

Culm Grassland: An Assessment of Recent Historic Change



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Scrub encroaching into Culm grassland

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Protecting Wildlife for the Future

Culm Grassland: An Assessment of Recent Historic Change

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"Perhaps the heyday of Culm grassland was from 1880-1950, when it played an important role in the livestock economy but was managed but with low-intensity. It was burnt (swaled) in February or March and then lightly grazed by beef cattle from May until October. The regime of swaling and grazing tended to keep rush infestation within acceptable bounds and prevented scrub encroachment. In dry years when grazing elsewhere on the farm was scarce, culm grassland came into its own with grass remaining palatable to stock."

John Bradbeer, Local Historian. 2014



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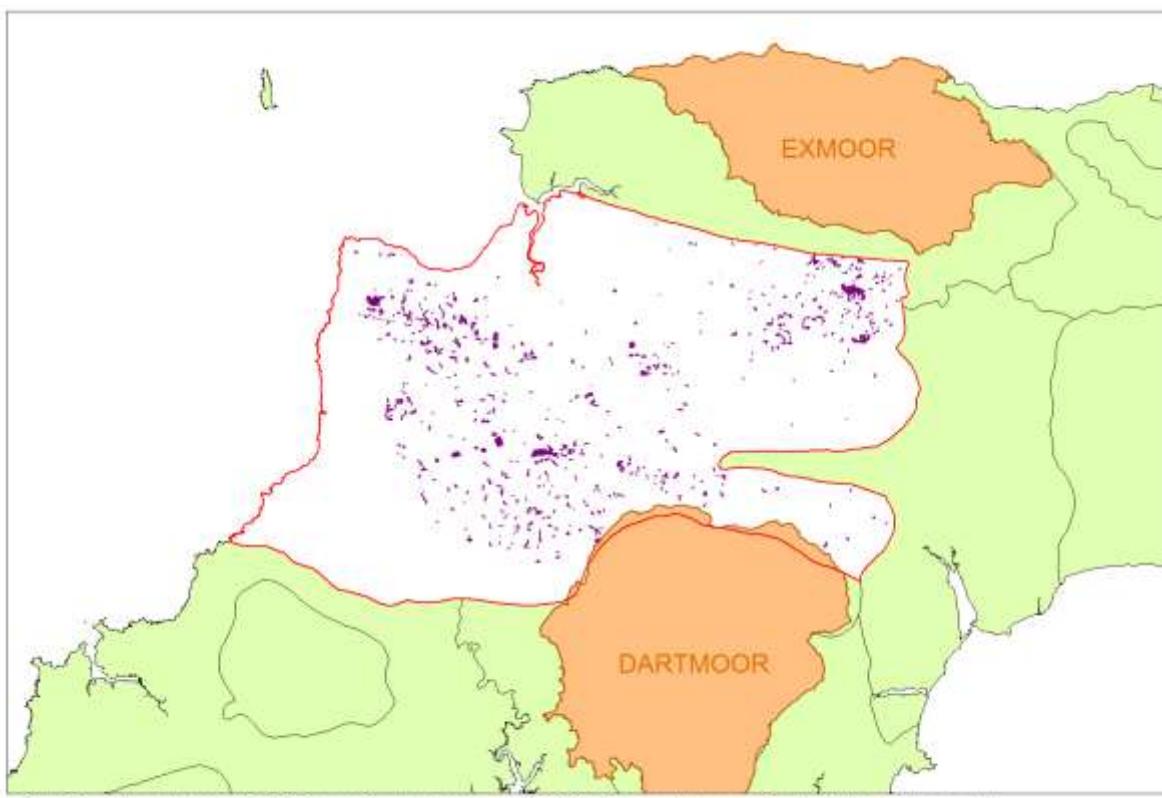
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Introduction

The Culm National Character Area (NCA) in north west Devon covers much of the area between the uplands of Exmoor, Dartmoor and Bodmin Moor and the Atlantic coast in the north. The A30 defines part of the southern boundary of the area linking Exeter with Launceston, the A361 North Devon Link Road forms part of the northern boundary linking Barnstaple and Bideford with the M5 to the east. The A39 provides the main coastal access to north Cornwall whilst Okehampton in the south is the gateway to Dartmoor National Park and Launceston in the south-west is the gateway to Cornwall.

The Culm National Character Area, nestled between Dartmoor and Exmoor includes a fragmented network of “Culm grassland” sites of varying type and condition



The Devon Wildlife Trust (DWT) has been working in the Culm NCA since the early 1990s. Situated near the Atlantic coast, the area is characterised by heavy clay soils over carboniferous shale with high rainfall levels. The poor draining wet grassland communities that form in these conditions are known locally as Culm grasslands. They consist of a continuum of different grassland types from the tussocky Purple Moor Grass Rush Pasture (Rhôs pasture) communities, to hay meadows, acid grasslands and rush dominated pastures.

In 1989 we published the Culm Grassland Resource Pilot Survey with the Nature Conservancy Council (now Natural England). This identified an internationally important wildlife resource, but highlighted an alarming downward trend with 61% of sites wholly lost between 1984 and 1989. At that time 95% of the losses were attributed to agricultural improvement.

Immediately we began a campaign to draw attention to the importance of this habitat and attract financial help for landowners wishing to retain Culm on their holdings. In 1991, this hard work paid off when Devon County Council's Environmental Land Management Scheme (ELMS) was extended to introduce a new category of payments for Culm grasslands.

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The following year the Countryside Commission chose the Culm as a pilot area for their new Countryside Stewardship scheme, and DWT advisors began to provide detailed advice on the scheme. In the years to come a succession of DWT advisory staff will help hundreds of landowners complete applications for this and subsequent schemes and look after their Culm. This work continues to this day with the Working Wetlands and Northern Devon Nature Improvement Area (NIA) projects providing this service.

Alongside this advisory work, the Devon Biodiversity Records Centre (DBRC), began to compile a comprehensive inventory of Culm grasslands which now contains 575 sites of varying sizes. The sites vary enormously. Many of the large key sites such as Hollow Moor and Bursdon Moor are designated as Sites of Special Scientific Interest (SSSI), and which are also included within the Culm Grassland Special Area of Conservation (SAC). DWT also owns or manages some of these large sites such as Dunsdon Farm National Nature Reserve (NNR) which is now also a Coronation Meadow, and Thorne and Doves Moors.

Many of the smaller sites that are not included within one of these statutory designations have been identified as County Wildlife Sites (CWSs) by DBRC. There are 470 CWSs designated within the Culm NCA, the majority of which are entirely or partially designated for their Culm grassland habitats.

Within the past 2 years, DWT joined a cross-channel Interreg project called “The Value of Working Wetlands”, in which a number of different wetland areas in England and France are being studied. DWT’s Working Wetlands staff designed and distributed a questionnaire with the intention of gathering information from Culm landowners on different aspects of the farmed landscape and their perceived changes over the past 20 years. (Appendix 1) The questions were deliberately very similar to those asked by our French partners so that a cross channel comparison of the changes can be made at a later stage. It was distributed to 1750 Culm landowners and other stakeholders via our regular newsletter “Culm Connections” in February 2014. A total number of 130 completed questionnaires were returned to us and as well as clear answers to our direct questions, some very interesting comments were also made.

This report was designed to summarise the findings of this survey and describe the state of the culm grassland resource as it is in 2014 and the issues that currently face it. We have also drawn on studies carried by experts from Exeter University into the economics of the area in 2006 and 2010, as well as work carried as part of DWT “The Land between the Moors” project. Natural England have kindly provided us with data on the uptake of Agri-environment schemes in 2004 and 2013/4.

Experiences from the nearby Somerset Levels and Moors are also incorporated into the report where they are considered to be relevant.

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Culm Country: An historical introduction

By John Bradbeer, Local Historian

Culm country has long been overshadowed by Dartmoor, Exmoor and other more famous parts of the Devonshire landscape. This is rather ironic as the Culm Measures underlie just over a quarter of the county and have as much a claim to be typical of Devon as the sandstones, shales, slates and limestones of the Devonian geological period named after the County. Until recently, culm country was usually dismissed as rather boring, bleak and inhospitable and its only saving grace was regarded as the rugged coastal fringe from Marsland Mouth to Hartland Point although a few people might also have allowed the stretch from Hartland to Clovelly as further mitigation for the interior.

This introduction will attempt to give an overview of culm country and discuss its distinctive landscape and ecology in historical terms. Culm country, like other regional landscapes in Devon is itself far from homogenous. The underlying geology is both a source of unity and a factor in diversity. The Culm Measures are a series of sandstones, mudstones, shales and occasional limestone lenses of lower and middle Carboniferous age, principally from the Visean and Namurian stages and dating from around 330 million years ago. The shales often weather to give cold and heavy clay soils. Much of culm country forms a series of plateau surfaces into which the principal rivers have been deeply incised. The region also experiences substantial rainfall, with much of it receiving in excess of 1200 millimetres per annum. Where slopes are very gentle and on the plateau tops, water-logging of soils is significant problem. On rather steeper slopes and where sandstones tend to dominate, then drainage is much better and soil fertility higher, although not the equal of the red Devon of the New Red Sandstones. The distinction between the dunlands of better soils and the wet lands of the plateau tops has long been recognised (eg Vancouver, 1808).

The work of environmental archaeologists (eg Fyfe, Brown and Coles, 2003; Fyfe, Brown and Rippon, 2004) has given some insight into the evolution of the culm landscape. Pollen analysis and radio-carbon dates from organic material recovered from cores taken from river valley mires and wetlands on the culm foothills of Exmoor, show that forest cover disappeared starting in the Neolithic (c 3200 BC) and was probably more or less completely removed by the late Bronze Age (c 1250 BC). There is no reason to suppose that the wider culm country differed in any substantial respect from the Exmoor fringe and there are barrows of probable late Neolithic/early Bronze Age across the culm from Exmoor to Broadbury near Halwill in the SW. Adverse climatic conditions and human activity effectively precluded significant forest regeneration and culm country has probably been sparsely wooded for some 3000 years.

The Domesday Book of 1086 allows some form of landscape reconstruction to be attempted for the medieval period. Past work on Devon in Domesday (especially Morgan 1940 and Welldon Finn 1967) has not looked so much at regional variations within the county as on more general patterns. I have attempted to use the land-use data for Domesday Book manors to get a picture of the northern Devon landscape at this time. A major problem confronting any user of the Domesday survey is the fact that we have general locational information but no precise boundaries and some doubt also surrounds the units used for areas of pasture and woodland, with leagues seeming to be both linear and square measure. When the lands of the Domesday Book entries are compared with modern areas, there is a shortfall of around 30-35%. Some of this is certainly waste, land with no economic value and not in any form of cultivation. Some may well be moorland, wet rushy pasture and perhaps wet willow woodland – areas we would now describe as culm grassland. However, the proportion of ‘waste’ does not vary greatly across northern Devon and culm country is in no way distinctive.

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Table 1 shows how arable land is the major land-use and that pasture is about half the area of waste. Perhaps the most striking figure is that for woodland cover, which is 5.6%. There are some tracts where woodland cover attains 10-15%, especially for some of the parishes in the middle Torridge valley, but culm country some thousand years ago must have been pretty devoid of large wooded areas.

Table 1. The Torridge catchment in Domesday: Land-Use

Land-use	% area
Arable	45.5
Meadow	0.8
Pasture	15.3
Woodland	5.6
Waste	32.8

Source: personal calculations using C and F Thorn (1985)

The limitations of the Domesday Book data mean that it is impossible to give a precise location for the waste in any manor or parish. The arable land was almost certainly worked in some form of open-field system, although many systems were probably quite small and focused upon hamlets rather than large nucleated settlements such as Braunton, where one of the open fields still survives. Open fields were generally enclosed and divided up within single ownership by the later medieval period and it is probable that most, if not all farmland was worked using 'convertible husbandry'. Here a few fields close to the farmstead, the 'in-field', would be worked in a conventional three or four year rotation, with applications of manure ahead of each arable crop and the ground was never left in bare fallow but had grass under-sown with the last arable crop in the rotation. The rest of the farmland constituted the 'out-field' and roughly one field in seven would be tilled for two or three years after a treatment called 'Devonshiring' or 'beat-burning'. This practice survived into the nineteenth century and was described by both Marshall (1796) and Vancouver (1808), although the latter felt that it was much abused and should be stopped. A field to be Devonshire had the turf stripped off, either with a mattock or a breast-plough (a kind of spade with a mould board pushed through the soil), both wielded by men or more usually by the end of the eighteenth century by special ploughs, a veiling plough or a skirting plough, pulled by draught animals. The turves were left to dry and then harrowed to knock out any soil. The residues were then gathered up into heaps and burnt with straw, gorse and hedge trimmings. The ashes were spread on the soil, with any manure, lime or sea-sand that was available. Two or three crops of cereals would be grown before the field was allowed to revert to a coarse pasture and left in this state for perhaps 15-20 years before being Devonshire again. It was also the practice to lay the hedges of any fields to be Devonshire, partly to generate kindling and because with fields in cereals, there was less need for hedges to be stock-proof.

A glimpse of convertible husbandry in action may be had from the Tithe Survey of the period c 1837-1841. Tithes were payments in kind to the church and by the early nineteenth century they had become both unpopular and difficult to administer. The Tithe Commutation Act of 1836 switched tithe from payment in kind to an annual monetary payment and to this end required a survey of lands in parishes to establish areas and land-uses so that a notional payment could be set (for more details on the Tithe Survey Prince (1959) is most helpful). Most Devon parishes were surveyed just before 1840. I have drawn a rather unsystematic sample of parishes on the Culm Measures and analysed the land use recorded in the Tithe Apportionments. These data are shown in Table 2

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Table 2 Percentage of land-use in selected Culm Country parishes from the Tithe Survey c 1840

Parish	Arable	Meadow	Pasture	Gardens, orchards	Houses, waste	Woodland
Abbots Bickington	53.72	6.61	34.40	0.68	0.51	4.09
Abbotsham	86.89	0.11	8.64	1.64	1.35	1.35
Alwington	67.71	1.19	20.86	1.66	0.86	7.72
Bulkworthy	78.79	4.76	11.99	0.78	1.33	2.27
East Putford	77.50	3.43	15.03	0.86	1.58	1.62
Huish	42.03	3.29	34.42	1.45	2.22	16.70
Landcross	59.45	0.57	19.36	3.52	1.11	16.00
Mariansleigh	56.90	8.97	24.07	2.57	0.84	6.65
Meshaw	53.44	5.14	32.06	1.59	1.22	5.55
Monkleigh	65.34	6.71	5.80	3.31	2.95	15.90
Newton St Petrock	77.02	6.28	12.35	1.44	1.47	1.42
Pancrasweek	79.88	5.93	11.13	0.82	1.32	0.92
Romansleigh	48.63	6.17	35.70	1.87	0.81	6.82
Sheepwash	62.41	7.99	15.72	2.43	0.89	10.57
Weare Giffard	74.38	4.82	9.09	4.65	0.87	6.23
Welcombe	78.50	0.04	13.92	0.83	0.94	5.77
West Putford	60.51	5.14	31.97	0.68	0.85	0.85
TOTAL	67.28	4.84	19.47	1.66	1.23	5.52

Before commenting on Table 2, I need to add that the surveyors, almost all local men, interpreted their task in subtly different ways. Some were at pains to make further distinctions within the land-use categories they were required to record, so some surveyors distinguished between ordinary pasture and coarse pasture, rushy pasture, moor pasture and furze pasture. All these are combined as pasture in Table 2. Many also recorded 'furze' as a land-use. This could well be reference to a coarse pasture invaded by gorse, which is today still quite frequent on culm pasture subject to light grazing and insufficient management. However, furze was also a valued commodity for use in pottery kilns in the Bideford and Fremington areas and in bread-ovens in homes across northern Devon. Some surveyors also recorded 'arable occasionally' and this appears to imply survival of the practice of Devonshiring. Two of the compartments on Devon Wildlife Trust's Stowford Moor reserve were so recorded. The surprising large proportion of the farmed area in arable reflects both convertible husbandry and Devonshiring on the out-field.

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What has to be realised is that many areas of classic wet culm grassland were recorded as arable in the Tithe Survey, although it has also to be admitted that some modern culm grassland was pasture in 1840. The Tithe Survey also shows some common land, usually described as coarse or moor pasture and this was grazed in common by stock from within the parish or from specific farms. This land would never have been ploughed. Woodland is no more prevalent than it was in Domesday, some eight hundred years earlier, although there are some considerable variations between the parishes. Huish is rather an anomalous parish, being one of the smallest in area and also the location of Heanton Stachville House, the seat of Lord Clinton. The lawns in the extensive park around the house were classified as pasture and large areas of woodland were maintained for shooting. The Pine-Coffin Estate at Portledge accounts for significant woodlands in Alwington and Monkleigh parishes.

The patterns recorded in the Tithe Survey of c 1840 were soon to be changed quite radically. At the end of the Napoleonic Wars in 1815, duties were levied on imports of cereals and domestic grain production encouraged. In 1846 the Importation Act repealed these duties effective from 1849. Through the 1850s and 1860s, Britain started to import grain from Europe and especially the New World, with the United States, Canada, Argentina and Australia to the fore. At the same time, the national railway network became fully integrated and allowed significant regional specialisation in agricultural production in England. The drier south and east progressively specialised in arable production, whilst the wetter north and west specialised in livestock and in dairying. The railways had made possible the bulk movement of fresh milk to urban markets. Dairying remained problematic in much of culm country as the railways were late in penetrating this area and the line from Okehampton to Bude, started in 1879, was stalled at Holsworthy until 1898 and a large area north of this line remained simply too remote for bulk milk movement. By the 1880s, British agriculture was generally in a depression which only intensified during the inter-war years of the twentieth century. The years 1880-1940 also saw significant rural depopulation in culm country and the population of many parishes had fallen to under a third of that of 1851. The First Land-Utilisation Survey of Britain, organised by Sir Dudley Stamp in the 1930s, produced maps which show the almost complete dominance of pasture across culm country. A handful of contemporary accounts and oral tradition describe the progressive infestation of pastures by rush.

Perhaps the heyday of culm grassland was from 1880-1950, when it played an important role in the livestock economy. Culm grassland was managed but with low-intensity. It was burnt (swaled) in February or March and then lightly grazed by beef cattle from May until October. The regime of swaling and grazing tended to keep rush infestation within acceptable bounds and prevented scrub encroachment. In dry years when grazing elsewhere on the farm was scarce, culm grassland came into its own with grass remaining palatable to stock.

At the outbreak of the Second World War, County Agricultural Committees were established to promote cereal production and achieve self-sufficiency in food products (see Short, 2007 for a good overview). Across the culm, pastures were ploughed up and cereals planted. Even on some of the wettest and roughest ground, potatoes were grown in raised beds. Patterns of lazy-beds can be seen on recent aerial photographs of culm grassland, even when signs on the ground are hard to detect. At Devon Wildlife Trust's Dunsdon Nature Reserve, some fields show tell-tale signs, with straight lines of soft rush two metres apart, where the trenches between the lazy beds once had been.

