government, for NRW, for farming organisations and for conservation NGOs, most also involving presentations from Irish colleagues.

On the technical side we had anticipated a major challenge in bringing together a range of public goods responsibilities for which are widely dispersed in a range of public bodies – a task which we assumed we would have to carry out ourselves. What we had not appreciated was the difficulty we would find in obtaining a clear qualitative, let alone quantitative, guidance on how to assess delivery levels for most of those public goods.

While the first half of the project, with its strict Covid restrictions, might have been a time when minds could focus on synthesising such detailed inputs from various agencies and NGOs, what progress was made only started being informed by substantive advice late in spring 2021. Even then, very little of the advice was detailed and ironically our cards were, in the end, built on the basis of Glastir guidance and payment rationales (with the latter being set out in the relevant section of the Rural Development Programme⁴). Once engagement did start however, we had some very useful discussions with specialists from NRW and elsewhere which enriched the work greatly.

Engagement with graziers was significantly hampered and delayed by both this lack of progress on the technical side and by the Covid rules themselves. It was only in the last third of the project that we were able to regain the ground lost through this delay, with the result that we were still actively developing the methodology and having substantive meetings with graziers in the final month of the work.

The original rationale of the project centred around the use of ‘example commons’, the idea being that they would focus the mind of topic specialists, with the need for a coherent message in a specific set of places helping to break down the ‘silo thinking’ of particular disciplines and expertise. We assumed that the ‘silo’ messages would come across easily, even quantifiably, while the cross-cutting perspective would be what was difficult to achieve.

In practice, we found almost the opposite – it was very difficult to get topic-focussed quantified messages in most cases, while the synthesising, which we had to do ourselves, was relatively straightforward, though sometimes involving reading between the lines and generalising from a very sparse set of inputs, which usually lacked reference to particular places (SSSI and particularly SAC being the exceptions).

The example commons have therefore come to fulfil quite a different role. While their function as places in which to explain our approach with graziers and to get their help in improving it remains unchanged, these commons are now the places where the various topic experts come to tell us whether our synthesis and generalisation ‘works’ for their particular public good – a role much later in the process, in other words.

⁴ <https://gov.wales/sites/default/files/publications/2019-07/rural-development-programme-document-2014-to-2020.pdf>

We committed to the funders that we would select 2 commons in each LAG area as examples. The commons were selected to cover as much of the range found in the region in terms of habitat and location in relation to both topography and settlements. The commons range in size from Buckland’s 4868 ha to Rudry’s 88 ha. Table 1 and section 6 set out some of the characteristics of the example commons, which are further described in the separate fiche for each common in Volume 2 of this report.

Lastly, and partly thinking not just of the future but of how best to respond to the initial visual of the scorecard as a forbidding sheaf of paper, we engaged a subcontractor, Dafydd Jones, to convert our cards into a phone app using Epicollect5. This enabled us to hide a lot of the mechanics of the card and to ask the questions in an even more user-friendly way, as well as allowing the user to see the output in map form.



Figure 3. The 12 example commons on a background map of all the commons in the project area (Mynydd y Betws and Carmarthen area of Mynydd Du, though shown on the map, are not included)

Common	LAG	Natural context	Human context	Nature designation
Pennard	S	Coastal & dune mosaic	Suburban	Pt. SSSI/SAC
Fairwood	S	Lowland heathy mosaic	Rural	SSSI/SAC
Cefn Gwrhyd	NPT	Upland mosaic	Rural	Pt. SSSI
Rhos	NPT	Intermediate wet mosaic	Rural	None
Llantrisant	RACT	Lowland wet grasslands	Suburban	SSSI
Graig Evan Leyshon	RACT	Upland bracken slopes	Inter-valley	None
Merthyr (pt.)	RACT/CM	Upland mosaic	Rural	None
Buckland	P	High upland mosaic	Rural	Pt. SSSI/SAC
Mynydd Llangatwg	P	Upland mosaic	Rural	SSSI
Coity & Mynydd James	CM/T	Upland mosaic	Inter-valley	None
Mynydd Maen etc.	CM/T	Upland mosaic	Inter-valley	None
Rudry	CM	Intermediate bracken	Rural	None

Table 1. Some ways of classifying the 12 example commons

5 Key considerations for results-based approaches to commons

For a results-based approach to be both appropriate and well-designed, a number of criteria have to be met, including

- Having a clearly-identified target and a clear understanding of what defines quality with regard to that target in all its variety
- The target quality being closely related to farming practice and relatively immune to non-farming factors
- Having an easy-to-understand, reliable, repeatable set of scoring metrics which correlate well with the underlying understanding of target quality
- A high proportion of the features scored being open to change within the relatively short term (or the results-based approach being complemented by action based incentives)
- Designing a payment matrix which reflects real costs relating to the actual systems encountered on the ground
- The payments associated with the various scores reflecting the costs not only of being at that score, but of changing from one score to another (or the measure complemented by other payments, e.g. for 'capital works')
- The existence of a support and guidance function within the implementation mechanism which has the capacity needed in terms of both skills and scale; if that support has a cost to the grazings association, that it is in no way prohibitive
- That there are clear mechanisms in place for dealing with any non-economic barriers which might impact on the achievement of the State's objectives vis-à-vis the chosen target
- Overall, there being a reasonable and transparent sharing of risk between the State and the scheme participant, and with a payment structure which fairly reflects and the risk on the side of the participant

These criteria are applicable to all results-based measures, but commons pose additional challenges. They involve multiple actors with legal rights on the same area of ground, who interact with it in a range of different ways (inactive; claiming agricultural support payments; use for grazing by a variety of livestock and for different periods of the year; peat-cutting, and so forth), and who have a range of different interactions with each other (co-operative/obstructive; communautaire/selfish; open to change/conservative; collaborative/individualistic, and so on), and whose interactions are to some extent controlled and guided by a specific body of law and the path dependencies developed through engaging with agri-environment schemes over the last thirty years or so.

Through a wider series of projects over many years, we have produced a set of principles and consequences for designing results-based measures for common specifically, which we discussed with some relevant experts and set out here:

5.1 Higher level aspirations

- To better deliver public policy goals as they relate to commons
- To ensure we have graziers available to manage these commons into the future through the improved financial sustainability of grazing
- To ensure that those who deliver public goods are adequately rewarded

- Where the public goods delivery is not incidental to profitable economic systems, or where optimal delivery requires a change in management from the economically-optimal, have a mechanism through which the state intervenes to provide that adequate reward
- To ensure that the reward should go first and foremost to those who incur the costs/income forgone
- To ensure that graziers' associations have the greatest flexibility possible to access that support, recognising that they also have transaction costs and allowing them to make their own assessment of risks and costs/benefits, while at the same time ensuring that the association acts equitably and reasonably and that there is an official fall-back for aggrieved parties
- To safeguard the rights of the currently active to benefit from their management activity, of the landowner to benefit from their management activity and, in so far as it is a factor, the ability of current and future rightsholders (and landowner) to exercise in future their grazing or other rights and any monies which may be linked to that through participation in any scheme (this is not a major factor in results-based models – see 11.1 below). There should be no privileging of unused rights.

5.2 Targeting

The measure should therefore:

- Support change in management (and/or continuation in current management where such management is uneconomic and in danger of deleterious change) which directly impacts on the delivery of policy objectives relating to specified policy target features set independently of the measure itself
- Be designed to work at the same scale as the scale of the objectives for the target feature wherever possible (even at a scale wider than the individual grazings, but avoiding the 'perfect is the enemy of the good' trap)
- Give a clear message to the graziers' association on the current and desirable future condition of the target feature(s)
- Give a clear message on the relative priority to give to various target features
- Have penalties which apply only in the case of negligent or deliberate actions or inaction and whose scale are proportional to the severity of the impact on the targets in space and time

5.3 Relationship to management practice

The measure should therefore:

- Give messages and be designed to work at the scale of and with the patterns of current management practices, or with modifications of the same which can be reasonably considered achievable given the design of the measure and its incentives.
- Adequately reward any action assumed necessary to maintain or enhance such target features in general and in the case of capital works the actual target features in question, where 'adequately' means fully covering any costs which do not also have an additional commercial benefit and 'fully' includes paying the going skilled/unskilled wage rates as appropriate.
- In terms of payment, be clearly and explicitly linked to the costs or income forgone of the likely necessary actions (or continuation of actions)

- Separate out where possible the assumed costs or income forgone of various classes of actors in support of the principle that payment should be made first and foremost to those who incur those costs/losses
- Where the needs of the target feature require action or cessation of action by the owner of the soil and failure to address the activities of the owner of the soil would have a significant impact on the likely outcomes, allow WG to refuse a proposal on the part of the graziers' association alone
- Where the target feature is under threat from the action of third parties and/or natural factors, provide a clear approach to how these will be dealt with and the consequences for payment, balancing considerations of natural justice with the results-based ethos of the measure, but up to and including full repayment and disbaring from the scheme

5.4 Safeguarding of rights

The measure should therefore:

- Allow the graziers' association to share some of the risk in terms of ability to participate vs. inability to deliver, using its judgement in assessing the likelihood and impact of problems, while being aware of the impact failure might have on payments. This means that associations do not have to secure universal consent, but may set out alternative thresholds based on their own assessment of risk. The approach of the association in this regard should be set out clearly beforehand and notified to the WG and be consistent with any relevant laws. Parties which can demonstrate that the proposed allocation of funds is disproportional to the pattern of actual income forgone or additional costs will be considered to have a prima facie valid basis for objection.
- Safeguard the rights of those not incurring any costs or income forgone at the time of signing the contract to enter into those commitments at any time in the future and to partake fully and promptly in the compensation for those costs or income forgone. These rights are inviolable irrespective of the method chosen to secure agreement on participation in the measure.
- Where those rights are thought not to be safeguarded adequately, the measure should provide for the aggrieved parties to appeal the proposal to WG in the first instance, with WG having the power to prevent participation until adequate provision is made for those rights.
- Safeguard the rights of the owner of the soil to the extent of their interests in the land; where those interests are not significantly impacted, there should be no right of veto, but the owner of the soil should be informed of the grazing association's decision to participate and be given sight of the proposal.

6 The commons of the project area

In the preparation of this and many other sections, we made much use of the Biological Survey of Common Land volumes covering the project area (Crowther and Aitchison 1994) (Heppingstall et al. 1991) (Penford et al. 1990) (Rural Surveys Research Unit 1994). We also had access to BPS and Glastir data provided by WG in the mid-2010s as well as the datasets publicly available on the Lle geoportal.

The project area has 95 Common Land Units (CL) with an area greater than 10ha, extending to just over 50,000ha all told. In most cases, the CL corresponds to the effective management unit, but in

some the management units (as reflected in the territories of the relevant graziers' association, for example) cover multiple CL, especially where the county boundaries during the registration period (1960s-1990s) artificially divide the common. In a few cases, the geography of the common works in the opposite direction, with more than one effective management unit under a single CL number. WG has clearly taken a sensible and pragmatic line during the Glastir application process; in the project we tried to take a similar approach, allowing the Glastir arrangements where they exist to guide our work.

In the case of our 12 example commons, 3 (Mynydd Llangatwg, Coety and Mynydd James and Mynydd Maen) in fact covered multiple CL numbers (3, 3 and 4 respectively), while 2 only covered part of a CL number (Fairwood, Merthyr (pt.)).



Figure 4. Getting technical input from NRW and the Local Nature Partnership on Cefn Gwrhyd (Image: Catherine Hughes)

Many of the CL form large coterminous blocks with no internal fencing. The largest of these are the three in the Brecon Beacons National Park (BBNP), the westernmost of which extends deep into Carmarthenshire, but similar blocks exist between the Tawe and the Llŵchwr and on the ridge between Afon Lwyd and the Ebwy Fach. The largest of those blocks is over 18,000ha in area – 36% of the total; compare that with the largest single CL unit which extends to around 4870ha.

Most of the CL units are however small to intermediate in size – the median CL unit has an area of around 156ha (Figure 5).

Going beyond the cliché that 'every common is different', the CL units can be grouped in various ways (Table 1). Two obvious gradients are obvious to even the most casual of observers. On the one side is the relationship of the commons to the population centres – many commons are the epitome of rural, while some in Swansea are essentially suburban; the inter-valley commons are

somewhat intermediate (Figure 6). Another perspective, one not totally independent of the first, is the biophysical (Figure 7). Participation in Glastir is of course another differentiator (Figure 8).

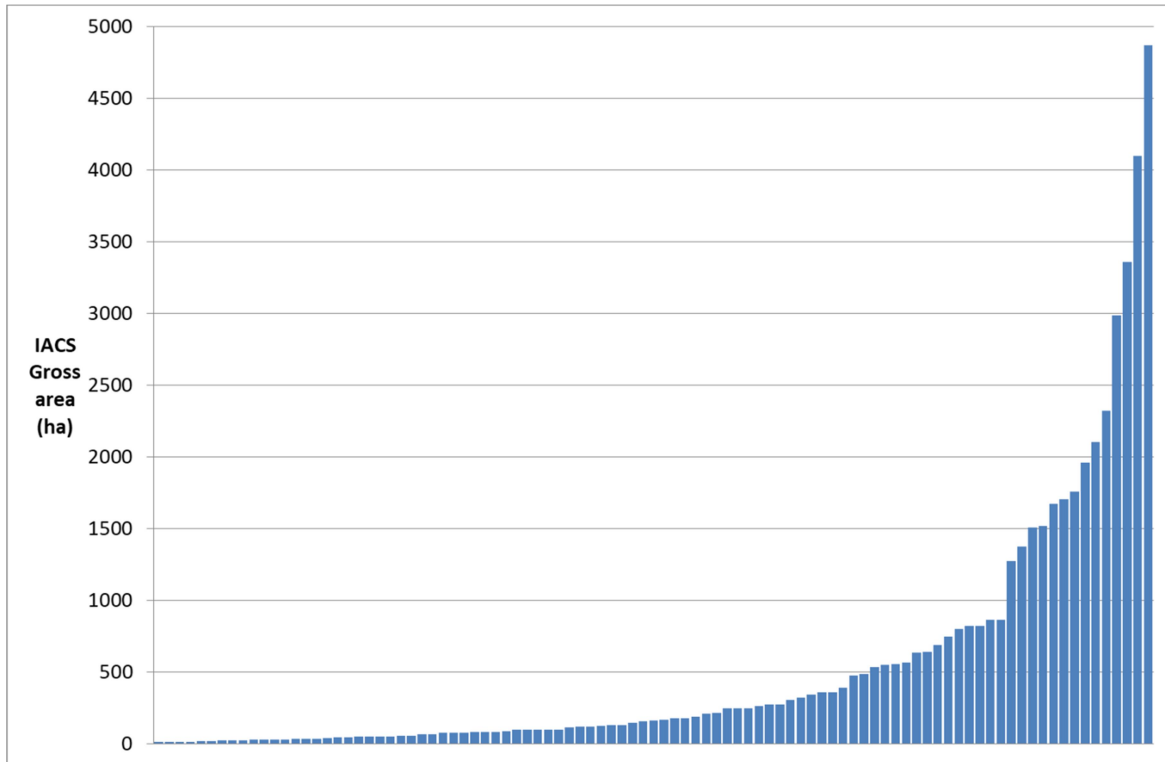


Figure 5. IACS gross area for the CL units within the project area

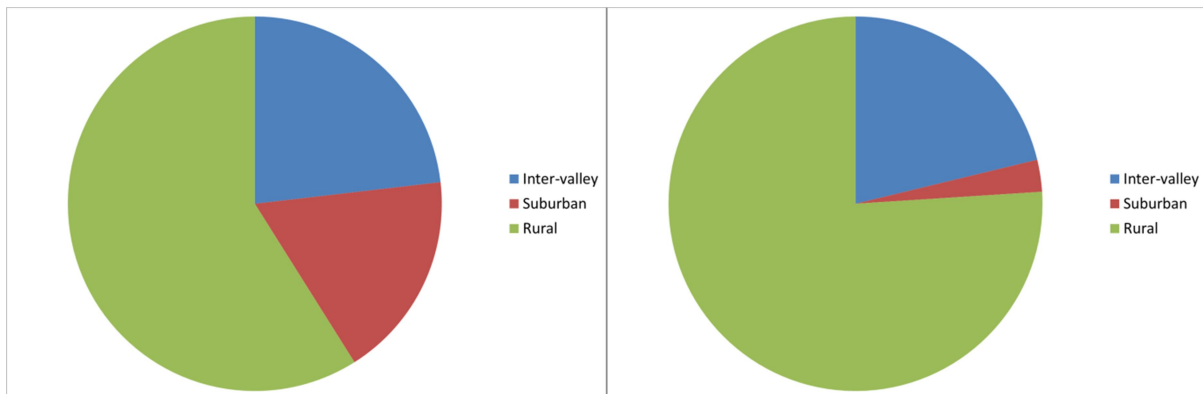


Figure 6. Indicative split of the CL units and CL area in relation to population centres

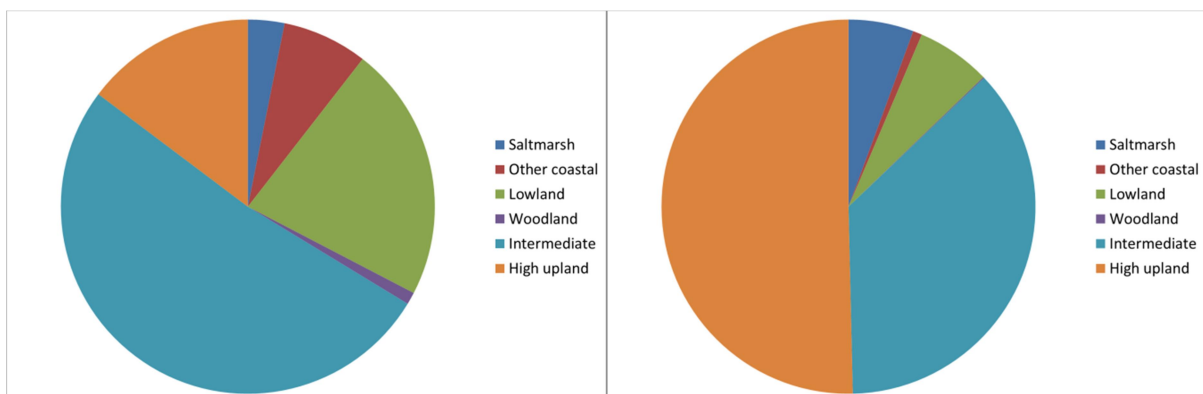


Figure 7. Indicative split of the CL units and CL area in relation to biophysical character

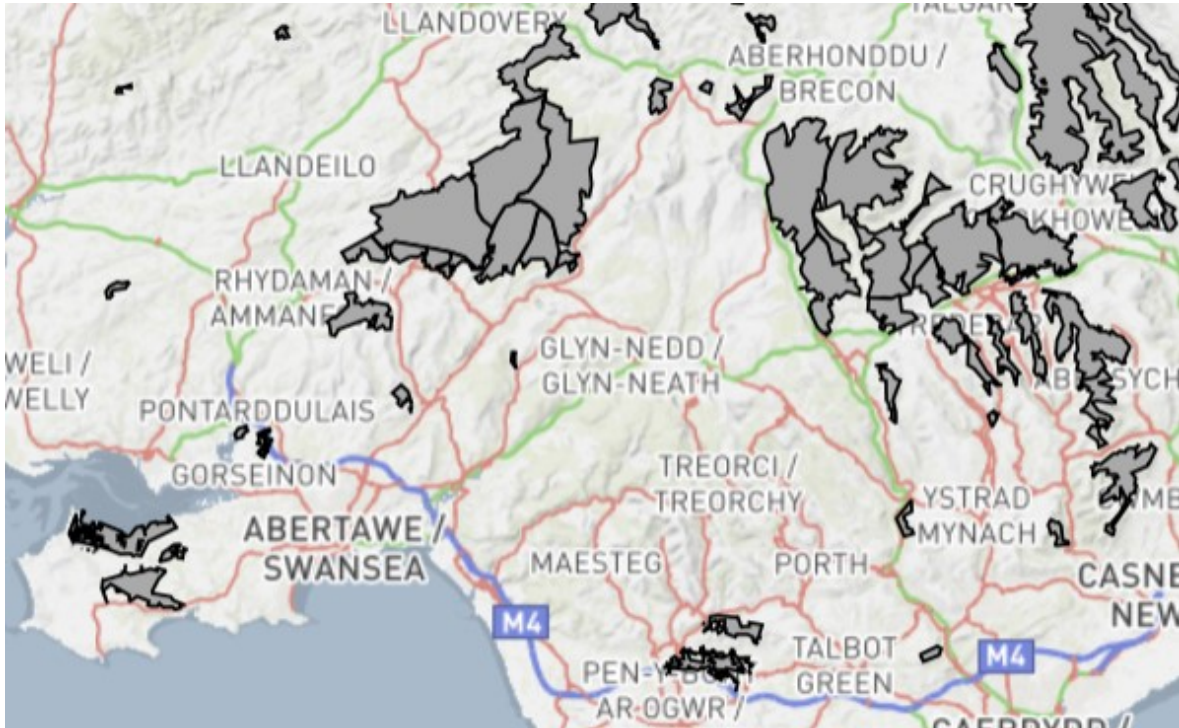


Figure 8. Participation in Glastir Commons, updated to 2018⁵

7 Public goods delivered by and on commons in the project area

Brexit and our land and subsequent documents make clear the proposed breadth of targeting of SMS. In previous versions of agricultural policy, the ‘toolbox’ has contained a number of different measures, each focusing on a specific limited range of policy outcomes. Now all of the objectives of policy, both as regards competitiveness and efficiency and as regards the delivery of any and all relevant public goods, are to be delivered by a single instrument – SFS.

In the prescriptive approach, based as it is on a single payment rate tied to the fulfilment of certain specified undertakings, farmers don’t need to understand the Government’s thinking on how various policy goals should be played off against each other to achieve an optimal set of policy outcomes. The farmer is free to choose whether or not the Government’s offer in a particular case and under a particular scheme is attractive enough to make it worth the effort, and may try to minimise the costs and maximise income through manipulating the choices made. But the core choices are rather black and white; priorities may be inferred, but are not the day to day concern of the farmer.

A policy which, in terms of direct payments on land at any rate, is focussed solely on the delivery of public goods on farmland (and other land types) and does so through a single scheme faces a mountain of challenges. In the case of a results-based payment approach, Government must take into account the whole range of potential policy outcomes, potentially need to find a way of measuring each (what is poor delivery; what is medium-scale delivery; what is excellent delivery?) and of balancing each against the other and giving a scale to that relationship (is medium delivery for a rare species more desirable or less than good delivery for public access?). And it must present not

⁵ <http://lle.gov.wales/map/gel>

only that picture of its priorities to farmers, but a picture also of what different levels of delivery look like across the whole spectrum of quality. We describe here how we approached that task and what conclusions we arrived at.

It is important to note at this point that the very same challenge presents itself to the WG should it choose to formulate a new prescriptive or action-based approach (and it faced it also in the past when designing previous schemes from ESA and Tir Cymen onwards). Only this time the challenge is much more immediate and unavoidable. To fulfil its stated objectives, it must come up with a small number of simple ways to describe actions which will, in a black and white, yes or no, coherent and unified way deliver what it considers to be an optimal outcome. That approach requires virtually perfect understanding and knowledge before the launch of the measure, would involve no exercise of farmers' skills (contrary to Lesley Griffiths's stated intent), and would, once put in place, be in reality very difficult to change. Glastir shows how difficult that is for biodiversity targets alone; the new prescriptions would need to promote the delivery of a long list of other public goods, all at the same time.

In the following sections we go through the public goods one by one, setting out what we think we understand Welsh Government policy to state or imply before finally bringing the various services together into a hopefully coherent single picture around which scorecards could be designed.

