

Conserving Culm Grassland

England's overlooked wildlife oasis

Dr Tim Gardiner, FBNA © May 2009

Introduction

As the mist rolls in across the fields on a chilly June day, the whole landscape acquires a rather eerie feel. You press onwards through the tussocks of grass, your Wellington boots squelching in the mud, being careful not to lose your footing. Bursting through a gap in the hedgerow, you find a field scattered with purple and pink orchids and a variety of other wildflowers. Even on such an inhospitable day, this find has made all your efforts traversing the Culm Measures and their associated Culm grasslands worthwhile. This special area, consisting of small fields surrounded by dense hedgerows and woodland, is very varied in its wildlife, the flora of one field often quite different to another. Unfortunately, Culm grassland is much scarcer than it used to be with scraps of habitat persisting amid large tracts of improved farmland.

It is the aim of this article to describe the wildlife and conservation management of the Culm grasslands in north-west Devon and north-east Cornwall, hopefully stimulating interest in this incredibly important and declining natural area.

What is Culm grassland?

Culm grassland is best described as 'wet, often heathy grazing pasture' (Devon County Council 2000) and is a mosaic of different habitats including wet heath, rush pasture, fen meadow, mire and scrub. These wet pastures are located on the Culm Measures, an area of poorly drained, wet, acid soils situated in north-west Devon and north-east Cornwall (Figure 1). The landscape of the Culm Measures is one of hills and valleys shaped by the three main rivers which cut through the region: the Taw, Torridge and Tamar. Elsewhere in the UK, in southern Wales, south-west Scotland and northern Ireland, this type of wet, unimproved grassland is called Rhôs pasture.

The acid, clay soils of the Culm Measures developed from the underlying shales, slates and sandstones which were laid down in the Carboniferous era (approximately

300 million years ago). The wet climate of north-west Devon and north-east Cornwall, where approximately 1000 mm of rain falls annually, leads to wet soil conditions throughout the year which promotes the development of Culm grassland vegetation.

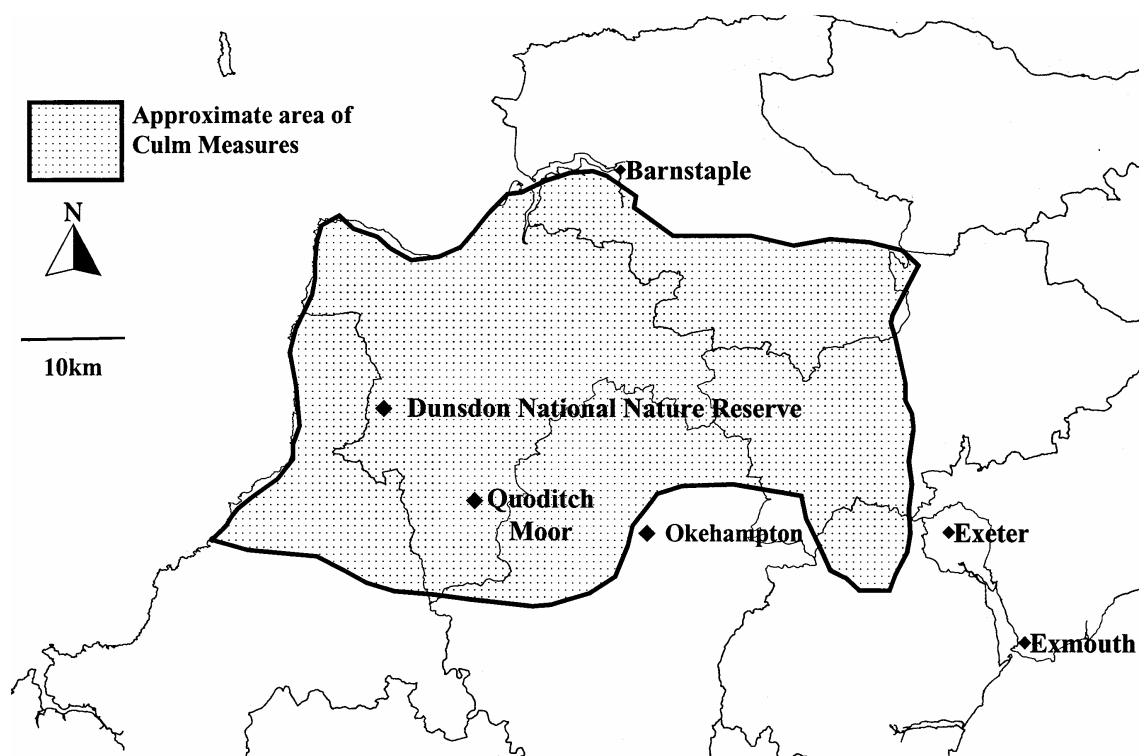


Figure 1: Location of the Culm Measures in north-west Devon and north-east Cornwall (two important Culm grassland sites are highlighted)