In 1947 the Agriculture Act introduced systems of subsidy, guaranteed prices and grant-aid for farming. The effect in culm country was perhaps delayed and while stability was restored to farming, actual agricultural practice remained little altered. Indeed, in some of the more remote parishes, mains electricity did not become available until the mid-1950s and hand-milking effectively limited the number of dairy cattle that could be managed. Furthermore, Devon farmers are a conservative and cautious breed and men who had farmed through the bleak years of the 1920s and 1930s were reluctant to embark on major capital schemes,

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even with grant-aid. Guaranteed prices for milk and schemes such as the Hill Farm Subsidies gave to a newer generation of farmers opportunities to modernise. Grant-aid for deep ploughing and under-drainage, together with the advent of more powerful tractors and specialised contractors, meant that wet culm grassland that had resisted all attempts in the nineteenth century to improve. From 1973, agricultural support has been through the Common Agricultural Policy but the effects have been little different to those of indigenous agricultural policy of the preceding quarter century. Perhaps 80% of culm grassland has been lost to afforestation and agricultural improvement since 1950. The rate of loss started to fall in the mid-1980s, partly as most of the larger tracts of culm grassland had already gone and partly as conservation bodies woke up to the previously under-valued biodiversity of culm grasslands. The extensive conifer plantations of Hartland, Halwill and Cookworthy forests were established by the Forestry Commission on what had once been prime culm grassland.

Some of the post-war loss of culm grassland was not caused by afforestation and agricultural improvement but by the abandonment of traditional grazing practices. If culm grassland is not swaled and grazed then it is very susceptible to invasion by soft rush, bramble and gorse and regeneration of willow scrub and woodland. This fate has overtaken many small patches of former culm grassland. Devon Wildlife Trust has endeavoured on its culm grassland reserves to restore traditional management practices of spring-time swaling and summer grazing. Through its Working Wetland project, the Trust has also been trying to get more sympathetic if not traditional practices adopted by farmers and land-owners with culm grassland and rushy pasture (Burgess 2010). In a few places, Forestry Commission plantations have been clear-felled and culm grassland has been allowed to regenerate from the remnants that survived in forest rides and by spreading hay cut from other patches of culm. The Devon Wildlife Trust has also been attempting to recreate culm grassland on formerly improved land acquired with other land of classic culm grassland.

The term culm grassland has increasingly been used to describe the prime habitat. It is a term that seems not to have been used at before the mid-1980s, and it is revealing that Procter, with a lifetime spent in the Botany Department at Exeter University, does not use the term in any of his work, even in his magisterial New Naturalist book (Proctor, 2013). In the National Vegetation Classification, habitats usually regarded as being 'culm grassland' are found in 15 classes, 11 in mire, 2 in swamp and 1 each in meadow and heath. The preferred generic term for wet grasslands is rhos pasture, after the Welsh name for such pastures developed on rocks of a similar age. Quite similar vegetation also is found on shales of Namurian age in the west of Counties Clare and Limerick in Ireland, where the landscape history has been quite different to that of Devon's culm country.

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Landscapes of the Culm

Overview

The exposed open plateaus of the Culm are separated by a complex pattern of small valleys, which form the catchments of the rivers Taw, Torridge and Tamar and small parts of the Exe and Teign. This landscape is often remote and sparsely populated and is typified by a mosaic of field patterns surrounded by characteristic hedge banks reflecting historic land enclosures, extensive agricultural practices and the use of small machinery. Small farm orchards are characteristic in the landscape and small hamlets and isolated farmsteads are linked by narrow, winding lanes with villages consisting of clusters of simple cottages with churches or small chapels as their focal point. A few towns such as Great Torrington and Launceston punctuate this peaceful landscape with no major settlements and very few main roads passing through the area.



Views south from Hatherleigh Moor, with Dartmoor in the distance

The Culm NCA boasts highly distinctive geology of national importance which defines the form, land use and character of this area.

"The area is almost entirely underlain by the Culm Supergroup, which consists of mudstones, siltstones, sandstones, cherts and thin limestone deposited from the late Devonian (365 million years ago) to the late Carboniferous (310 million years ago) in the Culm Basin."

Although neighbouring Dartmoor and Exmoor were subject to glaciation, the Culm NCA only ever experienced periglacial conditions with the development of head deposits on hill slopes and valley sides. The rocks in the periglacial landscape weathered through physical and chemical breakdown into "head" deposits, which have developed into different soils depending on the geology and the landform. A band of mainly shale across the south of the area has developed into heavy clays,

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which form a more or less impervious layer, and lead to widespread waterlogged, mottled soils. These also occur on the flatter hill tops and foot slopes of the rest of the NCA, but on steeper slopes (and where sandstones are more widespread) there are more freely draining, loamy soils. In the very wettest areas, on the hill tops to the north –west, peaty topped soils have formed.

The nature of the geology, combined with erosion has led to the development of dramatic landforms on the coast. Many of the cliffs, for example at Hartland Quay, expose spectacularly folded rocks. The Taw-Torridge estuary contains mudflats, salt marsh, sand banks, pebble ridges, dunes and beaches, demonstrating a wide range of geomorphological and tidal estuary processes. Of particular note are the dune systems at Northam Burrows.

(Taken from: Natural England- “National Character Area Profile” 2012)

The wild beauty and tranquillity of the coastal cliffs is recognised with a host of designations including the North Devon Area of Outstanding Natural Beauty (AONB), the Cornish AONB and Heritage Coast status. These coastal cliffs which support internationally important, lichen rich, western oak woods and maritime grassland and heath can be enjoyed from the South West Coast Path National Trail. The wealth of biodiversity to be found in the wider area is recognised by the UNESCO North Devon Biosphere Reserve and the designation of four Special Areas of Conservation (SAC), one of which is the Culm Grassland SAC. Dunsdon National Nature Reserve (NNR) acts as a show piece for the internationally important Culm grassland habitat, providing a great opportunity for public access and educational use.



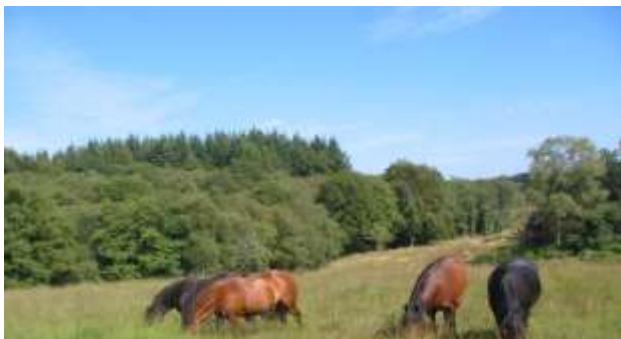
North Devon (Red Ruby) Cattle grazing Culm grassland

The essential landscape character of the Culm has remained largely unchanged over the years, giving a timeless feel to this pastoral landscape. As the soils of the area don't lend themselves to high production, grassland has dominated this extremely rural landscape for many years. Traditionally the Culm area has been grazed extensively by cattle and sheep, with cattle, notably the North Devon (Ruby Red) breed grazing the rougher ground.

Since the outbreak of Foot and Mouth disease in 2001 livestock are less evenly distributed across the Culm, although their numbers remain fairly stable. Many farms didn't restock after the Foot and Mouth outbreak and the land is now being rented for grazing by bigger farmers. The loss of many small herds has meant that cattle are now grazing in more concentrated groups whilst smaller pockets of Culm grassland are often undermanaged and at risk of being lost to scrub cover.

A knock on effect of all this is an evident shortage of suitable, available livestock to graze some of the smaller sites, though grazing remains essential in order to comply with the regulations of the Higher Level Stewardship Scheme. As a result native Dartmoor and Exmoor ponies can often be seen grazing to keep

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Dartmoor ponies are ideal for conservation grazing and are not subject to regular bTB testing.

The 17 % who have increased probably reflect the well-established trend of the larger farms increasing their land holding size by renting land from those retiring from farming.

Since the 1950's the area of Culm grassland has been in decline with more than 50% of the area of marshy moors and Culm grassland fields present in 1980 lost by the early 1990's as farmers ploughed, drained and reseeded in an effort to maximise production. The area lost between 1950 and 1980 is close to 80% as in addition to agricultural improvement vast areas were lost to afforestation- a prime example being the extensive conifer plantations of Hartland, Halwill and Cookworthy, planted by the Forestry Commission on what had once been top quality Culm grassland.

Other losses occurred due to the abandonment of land, common on the smaller pockets of Culm where a lack of grazing or swaling allowed land to become invaded by scrub. The rate of loss began to fall in the mid-1980s, partly due to the actions of Conservation bodies, partly because larger areas of Culm grassland had already gone and later due to the introduction of Countryside Stewardship to the Culm in 1994, which secured the management of many remaining areas of Culm.

Culm sites in optimum condition, something which Devon Wildlife Trust's Working Wetlands Project is helping with by putting landowners in touch with available livestock.

One of the first questions in the questionnaire asked landowners about the change in grazing levels on their farm over the last 20 years, the results below indicate that all but 17% of landowners have either decreased or maintained existing levels of livestock.

How have the grazing levels on your farm changed in the last 20 years?

Answer Options	Response Percent	Response Count
Higher	16.9%	22
Lower	45.4%	59
Same	37.7%	49
answered question		130
skipped question		2

How have the grazing levels on your farm changed in the last 20 years?



Abandonment has resulted in a large number of sites being invaded by scrub

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Wet woodlands such as this one on the Little Dart are a rare feature in the landscape

Woodland is most frequent in the steep sheltered valleys of the Torridge, Tamar and the Taw and its here that you can find the main areas of deciduous woodland, dominated by oak, birch and Rowan and often rich in Lichens due to the sheltered, humid conditions. Other areas of woodland can be found in the narrow wooded coombes that run down to the sea

or on land belonging to large estates.

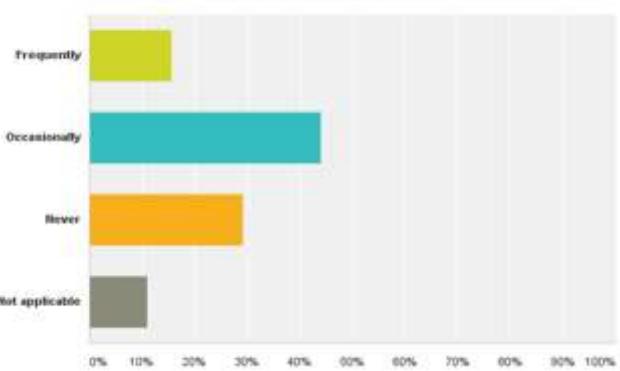
With a view to establishing whether farm woodlands were of any importance in modern day farms we questioned our Culm landowners about how much management they had carried out to their small farm woodlands over the past 20 years. The results clearly show that for almost 60% of respondents their woodlands still play an important role in the land holding as a whole, probably being of particular importance as a source of firewood, due to the steep rise in fuel prices in recent years. Others will have some degree of management obligation as a result of grant schemes.

Woodland, which often forms an integral part of the Culm habitat, has increased on Culm sites over the years as management has become less frequent and given way to scrub and woodland cover. More general woodland cover in the Culm landscape however has remained consistently quite low with only localised increases over recent years, with the help of Woodland Grant Schemes and other incentives. There is typically sparse tree cover on the more exposed Culm plateaus other than coniferous plantations and occasional hedgerow trees or trees sheltering farmsteads.

Have you carried out any management to your farm woodland over the past 20 years?		
Answer Options	Response Percent	Response Count
Frequently	15.7%	20
Occasionally	44.1%	56
Never	29.1%	37
Not applicable	11.0%	14
answered question		127
skipped question		5

Q12 Have you carried out any management to your farm woodland over the past 20 years?

Answered: 127 Skipped: 5



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Threats and Recent Landscape Change

Over the last 20 years the Culm area has seen some very obvious localised changes, the most prominent being the improvement of the main road network. The controversial North Devon Link Road (A361) completed in the late 1990's effectively cut straight through the high open plateau of the Culm between Tiverton and South Molton, dividing some of the region's most important Culm sites at Hares Down, Knowstone and Rackenford Moor in half. Other improvements to major roads such as the widening of the A30 to by-pass Okehampton, improvements to the A39 between Barnstaple and Bideford and the new River Taw crossing south of Barnstaple have reduced the feeling of tranquillity and increased the suburbanisation of the area.

Wind turbines have been a controversial issue over the past 20 years, with much local opposition to proposals. There is a small wind farm near Bradworthy but otherwise sizeable single turbines have become a common landscape feature notably between Holsworthy and Bradworthy and also between Okehampton and Launceston. Turbines are seen as an eye sore by some, though grazing can often continue on the land beneath them. Due to the exposed nature of this sparsely populated landscape developers are frequently putting new proposals forward and many farmers are tempted by the generous financial incentives for having turbines on their land.

Another recent addition to the landscape is the installation of solar panels, supported in part through the government's renewable energy incentives. These have been met with varying levels of opposition although the presence of panels doesn't always mean an end to agricultural grazing practices, as sheep and poultry are able to utilise the areas both in between and underneath the panels. Some solar farm companies also claim significant increases in biodiversity in the areas surrounding the panels. Whilst there is some opposition to both turbines and solar panels, this is one development pressure which is unlikely to go away as the wind and sunshine resources provide good returns on investment and climate change becomes a greater threat.

There was much recent interest in the Energy Crops Scheme administered by Natural England, which closed in 2013, with several applications made (and turned down) on Culm grassland sites. Some of the larger Culm farmers responded by growing bio fuel crops such as miscanthus, with high potential yields and rates of return identified across the area. There is currently one biomass digester locally near Holsworthy, creating localised demand for energy crops, which does visually change the landscape and crops such as miscanthus tend to persist in the soil long after the crop has been harvested. The government is showing no sign of reintroducing the scheme in the near future and any proposals would have to get through the Environmental Impact Assessment Regulations before coming to fruition. Woodlands and hedgerows also have the potential for some biomass production, though this seems unlikely to be on a scale large enough to have a great landscape impact.

Many farm orchards, which have played an important cultural role and contributed significantly to the local economy, continue to deteriorate and fall into decline. From 1994 the Countryside Stewardship Scheme helped to bring a wide distribution of orchards back into management, which was continued to some extent through the Environmental Stewardship Scheme. However realistically many small farm orchards remain financially unviable and only where the orchard is of sufficient size, or where local groups have formed cooperatives are they likely to be managed and harvested consistently.

The area is popular with visitors providing many opportunities for recreation including coastal trails and quiet coves with walking, riding and cycling also popular inland. Increased popularity may raise the threat of localised development pressure or further improvements to transport links but owing to the sensitivity of the natural environment development pressure is likely to be low.

Culm Grassland: An Assessment of Recent Historic Change

Most likely to threaten the future integrity of the Culm landscape are **changes in agricultural practice**, which are inevitable as farmers respond to ever changing government policy on farming and the availability of subsidy.

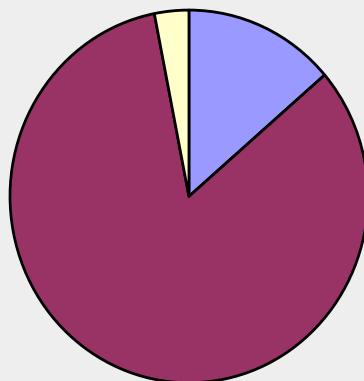
Most of the Culm grassland loss had already occurred between 1950 and the mid 1980's and from 1994 onwards the Culm NCA benefited from twenty years of Countryside Stewardship Scheme (CSS) funding. This helped greatly with securing management of the remaining Culm grasslands though did nothing towards re-creating new areas. Ten years of Environmental Stewardship (ES) has just come to an end and though many small Culm sites did not qualify for entry to the scheme, ambitious restoration and re-creation projects have been successfully undertaken on larger sites with the help of Natural England funding. The challenge will be to see these through to fruition as restoring Culm grassland takes longer than the 10 year period of any grant scheme. In the transition from CSS to ES the protection of many Culm sites was lost as sites were too small to qualify for the Higher Level Stewardship Scheme, this is likely to occur again in transition to the new agri-environment schemes currently being developed under the new England Rural Development Programme and due to be rolled out in 2015/16. Any lack of financial support is likely to lead to Culm grassland, which many farmers perceive to be worthless, being drained and improved in an attempt to increase farm productivity and profits or as a focal point for new woodland planting applications.

In our 2014 questionnaire farmers were questioned on whether they had drained any of their Culm grassland in the last 20 years. Their responses probably reflect the fact that most of it had already been drained, prior to the mid 1980's and that they are now receiving financial support from an agri-environment schemes to manage the remaining areas. All of the respondents who had drained land had done so for the purpose of agricultural intensification.

Have you drained any of your Culm grassland fields over the past 20 years?

Answer Options	Response Percent	Response Count
Yes	13.7%	18
No	83.2%	109
Not applicable	3.1%	4
	answered question	131
	skipped question	1

Have you drained any of your Culm grassland fields over the past 20 years?



- Yes
- No

Culm Grassland: An Assessment of Recent Historic Change

As climate change continues to bring more extremes of weather, the viability of farming on the Culm may become questionable as farmers already battling with difficult conditions struggle to compete in the market place. Periods of drought could threaten purple moor grass and rush pasture communities and extreme wet winters could continue to cause a great increase in the growth of soft rush in Culm pastures, to the detriment of more diverse plant species. This increase has certainly been noted by Devon Wildlife Trust's Working Wetlands Project team who are working with farmers to try to bring Culm grassland back into favourable management.

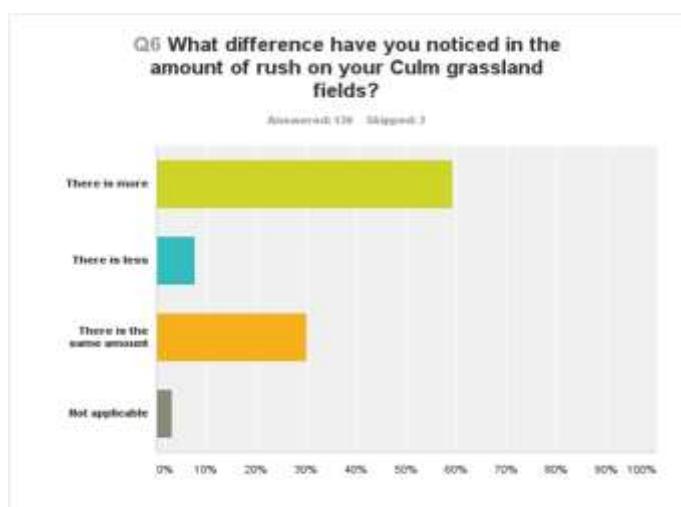
When questioned about the levels of rush in their fields nearly 60% of farmers themselves reported an increase in rush with only 30% managing to maintain it at current levels. The 7.7 % who report less rush could represent the small minority of landowners who use chemical treatment such as weed wiping as a means of control or the more intensive farmers who have managed to eradicate soft rush.

If extreme weather continues to cause flooding problems then the important role of these Culm grasslands in storing water for slow release later, will be more important than ever. Devon Wildlife Trust has carried out studies with Exeter University during 2012-2014 to

What difference have you noticed in the amount of rush on your Culm grassland fields?		
Answer Options	Response Percent	Response Count
There is more	59.2%	77
There is less	7.7%	10
There is the same amount	30.0%	39
Not applicable	3.1%	4
<i>answered question</i>		130
<i>skipped question</i>		2

measure the storage capacity of Culm in comparison with neighbouring improved grassland and also woodland and scrub. Further information about the project can be seen in the two information sheets attached in Appendix 3, the final results of the project will be published in the near future.

This proven ability to store water and release it slowly to ameliorate flood risk, together with the capacity of Culm to store carbon, are factors which could ensure some kind of future funding incentives for the Culm as a region. Without proper recognition of the Culm as an endangered landscape in its entirety and without financial support for farmers we are likely to see more widespread change and agricultural intensification across the Culm landscape.



Culm Grassland: An Assessment of Recent Historic Change

Habitats and Species of the Culm

Culm grassland is a generic term used to describe a range of grassland types found in the Culm NCA. The key National Vegetation Classification (NVC) communities that make up this Culm grassland continuum are M23, M24, M25, M27. These are also given the general name nationally of "Rhôs Pasture" and are recognised as being of national and international conservation importance. These are found within a rich mosaic of other species rich grassland and wet woodland and an array of wildflower species such as devils-bit scabious, ragged robin, meadowsweet, spearwort, bog bean, saw-wort, several species of orchid and many more.