7.1 Carbon sequestration and storage

(Gregg et al. 2021) provides a very useful survey of the state of knowledge regarding carbon stores and sequestration rates under various land covers and uses and is heavily drawn upon in this summary. WG's National Wellbeing Indicator 13 is the Concentration of carbon and organic matter in soils.

The land covers found on commons in the project area are all significant *stores* of carbon. Not only are they longstanding permanent pastures which have largely not seen the soil disturbed for centuries or even millennia, but many of those soils are organic in character. In all cases, the vast majority of the carbon is likely to be stored in the soil and not in the above-ground vegetation. One possible exception is woodlands, but even here the proportions vary widely with soil type and size of tree.

Peatlands are by far the biggest carbon stores per hectare, with the amount varying roughly in proportion to the depth of the peat. But mineral-organic soils (soils with a peaty upper layer which is not thick enough for them to be called peats) are also significant carbon stores (and are more widespread in the area than peat). Almost all of the soils on the project area commons fall into this broad group (e.g. Figure 9 for an example suite of coalfield soils typical of at least half the area).

Saltmarshes are also a significant store of carbon, part of which derives from their ability to trap carbon sequestered elsewhere through the laying down of sediments.

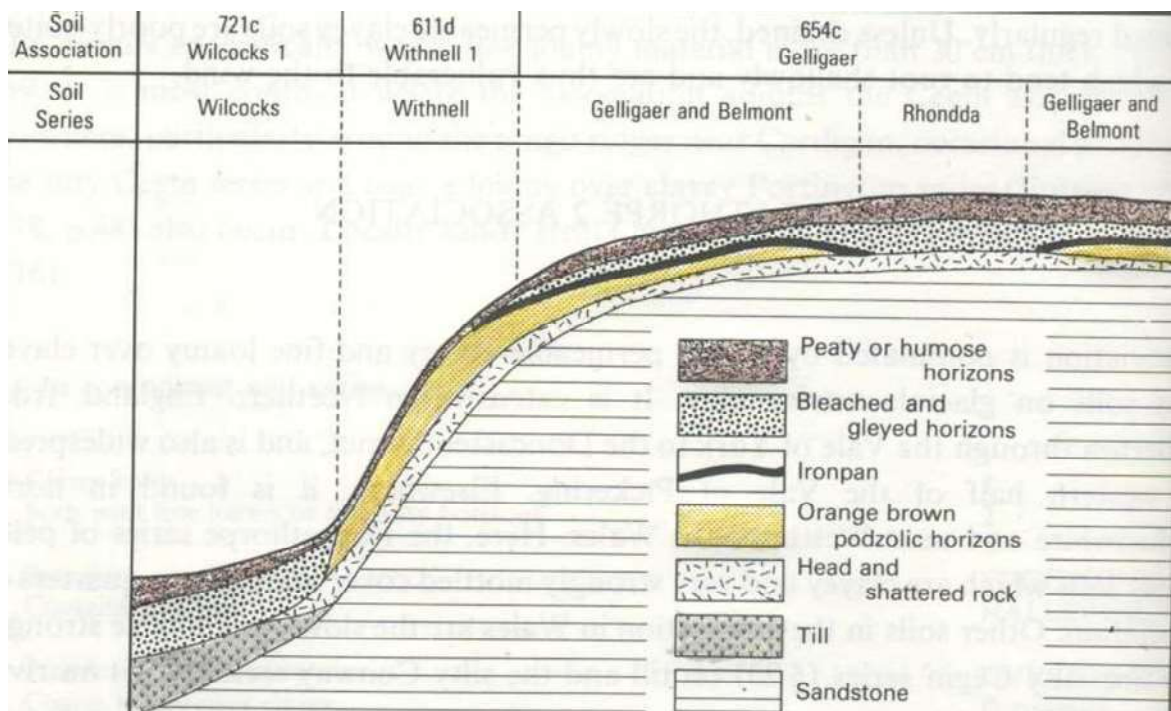


Figure 9. Typical association between soil types and topography on the Pennant sandstone (Coal Measures). From (Rudeforth et al. 1984). Note that there are marked organic layers in all of the soils.

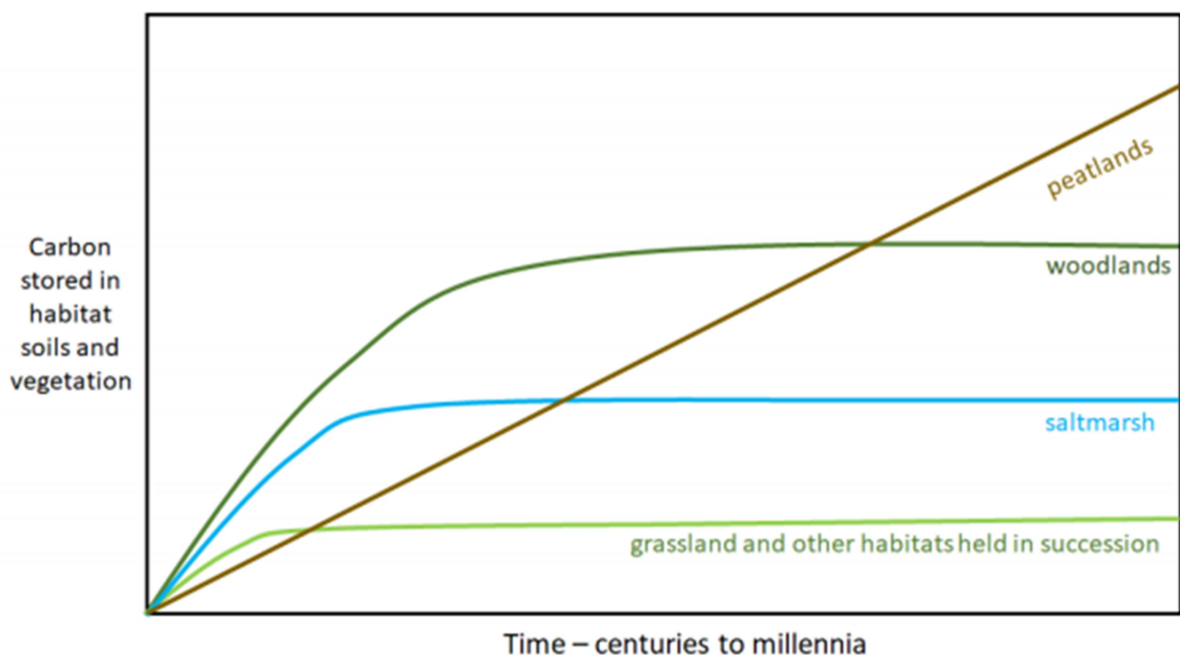


Figure 10. Schematic representation of carbon sequestration rates over time in various habitats. Relative size of the total store corresponding to the woodland equilibrium is highly variable and may be lower than that for heathlands or grasslands

On the other hand, most of the land covers found on commons in the project area (woodland, heathland, bogs, grasslands) are poor at *sequestering* carbon once mature – if they are in good condition (e.g. not subjected to artificial drainage), and all else being equal, they will long since have reached an equilibrium where net sequestration is on average zero (Figure 10).

Two habitats are at least potentially an exception to this general pattern. Both have anaerobic soils where various organisms are unable to oxidise the carbon. First, functioning, hydrologically-intact peatlands – although these have very slow sequestration rates, they do not reach an equilibrium which limits the size of the carbon store and can continue growing *ad infinitum*.

Second, sequestration rates recorded on saltmarshes are very high; however, it is difficult to reconcile these with estimates of carbon stores per unit area, which are rather modest. It seems likely that the net effect over time is limited by factors such as the balance of accretion and erosion of sediment occurs and where this erosion or accretion occurs across the marsh; this is the reason Figure 10 shows saltmarsh as also reaching an equilibrium in time.

The over-riding message, as set out by (Gregg et al. 2021), is the importance of protecting these carbon stores from oxidation:

- *Protect and restore peatlands. Peatlands are our largest natural carbon stores and it is important to slow and eventually halt greenhouse gas emissions, including through raising water tables, stopping burning and removing planted trees.*

It seems clear from the evidence presented in the same report that this need for protection and restoration applies also to other soils (for example, drained stagno-humic gleys – Wilcocks and Rhondda in Figure 9) where the peaty horizon is being oxidised due to drainage or other actions which damage the ground surface.

Another message, and one which is for the most part *not* dependent on special pleading for biodiversity, is:

- *Protect existing semi-natural habitats. ... Many of these, including grasslands and heathlands, also store appreciable amounts of carbon in their vegetation, undisturbed soils and sediments.*

Interestingly, one clear exception to this rule is dry calcareous grasslands – their persistence, and their species-richness, is usually linked to thin soils; succession to other vegetation types usually leads to higher carbon stores. A similar man-made situation arises on ‘colliery’ spoil (and other brownfield sites) in the project area. In these special cases, valuing the high biodiversity implies a local trade-off in terms of carbon sequestration.

To the ‘protection’ message should also be appended, as we understand it, ‘restoration’ – while well-functioning grasslands and heathlands (and woodlands) are at an equilibrium which protects the carbon store, damaged or poorly-functioning habitats are often net carbon emitters or reach an equilibrium at a lower level of stored carbon.

What then about the replacement of heathlands or grasslands by woodland, either by natural regeneration or planting? If woodland has both the highest biomass in terms of standing vegetation and the highest overall carbon stores (apart from bogs), as shown in Figure 10, does that mean that it is always positive for net carbon storage to plant trees? (Gregg et al. 2021) suggest that the message from the science is ‘rarely’, in the case of most of the habitats and soils found on commons,

very strongly in that direction. More often it is neutral or supports the opposite conclusion: it may well be better for net carbon storage to protect and restore existing habitats than to replace them with trees.

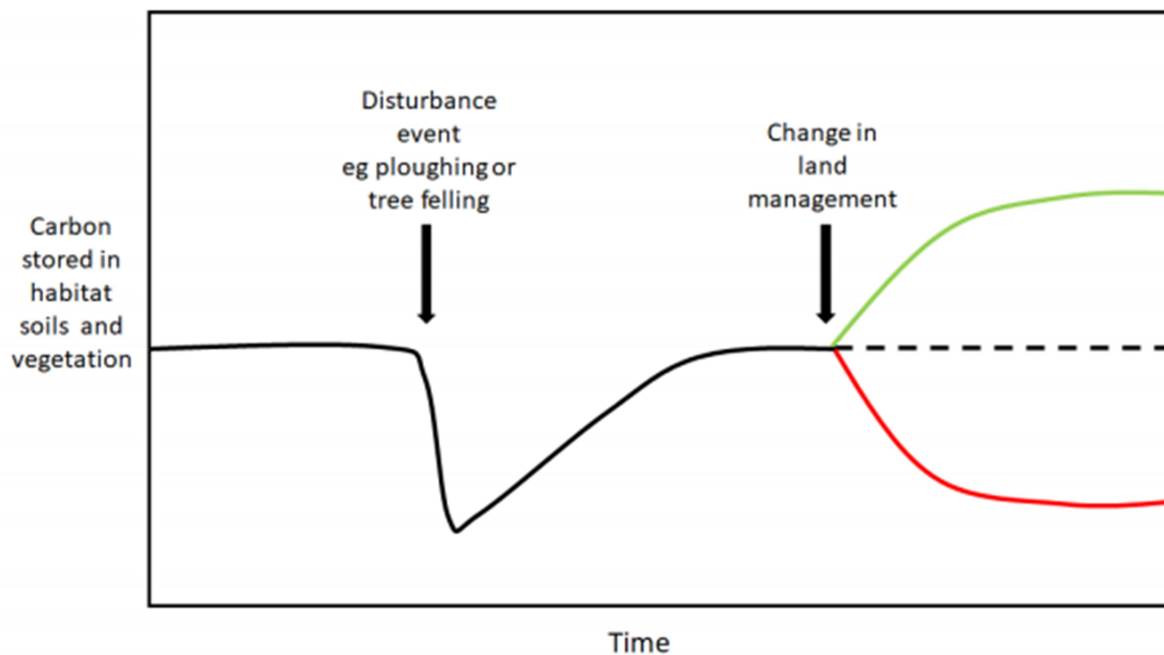


Figure 11. Schematic representation of the land use change carbon store dilemma

This surprising message emerges because some proportion of soil carbon store has to be sacrificed to produce the increase in the biomass store (Figure 11). Most carbon is in the soil in these areas – for example, on heathlands, the carbon in the vegetation may be as low as 2% of the total. Afforestation has the potential to deplete these soil carbon stores without replacing them with higher stores in the biomass, especially where low-yielding trees are grown on high carbon soils, and especially if they are planted using methods which disrupt the soil. As (Brown 2020) points out, the Scottish experience of afforestation has been that it is being taken up mostly on poorer land makes achieving a net positive impact in terms of carbon sequestration more difficult. (Matthews et al. 2020) attempted to quantify this impact, mapping the modelled impact of various afforestation approaches over the territory of Scotland; not only ‘commercial’ planting but also native broadleaf planting seems to cause a net carbon release on poorer land (Figure 12).

Even where the carbon balance is neutral to positive, afforestation implies the replacement of carbon in a stable long-term store (soil carbon) with carbon that may be relatively quickly released to the atmosphere (carbon in vegetation), for example by wildfire, decreasing the overall resilience of the ecosystem.

One significant area of uncertainty due to the lack of studies is the importance or otherwise of bracken. Data reported by (Gregg et al. 2021) suggest surprisingly low soil carbon densities under bracken; is it really the case that the huge volumes of carbon sequestered annually are then released again overwinter, as this seems to imply on first reading? Might woodland succession on bracken be a way of ensuring higher net sequestration and an increase in the overall carbon store?

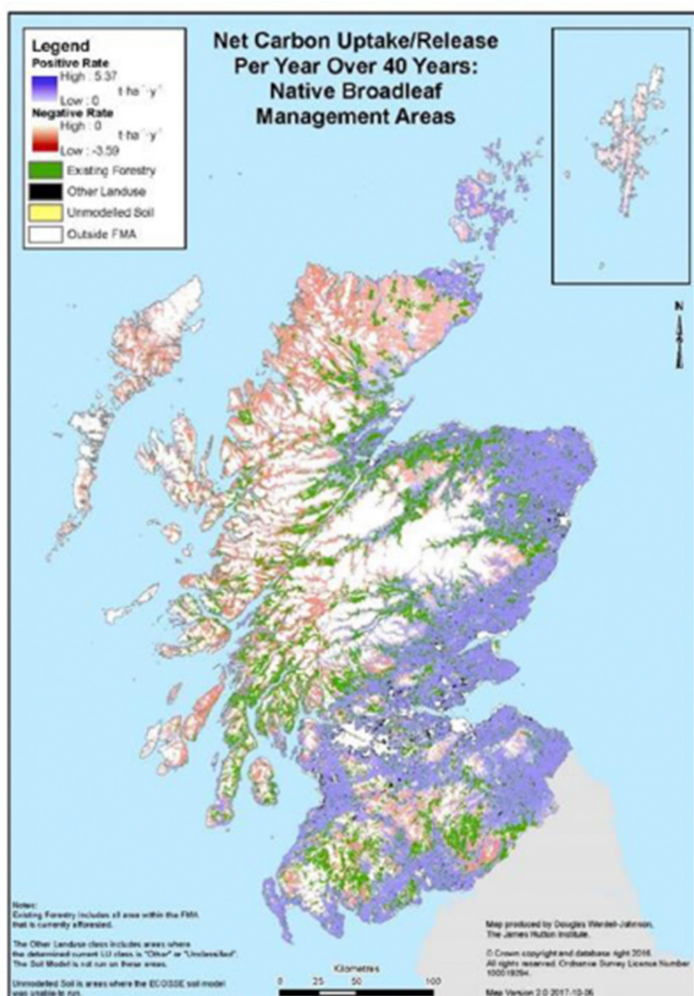


Figure 12. Map of modelled carbon accumulation or loss for native broadleaf planting in Scotland (Matthews et al. 2020)

In conclusion, it seems clear that apart from safeguarding the rare vegetation communities on calcareous rankers and the developing soils of ‘colliery’ spoil, there is little or no contradiction between the promotion of biodiversity and encouraging the best possible long term accumulation of carbon. Apart from bogs and saltmarshes, sequestration rates are low and are largely already at an equilibrium (if undamaged). There is no contradiction between safeguarding the existing carbon stores and the keeping of semi-natural habitats in good condition. Rather, in almost all cases the best way forward for both public goods seems to be the protection of soil carbon *and* biodiversity through the safeguarding and restoration of current habitats. On the other hand, woodland expansion onto bracken is quite likely to be a net positive for carbon stores, while there may be little impact on carbon of habitat mosaic improvement involving a higher proportion of scattered trees in the landscape outwith discrete areas of ‘woodland’.

We note in passing that this is *not* consistent with the message from the online Glastir Woodland Creation Opportunities Map⁶. Figure 13 shows that map alongside an online soils map⁷ for one of

⁶ <http://lle.gov.wales/apps/woodlandopportunities/>

⁷ <http://www.landis.org.uk/soilscapes/>

our example commons; even allowing for the very strange variation between grid squares, there seems to be no indication of the carbon storage value of the local upland habitats and their soils.

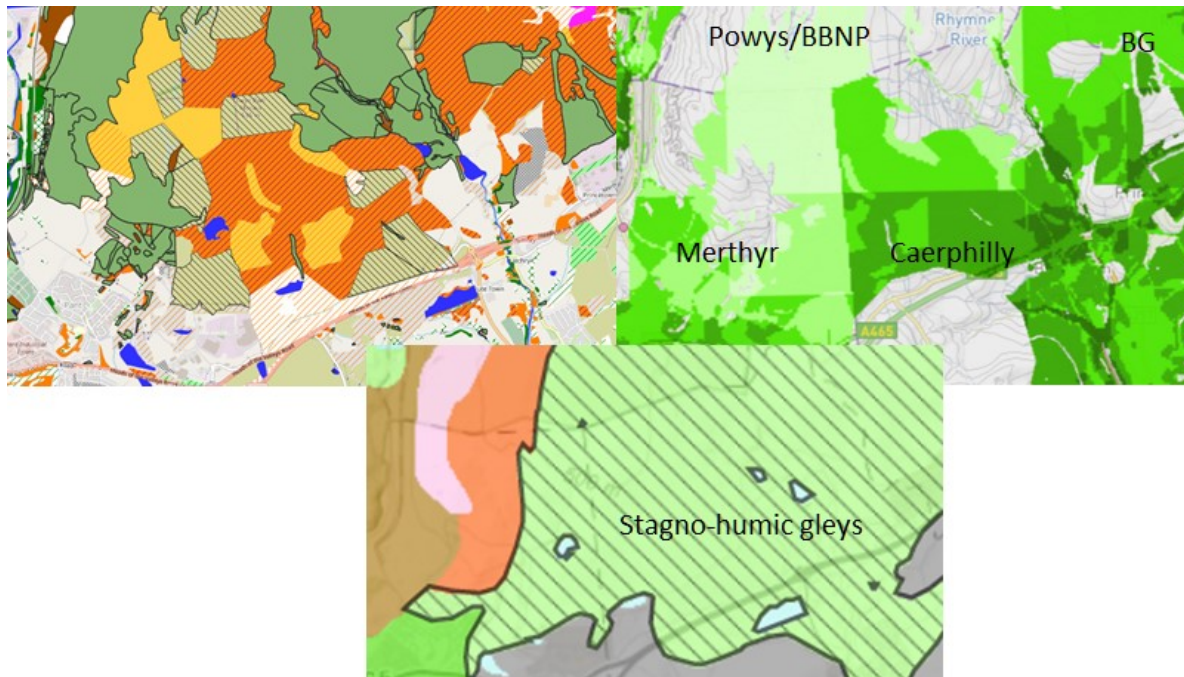


Figure 13. Phase 1 overlain with habitats 'sensitive' to planting in green (top left), Glastir Woodland Creation Opportunities (top right) and soils (bottom) maps for the northern part of Merthyr common (our labelling)

7.2 Biodiversity

WG's National Well-being Indicator 43 is the Area of Healthy Ecosystems in Wales, while Indicator 44 is the Status of Biological Diversity in Wales. But although biodiversity is probably the public good for which there is the most legislation, guidance and advice, it proved surprisingly difficult to get a full picture of what Welsh Government policies imply in practice, with the clarity of the sources diminishing rapidly in roughly the following order: habitats and species of Community interest on Natura 2000 sites >> other features on SSSI >> habitats and species specifically named in certain legislation >> other habitats and species.

7.2.1 Information sources

We used a number of different types of sources, aiming always for the source with the highest authority (as regards stated Welsh Government policies). They included:

- Legislation
- Official policy and discussion documents and guidance. For example, SAC management plans⁸, the State of Natural Resources reports (SONARR)⁹ and the guidance handbook for Glastir (Welsh Government 2018b)
- Verbal guidance from experts in statutory bodies
- Other non-statutory sources of guidance, including NGO staff and publications, independent experts and scientific publications

⁸ <https://naturalresources.wales/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/protected-areas-of-land-and-seas/find-protected-areas-of-land-and-sea/?lang=en>

⁹ <https://naturalresources.wales/evidence-and-data/research-and-reports/state-of-natural-resources-report-sonarr-for-wales-2020/?lang=en>

What follows is our attempt to pull the various pieces of information available to us together into what we think is a single coherent whole. Where Welsh Government policy is silent on specifics, we have interpolated from its general objectives, using our best understanding of expert opinion.

Very large areas	Upland heathland
Large areas	Upland flushes, fens and swamps
Large areas	Blanket bog
Large areas	Coastal saltmarsh
Local	Upland oak woodland
Local	Upland mixed ash woodlands
Local	Wet woodland
Local	Upland calcareous grassland
Local	Lowland heathland
Local	Purple moorgrass and rush pastures (<i>only certain types fit the 'priority' definition given elsewhere</i>)
Local	Inland rock outcrop and scree habitats
Local	Open mosaic habitats on previously developed land
Local	Maritime cliff and slopes
Very local	Lowland calcareous grassland
Very local	Lowland acid grassland
Very local	Limestone pavement
Very local	Coastal sand dunes
Very local	Coastal vegetated shingle
Unusual	Wood pasture and parkland
Unusual	Lowland dry acid grassland
Unusual	Lowland fens
Unusual	Reedbeds
Unusual	Mountain heaths and willow scrub
Frequent	Rivers
Occasional	Oligotrophic and dystrophic lakes
Occasional	Ponds
Infrequent	Mesotrophic lakes
Infrequent	Eutrophic standing waters

Table 2. Extract from Section 7 habitats list indicating main habitats occurring on project area commons

7.2.2 Habitats

Under the Environment (Wales) Act 2016, a public authority must seek to maintain and enhance biodiversity in the exercise of functions in relation to Wales, and in so doing promote the resilience of ecosystems, taking particular note of their diversity, connectivity, scale, condition and adaptability. They must take note of the State of Natural Resources reports and of local Area Statements, and of a 'Section 7' list of habitats and species which Welsh Government considers to be 'of principal importance for the purpose of maintaining and enhancing biodiversity in relation to Wales'.

7.2.2.1 *Habitat priorities*

This list contains a number of habitats which may be found on commons in the project area (Table 2¹⁰), including some which cover large areas.

Some habitats are notable for their exclusion from the list, specifically, upland acid grasslands and bracken-dominated areas. From other sources, we also understand certain forms of ‘purple moorgrass and rush pastures’ to have at least a lower priority than the other habitats on the list.

From SONARR and SAC Management Plans, it is made clear that some priority habitats are in fact better seen as degraded forms of other priority habitats (e.g. some upland heaths being degraded versions of blanket bog) and that fulfilling the Environment Act’s obligations for those ‘original’ habitats means working towards a shift between priority habitats in some circumstances. Policy also implies that in many cases, fulfilling those same obligations will mean a shift towards a priority habitat from a non-priority habitat; if, for example, upland heathland has been lost in the past by conversion into upland acid grassland, fulfilling the statutory obligations towards upland heathland would imply some degree of extension of its area at the expense of non-priority upland acid grassland.