Most Culm grasslands tend to be small and separated by thick hedgerows or areas of woodland. The main grass species, which dominates large tracts of Culm grassland, is Purple Moor-grass *Molinia caerulea*. This grass is well suited to the wet soil conditions and can be so abundant that very few wildflowers can persist. Dense leaf litter is characteristic of Culm grassland, especially where pastures have been unmanaged for several years. It is this litter which gives Culm grassland a typically brown, parched look over winter. If Purple Moor-grass is allowed to attain dominance through lack of management, a tussocky sward with dense hummocks of grass, interspersed with runnels of leaf litter, may develop.

Wildlife

Although Purple Moor-grass dominates the landscape, the unimproved nature of Culm grassland allows a wide variety of plants to persist between the *Molinia* tussocks. For example, orchids can often provide a profusion of colour in early summer. Typical species that can be found include Heath-spotted Orchid *Dactylorhiza maculata*, Lesser Butterfly Orchid *Platanthera bifolia* (locally frequent in Britain and Ireland), and Southern Marsh Orchid *Dactylorhiza praetermissa*.



Heath-spotted Orchid, photo: Michelle Gardiner

In addition to orchids, plants of particular conservation concern that botanists should look out for include Whorled Caraway *Carum verticillatum*, an umbellifer with a local national distribution found in west Britain and Ireland. A naturalist may also stumble upon Wavy St. John's-wort *Hypericum undulatum*, which has a local distribution in the UK, being found mainly in south-west England and west Wales.

Other plant species occur depending on the dampness of the clay soil. In particularly wet patches, Ragged Robin *Lychnis flos-cuculi*, Marsh Thistle *Cirsium palustre* and Meadowsweet *Filipendula ulmaria* can be seen flowering, whilst drier areas support Meadow Thistle *Cirsium dissectum* and Tormentil *Potentilla erecta*. Cross-leaved

Heath *Erica tetralix* and Ling *Calluna vulgaris* are often dominant in areas where the abundance of Purple Moor-grass is reduced. Rushes are also commonly encountered, particularly Sharp-leaved Rush *Juncus acutiflorus* and Soft Rush *Juncus effusus*. Where the soil is particularly waterlogged, bog vegetation, comprising Round-leaved Sundew *Drosera rotundifolia* and sphagnum mosses, develops.



Culm grassland at Dunsdon National Nature Reserve, note the tussocky sward and abundance of Cross-leaved Heath, photo: Tim Gardiner

It is this wide variation in botanical composition and vegetation structure that is one of the most fascinating features of Culm grassland. Within a single pasture there can be boggy parts with plenty of mosses, drier ground with Cross-leaved Heath, and ungrazed areas where *Molinia* grows unchecked and the sward is tall and dense. A naturalist can never be sure what might be found in an area of seemingly constant *Molinia* cover.

The diverse flora supports a wide range of insects, for example, butterflies such as Marbled White *Melanargia galathea* and Ringlet *Aphantopus hyperantus* can often be seen nectaring on Devil's-bit Scabious *Succisa pratensis* on warm summer days. This plant species is the larval foodplant for perhaps the most well known Culm grassland

insect, the Marsh Fritillary *Euphydryas aurinia*. The Marsh Fritillary was once widespread in Britain but has declined significantly, mainly due to agricultural improvement and inappropriate grassland management (Hobson *et al.* 2002). The species is classified as vulnerable in a European context and has been awarded full legal protection in Great Britain under the Wildlife & Countryside Act 1981. The presence of this species can also qualify a site as a Special Area of Conservation (SAC) under the Habitats and Species Directive. Culm grassland can support very large populations of Marsh Fritillary and its larval foodplant Devil's-bit Scabious and many sites are managed for these species. For a thorough review of the ecology of the Marsh Fritillary in the UK, I refer the reader to an article in British Wildlife (see Volume 13, Number 6, August 2002).



