

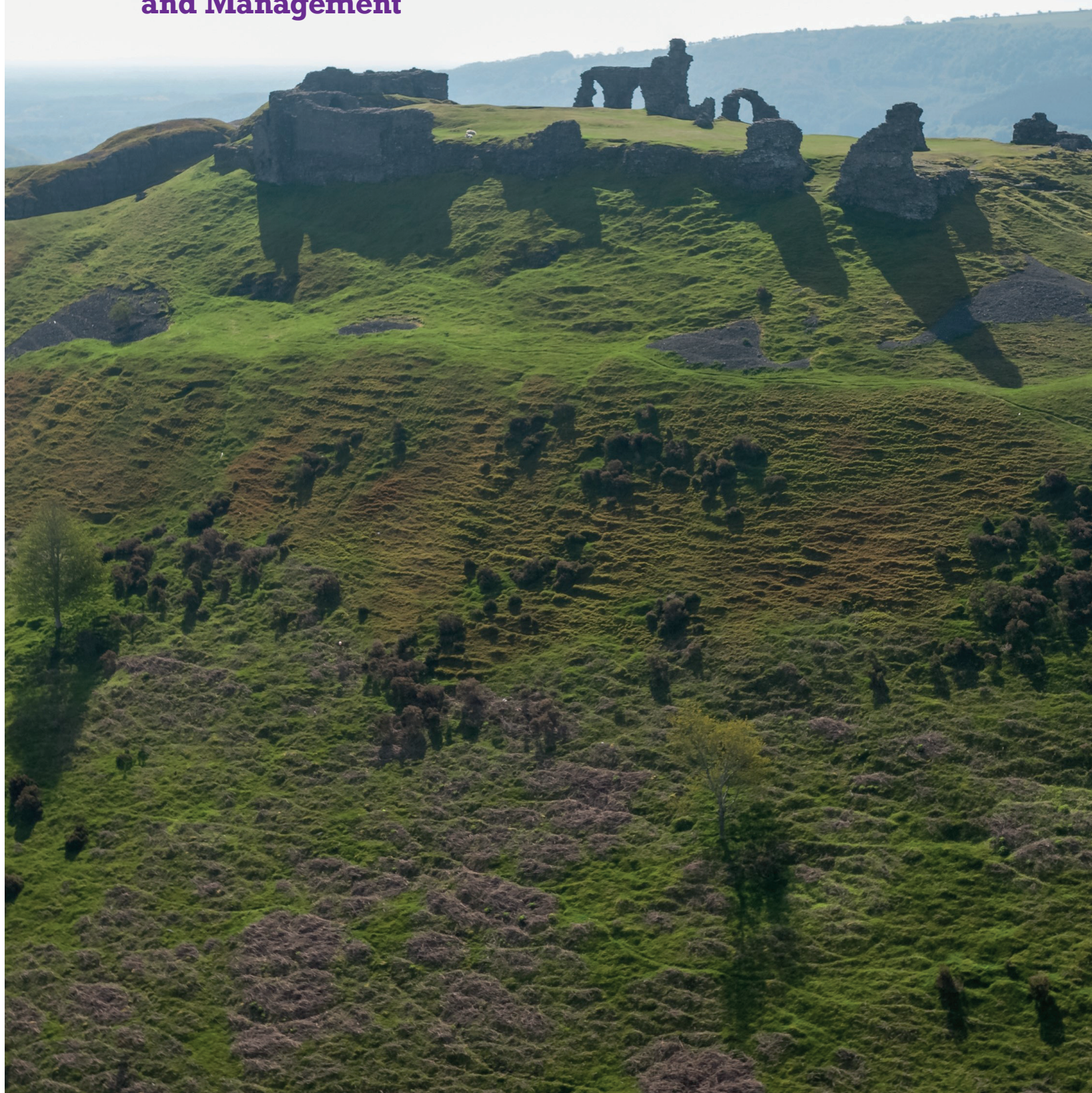


**Bryniau Clwyd a  
Dyffryn Dyfrdwy**  
Clwydian Range  
and Dee Valley

Ardal o Harddwch Naturiol Eithriadol  
Area of Outstanding Natural Beauty

# **Ffridd Handbook**

**Setting Objectives, Monitoring  
and Management**





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# 1 INTRODUCTION

## 1.1 Definition

In many parts of Wales there is a distinctive transitional zone on the lower hillsides where the uplands give way to more fertile low-lying farmland. This upland margin, known as ffridd in North Wales, has a distinctive habitat composition with elements common to both upland and lowland habitats. The habitats assemblages of the ffridd zone have been shaped by a long history of fluctuating management intensity which has resulted in complex vegetation mosaics. The vegetation found in the ffridd is predominantly semi-natural and any areas that consist entirely of improved grassland or conifer plantation would not be included within the definition of existing habitat, although they may form part of the mosaic.

In most areas, the upper limit of enclosure marks the upper boundary of ffridd, although there are examples of vegetation typical of ffridd located above this boundary. In recent years, as grazing levels have declined in the uplands,

ffridd mosaics have extended on to lower slopes. Ffridd can also be found on lower summits in the foothills of the uplands. (Below, left)

The lower limit of the ffridd is usually well defined by the distinctive boundary enclosing the intensively managed grassland. In areas where there is a high proportion of semi-natural habitat in the lowlands this differential can be more difficult to identify; although often, a break in slope divides the ffridd zone and the lowlands. (Below, right)

The composition of the habitat mosaic is highly variable and depends on geology, hydrology, topography, soils, local climate, historic farming systems and current management.