We summarise our understanding of the desired direction of travel for habitats currently found on commons within our project area in Table 3. The direction of travel in the case of ‘no change’ should be understood, in the case of poor quality examples, to imply an improvement in quality. Spatially, the implications are something along the lines of Figure 14.

Note again that the message from Glastir Woodland Creation – Sensitivity Map – Priority Habitats¹¹ is much more ambiguous. Its polygons are based solely on *existing* habitats, as mapped in Phase 1, implying that most of the central Beacons (Figure 14) are not sensitive, whereas our understanding of the Environment Act is that habitats which are understood as being degraded and restorable examples of priority habitats should be set on the path to restoration. In passing, note that the idiosyncrasies of the Phase 1 mappers may lead to seemingly identical habitat being mapped as ‘degraded bog’ in one area and ‘marshy grassland’ in another, with the former being ‘sensitive’ and the latter apparently not (is there no priority ‘purple moorgrass and rush pasture’ priority habitat in the uplands? See also next section).

7.2.2.2 *Habitat quality*

When it comes to habitat quality, the most detailed information, for Annex 1 habitats on Natura sites, is available in the SAC management plans; otherwise, although some qualitative indications is available in some cases in the SSSI Vision documents now provided online for each site, the only official quantitative information is that given as guidance in the various Glastir prescriptions (Welsh Government 2018b); the information on structure available in these sources informs all of the relevant questions on the draft scorecard.

¹⁰ For the full list, see <https://www.biodiversitywales.org.uk/File/57/en-GB>

¹¹ <https://lle.gov.wales/catalogue/item/Glastir%20Woodland%20Creation%20-%20Sensitivity%20Layer%20-%20Priority%20Habitats/?lang=en>

Current	Criteria	Direction of travel
Blanket bog (incl. Modified blanket bog, mosaics containing blanket bog)	(No change if functioning)	➤ (Functioning) blanket bog
Wet heath	<ul style="list-style-type: none"> - Vegetation characteristics indicating restoration to blanket bog possible - Vegetation characteristics indicating restoration to blanket bog <i>not</i> possible 	<ul style="list-style-type: none"> ➤ Blanket bog ➤ Wet heath
Marshy grassland – Molinia dominated	<ul style="list-style-type: none"> - Presence of certain species indicating species-rich (sub-) community (e.g. <i>Serratula tinctoria</i>, <i>Cirsium dissectum</i>, <i>Wahlenbergia hederacea</i>, <i>Hydrocotyle vulgaris</i>, <i>Anagallis tenella</i>, <i>Juncus acutiflorus</i>) – no change - Vegetation characteristics indicating restoration to blanket bog possible - Vegetation characteristics indicating restoration to blanket bog <i>not</i> possible 	<ul style="list-style-type: none"> ➤ Marshy grassland ➤ Blanket bog ➤ Wet heath
Marshy grassland – rush dominated	(Usually no change?)	Remain as marshy grassland – rush-dominated?
Dry heath	(No change)	Dry heath
Acid grassland and acid grassland mosaics without trees/scrub	<ul style="list-style-type: none"> - On rankers, no change - All other cases 	<ul style="list-style-type: none"> ➤ Acid grassland & their mosaics ➤ Dry heath
Bracken and acid grassland mosaics with trees/scrub	- Universally	➤ Scrub/woodland
Scrub/woodland	- No change (Universally? Q – what about when encroaching on certain habitats, e.g. calcareous grassland?)	➤ Scrub/woodland
Calcareous grassland	(No change)	Calcareous grassland
Inland cliff vegetation	- Universally?	➤ Tall herb communities
Maritime grasslands and heaths	(No change)	Maritime grasslands/heaths
Open mosaic habitats on previously developed land	(No change)	Open mosaic habitats on previously developed land

Table 3. Our understanding of the implications of Welsh Government policy for the main habitats on commons in the project area in terms of direction of travel

For most habitats, good condition, as described in the SAC management plans and the Glastir guidance, involves not only the presence and/or frequency of certain species, but also a varied structure at all levels in the landscape. Some vegetation should be taller and some shorter, and at all scales. Indeed, a mosaic of habitats is the norm and does not in itself indicate poor condition, even in the cases of a mosaic of a priority and a non-priority habitat. Uniformity is in general to be avoided, whether the vegetation is uniformly short or uniformly long. We return to the question of structure below when we consider species, but we should note here the main exception. The

species diversity of calcareous grassland (and the long-term survival of the habitat) very much depends on a very short turf where competitive grasses are suppressed and succession processes which would deepen the soil and eventually eliminate the influence of the calcareous substrate are prevented.

7.2.2.3 Areas of least clarity

The fate of a small number of habitats was unclear from the published documents and required rather more in the way of interpretation on our part.

First, what is the vision for upland acid grassland? It is quite clearly not a priority habitat (though the list of priority species may have some implications in that regard, see 7.2.3 below). Our impression is that it is not regarded as an 'undamaged' habitats except where soils are thin or as an element in a mosaic with e.g. dry heath or scattered trees. What then are the directions of travel indicated by policy in the round?

Originally we thought that there might be a choice to make between moving towards a greater proportion of heathland vegetation and woodland planting to increase carbon stores (assuming that natural regeneration, which is ecologically preferable, would be limited to marginal areas within reach of seed sources). But our reading of the evidence on the effects of planting carbon-rich soils on net carbon stores on the one hand and our understanding of the implications of the Environment Act duties for the priority habitat 'upland heathland' on the other leaves us in little doubt that the gross effect of policy should be to encourage a move towards more and better heathland in the upland mosaic.

Second, and linked to some extent to the first, what is the place of woodland and trees in the landscape of commons (including scrub, which must be rescued from its almost taboo status)? While it seems clear that large-scale woodland expansion by means of planting is not consistent with maximising either carbon storage or biodiversity public goods, except possibly onto bracken (which itself is not without its value), what of the benefits or otherwise of scattered trees and small copses in a wider mosaic and what of their expansion through natural regeneration?

We confess to still being quite unclear on the acceptability *at all* of trees on some priority habitats; we sense that the message may be different on the lowlands where abandonment is threatening what are there quite rare habitats, compared to the uplands which are often largely treeless for miles on end. Our initial thought was to encourage scattered trees or woodland up to 20% of an assessment block or whole common, but then we realised that some habitats are more vulnerable to loss by encroachment, while rewarding a current situation may have fewer pitfalls than encouraging rapid expansion. On the other hand, it is clear that as priority habitats in themselves, 'restoring' native woodlands habitat quality and connectivity by taking advantage of natural processes is just as valid as restoring heathland, for example. Getting the subtleties right would be an aspect of the card needing careful evaluation during further testing.

Finally, we struggled to pin down a vision for *Molinia*-dominated habitats. In this case in particular, official publications are extremely unhelpful, as much in what they don't say as what they say. 'Purple moorgrass and rush pasture' is a priority habitat, but what exactly *is* 'purple moorgrass and

rush pasture’? It took the project team a long time before we were confident that the habitat as defined for this purpose only comprises a certain subset of Molinia habitats – a subset with a certain range of characteristic species, most of which are linked to more lowland examples (meadow thistle, sawwort, whorled caraway...), but not all (ivy-leaved bellflower, marsh pennywort, bog pimpernel...).

What about the rest? Are they all the products of degraded bogs or degraded wet heaths? Is there a Molinia ‘problem’? All of these seem sometimes to be elements of the wider narrative but discerning the threads of principle was often something we found difficult. In the end, our approach was on the one hand to encourage the restoration of ‘natural’ hydrological processes where there is an obvious way to do so (ditch blocking) and, as with most habitats, to encourage a well-structured sward. If either of these results in a greater proportion of heathland species, for example, all well and good, but as we understand it, policy is ok with Molinia remaining as Molinia unless it is restorable to blanket bog, with more species-rich Molinia communities being particularly valued.

7.2.3 Species

In parallel to the list of priority habitats, the Welsh Government has, pursuant to s.7 of the Environment Act, also drawn up a list of priority species¹². Our scorecard does not make specific provision for any particular species, but should in general encourage a mosaic of good quality habitats which will suit a large variety of both common and rare species.

Having said that, we are aware that there has been a feeling that stressing the priority of particular habitats, defined and assessed largely in terms of higher plants, has sometimes led to the neglect of other less fashionable taxonomic groups such as invertebrates and fungi, despite those groups making up the bulk of our species diversity. Our understanding is that by for example giving full regard to issues of structure at all sorts of densities, or by encouraging trees and scrub in modest amounts, the card promotes a more clearly-balanced message without ‘demoting’ priority habitats.

We nevertheless recognise that there will be some things which can be done to encourage a wide variety of species, or indeed to encourage a single priority one which will mean either

- Modifying the definition of ‘good’ given by the cards in certain limited areas; we see no issue with this, as long as the appropriate authorities give their consent
- /or undertaking complementary actions such non-productive investments in addition to the land management indicated by the scorecards

A greater issue for us is how such additional effort is stimulated. Existing knowledge is highly coloured by observer effort; the amazing discoveries by enthusiasts such as Liam Olds, Emma Williams and others on colliery spoil only serve to highlight the traditional privileging of certain habitats and places, while what data has been collected is both difficult to access and to interpret. How to include species in a way which truly reflects their distribution and the potential of various sites is a topic well beyond the scope of this project, but should be the subject of serious consideration. Local human expertise surely has a role, but the experience of the Glastir species and habitat indicative maps is not an entirely happy one.

¹² <https://www.biodiversitywales.org.uk/File/56/en-GB>

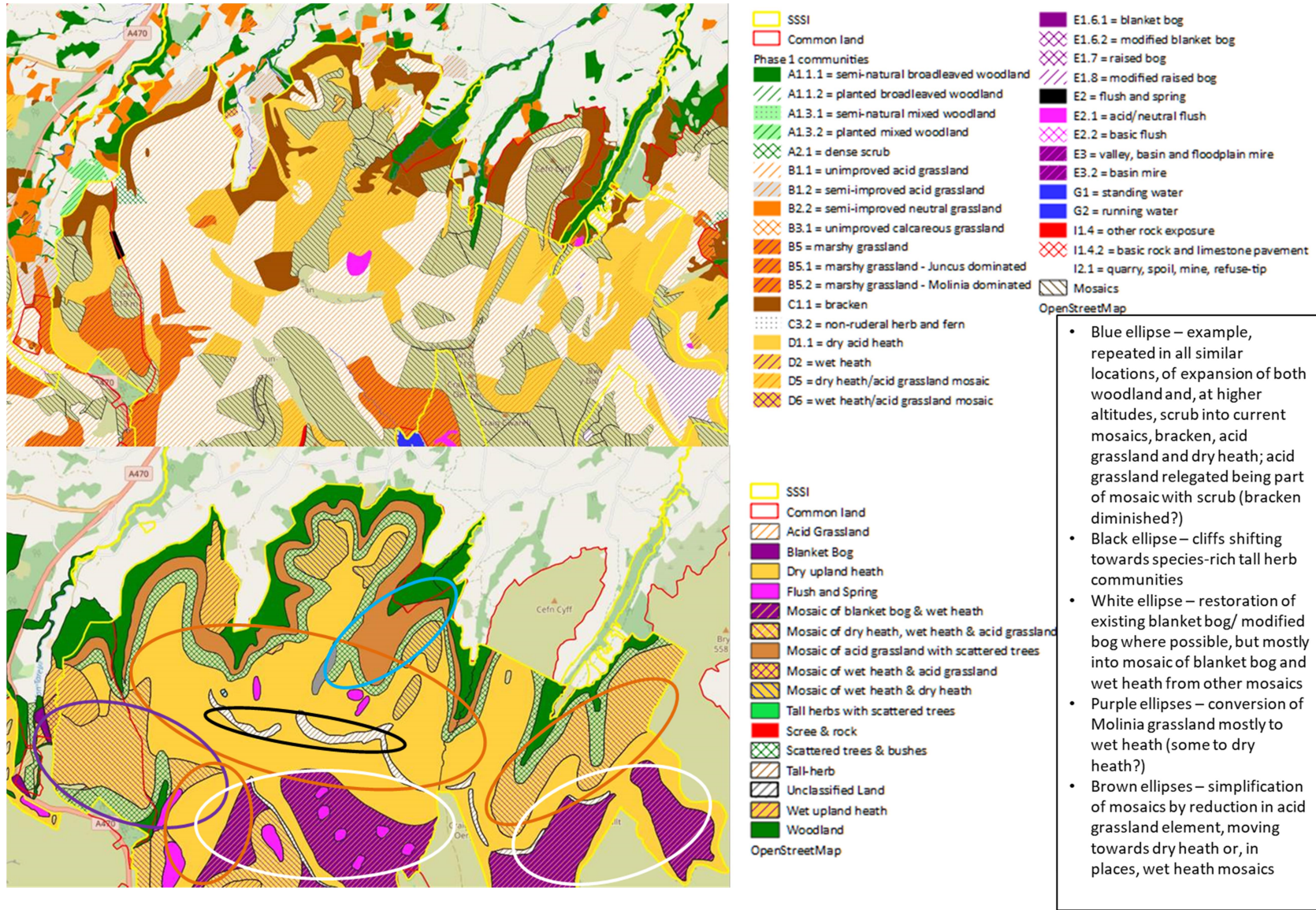


Figure 14. Phase 1 mapping (top) compared with our best understanding of the direction of travel indicated by policy, as illustrated in an area of the central Beacons

7.3 Water flow regulation

Water flow regulation means the dampening down of inherently intermittent rainfall events in such a way as to ensure that rivers are always flowing on the one hand and that the frequency of major damaging floods is reduced on the other.

Good water flow regulation aims to:

- slow the passage to water courses of large volumes of water, if possible by allowing it to infiltrate into the soil or, failing that, by making it difficult for it to cross the land surface
- have as low a density of watercourses as possible, since water flow is usually faster once it enters a watercourse
- slow the transfer of water down the catchment even when it has reached watercourses, including by diverting it temporarily onto floodplains

Many of these imply maintaining or restoring natural processes – allowing the natural overflowing of rivers onto their floodplain, not ‘tidying’ obstacles such as fallen logs out of watercourses; not modifying the courses of rivers by straightening meanders; not having additional artificial watercourses in the forms of ditches and drains. These are location-specific and may in some cases be suitable for support as non-productive investments; in others, having a sub-optimal situation could attract a reduction of scorecard points.

Perhaps the main difference management and vegetation cover makes is within the context of the first objective listed above. While soils have whatever infiltration capacity they have, the management of the vegetation has a key role in slowing flows and, if there is some infiltration capacity, in allowing the soil to take up the water from the rainfall event.

One way in which hydrologists think of this is in terms of ‘roughness’ – the ‘rougher’ the surface, the slower the flow over it. Experts have estimated how roughness varies with vegetation height relative to water depth – this is shown diagrammatically in Figure 15.

Note how the effective roughness initially increases disproportionately as the relative vegetation height increases – a little more height makes a big difference. However, once the vegetation is more than twice the height of the water, and consists of a dense growth rather than isolated plants, there is no additional benefit for an additional increment of vegetation height.

Note also that the benefit is related to the *relative* height of the vegetation compared to the depth of the flowing water. Whereas on a floodplain, this may imply a benefit to having vegetation 0.5m tall in the case of small streams to perhaps 6m or more in the case of large rivers, for most of a catchment away from watercourses, a vegetation height of a few inches is all it takes to make the difference (Figure 16).

In the context of semi-natural vegetation, it is also important to note that the simple distinction made between ‘soil’ and ‘vegetation’ is not at all clear, and that this is in fact one of the key reasons why such vegetation types are often good for flow regulation. An extreme example is blanket bog, where the upper layers of half-alive, half-dead, partially-decaying vegetation underneath the living

plants of the bog surface are sponge-like, with huge capacity to absorb rainfall and slow its passage to streams (Figure 17). The lower layers, though usually saturated, are almost impermeable and play little role in flood regulation. When they are exposed, through peat cutting or wildfire, they can create a situation which can in fact result in extremely poor infiltration and extremely rapid runoff.

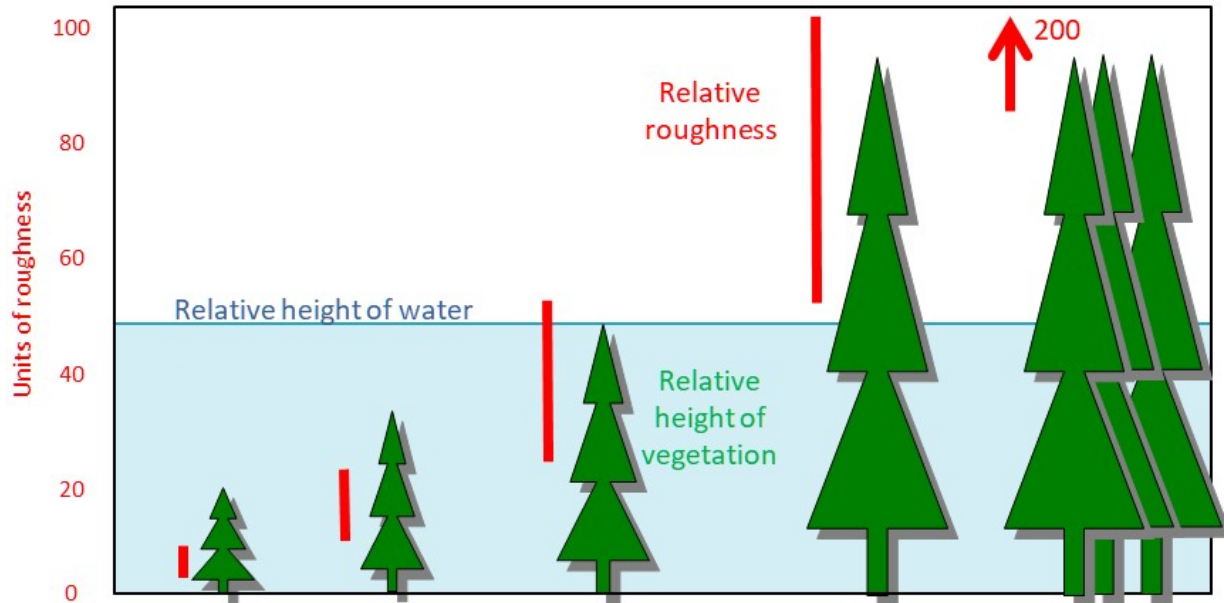


Figure 15. Variation in roughness with height of vegetation relative to depth of water, from data in (Arcement, Jr. and Schneider 1989)



Figure 16. Overland flow on common land on Dartmoor - the water depth is greater than the height of the vegetation (Image: East Devon Catchment Partnership)

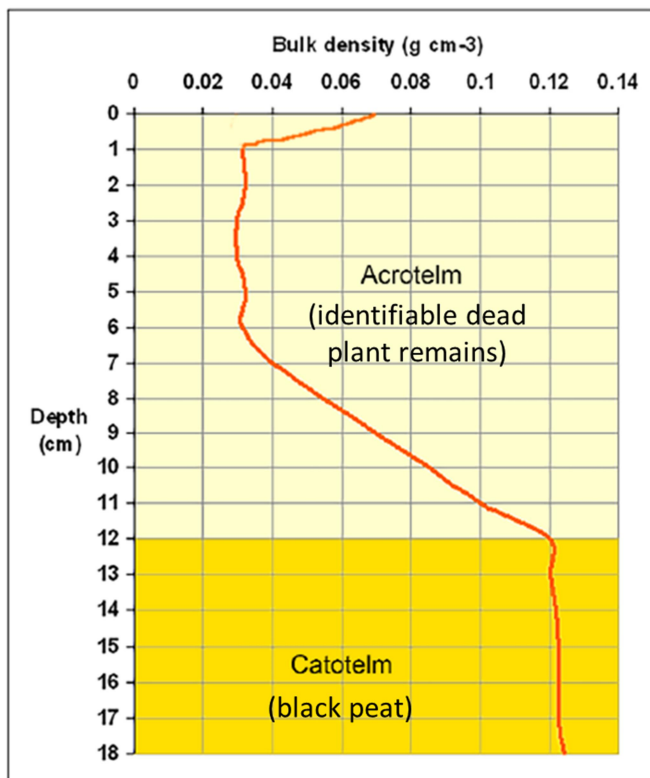


Figure 17. Undamaged peaty horizons have a spongy and upper extremely upper permeable layer which can absorb rainfall and a lower layer which has extremely low infiltration capacity. After Gregg et. al (2021), after Lindsay, after Clymo

Thus water flow regulation is favoured by

- good vegetation structure, with any smoother, tighter grazed vegetation which might be desirable for biodiversity or fire regulation reasons being sited if at all possible well away from watercourses, and on the less steep slopes. Good structure does *not*, from the point of view of flow regulation, imply unusually tall vegetation, apart from on floodplains – vegetation should be at least twice the depth of likely flows. (Note that ‘floodplains’ in this context is any area which is subject to flood – these maybe quite narrow and small).
- the restoration and maintenance of semi-natural habitats, including reinstating the hydrology of blanket bogs and mineral-organic soils
- blocking any artificial drainage ditches
- restoring or maintaining natural channel meandering
- restoring or maintaining natural floodplain function
- not removing any obstacles in-channel

It seems clear that as long as shorter vegetation is sympathetically located in relation to watercourses, there is no contradiction between good management for biodiversity and good water flow regulation; as we report in the next section, what is good for flow regulation is apparently also usually good for water quality.

7.4 Water quality

With the exception of sediment load, which also has long-term implications for flood management downstream, the water quality issues currently arising on commons emerge as problems in the context of the provision of public water supplies.

7.4.1 Colour

Colour issues on commons are linked to humic acids from organic soils. These pose no danger to public health, but are subject to regulatory limits, necessitating the appropriate treatment of the water, with its associated costs. The goal from a water treatment perspective is a predictable, ideally constant, level of colour.

The exact mechanisms leading to the release of humic acids and what causes fluctuations in their concentration is not known in detail. It seems clear however that intact, well-functioning habitats and catchments are more likely to lead to the desirable outcome. That means not only catchments where organic soils are not actively eroding, but ones where good water flow regulation characteristics serve both to reduce the flashiness of the flood response and to minimise the degree of drying out of organic soil habitats during periods of low rainfall. Fire within the catchment is unlikely to be conducive to stable colour levels.

7.4.2 Taste and odour

Taste and odour issues arise from the life cycle of blue-green algae in the aquatic environment. This was understood in the past as relating to reservoirs, but recently issues have been reported also in river water. As with colour, there is no danger to public health, but in this case the water is unpleasant to drink. They can also be eliminated during water treatment, but this brings associated costs, so again the goal from a public water supply perspective is a predictable, ideally constant, level of taste and odour.

The mechanisms which give rise to taste and odour issues are if anything more poorly understood than those involved in colour, from the factors controlling the blue-green alga population to exact role of blue-green algae and the part played by the temperature profile of the water column over time. Even the most general level of understanding which links blue-green algae to obvious sources of nutrients within the catchment have been thrown into question by episodes of concern in reservoirs situated in catchments which are overwhelmingly semi-natural vegetation.

A study into the factors involved in the dynamics of taste and odour is about to be completed and published by WW. Until that time, it is very unclear what their implications might be for the management of common land.

7.4.3 Sediment

Although usually not directly a danger to human health (although the erosion of sediment can be associated with the mobilisation of problematic elements such as manganese), sediment load is both an immediate issue for water treatment and leads to a long-term problem of siltation of reservoirs. The size of sediment makes a difference – while large grains settle out quickly in a reservoir, the smallest particles sizes may still be in suspension at the abstraction point, leading to higher treatment costs. As with the other issues listed thus far, the objective with sediment is to have a predictable, ideally low, level which has to be addressed by treatment.