Some Culm grasslands occupy the original "wastes" which were never brought into agricultural cultivation by past generations though by no means all surviving Culm has remained untouched. Some Culm fields have changed their character numerous times over the last few centuries, sometimes grazed, cropped or abandoned depending on the agricultural fortunes of the times (Land Between the Moors Report 2004). The Tithe maps of Culm parishes from around 1840 returned a surprising amount of land as arable, around 75% of the total, though this was probably inaccurate as arable land was considered more valuable than rough pasture meaning that there was certainly artistic licence in the recording!

There are approximately 3,000 ha of Purple Moor Grass and Rush Pasture in the Culm NCA; one of the last remaining strongholds of Culm grassland in Britain. They are a very distinctive feature in the landscape and represent one of the greatest concentrations of species-rich grasslands in the UK. Over 3,500 ha of the Culm NCA (1.2%) is designated as a site of Special Scientific Interest (SSSI), 74% of that area has a SSSI condition assessment category of 'Favourable'.(Natural England 2012)



Classic high quality Culm grassland at Volehouse Moor DWT reserve in late summer, rich in flowering devils-bit scabious

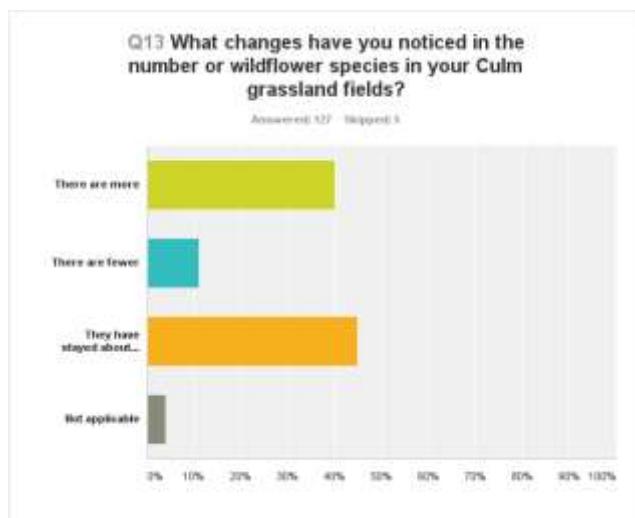
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As well as important plant communities the area supports a number of characteristic butterfly species such as silver-washed fritillaries, marbled white, common blue, skippers, green-veined whites and internationally important populations of the scarce marsh fritillary butterfly. A myriad of moth species can also be found in the Culm including the nationally important population of dingy mocha moth.

Huge losses of Culm grassland occurred mainly during the period between 1950 and the mid 1980's and only began to decline due to a huge drive by conservation bodies to prevent afforestation and agricultural improvement. The effects of this loss on habitats and species were far reaching leaving the remaining small areas of Culm in isolated pockets, which had disastrous consequences for the species it supports. A sobering illustration of this loss can be seen by using data, both past and present, from surveys of breeding wading birds and Marsh Fritillary butterflies. The decline of both of these will be explored further in a full report in the coming pages.

We questioned Culm land owners in our 2014 questionnaire on 'What changes they had noticed in the number of wildflowers in their Culm fields over the past 20 years?'

Their responses showed that 85% of farmers reported either an increase or that the diversity had remained the same. This is most likely to be a reflection of agri-environment schemes during this period which succeeded in maintaining if not enhancing species rich Culm grasslands. It could also suggest that as a result of agri-environment schemes that landowners have had to become more aware of the diversity of their farm habitats with a shift in emphasis to managing for wildlife rather than production.



The rare marsh fritillary butterflies can be seen in late May and early June as they seek out their larval food-plant devils-bit scabious



What changes have you noticed in the number or wildflower species in your Culm grassland fields?

Answer Options	Response Percent	Response Count
There are more	40.2%	51
There are fewer	11.0%	14
They have stayed about the same	44.9%	57
Not applicable	3.9%	5
<i>answered question</i>		127
<i>skipped question</i>		5

Culm Grassland: An Assessment of Recent Historic Change

Birds of the Culm

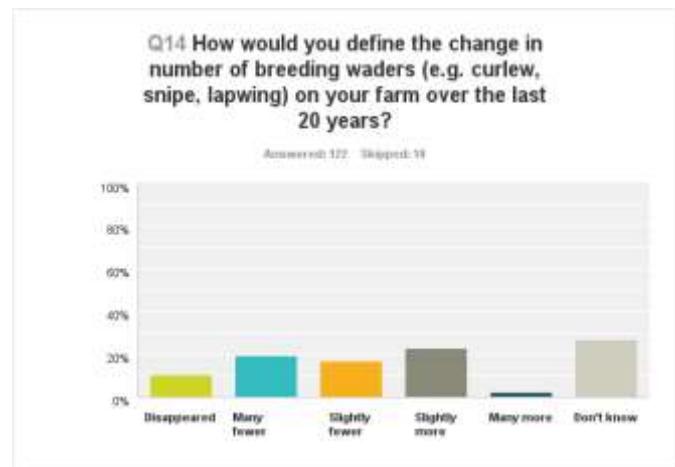
The open moors of the Culm landscape, together with its' rush pastures, damp meadows, wet woodland and network of thick hedges provide valuable habitat for a number of characteristic bird species. Typical species associated with this landscape include grasshopper warbler, tree pipit, stonechat and winchat. The Culm also provides breeding habitat for curlew and reed bunting, overwintering habitat for snipe and woodcock. Barn Owls use the rough grassland for hunting, increasingly important when the improved grasslands all around provide a poor source of small mammals. Woodland patches on the fringes of the Culm provide nesting sites for local Willow Tit, Buzzard, Sparrow hawk and Kestrel.



Grasshopper warblers are still very frequent in some of the larger blocks of Culm habitat

Over the last forty or so years there have been significant changes in the Culm landscape with a dramatic decline in the area of Culm habitat and a general shift to more intensive agriculture as discussed in the Introductory pages. The group of birds which perhaps best illustrate this decline are breeding waders. Prior to intensification in the 1960s, 70s and 80s, the rough, wet pastures of the Culm provided an abundance of nesting sites for Curlew, Snipe and Lapwing and important over-wintering habitat for Snipe, Jack Snipe, and Woodcock. There is plenty of anecdotal evidence from the older generation of farmers who clearly remember the return each spring of the Lapwing and Curlew to the meadows and rough pastures.

How would you define the change in number of breeding waders (e.g. curlew, snipe, lapwing) on your farm over the last 20 years?		
Answer Options	Response Percent	Response Count
Disappeared	10.7%	13
Many fewer	19.7%	24
Slightly fewer	17.2%	21
Slightly more	23.0%	28
Many more	2.5%	3
Don't know	27.0%	33
answered question		122
skipped question		10



Our respondents were asked how they perceive the change in number of breeding waders (namely curlew, snipe and lapwing) on their farms over the past 20 years. The results surprisingly suggest that 23% of respondents report seeing more birds over the last 20 years. This is most likely explained by the increase in managed wet rushy pasture attracting more visiting snipe and that landowners are noting sightings of visitors rather than actual breeding birds.

More systematic data for breeding wading birds are more difficult to come by, but it is now clear that there have been devastating declines in recent years, with breeding lapwings now entirely absent, and curlew and snipe now breeding one or two remaining sites at best. Here we examine the dramatic decline of these three species and consider whether there is any action that could reverse it. The conclusions are based on information and survey results from a number of historical datasets, which were compiled and used to focus a detailed field surveys in the spring of 2012 by Rob Macklin.

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Curlew

Curlews are Britain's largest wading bird instantly recognisable on estuaries in winter with its long curved beak and evocative call. In summer it breeds inland on moorland and now, very rarely, in the Culm.



Breeding habitat

Curlew in the UK breed on moorland, upland pastures and traditional hay meadows in summer, descending to lowland pastures, coasts and estuaries in winter. In the breeding season they favour quiet, open landscapes where they have good visibility. They are a wary species, which are easily disturbed, and hence good visibility is important for the safety of their nests and their young. They feed solely on invertebrates- the adults take the insects found on or just beneath the ground surface and the chicks use their shorter bills to feed on insects on the surface.

Historical records and survey results

The UK's breeding population of curlews is of international importance, being estimated to represent over 30 per cent of the west European population. However, there have been worrying declines in the breeding population throughout much of the UK, with the Breeding Bird Survey indicating significant declines in Scotland, England and Wales, and an overall UK decline of 42 per cent between 1995 and 2008.

- The Breeding Birds of Devon Atlas which covers the 1977-85 seasons (Sitters 1988, DBWPS) uses three categories of breeding; (confirmed, probable, possible). It identified 47 confirmed, 134 probable, 46 possible breeding records for tetrads across Devon (around half of these in the Culm).
- Within 10 years of the atlas, in 1998, only 6 breeding pairs of Curlew were recorded in the Culm area and 6 years later the "Land Between the Moors" report (2004) suggests there were no confirmed records of breeding waders in the Culm. The BTO Atlas of 2008-2011 records confirmed breeding in only two 10km grid squares in the Culm area.
- The survey of open ground breeding birds was conducted in 2012 by Rob Macklin, focusing particularly on Snipe and Curlew. Eight key Culm grassland sites were surveyed, the survey sites were each visited three times during three set periods between March 15th and June 15th. The survey results identified just one confirmed pair of breeding Curlew.

Culm Grassland: An Assessment of Recent Historic Change

In summary, within thirty years, Curlew appear to have declined in the Culm, from as many as 100 breeding pairs down to one or two.

Reasons for decline

Habitat loss

The loss of large moorland culm sites to conifer forestry plantations began after the First World War, and continued apace after the Second World War. This loss was most dramatic along the moorland ridge that runs between Okehampton and Holsworthy, where some 20 square kilometres of prime breeding habitat are now covered by dense conifer plantations. Although much of this habitat loss occurred before the period this report considers, it would have had the effect of pushing breeding Curlew into sub-optimal habitat, such as enclosed rush-pasture and hay meadows.

The second wave of habitat destruction, occurred during the 1960s and 1970s, as generous agricultural grants gave large incentives to farmers to drain and plough wet unimproved grassland. It was during the period from the late 1950s until the mid 1980s that estimates of an 80% loss of remaining culm grassland occurred.

A third wave of habitat loss has occurred since the mid 1980s, due to the semi-abandonment of many culm grasslands. As agriculture has withdrawn from these marginal areas, so an invasion of scrub and secondary woodland has overtaken many culm sites, reducing the number of available sites with the open views that the Curlew require. Another consequence of this habitat loss has been the increasing isolation and fragmentation of remaining sites, making it less likely that potential breeding birds are able to form pairs.

Changes in agricultural practices

As the loss of prime breeding habitat increased, it is probably that breeding Curlew moved onto sub-optimal habitat such as rush-pastures and traditional hay meadows. However these semi-improved habitats were also lost at a similar rate, to drainage, ploughing and increased use of non-organic fertilisers.

The wide availability of cheap nitrogen-based fertilisers from the mid 1950s onwards, enabled the production of two or three crops of cut-grass from fields that previously only provided one traditional hay crop. The move from hay to silage enabled earlier and multiple cutting operations. Most curlews are looking for somewhere suitable to nest in late April/early May. Curlews need around a month to incubate their eggs, with chicks fledging around 5–6 weeks after hatching. With traditional hay management, Curlew were able to raise chicks before the annual hay-cut, and even if not yet fully fledged, they would still be mobile enough to get out of the way of tractors and mowers. First-cut silage will now coincide with the period where adults are still incubating the eggs, and so nest destruction becomes unavoidable.

With intensification have come higher stocking rates. Higher grazing pressure has seen an increase in tightly grazed swards and the loss of tussocky grassland needed for nesting and a healthy population of invertebrates. Increased grazing pressure can also lead to further disturbance of nesting sites and an increased risk of nests being trampled.

RSPB research in Northern Ireland identified high levels of predation on nests as the likely cause of population declines, with foxes being the most important predators. Similar findings have been obtained from declining populations elsewhere in Europe, suggesting that increases in predator populations have also contributed to declines. In some upland areas, the control of foxes and crows by gamekeepers managing moorlands for rough shooting may be important in maintaining breeding curlew populations and preventing further declines.

The future

It is doubtful whether the Curlew will return to breed in the Culm in significant numbers in the immediate future. The fact that this species has continued to decline dramatically since 1995, despite a succession of agri-environment schemes targeted at its' prime upland habitats, is a major concern. Although Curlew have increased in some northern England strongholds, their virtual disappearance from Dartmoor over the last 20 years does not bode well. If this species struggles to breed successfully within the largest single block of moorland in the south-west, then there is little hope for it, within the fragmented landscape of the Culm.

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Snipe

Snipe are medium sized, shy wading birds with short legs and long straight bills. They are one of the more common waders found in wet fields of the Culm area during winter, though many are seasonal visitors from Scandinavia and Iceland.



Breeding habitat

Snipe prefer to breed in wet areas with reasonably tall tussocky grass in which to build their nests or in rush-pasture where they can hide their nest for protection. They love flooded grassland where worms have been forced to the surface and where the ground is soft and there is plenty of vegetation for camouflage. They are more tolerant of high stocking rates than Curlew though still prone to disturbance.

Historical records and survey results

Snipe are widespread as a breeding species in the UK, with particularly high densities on northern uplands but lower numbers in southern lowlands (especially south west England). In winter, birds from northern Europe join resident birds. The UK population of snipe has undergone moderate declines overall in the past twenty-five years, with particularly steep declines in lowland wet grassland.

The "Breeding Birds of Devon" Atlas covering the 1977-85 seasons, shows that Snipe breeding records were mainly from Dartmoor during this period, with a scatter of possible breeding bird records and the only confirmed records in the Culm area being north of Torrington and on Exmoor.

In the 1988-1991 BTO Atlas, Snipe are recorded as having breeding evidence in only one 10k grid square within the Culm. The 1988-91 BTO map showed a big contraction in snipe numbers over the first BTO Breeding Atlas of 1968-72, suggesting that the decline happened much earlier in the case of snipe. Both Lapwing and Curlew showed much greater numbers of occupied 10km squares in this earlier Atlas.

- The most recent BTO atlas (2008-11) show Snipe as confirmed breeding in two 10k squares, with probable/possible breeding in a further 7 squares. There are a number of possible reasons for this recent increase, which are discussed below.

Culm Grassland: An Assessment of Recent Historic Change

- The survey of open ground breeding birds was conducted in 2012 by Rob Macklin, focusing particularly on Snipe and Curlew. Eight key Culm grassland sites were surveyed, the survey sites were each visited three times during three set periods between March 15th and June 15th. The survey results identified just one possible breeding pair of Snipe on Bursdon Moor. A year later in 2013, a DWT advisor came across a snipe sitting on eggs on nearby Thorn Moor.

Reasons for decline (and recent increases)

Habitat loss

One of the possible reasons for the early decline of breeding Snipe could have been the loss of relatively small areas of wet rush-pasture as it was drained and improved- a process which happened faster than on the larger, open areas of moor. In addition, the habitat loss which has been described above for Curlew, will also have impacted on Snipe.

The drainage of land and widespread agricultural improvement have played a part in the decline of this species too. The fragmentation and small size of sites means that there is more competition for breeding territories and food supplies.

Changes in agricultural practices

Perhaps of more significance than habitat loss is the reduction in quantities of soil invertebrates due to increased pesticide use and poor soil health, caused by soil compaction and a lack of organic matter. Grazing with sheep rather than cattle has caused a reduction in the tussocky composition of the sward needed for nesting cover.

A possible explanation for the increased breeding of snipe in more recent years is the introduction of agri-environment schemes in the early 1990's, which adjusted management practice and encouraged favourable management of wet rush-pasture. These practices ensured that whole fields were not topped to reduce rush cover, reducing the risk of nest disturbance/destruction.

An increase in mild wet winters and prolonged wet summers in recent years has undoubtedly led to an increase in soft rush cover within the Culm, as the ground has often been too wet for farmers to carry out a regular topping regime. This increase in rush cover, allied to wetter, more water-logged soils, has potentially benefitted breeding snipe.

The future

The outlook for Snipe may be slightly more positive. An increase in water-logged rush-pastures over recent years has certainly favoured this species, and if the increase in mild, wet weather continues, there could be further increases in breeding. On the other hand, a couple of long-dry summers and cold winters is likely to see renewed efforts by many farmers to control Soft Rush, so these habitat benefits could be lost quite quickly.

In recent years, farmers have become more aware of the importance of good soil structure and organic matter content. Improving soil health is currently a hot topic, particularly as the current high prices of agro-chemicals are leading many farmers to seek other ways to maintain or increase yields.

Improved soil health, and thus invertebrate content, should only be a good thing for Snipe, and if these combinations of factors go their way, we could see increases in the numbers of breeding Snipe within the Culm.

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Lapwing

Lapwings are found on farmland throughout the UK, flocking in winter on pasture and ploughed fields. In the breeding season they prefer spring sown cereals, permanent unimproved pasture and wetlands with short vegetation.



Breeding habitat

In the breeding season, Lapwings need a mosaic of habitats. This is because they need different conditions for nesting and for chick rearing. The nest is a scrape in the ground, lined with a variable amount of plant material. The birds need a good all round view from the nest to spot predators, and nest either on bare ground or in short vegetation. They often choose rough or broken ground to aid concealment of the nest. Spring sown crops and rough grazing are ideal.

They lay clutches of four eggs from late March to early June, and chicks hatch 3-4 weeks later. They are covered in down when they hatch, and are able to walk about and feed within hours. Soon after hatching, the parents will lead them to suitable feeding areas, where the supply of surface invertebrates is good and the vegetation low. In particular, they need to have nearby grassland, especially if it contains flood pools and damp patches.

The transfer between the nesting and chick-rearing habitats can be hazardous, and chick survival often depends on how far they have to travel. The families stay in the chick-rearing habitat until the young are ready to fly at 5-6 weeks old.

Historical records

Lapwing numbers have decreased in Britain since the middle of the 19th century. The early declines were caused by large scale collection of eggs for food. Introduction of the Lapwing Act in 1926 prohibited this, and was followed by a considerable recovery in bird numbers. A further national decline occurred between the 1940s and 1960s as agricultural intensification got into swing after the war. After a period of stabilisation, further dramatic declines began in the mid1980s, the reasons for which are discussed below.

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The 1988-1991 BTO Atlas portrays that Lapwing showed evidence of breeding within nine 10k grid square within the Culm. The most recent atlas (2008-2011) shows no breeding evidence at all for Lapwing within the Culm area.

The “Land Between the Moors” report (2004) also found there were no confirmed records of breeding Lapwing in the Culm.

Reasons for decline

Habitat loss

Since the 1940s Lapwing declines have been driven by large-scale changes to farming. Large areas of grassland were converted to arable, marginal land was drained and improved, and chemicals were introduced for fertilisers and pest control with increasing reliance on them.

Lapwing would have been affected by the same habitat loss described above for Curlew and Snipe.

Changes in agricultural practices

A sharp and sustained decline in south-west England started in the 1980s following further intensification and specialisation. The abandonment of crop rotations, a switch from spring to autumn sown crops, increased drainage and the increased use of agrochemicals have all had significant effects on lapwing breeding viability.

Such changes have resulted in much of the arable land becoming unsuitable for nesting by April because the crop grows too high. Tillage, drainage and pesticides have also caused a reduction in food availability. Nest failures on arable land come from egg losses during cultivation and from predation, and poor chick survival due to crop growth. Crop growth can also shorten the laying season.

As pasture land is improved, the resulting increased risk of trampling by livestock, earlier cutting for silage and lower food availability have affected lapwings adversely.