Table 1 shows the breakdown of ffridd habitat components at a Wales level taken from classification of 1km squares in Phase 1 (Blackstock et al 2010).

**Table 1. Area of Phase 1 Habitats in 1km Ffridd Squares**

Phase 1 Habitats	% Cover
Semi-natural grassland	31
Improved grassland	19
Heathland	18
Conifer plantation	11
Continuous bracken	9
Mire and Swamp	6
Built-up, rock. Other miscellaneous.	3
Broadleaved woodland and scrub	2
Open water	1





The mosaics within ffridd exist at multiple overlapping scales ranging from patch size (sub- metre) to landscape scale (thousands of hectares). Therefore, whilst one site may, for example consist of a complex mosaic of grassland, heath scrub and bog, another site may have a more uniform cover of one or two habitats but be part of a larger mosaic at a landscape level e.g. on a valley side. The larger scale mosaics are equally important for a range of particular species.

Ffridd composition also varies widely across Wales, for example, in parts of South Wales rush pasture can be a significant component. In North East Wales the ffridd zone includes parts of the carboniferous limestone escarpment and therefore will include limestone grassland, scree, cliff and rock habitats.

## 1.2 Historical and Current Management of Ffridd

Over the centuries land management in the ffridd has been dynamic and highly variable as farming has reacted to economic and social pressures and climatic changes. Today the ffridd is primarily used for rough grazing but historical and archaeological evidence shows that there have been periods of much more intensive agricultural use in the upland margins including arable systems. This evidence includes cultivation ridges, field systems and associated building platforms (RCAHMMW 2003). Extension of more intensive agriculture into the uplands and ffridd may represent periods of social stability, economic expansion, the rapid increase in local populations, a more benign climate or a combination of these factors.

De-intensification in the ffridd has resulted in periods when scrub and woodland have expanded. For example, a study of veteran hawthorn trees within ffridd areas in Snowdonia showed that young trees were recruited into the population in every decade between 1880 and 1950 but thereafter intensification of grazing prevented any further sapling growth (Good et al 1990). Periods of less intensive agriculture may have resulted from social and economic decline, poor weather patterns over a series of years or when there was insufficient manpower to work the land such as during periods of conflict.

The pattern and type of grazing within the ffridd has also changed over time. From the medieval period the pastoral transhumance system known as Hendre-Hafod became common in Wales with stock being moved between winter pastures in the lowlands and upland rough grazings in the summer. Some ffridd areas would have been used as holding areas for livestock as animals were moved between the lowlands and uplands. This would result in “pulse” grazing with short periods of intensive grazing and long periods with no grazing. This type of grazing tends to create structural heterogeneity at a habitat and



Ancient hawthorns, Bryn Alyn, Clwydian Range



Coniferous forestry in the ffridd zone (CRDV AONB)



vegetation level and can allow plants to flower and seed during rest periods. Although some ffridd areas are still managed in this way, on the whole, grazing tends to be less variable over longer time periods resulting in more uniformity in habitat and vegetation structure.

Historically cattle would have been prevalent in the uplands and ffridd but, as the wool trade developed in the 17th and 18th centuries, sheep became increasingly important economically and a more mixed grazing system developed. Prior to mechanisation working horses were an important part of the farm and are likely to have been grazed on the rougher ground such as a ffridd for at least part of the year. During the 20th Century mixed grazing in the ffridd has largely been replaced by sheep-only grazing systems which has resulted in a significant change in habitat composition and structural diversity.

Over last 50 years or so polarisation in the management of ffridd has been evident with both intensification of agriculture and silviculture in some areas and neglect and abandonment in others. Intensification encompasses agricultural improvement of semi-natural grassland, increased grazing levels and conversion to coniferous

forestry. These changes reduce the ffridd mosaic diversity at both a site and landscape level. Conversion to forestry and improved grassland may represent more permanent change to the ffridd landscape which is difficult to reverse for both policy and practical reasons. Agricultural improvement of ffridd habitat should now be subject to EIA agriculture regulations.

The reduction in agricultural use of the ffridd and, in some areas, complete abandonment of agriculture results in the increase in gorse, bracken, scrub and ultimately woodland with the accompanying loss of the mosaic characteristics. Whilst this process could be seen as just part of the long-term cycle of change in the ffridd there is concern that there is little scope for those species associated with the open mosaics of the ffridd to find suitable habitat elsewhere either in the highly-improved lowlands or in the uplands which tend to support larger blocks of uniform habitat. In addition, both air pollution and climate change pose a long-term threat to the ffridd landscape. Atmospheric nitrogen deposition tends to promote more productive species at the expense of species adapted to low nutrient conditions such as those found in acid grasslands, heathland and bogs.



Former grass-heath mosaic now a mix of gorse and bracken as a result of the reduction in grazing (CRDV AONB)



### 1.3 Habitat Components

Many of the components of the ffridd are priority habitats listed under Section 7 of the Environment (Wales) Act 2016 e.g. heathland, calcareous grassland, lowland acid grassland, blanket bog etc. However, in the ffridd these habitats can occur in such small parcels that they

can be difficult to protect from land use changes such as coniferous afforestation and agricultural improvement. Other components of the ffridd such as bracken and scrub are not listed as priority habitat. Ideally ffridd will, at some point, become listed under

Section 7 to provide greater protection and management focus for the entire mosaic. Table 2 below provides a brief description of habitat components and their associated species.