Again, the way to achieve this is to have intact, highly resilient habitats. This means first and foremost avoiding land use practices which lead to erosion – pressure from trampling, opening of drains, construction of tracks, burning of vegetation (which exposes the soil and can cause short-term hydrophobicity). But it also means keeping the catchment functioning in a way which is good for flow regulation – minimising overland flow and maximising infiltration; reducing the frequency of high energy flood peaks; reducing the area prone to extreme drying and wetting, which can lead to cracking and erosion, etc..

7.4.4 Zoonotic pathogens

Bacterial pathogens are not a major issue, since any present can be killed by chlorination, which is in any case routine for public water supplies. The major challenge is the protozoan, *Cryptosporidium*. This is carried by both domestic and wild animals, each of which has the potential to expel millions of cysts annually. Unlike the other water quality issues listed above, this is a serious issue for human health, with very exacting standards set for drinking water. *Cryptosporidium* is not eliminated by chlorination; dealing with it requires additional ultra-violet treatment which is not currently installed everywhere and thus represents a significant additional cost (and thus a potential breach of the 2017 Water Resources Regulations, the follow-on to the EU Water Framework Directive).

Serious issues potentially arise from anything which causes a rapid increase in the amount of infected dung entering a reservoir. The problem therefore potentially has two elements, both of which offer the potential for improvement. First, the amount of dung entering a reservoir can be reduced. This might mean fencing off some area where livestock stand for long periods in the water, but the problem has to be considered in terms of source areas, which could just as easily be away from the watercourse on areas of frequent overland flow where dung accumulates until the next storm event. Once again, a holistic approach to the functioning of catchments which minimises overland flow by promoting infiltration and which lengthens the travel time of any remaining overland flow is likely to be beneficial for reducing the water quality challenge of *Cryptosporidium*.

Secondly, *Cryptosporidium* is also an animal health challenge, and one with potential economic impacts on hill farming systems. Reducing the *Cryptosporidium* load in the domestic livestock grazing a common is thus a second line of attack and one which could potentially benefit the farm economy. *Cryptosporidium* should be a major consideration in animal health and biosecurity plans and is a major justification for encouraging such planning in drinking water catchments.

7.4.5 Other potential issues

A major potential issue arises from the use of veterinary medicines in the broadest sense and any persistence through into water supplies. At present there are no issues, but this could change as the priorities for testing change or as farm veterinary practices change

7.4.6 Summary

In all cases, the best current understanding supports the idea that intact, well-functioning catchments – ones managed in a way which benefit habitats, carbon storage and water flow regulation and fire risk management – are also likely to give the predictable, moderate level of water quality challenge which the water supply sector requires.

There are still some major unknowns, particularly in the case of taste and odour; research is ongoing and some will be reporting soon. Any new information should be built into the signals given by results-based and action-based incentives.

There is scope for mutual benefit for farmer and water company alike from promoting the drawing up of commons/catchment animal health and biosecurity plans and supporting the subsequent implementation of those plans.

7.5 Fire risk management

Fire risk management involves dealing with both the frequency of fires and their impact, an approach similar to that used in weather warnings (Figure 18)

Impact can be assessed in terms of, for example:

- Potential destruction or damage to residential or business premises and their occupants
- Potential destruction or damage to forestry plantations
- Potential for disruption of or danger to road traffic
- Potential for damage to habitats and species, particularly if they are rare or particularly fire-sensitive
- Potential for damage to soils and particular to oxidising their organic carbon stores
- Potential for increasing the damaging effects of floods
- Pressure the fire would put on the emergency services' capacity to respond

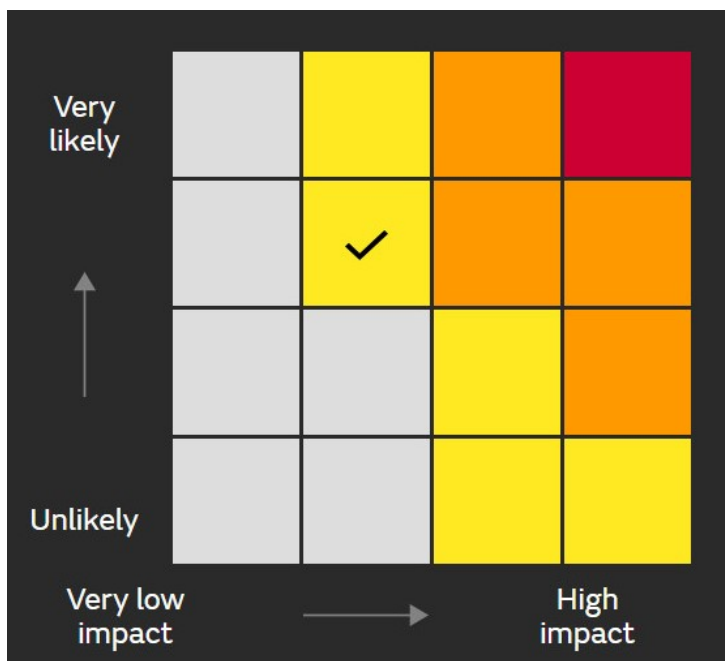


Figure 18. The frequency/impact matrix used by the Met Office for weather warnings

The South Wales Fire and Rescue Service admits publicly that the success of its policy of reducing the number of wildfires has led to a smaller number of very large, extremely challenging blazes – it reduced their frequency but increased their impact significantly. In projects such as Healthy

Hillsides¹³, they are working to better manage fuel loads so that the overall risk from fire can be reduced.

The challenge is how to manage fire risk while recognising that ‘fuel load’ can be another name for stored biomass carbon, or the structure which leads to better water flow regulation or which constitutes a habitat in good condition. The answer must lie in the spatial relationship of high fuel load and low fuel load areas and the management operations which can produce that optimum pattern over the landscape, producing good outcomes also for those other public goods (public goods which are themselves threatened by poorly controlled fire risk).

While the proposed scoring approach recognises the value and rewards a mosaic in terms of vegetation height and the retention of wet features which taken together can be positive for fire risk management, it seems clear that the spatial relationships necessary cannot easily be fitted into a simple scoring system which can be applied universally. We therefore see the need for discrete funding for both putting in place commons fire management plans and for implementing them through undertaking specific actions and for such plans to be a requirement of accessing the results-based area payments. The scope for a much higher degree of public-private partnership working founded on increasing grazier skills and capacity is huge; the collaborative, complementary, approach developed by the Devon and Somerset FRS and Dartmoor commoners is one from which many lessons can be transferred.

The role of fire itself in fire risk management (or in wider management for public goods) is an extremely difficult one to tackle. A controlled, low-impact fire is preferable to a high impact wildfire, but to what extent should managed burns be a permanent feature of commons management or should it (can it realistically?) be seen as no more than a temporary necessity while other more appropriate regimes are put in place? Is the stress on the adaptedness of some dwarf shrubs to fire obscuring the impact on other forms of biodiversity as well as on water flow management and water quality? How best to produce an incentive which promotes managed activities and discourages less well-managed activities under the cover of arson? If controlled fires are acceptable, how should that be reflected in the scorecard? Is it enough/acceptable for burnt areas to receive a low score on species and structure? These are difficult questions, but ones equally facing action-based approaches which take outcomes seriously.

7.6 Landscape

Commons are often an important element in the cultural landscape and in an area’s sense of place (Gower, Brecon Beacons, western and eastern Valleys), and has been an important element in the designation of AONB. The extent to which this can be diminished or enhanced, except in the case of wholesale change in land use, is very unclear but probably quite limited. We proceed on the assumption that everything the scorecards promote is neutral or positive from a landscape point of view and that everything the cards discourage is neutral or negative.

¹³ <https://www.welshwildlife.org/uncategorized/healthy-hillsides-project/>

7.7 Public access and recreation, and public health

Almost all of the commons in the study area and of our example commons are used significantly for public access and recreation, with knock-on impacts on public health. There are also likely to be unquantified benefits to mental health linked to the presence of the commons' open semi-natural habitats in the various locales. By the same token, seeing the commons abused through a range of antisocial behaviours may be stress-inducing and lead to a reduction in well-being.

Both the relative and absolute importance of commons varies geographically, as, to some extent, does the type of use encountered and its impact on the commons. In terms of LEADER group area (Table 4)¹⁴, commons are most important as open access resources at the western and eastern end of the study area, but the largest areas are of course in the huge open landscapes of the Brecon Beacons National Park. On the other hand, the importance for purely local use is likely to vary considerably, with a higher proportion of users travelling a longer distance in the case of Gower and the National Park. Some areas have high levels of use – from the high Beacons on Buckland to the coastal attractions of Pennard and the convenient dog walking of Llantrisant – while the commons of north Swansea and NPT have relatively low levels of public use.

	Commons as % of all land	Commons as % of open access land
Swansea	14	95
Torfaen	23	90
Cwm a Mynydd	19	87
<i>(Brecon Beacons NP)</i>	<i>37</i>	<i>86</i>
Neath/Port Talbot	5	60
Powys (whole county)	8	41
Rural Action Cwm Tâf	4	25

Table 4. Importance of commons as open access land by area

One of the main benefits provided by open access land and public rights of way are to physical and mental well-being. Public health is poorer than in Wales as a whole in every one of the study area local authorities apart from Powys, with worse statistics almost across the board for a number of indicators (Figure 19)¹⁵. Whether or not formal 'green prescribing' has a role in addressing some or all of these conditions, the potential importance of the local commons and access to them is likely to be significant.

It is not clear however what aspects of commons would make them more or less useful for recreation and public health, as long as paths are accessible and in reasonable condition.

Furthermore, public use is by no means without its impact on the grazing management of the commons. At one end is mere inconvenience and accidentally-damaging actions; at the other, negligence or downright criminal activity in the form of sheep-worrying, unlawful off-roading, illegal

¹⁴ <https://cdn.cyfoethnaturiol.cymru/media/677725/open-access-mapping-review-stats-external.xls?mode=pad&rnd=131043219690000000>

¹⁵ <https://statswales.gov.wales/Catalogue/National-Survey-for-Wales/Population-Health/Adult-general-health-and-illness/genhealthillness-by-localauthorityhealthboard>

fly-tipping, arson and the like. Actions of this type ‘bring an area down’ and have a range of impacts on the quality of life and well-being.

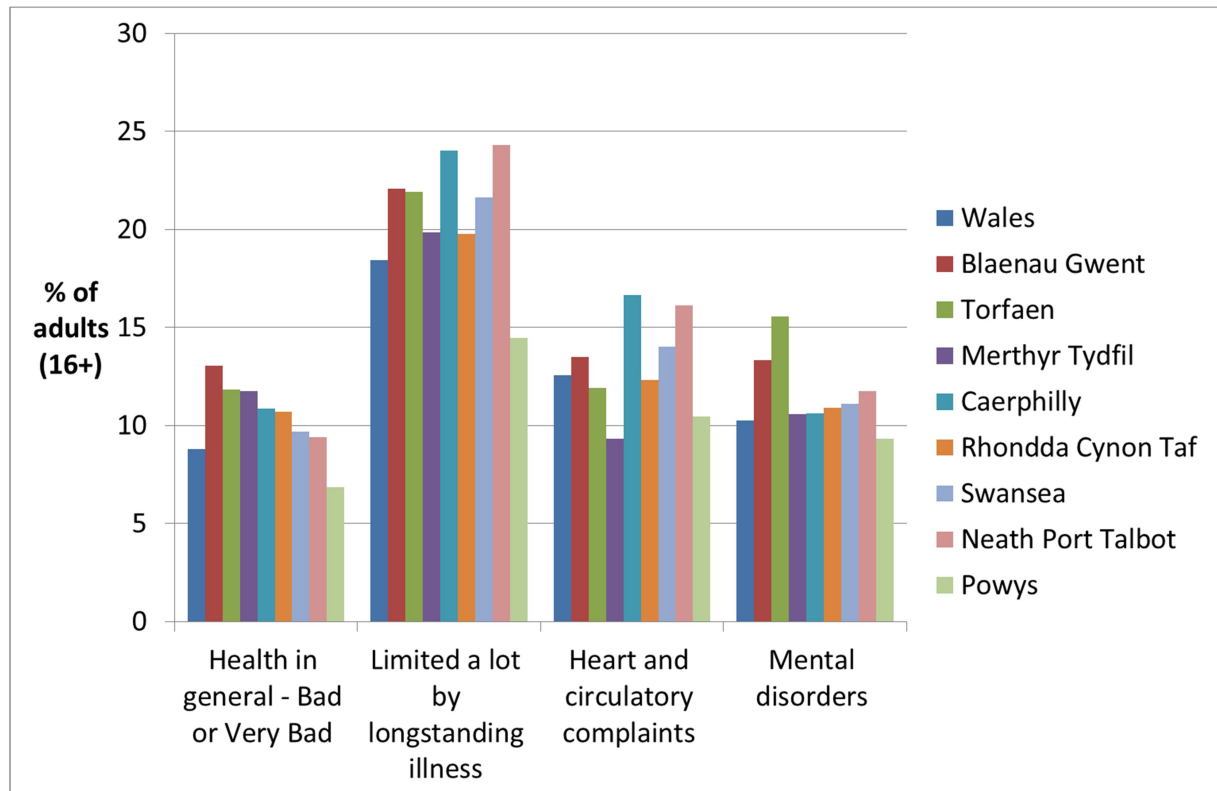


Figure 19. Selected health indicators by local authority relative to Wales average

Our conclusion is that while commons provide high level of public goods under these headings, the way to recognise them and support them and to better integrate them into other public goods as well as the livelihoods of graziers is to have a higher level of effective collaborative action between public authorities to address the problem of anti-social behaviour. Enhancing the experience of the user/visitor sits on top of that and again involves collaborations with public authorities; grants to graziers for capital works etc. may well have a part to play. But we do not see how such a place-specific thing can be converted into a wider results-based approach; rather it should sit alongside it.

7.8 Protection of historical and archaeological remains

Common land, having rarely, if ever, been put to the plough, is a treasure trove of archaeological remains. These span the whole of our history, from Palaeolithic remains in caves on commons through to remnants from our recent industrial past.

For the most part, such features do not need active management, but rather protection from damage; such damage is rare under normal grazing use. In some cases, archaeologists might prefer sites to be easily visible, or to reduce the cover of bracken, with its disruptive system of rhizomes, but again these are very specific to individual sites.

We struggled even to find a useful way of presenting archaeological information: the online resources present their data as points, yet it is clear on reading the details that these locations are part of a feature (colliery remains, for example) which covers a whole area of the landscape.

Our sense is that archaeological features are difficult to fit into a broad results-based approach, if only because some areas will have huge numbers of remains and others none (or apparently none – another issue with the online sources). Effective management probably requires a system of identification and advice similar to that which operated in the older AECM in the 1990s, supplemented by targeted non-productive investment support where appropriate. Such a system would complement the wider results-based approach to other public goods.

7.9 Animal health and biosecurity

Animal health and biosecurity is a broad catch-all phrase, some of whose elements are clearly private goods with a direct short-term impact on the grazier's business. However, it also has aspects which are just as clearly costs to other graziers and to the general public which external to the farm economy. This is particularly the case on commons, where there is no formal physical separation of animals. Examples of such externalities which can be thought of as public goods are:

- Knock-on impacts of TB testing rules (and TB breakdowns) on other graziers
- Knock-on impacts of poor animal health practices on other graziers (e.g. scab)
- Knock-on impacts of poor *Cryptosporidium* control on public water supplies
- Knock-on impacts of animal medicines on biota

Some public goods themselves bring negative externalities which impact farming businesses, for example infertility in cattle due to *Neospora* infection arising from the faeces of walkers' dogs.

It is however extremely difficult to see how such matters can be easily implemented into an area-based scorecard; rather, animal health and biosecurity is something which should be addressed through complementary planning and action. We recommend funding a free-standing animal health and biosecurity plan covering the whole range of issues likely to be of significance; such a plan could be made mandatory for claimants of the results-based area payments.

7.10 Safeguarding of skills and other intangible resources

We recognise that there is a value to society in maintaining skills and knowledge which might be of use to future generations. We also recognise the economic trends recognised by the economist Engel¹⁶ which tend to lead to a shrinking in the number of farms, and the knock-on effects that can have on rural communities. We therefore accept in principle that there are reasons to support farming activity which are not covered by the previous eight headings.

However, we think that, for commons at least, it is perfectly possible to address these issues by addressing the eight specific public goods outlined above and we see no self-evident case for proposing additional support independently of those objectives.

7.11 Summary

Having worked through the public goods, we find that, broadly speaking, there are no systematic conflicts between them. In particular, finding the optimum balance between habitat distribution

¹⁶ https://en.wikipedia.org/wiki/Engel%27s_law

and carbon stores seems less intractable than we had initially suspected, though we find this difficult to reconcile with any message that there should be large scale planting of semi-natural habitats.

Having established that balance, and having stressed the importance of mosaicity and structure both within the definition of ‘good condition’ for the habitats on their own terms and for groups such as invertebrates and fungi, we found that the other public goods could, with just some thought, fall into place. Water flow management, maintaining water quality and fire risk management all have their (not so very different) additional spatial aspects, but then so do the needs of some of the priority species. The scorecards don’t cover everything, but can provide a robust, sympathetic underpinning to addressing those needs using complementary planning and targeted, separately-funded actions.

8 General principles of scorecard design

The development of scorecards followed the same approach that has been successfully used across a range of results-based projects in Ireland e.g. Fresh Water Pearl Mussel EIP Project (<https://www.pearlmusselproject.ie/>) – the approach which was built upon in the Scottish POBAS and LEADER projects. This approach adopts a scoring system on a scale of 0 to 10 for the achievement of a desired environmental result e.g. species richness, with each increment associated with an increase in payment. Negative scores are also possible, but attract no penalty – the system deducts points for undesirable outcomes such as encroaching bracken or soil damaged caused by supplementary feeding.

The prime function of the scorecard is to translate policy objectives into a repeatable, reliable way of measuring progress which can be used by graziers and others with the minimum amount of training. The process of developing scorecards must therefore follow the following steps:

1. Identify the key environmental priorities and objectives for the land to be covered by the measure, including, but not only, addressing the requirements of statutory designated sites
2. Reach an understanding of what characteristics of an assessment area would indicate its quality as regards those various priorities and objectives
3. Bring the understanding of those separate mental pictures into a cohesive whole which addresses all of those needs at the same time, or which makes a clearly-explained set of compromises between them
4. Define clear potential results-based indicators which are representative of the condition of and potential pressures on the target public goods and which, if possible, are amenable to change through grazing and other management of the commons (if no such indicators are available, the applicability of a results-based approach must be brought into question)
5. Collate information on the trends and pressures of key importance for this synthesised vision, thereby identifying, if possible in a clearly-described way, the specific issues on which the card will give a ‘message’ through its points totals and associated payments at all points in the quality spectrum

6. Ensure that the selected results-based indicators are likely to be reliable and universally applicable in the target area (i.e., at least in the whole of the project area) and are easily implemented by the end users

8.1 The scorecard development process

Scorecards are designed to be a simple but accurate measure of public good delivery within a broad range from poor to very good. Having said that, it is not the purpose of the scorecard to identify exceptional performance (for example, the presence of very rare species), but rather to differentiate the vast majority of conditions which might be encountered. Scorecards are not a magic bullet – exceptional conditions may need specially-tailored action; the scorecards provide a foundation for those additional measures. Some targets are so vulnerable to the wrong choice of management that prescriptions are the lowest risk option; such cases are however the exception, not, as with Glastir, the norm.

Particular consideration should be given to selecting results-based indicators intended as a surrogate for more fundamental measures of public good delivery, since the possibility of a missed step is all the greater – the surrogates must be well correlated with the desired underlying public goods metrics, but only with those qualities. For example, we rejected red clover as an indicator species for biodiversity because although it is frequently a component of species-rich swards, it can also be found in intensively-managed, species-poor grasslands.

We aimed throughout for results-based indicators which would:

1. Be quantifiable, measurable and related to management
2. Be directly related to or closely correlated with the delivery of public goods
3. Focus on attributes of the land and particularly of the vegetation community; we did use species as part of this characterisation, but the individual species are not the target; the presence of individual species is outwith the direct control of the common grazing and even a high score can be obtained with many different combinations of species
4. Be applicable across the commons of the project area while still allowing for local distinctiveness
5. Take into account landscape and ecosystem dynamics e.g. not only the presence of woody species, but whether they are expanding and whether or not this is desirable for the various habitats
6. Be simple enough to be used and understood by graziers, advisors, project officers (i.e. people who broadly understand commons, but would not consider themselves to be skilled botanists/ ecologists) after a few hours of training

Another critical aspect of scorecard development is the weighting of the card i.e. how many points are allocated for each results-based indicator. In the Welsh case, we were addressing a broader range of public goods than in Scotland, where species-richness was a particular focus. The scorecard then has a higher weighting for structure and other characteristics and a lower weighting for species, though species-rich habitats always receive a higher score than an otherwise-similar species-poor area.

Scorecards can use a mixture of positive and negative scoring in order to provide a clear message to promote positive management. By and large, positive scores should be given for positive management and negative scores are given for negative management, otherwise those who are doing a relatively good job may find themselves receiving the same reward as someone who has just avoided damage. Spreading 10 points around a range of positives is difficult enough; the avoidance of egregious damage is ultimately the role of regulation.

Some results-based indicators can receive a range of scores and can be assigned to a number of categories which describe the varying condition found within the measures of habitat quality. For example, Figure 20 is an excerpt from the general part of the scorecard card which aims to assess species richness. The lowest level of species richness receives no reward (it may receive a positive score in other questions of course), moving up a scale of rewards to the highest level of 2 points for the presence of over 15 indicator species, clearly indicating the desired outcome.

A.1 What is the number of positive indicators within 20m of the assessment point? Circle all positive indicators present from List A.					
PI no.	Low: 1 to 4	Low: 5-8	Medium: 9-12	High: 13-15	Very high: >15
Score	0	0.5	1	1.5	2

Figure 20. Excerpt from a scorecard

This particular metric is usually very difficult for the grazier to change in a positive direction. And so, since a key consideration for the scorecard designer is to ensure that a significant element is under the farmer’s control, the majority of the remaining 8 positive points are for vegetation structure. Similarly all of the negative points are linked to evidence of damage that can be addressed within the short or medium term by remedial action.

8.2 Building on the Scottish cards – similarities and differences

Just as the Scottish work in the Outer Hebrides LEADER project (Stewart and Jones 2020) and Skye and Argyll POBAS project areas built on the RBAPS Irish cards¹⁷ (and were themselves in turn ultimately built on the pioneering work of the Burren projects¹⁸), so the current work started with the Scottish cards, with whose development one of us (GJ) was intimately involved.

Having struggled in Scotland with how to measure and balance species diversity and structure and having come to a novel solution in a table which brings the two aspects together, we particularly wanted to retain and build on that element, not least as something we could underpin with more habitat-specific guidance in Wales.

We also wished to adhere to the Scottish principle that separating out habitats or features is usually very difficult; habitats shade from one to the other and anyway exist in a mosaic. The former advisors amongst us have experienced the difficulties that such choices can pose for farmer, project officer and auditor alike. We therefore assumed, as in Scotland, that separating out certain habitats should only be done when there are clear, unambiguous, differentiating criteria (saltmarshes, active sand dunes....) or needs (blanket bog...). Even then, we struggled at times.

¹⁷ <https://rbaps.eu/>

¹⁸ <http://burrenprogramme.com/>

Scotland is not Wales of course, and we found, as expected, that some of the Scottish indicator species were inappropriate (pale butterwort, black bog-rush), while other species not present further north were ripe for inclusion (ivy-leaved bellflower and marsh St. John's wort, for example). We duly made a series of changes to account for those differences.

Other aspects were rather more nuanced. First, and very significantly, all previous attempts at drawing up results-based scorecards have assumed that the scheme in question would sit atop one or more less demanding form of support and that the scorecard would then, as a matter of principle or as a matter of avoiding accidental double funding, not reward the lowest level of delivery. In Wales, on the other hand, the stated intention of WG is that the SFS will be the only means of support available to encourage and reward positive management which goes over and above the new statutory baseline. Our proposal cannot be therefore be targeted only at a small subset of commons or of a subset of public goods – just on the biodiversity of priority habitats on designated sites, for example. It is for this reason that we propose (modestly) rewarding a well-structured pasture even if it only has one indicator species reliably present.