Mosaics where grass and spring tillage fields are close together has declined significantly in recent years, and the loss of this prime habitat has resulted in a decline in lapwing numbers.

Within the Culm area, Lapwing would have been heavily dependent on traditional, extensive mixed farming. This type of farming has virtually disappeared from the Culm area, and its' return is unlikely. The polarisation and specialisation of agriculture in the UK which has witnessed a growing south-east/north-west divide between arable and pasture, can also be seen within the culm. Spring-sown crops have virtually disappeared from many areas, and even winter-sown crops are now concentrated where the Devon Redland soils intrude into the Culm clays. On the poor clay soils in the west of the Culm, maize is the only arable crop for miles around, but its' late establishment and heavy growth make it unsuitable for Lapwing.

The future

There seems even less hope of Lapwing returning to the Culm, than there is for Curlew. The mixed, extensive farming systems they require are long gone, and there seems very little likelihood of these systems returning.

Arable production has virtually disappeared from large swathes of the Culm. Where arable still occurs on the better soils, it is almost entirely dominated by unsuitable winter-sown crops, and is rarely close to suitable unimproved pasture habitat for rearing chicks.

Culm Grassland: An Assessment of Recent Historic Change

Some conclusions from the breeding wader survey

A farming landscape left entirely to free-market economics will not produce the positive changes required to bring these three iconic bird species back to the Culm. Only carefully targeted agri-environment schemes could hope to reverse the declines. However, nearly 20 years of agri-environment schemes, have done little more than slow the declines of many farmland bird species. This is not through a lack of will. The schemes have been popular and well subscribed, and the annual budgets have been spent. However, the success of many of these individual agreements have been reduced by the limited “care and maintenance” support available.

Successful restoration and re-creation of internationally important habitats cannot be achieved by giving the farmer a list of do's and don'ts at the beginning of a 10 year scheme, and then walking away and leaving them to it. We are about to emerge into a new cycle of schemes following the 2013 CAP reform. If such failures of past schemes are not recognised in the make-up of the new schemes, then there is little hope of halting the declines of farmland birds within the Culm, the UK, and the rest of Europe.

A comparison with changes in Breeding Bird Numbers in the Somerset Levels and Moors

- Breeding waders have been closely monitored in SL&Ms since 1977. Four species currently breed in the area: lapwing, redshank, snipe and curlew. In 1977 a total of 580 pairs of breeding waders were recorded widely across the SL&Ms. In 1992 a similar survey located only 282 pairs, and in 2002 there were 284 pairs, in 2009 a total of 275 pairs, and in 2013 up to 343 pairs. The 2013 populations were: 100 lapwing, 156 snipe, 50 redshank and 37 curlew.
- From 1977 to 1992 there was a loss of wetland habitat as farming and drainage intensified and the commoner species, lapwing and snipe, declined dramatically. From 1992 to 2009 the new RWLAs provided better habitat for breeding waders and birds began to concentrate in these areas and snipe started to increase, while the decline continued in the wider wetland.
- From 2009 to 2013 the overall numbers of breeding waders increased, mainly due to a sharp increase in snipe, but also a modest increase in lapwing for the first time in many years. The picture is however not all good as the vast majority of breeding waders are now concentrated on the 2 RSPB Nature Reserves in the area, where extra special management measures are carried out each year, and the decline continues in the wider wetland and on most of the other SSSIs. RSPB Greylake reserve now has 58% of the lapwing nesting in SL&Ms, and 80% of the redshank. RSPB West Sedgemoor Reserve in 2013 had 60% of the nesting snipe and 86% of the curlew.
- There is much more work to be done to encourage breeding waders back onto farmland in the wider wetland area. Swards need to be better managed with more grazing with the right breeds of cattle; water levels need to be better managed especially in dry springs; ditches and in-field gutters need better management to ensure good feeding areas for waders at the water's edge; and predation and human disturbance issues need to be tackled.

(John Leece, FWAG Southwest, February 2014)

Culm Grassland: An Assessment of Recent Historic Change

Marsh Fritillary

The Marsh Fritillary *Euphydryas aurinia* is one of the iconic species of culm grasslands. Populations are highly volatile and the species requires extensive habitat networks for its long term survival.



The marsh fritillary breeds in open grassy habitats, particularly damp grassland dominated by tussock-forming grasses; calcareous grassland, heath and mire vegetation. Devil's-bit Scabious is the larval foodplant and can be found in all these habitats. The wet grasslands or Rhôs pastures of the Culm are recognised as one of the marsh fritillary's UK strongholds but even here they have been affected by the loss of unimproved grassland, mainly due to agricultural improvement and changes in land management.

The marsh fritillary is threatened, not only in the UK but across Europe and is therefore, the object of much conservation effort. The butterfly is one of the fastest declining species in England, recorded as losing 66% of its colonies in England between 1990 and 2000. There has been a widespread programme of monitoring of marsh fritillary colonies with the Culm over the last 10 years but records before then are slightly more sporadic.

This section will look at the ecology of the butterfly, and the habitat and management that it requires. The changes in distribution across the Culm, and some of the reasons for these changes, will also be discussed.

Ecology

The marsh fritillary is a beautiful and distinctively marked species of butterfly. The upper side is reddish-orange with yellow-ochre patches and brown veins and cross-bars. The underside is considerably duller. Average wingspan is about 45 mm.

Marsh fritillaries in Devon occupy a specific habitat type: damp, neutral or acidic grassland. This is usually dominated by tussock forming grasses such as purple moor grass on more acid soils or tufted hair grass on more neutral soils. Breeding areas are generally very open and un-shaded, though may be sheltered by scattered scrub or adjacent woodland.

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Lifecycle

The butterfly has one flight period, between May and mid-July. The first egg batch is large with about 300 eggs, successive ones smaller. Females lay their eggs on larger devil's bit scabious plants, typically growing where the turf height is 8-20 cm. Susceptible to grazing pressure, most colonies occur where there is light, often extensive cattle or horse grazing, or where grazing has been recently abandoned. Sheep grazed sites rarely support colonies as sheep will preferentially graze the food plant, leaving it too small for egg laying.

After overwintering the caterpillars emerge in late winter or early spring to bask communally on warm days. After dispersal from the communal group they eventually pupate close to the ground under dead leaves or on plant stems.

Emergence of the adults usually starts at the end of May or early June, although this varies each year. The males can emerge several days before the females, remaining on site for 4-9 days and the females for 3-6. Although many individuals are highly sedentary, there is some dispersal from colonies and some are seen in non-breeding habitats near to existing colonies.

Populations

Populations fluctuate tremendously in size from year to year. It is possible that in lean years they contract to core sites during sequences of poor seasons. The fluctuations seem to depend on weather, food supply and the proportion of caterpillars killed by the parasitic braconid wasp *Cotesia bignelli*. Warm but relatively sunless spring weather may lead to higher larval deaths by the parasites which can fit in three generations to the butterfly's one. It is also thought that the parasite may control the size of marsh fritillary colonies, preventing them from outstripping the supply of food plant. As an integral element of the butterfly's ecology they are of significant conservation value themselves.

The large fluctuations in the populations can cause problems where habitats are small or fragmented.

Periodic extinctions of isolated colonies can give the appearance that colonies are shifting, either around fields or between groups of sites. But this is more probably caused by local extinctions and periodic colonisations. With these limited emigrations and movements the butterfly and the parasite *Cotesia* may be adapted to a meta-population structure, which possibly also helps keep the parasite in check. It is therefore vital to maintain colonies or meta-populations that are centred on relatively large areas or viable mosaics of suitable (but sometimes unoccupied) habitat so that the process of dispersal at times of high populations compensates for local extinctions.

The young larvae spend their time feeding within a communal web before overwintering in a small hibernaculum



Meadow thistle generally flowers at the same time as the adult butterflies are on the wing, providing a very important source of nectar and energy.

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Habitat and Management

Maintaining good populations of the food-plant, devil's-bit scabious in a particular habitat is essential for the marsh fritillary. Devil's-bit scabious can be very patchy in its' distribution across culm grassland. Abundant on some sites, it can be virtually absent from others. Abandonment of sites, will usually lead to purple moor-grass becoming dominant, and shading out the scabious plants. Alternatively, over-grazing, particularly in late summer, can stunt the scabious and inhibit its ability to produce sufficient flowers and seeds. Tests have shown that much of the seed produced by this species is not viable, an important factor on sites which are poorly managed.

Flowering plants availability during the flight period is important in sustaining the adults during the short breeding season. One of the key flowering species at this time is meadow thistle *Cirsium dissectum*. However when flowering is late due to a cold spring such as occurred in 2013, this timing is not synchronised, preventing the butterflies feeding and replenishing their energy levels. Low levels of grazing reducing botanical diversity and over grazing in the spring will also reduce spring flower abundance.

Shelter

Shelter seems to be an important factor in providing favourable habitat. Butterflies are generally most abundant in sheltered areas of culm grassland, or around the sheltered edges of large, open moorland blocks. Small areas of scrub can be beneficial in this respect, but major increases will reduce the areas of prime grassland habitat.

Grazing and site management

Grazing levels are the key to managing the habitat, but must be carefully tailored for marsh fritillary. The aim is to produce an uneven patchwork of short and long vegetation by the end of the grazing period. Extensive grazing in spring and summer with cattle or ponies is ideal for the marsh fritillary. Sheep grazing is unsuitable. The aim is for an uneven sward at the end of the grazing season between 8 and 25 cm (3-10" high).

Burning is used to maintain some sites, by reducing the build-up of purple moor-grass thatch but it can kill marsh fritillary caterpillars. Burning should only occur between January and March, and should avoid burning more than one third of a field in a year. Cool, quick fires are best. Mowing is unsuitable for Marsh Fritillary breeding areas and is difficult on these wet, tussocky grasslands, anyway.

Connectivity

Connectivity between sites seems to be vital for maintaining healthy genetically diverse populations of marsh fritillary across the landscape.

The butterfly forms close-knit colonies on discrete patches of habitat (typically 5 - 20 ha). Adults rarely fly more than 50-100m but a small proportion seem to disperse further. The butterfly is renowned for its large fluctuations in population size that make it highly prone to local extinction, but in "good" years enable it to spread and colonise new sites as well as patches of less suitable habitat. It is known to exist as meta-populations comprising groups of local populations connected by occasional dispersal.

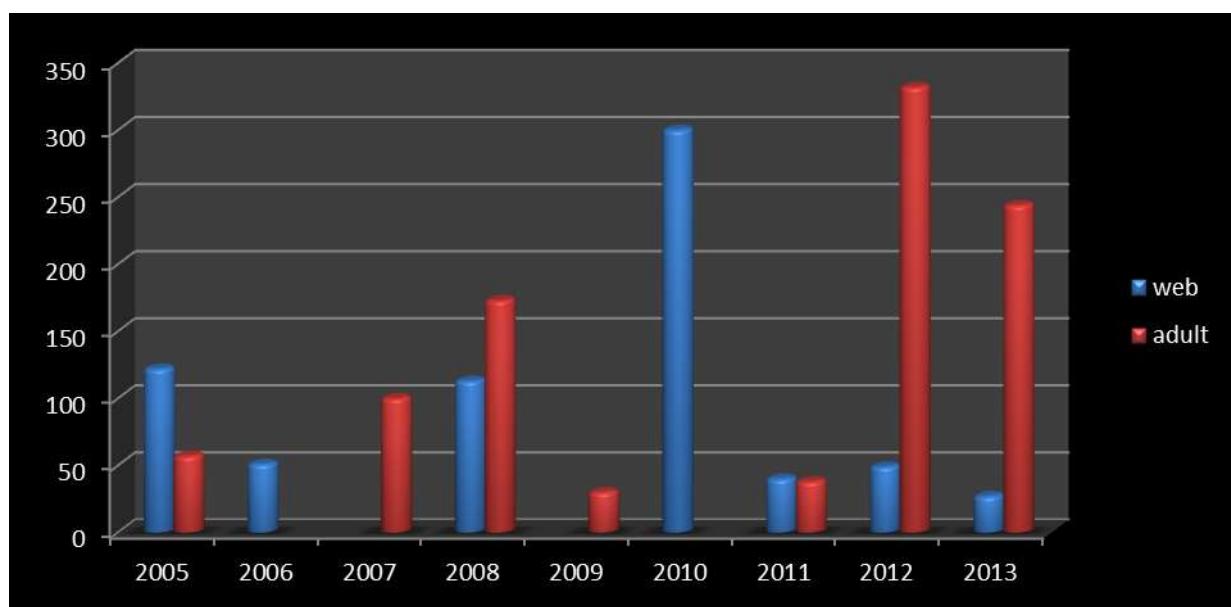
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Population trends within the Culm

It is impossible to give a definitive population trend for marsh fritillary across the Culm area. However, it is certain that the species has disappeared from many sites, where it was recorded in the early 1990s, although there have also been some new populations identified in recent years. There are multiple problems with trying to define trends though. These include:

- No sites have been consistently monitored every year since the early 1990s
- Most sites have only been surveyed occasionally to determine if the species is still present
- Flight surveys are very weather dependent. If the weather is cool, windy and cloudy on the day of the survey, then flying adult numbers will be much lower than if the survey happens on a hot, still day.
- Some sites which have been monitored regularly may have had flight surveys one year and web surveys the following year. It is difficult to directly compare such surveys
- The species goes through regular boom and bust cycles

A good example of the difficulties in determining trends is to look at one Devon Wildlife Trust reserve, which has been surveyed annually since 2005. Numbers fluctuate wildly between the years, and even on this site, not every year has had both flight and web surveys.

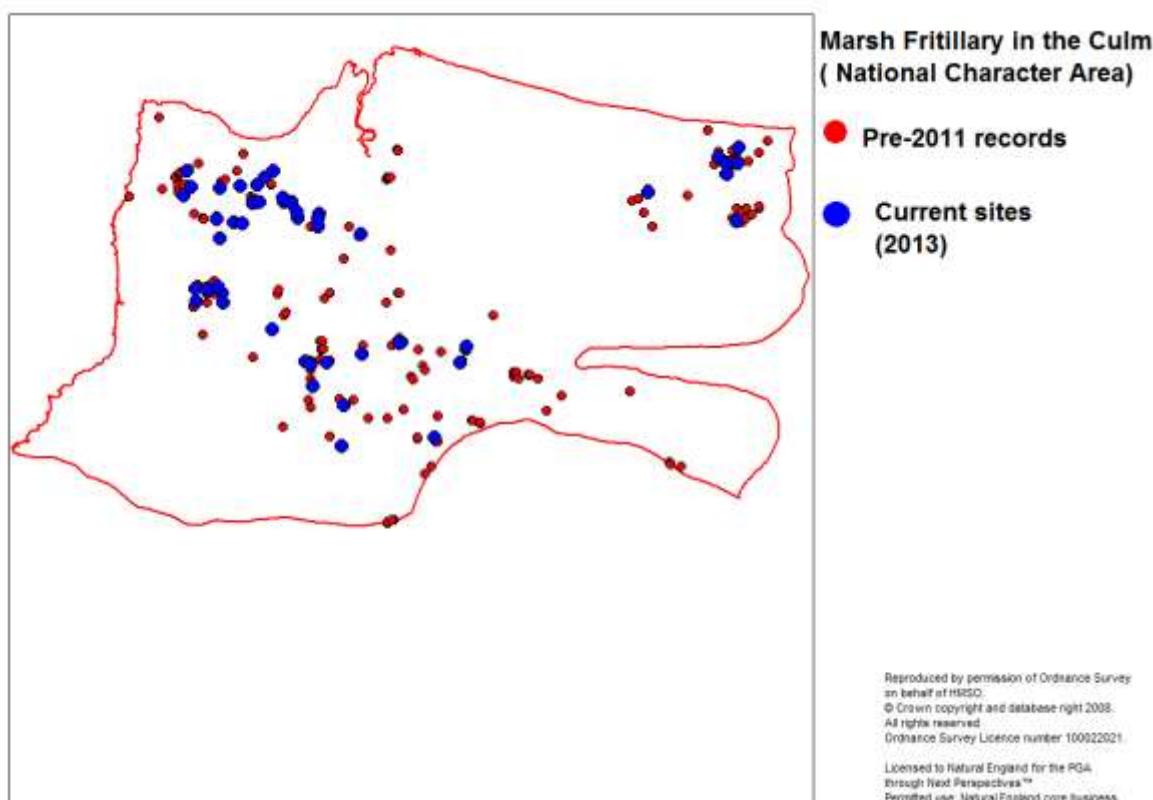


Numbers of marsh fritillary butterflies at Volehouse DWT reserve between 2005 and 2013

Looking at years 2011 and 2013 could give contrasting results, depending on which survey is considered. Web numbers declined from 40 webs in 2011 down to 27 webs in 2013, hinting at a slight decline. However flying adults increased from 38 in 2011 to 244 in 2013, suggesting a massive increase.

In 2004, Butterfly Conservation estimated there had been a 66% decline in the species since 1990. This figure would fit with anecdotal evidence from the Culm, and it is highly likely that the species has continued to decline since 2004. It appears that there has been a major contraction in the species, away from small isolated sites, and concentrated towards fewer bigger sites, mostly large SSSIs.

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Reasons for decline

The reasons for the decline of marsh fritillary are not fully understood, but are likely to be the culmination of a number of factors. Each of these factors has put pressure on marsh fritillary colonies. One single factor may not be enough to cause a site extinction, but when several are combined, particularly in consecutive years, the impact can be disastrous. Weak colonies with low numbers reduces the species' ability to expand out from these areas in boom years.

- **Loss of habitat & habitat management**

Habitat loss is a primary factor in the decline of this species. The majority of habitat destruction occurred in the period 1940 to 1990, when 80% of culm grasslands were lost to agricultural improvement, forestry plantations and secondary woodland. Although there has been relatively little wholesale destruction of habitat in the last 20 years, much of the existing habitat has fallen into unfavourable condition for the species to utilise. Abandonment of many sites has led to scrub invasion and the dominance of Purple Moor-grass and/or Soft Rush. This has in-turn caused a big reduction in the levels of available food-plants and nectaring plants on such sites.

Other sites have lost favourable condition due to overgrazing and partial improvement. As above, such management can lead to a large decline in Devil's-bit scabious, with the knock-on effect on the viability of successful breeding.

- **Isolation, Dispersal and Re-colonisation**

As the landscape of culm grassland has become broken-up and fragmented, individual colonies become more isolated. Isolation can lead to problems of genetic inbreeding, and raise the likelihood of local extinctions. In a well-connected habitat landscape, such sites can be re-colonised relatively easily on a boom year. However when sites become isolated, the likelihood of re-colonisation reduces.

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Marsh fritillary behaviour is central to the strategy of coping with local extinctions. There is evidence that later in the season, females are likely to disperse from the main breeding colony. If these females are carrying eggs and suitable habitat is found, then there is potential for carrying fresh genetic material onto other existing colonies, or colonising new or previously extinct sites. However as suitable habitat becomes more isolated, the chances of successful dispersal are lowered.

- **Weather**

Cold, wet, windy weather during the adult flight period of May to mid-July will have impacts on breeding success. Marsh fritillary are weak flyers and will avoid flight in poor weather. Prolonged bad weather reduces the chances of successful mating, and will also reduce the chances of successful dispersal from the colony. Weather during the preceding winter and early spring can also dictate survival rates. The spring of 2013 was dry and cold, and by the time of adult emergence, plant growth was nearly a month behind usual. The butterflies emerged onto culm grasslands without any sources of nectar, hindering their ability to feed successfully, and maintain body condition. A succession of poor years could lead to local extinctions.