**Table 2. Ffridd Habitats**

Semi-natural Habitats	Description
Unimproved dry grassland	Acid grassland is the most frequently found grassland in the ffridd supporting a range of flowering plants, grasses and bryophytes. Important for grassland fungi. In NE Wales drought-prone acid grassland and calcareous grassland support uncommon plant species (shepherd's cress, erect chickweed, rue-leaved saxifrage)
Marshy grassland	Rush and Molinia pasture, can support a diversity of wetland plants. Large area of marshy grassland in the ffridd are more common in South and Mid Wales. Important for marsh fritillary, grass snake, snipe etc.
Heathland	At higher altitude, dry heath tends to be heather dominated with crowberry, bilberry and cross-leaved heath in wet areas. Western gorse and bell heather become more prominent at lower altitudes. Important for moorland and ffridd birds and invertebrates.
Mires, bogs and flushes	Pockets of deep peat and flushes can support a richness of species including bog asphodel, sundew, cotton grasses and Sphagnum moss
Bracken	Bracken is a significant component for many ffridd birds. Bracken is important for butterflies where the canopy is open with a sward of grasses and flowering plants such as violets beneath. Large blocks of dense bracken have less value.
Gorse scrub	Important for pollinators early in the season. Many ffridd birds favour a proportion of gorse within the mosaic. Trees can establish in patches of gorse
Wood pasture	Important for veteran trees; saproxylic invertebrates; epiphytic lichens, bryophytes and ferns; grassland and woodland fungi; moths and other invertebrates
Woodland	Small blocks of woodland increase structural and species diversity and provide edge habitat favoured by invertebrates, birds and bats.
Cliffs and outcrops	Support calcareous and siliceous chasmophytic communities and tall herb ledge vegetation.
Scree	Calcareous and siliceous scree important for bryophytes and lichens
Open water	Mainly flowing water including streams and rivers. Important for ffridd invertebrates including butterflies. Some large ffridd blocks may encompass pools, ponds and lakes.



### 1.4 Species

Whilst there are no species which can be truly regarded as ffridd specialist there are some species which particularly favour the mosaic of habitats within the ffridd, for example Fuller et al (2006) found that tree pipit, whinchat, linnet and yellowhammer were a likely to be more abundant in the ffridd than in adjacent habitats. Their research

showed that ffridd with a proportion of bracken and scattered trees and bushes supported a higher diversity of ffridd bird species than those sites dominated by mosaics of acid grassland or heathland. On the other hand, acid grassland within the ffridd is particularly important for grassland fungi such as wax caps and earth tongues with 8 out

of the top 10 Welsh grassland fungi sites being found within this zone (RSPB 2013). The complexity and variability between ffridd sites are therefore of paramount importance for Welsh biodiversity. Table 3 Provides information on habitat preferences for a sample of ffridd species.

Table 3. Species Habitat Preferences

Species	Preferred Mosaic
Yellowhammer	Mature gorse, scrub, bracken and grass
Ring ouzel	Heather, bracken and rock outcrop/scree. Fruiting trees in autumn. Close proximity to worm-rich pasture
Tree pipit	Bracken, grassland, sparse tress, woodland edge
Whinchat	Bracken, insect-rich meadows, extensively grazed pasture and the edges of scrub.
Stonechat	Grass, bracken and gorse mixtures
Grassland fungi	Grazed unimproved acid grassland,
Lichen assemblages	Assemblages associated with rock habitats, mature trees and woodland
Pearl bordered fritillary	Well-drained mosaics of grass, dense bracken and light scrub
Small pearl bordered fritillary	Damp grassland flushes, stream sides, moorland edge
Welsh clearwing	Hillside pastures with scattered old birch trees. Also, in open birch woodland and on wooded heathland.
Eyebright	Unimproved grassland and heath mosaics
Mountain everlasting	Rock ledges, crags, stream sides, screes, well-drained acidic grasslands, heathy pastures and dwarf-shrub heaths
Lesser butterfly orchid	Heathy pastures, grassland, open scrub, woodland edges and rides, moorland edge
Adder	Heathland, wet and dry grassland, moorland edge, open woodland.
Lesser horseshoe bat	Wooded ffridd, hedgerows, tree lines



## 1.5 Archaeological Interest

The land management history and settlement of the ffridd has left a rich archaeological record which includes scheduled ancient monuments such as Neolithic hillforts and medieval castles, and extensive historical landscapes. The latter includes both agricultural landscapes such as medieval field

systems and industrial landscapes such as those left by the coal and slate industries. There are also countless quarries and smaller mines, many abandoned but some still active.

The coal industries of South and North East Wales and the slate mining in North

West Wales have undoubtedly helped to prevent agricultural intensification in the upland fringes over the last few centuries and now support a diverse ffridd mosaic of grassland, woodland, heathland scrub etc. intermixed with remnant spoil heaps, tailings, quarry ponds, rock faces and ruined buildings.

Caer Drewyn, Corwen (CRDV AONB)





**Slate Landscape – around Llanberis**



- 1. Woodland and scattered tree
- 2. Spoil heaps
- 3. Bracken



- 1. Spoil heaps
- 2. Marshy grassland/wet heath
- 3. Acid grassland

**Coal Landscape – Rhondda Valley**



- 1. Gorse
- 2. Heath
- 3. Bare coal spoil
- 4. Tree regeneration



- 1. Mature trees
- 2. Acid grassland



# 2 FFRIDD CASE STUDIES

The complexity and variability of the ffridd landscape is best illustrated through case studies. A selection of ffridd sites is presented below:

## I. Elan Valley – In the Elan Valley, very little ffridd is fenced out from the open hill.



1. Scattered tree
2. Flush
3. Small patches of acid grassland
4. Dense bracken

This ffridd is within a ring ouzel priority area. For this particular species, the objective is to create more acid grassland, reduce bracken cover and encourage more fruiting trees e.g. hawthorn and rowan.