Second, the Welsh approach aims to reward the delivery of *all* public goods. But it also became clear that some public goods are more 'demanding' (there are fewer good examples) - it is possible to be 'good' for water flow regulation, for example, while having relatively low numbers of flowering plant indicators. So while our card therefore generally gives structure a higher relative weighting compared to the Scottish cards, they still allowing us to give the highest rewards to the places delivering the best results for those more demanding targets - species-rich areas, for instance.

In some cases, this requires us to be *more* sensitive to things than in Scotland. There, we were 'blind' to drains except where they impacted negatively on the surrounding habitat. In the Welsh context, where we consider carbon stores, water quality and water flow regulation as well as habitat quality, any drain is seen as a probable negative, though again the points reduction is greater when adjacent habitats are clearly showing negative impacts.

Third, in the general Scottish context the presence of trees was taken to be a positive feature, and our card did not give any negative message in that regard; we rewarded trees up to a certain level of cover, but didn't penalise them even at 100% cover (while tailoring the payments to encourage the management of denser woodlands and wood pastures through alternative funding sources).

The message from experts in Wales was a lot more differentiated. There are some habitats (calcareous grasslands) where trees are seen as undesirable in all cases. For many others, the sense that the habitats are rare enough (and a Welsh priority) on the one hand, and of having experienced habitat loss to scrub and woodland as a current issue on many sites on the other, combined to produce an acceptance of current tree cover. At the same time, there was an unwillingness to reward or encourage expansion and, in some cases, even a desire to penalise it (e.g. on lowland heaths or lowland purple-moorgrass-and-rush pastures). On the other hand, woodlands are themselves priority habitats and opportunities for reconnecting fragmented networks should be taken – bracken slopes are such an opportunity on many commons, but even there, as with every priority habitat, the possible needs of priority species have to be taken into account.

8.3 Testing and further development

As in Scotland, the issue of how to describe and deal with structure was the main issue we struggled with having made the basic changes to account for the different species and the different weighting being given to species and structure respectively. The approach of the Scottish card was found to be good in principle, but inadequate in its current state of development. Our solution was to make the most of the kind of differentiation set out in the Glastir guidance, asking additional questions to guide the selection of the appropriate criteria.

The ‘vision’ for *Molinia*-dominated pastures was another issue which caused considerable uncertainty. In this case, it stemmed from the mix of signals we got from official documents, signals which those documents did little to resolve. On the one hand ‘purple moorgrass and rush pastures’ are a priority habitat – does that encompass *all* *Molinia* habitats, and if not, how is it to be distinguished? On the other, remarks in passing and some Phase 1 mapping gave us to understand that some *Molinia* was to be regarded negatively as a result of the drainage and/or burning and/or inappropriate grazing of blanket bog and other priority habitats. How were *those* *Molinia* swards to be identified?

Our eventual solution was pragmatic and, we believe, gives the ‘right’ signal to each priority in the appropriate place – to penalise drainage and damage by fire everywhere, to reward species-richness everywhere, to reward the presence of heathy species in all low-scoring plots and to reward good structure everywhere.

Trees and scrub were another dilemma. While it was clear that a more differentiated approach was demanded compared to Scotland’s (see above), how should that work in practice? Wasn’t there a choice or balance to be struck between tree regeneration (even planting?), with its concomitant benefits in terms of carbon balance, water flow regulation and so forth, set against habitat conservation? A choice which, given the climate crisis, carbon should win?

The resolution to this dilemma came from the realisation that there seems in fact not to be a dilemma between appropriately-targeted tree planting and the other public goods, biodiversity included. The confusion was rather the result of thinking, falsely, that it would be carbon-positive to plant thousands of hectares of woodlands on the semi-natural pastures and organic soils of the commons when the evidence seems to point in the other direction. The result was the modest and targeted encouragement for woodland expansion referred to above.

Our approach to scoring a common also developed a lot over time, with the key difficulty being how to be both representative and efficient. We discuss this further in section 8.5 below.

8.4 The final scorecards

The final draft of the scorecard took the following form:

8.4.1 Grazing management test

The results-based area payments developed here are based on the additional costs of grazing (see section 9 below). In compliance with the principle of avoiding overcompensation, they should not be awarded to commons where there is no grazing occurring. If the common can be managed by

‘capital works’ only, our approach allows that to happen, since capital works are not contingent on the award of area payments (the scorecard can still be used to measure progress of course). The cards therefore start by noting whether or not the common shows signs of recent grazing.

Why could we not just identify ungrazed commons through the scoring criteria? Because the effects would initially be subtle and the transition to a low score might take years – years in which none of the costs were incurred and in which the payments arguably encourage the lack of grazing (a low payment with no costs is more attractive than a higher payment with high costs) and give the power of collective inertia to those who are minded to persist with a lack of activity. We also know that restarting activity is more financially costly than just continuing or modifying an ongoing one; our approach minimises the risk of the taxpayer having to confront those higher reinstatement costs.

For the same reason, we don’t propose paying an area payment on mobile sand dunes and bare rock – these are not areas maintained by (or in an appreciable way used for) grazing.

8.4.2 Initial filter

By means of a simple set of questions, we filter the small number of cases which we will treat so differently that we don’t try to allow for them on the general card:

- Areas not managed by grazing (see above) – these are not eligible for the grazing management payment
- Saltmarsh (very different species, clear boundary)
- Blanket bog (narrowly defined)
- Dense woodland and scrub
- (Optional) Areas dominated by rhododendron or Japanese knotweed or exotic conifers (see 8.4.6.3 below)

8.4.3 Saltmarsh card

This card focuses mostly on structure.

8.4.4 Bog card

An issue on some of the places we visited is that blanket bog is identified by a different criterion (depth of peat) to other habitats, creating what we sometimes perceived to be unproductive narratives about the value and future prospects of the habitat while at the same time undervaluing the carbon in other organic soils. We try to value carbon in whatever soil it occurs, and identify blanket bog solely by its vegetation and/or the dominant presence of bare peat. Highly modified former bogs are scored under the general card (with all of its encouragement for drain blocking). We also propose, where appropriate, complementary support for actions, such as peat bank reprofiling or ditch blocking, which revitalise the habitat, reduce or eliminate the oxidation of peat and promote the sequestration of carbon. Should any of those areas change their character sufficiently to meet the bog card criteria, then of course it should be used from then on.

8.4.5 Woodland card

Our woodland card is minimalistic (and could be further developed). Our aim is mainly to safeguard the woodland and to ensure that it is not a source of invasive species; we assume that more detailed woodland management support would be available from other funds.

8.4.6 General card

8.4.6.1 *Species diversity, abundance and vegetation structure*

This is the heart of the card – the most species-rich habitats can score a perfect 10 through the first two questions (and if they do, they should be good for the other public goods or at least provide a good starting point from which to carry out more targeted actions).

The first question asks about the *presence* of indicator species and acts as a top-up for the second question for the most species-rich habitats. That second question takes the form of a matrix or table and focusses more on the *abundance* of indicator species and on the structure of the vegetation. Vegetation with higher species abundance score higher than those with lower species abundance, but at any particular level of abundance there is a reward for having a better structure.

The list of indicator species was drawn up to include ones which are likely to be found in the most species-poor swards through to those found on species-rich communities, but avoiding the unusual or rare. All the species were either unmistakable or ones where an error would only result in the inclusion of more ‘interesting’ species. The species mix was balanced to ensure that a good example of each broad habitat (wet, dry, acid, calcareous, etc.) had a similar chance of a good score, while still differentiating between more species-rich and species-poor habitats.

The list is accompanied by a crib sheet of images of each species or species group. In that and on the card, we listed the species alphabetically. We avoided the conventional order as well as listing by habitat type as demanding too much prior knowledge, but other classification systems (e.g. by flower colour) might work equally well.

Describing structure in a way which is both appropriate and clear is a real challenge. We made the most of the guidance available for Glastir habitats, recognising between three and five classes, depending on the degree of possible differentiation implied by the guidance.

At the heart of this is the idea that optimum structure for various habitats can be very different – a degree of detail which we didn’t feel was available in Scotland. An example of the difference this makes is calcareous grassland. It requires a short turf, at least in our climate. Where succession is feasible, undergrazing quickly leads to both the outcompeting of the typical characteristic low-lying species of the herb-rich sward and to the deepening of the soil to the point where the influence of the underlying limestone is significantly reduced.

8.4.6.1 *Anthills*

Anthills are a well-recognised indicator of long-established semi-natural grasslands. For simplicity, we have active (lived-in) anthills in the species table, adding the equivalent of 2 species to the total.

8.4.6.2 *Heathland and tree/scrub questions for lower species-richness plots*

As in Scotland, we gave priority to well-managed species-rich habitats – if those exist, they should be safeguarded. If the habitat is species-rich but not well-managed in terms of structure, the only way to improve the score is to instigate improvements in management. However, for species-poor swards (those in the white-coloured rows on the abundance/structure table), the card recognises

that other variables can also be used to distinguish quality. We followed the same principle in our Welsh cards.

'Heathiness' is one such attribute; wet and dry heaths are Welsh priority habitats (and ones for which we have a European significance, as witness their presence in Annex 1 of the EU Habitats Directive). It is also apparent from various WG/NRW documents that the recovery of those habitats and their connectivity implies a shift towards them, particularly from acid grassland. The card rewards steps in this direction. Dry heath (not something we dealt with in our project areas in Atlantic Scotland) is particularly poor in herb species, so we introduced a question to recognise the diversity of dwarf shrubs.

Western gorse needed some subtle treatment. It is a very typical, and valued, element on many Welsh heaths (and of heaths in Wales and Western Britain in general on a European scale, as witness its Latin name, *Ulex gallii*). But more so than the ericaceous species, it can easily form carpets which outcompete everything else, are a significant fire risk and are very difficult to turn back through grazing. The card therefore, following NRW's site condition criteria, rewards a certain moderate cover, but strongly penalises heavy cover to encourage its active management. In fact, we penalise a high cover of western gorse for *all* habitats.

Trees and woodland, including the 'savannah-like' wood pastures typical of the coetgae (ffridd is very much a foreign word in the project area!) are another opportunity for biodiversity gain. But again, some habitats are both very vulnerable to succession and currently experiencing it in many places – coastal and calcareous grassland on Pennard common is one example, but wet heath and priority *Molinia* habitats are also extremely prone to being lost to trees on some of the more undergrazed commons (we recognise them as being undergrazed partially for that reason, in fact). On the other hand, trees are a positive feature on many habitats, and in some places the best thing for biodiversity would be to expand their cover.

The card tries to better cover this variety of messages by splitting the consideration of trees into two questions – the cover of trees and the amount of regeneration. Only in a few cases does the card penalise existing trees and scrub; in others it is neutral or positive on current trees but discourages expansion; and in others, it positively encourages the natural regeneration of tall woody species.

8.4.6.3 *Invasive non-native species and potentially undesirably-dominant species*

Some species are exotic, even invasive, and are considered to impact negatively on the biodiversity public goods. Other species are native and acceptable, even welcome, at low density, but can, under the right circumstances, come to dominate the habitat to the detriment of habitats or species which considered more valuable due to their rarity etc..

Ideally, the commons should be free of exotic invasive species. However, eliminating them will often be a very costly and possibly endless task. Whether or not this is something policy is willing to devote the resources to achieve is something of which we are uncertain, but it seems clear to us that:

- The budget of this proposed measure could be easily absorbed by doing so and we should propose a Plan B

- The scale of the task is anyway too great to be annualised into a results-based area payment
- It would be inappropriate to drown any support or policy signal focussed on the positive management of the rest of the common because there is an area of invasive species in one corner
- It would be equally inappropriate to reward a common which is allowing the area of invasive species to expand

Our solution is a compromise. We propose allowing scheme participants, as a one-off at the start of participation, to identify a GIS-defined area on the common which is a write-off for one or more of rhododendron, Japanese knotweed or exotic conifers, without prejudice to the legal duty (presumably the owner of the soil's, and albeit rarely enforced) to remove them. This area will not be allowed to expand for the duration of their participation and will be excluded from payment (they are still unable to use it for damaging feed sites and the like). If they want to reduce the area due to successful management work, that would be acceptable. Outwith this area, we have a zero tolerance message meaning that the association has to remove any seedlings or lose points (and payment). The minimum proposed area is 0.25ha, so that there is an incentive to address any problems which are still limited in scale. We would hope that complementary capital works are available where appropriate and cost-effective.

For other exotics and for native species with the potential to dominate, we have more tolerance, but the scale of our tolerance is greater for the native than the non-native.

We changed our minds during the course of the project on how to deal with dense bracken or European gorse. Initially we separated them out into a separate card, but in doing so created a choice of two potential set of questions – something we tried in general to avoid. In fact, the two sets of questions were rather similar (species, presence of trees, etc.), so the card now has a bracken/gorse question which is part of the list of structure options and bracken is removed from the 'potentially-dominating species' question. The card is currently 'blind' to bracken, except where it is expanding; applicants would be free to leave it or manage it as they saw fit, while the card also in effect rewards its conversion, by natural regeneration, into wood pasture.

8.4.6.4 Negative reflections on management

The remainder of the card reflects negative aspects which are in some way connected to management and can be remedied by action in the present day (we don't penalise loss of blanket bog by past peat cutting, for example, but do penalise the presence of drains through peatlands).

The current version of the card asks some questions in the context of the 10m radius assessment points and some on the scale of the whole common, on the basis that (for example) a bad example of damage by a large feed site might be missed in a random sampling process, but should in fact reflect on the whole common.

We separated out three aspects:

- Drainage (now seen as universally negative due to our taking account of all the public goods, not just biodiversity, but with a stronger penalty is there is also an effect on the surrounding habitat)

- Supplementary feeding
- Any other damage caused by the graziers

The final cover-all question raises at least two difficult issues. The first is how to distinguish with certainty damage caused by graziers from damage caused by the general public; we suspect that further input is necessary from stakeholders. The second is how to deal with fire. Fire is a damaging event which has already finished (unlike ongoing feeding or still-operative drains) and is difficult to assign with certainty to any initiator (grazier or arsonist?). Is it sufficient to assume that an area with a recent fire will have a low species count, a poor structure score as well as a damage penalty, as we have done? Or if that is unfair, how should it be done, given the focus on outcomes, not actions?

8.5 How to score a common

We produced a guide to scoring a common, which forms Annex 1: How to score a common. At this point we can note certain issues.

Pre-planning before the scoring visit(s) is vital. There are a number of publicly-available sources of information (Phase 1, soil maps, BSCL reports, documentation relating to designated sites...) which should form an essential part of the preparatory work, and time should be allocated to going through them. The BSCL is available in paper copies only, and they are out of print; they should be scanned and made publicly-available as pdf documents online.

Having said that, in our experience, pre-planning is never enough to enable scoring to start immediately; sources are often old and imperfect and issues such as accessibility may emerge in the field. Time should also be allocated to secondary preparation as part of the field visits.

The main challenge is how to choose a representative subset of places on the common for scoring – one which takes in all of the variety but assigns every variation the weight it has in real life in terms of percentage cover of the common. We started by taking the structured walk/continuous recording approach, but found that this was difficult to work on large sites, if nothing else. The assessment point approach, which we eventually adopted, also has challenges. We went for what we hope is the best of both worlds, recommending assessment points, but ones with a 10m radius assessment area (>300 m²) and with a maximum assessment time of 5 minutes in each.

We envisage the need for guidance as to the number of scoring points to ensure a consistency of effort and, ultimately, auditability. We approach this topic cautiously – it clearly needs more evaluation during piloting – but we suggest a minimum number of points per km² (100ha) and a minimum number of points per common (10 in both cases). These still need to be representatively spread out over the various areas of the common, so that an average of them gives an appropriate overall payment.

9 Area payment rationales and structures

The result of the decisions taken on the scorecards (Section 8 above) have the potential to provide a seamless set of non-overlapping signals or incentives to graziers' associations and individual graziers alike. However, in getting rid of most habitat/measure boundaries which have in the past proved problematic for applicant, agent and administrator alike, this approach opens up a potentially even

greater challenge, namely designing a payment rationale and structure which works across that broad range of scales and intensities.

The current project has one significant difference from all other results-based initiatives up to this point. All of those are underpinned by one or more other direct payment or rural development support (BPS, ANC and GLAS payments in Ireland; BPS, LFASS, beef and sheep coupled payments in the case of Scotland; and so forth). In Wales, the plan is to replace both BPS *and* Glastir with a single Sustainable Farming Scheme which will then be the sole year-on-year means of support for Welsh farms.

It could be argued that this in effect means it is replacing Glastir: BPS makes few demands on the farmer and many of those will be moved from the support-linked GAEC framework to a standalone statutory basis with which all farmers have to comply. Only Glastir currently pays for actions going beyond this baseline; the SFS therefore replaces Glastir. Such an account is however rather misleading for two reasons.

First, the money supporting farming management which conforms to Glastir prescriptions is the sum total of both Glastir *and* BPS. Secondly, the few-strings-attached BPS funding supports many more farms than are in Glastir (15,500+ received BPS payments in 2020¹⁹, while around 2600 were in Glastir Advanced or Commons in 2019²⁰); some of the management carried out on those farms will maintain and enhance habitats without attracting Glastir payment, being supported in practice by the direct payments.

Scorecards developed in Ireland have tended to start rewarding at a score of 3 or 4, on the basis that delivery below this level is supported by BPS, ANC and the local AECM, GLAS. But if our proposed mechanism is not to result in a significant drop in the overall level of support or of the breadth of public goods supported currently, we have to start providing payments at the lowest scores and to take the underlying economics of the agricultural system into account, not just the additional costs of specific management.

In this section we set out how we approached that task, what assumptions we made and what data we use.

9.1 Data sources

We used the following data sources, which we refer to by the abbreviations below for the rest of this section:

- IBERS Welsh farm incomes survey 2018/9²¹. IBERS
- Wales RDP (Wales RDP, n.d.). RDP
- Glastir handbook (Welsh Government 2018b). Glastir
- QMS enterprise costings (Quality Meat Scotland 2019). QMS
- Data on wintering costs of hill cows (Robbins and Fogerty 2005). Exeter

¹⁹ <https://cap-payments.defra.gov.uk/>

²⁰ <https://gov.wales/sites/default/files/publications/2020-09/programme-monitoring-committee-papers-9-september-2020.pdf>

²¹ <https://www.aber.ac.uk/en/ibers/research-and-enterprise/fbs/stats/2018-2019/>

- Nofence²² website. Nofence

9.2 Developing the logic

9.2.1 What should be rewarded

On commons, there is usually a mixture of pasturing rightsholders, some of whom have no farming operation, some of whom are farmers but don't graze the common and some of whom actively graze (or otherwise actively manage) the common. There is also the owner of the soil to consider. One of the ongoing issues which burdens the governance of agri-environment schemes on commons is who should get paid and how much.

Under Glastir, different commons came up with very different answers. But the scheme itself gives graziers no assistance and provides little in the way of moral support for the active minority. All of the core Glastir payments, as set out in the RDP document, are based on income forgone for carrying lower numbers of livestock. This gives no message that a certain (perhaps modified) degree of grazing and management of that grazing is beneficial and positively desirable. Given that hill farming is financially unrewarding (see below), we aim if possible to take the opposite approach, basing our calculations where possible on additional costs.

Prescription	Stocking rate	Comment
Lowland bog <60% Molinia	0.1	
Blanket bog	0.1	
Upland heath	0.198	
Lowland wet heath <60% Molinia	0.25	
Lowland unimp. calcareous grassland	0.2505	
Coastal and Lowland Heath	0.3	
Lowland wet heath >60% Molinia	0.3	
Lowland bog >60% Molinia	0.3	Same document also has 0.5535
Upland grassland	0.3	
Lowland unimp. acid grassland	0.342	
Lowland marshy grassland	0.396	Same document also has 0.5535
Saltmarsh	0.4	
Lowland dry heath	0.45	
Rough grassland (enclosed)	0.45	Same document also has 0.3
Saltmarsh	0.4995	
Lowland fen	0.5835	
Sand dunes	0.6	
Coastal grassland	0.705	
Neutral grassland	0.7995	
Lowland unimp. neutral grassland	0.7995	
Open country	0.843	
Wood pasture	0.951	
Ring Ouzel	1.05	(7 ewes/ha: default current stocking rate)

Table 5. Optimal stocking rates as implied by the RDP Glastir payment calculations

²² <https://www.nofence.no/en>

9.2.2 Presumed stocking rates

The logic of results-based payments is that the farmer responds to the signals given by the scheme with whatever intensity and duration of grazing or other management that seems to give the right balance of costs and rewards. However, a payment rationale has to make certain assumptions about what those management decisions would need to be to give the best possible outcomes, using such assumptions to give a scale to the payments offered. The Glastir payment calculations in the RDP usually specify such an estimated optimal grazing density, as set out in Table 5.

9.2.3 The underlying costs of farming

The RDP calculations give an impression that the intensive management of semi-natural habitats is quite a lucrative operation, one whose discontinuation requires the compensation of the farmers in question. This picture fails to explain why undermanagement or even abandonment is an issue in some places, and ignores the fact that whole farm IBERS data suggests that farmers are unable to pay themselves a reasonable wage.

IBERS records hill sheep farms below £55k of Standard Output as having:

• Net Farm Income (A)	£7,791
• Manual labour costs of farmer and spouse (B)	£16,888
• Management and Investment Income (A-B)	-£9,097

The average livestock complement of the sample farms is 38.3 LU, giving a figure per LU of -£237.52. This is the baseline on top of which the additional costs of more specific management are calculated.

9.2.4 Estimated additional costs of optimal management

9.2.4.1 General additional costs

Glastir recognises additional management costs for specifically conservation management over and above normal agricultural management of 1.5 hrs. At £15/hr, that equates to £22.50.

9.2.4.2 Additional costs relating to cattle

Our strong sense from comments from both nature conservationists and farmers is that optimal management is likely to need or to be easier with a certain level of cattle grazing. Although IBERS figures suggest that cattle farming is more financially rewarding than sheep, even on hill farms, even the casual observer will realise that this is not reflected in the hill land use. Not only are sheep almost always the 'grazing of last resort', but many hill farms have no cattle at all; there have to be economic factors at play which are not reflected in the IBERS dataset.

In discussions with graziers and advisors with experience of cattle keeping, a number of factors are mentioned:

- Additional TB costs and risk. In addition to the cost of an additional (at least) two TB tests, there is also the additional risk associated with breakdown. The issue here is not that the cattle are more likely to be TB reactors – the opposite seems to be the case. Rather, the concern is the knock-on impact of *any* of the farms actively-sharing the commons of any of their cattle anywhere on their holdings testing positive

- Road traffic hazards and the higher unit cost of any cattle injured or killed compared to sheep
- Difficulty of wintering. Wintering at home is often limited by the area of ground suitable for producing winter keep; away-wintering is costly and nowadays brings high biosecurity concerns, not least in the form of TB
- Higher management costs of rough grazing relative to inbye

The advent of virtual fencing collars – currently only available in the UK from the Norwegian company Nofence – has the potential to help address many of these issues as well as helping to target grazing on vegetation which the cattle might otherwise avoid. We suggest an approach which combines a results-based area payment with complementary support for the use of collars (see 9.4.4 below). The additional items we include in the former are as follows:

Wintering cost

Exeter produced an estimate of £208/LU for a 6 month ‘winter’. This figure is now over 15 years old, so is unlikely to be an underestimate. We used half of this figure for each overall livestock density calculation, on the basis that half of the livestock were cattle.

Extra cost of two TB tests

Steffan Vets (pers. comm.) charge a fixed call-out fee of £40 plus £4.87 per head per test. For a model herd of 20 animals, this works out at £13.74/‘LU’ for the extra two tests needed for one move to and from the common.