Rates of mortality caused by the parasitoid might depend on spring weather conditions that affect the relative development rates of the host and parasitoid. In cool but sunny weather conditions, the host is able to develop faster and reach pupation before the adult parasitoids emerge, resulting in a low parasitism rate. When spring conditions are cloudy, larval development is synchronised with parasitoid emergence and thought to result in an increased incidence of parasitism

- **Parasitism**

Parasitism by the *Cotesia* wasps is capable of causing local extinctions, particularly on small sites. The ecology of both species is intimately linked as *Cotesia bignelli* appears to only parasitise Marsh Fritillary. *Cotesia* follows the same boom and bust cycle as their hosts, and the relationship between the two is likely to have remained unchanged in millennia. In a well-balanced system, parasite-related extinctions will be followed by re-colonisation from neighbouring colonies. However, as previously discussed, habitat fragmentation and isolation reduces the chances of re-colonisation. In such cases the parasite causes an extinction of the host, and thereby ensures its own demise.

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Land-use change in the Culm

The dominant influence on this landscape is the heavy clay soils overlaying the Upper Carboniferous Culm measures, giving rise to heavy, wet soils which are notoriously difficult to cultivate. As a result of this, and the oceanic climate with high rainfall, the predominant land use in the Culm has long been grass production for livestock. Data from Natural England in 2010 shows that 94% of the land area in the Culm NCA has an agricultural land classification of grade 3 or 4. The better land has traditionally been occupied by the dairy sector, which once dominated the livestock industry of the area, whilst the beef and sheep industries thrive on the less fertile areas, which have been the focus of various efforts to improve their productivity over the years. North Devon 'Ruby Red' cattle are the local, traditional breed found in this landscape, together with Highland cattle, Longhorns and other hardy breeds such as Galloways, which are able to thrive on the rushy Culm pastures.



Hollow Moor SSSI is one of the largest blocks of Culm grassland, where grazing under agri-environment schemes is key to scrub management.

Apart from the influence of the underlying geology and climate the farming and forestry industries of the area have been shaped by policy and price support, market preferences and the objectives of individual businesses. These variables are constantly changing and hence changes in landscape and land use are inevitable.

Culm Grassland Resource Pilot survey 1989

The dramatic loss of Culm grassland was first picked up in 1989 in the Culm grassland Resource Pilot Survey. This survey sampled four 10km squares covering about 16% of the total area of the culm NCA in Devon. 130 sites were examined, including 8 SSSIs, and it found that 79 sites (61%) had been wholly lost between 1984 and 1989. In terms of land area 39% of Culm grassland was lost over the same period – without including the SSSIs in this analysis, 65% of non-designated Culm grassland was lost. In 1989 it was estimated that 3,200ha remained, covering about 1.3% of the land area, and of that 931 (29%) was within SSSIs. Within this sample area, 95% of the loss between 1984 and 1989 was a result of agricultural improvement, with 3% due to afforestation. Four sites (1%) were completely lost to scrub encroachment, although others would have been partially affected.

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River Wolf case study – Land-use change upstream of Roadford Reservoir since 1947



DWT is working extensively in the headwaters of the River Wolf around Roadford

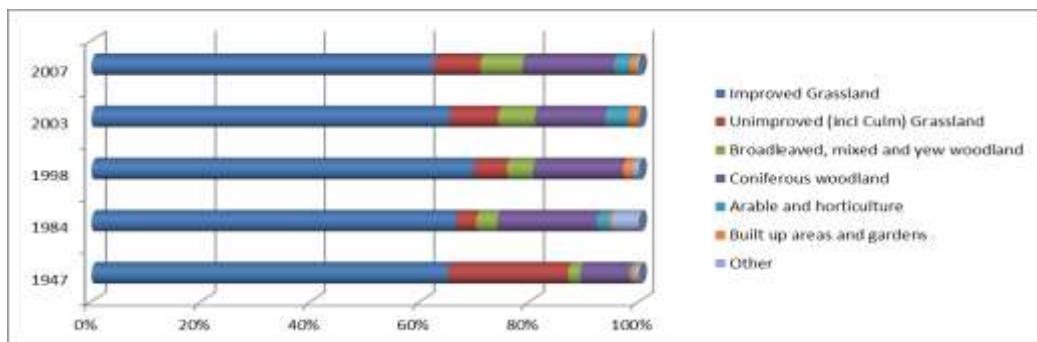
Accurate historic land-use data is very hard to come by in the Culm. A recent study investigating the relationship between hydrology and land-use change carried out internally by the Working Wetlands team was unable to unearth accurate detailed land-use data that could be analysed digitally.

As part of a discrete study into the impacts on land-use change on hydrology, 2,119ha of this upper Wolf catchment, was analysed in detail by the Devon Biodiversity Records Centre (DBRC). Land-use data was available for 5 different time periods. However much of this data was not available in digital map (GIS) format, and so was digitised. The following datasets were investigated and mapped:

- 1947 aerial photos
- 1984 Phase 1 land-use map (paper based)
- 1998 aerial photos
- 2003 aerial photos
- 2007 Parish Biodiversity Audit (already digitised).



The results of this land-use analysis show significant changes since 1947, when 22% of the area appears to be unimproved grassland – based on expert interpretation of aerial photos. By 1984 when the next detailed survey was carried out, this had dropped right down to 3.7%. In this same period, the extent of coniferous woodland doubled from 9% of the land area to 18%.



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Changes in agricultural practice

Over the past 60 years the drive for agricultural intensification has resulted in many changes to local agricultural practices. Traditional hay making has been replaced by multiple cuts of silage often with heavy use of fertiliser in between cuts. Larger machinery and the availability of specialist contractors means that agricultural improvement is now relatively easy. This is often carried out with little concern for, or knowledge of, the soil compaction caused by such large machinery. Hedges are cut tight with flail mowers rather than being layed and the increased applications of herbicides to arable fields is now common practice. Intensive plant breeding has produced varieties of crop able to flourish in Devon's maritime climate, resulting in a great increase in the areas of barley and maize grown.

During the 1980's the Culm was designated as a Less Favoured Area, reflecting the real difficulties faced by smaller farmers trying to make a living in the region. Although the livestock industry is well provided with grass the heavy soils are not naturally well suited to highly productive farming and the wet climate produces prolific growth of soft rush. The wet Culms fields also make livestock susceptible to other diseases typical of wet lying area such as Red Water and Black Leg which affect cattle not used to this type of ground.



Longhorn cattle are one of the traditional breeds being used to graze Speccott CWS as part of the DWT Grazing Links work. Although slow growing, they can convert rough grazing to high quality protein.

In the late 1980's pressure for change from conservation bodies began to gain momentum and this marked the beginning of a change. However, undoubtedly one of the biggest drivers of change has been the effects of government policy. By the 1990's the Common Agricultural Policy was becoming expensive and resulted in serious over production, so mechanisms were introduced to rectify things. Quotas on milk production were introduced in 1984 and then set aside in 1988 which required land to be temporarily taken out of arable production. Both were made compulsory in 1992 and the difficulties they entailed helped to accelerate the trend towards fewer full time farmers as they sought alternative incomes or entered semi-retirement.

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In addition to the physical and technical challenges of farming in the Culm, various farming crises have added further pressures. In the 1990's BSE was a major problem for cattle farmers, the Culm was at the centre of a major outbreak of Foot and Mouth Disease (FMD) in 2001 and the ongoing Bovine Tuberculosis (TB) problem continues to see widespread livestock movement bans. Another more recent disease threatening cattle herds is Bovine Viral Diarrhoea, an infectious disease affecting the respiratory and reproductive systems in cattle, and combinations of these pressures have brought the sustainability of many herds into question.

The introduction of agri-environment schemes in the early 1990's together with improvements to Woodland Grant Schemes accelerated a shift in emphasis away from production for many less commercial farms, with a new source of income available for producing "environmental services". The Countryside Stewardship Scheme (CSS) was introduced to the Culm area in 1991 after campaigning for the Culm area to receive ESA (Environmentally Sensitive Area) status had failed. This was a life-line for many small farm businesses in the Culm, though being a competitive scheme, not all farms qualified and this mechanism was insufficient to address the array of difficulties faced by farmers. The scheme helped to arrest the further decline of Culm however. The broader reaching impacts of agri-environment schemes will be looked at in more detail later in the report.



Wildflower meadows take time and commitment to re-create, and ongoing support from DWT advisors has been a vital ingredient.

A new way of thinking for farmers

Changes to European agricultural policy had a marked effect on the viability of livestock farming in marginal areas such as the Culm. The decoupling of subsidy payments from production under CAP Reform in 2005 saw the introduction of the Single Payment Scheme (SPS), which produced a mixed response from farming businesses across the area. Some of the larger farms responded by expanding and intensifying their farm business to practice entirely market led farming whilst many of the smaller farms looked for niche markets for their produce, diversified into alternative farm based businesses or chose to leave the farming industry altogether. On the smaller farms this caused the widespread reduction of stocking levels and in some cases land became completely ungrazed or abandoned. Between 2000 and 2009 there was a decline in the number of all livestock with sheep numbers falling by 31%, pigs by 27% and cattle by 5% (DEFRA Agricultural Census 2010). The majority of this decline was due primarily to Foot and Mouth and other diseases but it was certainly accelerated by CAP reform.

The 2010 Exeter University Survey asked 279 farmers to what extent their farm business had been influenced by CAP reform since 2005. 74% replied that they had been influenced to some extent, 35% of those were heavily influenced by CAP. Only 23% reported not having been influenced at all by CAP reform.

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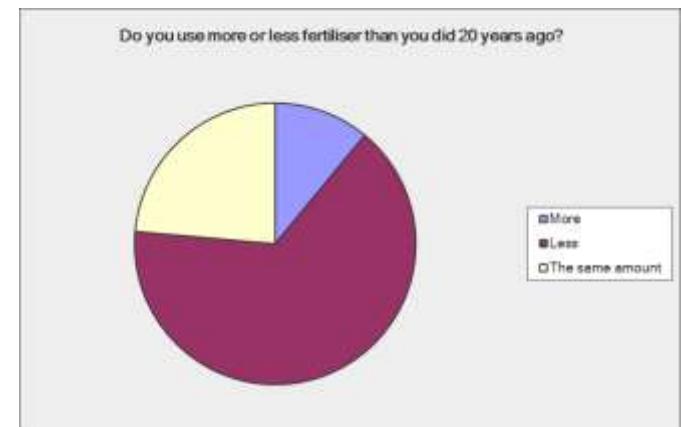
Today agriculture remains fundamental to the rural economy of the area and unusually for industries in the modern economy, small family farms still prevail. Livestock production continues to dominate agricultural production with 77% of the farmed area being grass or uncropped land (Natural England 2012). In 2002 permanent pasture accounted for 64% of the land cover in the Culm (Land Use Consultants 2002). Only relatively small areas of arable land are producing cereals in the south-east of the Culm NCA. In 2009 the DEFRA Agricultural Census records that only 8% of the total farmed area of the NCA was represented by cereals, in 2012 that figure had risen to 12% (Natural England 2012).

There has been a noticeable fall in the number of dairy farms over recent years confirmed by data from Exeter University. This was collected in 2006 and 2010 respectively from a sample of 179 farms, and shows a decline in dairy enterprises from 39% in 2006 to 28% in 2010. More significantly however- across the entire NCA during the period from 2000– 2009 there was a 40% decline (DEFRA Agricultural Census 2010). This decline can be attributed to various factors including localised problems with TB affecting the viability of dairy units, the high cost of labour in a very labour intensive industry, rising land prices affecting ability to expand and the low price paid to the farmer for milk decreasing profit margins. Many dairy farmers have turned to alternative beef and sheep or mixed enterprises and it's not surprising therefore that there was a rise in these enterprises from 36% of the sample in 2006 to 46% in 2010 and a rise in mixed farms from 10% to 23% during the same period (Exeter University). The number of dairy enterprises continues to fall today, verified by our DWT Culm landowner questionnaire distributed in February 2014. We asked landowners for their observations on how the landscape or farming community has changed over the last 20 years with one of the most frequent comments being the noticeable reduction or disappearance of dairy farms in their local area.

The 2014 questionnaire data below highlights the 11% of farmers who have expanded and intensified their business increasing their fertiliser use in the

Do you use more or less fertiliser than you did 20 years ago?

Answer Options	Response Percent	Response Count
More	11.0%	14
Less	65.4%	83
The same amount	23.6%	30
answered question	127	
skipped question	5	



process, whilst 89% have reduced their usage or only use the same amount. Many of the latter will be adhering to levels of fertiliser use prescribed in agri environment scheme options, making smarter use of fertilisers in line with current guidance, changing from intensive dairy to more extensive beef and sheep or simply unable to afford the higher fertiliser prices of recent years.

Although the predominant farming activity is livestock production the area supports a wide variety of farm types including mixed farms, cereals, horticultural, specialist pig and poultry farms, equine enterprises and also holdings with only grass and fodder crops for harvesting. Whilst dairy farms were in decline between 2000- 2009 there was a short lived sharp increase in the number of specialist pig farms, an increase of 49% in specialist poultry farms, cereal farms rose by 36%, horticulture by 19% and other types by 17% (DEFRA Agricultural Census 2010). These trends are testimony to the fact that farmers were forced to diversify into new enterprises and look for alternative ways to make a profit in response to changes in policy on government subsidy and due to the various pressures of disease outbreaks.

When Exeter University surveyed 179 farms in the Culm NCA in both 2006 and 2010 they recorded a 52% incidence of farm diversification activities on the sample farms. This was broken down into the percentage of

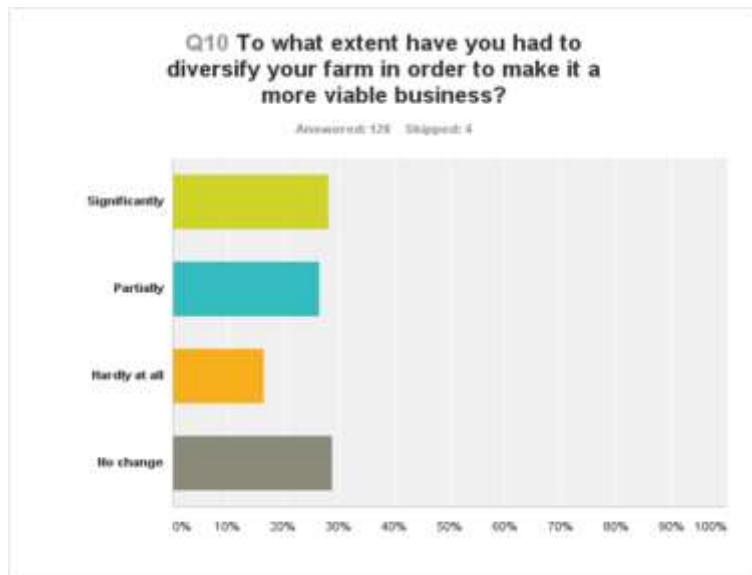
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farms who offered particular activities such as processing and retailing of farm produce (7%), tourist accommodation (25%), rents from non-tourism letting (30%), shooting (19%), fishing and nature trails (10%), rural crafts (1%), agricultural contracting/ consultancy (26%), equine services (7%), forestry (7%) and other miscellaneous activities (18%). There was a significant reduction in all of these enterprises by the time the survey was repeated in 2010, which can probably be best explained by the recession and by the market becoming flooded with similar, new businesses meaning that only the best could survive.

When questioned in 2014 about diversification, 55% of the respondents reported that they had diversified their businesses, which also correlates with the data above from Exeter University.

To what extent have you had to diversify your farm in order to make it a more viable business?

Answer Options	Response Percent	Response Count
Significantly	28.1%	36
Partially	26.6%	34
Hardly at all	16.4%	21
No change	28.9%	37
answered question	128	
skipped question	4	

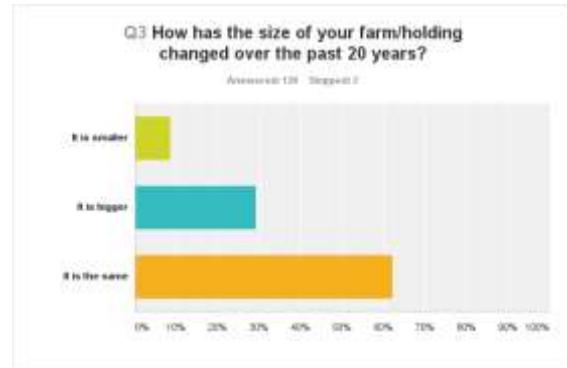


In 2012 farm units between 5 ha and 20 ha in size were the commonest in terms of number of holdings, covering 6% of the total farmed area in the NCA. Holdings between 20 ha and 50 ha are the second commonest covering 15% of the total farmed area and 51% of the total farmed area is represented by farms over 100 ha in size. During the period between 2000 and 2009 the number of holdings across most farm sizes fell, the most significant being among farms of 20ha to 50 ha which reduced by 14%. The trend of larger farms increasing in size also prevailed during this period with farms over 100ha increasing by 18% (Natural England 2012, DEFRA Agricultural Census 2010).

In our 2014 questionnaire 130 respondents gave the following response to how the size of their holding has changed over the past 20 years, which corresponds with the figures above. Given that 51% of the farmed area in the NCA is represented by farms over 100ha in size we would expect to see little change reported by over half of respondents. 29% reported an increase in the size of their holding which fits with the well recognised pattern of the larger farms increasing in size and intensity, whilst the smaller ones decrease in size or cease farming altogether.

How has the size of your farm/holding changed over the past 20 years?

Answer Options	Response Percent	Response Count
It is smaller	8.5%	11
It is bigger	29.2%	38
It is the same	62.3%	81
answered question	130	
skipped question	2	



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In terms of **farm ownership** in 2004 the “Land Between the Moors Report” showed that only 18% of the land was tenanted, the remaining 82% being owned, confirming an established pattern of small family farms, with a few larger estates, which have characterised the area for centuries. Around this time the same report claimed that three times more people were employed in farming in the Culm area than the European average. There was a decrease in owned land by 2010 with only 78% of the area owned whilst the tenanted area rose by 46%, perhaps a reflection of those farmers who were intensifying and increasing their land holding by taking on more rented land. Most farms continue to be run by owner farmers and their families though between 2000- 2009 there was a reduction in the number of owner farmers and an increase in salaried managers, due perhaps to non-farming folk taking on small farms and not having the knowledge to run the farm themselves. During this period the number of full time workers and casual workers has decreased and the number of part time workers has increased in line with all other areas of the UK. (DEFRA Agricultural Census 2010).

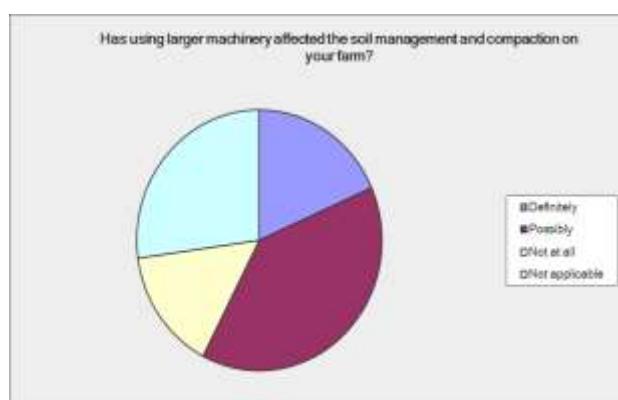
As part of the Exeter University survey of 279 farms in 2010, farmers were questioned about their plans for the next five years. A surprising 21% responded that they were planning to continue farming at an increased scale, 13% responded that they would continue farming with increased diversification, 33% planned to make no significant changes to their farming practice, 8% planned to reduce farming or increase off farm work, 21% planned to semi-retire from farming and a further 3% to retire completely from farming. These figures are broadly the same as when the survey asked the same questions in 2006 and the trends mentioned earlier in the text verify that farmers did actually carry out the changes to their farm businesses as projected.