1. Dry heath
2. Acid grassland
3. Gorse



1. Conifer regeneration
2. Dry heath
3. Dense bracken
4. Native tree regeneration

This ffridd is within a ring ouzel priority area and at its eastern edge links to the Cambrian Mountains woodland initiative site. The ffridd has a good diversity of habitats but the acid grassland is rather under-grazed and gorse is spreading. Priorities are to ensure sufficient acid grassland for ring ouzel at the western edge and to allow woodland extension on the eastern edge but also to control conifers.



1. Dense bracken
2. Acid grassland



1. Mature trees
2. Dense bracken
3. Tree regeneration spreading from woodland edge

The ffridd has dense bracken dominated lower slopes with native trees invading from adjacent woodland. The upper slopes are a patchwork of acid grassland, bracken and heath on the moorland edge. There are no species of particular priority noted. The objective is to allow scattered trees to establish in dense bracken and increase the area of acid grassland.



II. North West Wales – Ffridd landscape Nant Ffrancon Valley – this ffridd is fenced from the open hill.



- 1. Dense bracken
- 2. Rock outcrop
- 3. Acid grassland
- 4. Heath
- 5. Mature trees
- 6. Scree



- 1. Species rich wet flushes
- 2. heath regeneration
- 3. Native tree regeneration

The ffridd is diverse at both a landscape and site level. On the southern valley side, reduced livestock numbers on formerly heavily grazed acid grassland is allowing flower-rich vegetation, heathland and native scrub to develop. The ffridd is noted for ring ouzel, chough and twite.

Rhinog Ffridd (Cwm Bychan, Dolmelynlyn)



- 1. Wood pasture



- 1. Bracken
- 2. Heath, scree, outcrop on cliffs
- 3. Old mine

- 4. Forestry, coniferous and native
- 5. Acid grassland

The wood pasture at Cwm Bychan is well grazed and is important for lichens and bryophytes. There is no tree regeneration due to grazing pressure but this is not necessarily an issue at a wide scale so long as there are

there places within the ffridd landscape where trees are regenerating. Forestry within the ffridd at Dolmelynlyn adjacent to an area of open ffridd with bracken, acid grassland and heath.



Cadair Idris and Talyllyn



- 1. Bracken, billberry and heather above wall
- 2. Woodland, bracken, acid grassland and gorse



- 1. Banks of bluebells
- 2. Bracken, woodland and acid grassland

On the south side of Cadair Idris a mosaic of heath, grass and bracken is seen above the hill wall on the lower slopes. Between the hill wall and the inbye there is a mosaic of woodland, grassland, bracken and scrub. Banks of bluebells are a feature amongst bracken on the north-facing slope of the Talyllyn valley.

III. Black Mountains



- 1. Enclosed fields
- 2. Old hawthorn
- 3. Dense bracken



- 1. Dense bracken
- 2. Scattered trees

In this part of the Black Mountains the improved land is immediately adjacent to the open hill. Ffridd is found on the lower slopes and is dominated by dense bracken with few scattered trees and small patches of acid grassland.



# 3 CONSERVATION OBJECTIVES AND MONITORING

## 3.1 Background

Setting objectives for your ffridd is essential for guiding management decisions and for monitoring the impact of that management. Because of its very dynamic nature and the complexity of the mosaics this can be a difficult exercise. As a response to the vast loss of biodiversity in the UK, there is a tendency in conservation to want to preserve sites or habitats in an optimum condition at all times. Although this response is understandable it is not necessarily the right approach for many habitats and certainly not for ffridd. You must expect your ffridd to change and therefore need to set limits to this change. Limits will vary depending on the site location, species interests, climate, archaeological interest etc. Reaching a particular limit will be the trigger for a management response which will initiate change in a different direction i.e. the site has been moving from an open habitat mosaic to scrub. At a particular point management will be initiated to reduce the scrub and increase open grassland. Within the ffridd it is often possible to tolerate much larger changes in habitat-mosaic composition than in some other habitat types. For example, on blanket bog, tree invasion is harmful to the deep peat resource and therefore needs to be dealt with rapidly. Tree invasion on ffridd

is often beneficial and management may be delayed to allow some trees to establish before measures are taken to prevent the conversion to woodland.

Where you have a good understanding of the habitats and species of the ffridd, setting the conservation objectives may be relatively straightforward. However, many ffridd areas have not been surveyed in detail and may have few species records so that there is little information to guide decision making. The bullet points below provide some pointers for enhancing the ffridd.

- Trees and scrub are a valuable part of the ffridd landscape even where the main interest lies in open habitats such as grassland and heathland. Many ffridd species particularly birds and invertebrates favour the interface between open and wooded habitats. If your ffridd is relatively tree-less, identify opportunities to introduce some scrub or consider the benefits of developing wood pasture which is in itself a scarce habitat.
- Bracken is typically regarded as a management problem but research has clearly shown that it is a very important component of the ffridd landscape. Bracken is more beneficial

where it has an open canopy with a ground layer of grassland and flowering plants such as violets. Bracken can also provide ideal areas for the establishment of scattered trees and scrub. Ensure that you consider the positive features of the bracken component within your conservation objectives.