Marsh Fritillary, photo: Tim Gardiner

At key Culm grassland sites such as Quoditch Moor Nature Reserve, 28 butterfly species have been recorded (see www.quoditch.org.uk for a full list). The species list for this site reads like a who's who of the butterfly world and includes Marsh Fritillary, Silver-washed Fritillary *Argynnis paphia*, Dingy Skipper *Erynnis tages* and Wood White *Leptidea sinapis*. However, butterflies are not the only important insects of Culm grasslands, for example, the nationally scarce Narrow-bordered Bee Hawk-

moth *Hemaris tityus* and Double Line *Mythimna turca* are notable amongst the moth assemblages. *Urophora spoliata*, a picture-wing fly listed in the Red Data Book as rare, is associated with Culm grassland and has been found to feed on the dead seed heads of Saw-wort *Serratula tinctoria* in Cornwall (Alexander 1993). Grasshoppers such as the Meadow Grasshopper *Chorthippus parallelus* and the Common Green Grasshopper *Omocestus viridulus* can be numerous in Culm grassland, although they have a strong preference for patches of shorter vegetation with plenty of Cross-leaved Heath (Gardiner *et al.* 2005).

This rich insect fauna supports a wide range of bird species including Barn Owl *Tyto alba* and Curlew *Numenius arquata*. Mammals that inhabit the Culm Measures include the Dormouse *Muscardinus arvellanarius*, Harvest Mouse *Micromys minutus* and several species of bats.

Management

Culm grasslands have been traditionally managed by light grazing with local breeds of cattle such as Devon Ruby Red (sometimes called Devon or North Devon). This light grazing, usually between mid June and late September, at a stocking rate of approximately one suckler cow per hectare (Wolton 1991), produces a short, diverse sward approximately 15 cm in height.

At some sites such as Dunsdon National Nature Reserve (see Figure 1 for location) owned by Devon Wildlife Trust, it is possible that traditional grazing management has occurred for many centuries and chemical fertilisers have never been used. This continuity of management has led to stable plant communities which are well adapted to a regime of light grazing interspersed with hay making and periodic burning. Winter burning (or swaling) has been traditionally used when it was impossible to graze livestock, perhaps due to a wet summer. This burning is usually conducted in January or February when weather conditions are suitable and the main objective is to reduce the quantity of leaf litter and provide fresh herbage for livestock during the following summer.

Wolton (1991) describes the management that may favour populations of rare Culm grassland plants and animals and also of those species which are not necessarily rare

in the national sense but are characteristic of pasture on the Culm Measures. I refer the reader to this authoritative account for detailed guidance but present a summary of Wolton's management guidelines, coupled with the findings from my own research on grasshoppers, in this article (Table 1). It would seem that plant species such as Wavy St. John's-wort and Whorled Caraway are characteristic of lightly grazed cattle pastures, in contrast, Lesser Butterfly Orchids may flourish in sites burnt in the winter. Grasshoppers may also benefit from winter burning, being particularly numerous in the post-burn year (Gardiner *et al.* 2005).

Table 1: Suggested management for populations of important Culm grassland species (adapted from text in Wolton (1991) and other specialist literature)

Plants	Management
Wavy St. John's-wort	Light grazing
Lesser Butterfly Orchid	Burning
Whorled Caraway	Light grazing
Butterflies	
Marsh Fritillary	Light grazing, burning
Marbled White	Light grazing, burning
Moths	
Narrow-bordered Bee Hawk-moth	Light grazing, burning
Double Line	Light grazing
Grasshoppers	
Common Green Grasshopper	Burning
Meadow Grasshopper	Burning
Flies	
<i>Urophora spoliata</i>	Light grazing
<i>Limnophila pulchella</i>	Light grazing
Birds	
Barn Owl	Light grazing, maintenance of woodland edge
Curlew	Light grazing

The Mid Cornwall Moors LIFE Project Team (2005) showed that burning of *Molinia* pastures leads to increased numbers of Marsh Fritillary in Cornwall, whilst Barnett & Warren (1995) suggest that rotational burning can be used to maintain populations of this species. Grazing by rare cattle breeds such as Devon Ruby Red and Welsh Black may produce a sward with a high degree of heterogeneity that leads to increased numbers of the Marsh Fritillary and is perhaps the ideal management. Marbled White would also seem to favour pastures with a mixture of tall grassland and shorter patches of fine-leaved grasses, but may also benefit from winter burning if livestock are unavailable.

Moths such as the day-flying Narrow-bordered Bee Hawk-moth may have similar habitats requirements to the Marsh Fritillary, as one of its larval foodplants is Devil's-bit Scabious and populations may be enhanced by grazing management or winter burning (Wolton 1991). The Double Line moth prefers the sheltered edges of woodland and scrub and may respond favourably to light grazing by cattle or horses which creates a botanically diverse sward (Waring & Townsend 2003). Much less is known about how to manage Culm grasslands for flies, but *U. spoliata* would seem to respond favourably to grazing management that maintains a sward of uneven height but still allows the seed heads of Saw-wort to ripen. Wolton (1991) warns that winter burning may damage seed heads of Saw-wort which the larvae of this species overwinter in. Cattle may also be useful in creating patches of bare earth through poaching that *Limnophila pulchella*, a crane-fly species often associated with exposed peat, may need.