Additional labour requirement of ‘normal’ management of cattle on rough grazing

IBERS do not provide detailed enough data to enable the estimation of this cost. In QMS data for hill and upland suckler herds (where other costs are comparable), the labour requirement is significantly higher for the hill systems (10 hrs per cow; 18 hrs compared to 8 hrs)²³; this must be largely due to the additional demands of managing a hill grazing herd. We estimate the additional cost therefore to be £150/LU. We used half of this figure for each overall livestock density calculation, on the basis that half of the livestock were cattle.

Additional labour requirement of ‘conservation’ management of ‘heavy stock’

Glastir estimates this at 1 hr/ha, which @£15 is £15/ha.

9.2.4.3 Annual transaction costs

We assume there will be a significant transaction cost initially and propose paying for that as a separate item (see section 9.4.1 below). However there would also be an ongoing annual cost relating to the implementation, monitoring and reporting of the scheme, and including the additional transaction costs of negotiation, organisation and administration associated specifically with a common. In this first draft of a scheme, we suggest an ongoing payment based on 20% of the total previously calculated, but recognise that there may need eventually to be both a minimum and maximum amount set (per hectare? In total?).

²³ A similar large difference in the amount of family labour is apparent in the whole farm IBERS data when comparing hill and upland cattle and sheep farms, but this cannot with confidence be ascribed to the cattle

9.3 The calculation and payments table

The table below (Table 7) shows the calculation for a livestock density of 0.5 LU/ha. We calculated a range of values for different livestock densities using this formula (Table 6). We then had a series of possible reference points onto which to ‘anchor’ the table of proposed payments (Table 8).

LU/ha input into costs model	Modelled cost/ha
0.1	97
0.2	148
0.3	200
0.4	252
0.5	303
0.6	355
0.7	407

Table 6. Variation in estimated costs per ha by stocking density using model set out in Table 7

The resulting payment breaks down as shown in

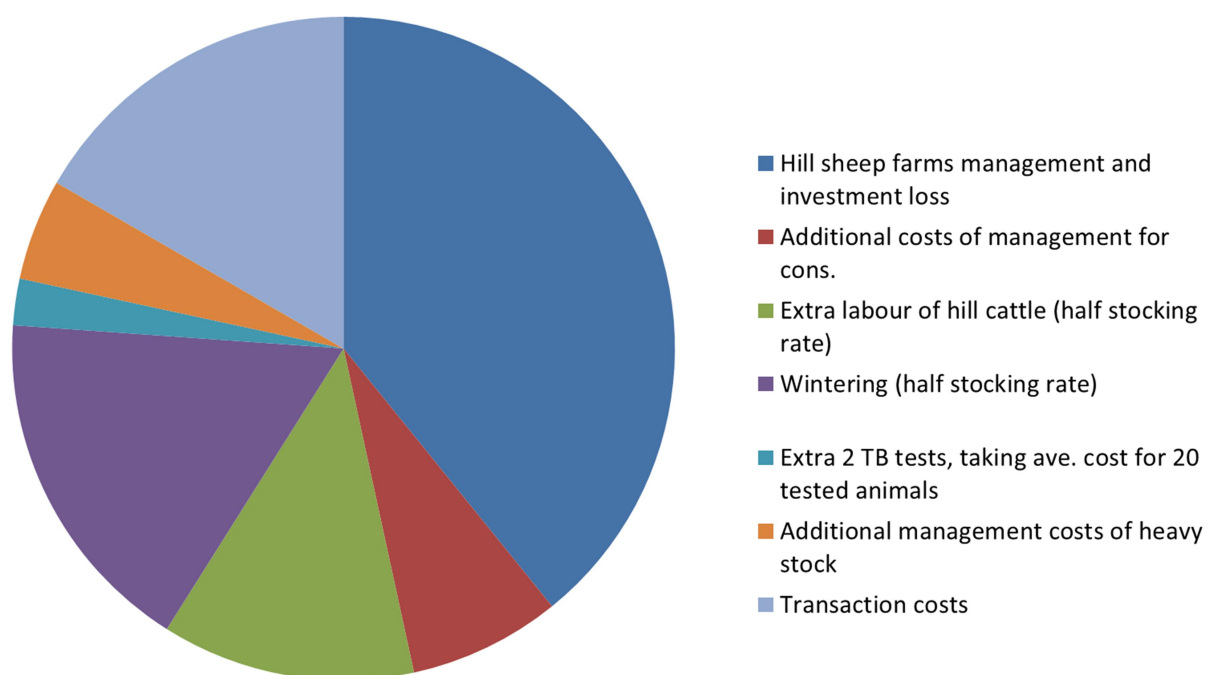


Figure 21. Breakdown of the proposed payment

Our anchor points are:

- the current approximate rate of BPS, which underpins the delivery of any public good going beyond GAEC (legislative standards in future) and which we took to be £65/ha. We assign a payment of £60 to what the scorecard deems to be the smallest delivery of additional public goods (score 0.5)
- the values corresponding to 0.3-0.5 LU/ha, which are the densities associated with a range of the habitat types grazed at relatively low densities (Table 5). We designed the cards to give a score of the order of 5-6 to good examples of those habitats.

Item	per LU	per ha	Source; comment
<i>Per LU costs</i>			
Hill sheep farms management and investment loss	237.52	118.76	IBERS
Extra labour of hill cattle (half of stocking rate)	75.00	37.50	QMS – half of difference in labour cost between hill and upland
Wintering (half of stocking rate)	104.00	52.05	Exeter – half of calculated cost
Extra 2 TB tests, taking ave. cost for 20 tested animals	13.74	6.87	Steffan Vets, pers. comm.
<i>A. Sub-total per LU costs</i>		<i>215.18</i>	
<i>Per ha costs</i>			
Additional costs of management		22.50	Glastir
Additional management costs of heavy stock		15.00	Glastir
<i>B. Sub-total per ha costs</i>		<i>37.50</i>	
<i>C. Sub-total field-based costs</i>		<i>252.68</i>	A + B
<i>D. Transaction costs 20%</i>		<i>50.54</i>	20% of C
<i>E. Total estimated cost</i>		<i>303.21</i>	C + D

Table 7. Calculation of estimated costs for a stocking density of 0.5 LU/ha

Score	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
Payment/ha	65	83	101	119	137	155	173	191	209	227	245	263	281	299	317	335	353	371	389	407

Table 8. Proposed relationship between score and results-based payment

- Values corresponding to 0.7 LU/ha, which is the highest for a particular habitat in Table 5; we used this value to indicate the approximate upper limit for our values (note that the results-based approach does not preclude additional management for particular species and the associated payment)

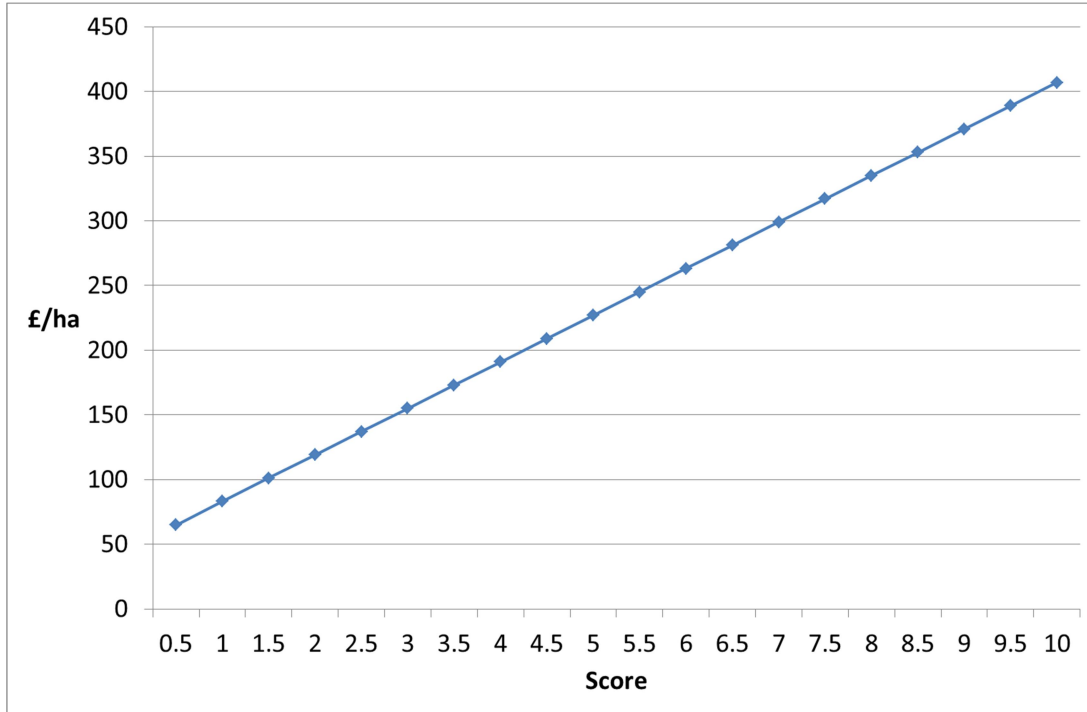


Figure 22. Proposed relationship between points and payments

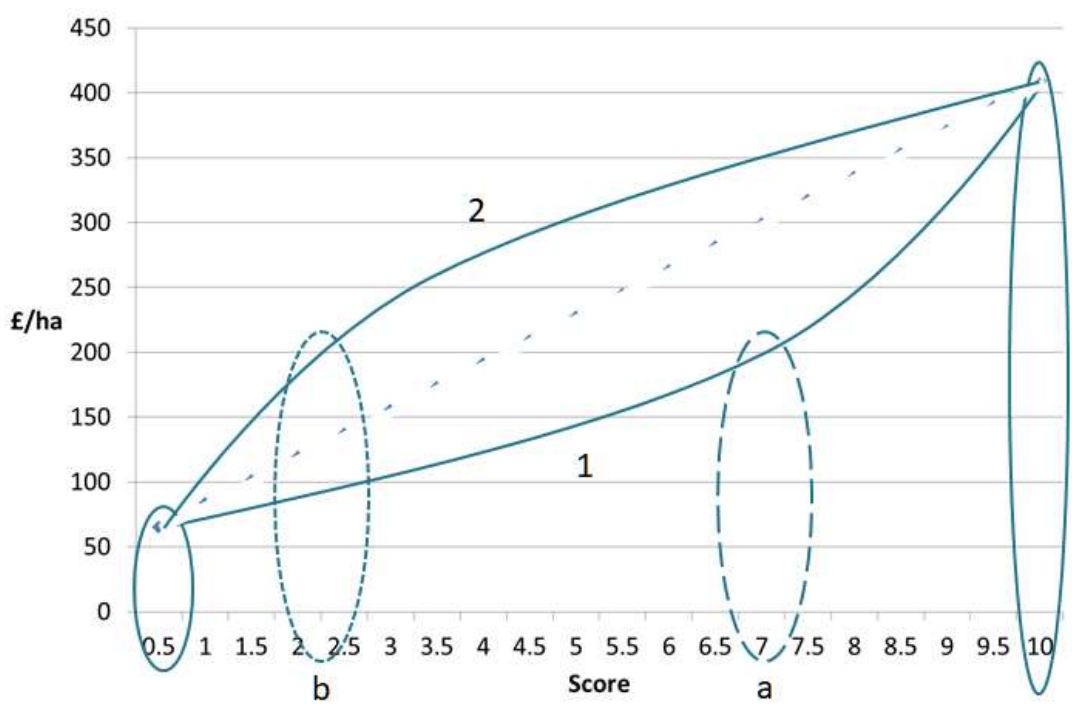


Figure 23. Possible alternative curves - curve 1 allows for greater differentiation of low-scoring condition (c. 14 scoring points for a £200 payment); curve 2 similarly for high-scoring areas (c. 5 scoring points for £200)

We fitted these onto a straight line as per Table 8 and Figure 22. Note however that as long as the line fits the chosen anchor points, a range of different curves are possible (Figure 23). Each line would necessitate an adjustment of the balance of scores on the scorecard, so that the same absolute quality continued to receive the same payment. The benefit would be in allowing greater focus on certain parts of the spectrum. If, for example, most commons score at the lower end of the spectrum, it might be wise to allocate more points out of the total of 20 available to this part of the curve (option 1/a).

The various parts of the scoring package – the cards for saltmarsh etc. - are tied in by the payment rate corresponding to the estimated cost of the imagined optimal livestock density given in the RDP. The score associated with that rate then becomes the maximum that can be achieved on that particular card.

9.4 Additional complementary/stand-alone payments

Not everything can be delivered through a results-based scorecard and its accompanying payments, and even the scorecard itself needs to be delivered through some sort of integrated framework or support structure. In this section we discuss items which fall into the preparatory, ‘management planning’ and ‘capital works’ boxes, but some of those aims also require investment in training and other forms of human capacity building. All of the elements in this section could and in many cases should complement the results-based area payments developed in this project. However all of them, including even the preparatory work, could also be made available as stand-alone items, or items in a package which could, exceptionally, not include area payments; the criterion for deciding on this should always be whether doing so would produce a better outcome for public policy, and at a reasonable cost-benefit ratio.

9.4.1 Preparatory work

As WG found when it first rolled out Glastir for commons, the transaction costs involved in considering whether to apply for a scheme and how such an application can work are considerable. This process has to have due consideration for the range of rightsholders, the owner of the soil and the relevant statutory agencies.

Graziers, whether or not they think the wider roll-out of SFS on individual farms should depend on or even involve farm advisors, seem united in their belief that a neutral expert facilitator should be made available as a part of the process.

Given that deciding whether or not to apply for the scheme is an essential and necessary precondition of actually applying, it is important for the objectivity of the process that availing of this assistance is not made contingent upon actually entering the scheme. Government should want commons to participate – factors which needlessly prevent this should be mitigated where possible.

We propose therefore that either the WG provides free support for commons along the lines of the CDO or that there is a 100% standalone grant for the production of an evaluation report and internal agreement. This would need to be acceptable to the majority of active graziers and to reach a minimum standard quality for WG. Such a grant would need to have a fixed minimum payment, for example £500 plus £5/ha.

9.4.2 Fire management plan and its implementation

We propose that the preparation of a fire management plan during the first year of participation is a mandatory condition (i.e. no payment at the end of the first year if no plan is in place), but that the preparation of the plan should be 100% funded according to a fixed formula.

Assuming that the FRS are not able to prepare or fund the preparation of the plans, we propose a similar payment approach to that proposed above, with a fixed minimum payment, for example £500 plus £5/ha.

Funding for training, fire-fighting equipment and fire risk management actions in support of implementing a fire management plan should be made available. Where appropriate and with the prerequisite training, this should include items paid using standard costs to allow graziers and others authorised by the graziers' association to be paid for any work. One way of controlling costs is to limit the total funding available to £n/ha over 5 years.

Development work on this part of the proposal should involve the relevant FRS and be signed off by them.

9.4.3 Commons animal health and biosecurity plan

In its various consultation documents, WG makes it clear that animal health and biosecurity are two of its priorities and both have a wider public goods element. This is particularly the case on commons, where the decisions of one grazier has potential knock-on effects on other farmers' businesses at no cost to that original grazier. TB risk management is a particular challenge which is currently holding back the sustainable management of commons, but the plan would also cover issues such as scab, Cryptosporidium and Neosporosis.

We propose that the preparation of a commons animal health and biosecurity plan during the first year of participation should be a mandatory condition (i.e. no payment at the end of the first year if no plan is in place), but that the preparation of the plan should be 100% funded according to a fixed formula.

A banded payment approach may be appropriate, taking into account the number of active graziers and the size of the common.

The plan should describe the challenges, proposed responses and opportunities for further improvement in:

- Issues arising to animal health from the management decisions of the graziers
- Issues arising to animal health from the behaviour of the wider public
- Issues arising to public health (e.g. drinking water) from the management decisions of the graziers

Funding for appropriate training and risk management actions in support of implementing the animal health and biosecurity plan should be made available. One way of controlling costs is to limit the total funding available to £n/ha over 5 years.

Development work on this part of the proposal should involve the State vets and the plans themselves should be signed off by a vet.

9.4.4 Support for livestock containment collars

A potential game-changer in the management of commons is the advent of electric animal containment collars, of which those of the Nofence²⁴ brand are the only ones so far available in Wales. Working as a virtual electric fence utilising GPS satellites, they have the potential to address many of the issues which prevent the use of certain commons (road casualties, TB regulations and breakdowns, huge unfenced blocks of land) and to make the more focussed management of certain areas achievable.

The collars are linked to phone apps and provide a record of the location of the collared animal over time. They are therefore well suited to a rather more direct means of support, one which would enable a grazings association to target the funds at those farmers whose animals were carrying out the desired grazing. It also gets round the problem that the expense of cattle grazing, and therefore collars, is often most needed on areas which get a *low* score and therefore a low payment.

The pricing model is rather complicated, combining initial purchase with an annual charge based on use and modulated by the number purchased (and livestock species). Based on current prices, the following approach to payment would seem reasonable:

Cost item	£	Commentary
Depreciation over 10 years	26.90	Based on initial price of £269 (cattle collar)
Annual charge per collar	60.00	Variable, figure used based on 20 collars
Total monthly charges per collar	55.48	Variable, figure used based on 6 months
Cost per LU per annum	142.38	Sum of 3 costs

Figure 24. Estimated costings for 6 month use per annum of a Nofence cattle collar

Based on those figures, the cost per beast (~LU) per grazing day over a six month season is approximately £0.78, while the annual cost per hectare for 0.5 LU/ha over the grazing season is £71.19.

A number of ways of controlling spend could be imagined, including a limit on the number of grazing days per ha (of the common, of a particular habitat....).

9.5 Support for traditional ‘capital works’

Section 38 of the Commons Act 2006 requires works which 'have the effect of preventing or impeding access to or over' common land to go through a process of approval. This has a particular impact on fencing and could possibly be part of role for any facilitation service associated with the results-based payment model.

²⁴ <https://www.nofence.no/en>

That still leads a lot of one-off or time-limited operations which can and should be supported by dedicated payments, including, but not limited to:

- Works associated with fire risk management
- Ditch blocking
- Peat hagg/bank reprofiling
- Provision of water supplies
- Livestock handling facilities
- Adjustments to tracks, water crossings etc. to reduce erosion and runoff
- Control of invasive species

Most of these works have little or no benefit to the graziers and should be paid at a realistic rate intended to cover 100% of the cost. Items which also have a business benefit could be offered at a lower rate.

Note that the timing of payments is particularly sensitive in the case of commons: cashflow is difficult for all businesses and organisations, but for a commoners' association, the prospect going into the red may be enough to prevent an item being carried out. Serious consideration should be given to the provision of advance payments or at least quick turnover interim payments, bearing in mind that these are not activities which are carried out for the benefit of private businesses but rather to advance public policy goals.

10 The nature of the commitment and commons governance

It would be quite wrong to see a results-based approach as just a different coloured brick which can be substituted easily for a corresponding action-based measure within an otherwise-unaltered wall of roles, processes and governance requirements. In the Welsh case, that the framework is the same as that which was and is used for Glastir. In fact, results-based approaches involve a completely different pattern of commitment and decision-making over time, and a transformed set of relationships between the various actors in the process.

In this section we compare the Glastir model (which was also followed by previous AECM in Wales) with the results-based approach with regard to its implications for the governance aspects of the agreement on commons. In the next section, we look at the implications for State or third party advisory and/or support systems.

10.1 The traditional AECM model

Traditional AECM have a period of initial activity – learning about the scheme's offer, consideration of its possible implications both positive and negative, and completing the actual application – followed by a number of years of routine – obeying the prescriptions and claiming the payments – punctuated in some cases by carrying out capital works according to a pre-determined schedule.

In the case of commons, the initial period is particularly demanding under the traditional AECM model. Not only does the process need to create an arrangement which can receive the consent of present-day graziers and non-grazing rightsholders (both very diverse groups), as well as that of the

owner of the soil, but there must also be consideration of how rights might be exercised in the future, including by the successors of the current rightsholders.

There must be agreement both as regards the commitments being made to the State over the term of the agreement (5 years in the case of Glastir), but also the commitments being made to each other regarding dispersal of funds over that same period. The signatories of the agreement do not technically bind their individual successors (their commitments rather have implications for them as a collective – a successor may refuse to carry out commitments to which he or she was not a party), but that still means that the remaining members of the collective would have to do more (or less, as appropriate) in order to deliver the same undertakings to the State and to satisfy their financial undertakings to each other.

This forward-looking aspect of traditional AECM represents a very significant risk, one which is of course compounded by distrust, rivalry or hatred between individual commoners. It also creates a potential legal nightmare – do graziers *really* have the power to limit the property rights of their successors, let alone of the successors of non-graziers who may not even be parties to the agreements?

10.2 The very different results-based approach

The 'Irish' results-based model is very different. Now the initial application is, in principle, just an expression of interest – a request to be scored at the appropriate time in the coming year.

When that time comes, the scoring essentially looks at a point in time. To the extent that its time horizon is longer, it is looking back at events or periods in the recent management of the commons which bear directly on the condition on the day of scoring.

The official process doesn't ask who did what (except when it comes to damage by third parties) – it just evaluates the condition (the 'outcome' or 'result'). It doesn't ask either who will do what going forward.

From the point of view of the participant's relationship with the State, the relationship is thus completely different. There is no real 'undertaking', just a willingness to engage annually. There is no prospect of a 'breach' (although a State which has just invested in large capital works may wish to build in some safeguards against wasting its money).

In fact, there is no reason why a participant should have to commit to a particular duration of engagement. Experience in Ireland, where participants can leave at any point, is that taking this approach brings in the more risk-averse farmer, while the drop-out rates are if anything lower than for traditional schemes where dropping-out is penalised.

In the case of a sole-use farmer, there is therefore no real application process (although would probably need to be some sort of capacity building work to enable him or her to engage with the scheme).

For a commons, as always, things are rather more complicated. It is just as true for commons that the relationship with the State is year-to-year and very simple. But commoners also have to deal with each other. For commons there is still an essential and demanding initial phase of working out general principles of how to allocate the money: who to reward; who to penalise, and what third parties to pay.

And commons then every year have to convert those general principles into an actual allocation of funds. And to decide whether or not to respond to the scoring by requesting support for capital works, and if so, how that will be carried out.

Still, this is a very different type of commitment. No one needs to bind their successors, nothing is fixed for a period longer than a year ahead, and most things aren't fixed at all – payments are backward-looking, while the forward-looking aspects are the focus of continual reflection, negotiation and adjustment.

10.3 Implications for consent requirements

10.3.1.1 Between pasture rightsholders

Who then needs to consent and for what period? If there is some oversight by the State of the protocols for the distribution of monies and for requests for capital work support, then there is a case to be made that there is no need for consent, only for annual indications of willingness to engage. This could be done through the provision of proforma agreements, and by guidance indicating that a valid agreement should be formed of general statements of principles, avoiding the naming of individuals, for example. The internal agreement would nevertheless be most sensibly drawn up with the assistance of a land agent or lawyer.

In general, the less the breadth or gravity of the multi-annual undertakings, the more the relative importance of the annual process. If, for commons, multi-annual undertakings are to be avoided, then provision has to be made for the annual discussions. But annual discussions, especially if moderated and assisted by external agents, are something which can be very positive as a vehicle for and expression of ongoing engagement in the management of a common.

10.3.1.2 The owner of the soil

What then of the owner of the soil? He/she has no right to interfere with the lawful exercise of rights of pasture and since the results-based payments are based on the costs of grazing, they would have no stake in them unless they are currently using the 'surplus' rights for grazing. Normally then, the owner of the soil's consent should not be required. The same thing applies to the biosecurity and animal health plan.

Capital works are a different case. Managing a grazing by mowing (other than as a way of exercising rights of estovers, e.g. mowing bracken for bedding) or burning arguably do not involve the exercise of rights of common. All capital works should probably be subject to the consent of the owner of the soil. Conversely, on commons where the owner of the soil is actively managing the land surface of the common, there should be standard guidance of how he/she should be involved in the internal agreement as it pertains to capital works, with a right to submit stand-alone capital works on their own behalf.