- There is considerable opportunity to increase the value of the ffridd for pollinators. Ffridd can provide a very long flowering period from spring flowers and gorse in the early season, through summer flowering grasslands to prolific flowering of heathland in the late summer and early autumn. Consider how habitats which are currently poor for pollinators can be enhanced e.g. changing livestock type or adjusting grazing levels and timing
- Non-native Invasive species can be particularly problematical in ffridd because the sporadic nature of management may give them time to establish and become a very costly and time-consuming management issue. You may wish to set a zero tolerance of certain invasives such as cotoneaster, rhododendron etc. within your conservation objectives.



## 3.2 Setting Conservation Objectives

### 3.2.1 Landscape Level Mosaic

If the mosaic is at a landscape scale you may only have management control over a single component and therefore can only set conservation objectives for that habitat. Follow through the steps 1 to 4 in 3.2.2 below.

Where other parts of the mosaic are in sympathetic management e.g. NGO, statutory body, sympathetic landowner etc. it may be possible to work together at the landscape scale to develop a vision and objectives for the ffridd.

If other parts of the landscape mosaic are threatened e.g. by afforestation or other development, consider whether it is possible to include some of the elements which will be lost within your site.

### 3.2.2 Site/Unit Level or Subsite/Unit Level Mosaic

#### Step 1 Identifying habitat components

Identify all the habitat components on the site/unit. If recent detailed habitats maps are available it should be possible to accurately determine the area/proportion of each habitat in the mosaic. Otherwise an estimate will have to be made based on old data, field reconnaissance and aerial photographs. It is important to ensure any small-scale features of the mosaic are not overlooked e.g. flushes, bare ground or very small patches of species rich grassland (i.e. U1 grassland found on hummocks and old ant hills). Include notes on the current condition of each of these components and any anecdotal evidence of change or loss of certain components.

*Conservation Objective – maintain all the components of the habitat mosaic*

#### Step 2 Identifying Species Interest

Identify the species interest on the site providing as much information as possible on the data sources, survey dates and reliability of anecdotal information. Whilst the focus should be on species which favour the habitat mosaic it also important to include notable species or species assemblages associated with a particular component of the ffridd e.g. grassland fungi. You may also wish to include the future potential for species which are currently not present but are known to occur locally.

If there is very little information on particular species of interest it is still helpful to have an understanding of the species-composition of the habitat components e.g. a list of common species.

*Conservation Objectives – specific objectives for particular species / assemblages*

#### Step 3 Identifying factors

Factors are things which have an influence on your habitat or species features and can potentially change their extent, condition or population dynamics.

Factors can be natural or anthropogenic and can be internal to the site for example grazing or burning management or external e.g. climate change or nitrogen deposition.

You need to identify which factors are influencing you features and whether you have control over these factors e.g. you can change grazing pressure or timing of grazing but have no control over nitrogen deposition. Identifying your factors is essential for developing you management activities.

#### Step 4 Determine limits of change for the habitat mosaic

The guiding principle is to maintain all the component habitats of the mosaic but to allow the relative proportions to change within limits over time. When deciding on limits you need to think about trade-offs and compromise between maintaining the mosaic and ensuring the needs of particular species are met. The extent of some habitats is “fixed” e.g. bogs, scree, cliff habitat and open water, and some small-scale habitats or features can be less tolerant of change and may need to be conserved at their optimum extent.

*Conservation Objectives – set limits for the habitat components of the mosaic*





Figure 1 Example Limits of Change in a Habitat Mosaic



As ffridd is so variable it is not possible to provide examples for all eventualities, but three potential scenarios are given below.

A. The ffridd is important for a scarce habitat (limestone grassland/wood pasture) or particular species/species assemblages which favour one habitat component of the mosaic (e.g. grassland fungi).

The focus is on the key habitat, the upper limit will be the maximum area it could occupy without reducing the value of the habitat mosaic. This means ensuring all habitat components are maintained and that they are functionally viable i.e. they are not so reduced that their species composition and structure is compromised. Heathland, for example, can become very impoverished if reduced to very small blocks. The first box in Figure 1 illustrates the grassland component is at its maximum extent of 60% with the other 3 components are at their minimum extent.

The lower limit for the key habitat is the extent below which the species population/assemblage is likely to decline. Unless you have specific

information to guide this decision e.g. survey or research data which links species decline to habitat loss, err on the side of caution (see box 3 Figure 1)

Once you have established the upper and lower limits for your key habitats, consider the upper limits for the other habitats in turn, starting with the open habitats e.g. heathland, grassland etc.

Consider any missing elements in the mosaic and determine whether they can be incorporated without impacting on the species interest e.g. is there an opportunity to establish trees if none are currently present?

B. The ffridd has a good diversity of habitats and/or is important for species/species assemblages which favour a well-developed habitat mosaic

The aim will be to maximise the diversity of the habitat mosaic. No one component is favoured over the others but you may wish to set the limits for the open habitats e.g. grassland, heathland, mire before considering bracken, scrub and woodland.

Consider any missing elements in the mosaic and determine whether they

can be incorporated without impacting on the species interest e.g. is there an opportunity to establish trees if none are currently present?

C. The ffridd has no particular species or habitat interest and is currently rather uniform

The aim will be to improve the diversity of the mosaic as far as possible. Before considering the habitat mosaic you wish to re-establish you will need to think about practicalities and costs. For example, it may be both difficult and costly to re-establish open habitats on very large areas of dense bracken or gorse scrub and there may be some situations where it would be more realistic and beneficial to establish woodland. On the other hand, a ffridd dominated by species-poor acid grassland is more readily converted to a diverse mosaic, for example by reducing grazing, tree planting etc.