Barn Owls seem to like pasture adjoining woodland with a mosaic of different vegetation heights and healthy numbers of prey such as voles. Curlews are found in extensively grazed grasslands and an absence of disturbance during the breeding season seems to be important.

From consulting an array of literature on Culm grasslands, it quickly becomes clear that light grazing (approximately one suckler cow per ha over a 20 week period or two 12-24 months old cattle per ha; Wolton 1991) seems to be favourable for the widest range of Culm grassland species (Table 1), although there has to be some flexibility in stocking densities due to the uncertainty of weather conditions or

livestock availability. However, when livestock are unavailable, or it is impossible to graze a pasture due to a particularly wet summer, then winter burning could be used as a management tool (Figure 2) to reduce quantities of leaf litter and to provide fresh *Molinia* growth for the following grazing season.



Grazing Devon Ruby Red cattle, photo: Michelle Gardiner

Where rushes are a problem then a flail mower could be used to top pastures. Mowing ideally should be undertaken after the beginning of August and the cutting height should be set relatively high (15 cm; Wolton 1991). Scattered trees and scrub should be maintained due to their importance as woodland edge habitat for birds. The ideal management for Culm grassland as summarised from the excellent work of Wolton (1991) is presented in Figure 2.

A habitat under threat

Unfortunately, this important UK habitat is under threat from agricultural improvement, abandonment of grazing, fragmentation of sites, and afforestation. Approximately 48% of the total area of Culm grassland was destroyed between 1984

and 1991 with the main causative factor being agricultural improvement through drainage, ploughing, re-seeding, and fertiliser application (DCC 2000). Grassland management has intensified on the Culm Measures due to low market prices for beef and declining milk prices, which have forced many farmers to increase the productivity of their grasslands. These grasslands continue to be improved, although the rate of agricultural improvement has decreased in recent years. The impact of agricultural improvement on Culm grassland wildlife has been devastating and is a contributory factor in the decline of the Marsh Fritillary in the UK (Hobson *et al.* 2002).

Light grazing by cattle from May-September at a low stocking rate	} Maintenance of sward approximately 15 cm in height over summer
Burning in January or February, no more than 50% of pasture should be burnt	
Topping can be used to control rushes, mow after the beginning of August	
Scattered trees and scrub should be maintained in open pastures	
Scrub clearance should be undertaken to restore neglected overgrown pastures	

Figure 2: Ideal management for Culm grasslands (summarised from Wolton 1991)

Even sites with some legal protection are not immune from destruction. For example, Southmoor Farm SSSI in Devon was severely damaged by agricultural improvement as recently as 1999. Several pastures were re-seeded, whilst others were fertilised or drained and approximately 80% of the site was destroyed by improvements according to English Nature (now known as Natural England).

Abandonment of grazing on many of the remaining unimproved grasslands has resulted in the invasion of sites by tall, rank vegetation and ultimately, succession to scrub and woodland. Other threats may occur to wildlife through overgrazing or not grazing at appropriate times of the year. Injudicious use of burning is also likely to

have detrimental impacts on wildlife, particularly on those species which over-winter in the sward and are consequently unable to escape the fire.

Due to the destruction of Culm grassland sites through agricultural improvement, lack of management or in some cases afforestation; the remaining areas are often small and isolated amidst large tracts of improved farmland or forestry plantations. Therefore, if sedentary species dependent on unimproved Culm grassland become extinct in an area, either through natural causes (e.g. due to unfavourable weather in successive seasons) or human influences (e.g. careless burning), then the chances of recolonisation from a nearby site are remote. At present it is estimated that only 4000 ha of Culm grassland remains on the Culm Measures in north-west Devon (DCC 2000). Particularly important sites owned by Devon Wildlife Trust include Meshaw Moor, Rackenford and Knowstone Moors, Vealand Farm and Volehouse Moor.

Conservation and the future

The wildlife value of Culm grassland has long been recognised and many areas have been designated as Sites of Special Scientific Interest (SSSIs). There is also one National Nature Reserve (NNR) at Dunsdon Farm, which has been recently acquired by Devon Wildlife Trust and is actively managed for the benefit of the wildlife present. Currently 70% of Culm grasslands in Devon are managed for conservation (Hobson *et al.* 2002).