Soil Health and Compaction

There have been great efforts made in recent years to increase farmer awareness of soil health and the impact this has not only on successful crop production but also the negative impacts on the environment. There is no doubt that machinery has got larger and heavier and particularly on those farms which have continued to intensify little attention has been paid over the years to soil compaction. We are now, throughout the course of our work in the Culm, seeing the effects of serious soil compaction problems, as flooding is compounded due to the increased run off from compacted soils and water courses suffer increased siltation. We asked landowners in our 2014 questionnaire whether they thought that using larger machinery had affected the soil compaction on their farm. A total of 58% responded that their soil had definitely or possibly been affected which at least shows a greater level of awareness of soil health.

Has using larger machinery affected the soil management and compaction on your farm?

Answer Options	Response Percent	Response Count
Definitely	18.4%	23
Possibly	39.2%	49
Not at all	15.2%	19
Not applicable	27.2%	34
<i>answered question</i>		125
<i>skipped question</i>		7



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Some Key Points on Farming Practices since 1990 on the nearby Somerset Levels and Moors

- Under ESA and SSSI management agreements cutting dates have been restricted to July and August, and grazing has been restricted to cattle (mainly) with stocking rate restrictions before July. These measures attempted to simulate the traditional practices of early grazing at low stocking rates which prevented nest trampling; and taking a late hay cut after the flowers had gone to seed in fields where no fertilisers were applied.
- Sheep grazing has only been permitted on improved pastures. Application of artificial fertiliser and silage making are largely restricted to improved grassland.
- On unimproved fields and Raised Water Level Areas (RWLAs) there was a ban on fertilisers to protect botanical interest. These fields are still cut for hay (often poor quality) rather than silage. Such fields have seen a steady decrease in grazing adding to the decrease in soil fertility. Many fields are now managed by contractors who often use very large and heavy equipment to cut and clear the hay, leading to soil compaction issues, and infestations of invasive species like soft rush (*Juncus effusus*).
- Cattle grazing is generally decreasing, but it is concentrated in fewer farms that have larger herds of beef or dairy animals. Some of the improved fields are indeed over-grazed while nearby unimproved fields are under-grazed, a pattern which is similar within the Culm NCA.
- Often herds are electric fenced because the farmer cannot employ enough staff to shepherd the animals throughout the day. Fenced off fields lead to the under-management of ditch edges, which become rank with woody vegetation. The purpose of the water-filled ditch is to act as a wet fence to keep the cattle in the field and to provide them with drinking water. The grazed ditch edge is a rich habitat for plants, invertebrates and birds. Ungrazed ditch edges are far less interesting or beneficial.
- A few farms have taken up funding schemes to change to rearing traditional native breeds of cattle, which produce better grazed swards (particularly on unimproved fields) favoured by breeding waders, and these farms can often attain a premium for the sale of their conservation-grade beef.

John Leece, FWAG SW, February 2014

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Socio-economic Impacts of change

The social, economic and emotional impacts of the recent economic downturn in farming and crises such as major outbreaks of disease, have led to severe stress amongst farming communities. Due to the previously discussed factors and the reduction in farm labour, farmers have also become increasingly isolated. As a result many farmers have left the industry, some retiring completely, others entering semi-retirement whilst perhaps developing alternative farm incomes and others have taken up completely different careers. The number of part time farmers and small businesses has increased significantly in recent years with a sharp increase in the number of holdings of 5ha or less during the 1990's.

Farming has become less and less attractive to the younger generation and the offspring of many farming families are not entering the industry to inject new energy and ideas. This is due in part to the unappealing economic situation in farming and the attraction of higher salaries and up-to-the-minute technology in the city. It is no longer cheap to live in rural areas and many young locals and farm workers have been forced to move outside of their home communities as they struggle to pay the high rents or secure scarce affordable housing in the countryside. In some areas second homes are left empty for a large proportion of the year depleting available housing further, creating ill feeling and to the detriment of the local economy and cohesive community relationships.

It is not surprising then that there has been a significant ageing of the farming population, with a sharp increase in the number of farmers over 55 in the last 20 years. In 2004 almost 40% of farmers were over 55 (Land Between the Moors report 2004) and according to data gathered by Exeter University in 2010 this has increased further to almost 59%.

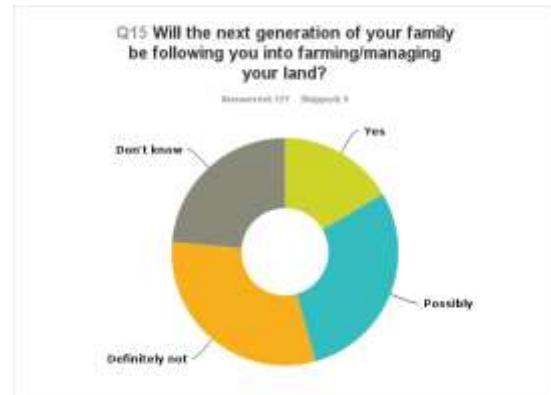


For those landowners without access to farm machinery, the DWT machinery ring has been a vital source of specialist support.

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Farmers were asked via our 2014 questionnaire if the next generation of their family will be following them into farming. Only 46% responded with a definite "yes" or "possibly" in contrast to 54% who said "definitely not" or didn't know, a reflection of the situation outlined above.

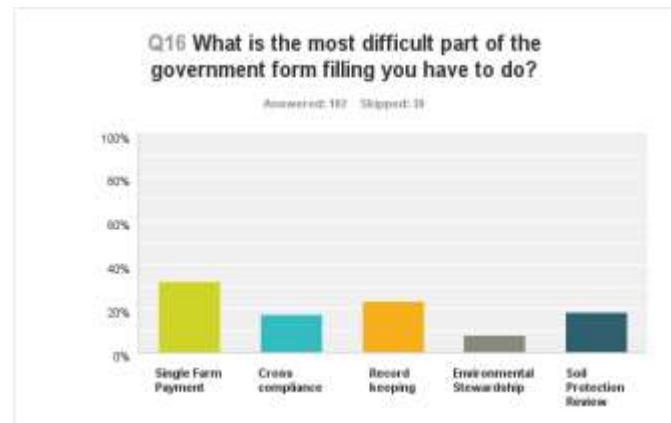
Will the next generation of your family be following you into farming/managing your land?		
Answer Options	Response Percent	Response Count
Yes	16.5%	21
Possibly	29.1%	37
Definitely not	30.7%	39
Don't know	23.6%	30
<i>answered question</i>	127	
<i>skipped question</i>	5	



As farms are sold and farmers retire, the land is often bought up by neighbouring farms and amalgamated into much larger, often more intensive holdings, leaving little opportunity for youngsters to set themselves up on a small acreage. The farmhouses are often bought, together with a few acres, by non-farming folk with careers elsewhere, and the land rented out as grass keep or converted into pony paddocks for personal use or for small equine businesses. Apart from the landscape impact this has naturally impacted upon the price of land and rural property and the sharp price rise has meant that it's an easier option for farmers to sell to incomers than to be creative about alternative farm incomes. Other small farms have been being left abandoned and unmanaged facing the likelihood of being auctioned off and the Culm grassland eventually improved. With the dispersal of old family farms comes not only the loss of community but also the loss of many years of accumulated local knowledge which cannot be replaced.

In our questionnaire many landowners freely commented that they found the paperwork they have to do these days a real burden on top of all the other pressures faced by farmers. When questioned specifically about which aspect of the government form filling they found most onerous, unsurprisingly 32% struggled most with the Single Farm Payment Scheme and 23% with just the general record keeping required by cross compliance. Cross compliance requires a soil protection review and that livestock movements and veterinary records are also kept. With less farm labour present on farms, farmers are doing more of the work themselves, working longer hours in isolation and the required levels of detailed paperwork are an unwelcome extra burden.

What is the most difficult part of the government form filling you have to do?		
Answer Options	Response Percent	Response Count
Single Farm Payment	32.4%	33
Cross compliance	17.6%	18
Record keeping	23.5%	24
Environmental Stewardship	7.8%	8
Soil Protection Review	18.6%	19
<i>answered question</i>	102	
<i>skipped question</i>	30	



Culm Grassland: An Assessment of Recent Historic Change

The Culm area has attracted many newcomers to villages and farms over the past thirty years and in some areas they make up nearly half of the land managers in an area. With this new blood, come new ideas and skills to contribute to the local economy and community, and often wealth from incomes generated outside of the Culm area. Whilst there are also disadvantages to their arrival, many are keen to implement measures for biodiversity into their land management. This is often good news for Culm grassland sites meaning that DWT advisers can work with the landowners to ensure suitable management on sites which may otherwise be lost.



Many newcomers to the area bring with them a desire, to improve the wildlife value of their land-holdings. In many cases their business model depends on it.

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Agri-environment Schemes

Overview of Schemes

Although parts of the Culm NCA fall within the North Devon and Cornwall Areas of Outstanding Natural Beauty (AONBs), the area doesn't have its own landscape designation. This means it has not benefited from overarching policies designed for the protection of this landscape in its entirety and despite the existence of various land management strategies for the Culm, the integration of activities towards common objectives has been difficult to achieve.

The Devon Wildlife Trust has campaigned to see the Culm's importance recognised since our joint DWT / NCC 1989 report highlighted just how important the landscape was, but how quickly it was being destroyed. In 1991 the Devon County Council (DCC) Environmental Land Management Scheme (ELMS) introduced a new category of payments to include Culm grasslands, and around the same time the Countryside Commission piloted their Countryside Stewardship Scheme (CSS) in the Culm. This 10 year voluntary scheme was aimed at providing targeted management options to protect vulnerable habitats and species. It was a competitive scheme, though in the early years it proved relatively easy for most medium sized Culm farms to get an agreement, and at the time was the best hope of affording some sort of protection to Culm grassland.

It was hoped that the Culm area may achieve Environmentally Sensitive Area (ESA) status when the new ESA's were designated in 1992, which would have afforded protection to the entire Culm grassland resource. It was however not accepted by the Ministry of Agriculture Fisheries and Food (MAFF) possibly due to the fragmented nature of the remaining habitat (Devon Culm Grassland- Project Officers Report 1992). Alongside these early agri-environment schemes, the Wildlife Enhancement Scheme (WES) offered agreements to Culm landowners on SSSI's and adjoining areas, and for sites on the fringes of Dartmoor National Park there were also management agreements available and for the scrub and woodland components of Culm the Woodland Grant Scheme could offer help.

In a relatively short period of time the Culm went from having no financial support to suddenly having a plethora of support mechanisms in place. The continued lack of a single, comprehensive scheme operating in the Culm and the speed at which support suddenly became available led to confusion about exactly what was available and which schemes were best suited to farmers, not helped by the conflicting rates of payment for different schemes. CSS closed to new applicants in 2004 and whilst existing agreements were allowed to run their course, with the final agreements ending in Autumn 2014, the new Environmental Stewardship (ES) scheme was launched by DEFRA in 2005. This consisted of two tiers of entry:

Entry Level Scheme (ELS), which was piloted in several areas in England from 2003; Tiverton in Devon being the pilot scheme for grassland options. This offered low level fixed payments to farmers across the whole farm, for basic management options which they could choose themselves and were not influenced by the expertise of an adviser.

Higher Level Stewardship (HLS) was the second tier, effectively replacing Countryside Stewardship, for those farmers willing to implement more demanding management options. The scheme operated on the same principle as CSS with target areas and particular habitats, species and features being the focus of individual agreements. HLS had the advantage of a wider range of options which could more easily be tailored to managing Culm, and with higher payment rates than CSS, there was more incentive for farmers to apply. However the scheme was highly targeted making it more difficult than ever to secure an agreement. HLS closed to new applications in Spring 2014, and a new scheme to replace it is currently in development.

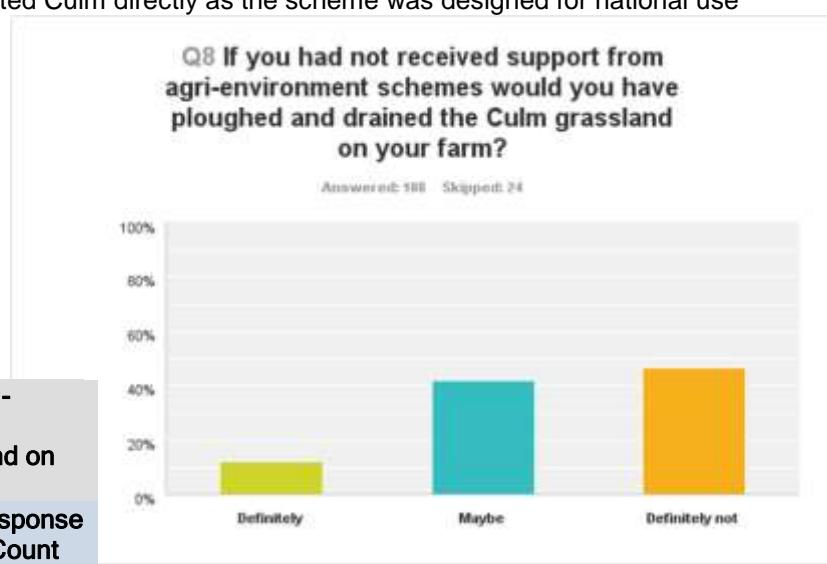
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Impact of the Schemes on Culm Grassland

The Countryside Stewardship Scheme (CSS) was a competitive scheme and not all farmers with good quality Culm were able to secure an agreement as they needed a variety of features of interest to qualify. It was also a voluntary scheme so not all farmers wished to apply meaning that plenty of Culm still remained unprotected. With farm incomes under pressure it was still worthwhile for some farmers to agriculturally improve those grassland that couldn't provide an economic return, and further losses did occur. Whilst CSS did slow the rate of loss of Culm it did little more than merely maintain the status quo in terms of the condition of much of the Culm under agreement.

CSS failed to provide options that benefited Culm directly as the scheme was designed for national use meaning that many of the options didn't quite fit the habitats and traditional farming methods of the Culm. The very early agreements had to include Culm in the Lowland Heath or Waterside Landscapes categories until a new category- 'old meadow and pasture' was introduced in 1992 specifically to include Culm grassland.

If you had not received support from agri-environment schemes would you have ploughed and drained the Culm grassland on your farm?		
Answer Options	Response Percent	Response Count
Definitely	12.0%	13
Maybe	41.7%	45
Definitely not	46.3%	50
<i>answered question</i>	108	
<i>skipped question</i>		24



Capital grants were available to fence previously unfenced sites and to install new water supplies, which was helpful for the reintroduction of grazing management. However payment levels fell far short of the actual cost of scrub control on such challenging sites and consequently most scrub control programmes barely scratched the surface in terms of addressing the extent of the existing scrub problem. A positive effect of returning these neglected culm sites to grazing management was the knock on effect on the demand for the local traditional breed of cattle, Ruby Reds, which are ideally suited to Culm sites.

However to highlight the important role that CSS played in arresting the loss of Culm grassland to agricultural improvement we asked Culm landowners in our 2014 questionnaire whether they would have ploughed and drained their Culm grassland in the absence of financial support from agri-environment schemes, and 54% replied that they may well have sacrificed their Culm.

New arable options were introduced to CSS in 2002 including winter stubbles and wild bird cover, which should have benefited all of the priority farmland birds in the Culm. By this time Culm grasslands were a target area for CSS within Devon but unfortunately the options were targeted at species that do not breed in the Culm. Therefore these options couldn't be used despite the obvious benefits to declining species such as the skylark and yellowhammer. Despite advice from the RSPB in 2002 during the agri-environment

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schemes review, this example is typical of many other instances where the rules set for a national scheme failed to deliver what is needed to protect vulnerable biodiversity at the local level.

The Countryside Stewardship Scheme was a relatively easy scheme for farmers to understand with clear maps and prescriptions and little paperwork. Most farmers managed to set up successful agreements without the help of an agent and due to the availability of help from Natural England advisers in the early scheme years it was straightforward to establish comprehensive capital works plans.

This was advantageous for hedgerows and CSS was very successful in bringing many neglected hedges back into a traditional management cycle. The grant payment rates were generous enough to encourage widespread uptake and for many years the scheme made a visible landscape difference in terms of hedgerow management in the Culm. Unfortunately tightening of NE budgets later on in the life of CSS saw hedgerow options become virtually unused in favour of more targeted management towards SSSI's and other priority habitats.

Entry Level Stewardship (ELS) options available for Culm grassland were restricted to low input grassland options which had limited value for important sites. In the Culm the hedgerow management and low input grassland options were straightforward for many farmers to achieve with little or no change to their existing management practices. Furthermore the 'broad brush' and inflexible options made it difficult to control problems like soft rush, or apply more tailored management for individual sites where necessary.

ELS did include arable, wild-bird and buffer strip options that could have potentially benefited target Culm bird and other species. However the lack of adviser input in setting up new agreements reduced the uptake of these options meaning that opportunities for environmental improvements over a wide landscape area were limited. The impact of additional environmental payments for no change in management, risks creating a culture where other schemes are assumed to be similar and no real change occurs.

Higher Level Stewardship (HLS) had more stringent entry requirements than CSS and was highly targeted. This scheme did require land-owners to significantly change their practices in many cases, and the role of advisors was absolutely key in ensuring this cultural change occurred, and management prescriptions were understood and followed. The role of DWT advisors in providing this 'care and maintenance' support was paramount, particularly when Natural England budgets and staff resources became more restricted in recent years.



In practice in the Culm, the minimum size of BAP habitat required to qualify means that many of the smaller sites were excluded from the scheme. This focus on larger and designated sites further fragmented the resource, as the small sites surrounding the larger Culm sites, become abandoned and invaded by scrub. ELS provided some incentive but it left many Culm sites vulnerable to agricultural improvement or a slow decline through inappropriate management.

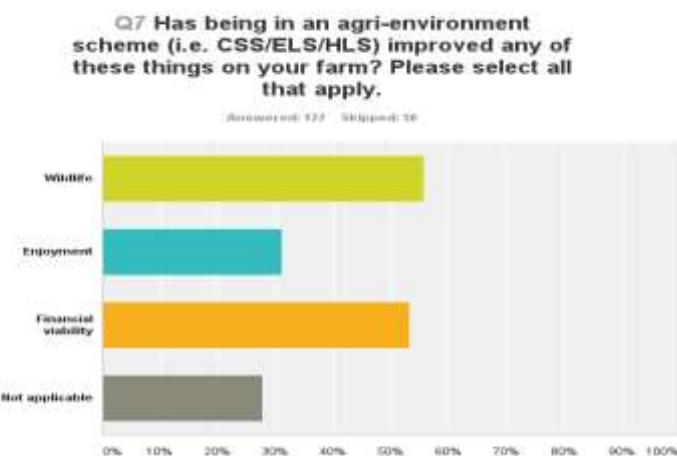
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One of the key lessons learned from all of these agri-environment schemes is the importance of ongoing support throughout. Increasingly limited staff resources within Natural England, and a focus on managing agreements remotely has left many well-meaning agreement holders without the support they need.

When things go wrong, which they will inevitably do in this situation, demoralised landowners are less likely to participate in further environmental projects on their holding. Advisers from Devon Wildlife Trust have played a key role in supporting farmers throughout their HLS agreements, with the aim of getting the best out of their Culm habitat and enabling them to continue to receive this important source of funding. The support that we have provided has also included some practical and logistical support through our grazing links and machinery ring work, and in some cases additional grant money for certain capital projects.