It is likely that on many sites you will not achieve the habitat diversity of Scenario 2 nor the specific species/habitat interest of Scenario 1 but any increase in the diversity and structure of the mosaic will benefit connectivity and increase niche availability for a range of ffridd species.

## Step 5. Habitat Condition

Provide a simple description of the desirable condition of the habitat taking into account the species needs. This may include a list of typical species and the required habitat structure. Simple targets or performance indicators can be set for monitoring (see 3.3.3).

Remember where habitats occur as small fragmented patches within a mosaic, they typically have fewer species and less structural diversity than larger blocks of the same habitat. Therefore, it is important not to set condition targets which are unachievable.

Consider the impacts of non-native species on habitat condition.

*Conservation Objectives – set simple condition targets*

**Table 3. Worked Example of Conservation Objectives**

1. Habitat components and Current Proportion (based on site reconnaissance)			
Acid grassland	50%		
Heathland	15%		
Gorse scrub	15%		
Bracken	20%		
Trees	Few saplings and several older trees		
2. Species Interest			
Grassland fungi	5+ species (wax caps, earth tongue etc.)		
Ffridd birds	Breeding stonechat, yellow hammer, linnet		
Welsh clearwing	Present on adjacent site		
3. Conservation Objectives, Limits of Change, Condition			
<ul style="list-style-type: none"> <li>Maintain all habitat components</li> <li>Maintain grassland fungi population over at least 40% of the site – at least 5 species present</li> <li>Ffridd birds – 3 species breeding on the site</li> </ul>			
Acid grassland	Acid grassland should include a range of typical species (provide list). Forbs should be able to flower during the spring/early summer. The sward should be grazed short from mid-summer to promote grassland fungi		
Upper Limit	60%	Lower Limit	40%
Factors	Grazing, compaction from public use, native scrub/bracken encroachment,		
Heathland	The heathland should comprise a mix of ericoids including common heather and bell heather which are able to flower profusely in the summer and autumn. There should be signs of heathland regeneration through seeding or vegetative growth.		
Upper Limit	25%	Lower Limit	15%
Factors	Grazing, heather management, fire (accidental/arson), heather beetle, public access		
Gorse			
Upper Limit	15%	Lower Limit	10%
Factors	Grazing, fire (accidental/deliberate), vegetation management		
Bracken	At least half of the area should have an open canopy with grassland forbs beneath and little accumulation of litter		
Upper Limit	20%	Lower Limit	10%
Factors	Grazing, fire (accidental/deliberate), vegetation management, public access (i.e. paths through bracken)		
Native trees	Native trees only. Encourage the establishment of birch to provide future habitat for Welsh clearwing		
Upper Limit	widespread scattered mainly within gorse and bracken but with some spread onto grassland and heath	Lower Limit	few scattered in gorse and bracken
Factors	Grazing, browsing, tree disease, public access, vandalism		



3.3 Monitoring

Monitoring is essential to measures species and habitat trends and to provide guidance for management decisions to ensure an adaptive approach to management activities. Monitoring activity is linked directly to the Conservation Objectives for the site (3.2.2).

Monitoring can be both expensive and time consuming, the latter particularly on larger, less accessible sites on the upland fringes. Monitoring needs to be carried out regularly and the monitoring cycle needs to be appropriate for the site and its species and habitat interest, for example every 6 years for habitats and every 10 years for some species groups. As the ffridd mosaic is complex and resources are typically limited within Conservation Organisations and Local Authorities it is important to make monitoring as simple as possible and accessible to non-specialist countryside staff and volunteers.

3.3.1 Assessing the Habitat Mosaic

This can be done by the use of recent aerial photography combined with field checking and fixed-point photography. The aim is to produce a map of the various habitat components. This does not need to be a detailed map (e.g. NVC communities etc.) but should be sufficient to show the relative proportions of the different components.

Questions to answer:

- Are all the habitats components still present, if not why not?
- Does the mapped extent of each habitat lie within the limits of change, if not why not?
- What are the overall trends?
- What management changes are required

3.3.2 Assessing Habitat Condition

The desired habitat condition is expressed in the Conservation Objectives. Simple targets or Performance Indicators can be set for each habitat (see example Figure 3). Common Standards Monitoring targets can be used as guidance but on most ffridd sites there will be a need to simplify these, otherwise monitoring the complexity of habitats will become too onerous. Training in plants identification etc. might be required for staff and volunteers.

The habitats are monitored by sampling the vegetation (e.g. using quadrats), this might be through random sampling i.e. a W-walk or through fixed monitoring plots, the latter is more time consuming and plots can be difficult to relocate.

Questions to answer:

- Are the condition targets being met and if not why not?
- What are the overall trends for habitat condition?
- What management changes are required

3.3.3 Assessing species and species assemblages

Species surveys usually require specialist knowledge and can be both expensive and time consuming. There are various ways that monitoring can be undertaken.

- Contracting species specialists to undertake monitoring of difficult groups e.g. grassland fungi, lichens etc. – as this is costly the monitoring cycle may need to be relatively long e.g. once every 6-10 years
- Engaging local recorders and specialist groups – some financial support may be required
- Linking into existing survey programmes e.g. breeding bird surveys.
- Training non-specialist staff and volunteers to carry out simple surveys e.g. butterfly transects

Questions to answer:

- What are the overall trends for specific species or assemblages?
- Are the trends linked to changes in habitat?
- What management changes are required?