Having said that, it would be a very foolish association which decided not to engage with the owner of the soil throughout the process, regardless of the precise legal requirements. We came across instances of extremely positive collaboration. We are also aware of the opposite scenario; the measure should therefore avoid being prescriptive in this regard except where property rights and statute demands it.

10.3.1.3 Statutory authorities

Since there is no ongoing 'plan' of grazing levels, dates etc., the traditional model of prior consent for the five years covered by the AECM application is difficult to transfer. Rather, changes in management proposed at the start of or during a plan year must be dealt with as they arise. Ideally, on designated sites, NRW or other relevant agencies should be involved during the annual discussions, to allow them to have an overview of the assessment process and of how graziers might be considering responding to it. From the State's perspective, this is perhaps the most difficult aspect of this flexible, adaptable, dynamic approach to support.

10.3.2 Going beyond what the law requires?

While very little helpful guidance seems to have been published in Wales, Natural England and the Foundation for Common Land have over the years produced a range of useful material to cover what is still in essence an area subject to the same legal provisions. Prime examples are the current version of the Commons Toolkit²⁵, including documents on agri-environment agreements (Natural England and Foundation for Common Land 2010b) and on negotiation (Natural England and Foundation for Common Land 2010a) and the Common Purpose guide to community engagement (Natural England 2012). We understand that a new toolkit is being produced as part of the Foundation for Common Land ELM test and trial.

All of these documents, it could be argued, are framed around a situation very different to the year-by-year ethos of results-based payments. It is also difficult not to feel at times when reading them that they envision the graziers and owners of common land needing to go through many more hoops than the graziers or owners of adjoining sole use hill farms subject to the same designations and rights of access.

Nevertheless, they contain many useful lessons for the frameworks which would need to be developed for results-based models. Perhaps the most important is their stress on the need to look beyond the short-term needs of the immediate circumstances and to develop a strategic view of what is useful over the longer timescale. This might well involve going beyond what is necessary at the time (or, perhaps, ever) from a legal and equitable perspective.

Examples might include:

- Involving stakeholders at an early stage so that they are willing allies if needed later. For instance, the owner of the soil might need to consent to or be involved in some one-off actions going beyond the grazing of the land at some point. Or the local authority, by virtue of its planning duties, might at some point be asked to approve capital items subject to

²⁵<https://webarchive.nationalarchives.gov.uk/ukgwa/20150303030401/http://publications.naturalengland.org.uk/publication/36015>

Section 38 of the Commons Act (2006). Indeed, a sympathetic authority might do much of the paperwork itself, as Caerphilly Council has shown on Merthyr and Gelligaer common.

- Taking pre-emptive action to prevent public relations disasters. The general public often misunderstand management actions on commons, for example wrongly reporting commoners for animal cruelty, leading to unnecessary hassle and bad publicity. In turn, this can put public authorities in what are felt to be politically-difficult situations, potentially threatening their ongoing active support.

One of the big challenges during any full pilot of this results-based approach is to work through the ramifications for consent and engagement processes.

11 Advice/guidance/facilitation models

11.1 The Glastir model

The agri-environment tradition in Wales has been shaped by its adherence, from Tir Gofal onwards at least, to the strictly prescriptive approach. In as much as it existed at all, the level of discretion has diminished as time went on. By the time of Glastir, WG Contract Managers made farmers an offer of a set of prescriptions which the applicant either accepted or rejected, with very limited room for the exercise of discretion.

The space in which third party advisors (FWAG, ADAS, various individuals...) could do meaningful chargeable work was very limited, most usefully talking farmers through the few options available to address any particular target in order to work out which would work best for them and alerting them to the possibility of being funded to carry out complementary capital works and helping them to decide whether or not they could 'work their business around' Glastir.

In the case of commons and Glastir, things were slightly complicated by the existence of a team of Commons Development Officers, a true innovation on the part of WG which arose as a response to the initially low uptake of scheme. Though in formal terms, they only put forward a plan to the Contract Managers for approval, there seems little doubt that their intensive work with graziers led to a better understanding of the limited choices before them. Having said that, those options were very limited in the first place; the main focus of their work, and what made them necessary in the first place, was to bring graziers together into properly constituted legal persons which could apply for the scheme, and giving independent advice on tricky issues such as the distribution of funds.

Because they saw the need for independent advice as being an obstacle only at the initial pre-application stage, WG did away with the services of the CDO once uptake levels were considered satisfactory. However, interviews with graziers in an earlier project (Brackenbury and Jones 2016) suggests that this was seen as a backward step by both graziers and former CDOs, with many instances recollected where the services of an independent outsider who knew the common and the association being useful even after the contract had been signed.

In the traditional AECM model (Figure 25), most of the work is carried out before applying (also during application in systems with a rather broader range of options than seem to be the norm in Wales, e.g. the Scottish AECM). This is the time when all of the financial details (who will get what,

whether there will be a paid administrator, whether there will be a rainy day fund etc.) are sorted out, and a prudent grazings association also thinks about how it will reallocate undertakings and funding if and when life events (death or incapacitation causing new inactivity or succession etc. bringing new activity) necessitate doing so. Advice at other periods seems to be of the ‘keeping them right’ variety – reminders of the details of prescriptions or of claim deadlines for various items.

This model puts large amounts of strain on the system during this initial period, but once set in motion, the contract is supposed to proceed like clockwork, interrupted only by occasional audit checks and the carrying out of one-off ‘capital’ works. Monitoring and evaluation are treated as a completely separate matter, perhaps contracted out to a large consultancy firm.

11.2 The different needs of a results-based approach

As set out in the previous sections, the needs of a results-based approach are both broader in scope and potentially more long-term.

While the initial period is more demanding for a common than for a sole use farm (which basically just expresses interest in participating and nothing more), this is still very much a preparatory phase of the work. The aim is to set in place a governance system for implementation of the scheme by the graziers’ association.

The bulk of the work and the thinking is ongoing; this is the very essence of the RBPS approach – to engage the graziers in continuous reflection on the success or otherwise of their management, resulting possibly in a change of approach or a decision to avail of complementary supports.

The real starting point is the time sometime between April and August when the common is scored. Not only does this decide the payment awarded that year but the detail of which areas scored what, and why they didn’t achieve a higher score is intended to lead to a process of discussion and deliberating on the part of the graziers. One area might have a score which can easily be increased by appropriate management, while another might be reaching the best of its potential with the same score. Some possible adaptations might be more costly or higher risk, while others might be low-hanging fruit. It is not just that capacity building advice is needed for graziers to respond to the scheme; dealing with the scheme is itself a means of capacity building where facilitation and experts advice has its role.

Graziers may also decide at this point that some capital works or other non-grazing management are in order. These may require consent from statutory authorities or from the owner of the soil before the request is submitted to the scheme administrators.

In short, the RBPS advice/facilitation role is needed in the lead-in period and then annually in the period outwith the scoring window. The admin function has at a minimum to provide the auditing function during the scoring window and then to deliver the area payments based on the scores. Scoring itself happens within an even shorter window of 5 months at the most.

In their responses to the various WG consultations, farming organisations have been keen to play down the role of advisory services, and especially of models where attending courses etc. is

mandatory. They stress the need rather to empower the farmer, facilitating knowledge transfer and knowledge sharing. It has been very striking in conversations with farmers and their representatives how firmly they make an exception for commons, stressing the value of the independent 'honest broker' role. It was striking also how CDOs were seen as being this despite their being a service wholly paid-for by Government; the fact that they were employed by the three development company contractors might have contributed to this perception of independence.

11.3 Overcoming the bottlenecks: the Irish model

The Irish implementation model, developed in stand-alone projects, but now also mainstreamed in the Burren Programme, manages to:

- Combine an approach which is both locally-based in its public face and nationally integrated in terms of systems, processes, auditing standards etc.
- Maintain both standards oversight and freedom to contract on the part of the farmer
- Spread the work required over the year

It achieves all this by differentiating between project staff and advisors

The schemes are run by a small project team, working under contract to Government. The team

- In practice designs the scheme
- Is mainly responsible for raising awareness of the scheme
- Trains and oversees the quality of work of the independent advisors certified by the scheme
- Puts out requests for Expressions of Interest for participating in the scheme and accepts participants into the scheme using, if necessary, whatever filter is deemed appropriate
- Undertakes audit samples of the scores received
- Pays the participants on the basis of the (audited) scores received
- Agrees to any proposal for capital works
- Assists the farmer (in practice, does most of the work) in obtaining any necessary permissions (equivalent of PDO consents etc.)
- Undertakes annual farmer training events
- Undertakes some additional monitoring work where appropriate
- Supports complementary action either by farmer participants or otherwise (e.g. nest protection)
- Raises awareness of the scheme with third parties

The project team is itself subject to audit and compliance protocols and checks from the Department and EU.

The more numerous certified advisors:

- Are self-selecting (usually the farmers' existing advisors)
- Are trained and certified by the project team
- Are chosen from the officially-certified list by the farmer
- Usually score the fields with/for the farmers
- Declare the score to the project team

- Advise the farmers regarding the opportunities to increase each score and usually help them decide on the relative cost/benefits of each and what to do, along with what capital works they might request support for

One negative aspect of the Irish system is that all participants have to use an advisor – this is a reflection of a general tradition there. Here in Wales, it would seem perfectly possible for named representatives of any applicant to be equally certified (attend the mandatory courses, be subject to the same audit sampling). In the case of commons, this is perhaps less of a concern, especially if the independence of an advisor is prized by the graziers.

But overall, the simplest way to maintain quality while avoiding seasonal over-provision or under-provision is by having a small number of project managers and a larger number of trained advisors; it is one that should be emulated in Wales.

11.4 How to pay for advice

It is clear that ongoing support has a cost, but how should that cost be paid for and kept to a reasonable level? Participation in the scheme is desirable for public policy goals and its payments are not designed to make a profit for the participants beyond paying them adequately for their labour. There is absolutely no reason why the cost of advice should not be 100% covered by the State; the issue is how this support should be delivered.

A completely free market seems undesirable. On the one hand, advisors should have a certain level of competence, so graziers would have to be limited to a list of appropriately trained individuals. On the other, and more debatably, should that limited pool of individuals be allowed to charge what they will or does becoming part of a quasi-monopoly mean accepting some limits on rates? A number of models are possible, e.g.:

- Irish model – list of certified advisors, freedom to charge as they will
- Glastir model – free advice from State-contracted advisors
- Hybrid model 1 – farmers choose from certified advisors; Govt. pays them fixed amount
- Hybrid model 2 – farmers choose from certified advisors; specified portion of payment ‘for advice’ but amount paid by negotiation
- Etc.

12 List of items for further consideration in ‘Phase 2’

Despite reaching a point where there we have an apparently comprehensive set of scorecards and an accompanying apparently coherent payment structure and underlying set of rationales, this is very much a work in progress. The inability to spend time in the field with graziers has been a particularly significant constraint. Irrespective of any advance in knowledge which might need to be incorporated at some later stage, we know already of many issues which remain to be ironed out or further evaluated during any future pilot, including:

Stage of participation	Traditional AECM	Time frame	Results-based approach	Time frame
Initial fact gathering	<ul style="list-style-type: none"> - Understand scheme, prescriptions, length of obligation, payments, penalties - Ascertain whether worth pursuing 	Year 0	<ul style="list-style-type: none"> - Understand scheme, prescriptions, length of obligation, payments, penalties - Ascertain whether worth pursuing 	Before scoring period of Y1
Preparing to participate	<ul style="list-style-type: none"> - Ensure legal person in place - Draw up protocol for allocating funds - Draw up protocol for changing circumstances (e.g. new grazier) over 5 yrs. - Obtain any consents 	Year 0	<ul style="list-style-type: none"> - Ensure legal person in place - Draw up protocol for allocating funds 	Before scoring period of Y1
Submit application	<ul style="list-style-type: none"> - Fill out detailed proposal OR agree to prescriptions in offer from project officer, incl. all proposed capital works 	Year 0	<ul style="list-style-type: none"> - N.a. 	
Submit expression of interest	<ul style="list-style-type: none"> - N.a. 		<ul style="list-style-type: none"> - Submit simple EOI - Submit draft protocol, for payment 	Before scoring period of Y1
Annually ²⁶	<ul style="list-style-type: none"> - (continuous) obey prescriptions - (annually) claim and distribute payments - (intermittently) carry out agreed capital works and claim them at appropriate time - (intermittently) deal with deaths, new graziers etc. 	Y1-5 Y2-6	<ul style="list-style-type: none"> - (first year) draw up mandatory plans (section 9 above) - (annually, or maybe not?) Get scored - (annually) decide how to respond to score in terms of management for year ahead - (annually) decide whether to request capital works in year ahead, then carry them out and claim - (annually) receive and distribute payments - (intermittently) obtain necessary consents 	Before Aug Apr-Aug Sep-Aug Sep-Aug Dec-Mar

Figure 25. Comparison of the work involved in each stage of a traditional AECM and a RBPS

²⁶ Traditional AECM: for length of contract; results-based approach: until participation ceases

12.1 Scorecard issues

- Are the results-based indicators workable in practice across the whole range of habitat conditions found on commons in Wales? Rugged mountains are one land type which is clearly missing in the project area. Does the balance of positive and negative scores within and between questions need to be adjusted? Are the indicators, even if relevant in principle, able to detect changes in condition in practice?
- Do they and the relevant guidance deal successfully with the range of scales encountered, and in particular the landscape scale? How can the process of deciding on the number and siting of scoring locations be made more robust and easy to replicate?
- Are the results-based indicators consistent with the needs of the large majority of priority species within those habitats and are they likely to deliver benefits for those species?
- What 'bolt-on', e.g. species-specific, measures (perhaps results-based, perhaps action-based) would be necessary to make up any deficiencies?
- How should fire be treated? Arson versus managed burns – how to identify each? Impact of even a managed burn on scores?

12.2 Scoring issues

- Is the method of setting out assessment points robust?
- Is the suggestion for deciding the minimum number of assessment points both robust and workable?
- Is the step which converts scores at a series of points into payments for hectares robust and workable?
- How frequently would scoring need to happen? Could it be every other year? Could it be a sub-sample scored after the initial scoring? (In both cases, it would need to be open to graziers to submit revised scores after a change in management)

12.3 Payment calculation issues

- Are the variables included in the payment calculation reasonable and should others (e.g. an element of fixed costs) be included?
- Does the intended complementarity of payments (and therefore of related scores) between the habitat-specific scorecards and the general card work in practice?
- Are the total payments at parcel and holding level fair and reasonable across the range of scores and scale?

12.4 Governance issues

- What issues arise in practice when drawing up internal agreements? Who needs to be included from the start, and how? What consent, if any, is needed for the approach to be workable? How would it work on designated sites if annual discussions become the norm? What might a fair set of rules for identifying 'activity incurring costs' be? Should it involve thresholds or ceilings? How might unit payments (what should the units be?) be fairly differentiated?

12.5 Building on the app

A key benefit of using a more comprehensive data analysis app would be when visualising the data on a map. Currently the map of sites only pinpoints the exact location of the assessor when they're

doing an assessment. The assessor could be in the middle of the assessment area, or near to the edge of the assessment area. Using a more sophisticated app would allow the assessor to draw the assessment area. This would make it easier for the assessor to work out the size of the common, as well as be easier to visualise which parts of common land in a site have scored higher/lower as a heat map could be created.

Creating maps would also be easier. Currently, Google My Maps is used, this system requires manually updating every time a new assessment is added. By using a more sophisticated system, a map would be automatically updated each time a new assessment is added. Apps such as ArcGIS have additional features that allow users to manipulate sections of a map and carry out extensive analyses of the assessment sites, features not available on Google Maps. Epicollect5's map system updates automatically, but creating a heat map based on scores is not possible.

Data security may also be improved by using a different app to collect data. Currently, the data is imported into google sheets through the "ImportData" function. Although there is a way to circumvent it by using a macro, this brings up different issues in terms of ease of use.

Having to leave the Epicollect5 app to use Google Sheets for analysis is inconvenient. One of the benefits of using a bespoke data collection app would be that you would be able to see the scores of each area instantly without having to leave the app. Using the system used in the pilot system, an assessor would have to wait to upload each record onto the internet, and wait more time as the data updates on the dashboard where the score will be shown. A bespoke app could have an improved dashboard which would allow users to create reports without the need for spreadsheet formulas.

In terms of data collection, one of the issues faced with the current app relates to the questions which ask about the number of species at an assessment point. Currently, assessors must answer separate questions if named species are "present", "common" and "abundant". They must then answer up to five questions about the number of species in the same area. This could be replaced by a single "checkbox grid" and an ability to skip questions based on the amount of boxes ticked, unfortunately, this was not possible with Epicollect.

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Annex 1: How to score a common

Before going into the field the first time

- Find the most recent and/or detailed vegetation mapping and satellite images
 - Google Earth, Grid Reference Finder, Where's the Path and What3Words (W3W)
 - Site of Special Scientific Interest (SSSI); Special Area of Conservation (SAC), National Nature Reserves (NNR) citations/visions/management statements/surveys
 - Biological Survey of Common Land (only available on paper)
 - Phase 1 Terrestrial Habitat Maps on Lle²⁷
 - Wildlife Trusts & Biological Records Centre Information (may carry a cost)
 - Individual commons' maps/surveys e.g. Mynydd Maen Commons Innovation Plan
- Using a combination of the divisions which emerge from those and a pragmatic approach to divide the common into blocks, e.g. fence lines, roads, rivers, topographic changes, hefts.
- Distinguish the following where possible (bearing in mind you will be refining the boundaries in the field):
 - Dense bracken and/or dense European gorse
 - areas of dense woodland and scattered scrub. Scrub in this case includes small trees & large shrubs (willow, hawthorn, hazel etc) but does not include European gorse or any non-native or invasive species, nor dwarf shrubs (heathers).
- Exclude the following from the scoring exercise (also may be refined in the field):
 - Bare sand or rock, shingle or scree.
 - Areas of rhododendron, Japanese knotweed or exotic conifers which exceed 0.25ha should also be identified where possible and may be excluded from scoring on the basis of an initial one-off decision (see main text)
- Work out the total number of assessment stops to be used (this element needs further testing, but we suggest a minimum number per square kilometre and a minimum number overall, e.g. 5 per square kilometre and a minimum of 20)
- Divide these stops per block proportionate to the area of each block, so that a block which makes up 25% of the area gets a quarter of the assessment stops
- Within each block, locate these fixed scoring locations in a way which appears representative of the variation within that block. These should be recorded as What3Words (W3W) or GPS coordinates. Ideally use W3W or GPS on a smartphone directly in the field. This can be done through Google Maps, W3W, or UK Grid Reference Finder which will show grid refs or a W3W reference if you right click on

²⁷ <http://lle.gov.wales/catalogue?lang=en>

the point. (Note: Once in the field you need to refine these anyway, i.e. on visual inspection they may not be representative of the block, or not accessible.

- You should also read any published objectives for the site and its habitats to check that the card is giving messages consistent with those objectives, and assessing in the field which additional measures are needed to better deliver the objectives. These may include SSSI/SAC vision statements, individual surveys or biodiversity plans (e.g. Mynydd Maen).

Before going into the field, you will therefore

- Have a clear idea whether you need to use separate scorecards (saltmarsh, woodland, bog)
- Have an indicative map of habitat blocks and number and potential W3W/GPS-location of assessment stops within each block. A printed out map will enable you to make notes in the field
- Be familiar with any specific policy objectives for that site and those habitats/blocks

In the field for the first assessment

You will have a number of objectives

- To assess the validity of the blocks delineated at your desk, and of the location and number of W3W/GPS assessment points. Points may well need to be moved if they are not representative of a block or significant area; or inaccessible. New points should have their coordinates recorded, and the reason for them noted, bearing in mind the need for the stops to be distributed proportionally between the blocks. The boundaries of dense bracken and woodland polygons should always be specifically assessed (where possible). It may be necessary to inspect the whole area before deciding assessment locations.
- To score each W3W/GPS assessment point using the relevant card and criteria. The area scored will be the area of representative habitat within a 10m radius of the point – record any decisions as to what ‘representative habitat’ means in each case. Spend five minutes looking for positive indicators within the 10m circle for question A.1. Note that the A section of scorecards refers to each assessment point, B section refers to the whole common. Make a record of all identifiable species both for the survey point and for the block; note general description of the survey point (eg Molinia-dominated grassland) & take a geotagged photo if possible. These can give an indication of the potential to improve biodiversity.
- Having walked through the block and carried out all of your scoring in it, check mentally that your assessment points have indeed been representative of the block and the variation within it. Record date of survey & any decisions made so they can be taken into consideration annually.
- As you move round the block, note any negative features – burning, soil erosion, INNS, etc. A good scale map to annotate in the field can be the best way to record

summaries of each block area and to record detail not visible on aerial of other vegetation surveys.

- Even during this first scoring exercise, start to think at each point what management changes might change the score in a positive direction, how possible they are, and what additional help (e.g. non-productive investments, specific plans) would help/be needed

Back in the office

- You will record the boundary changes for any block which was changed or created in the field
- Adjust as necessary any scores recorded before a negative feature was observed
- Note whether any negative indicators are outwith the control of graziers, e.g. fly-tipping
- Work out the average payment by adding up the scores and dividing by the number of assessment points, round to the nearest 0.5 point and multiply the corresponding payment rate by the area of the common to give the total area payment for the year

In subsequent years

- On slowly-changing commons, it would be possible to agree not to re-score every year
- Another possibility is to rescore a random sample each year, with full-rescoring every 2 or 4 years
- It should however always be open to the association to rescore any point in any year (e.g. to reflect potential improvement in score due to adjustments in management or the carrying out of 'capital works')
- The aim is always to have submitted the most up-to-date and representative set of scores, bearing in mind the possibility of an audit visit. Unsatisfactory scoring performance discovered at audit would lead to mandatory rescoring of part or all of the common in the subsequent year. All commons would need to be subject to an audit in the first year of scoring to reassure both association and scheme administrators.

Using the scorecard

- Begin with the aptly named 'Start with this Sheet' page. This tells you how to separate out saltmarsh; bog (distinguished by vegetation rather than depth of peat); and dense woodland. Note that there are definitions specific to this scorecard which may not always coincide with (e.g.) NVC communities.
- Each of these habitats has its own scorecard, but more than one card may be used on the same common.
- If none of the above habitats apply, use the general card.
- The scorecards include positive indicator species of flowering plants and live anthills; vegetation structure; presence, structure and diversity of heather and other ericoids or dwarf shrubs (heathland species); native tree cover and regeneration; and a

variety of negative factors which affect the ability of the common to provide public goods.