For those without a farming background, entering a scheme has given them useful guidance on how to farm for biodiversity and allowed them to enjoy the land with some element of financial support. For more commercial farmers, the schemes have often meant the difference between remaining viable or not. Many have been running their farming business more extensively as they near retirement and have also begun to appreciate the wildlife and wider value of their land now that the focus on production has eased. The additional income from agri-environment schemes has allowed them to do this.

We questioned landowners in our 2014 questionnaire on the impacts of being in an agri-environment scheme. The benefits are clearly demonstrated in the table below with wildlife and financial benefits rating highest. 31% responded that their enjoyment of the farm had increased, which ties in with the above theory of an ageing population of farmers who receive low levels of financial support to stay on the land.



Has being in an agri-environment scheme (i.e. CSS/ELS/HLS) improved any of these things on your farm? Please select all that apply.

Answer Options	Response Percent	Response Count
Wildlife	55.7%	68
Enjoyment	31.1%	38
Financial viability	53.3%	65
Not applicable	27.9%	34
<i>answered question</i>		122
<i>skipped question</i>		10

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In terms of the quality and condition of Culm habitat there has been much debate about whether participating in an agri-environment scheme has actually benefited the habitat or not, other than to prevent the further loss of sites. English Nature report 636 “*The Condition of Lowland BAP Priority Grasslands: Results from a 2005 Sample Survey of Non-Statutory Stands in England*” highlights some of the effects of agri-environment schemes on the condition of Purple Moor grass Rush Pasture BAP communities.

A strong link was established between the mandatory attributes used to measure condition and the presence of an agri-environment scheme. Pass rates increased from 14% on samples outside of an agreement to 27% on Culm sites within an agreement. Attributes such as area of rush cover, were better in the presence of a scheme. In the case of scrub it made no difference with or without the scheme and positive indicator species and herb species were better on samples within a scheme.

Culm failed on the assessment of vegetation height, due to the soft rush being too high, which suggests that while the area coverage of soft rush is better under scheme management it is perhaps not being managed on an annual basis giving rise to tall clumps of undermanaged invasive rush. This is also linked to issues with water logging and a relaxation in grazing (which may also be linked to reduced stocking levels in agri-environment schemes). Culm was in the poorest condition within Sites of Special Scientific Interest (SSSI's), where only 40 % were in favourable condition (English Nature 2005).

The results of this survey need careful interpretation. There is no way of knowing the condition of the grassland at the point of entering the scheme or how long the sample sites had been under the scheme management. The high pass rate of condition assessment could also be due to the better grassland sites having been entered into the schemes in the first place. Whilst the presence of an agri-environment scheme obviously had a positive effect on the condition of Culm in these sample sites, it is interesting to note the conclusion that the CSS scheme was unsuccessful at dealing with the scrub problem on Culm due to too little capital grant being available to encourage landowners to undertake the work.

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A comparison with Agri-environment Schemes on the Somerset Levels and Moors

- In 1987 the ESA scheme was introduced and SL&Ms was one of the first designated areas (29000ha – the ‘wider wetland’ below the 8m contour line). This scheme was part funded by EU and part by UK government and it paid farmers to manage their fields to conserve the area of wet grassland and benefit wildlife. It was a voluntary scheme, and not everyone joined because of restrictions on management, but many farmers were attracted by the high annual payments and considerable areas of arable production were converted back to permanent grassland in the wider wetland.
- In 1992 RWLAs were introduced into the ESA scheme in Somerset. Farmers going into RWLA agreement received a very high annual payment in return for having raised water levels maintained during winter and spring (to provide habitat for breeding waders and wintering waterfowl), and further restrictions on management, which meant a much shorter farming season than before. By 2004 there were 1400ha in RWLA agreement (12 separate areas) out of a total of 17300ha in all ESA agreements in SL&Ms (8% of total). By 2008 the figure had increased to 1600ha involving nearly 100 RWLA agreements.
- In 2005 the new ELS/HLS scheme was introduced to replace the old ESA schemes in England. In SL&Ms the last of the old ESA agreements will expire in 2014, while most of the ESA agreements have already been replaced, but the higher paying HLS agreements are now only offered to land within the SSSIs, to ensure the best wildlife sites are protected. A large area of the old ESA (outside of SSSIs) is only able to attract the lower ELS payments, and in these areas many farmers are starting to intensify their production once again to maintain their farm income after their ESA agreement has ended.
- The UK government set a target to have 95% of SSSIs in ‘favourable condition’ by 2010. In Somerset Natural England set conservation objectives for the recently established (1997) SPA/Ramsar site (those SSSIs important for wintering waterfowl) and the SSSIs (important for plants, birds, invertebrates). Requirements for habitat, land management and water were set out. These objectives and requirements helped steer the prescriptions of the new HLS agreements (to deliver favourable condition for the land), but also encouraged the Drainage Boards to draw up water level management plans for the areas around the SSSIs. The approved plans were funded by government in terms of paying for new infrastructure required to deliver favourable water level conditions for the SSSIs. It is a fact that the 95% target was met in 2010, but some of the water level infrastructure to deliver favourable hydrology is still being built today including new RWLAs.

John Leece, FWAG SW, February 2014

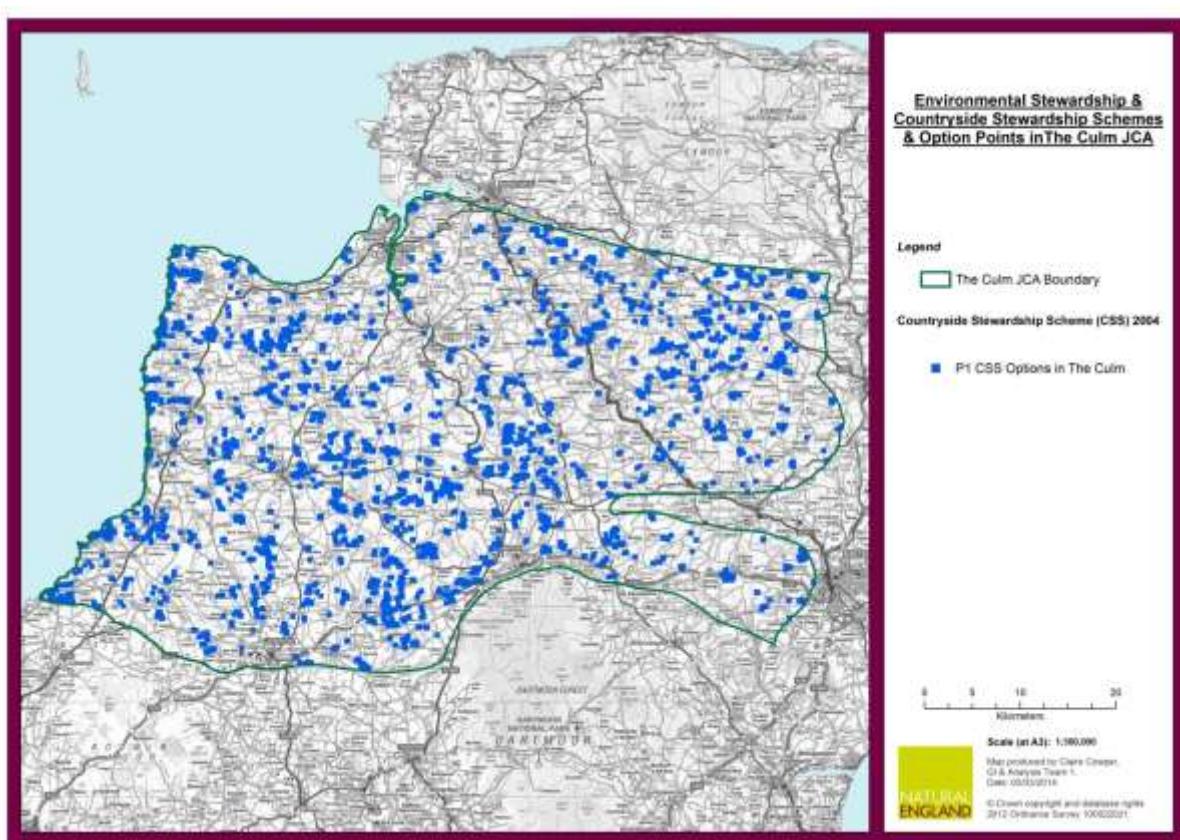
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An analysis of agri-environment scheme data provided by Natural England

We asked Natural England (NE) to provide us with some data to give a snap shot of the Culm habitats under management in 2004 under CSS and then again in 2013/14 under ES, to give us a comparison of the levels of environmental investment in the Culm NCA. We asked specifically for data on grassland options, orchard management options and hedgerow options.

Grassland options

Under Countryside Stewardship there were no specifically tailored options for Culm grassland meaning that most sites were entered into P1 grassland along with other species rich pasture or sites buffering species rich grassland. The maps for 2004 clearly show a healthy number of agreements with the P1 option and they were very evenly distributed across the Culm NCA, with the exception perhaps of the finger of land which extends out beyond Tedburn St. Mary towards Exeter. This reflects the high number of farms, including many of the smaller holdings with small areas of Culm, who were eligible to benefit from the CSS scheme. There was however only one P1 option to encompass all grassland situations and it was often used as a “catch all” for all grassland in need of protection for various reasons. The data provided by NE suggests that only 1,280 ha of grassland was under this option, which looking at the large number of sites plotted suggests a high number of small sites.



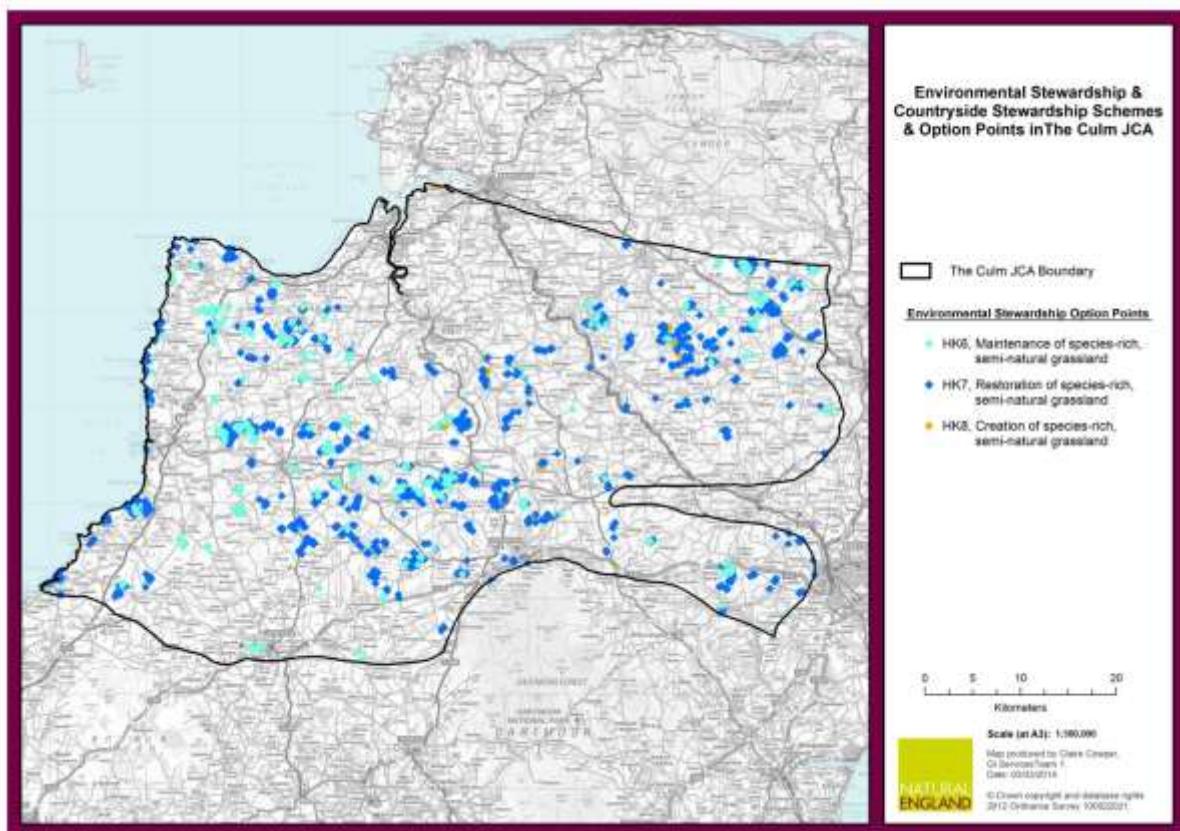
Uptake of Grassland options in 2004 CSS

Under HLS in 2013/2014 there are three main grassland options- HK6- Maintenance of species rich, semi-natural grassland, HK7- Restoration of species rich, semi-natural grassland and HK8- Creation of species rich, semi-natural grassland. The data from NE, even when all three options are plotted together on one map, shows a startling reduction in the total number of grassland options present in the NCA in 2013/2014

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and they are much more sparsely distributed across the NCA than CSS. There are some noticeable clusters where all three options appear together in concentrated small areas, suggesting that the HLS grassland options are more specifically targeted at prominent individual sites with larger areas of habitat and HLS special projects for restoration and creation.

HK8, the creation option, only occurs on 8 sites across the NCA likely to be the above mentioned larger HLS special projects. This option only covers 117 ha of land but will have attracted substantial capital funding to achieve their outcomes. CSS did not offer an option for grassland creation so we cannot make a direct comparison but in general there was less capital money available in CSS than in HLS. Under CSS land was converted from arable back to grassland using standard seed mixes but the diversity of existing swards was rarely enhanced through capital projects.



Uptake of grassland options in 2013/4 HLS agreements

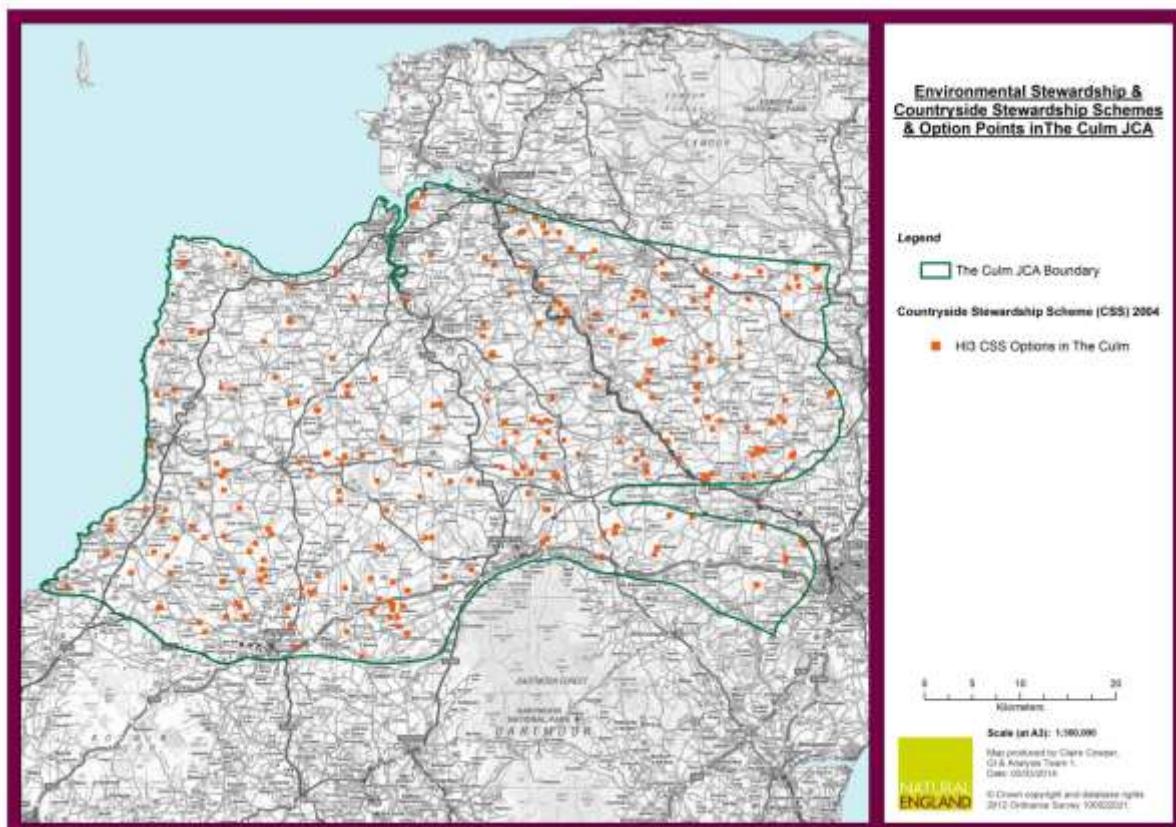
HK7, the restoration option, covered a larger area- a total of 2,615 ha but probably less in terms of total number of agreements. This reflects the highly targeted nature of HLS, focusing efforts on the larger, more prominent Culm sites and SSSI's, many of which did not improve under CSS management and were then scooped up into HLS.

HK6, maintenance option, covered 1,402 ha of land which was very unevenly distributed across the NCA. In some areas there are small clusters of this option and in others none at all, reflecting the difficulty that many farmers faced in gaining access to the scheme. Fewer agreements in between the larger areas of supported Culm only increased the problem of fragmentation of Culm sites, so detrimental to Culm species as for most farmers it would neither be a priority or viable to manage these sites without financial support.

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Orchard Options

Under CSS the option for Management of Traditional Orchards was HC13, which at the time of the NE data snapshot in 2004 was a very popular option, very evenly distributed across the NCA. There were problems in producing the area figures for this option though the distribution map below clearly shows the high number of orchards in a management option. There was generally an orchard management plan produced and capital works items were also available for orchard pruning, tree planting, guards etc .

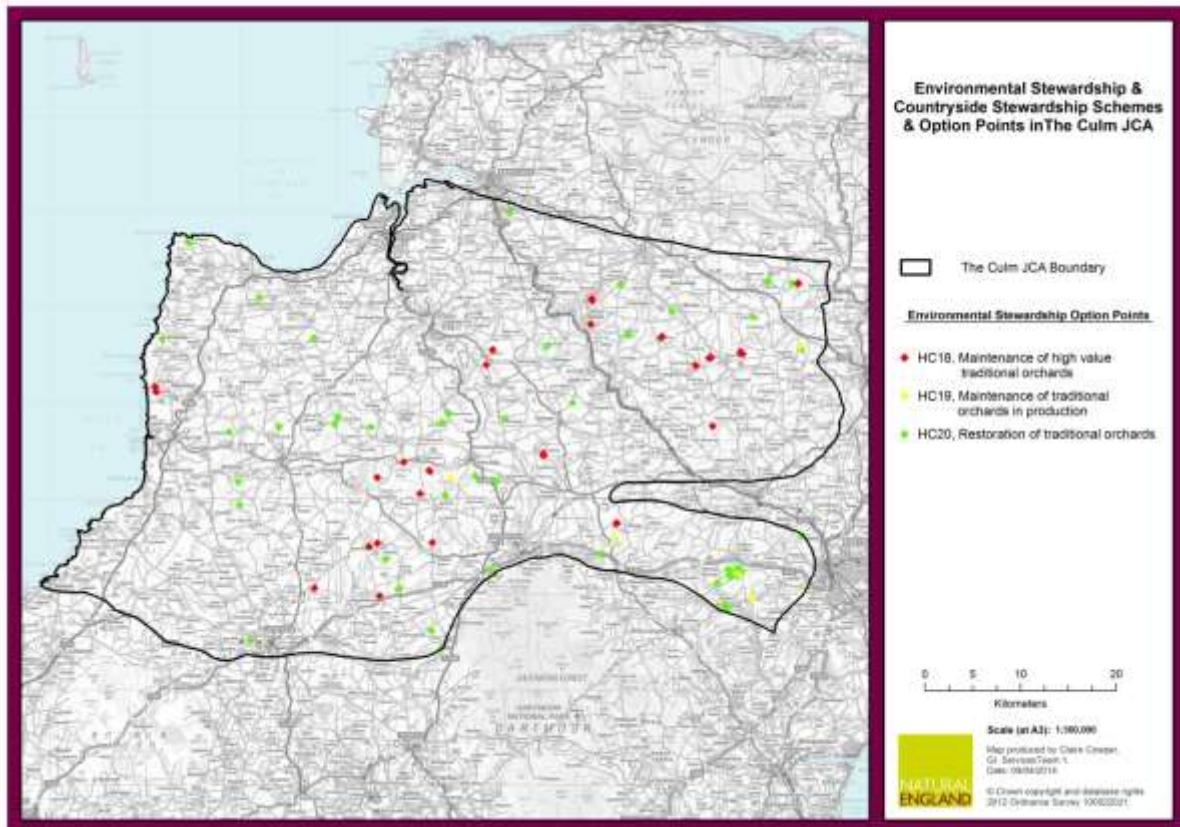


Uptake of Orchard options in 2004 CSS agreements

In 2013/14 the distribution map for HLS orchard options- HC18- Maintenance of High Value Traditional Orchards, HC19- Maintenance of Traditional Orchards in Production and HC20- Restoration of Traditional Orchards shows a sharp decline in the number of orchards in a management option, even when all three options are viewed on one map. There are only 6 agreements in HC19 amounting to 5.65 ha, though they are worthy of support due to the hefty losses of orchards and the decline in management of the remaining ones. However often these productive orchards rely on others nearby to work together perhaps forming small groups for labour sharing and to make it viable for the harvest to be collected for processing.