Figure 3. Example of Performance Indicators set for Ffridd in Snowdonia

<p><b>Dry Heath</b></p> <ul style="list-style-type: none"><li>• 2 ericoid species + 2 other indicator species from list 1 present</li><li>• Ericoid cover ≥50%</li><li>• Juncus squarrosus cover ≤10%</li><li>• Nardus stricta ≤10%</li><li>• INNS e.g. rhododendron not present</li></ul> <p><b>List 1</b></p> <p>Ericoids – Calluna vulgaris, Vaccinium spp., Erica spp., Empetrum nigrum.</p> <p>Non-ericoids – Carex spp, Dactylorhiza spp, Euphrasia agg., Cladonia spp. Pleurocarpous mosses, Potentilla erecta, Galium saxatile, Veronica officinalis, Polygala serpyllifolia, Lotus corniculatus, Hieracium pilosella. Plantago lanceolate, Pedicularis sylvatica, Thymus praecox.</p>	<p><b>Acid Grassland</b></p> <ul style="list-style-type: none"><li>• Juncus squarrosus cover ≤10%</li><li>• Nardus stricta ≤10%</li><li>• At least 2 species from list 1 present</li><li>• INNS e.g. rhododendron not present</li></ul>
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# 4 MANAGEMENT

Variability in management is key to developing and maintaining habitat mosaics in the ffridd. This includes variability in grazing such as livestock type and breed, pattern and timing of grazing and intensity of grazing. It also includes variability in the frequency and intensity of other management such as bracken and gorse control, heather cutting or burning, tree planting and felling etc.

## 4.1 Grazing

Grazing is the most effective tool in producing varied vegetation structure, i.e. not uniformly tall and rank or short and close cropped, which is important for many ffridd species. Over the last 50 years or so grazing has tended to become uniform, partly as a result of the shift towards sheep-only systems and partly as a result of prescriptive agri-environment schemes.

### Livestock Type and Breed

Sheep have thin, mobile lips and move slowly over the sward nibbling the grass. They eat selectively, biting off single leaves or shoots down to a height of 3 cm. Sheep only develop a full set of adult teeth after 3-4 years and then steadily lose them as they age, therefore young and old sheep may not graze as effectively as middle-aged sheep. As well as grasses and herbs, hardy breeds such as Soay and Hebridean sheep will also selectively eat some low scrub. The benefits of grazing with sheep are:

- They are light and more agile than cattle and are more suited to steeply sloping land.
- Although on heavy, wet soils sheep can cause trampling and poaching they do not have such an impact as heavier grazers.
- Their dung is deposited randomly and they will graze next to it, therefore grazing swards to a uniformly low height.

Cattle prefer to eat longer grasses and use their tongue to pull and tear the vegetation. The benefits of cattle are:

- They do not graze so close or as selectively; grazing to a minimum height of 5-6 cm so flowers and tussocks are left which can be used by small mammals and insects.
- They are generally better than sheep at creating and maintaining structurally diverse grassland.
- Their large size and heavy weight can break-up the ground and their hoof prints create niche environments for ground nesting birds and for new plants to germinate.
- They avoid grazing around dung pats which creates patches of longer vegetation which is important for insect communities.
- Cattle are particularly good at creating gaps in tall, coarse vegetation such as bracken and scrub.

The breed of cow is important, native cattle are recommended for their ability to withstand bad weather and thrive on poor quality forage. Dexter cattle are renowned for their dexterity and ability to graze steep, rough ground. Their small size means that they are less likely to cause poaching.

Equines have forward facing teeth and can graze extremely close to the ground. The benefits of grazing with horses and ponies are:

- They preferentially select sweet grasses, but will also eat a variety of sedges and rushes, particularly later in the summer and will also browse scrub.
- They tend not to select flowers.
- They regularly graze tufted grasses.
- Their 'fussy' diets are ideal for maintaining the mosaic habitat needed by many insects.
- They browse gorse in the winter, nibble bracken and graze its grassy understorey and are heavy enough to trample bracken.
- Their trampling provides niche environments for plants and insects.

Ponies, particularly hill ponies, can be a cheaper and less management intensive option for grazing than cattle.



## Grazing Pattern – timing and intensity

Monitoring is essential to measures variability in stock density and the timing of grazing can promote diversity both at the sward and habitat mosaic level. Prescriptive approaches i.e. setting grazing levels and timings, tend to favour grazing patterns which are essentially similar year after year. An outcome-based approach allows the grazing to be manipulated within year and between years. Possible grazing options which can be considered include:

- **Pulse grazing** – shorter periods of more intensive grazing – create sward structure
- **Rest periods** – no grazing – can allow recovery after heavy grazing, allow tree and scrub establishment
- **Mob grazing** – can be used after a rest period to reduce vegetation
- **Close-shepherded grazing** – grazing can be targeted by moving livestock on a daily basis
- **Year-round grazing** – best to aim for a stocking rate just sufficient to maintain a varied sward structure in an average year – preferably mixed grazing or cattle

Seasonality is also important, for example grazing in woodland will encourage tree regeneration in the autumn and reduce it in the spring. Grazing in the spring reduces flowering whilst winter grazing can reduce ericoids in heathland. Grazing does not have to be restricted to a specific season. It can be a combination, for example, spring grazing, then a resting period over the summer followed by autumn grazing, or late summer grazing followed by winter grazing.