The 1989-91 Culm Grassland Survey, undertaken by Devon Wildlife Trust, ascertained the full extent of the habitat and the losses that had occurred during the 1980s (DCC 2000). One of the main outcomes of the survey was the production of an invaluable Culm Grassland Inventory which documents the distribution of sites throughout the Culm Measures. The Inventory is currently updated by the Devon Biodiversity Records Centre. It is hoped that the Inventory helps to prevent further losses of sites through ignorance of their existence.

Culm grassland has been added to the Devon and UK Biodiversity Action Plans reflecting the diversity and number of rare species that are present. Considerable focus has been placed on environmentally friendly farming of Culm grassland and many farmers have entered their land into agri-environment schemes administered by

DEFRA (Department for Environment, Food and Rural Affairs). Farmers may have to rely on receiving monetary reward for appropriate management (e.g. pasture with very low inputs) through the Environmental Stewardship Scheme. Indeed, Tallwin *et al.* (2002) analysed the constraints and opportunities for livestock grazing of Purple Moor-grass grasslands and showed that estimated output from unimproved pastures ranged from <10-45% of that expected from agriculturally improved sites. These authors also state that money from agri-environment schemes frequently contributes over 50% of the income from a Purple Moor-grass/rush pasture indicating that financial incentives to graze these areas is all that keeps their management economically viable.

In recent years, the conservation of Culm grassland is being addressed through important initiatives such as Reconnecting the Culm, a project run by Butterfly Conservation (see www.butterfly-conservation.org for more details) and Natural England. Other projects include the Culm Natural Networks organised by Devon Wildlife Trust and funded by DEFRA and Natural England. Both projects are aiming to raise the profile of Culm grassland whilst offering support and advice for farmers to ensure that these habitats are properly managed.

Anyone interested in Culm grasslands should get in touch with the Reconnecting the Culm Project Officer (email is on the Butterfly Conservation website). So if you visit Devon in the near future, why not visit a well known Culm grassland site and have a stroll amongst the heathers, orchids and Marsh Fritillaries on a warm June afternoon, you'll not regret it!

Contact details and further information

For further information on the plants and animals to expect, there is an excellent website on the wildlife of Quoditch Moor by Richard Douglas-Green at www.quoditch.org.uk. Important note: Quoditch Moor is a private property but visitors are always welcome by prior arrangement with the owners (see website). The Devon Wildlife Trust website also has details of Culm grassland nature reserves to visit (see www.devonwildlifetrust.org/ for further details).

Acknowledgements

I would like to thank the following individuals for providing information on Culm grassland nature reserves: David Appleton (Natural England), Richard Douglas-Green (Quoditch Moor), Gary Pilkington (Devon Wildlife Trust), and Gavin Saunders (Devon Wildlife Trust).

Further reading/references

ALEXANDER K.N.A. (1993) *Terellia vectensis* (Collin) and *Urophora spoliata* (Hal.) (Diptera: Tephritidae) reared from dead seed heads of saw-wort in Cornwall. *British Journal of Entomology & Natural History* **6**: 44.

BARNETT L.K. & WARREN M.S. (1995) *Species Action Plan Marsh Fritillary Eurodryas aurinia*. Butterfly Conservation, Wareham.

DEVON COUNTY COUNCIL (2000) *Devon Biodiversity Action Plan*. Devon County Council, Exeter.

GARDINER T., GARDINER M. & HILL J. (2005) The effect of pasture improvement and burning on Orthoptera populations of Culm grasslands in northwest Devon, UK. *Journal of Orthoptera Research* **14**: 153-159.

HOBSON R., BOURN N. & WARREN M. (2002) Conserving the Marsh Fritillary in Britain. *British Wildlife* **13**: 404-411.

MID CORNWALL MOORS LIFE PROJECT TEAM (2005) *Restoration of the Mid-Cornwall Moors for the Marsh Fritillary* (abstract). Butterfly Conservation 5th International Symposium, Lepidoptera as Indicators of Biodiversity Conservation, Southampton University, Programme and Abstracts, p. 46.

TALLOWIN J.R.B., SMITH R.E.N., GOODYEAR J., BULLOCK J.M. & LEHAIN P. (2002) Sustainable management of lowland purple moor-grass and rush pastures: constraints and opportunities for livestock, in Frame J. (ed.) *Conservation Pays?* British Grassland Society, Chippenham, pp. 47-50.

WARING P. & TOWNSEND M. (2003) *Field Guide to the Moths of Great Britain and Ireland*. British Wildlife Publishing, Hook.

WOLTON R.J. (1991) *Management Guidelines for Culm Grasslands*. English Nature, Okehampton.

Please cite this paper as:

Gardiner, T. (2009) *Conserving Culm Grassland*. British Naturalists' Association, Corby.