- Within the General scorecard, use the Structure Scoring Matrix to distinguish appropriate grazing or cutting levels for and to determine how trees and woodland regeneration are to be scored:
 - Tall (jointed or soft) rush dominated areas
 - Molinia dominated areas
 - Wet grasslands/heaths and their mosaics
 - Coastal mosaics
 - Calcareous grassland
 - Areas with more than 50% cover of bracken or European gorse
 - Neutral/acid dry grasslands and heaths and their mosaics
- The A section of a scorecard (positive items) refers to each assessment point, while the B section (negative indicators) refers to the whole common

Annex 2: The scorecards

Initial filter

LEADER/NRW Welsh project scorecards			
Start with this sheet			
<p><i>The results based area payments are based on the additional costs of grazing and are not available where there is no evidence of grazing. Other planning and management payments may be available and the scorecard remains a useful tool for measuring condition.</i></p>			
<p>You must choose a scorecard based on which characteristic species are found in the area to be scored.</p>			
<p>1) Is the area a saltmarsh (i.e. Covered at least monthly by the tide)?</p>			
<p>If so, use the Saltmarsh card</p>			
<p>2) Is the area dominated by bare sand (even if marram grass is common), or shingle, bare rock or scree? If so you are not able to get payment on this area</p>			
<p>Sandy, rocky and scree areas with significant vegetation are scored using the general card</p>			
<p>3) Is the area DOMINATED (more than 50% cover) by any of the following alone or in combination:</p>			
Sphagnum mosses	Cotton-grass	Deer-grass	Bare peat
<p>If so, use the Bog card</p>			
<p>4) Is the area woodland (>75% canopy of native trees)?</p>			
<p>If so, use the Woodland card</p>			
<p>5) Is there an area of at least 0.25 ha of rhododendron or Japanese knotweed or exotic conifers?</p>			
<p>Such a block must be identified on entry to the scheme and may be excluded from scoring.</p>			
<p>Its boundaries may not be changed for the duration of participation in the scheme.</p>			
<p>In every other case, use the General card</p>			

Saltmarsh card

LEADER/NRW Welsh project scorecards				
SALTMARSH card				
<i>Common:</i>		<i>Date of scoring:</i>		<i>Surveyor:</i>
<i>Area:</i>		<i>Location Number:</i>		
Active management				
Is at least 10% of the total area of grasses and herbs in the overall block <7cm in height during the growing season?				
If no, you are not able to get payment on this area in the current year, as there is insufficient evidence of active management; you may be eligible for complementary support to re-initiate active management and the parcel is eligible for scoring again next year				
A. Ecological quality				
A1. Structure of vegetation within 10m of the assessment point				
Heavily grazed: <20% of sward >10cm	Appropriately grazed: >20% of sward <10 cm and >20% of sward >10 cm	Too lightly grazed: <20% of sward <10cm		
1	10	0		
B. Indicators of damage				
B.4 What is the scale and impact of supplementary feeding in the block as a whole?				
	High: Evidence of feed sites on the saltmarsh habitat	None: No feed sites on the saltmarsh habitat		
Score	-10 and whole common penalty	0		
B.5 What is the scale and impact of any other damaging activities in the block as a whole in terms of their impact on soil or water?				
	High: Either soil or water being severely affected in terms of either seriousness or scale	Medium-high: Either soil or water being affected in a limited way	Medium-Low: Occasional and localised impacts	Absent or negligible impact
Score	-10 and whole common penalty	-7	-3	0

Bog card

LEADER/NRW Welsh project scorecards				
BOG card				
Common:		Date of scoring:		Surveyor:
Area:		Location Number:		
This card it to be used on any area falling into the criteria set out in START HERE				
A. Species criteria				
A.1 What is the number of positive indicators within 10m of the assessment point? Circle all positive indicators present from List A.				
	Low: up to 2	Medium: 3-4	High: 5-6	Very high: 7+
Score	0	0.5	1	1.5
List A - positive indicators				
Moss layer:		Dwarf shrub layer:	Sedge/herb layer:	
1. Mound-forming sphagnum		5. Cross-leaved heath	7. Sundews	
2. Blanket-forming sphagnum		6. Ling heather	8. Common cotton-grass	
3. Bog pool sphagnum			9. Deergrass	
4. Non-crustose lichens			10. Hare's tail cotton-grass	
			11. Cranberry	
A.2. What is the cover of Sphagnum mosses away from ditches/water tracks within 10m of the assessment point?				
	Low: 0-10%	Med-low: 11-20%	Med: 21-30%	High: 31-40%
Score	0	0.5	1	1.5
A.3 Are there non-native species present anywhere on the block?				
	Yes	No		
	-3	0		
A.4 What is the combined cover of negative indicators within 10m of the assessment point? Circle all species from list B present				
	High: >25%	Med: 11-25%	Med-Low: 1-10%	Low: <1%
Score	-2	-1	-0.5	0
List B - negative indicators				
European gorse				
Tufted hair-grass				
Heath or Soft rush				
Nettle				
B. Vegetation Structure				
B.1 How is vegetation structure within 10m of the assessment point impacted by grazing?				
	Heavily grazed	Moderate-high	Moderate-low	Good
	Too lightly grazed			
	Uniformly short herb and dwarf shrub vegetation. Many other signs of excessive stock pressure e.g. hoof prints, dung and paths and of enrichment.	Uniformly short herb and dwarf shrub vegetation. Only localised other signs of excessive stock pressure e.g. hoof prints, dung, paths and of enrichment.	Herb and dwarf shrub vegetation a mix of tall and short over most of the site. Few signs of excessive stock pressure e.g. hoof prints, dung and paths and of enrichment	Herb and dwarf shrub vegetation a mix of tall and short over most of the site. No signs of excessive stock pressure e.g. hoof prints, dung and paths and of enrichment.
	Herb and dwarf shrub vegetation uniformly tall; litter may be common in certain vegetation types; few or no signs of grazing			
	-3	-0.5	0	0.5
				-0.5

C. Integrity of bog function

C.1 To what extent has modification impacted on bog hydrology within 10m of the assessment point?

	Damaged/drained bog	Modified bog with significantly altered hydrology	Modified bog with slightly altered hydrology	Near natural bog with slightly altered hydrology	Near natural bog with intact hydrology
	Free flowing drains/gullies allow rapid water flow away from most of the bog area causing significant impact on surrounding bog vegetation.	Evidence of rapid water flow from site at multiple locations e.g. extensive peat banks with seepage or drainage channels without vegetation to slow water flow.	Localised evidence of rapid water flow from site e.g. roadside ditch.	Negligible evidence of rapid water flow from site.	Minimal evidence of rapid water flow from the site.
	Areas of flat bare peat with standing water or cracked surface may be present.	Areas of flat bare peat with standing water or cracked surface may be present.	Bog surface intact across over most of the site. Water flow in ditches/ gullies slowed by the presence of vegetation but movement of water still evident. Seepage evident on peat banks but cut banks are not numerous.	Bog surface largely intact. If drains or channels present the flow of water is slowed by dense vegetation. If old peat banks are present they are localised and largely revegetated.	Intact bog surface with negligible evidence of past drainage or disturbance.
Score	-3	-1.5	0	0.5	1.5

C.2 What is the height of the water table within 10m of the assessment point for most of the year?

	Very poor	Poor	Moderate	Good	Excellent
	Little evidence of high water table apart from small localised wet areas.	The ground is noticeably dry across multiple damaged locations. The water table is not high throughout or low for some of the year.	The water table is high in places although some areas of dry ground where surface is damaged.	High water table mostly throughout although some small localised drier areas.	High water table with ground obviously wet throughout.
Score	-2	-1	0	0.5	1.5

D. Threats to site

D.1 Select from the table below the most serious category of damage anywhere within the area scored as bog, considering the indicators of damage which occur:

	High	Medium	Low	Negligible
	Areas of bare and eroding soil (>5%) e.g. large peat hagg/gully systems	Small areas of bare and eroding soil evident (1-5%) across the assessment area	Bare soil evident along more frequently used routes but (<1%) but no peat hagg/gully system present	Little or no bare soil across the entire assessment area. Some bare patches at 'pinch' points (e.g. gateways) is acceptable providing there are no signs of erosion.
	OR	OR	OR	AND
	Peat cut by machine	Small peat hagg/gully system starting to form	Few areas of bare soil although some old peat bank 'cliffs' evident.	Vehicle tracks are restricted to established tracks only.
	OR	OR	OR	
	Significant damage caused by vehicle tracks with multiple areas of bare soil from rutting and/or extensive damage to moss layer (>2%)	Active peat banks with steep bare peat "cliffs" with vegetation layer not replaced	Vehicle tracks causing limited erosion and/or damage to moss layer (<1%).	
		OR		
		Small areas of damage to soil and/or moss layer from vehicle tracks (1-2%)		
Score	-5	-3	-1	0

D.2 Is there evidence of damage to vegetation, soil or water from other activities anywhere on the common? (if yes, list them all below)

Examples can include: burning, dumping, pollution to soil/water, inappropriate herbicide use, litter, etc

	High: >10%	Med: 1-10%	Low: <1%	Absent
Score	-5	-3	-1	0

Woodland card

LEADER/NRW Welsh project scorecards				
DENSE WOODLAND/SCRUB card				
Common:		Date of scoring:		Surveyor:
Area:		Location Number:		
This card is to be used in blocks of woodland or scrub which are >75% canopy cover and which are part of the grazed area of a common. Woodland which does not fit the grazing criterion may be eligible for woodland management payments outwith this measure				
A. Species criteria; measured at individual assessment points				
A.1 What is the number of tree/shrub species within 10m of the assessment point, excluding dwarf shrubs, ivy, honeysuckle, brambles, gorse and any non-natives?				
	Low: up to 2	Medium: 3-4	High: 5-6	Very high: 7+
Score	2.5	3	3.5	4.5
A.2. Is there regeneration/Is it suppressed by grazing within 10m of the assessment point?				
	Any regeneration present is below 15 cm tall or clear browse line	Limited number of young trees/bushes and unbrowsed saplings	Good spatial distribution of trees/bushes of all ages - equivalent to at least 10% of the wooded area is regenerating	
	-2	1	3.5	
B. Indicators of damage within a block (not individual assessment points)				
B.1 Is there Rhododendron present anywhere in the block?				
	Yes	No		
	-5	0		
B.2 Are there non-invasive non-native species present anywhere in the block?				
	Yes	No		
	-2	0		
B.3 What is the scale and impact of supplementary feeding anywhere on the common?				
	High: Some feed sites are impacting >0.5 ha each and/or are impacting directly on watercourses in terms of poaching or disturbed vegetation	Medium-high: No feed sites are impacting directly on watercourses but some sites impacting >0.5 ha in terms of poaching or disturbed vegetation	Medium-Low: No feed site impacting >0.5 ha in terms of either poaching or disturbed vegetation	Absent or negligible: Minimal or no damage from feed sites
Score	-5	-3	-1	0
B.4 What is the scale and impact of any other damaging activities in terms of their impact on soil or water anywhere on the common?				
	High: Either soil or water being severely affected in terms of either seriousness or scale	Medium-high: Either soil or water being affected in a limited way	Medium-Low: Occasional and localised impacts	Absent or negligible impact
Score	-5	-3	-1	0

General card

LEADER/NRW Welsh project scorecards							
General scorecard							
Common:		Date of scoring:		Surveyor:			
Area:		Location Number:					
A. Ecological quality; measured at individual assessment points apart from A.8							
A.1 What is the number of positive indicators within 10m of the assessment point? Circle all positive indicators present from List A.							
Pl no.	Low: 1 to 4	Low: 5-8	Medium: 9-12	High: 13-15	Very high: >15		
Score	0	0.5	1	1.5	2		
List A - positive indicators							
1	Birds-foot-trefoils (Common & Greater), Kidney vetch		25		Plantains		
2	Bog Pimpernel, Creeping Jenny		26		Ragged Robin		
3	Bushy lichens		27		Rock-roses		
4	Campions		28		Royal fern		
5	Centauray, Yellow Wort		29		Rushes, Woodrushes, Spike Rushes, not soft/cong. rush		
6	Cowslip & Primrose		30		Scabious spp., Sheep's bit		
7	Eyebrights		31		Sedges - all species		
8	Goldenrod		32		Selfheal, Bugle, Betony		
9	Harebell, Ivy-leaved Bellflower		33		Small umbels - e.g. Pignut, Yarrow, Sneezewort, Wild Carrot, Whorled Caraway		
10	Knapweeds		34		Sorrel - Common, sheep, wood		
11	Lady's bedstraw		35		Spring squill		
12	Lady's Mantle		36		St John's Worts (not garden varieties)		
13	Lady's Smock/Cuckooflower		37		Saw-wort or thistles - not creeping or spear		
14	Large Umbels - e.g. Angelica, Common Hogweed		38		Tormentil and other yellow cinquefoils, not silverweed		
15	Lesser spearwort		39		Thrift		
16	Louseworts - Common & Marsh		40		Valerian		
17	Marsh Cinquefoil		41		Vetches/vetchlings - Meadow, Bitter, Tufted etc.		
18	Marsh marigold		42		Violets and pansies		
19	Marsh Pennywort		43		White-flowered bedstraws (heath, marsh)		
20	Meadowsweet		44		Wild Thyme		
21	Milkworts		45		Wood sage		
22	Mints - all species		46		Yellow Composites which are not dandelion		
23	Orchids - all species		47		Yellow-rattle		
24	Ox-eye Daisy (not common daisy)		48		Live anthills - count as 2 species (in A.1 only; don't count in A.2)		
A2. Frequency of positive species and structure of vegetation within 10m of the assessment point							
		Structure of the vegetation					
This column first (Answer each question in turn from the top) All questions apply to the main body of the assessment area (i.e. Away from running water, rock outcrops and tracks) ↓		Then this row →	1. Much too heavily grazed (use criteria on the Structure Scoring table, as appropriate to the habitat)	2. Somewhat heavily grazed (use criteria on the Structure Scoring table, as appropriate to the habitat)	3. Optimal (use criteria on the Structure Scoring table, as appropriate to the habitat)	4. Somewhat too lightly grazed (use criteria on the Structure Scoring table, as appropriate to the habitat)	5. Much too lightly grazed (use criteria on the Structure Scoring table, as appropriate to the habitat)
Frequency of positive indicator species from List A	1 or more species from A.1 present? If yes,	If no →	0	0	0.5	0	0
	5 or more species from List A present? If yes	If no →	0	0.5	1.5	0.5	0
	5 or more species from list A common (>10 plants of each)? If yes	If no →	0.5	1.5	2.5	1.5	0.5
	1-5 species from List A abundant (>30 plants of each)? If yes	If no →	1	2.5	4	2.5	1
	>5 species from List A are abundant? If yes →	If no →	1.5	4	6	4	1.5
		If yes →	2	6	8	6	2

LEADER/NRW Welsh project scorecards

Structure Scoring Table

You must use the appropriate scoring criteria based on which characteristic species are found in the area to be scored:

In each case, look at the vegetation within 10m of assessment point

1) Is the area dominated by tall (>30cm) rushes?

Do most of them have a flower at the side of the stem?

If so, use this scoring matrix,

1. Much too heavily grazed sward between rush clumps mostly closely-grazed; rush-free areas present		3. Optimal varied sward between rush clumps ; rush cover not uniform - some rush-free areas present	4. Somewhat too lightly grazed varied sward between rush clumps ; rush cover uniform	5. Much too lightly grazed Tall vegetation between rush clumps, rush cover uniform
---	--	---	--	--

If not, use this scoring matrix

		3. Optimal Any structure you find		
--	--	---	--	--

2) Is the area dominated by (>50%) Molinia?

If so, use the **Molinia** scoring matrix here:

		3. Optimal Molinia 50-75%, >25% of clumps show signs of grazing	4. Somewhat too lightly grazed Molinia 50-75%, <25% of clumps show signs of grazing	5. Much too lightly grazed Molinia >75%
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3) Does the area, away from streams, have one or more of the following species:

Greater bird's foot trefoil	Cross-leaved heath	Marsh marigold	Ragged robin	Bog pimpernel
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If so, use the **Wet Grass/Heath Mosaics** scoring matrix here: In each case, exclude rushes, heather, gorse and Molinia from height calculations

1. Much too heavily grazed Less than 20% of the sward is over 10cm		3. Optimal At least 20% of the sward is >10cm; less than 70% is over 20cm tall		5. Much too lightly grazed Over 70% of the sward is over 20cm and/or over 50% is over 50cm and/or considerable dead litter present; few or no low-growing areas
--	--	--	--	---

4) Is the area next to the sea but non-tidal and does it have one or more of the following species:

Thrift	Bladder campion	Spring squill	Buck's horn plantain	Sea plantain	Wild carrot
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If so, use the **Coastal Mosaics** scoring matrix here:

1. Much too heavily grazed <30% of sward >20cm		3. Optimal: >30% of sward is <10cm and >30% >20cm		5. Much too lightly grazed <30% of sward <10cm
--	--	---	--	--

5) Does the area have some or all of the following species:

Thyme	Lady's bedstraw	Lady's mantle	Kidney vetch	Carline/dwarf thistle	Cowslip
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If so, use the **Calcareous Mosaics** scoring matrix here:

1. Much too heavily grazed Sward all below 5cms and no or few flowers blooming apart from agricultural species e.g. white clover/dandelion	2. Somewhat heavily grazed: 70% of sward 2-15cm, <30% herbs; no trees or scrub	3. Optimal: 70% of sward 2-15cm. 30-90% herb cover; no trees or scrub	4. Somewhat too lightly grazed: <50-70% of sward below 15cm, OR 70% <15cm and scrub or trees present but in small quantities and not actively invading	5. Much too lightly grazed: <50% of sward 2-15cm and/or considerable dead litter present and/or trees/scrub actively invading
--	--	---	--	---

6) Does the area have more than 50% dense bracken or dense European gorse?

		3. Optimal: All structures		
--	--	--------------------------------------	--	--

7) Otherwise:

Use the **Neutral, Acid & Dry Heath mosaics** scoring matrix here: In each case, exclude drought-prone swards from height calculations

1. Much too heavily grazed More than 80% of herbaceous sward is shorter than 10cm; if less than 5% herbaceous, see undergrazed		3. Optimal: At least 20% of herbaceous sward is taller than 10cm; less than 50% is over 20cm tall; if less than 5% herbaceous, see undergrazed		5. Much too lightly grazed More than 50% of the herbaceous sward is over 20cm and/or considerable dead litter present; few or no more grazed areas OR less than 5% herbaceous
--	--	--	--	---

A.3 Western gorse on species-rich habitats

Is the percentage cover of western gorse within 10m of the assessment point

<50%	>50%	
0	-3	Now go to A.7

A.4 Is there more than 20% of dwarf shrubs (heathers, crowberry, bilberry, cowberry, western gorse) present within 10m of the assessment point?

No - not present	Present but less than 20%, poor age structure	Present but less than 20%, good age structure	Yes - more than 20%
0	1	1.5	Go to A.5

A.5 What is the cover and age structure of the heathy vegetation?

20-70% and poor age structure	20-70% cover and good age structure	>70% and good age structure	>70% and poor age structure	>50% western gorse irrespective of age structure
1.5	2.5	1.5	1	-4

A.6 How diverse are the dwarf shrubs?

How many of (ling heather, bell heather, cross-leaved heath, bilberry, crowberry, cowberry, Western gorse) are present within 10m of the assessment

2 or fewer	3	4	5 or more
0	0.5	1	1.5

A.7 Native woodland and scrub in different habitats . Exclude ivy, honeysuckle, brambles and gorse

What is the frequency of native woodland and scrub in the block being assessed within 10m of the assessment point?

This column first: Find the appropriate habitat type indentified for structure scoring in A.2.	None	At least 1 plant taller than 1m present	2-5 plants taller than 1m present	>5 plants taller than 1m present
Terminal flowered rush dominated	0	0	0	0
Soft rush dominated	0	0.5	1	1.5
Molinia dominated	0	0	0	0
Wet Grass/Heath mosaics	0	0	0	0
Coastal mosaics	0	0	0	0
Calcareous mosaics	0	0	-0.5	-1
Neutral, Acid & Dry Heath mosaics	0	0.5	1	1.5
Dense Bracken or European Gorse	0	1	1.5	2

If woodland and scrub is present, is there any regeneration?

This column first: Find the appropriate habitat type indentified for structure scoring in A.2.	Any regeneration present is below 15 cm tall	Limited number of young trees/bushes and unbrowsed saplings	Good spatial distribution of trees/bushes of all ages
Terminal flowered rush dominated	0	-0.5	-1
Soft rush dominated	0	0	0
Molinia dominated	0	-0.5	-1
Wet Grass/Heath mosaics	0	-0.5	-1
Coastal mosaics	0	-0.5	-1
Calcareous mosaics	0	-0.5	-1
Neutral, Acid & Dry Heath mosaics	0	0.5	1.5
Dense bracken and European gorse	0	1	2

A.8 within 10m of the assessment point are any of the following potentially-dominating species spreading:			
bracken, brambles, tufted hair-grass, European gorse, sea buckthorn			
(Do not count areas of any of the species showing signs of mechanical control in the year of survey)			
	Yes	No	
Score	-4	0	
B. Indicators of damage			
B1. Is rhododendron or Japanese knotweed present anywhere in the scored area of the common? i.e. areas not already excluded			
If found during the initial assessment, has no impact on payments; but no payments will be made in subsequent years unless the issue is addressed			
If found in any other annual assessment, no area payments will be made before issue is addressed			
B.2 What is the combined cover within the scored area of the common of the following negative indicators: docks, cotoneaster			
Crocosmia(Monbretia), nettles, spear or creeping thistles, ragwort, self-seeded non-native conifers, other exotic species?			
	High: Is it common over 10% or 5 ha (whichever largest)	Medium: Is it Common over 5-9% or 0.5 to 2 ha (whichever largest)	Low: Is it common over more than up to 4% or 0.5 ha (whichever largest)
	Absent or negligible: Less than 1% or 0.5 ha (whichever is the smallest)		
Score	-4	-2.5	-1.5
			0
B.3 What is the impact of artificial drainage on the common?			
	High: Drains are delivering sediment to the natural watercourse and having clear impact on the habitats	Medium-high: Drains either significant in terms of sediment or impact on surrounding habitats	Medium-Low: Drains present but have limited or highly localised impact on habitats
			Drains Absent
Score	-5	-3	-1
			0
B.4 What is the scale and impact of supplementary feeding on the common?			
	High: Some feed sites are impacting >0.5 ha each and/or are impacting directly on watercourses in terms of poaching or disturbed vegetation	Medium-high: No feed sites are impacting directly on watercourses but some sites impacting >0.5 ha in terms of poaching or disturbed vegetation	Medium-Low: No feed site impacting >0.5 ha in terms of either poaching or disturbed vegetation
			Absent or negligible: Minimal or no damage from feed sites
Score	-5	-3	-1
			0
B.5 What is the scale and impact of any other damaging activities caused by graziers in terms of their impact on soil or water on the common?			
	High: Either soil or water being severely affected in terms of either seriousness or scale	Medium-high: Either soil or water being affected in a limited way	Medium-Low: Occasional and localised impacts
			Absent or negligible impact
Score	-5	-3	-1
			0

Annex 3: Using the Epicollect5 App and Google Sheet Analysis Tool

Collecting Data on Epicollect5

To use the Epicollect5 app on your phone, you will need to download it from the AppStore or Google Play store. Once the Epicollect5 app has been downloaded, you should be able to open the app. Once you have opened Epicollect5, click on “Add Project” and type in “Welsh Common Land Assessment”. You should now be able to access the questions by clicking on “Add Entry”.

The Questionnaire starts with a few general questions about the location of the common and about the assessor. The questions asked in the questionnaire will differ depending on the type of common and answers to other questions within the questionnaire. This replaces the old system of scoring grids and different sheets of paper.

If possible, the assessor will complete the questionnaire at the assessment site. Once an assessment has been completed, the assessor will need to upload the data onto Epicollect’s system, this is easily done by pressing “Upload now” at the end of the questionnaire then pressing “upload data” and “upload photos”. Once this step is complete, the data will be on Epicollect5’s system. If there is no access to the internet on the assessment sites, a bulk upload can be completed at a later time.

Data Analysis

Epicollect5 will change the qualitative data into quantitative data based on the scoring system. A map of the assessment points will also be created on the Epicollect5 website.

The data will then be imported automatically into the [Google Sheet](#) using the “importdata” function. Alternatively a simple program can be used to import the data which has been built into the system. The data will be scored in the “[Calculation](#)” Tab. The total score for each assessment point is visible in column A of the “calculation” tab and is highlighted in red. To simplify the process of looking at a specific assessment point, a [dashboard](#) was created. Users can fill in the yellow cells in this tab to see what each common has scored, or to see a specific assessment point score. The Google sheet can be used on a computer, or through the google sheets app on a mobile device.

The analysis process will happen automatically for every new assessment point from now on (until 1000 records are collected). No input from the assessors is needed apart from filling the questionnaire on Epicollect5