## 4.2 Bracken and Scrub Management

Many ffridd areas have become bracken, gorse or scrub dominated in recent decades with a corresponding decline in open habitats. As long as this is reversed at some point and open habitats are reinstated this can be regarded as part of the process of continual change in the ffridd. The limits of change set in 3.2.2 provides the maximum limit for these habitats but it is up to the site manager to decide whether to undertake management when these scrub habitats near their maximum extent or sometime before. In other words, the choice is between frequent micro-management and infrequent management on a larger scale. There are advantages and disadvantages to both.

**Frequent management:** Creates a less dynamic system. Favours open habitats and associated species. Less costly. May be possible to carry out with volunteers.

**Infrequent management:** Creates a more dynamic system. Allows tree establishment. Favours scrub and woodland species. Costly, but can be part of large-scale funded projects. Uses contractors with less opportunities for volunteers. Can create a lot of arisings.

It is possible to combine both of these approaches on a single site i.e. Some areas are managed annually but blocks of scrub are allowed to develop for 10-15 years before management.

On some sites, it is possible to encounter the opposing impacts of heavy grazing on open habitats such as grassland, heath and mire and under-grazing on areas of dense gorse and bracken. Whilst this can have a negative impact on the open habitats it can allow native trees to establish within the under-grazed scrub. Once a proportion of the trees have reached a sufficient size to withstand grazing the surrounding gorse and bracken can be managed to create a mosaic of open habitats, with smaller patches of scrub and clusters or a scattering of trees. With appropriate grazing levels and the right livestock, this can be taken a step further to create a much more open wood pasture landscape.



Large-scale gorse management – retaining young trees



### 4.3 Tree Planting and Management

Trees can establish naturally in the ffridd as discussed above (4.2) but on some sites there is limited local seed source and tree regeneration is very slow. Planting using native and preferably locally sourced trees is a practical solution but if large areas are densely planted and/or the continued management of both the trees and the understorey is not undertaken the end result can be a reduction in the diversity of the ffridd mosaic. Before planting trees within the ffridd it is important to consider what you are trying to achieve e.g.:

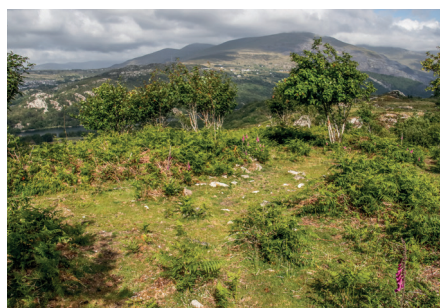
- Do you simply want a few trees scattered across the site?
- Are you trying to create new wood pasture or maintain existing wood pasture by replacing dying trees?
- Do you intend to create new woodland blocks or extend woodland cover?

Having a clear vision of the desired outcomes will help determine how the trees are planted and the management requirements once the trees have become established. How the trees are planted depends on the site, number of trees and desired outcomes. Options include:

1. Planting and protecting individual trees
2. Planting within small exclosures on a grazed site.
3. Excluding grazing from part or all of the site.
4. Planting within dense scrub/bracken to provide protection from grazing.
5. Sabre planting on steep ground to provide protection from grazing.

Option 4 and 5 are relatively cheap and can be carried out without any additional protection however, the use of tree guards can reduce grazing impacts. Tree guards whether used in exclosures or unfenced areas need to be checked regularly and removed at an appropriate time. Tree survival is improved in bracken areas when a 1 metre area is cleared around the tree when it is planted and maintained for 3 years until the tree is above the bracken height. Mulch mats are also useful in protecting trees in the first few years. Regular maintenance of planted tree is essential but the added costs means this is often neglected resulting in poor survival.

Where there is heavier grazing, planting within exclosures is often the easiest solution but if the fencing is left too long or not removed at all the end result is likely to be a dense block of woodland with little structural diversity. It is therefore important to allow grazing to resume once a given proportion of the trees are sturdy enough to withstand the impacts of browsing. This will depend on the tree species used, the type of grazing livestock (and presence of deer), the terrain and local climate. Once grazing is resumed some trees may be damaged or even killed by browsing thus creating a more “natural” open woodland mosaic.



Planted site with grazing, some browsing damage

Mature and veteran trees are essential for a range of epiphytic and saprophytic species associated with the ffridd and wherever it is safe to do so dead timber should be maintained. Thought needs to be given to the continuity of older trees within the ffridd, for example in grazed wood pasture it may be necessary to plant individual trees or seek an adjacent or nearby site where wood pasture can be created.



Mature trees on hill edge

Mature trees may also be found within hedgerows at the boundary of the inbye and ffridd. The predominance of mature ash as standards within hedgerows and as individual trees on the ffridd within the ffridd also needs to be taken into account when considering replacement tree planting, as in many parts of Wales, these trees are suffering from the impacts of ash dieback.



Planting and protecting individual trees



#### 4.4 Other Vegetation Management

Trees can establish naturally in the Management of other vegetation such as rushes or heather may sometimes be required for particular species interest or to revitalise the mosaic. On large areas of ffridd heath rotational heather management may be possible but this kind of management promotes heather dominance reducing the diversity

of other habitat components and preventing tree establishment.

Unless there is an imperative reason for this management i.e. particular species interest, it is often preferable to allow the heath to develop and more varied structure using grazing as a management tool. Sporadic cutting/burning in limited areas can help rejuvenate particularly

moribund heather without reducing the diversity of the mosaic.

Similarly, regular cutting of rushes or *Molinia* are not a typical management practices in the ffridd but may be required for intermittently or for particular species reasons i.e. cutting rushes as part of management for curlew.



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