The distribution maps do not illustrate such proximity to other productive orchards in this management option though across all three options there are clusters of managed orchards, where people no doubt do work together in small cooperatives and labour sharing arrangements. There are comparatively few entered into HC20, the restoration tier, amounting to a total of 25.03 ha, though there are good payments for restoration works under the capital works plan. HLS has probably picked up those orchards which were entered into the CSS option but the work never completed, as was often the case. On the other hand the 14.75 ha entered into HC18, the maintenance tier, probably represents those who did restore their orchards in CSS and are now being paid to maintain them in HLS.

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Uptake of Orchard Options in 2013/4 HLS agreements

The lower number of orchards benefiting from a HLS option is consistent with the lower numbers of HLS agreements in general across the Culm NCA. For orchards this will have had a very negative impact and will no doubt have added to the losses of orchards already experienced over the last 20 years, as it is not likely that farmers will restore them without financial help. This has left producers isolated, orchards falling into neglect and will also impact upon the survival of local varieties of Devon fruit.

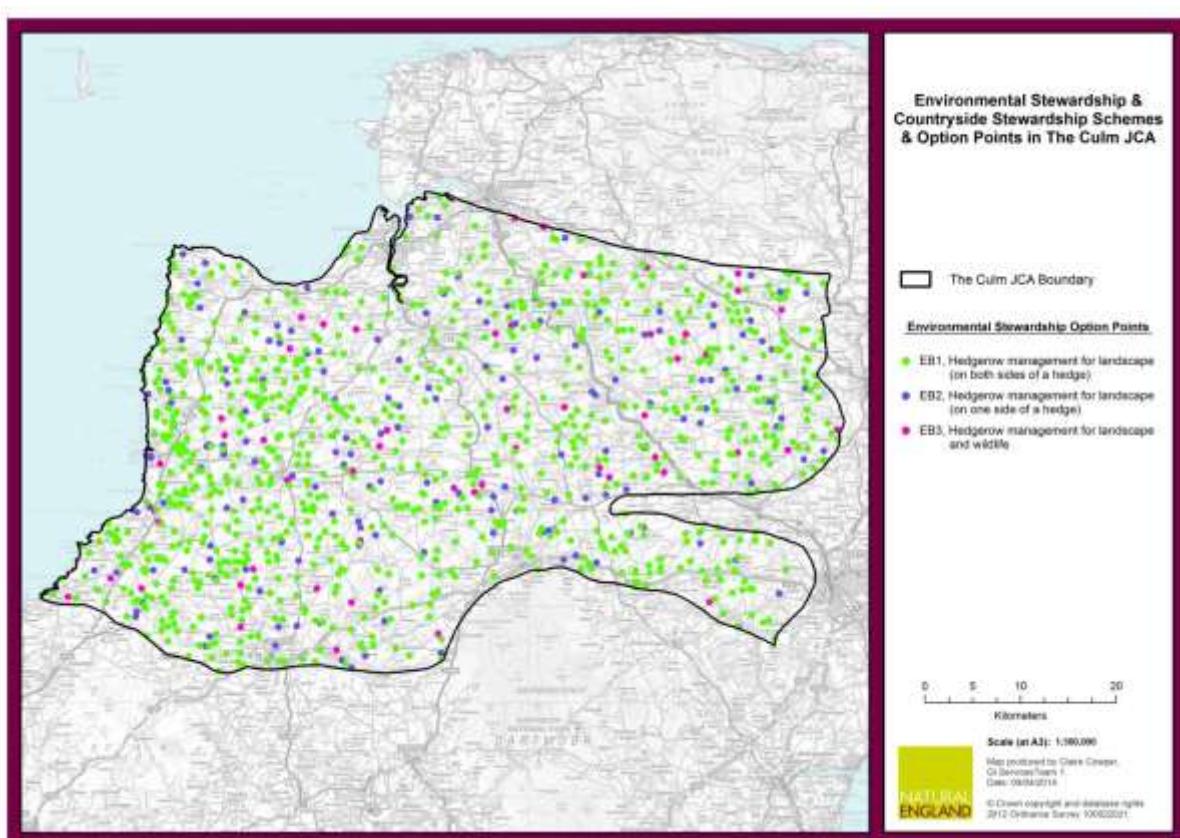
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Hedge Options

We obtained data from the ELS scheme on hedgerow options EB1, EB2 and EB3. These were chosen to get a feel for the coverage of hedgerow management across the NCA and do not reflect the very small number of hedges entered into the HLS options- HB11 and HB12- Management of Hedgerows of very high environmental value, which were not used very frequently in recent years due to budget cuts and highly targeted funding.

EB1- Hedgerow management for landscape on both sides of the hedge - is the most popular option with the widest coverage and an even distribution across the entire NCA, possibly slightly more dense in the West of the Culm. This ties in with the knowledge that when landowners are choosing the options to make up their ELS points, hedgerow options are widely chosen as an easy way of accumulating points without having to make changes to the management of the remainder of the farm. Hedges are cut every two years offering some level of environmental gain.

EB2- Hedgerow management for landscape on one side of the hedge - there is sparse coverage of this option though it is evenly distributed across the NCA. There are low points allocated for this option which is best suited to road hedges or boundary hedges where there is only management control of one side of the hedge. The distribution of EB1 and EB2 combined is very similar to the coverage of P1 grassland, suggesting that all the small CSS agreement that didn't qualify for HLS are now in ELS instead.



Uptake of hedge-row options in 2013/4 ELS agreements

There has been much debate over whether hedgerow management under ELS has provided valuable environmental gain. Trimming every two years instead of annually has helped though the minimum height

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set for the hedge of 1.5m has been of limited value due to the regional variation in hedgerows not being accounted for in the prescriptions. Hence hedges on tall Devon banks have still been cut too tightly.

EB3- Hedgerow management for landscape and Wildlife- had a very low uptake with a sparse but even coverage across the NCA. Whilst it's good to see that sympathetic hedge management is occurring outside of HLS the incentives in ELS are too small to make a difference at a Landscape scale.

In Countryside Stewardship hedges were not entered into a management option but were dealt with in comprehensive capital works plans for hedgerow restoration. Much good work was done and many hedges bought back into traditional management, which was not only good for livestock management, wildlife and for keeping traditional skills alive but also had a very positive effect on the local economy. The focus changed in HLS and not long into the scheme budgets were cut and targets became more narrowly focused meaning that there was no longer funding to continue the impressive hedge management achieved under CSS.



Ancient Devon hedge-banks are a significant landscape feature with hedge-laying the traditional way of managing them in a wildlife-friendly way.

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Conclusions

The timeless character of the Culm landscape has remained largely unchanged for many years, and the heavy, unproductive clay soils have ensured that the area has remained dominated by livestock farming. The last 20 years have however seen significant change socially, economically and ecologically.

Major changes to the economics of farming have been brought about by exposure to global markets, the rise of the supermarkets and the increasing reliance on ever more expensive fossil fuels. Many small farms have diversified or disappeared altogether as larger farmers have bought up the land and intensified their farm businesses. The social structures of local farming communities are changing too with a lack of young people to take on family business as they struggle to pay high prices for land and property.

Disease outbreaks such as Foot and Mouth have resulted in a reduction in the distribution of livestock across the Culm NCA and the appearance of wind and solar farms have all made their presence felt on the landscape.

These social and economic changes have dramatically impacted on the ecosystems of the Culm. Culm grassland is a vital component of the landscape and provides a wide variety of benefits, not least for traditional farming and the conservation of key wildlife species. However this remains a small and fragmented resource and although the greatest losses of Culm occurred between the 1950's and the late 1980's, it is still vulnerable to further losses today.

The intensification of the landscape has resulted in the gradual decline in many of the more natural features in the landscape, and the smaller pockets of Culm grassland and other natural features are no exception. With this, indicator species like breeding curlew, snipe and lapwing have all but disappeared.

However in the past 20 years, the threats caused by intensification have largely been replaced by neglect and abandonment leading to the loss of sites to rank vegetation, scrub and woodlands. Fragmentation is increasingly recognised as a major threat to our wildlife, and much is known about the risks of increasing isolation to butterflies like the marsh fritillary, a species so characteristic of the Culm.

Devon Wildlife Trust has been working in the area for over 20 years now and has been able to tackle many of these issues. We have seen all of the largest blocks of habitat designated as SSSI or CWS, and many are now covered by agri-environment payments. DWT also owns a significant number of Culm grassland reserves including the showcase reserves like Dunsdon NNR and Knowstone Moor.

The role of agri-environment schemes in protecting and managing many sites shouldn't be underestimated. However twenty years of schemes have failed to reverse the decline of species like the curlew and lapwing and many small pockets of Culm have missed out on protection or support, leaving them vulnerable to improvement or scrub invasion, further exacerbating the problem of habitat fragmentation. Any gaps in funding such as in transition from CSS to the more stringent requirements of HLS and now in transition to the new schemes currently being developed, pose a serious threat to Culm habitat - still considered economically unviable in the absence of funding support by farmers struggling to make a living from marginal farmland.

The DWT advisory service currently made up of around 10 staff in both the Working Wetlands and Nature Improvement Area Projects have promoted and implemented the various agri-environment schemes hard over the last 20 years. This has had a huge impact on the ground, and in the last 7 years alone we have restored over 3,600ha of wet grassland habitat, and over 400kms of hedgerow have had their management improved. We have also re-created 350ha of habitat, much of it from totally different land-uses such as conifer plantation, and there is huge potential to recreate Culm on a truly landscape scale.

Possibly the greatest opportunities exist through the further development of the Payment for Ecosystem services. Much work is currently being undertaken by DWT with Exeter University and the Environment Agency to quantify the water and carbon storage benefits provided by these Culm grasslands.

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The South West Water Upstream Thinking Programme is supporting the Working Wetlands project to implement habitat improvements in the upper river catchments to store and clean water in these wetlands.

The next phase of this exciting project begins in 2015 and it is hoped that this work will continue to provide the resources to protect and expand the resource in strategically important headwaters in the upper Tamar and Exe catchments. The flood relief and drought mitigation benefits of these headwater wetlands will become even more significant as climate change brings more extreme and changeable conditions.

Climate change remains the greatest potential threat to the landscape over the coming decades, although the detailed impacts remain unclear. As farming has become more intensive, it becomes more vulnerable to changeable weather. A few years of extreme dry or wet conditions could push many farms to the edge of viability, and this combined with a greater reliance on fossil fuels makes climate change a huge potential threat to the area.

In the short term the carbon sequestration and water storage benefits may help to mitigate this, and there are certainly opportunities to diversify around these developing concepts.

The threat of further agricultural improvement is ever present as the farming community respond to the government incentives of the time. Any loss of funding, however temporary, poses a real threat as does government failure to recognise Culm grassland as a priority, and its species worthy of careful targeting in the new schemes. Without proper recognition of the Culm as an endangered and very vulnerable landscape and without meaningful financial support for farmers the future integrity of the Culm landscape will continue to hang in the balance.

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Appendices

Appendix 1 - Changes in farming and the landscape over 20 years – questionnaire

This survey of residents and farmers of the Culm is being carried out as part of a project called the Value of Working Wetlands. A number of different regions of England and France are being studied and the information will then be compared so that we can develop a picture of some of the changes that are happening to the countryside.

You can also complete this questionnaire on-line at https://www.surveymonkey.com/s/DWT_farming

1. How have the grazing levels on your farm changed in the last 20 years? (circle one)

Higher Lower Same

2. Do you use more or less fertiliser than you did 20 years ago? (circle one)

More Less Same

3. How has the size of your farm/ holding changed over the past 20 years? Is it

Bigger Smaller Same

4. Have you drained any of your Culm grassland fields over the past 20 years?

Yes No Not applicable

If yes, was it to improve the quality of the **pasture or other purpose? (circle one)**

If other purpose ?

5. What difference have you noticed in the amount of rush on your Culm grassland fields? Is there

More Less Same Not applicable

6. Has being in an agri-environment scheme (ie.CSS/ ELS/ HLS) improved any of these things on your farm? (circle more than one if applicable)

Wildlife Enjoyment Financial viability Not applicable

7. If you had not received support from agri-environment schemes would you have ploughed and drained the Culm grassland on your farm? (circle one)

Definitely Maybe Definitely not

8. What are the main changes you have noticed in your farming community over the past 20 years?

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9. To what extent have you had to diversify your farm in order to make it a more viable business? (circle one)

Significantly Partially Hardly at all No change

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10. Has using larger machinery affected the soil management and compaction on your farm? (circle one)

Possibly Definitely Not at all Not applicable

11. Have you carried out any management to your farm woodland over the past 20 years? (circle one)

Frequently Occasionally Never Not applicable

12. What changes have you noticed in the number of wildflower species in your Culm grassland fields

More Less Same Not applicable

13. How would you define the change in number of breeding waders (eg curlew, snipe, lapwing) on your farm over the last 20 years? (circle one)

Many less Slightly less Disappeared Slightly more Many more Don't know

14. Will the next generation of your family be following you into farming/ managing your land? (circle one)

Yes Possibly Definitely not Don't know

15. What is the most difficult part of the government form filling you have to do? (circle one)

Single Farm Payment Cross compliance Record keeping Environmental Stewardship

Soil Protection Review

16. Please tell us which parish you live in

Please add any further detail about any of the questions above, or any other observations that you would like to make about the way the landscape and community has changed over the last 20 years.

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.....

We may use your answers in our reports or publications. If you would like us to credit you, please tell us your name and village here

.....

Thank you from the Working Wetlands team!



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Appendix 2.

A summary of changes in farming and management practices in Somerset Levels & Moors in last 20+ years, including changes in cutting and grazing practices, and effects on breeding bird numbers.

Background History

- The early draining of the Somerset Levels was part of a fundamental process that occurred throughout the medieval and later centuries in Europe of reclaiming the waste lands. During the medieval period the Christian church established monasteries and abbeys on the several islands in the marshy wetlands and huge ecclesiastical estates developed. It was these estates which first organised work to embank and reroute rivers (eg. River Tone work at Athelney in 1375) in order to 'tame the floods' and drain their wetlands for farming. This restoration work brought increased prosperity to the area. After the dissolution of the church estates in the 17th century, the Crown became the largest land owner in the region and further drainage improvements were undertaken. However, the piecemeal reclamation of moorland blocks were only nibbles at the edge of the problem of flooding in the Levels. The central core of the problem of unsatisfactory main river channels and outfalls, complicated by tidal entry and siltation remained untouched. The Crown removed its sponsorship of draining following the Civil War (local people had fought on the losing side), and little progress was made for another 130 years. From 1770 there was an upsurge in draining activity associated with the general improvement in agriculture throughout Britain. The economic conditions were favourable for the reclamation of the remaining moors. Comprehensive drainage schemes were started. New main drains were dug and tidal sluices built (eg Kings Sedgemoor Drain and Dunball Clyse in 1796). The moors in the Parrett catchment still lacked a comprehensive drainage plan. Moors were drained separately (eg West Sedgemoor in 1816 and West Moor in 1833). All areas still relied on gravity drainage to evacuate flood water. 8 Pumping stations, powered by steam engines, were built from 1830 to 1869 (first one at Westonzoyland) to lift surplus water out of the moors and into the embanked river channels. Newly drained moors became covered in grasses, the amount of grazing land increased, the quality of the grass improved, and the length of the grazing season increased. The value of the moors rose significantly.

The Post-war Years

- After 1945, government funding enabled much of the SL&Ms to become better drained with the building of new pumping stations and new watercourses. The drained land was improved for agriculture and much of the land was ploughed and reseeded to increase production. This was very successful and by 1970's there was a perceived loss of wetland habitats and species. Many small farms were slowly being replaced by fewer, larger and more intensive farms, specialising in dairy, beef or arable production.
- In 1981 the new Wildlife and Countryside Act enabled areas still rich in wildlife to be designated by UK government as SSSIs. In SL&Ms there are now 12 designated SSSIs where management is restricted to protect wetland flora and fauna (area of wet grassland SSSIs in Somerset is 6500ha).
- In 1987 the ESA scheme was introduced and SL&Ms was one of the first designated areas (29000ha – the 'wider wetland' below the 8m contour line). This scheme was part funded by EU and part by UK government and it paid farmers to manage their fields to conserve the area of wet grassland and benefit wildlife. It was a voluntary scheme, and not everyone joined because of restrictions on management, but many farmers were attracted by the high annual payments and considerable areas of arable production were converted back to permanent grassland in the wider wetland.
- In 1992 RWLAs were introduced into the ESA scheme in Somerset. Farmers going into RWLA agreement received a very high annual payment in return for having raised water levels maintained during winter and spring (to provide habitat for breeding waders and wintering waterfowl), and further

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restrictions on management, which meant a much shorter farming season than before. By 2004 there were 1400ha in RWLA agreement (12 separate areas) out of a total of 17300ha in all ESA agreements in SL&Ms (8% of total). By 2008 the figure had increased to 1600ha involving nearly 100 RWLA agreements.

- In 2005 the new ELS/HLS scheme was introduced to replace the old ESA schemes in England. In SL&Ms the last of the old ESA agreements will expire in 2014, while most of the ESA agreements have already been replaced, but the higher paying HLS agreements are now only offered to land within the SSSIs, to ensure the best wildlife sites are protected. A large area of the old ESA (outside of SSSIs) is only able to attract the lower ELS payments, and in these areas many farmers are starting to intensify their production once again to maintain their farm income after their ESA agreement has ended.
- The UK government set a target to have 95% of SSSIs in 'favourable condition' by 2010. In Somerset Natural England set conservation objectives for the recently established (1997) SPA/Ramsar site (those SSSIs important for wintering waterfowl) and the SSSIs (important for plants, birds, invertebrates). Requirements for habitat, land management and water were set out. These objectives and requirements helped steer the prescriptions of the new HLS agreements (to deliver favourable condition for the land), but also encouraged the Drainage Boards to draw up water level management plans for the areas around the SSSIs. The approved plans were funded by government in terms of paying for new infrastructure required to deliver favourable water level conditions for the SSSIs. It is a fact that the 95% target was met in 2010, but some of the water level infrastructure to deliver favourable hydrology is still being built today including new RWLAs.

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A male reed bunting



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